Traffic Stop Data Analysis Study: Year 2 Final Report

Prepared for the Arizona Department of Public Safety

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OVERVIEW

In November 1979, the Arizona Department of Public Safety (DPS) enacted its first Bureau Order prohibiting the use of race or ethnicity as a predictor of criminal activity or as a factor for stopping, detaining or searching vehicles traversing Arizona's roadways. In November 1999, the DPS enacted its first General Order addressing the issue of racial profiling. The General Order entitled "Racial or Ethnic Profiling in Traffic Enforcement" renewed DPS' commitment to unbiased policing, and clarified the only circumstances in which officers can consider race/ethnicity when making law enforcement decisions.

In January 2003, DPS began voluntarily collecting data regarding traffic and pedestrian stops. In 2006, as part of a settlement agreement in a class-action lawsuit, DPS agreed to conduct a comprehensive evaluation of stop data being collected by Officers. The DPS contracted with Dr. Robin Engel and the University of Cincinnati Policing Institute to conduct this analysis over a three year period. In November 2007, the UCPI research team released its first of several reports: *Traffic Stop Data Analysis Study: Year 1 Final Report,* which analyzed data from officer-initiated traffic stops between January 1, 2006 and December 31, 2006 and offered data collection, training, and policy recommendations to the DPS based on the findings.

Based on these findings and recommendations, the DPS made numerous and widespread improvements to the data collection and training procedures related to the Traffic Stop Data Analysis Study. Specifically, the DPS took the following actions:

1. The findings from the *Year 1 Final Report* were made publicly available and the entire document was posted on the DPS website (http://www.azdps.gov/agreement/agreement.asp).

2. The DPS Executive Staff as well as other supervisory and management personnel across the department were advised of the statistical findings relevant to their areas during presentations by Dr. Engel, and were also informed of the UCPI research team's recommendations based on the research.

3. The DPS explored options for a more effective and efficient method of data collection, and ultimately decided on an electronic data system. The new system was developed in direct consultation with the UCPI team and pilot-tested by officers and supervisors. The DPS voluntarily added and made revisions to a number of data fields recommended by the UCPI research team that may shed some light on alternative explanations for currently reported racial/ethnic disparities. The use of the redesigned electronic data collection form department-wide began October 1, 2008.

4. The electronic capture of these data is a dramatic improvement over the use of scannable forms for validity, accuracy and consistency. Specifically, it will eliminate logical inconsistencies and missing data due to the inclusion of error checks/validation tests prior to the submission of data. The accuracy and consistency

of the data should also be improved by the presence of a help menu option for each of the included data fields, which provides immediate access to the established department training guidelines for filling out individual data fields. The development of the new electronic data collection system also allows the DPS to institute quality assurance measures to ensure DPS Officers are completing the data collection form for every contact.

5. Prior to the implementation of the new electronic data collection, all officers viewed a video training program developed to ensure accuracy and consistency across the state with data collection. Specifically, officers were reminded of the background of this data collection effort and the department's commitment against bias-based policing, and instructed on the proper procedures needed to utilize the new software and complete the redesigned data collection form.

The current report documents the findings from statistical analyses of data collected during all officer-initiated traffic stops conducted by the Arizona Department of Public Safety from January 1, 2007 through December 31, 2007, which represent the second year of data analysis for the *Traffic Stop Data Analysis Study*. As noted throughout this report, it is impossible with these data to determine the motivating factors behind traffic stops conducted by individual DPS officers. Rather, this data collection effort and subsequent data analyses can only examine patterns and trends in traffic stops and post-stop outcomes to determine if racial disparities exist after considering a host of additional legal and extralegal factors that might influence officer decision making. While it cannot be determined if DPS officers are engaging in the behavior commonly referred to as "racial profiling," analyses can demonstrate if patterns of racial disparities exist in stop and post-stop outcomes that warrant further scrutiny.

This Executive Summary provides a brief description of the data collected, the analyses conducted, and the major findings included within this report. The findings from this report can be generally examined as three separate, but related issues: 1) the initial stopping decision, 2) post-stop outcomes received by motorists (e.g., warnings, repair orders, citations, arrests, and searches), and 3) specific examinations of searches and seizures. Regarding the initial stopping decision, no department-wide conclusions can be drawn regarding whether racial/ethnic disparities in stopping behavior exist. Regarding post-stop outcomes, it is the conclusion of this report that, even after controlling for other explanatory factors, racial/ethnic disparities exist for warnings, repair orders, citations, arrests, and searches. The levels of unexplained racial/ethnic disparities are greatest for the most intrusive outcomes – arrests and searches. Further analyses of searches and seizures illustrate that although Hispanic, Black, and Native American drivers are significantly more likely to be searched compared to Whites, Hispanics (and to a lesser degree Native Americans) are significantly less likely than Whites to be found in possession of contraband. Following the review of findings, the UCPI research team's recommendations related to data collection, policy and training for DPS consideration are summarized.

DATA AUDIT

Data "auditing" is an important oversight mechanism to maintain data quality and integrity. To assess the current status of the DPS data collection process, the UC research team conducted a two-phase data audit to assess the validity of the 2007 data. Phase 1 of the Year 1 Data Audit involved a manual comparison of 1,000 paper copies of traffic stop forms with information in the electronic database to determine the extent of errors due to the data transfer process. Of the sampled forms, 26.5% had at least one field with an error where the scan form simply did not match the electronic copy. Given the known inconsistencies in the data from the 2006 data review, and that no changes in the data collection system were made prior to the collection of 2007 data, there is no reason to believe the 2007 data analyzed in this report are any more reliable or valid compared to those reported in 2006. Therefore, the same type of data audit was not necessary for 2007 data.

Phase 1 of the 2007 data audit assesses the missing data and logical inconsistencies within the electronic data for all traffic stops conducted by DPS officers from January 1, 2007 – December 31, 2007. An overall error rate was created based on the rate of missing data (i.e., no information entered by the officer) and logical inconsistencies within the data (i.e., fields with missing and/or incorrect entries that contradict other fields). The overall error rate calculated for Phase 1 of the data audit is 10.4%.

Phase 2 of the data audit examines the data accuracy by comparing the content of the electronic data to other independent sources of information and addressing the question of whether all stops recorded in external sources of information are represented in the electronic data. This type of audit determines the extent to which officers are completing data collection forms for all stops. Discussions with DPS personnel determined that the most appropriate comparison data for comparison purposes were officers' activity logs. The results of this analysis indicate that in 11 of the 19 districts/shifts, there were greater numbers of stops in the activity logs compared to the electronic data set, while in the other 8 districts/shifts, there were greater numbers of stops in the electronic data set compared to the activity logs. The Police Executive Research Forum (Fridell, 2004, 54) suggests that "correspondence of 90 percent or more between the two sources of information is quite acceptable." Using this standard, the results of this audit are positive. All nineteen of the districts/shifts fall within the parameter of 10% error in either dataset, with nearly half of the districts/shifts demonstrating a difference of 1% or less between the two datasets.

In addition to the availability of the activity log data, additional comparison data are available for contacts in which a citation or warning was issued. Unfortunately, these comparisons suggested two widespread types of inconsistencies that question the validity of the traffic stop data. In some cases, a citation or warning in the violation file was not accompanied by information in the stop data. Conversely, in other cases, citations and warnings in the original stop data that did not have corresponding violation information in the violation data file. These discrepancies in the data indicate that the DPS data collection and analysis study needs to focus on improving data accuracy to ensure that recommendations regarding policy and training changes are made based on the highest quality data possible.

The Police Executive Research Forum recommends less than a 10% error rate for traffic stop data (Fridell, 2004). Our research team recommends a more stringent standard of under 5%, with a goal of 2% missing/incorrect data. This analysis produced an error rate of 10.4% based on the fields listed in Table 2.1. While this is an improvement from the Year 1 error rate of 14.1%, it still indicates a need for steps to be taken to reduce the overall error rate. Furthermore, although comparisons between electronic stop data and activity logs indicate officers are generally recording information on the traffic stop forms when required, additional analyses examining the citation and warning violation data uncovered large discrepancies between violation data and traffic stop data. The reasons for these inconsistencies across data sources are unknown.

Based on similar findings in Year 1, the UCPI research team made a number of recommendations designed to reduce data collection errors, including strategies that have been effective in other departments in improving data quality (see Engel et al., 2004, 2005; Engel, Frank, Tillyer & Klahm, 2006). As described above, the DPS has taken significant action on these recommendations and the UCPI team is optimistic that data quality will be enhanced by the DPS's actions. Because the data utilized to conduct this year's data audit were collected prior to these changes by the DPS, the UCPI team will await results from analyses of the 2008 data before determining whether further recommendations are necessary.

THE INITIAL STOP

During 2007 there were 485,183 valid member-initiated traffic stops recorded by DPS Officers. Department-wide, approximately 61.3% of the drivers stopped were White, while 25.4% were Hispanic, 5.2% Native American, 4.8% Black and 3.3% Other (Asian, Middle Eastern, other or unknown). The rate of stops for particular racial and ethnic groups varied dramatically across divisions, bureaus, districts/shifts, and counties. Some variation, however, is to be expected given residential patterns related to race/ethnicity, along with racial/ethnic differences in travel patterns on interstates, highways, and major thoroughfares. The percentages of drivers stopped within particular racial/ethnic categories are extremely similar to those reported in the Year 1 Report.

The crux of interpreting data regarding officers' initial decisions to conduct a traffic stop is dependent upon comparison data. That is, a racial/ethnic group's representation in traffic stops is only meaningful when compared to the same group's "expected" representation in traffic stops given no officer bias. Estimates of minority groups' expected representation in traffic stops given no officer bias are based on alternative data other than the traffic stop data collected by officers – referred to as a benchmark. Unfortunately, all available external benchmarks have severe limitations that restrict the level of confidence in the results of comparisons to traffic stop data. Internal benchmarking – which compares the racial/ethnic breakdown of traffic stops across officers assigned to the same location, assignment and shift – is also not feasible with these data given the size and deployment patterns of DPS that leads to small number of officers that have such similarities. In addition, internal comparisons through trend analysis are not advisable based on the data quality issues with previous years

of DPS traffic stop data. Given these limitations, no statistically valid analyses of the initial traffic stop decision are available. Therefore, department-wide conclusions cannot be drawn regarding whether racial/ethnic disparities in stopping behavior exist. Instead, this report focuses on whether racial/ethnic disparities exist for traffic stop outcomes.

TRAFFIC STOP OUTCOMES

Citations were the most frequent stop outcome for drivers in 2007 (45.2% of all stopped drivers received at least one citation). In addition, 41.3% of drivers stopped were issued at least one warning, while 15.3% were issued repair orders. Slightly more than 5% of drivers were issued DVERs. Stops resulting in field interviews and tribal orders were statistically infrequent events across the department, and were not examined in detail within this report. Occurring rarely were the most serious stop outcomes – specifically, arrests (2.5% of drivers stopped), warrant arrests (0.5%), and searches of the drivers, occupants, or vehicles (5.0% of the stops; note that this percentage includes searches conducted for mandatory reasons including vehicle inventories and searches incident to arrest).

Analyses of post-stop outcomes are an important consideration of any data collection effort because the potential exists for differential treatment based on the drivers' characteristics *after* the initial stop has been made. Bivariate and multivariate analyses of post-stop outcomes examined racial/ethnic differences in warnings, repair orders, citations, arrests, searches, and seizures of contraband.

Bivariate Analyses:

Initially, bivariate analyses demonstrated that, across the department, post-stop outcomes differed across racial/ethnic groups. As illustrated in Figure 1, racial/ethnic differences were reported for the most severe outcome received. Specifically, Hispanics were significantly less likely than other racial/ethnic groups to have a warning be the most severe outcome received. Hispanics and Native Americans were significantly more likely than Whites and Blacks to have repair orders or DVERs as the most severe outcome received. Hispanics and Blacks were significantly more likely than Whites and Native Americans to have a citation as the most severe outcome received. Finally, for the most severe outcome—arrest—Hispanics, Native Americans, and Blacks were all significantly more likely than Whites to have arrest as the most serious outcome received.

Figure 1: Racial/Ethnic Differences in Most Severe Outcome Received
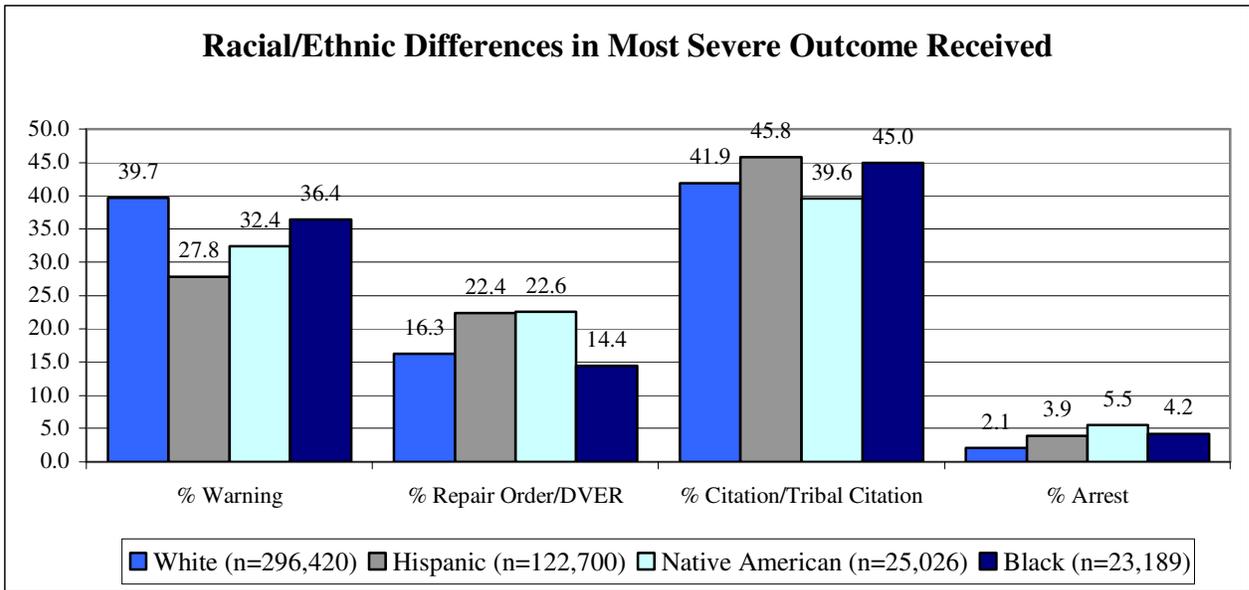
In addition, racial/ethnic differences were found across all outcomes (regardless of the most severe). Measures include whether or not any outcome was received, regardless of its severity compared to other outcomes during the same stop. As illustrated by Figure 2, at the department level, Hispanic drivers were the least likely to be issued warnings, Native Americans were the most likely to be issued repair orders, Hispanics and Blacks received the highest percentages of citations, and Hispanic, Native American and Black drivers were all significantly more likely than White drivers to be arrested and searched.

Figure 2: Racial/Ethnic Differences in Stop Outcome Received

Statistically significant differences in the *types* of violations for which citations are issued were also evident by race/ethnicity:

- o White drivers were significantly more likely to be issued citations for speeding violations compared to Hispanic, Native American, and Black drivers.
- o Hispanic drivers were significantly more likely than other racial/ethnic groups to be issued citations for violations related to drivers' license, seat belts/child restraints, required equipment, and insurance.
- o Native American drivers were significantly more likely than other racial groups to be issued citations/arrested for DUI/reckless driving, while White drivers were least likely.
- o Black drivers were significantly more likely than other racial/ethnic groups to be issued citations for speeding over 85 mph and for violations related to vehicle registration and/or license plate.

These results suggest that minority drivers were more likely to be issued citations for violations that are indirectly linked to income. In addition, the severity of offenses was not evenly distributed across racial/ethnic groups (e.g., Black drivers were more likely to be stopped for speeding at the highest levels over the limit, and Native American drivers were more likely to be stopped for DUI / reckless driving). This provides support for the proposition that officers make enforcement decisions based on drivers' behaviors rather than their demographic characteristics – and demonstrates the need to perform multivariate statistical analyses.

<u>Multivariate Analyses:</u>

Multivariate analyses were modeled to better estimate the independent effect of drivers' racial/ethnic backgrounds in relation to the post-stop outcomes after taking into account other legal and extralegal factors known to influence officer decision making. As a result, multivariate analyses provide a more thorough understanding and interpretation of the data.

Results from the multivariate analyses demonstrated that, even after controlling for some other explanatory factors measured in these data (e.g., other driver characteristics, vehicle characteristics, stop characteristics, and legal variables), racial/ethnic disparities exist for warnings, repair orders, citations, arrests, and searches.
- <u>Warnings</u>: The strongest predictors of whether or not drivers receive warnings were the legal reasons for the stop.
  - o Hispanic, Black, and drivers of other race/ethnicity were significantly *less* likely compared to Whites to receive warnings.
  - o Compared to White drivers, Hispanic, Black, and Other drivers were 1.3, 1.1, and 1.3 times *less* likely, respectively, to receive warnings.
  - o The odds ratios of these coefficients indicate that all of these relationships, though statistically significant, are substantively *not* strong.
- <u>Repair Orders</u>: Drivers stopped for equipment violations were 120 times *more* likely to receive a repair order compared to those stopped for moving violations.

- o Drivers of trucks/tractor trailers were 15 times *more* likely to be issued repair orders compared to drivers of cars.
  - o Hispanic, Black, and drivers of other races were significantly *less* likely, while Native Americans were significantly more likely, compared to Whites to be issued repair orders.
  - o The strength of these race/ethnicity relationships range between 1.2 to 1.5 times more/less likely, indicating they are not very strong explanatory factors.
- Citations: The strongest predictors of the number of citations issued to drivers were legal reasons. As the number of citations issued increased, the importance of these legal variables also increased.
  - o Traffic stops where evidence was found were 1.7 times more likely to result in one citation issued, but 12.7 times more likely to result in three or more citations issued.
  - o The impact of drivers' race/ethnicity also increased as the number of citations increased.
  - o While Hispanic drivers were only 1.1 times more likely than White motorists to receive one citation, they were 3.4 times more likely to receive three or more citations.
  - o Similarly, Black motorists were only 1.1 times more likely than Whites to be issued one citation, but 1.9 times more likely to receive three or more citations.
  - o The reasons for the reported racial/ethnic disparities in multiple citations, however, cannot be determined with these data.
- Arrests: The strongest factor associated with arrest is the discovery of contraband – drivers with contraband were 65 times *more* likely to be arrested compared to drivers without contraband.
  - o It is important to estimate the influence of drivers' race/ethnicity on the likelihood of arrest after legal variables (such as reason for the stop and evidence seized) are taken into consideration.
  - o Hispanic, Native American, and Black drivers were 1.7, 2.7, and 1.7 times significantly more likely to be arrested, compared to Whites.
- Searches: The search model – though weak in predictive power– indicated that the reason for the stop and other legal variables were the strongest predictors of the likelihood of a search.
  - o Racial/ethnic disparities also existed in whether or not searches were conducted.
  - o Compared to White drivers, Hispanic, Black, and Native American drivers are 2.5, 2.2, and 2.2 times *more* likely to be searched given similar reasons for the stop, vehicle and stop characteristics.

In summary, important racial and ethnic disparities in traffic stop outcomes were found even after taking into consideration other legal and extra-legal factors known to influence police decision making during traffic stops. In comparison to findings reported in the Year 1 Report (based on data from 2006), these bivariate and multivariate results based on data from 2007 are very similar, with only minor variation in the strength of relationships, but no substantive differences in the racial/ethnic disparities discovered.

It is important to note, however, that racial/ethnic differences in post-stop outcomes may be explained by other characteristics that are also believed to potentially influence officer decision making, but were not included in the current data collection system at this time (e.g., more specific measures of the severity of traffic offenses, motorists' compliance with officer requests, drivers' socioeconomic status, officers' characteristics, organizational characteristics, etc.). Because of the potential influence of unmeasured variables, the reasons for the racial/ethnic disparities in post-stop outcomes cannot be determined with these data. Therefore, no definitive conclusions regarding the reasons for the observed racial/ethnic disparities in traffic stop outcomes can be made.

SEARCHES & SEIZURES

Although the reasons for the stop were the strongest predictors of decisions to search, some differences in the likelihood of conducting searches are still attributable to drivers' characteristics (most notably, drivers' race and ethnicity). Therefore, additional analyses were conducted to better understand the racial/ethnic disparities in officers' search decisions during traffic stops.

Across the DPS in 2007, officers reported 24,302 searches of drivers, vehicles, and/or passengers during officer-initiated traffic stops. These searches were classified as belonging in one of three categories based on their lowest level of discretion):
- Type I = Mandatory; required by departmental policy; little to no discretion (e.g., incident to arrest, inventory, plain view)
- Type II = Discretionary; guided by case law and/or legal statue; low/medium discretion (e.g., probable cause, canine alert, Terry)
- Type III = Consent only, high discretion

The majority of searches conducted were classified as Type I (low discretion) searches (70.2%), while 15.3% and 14.5% were Type II (guided by case law/legal statute) and Type III (solely consent) searches, respectively. Figure 3 shows the types of search by race/ethnicity. As shown, statistically significant racial and ethnic disparities in searches exist across all three search type categories. Specifically, Black drivers were *least* likely to be searched for low discretion reasons (Type I), while Native Americans were *most* likely to be searched for these reasons. For Type II (discretionary) searches, the opposite is true; Blacks were significantly more likely, and Native Americans significantly less likely, to be subject to Type II searches. In the case of solely consent searches (Type III searches), Black and Hispanic motorists were significantly more likely to be searched based solely on consent compared to Whites and Native Americans.

Figure 3: Racial/Ethnic Differences in Types of Searches
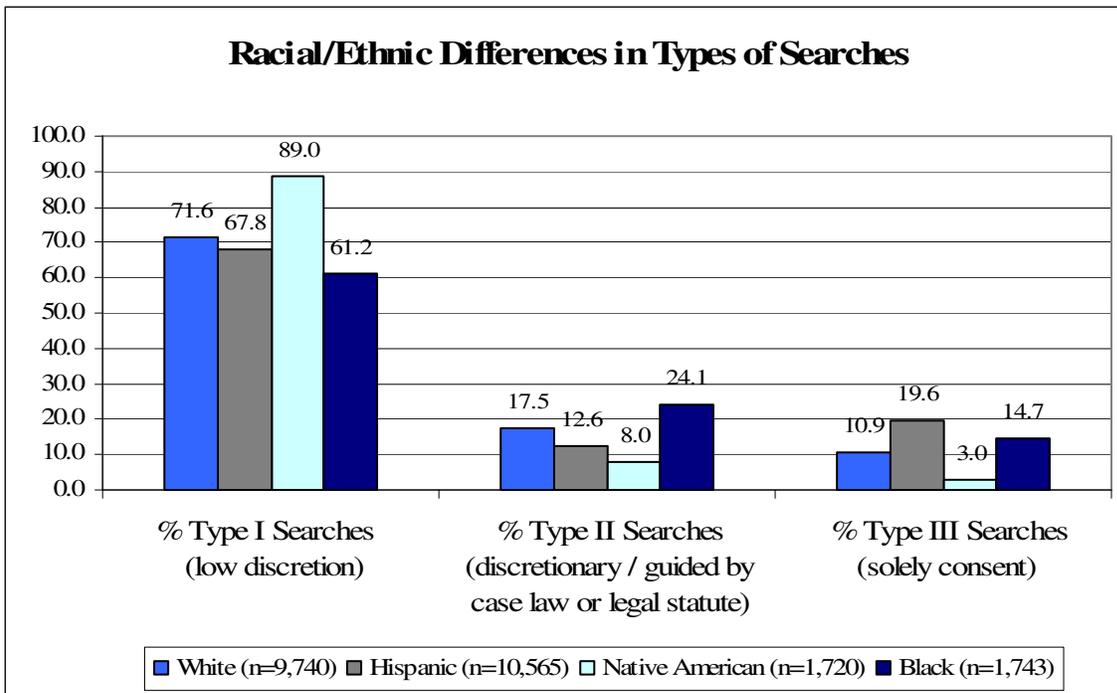
Racial/Ethnic Differences in Types of Searches

	% Type I Searches (low discretion)	% Type II Searches (discretionary / guided by case law or legal statute)	% Type III Searches (solely consent)
White (n=9,740)	71.6	17.5	10.9
Hispanic (n=10,565)	67.8	12.6	19.6
Native American (n=1,720)	89.0	8.0	3.0
Black (n=1,743)	61.2	24.1	14.7

Of the 24,302 searches, DPS officers successfully seized contraband during 5,179 searches; thus, the overall search success rate is 21.3%. As shown in Figure 4, search success rates across the department varied considerably by the reason for the search. Probable cause and canine alert searches were the most productive, while searches based solely on consent are the least productive in terms of contraband seizures. As detailed within the report, search success rates also varied dramatically across organizational unit.

Figure 4: Search Success Rates by Reason for Search
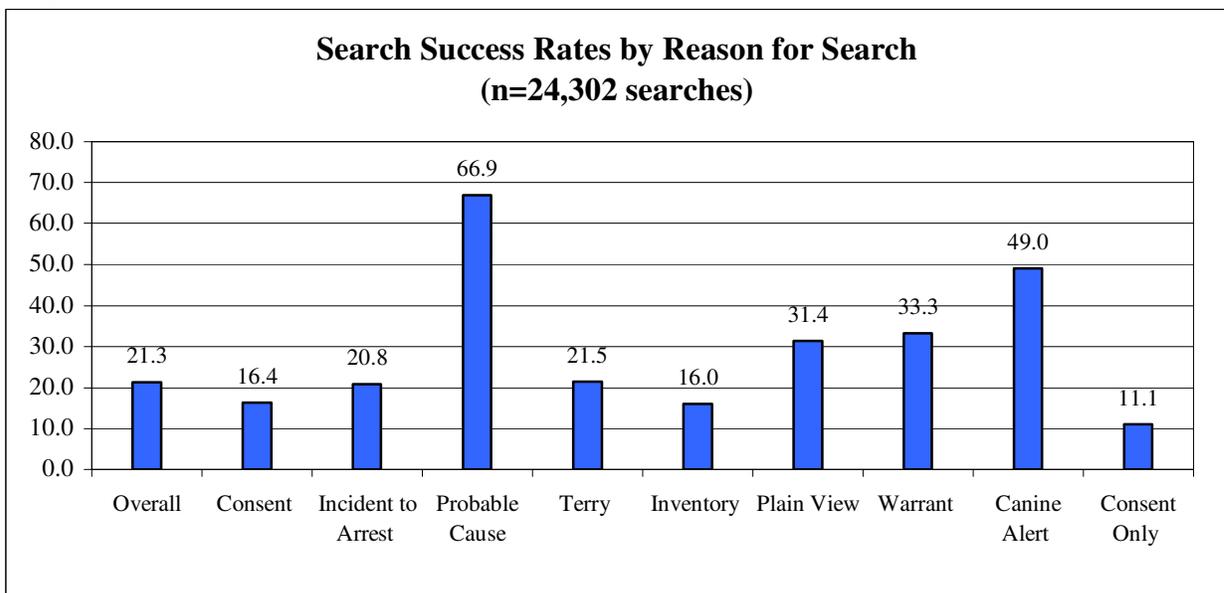
Search Success Rates by Reason for Search
(n=24,302 searches)

Reason	Success Rate
Overall	21.3
Consent	16.4
Incident to Arrest	20.8
Probable Cause	66.9
Terry	21.5
Inventory	16.0
Plain View	31.4
Warrant	33.3
Canine Alert	49.0
Consent Only	11.1

The overall Type II (discretionary / guided by legal statue and case law) search success rate for DPS was 45.7%, but, as shown in Figure 5, success rates varied significantly by race/ethnicity. Specifically, Type II (discretionary) searches of Hispanic drivers were the least likely to be successful in the discovery of contraband, compared to all other racial/ethnic groups. Native Americans, Blacks and Whites had higher and fairly similar search success rates, when compared to Hispanics and drivers of other races/ethnicities.

Figure 5: Racial/Ethnic Differences in Type II (Discretionary) Search Success Rates

Racial/Ethnic Differences in
Type II (Discretionary) Search Success Rates

% Type II Searches Resulting in Seizure

■ White (n=1,703) ■ Hispanic (n=1,335) □ Native American (n=138) ■ Black (n=420) □ Other (n=112)
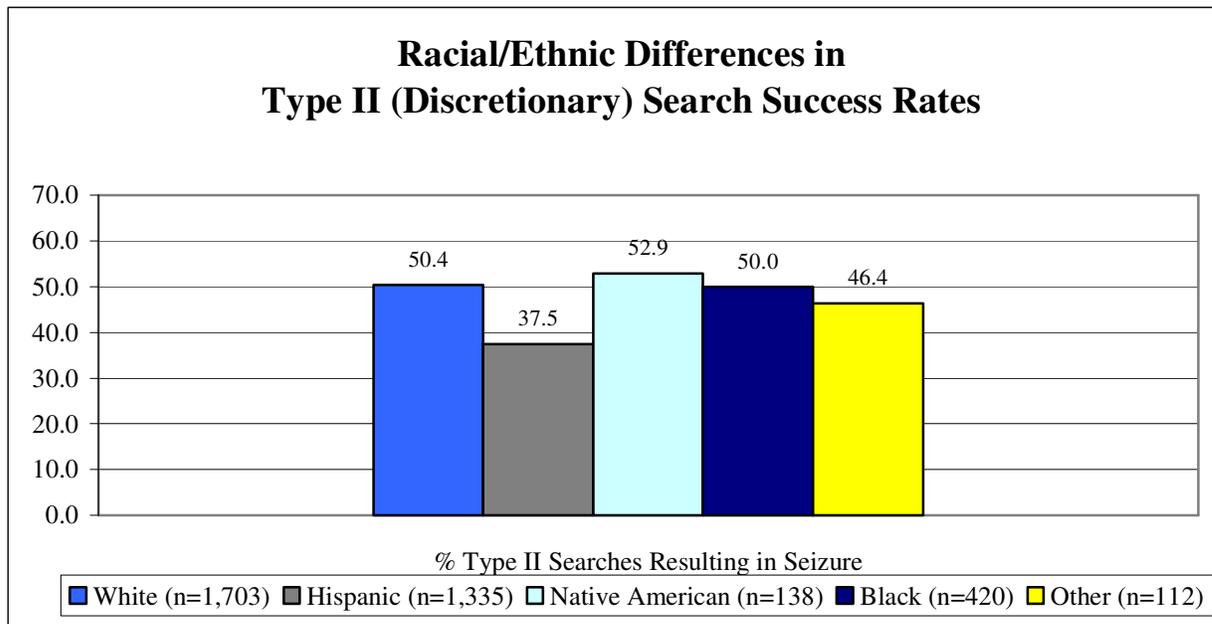
Analyses of consent searches also revealed racial/ethnic differences in those asked for consent to search as well as refusals to consent:

- Specifically, Hispanics were significantly more likely than other racial/ethnic groups to be asked for consent to search, and significantly less likely than members of other racial/ethnic groups to refuse consent to search.

A multivariate model predicting consent searches revealed that, although this model is weak in predictive power, statistically significant racial/ethnic disparities exist in whether or not consent searches are conducted.

- Hispanic and Black drivers were 3.9 and 2.9 times more likely to be searched based on consent compared to Whites, given the same reasons for the stop, and vehicle/stop characteristics that can be measured with these data.

The weak overall ability of this model to predict the likelihood of consent searches indicates that this model is likely misspecified. That is, other factors more central to explaining whether or not drivers are searched based on consent have likely not been included in the data collection (e.g., driver and passengers' behaviors, cues of suspicion, compliance with officers' requests, etc.). The inclusion of this type of information could demonstrate that the reported racial/ethnic disparities in consent searches are based on motorists' behavior that

may be correlated with race/ethnicity. This explanation was further explored during focus groups with DPS Officers heavily involved in criminal interdiction activities. Officers participating in the focus groups noted several plausible alternative explanations for these racial/ethnic disparities that simply cannot be tested with the traffic stop data currently available. The redesigned electronic data collection form now in use for the last quarter of 2008 data collection, however, does include additional data field designed to capture some of this information.

Because consent searches are not solely dependent on officer's discretion (i.e., a citizen may refuse), analyses of consent search success rates are not recommended. They were, however, conducted, at the request of DPS administrators. As shown in Figure 6, results indicated statistically significant racial/ethnic differences. Specifically, consent searches of Native American drivers were the most likely to be successful in the discovery of contraband, Blacks and Whites had similar consent search success rates, while consent-only searches of Hispanic drivers were the least likely to be successful in the discovery of contraband. In summary, Hispanic motorists were the most likely racial/ethnic group to be asked for consent to search, the least likely group to refuse consent when asked, and the least likely group to be found in possession of contraband when searched.

Figure 6: Racial/Ethnic Differences in Type III (Consent Only) Search Success Rates
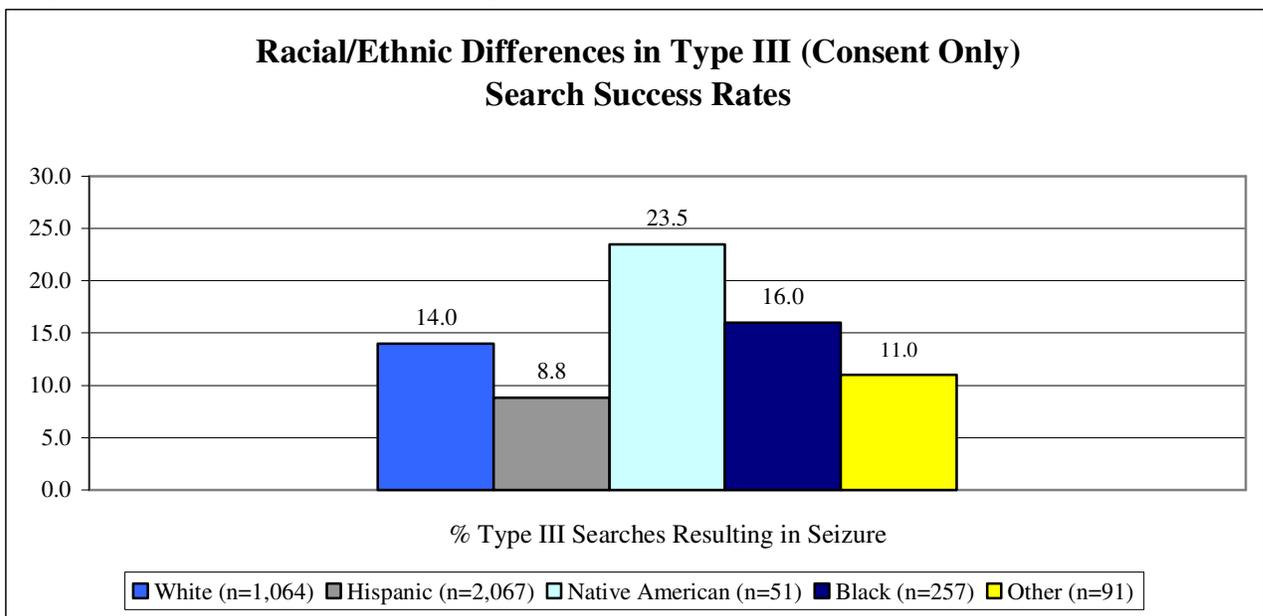
Finally, undocumented aliens (the majority of whom are Hispanic) were significantly more likely to be searched than those with legal residency status.
- During Type II (discretionary) searches, undocumented aliens were significantly less likely to be found in possession of contraband compared to legal residents. In contrast, during consent-only searches, undocumented aliens were significantly more likely than legal residents to have searches result in seizure contrabands.
- When considering undocumented aliens as a form of contraband, both the Type II and III search success rates for Hispanics increase, though they remain below the rates of

White drivers. These search success rates would likely increase further if information regarding undocumented alien passengers was also collected on the form. This change has been made for the 2008 data collection.

Based on these findings, it is the conclusion of this report that some racial and ethnic disparities exist for searches and seizures conducted during officer-initiated traffic stops. Again, these results are substantively similar to those reported in the *Traffic Stop Study Year 1 Report,* issued in November 2007. These findings, however, do not address the legality of individual searches. The data collected and reported within this document only examine patterns and trends in racial/ethnic disparities and cannot address questions of whether or not individual searches conducted by DPS Officers were legally justified. Further, given the limitations of the available data, and the plausibility of several explanations for these racial/ethnic disparities reported during the focus group research with DPS Officers, the UCPI research team cannot determine if officers are engaging in racial biased practices.

RECOMMENDATIONS

In summary, it is the conclusion of this report that, even after controlling for some other explanatory factors, racial/ethnic disparities exist for warnings, repair orders, citations, arrests, and searches. The levels of unexplained racial/ethnic disparities are greatest for the most intrusive outcomes – arrests and searches. Further analyses of searches and seizures illustrate that Hispanic, Black, and Native American drivers were significantly more likely to be searched compared to Whites. For discretionary searches, Hispanics were significantly less likely than Whites to be found in possession of contraband. It is important to reiterate, however, that statistical data alone cannot determine whether or not officers are engaging in racial profiling. This limitation of standard traffic stop data collection served as an impetus for conducting additional focus group research with DPS officers and redesigning the DPS data collection form to gather more relevant information. Officers participating in the focus groups were able to provide invaluable context and alternative explanations for findings that are simply beyond the capability of statistical analyses. Although it is unlikely that any traffic stop data collection protocol can accurately capture all possible explanations for disparities, the additional data fields DPS has incorporated into data collection as of October 1, 2008, should allow for analyses in the *Year 3 Report* (due in November 2009) that can shed additional light on the reported racial/ethnic disparities in stop outcomes received by drivers stopped by the DPS. With these limitations in mind, and based on the findings presented in this report, a series of recommendations to DPS administrators related to data collection, training and policy are provided below.

Data Collection

Recommendation #1: The UCPI team recommends that the established video training on the data collection protocol be incorporated into academy training and/or the FTO time period.

The data audit conducted for the 2007 data confirms the same types of data collection inconsistencies and errors reported in the Year 1 Report based on 2006 data. The recurring

nature of these problems reinforces the need for DPS to transition to an electronic data collection system that will eliminate the majority of errors associated with the previous scan system. Although DPS already required all current officers to view the training video associated with the new data collection form and method of collection, it will be critical to ensure that new officers are systematically trained on the data collection protocol as well.

Recommendation #2: It is recommended that the field supervisors be held directly accountable for ensuring the proper collection of traffic stop data by their subordinates. Further it is recommended that a standardized tracking procedure be utilized to confirm that all field supervisors are actively monitoring subordinates' data collection.

Continual supervisory oversight and routine data audits are necessary to ensure the accuracy and validity of these data. Although the electronic data capture will eliminate data entry errors, it will not ensure that officers are completing the form during every traffic stop. As described in Section 1, the supervisory oversight process in place should allow for any errors of this kind to be detected through a weekly comparison of electronic data and activity logs.

Recommendation 3: It is recommended that DPS administrators prioritize the full implementation of the electronic data collection system in the districts/shifts where it is still incomplete. In addition, it is recommended that DPS explore handheld options that would allow officers assigned to Metro Motors to collect information electronically.

During 2008, DPS began the transition from collecting all information regarding traffic stops on scannable paper forms into an electronic system via MDCs. Based on information from DPS regarding the implementation of this electronic system, approximately 100 Highway Patrol officers remain without patrol cars that are MDC equipped. In addition, officers assigned to the Metro Motorcycle District do not use MDCs because they patrol in motorcycles rather than patrol cars. During stops, officers without MDC capability record the traffic stop data on a data collection worksheet (the content of which is identical to the electronic data capture system) and later enter the data into a computer.

The data collection changes instituted by the DPS in the past year have resulted in one of the most comprehensive data collection systems currently in use by any state police agency. This effort should be applauded, but also continually supported. The continued collection and monitoring of traffic stops for better understandings of the existence and reasons for racial/ethnic disparities will demonstrate that the Arizona Department of Public Safety is a progressive leader for professional state police agencies across the country to model.

Supervisory Oversight

Recommendation #4: It is recommended that DPS continue to focus on supervisory oversight for traffic stops and specifically discretionary searches, which is necessary to ensure officer compliance with existing departmental rules and regulations.

Field supervisory oversight is a key component for police organizations striving to provide legitimate, unbiased, and effective police services to the public. Effective field supervision is critical for the successful monitoring and provision of police services. Comments regarding best practices for criminal interdiction and traffic stops made during focus groups with DPS officers suggested that they perceived several supervisory-related impediments to criminal interdiction work. For example, officers suggested that some supervisors focused on the quantity of traffic stops, rather than the quality of those stops. It was also suggested that some supervisors' encouraged their subordinates to engage in specific types of stops that match their personal enforcement preferences rather than the priorities of the department. Finally, it was repeatedly noted that there was inconsistent supervisory support for criminal interdiction. Some participants perceived strong support from their supervisors while others indicated little support, and most participants agreed that due to the amount of discretion afforded to supervisors, there was little consistency across supervisors in terms of support for interdiction. These inconsistencies across field supervisors should be addressed by DPS officials. More uniformity in field supervision will result if field supervisors are held accountable for ensuring their officers' compliance with existing rules and regulations.

Recommendation #5: **The UCPI team also recommends that DPS make some modifications to the current process of supervisory oversight of the video recordings of traffic stops. The UCPI team also recommends prioritizing the purchase and installation of video recording equipment in all patrol cars as soon as fiscally possible.**

To provide enhanced supervisory oversight of officer-initiated traffic stops, it is important that supervisors be required to *systematically* examine recordings that are *randomly* selected, a system which DPS already has in place. Specifically, the current DPS policy for supervisory review of videotapes of traffic stops allows for supervisors to review recordings for evaluation, training, or administrative purposes at their discretion. Furthermore, at least quarterly, each supervisor is required to review each officer's use of the mobile camera equipment, and review a minimum of three randomly recorded events submitted by the officers. Following the review, the supervisor is required to complete the Mobile Video Program Supervisor Review form and submit it on a quarterly basis to the commander/manager. The UCPI team recommends expanding the current Supervisor Review form to allow for a more in-depth audit of officers' compliance with department policies and procedures. For example, the form might include a checklist of items related to: 1) courteous treatment of motorists (e.g., explaining the reason for the stop and the action to be taken, officer demeanor, etc.), 2) officer safety (e.g., approach of vehicle, safe road position, etc.), and 3) proper search protocol if applicable (e.g., use of required written consent form).

Currently, in Highway Patrol, approximately 32% of the patrol vehicles assigned to officers full-time are equipped with video cameras. The UCPI team recommends that DPS prioritize the purchase and installation of video recording equipment in all patrol cars as soon as fiscally possible. The financial implications of this commitment are beyond the purview of the research team. Video records of traffic stops, however, are an invaluable tool for officer accountability and supervisory oversight and should be a priority for the DPS.

Recommendation #6: It is recommended that the specific findings documented in this report be disseminated immediately to DPS supervisory personnel with a very clear mandate to begin exploring the reasons for the racial/ethnic disparities reported, and attempt to reduce them if believed to be based on illegitimate factors.

Better understanding of the racial/ethnic disparities in post-stop outcomes is necessary to ultimately reduce these disparities. The racial/ethnic disparities in citations, arrests, and searches cannot be explained by factors currently collected on the current data forms. It continues to be important for DPS administrators to better understand and examine these trends. Field supervisory staff must be made aware of racial/ethnic disparities in citation, arrest, search, and seizure rates within their jurisdictions. There are several possible explanations for these elevated rates that can only be determined based on local knowledge of the area and additional information that is not included in the data collection. In addition, racial/ethnic disparities in outcomes may be explained by other factors that were not included on the 2007 data collection form, but are now being collected as part of the redesigned electronic data collection system. Analyses in the Year 3 report may shed additional light on the reasons for the existence of these racial/ethnic disparities.

Further Examination of Racial/Ethnic Disparities

Recommendation #7: The UCPI team does not make any specific recommendations related to the racial/ethnic disparities in search success rates until more complete analyses are able to be performed with the data collected in 2008 under the new data collection process. However, 2008 data collection will only include 3 months of data collected under the changed system. Therefore it is the recommendation of the UCPI team that data analyses be continued beyond the three year period required by the current contract.

In an effort to better understand racial/ethnic disparities in search and seizure rates, the UC research team conducted focus groups with canine handlers and officers assigned to the Highway Division that are actively engaged in search and seizure activity. The purpose of these focus groups was to provide a better understanding and context for criminal interdiction work in which to interpret the statistical findings related to searches and seizures.

Despite the high degree of confidence that focus group participants described in their ability to detect criminal activity, actual contraband seizure rates vary from approximately 50% or higher for searches initiated due to probable cause and canine alerts to less than 20% for searches conducted partially or solely based on consent. Focus group participants offered a number of possible explanations for this disparity between their perceived success in detecting criminal activity and the actual success in recovering contraband. One such explanation was the prevalence of undocumented aliens, who might exhibit similar cues of suspicion as drug traffickers or other criminals based on nervousness related to their illegal immigration status. The revised data collection system should include the ability to document the presence of *all* undocumented aliens (whether driver or passengers).

Documenting the presence of any undocumented aliens will allow for more thorough analyses and a better understanding of racial/ethnic disparities in search success rates.

Although next year's analysis will include data from the redesigned electronic data collection system, it will only be for a 3 month period of 2008. Continuing the data collection analyses by an external research team after 2009 will allow for analyses of data that should be of higher quality and will include additional relevant variables that may explain the observed racial/ethnic disparities in post-stop outcomes. Additionally, ongoing data collection and analysis will allow for an assessment of the relative effectiveness of any policies, procedures, and training related to bias-based policing.

Recommendation #8: The UCPI team recommends that the DPS consider empirically investigating the predictive power of indicators of suspicion that officers utilize.

Another possible alternative explanation for the disconnect between actual contraband seizure rates and the focus group participants' confidence in their ability to detect criminal activity is the use of ineffective indicators of suspicion. Several participants indicated that it is not effective criminal interdiction to make a stop or initiate a search based on one indicator. Instead, focus group participants considered the totality of the circumstances (e.g., multiple indicators of suspicion) as paramount in determining whether to conduct a search. The predictive power of individual indicators of suspicion, either singularly or in combination with other indicators, however, is largely based on anecdotal evidence. A systematic examination of the predictive power of indicators of suspicion could develop empirical support for what indicators are the most successful and what combinations of indicators are the most powerful predictors of contraband seizures. A study of this nature would not necessarily involve new data collection, but could be conducted retrospectively. That is, archived DPS search reports (of non-mandatory searches) could be systematically coded for: pre-stop indicators present, during-the-stop indicators present, whether the search resulted in a contraband seizure, and the type and amount of contraband seized. The results of this research could be invaluable in future criminal interdiction training by developing empirical support for the most effective indicators of suspicion and the combinations of indicators that are most likely to produce successful searches.

Recommendation #9: The UCPI team recommends that the DPS consider requiring officers heavily involved in criminal interdiction (e.g., Canine handlers) to systematically record any search situations where no contraband is seized but criminal activity is detected.

Many focus group participants lamented that often searches justified by the circumstances (e.g., multiple indicators of suspicion) do not result in contraband seizures even when evidence of other criminal activity is detected. Participants described several situations that they argued justified the search, despite the lack of contraband seized. For example, participants suggested it is fairly common to encounter situations where a motorist admits illegal behavior or has drug debris or paraphernalia in the vehicle. Participants expressed frustration at having no place to indicate "admission of illegal activity" on the data collection form. If a motorist admits using drugs in the vehicle, but there is no contraband, this search

is recorded as "unsuccessful" in terms of a seizure, despite having evidence that criminal activity was verified (and that officers' interpretations of the cues of suspicion were accurate). In addition, a few participants also noted that searches might be unsuccessful due to organized decoy vehicles. Participants explained that sometimes organized drug traffickers employ the use of a decoy vehicle with some drug odor to attract the attention of law enforcement and divert their attention from the vehicles carrying drugs. Although officers are aware of this tactic by drug traffickers, they indicated that sometimes they still end up in these scenarios.

It is recommended that officers heavily involved in criminal interdiction be required to systematically record the specific types of criminal activity detected that did not result in the discovery of contraband (e.g., admission, drug debris, etc.). With this type of information available, this possible explanation of the racial/ethnic disparities in searches and seizures can be empirically examined.

Recommendation #10: Based on the continuing trends of racial/ethnic disparities in search success rates, the UCPI team reiterates its recommendation based on the focus group findings that the DPS institute changes in training related to educating officers about the complexities of interactions with members of different racial/ethnic groups.

Focus group participants also offered possible explanations for racial/ethnic disparity in search success rates. In particular, they were asked to describe factors that may contribute to the comparatively lower Hispanic search success rates that were reported in Year 1 and are replicated in this Year 2 report. One of these explanations focused on the cultural differences in behavior that might lead to misinterpretation of indicators of suspicion. Specifically, the UCPI research team recommends that officers receive training in at least survival Spanish, if not more advanced language training. Furthermore, based on officer experiences and empirical research that supports the existence of cultural differences in behavior (for review, see Engel & Johnson, 2006), it is recommended that DPS consider developing training curricula that directly addresses cultural and racial differences in verbal and nonverbal behaviors, and the impact that these differences may have on the accuracy of indicators of suspicion and/or deception. Changes in training to address this issue, however, must be carefully considered by DPS personnel. There are a number of concerns surrounding training curriculum that identifies behavioral differences across racial/ethnic groups. It is critical that changes in criminal interdiction training designed to address these divergences provide accurate information regarding the potential differences in behaviors across racial/ethnic groups through descriptions regarding how these behavioral differences are best interpreted, as well as the use of tactics that provide more effective, efficient, and equitable services during traffic stops with all racial/ethnic groups.

Recommendation #11: The UCPI team reiterates its recommendations based on the focus group findings that DPS administrators review the manner in which members of the canine unit are trained and supervised. It is the specific recommendation of the UCPI research team that the procedures followed by canine handlers assigned to the northern unit should be used as the model for the other canine handlers in the central and south regions.

DPS administrators must closely examine the differences in searches and search success rates across divisions, bureaus and district/shifts and attempt to determine if these differences are due to legitimate factors. Of particular note are the obvious differences within the Canine District that were described by canine handlers in the focus group sessions but are also evident in the statistical findings documented in this report.

It was clear from the focus groups with canine officers assigned to different geographic areas that there are differences in the criminal interdiction philosophies of the field supervisors of this unit. Most importantly, these philosophical differences result in different procedures followed by canine officers. These differences in procedures are evident in the statistical analyses of searches and seizures conducted by this unit. Given the high profile and liability of the canine unit, it is essential that instruction and procedures be consistently followed across the state. It is essential that both the procedures used in canine deployment and other interdiction practices by canine handlers be uniform. Further these procedures must conform to the known best practices in criminal interdiction work and law enforcement more generally. Based on information from the focus groups as well as the UCPI research team's experience riding along with members of the Canine unit across the state, the northern canine squad's procedures are the most consistent with best practices in criminal interdiction used in other agencies across the country.

In conclusion, the racial/ethnic disparities in traffic stop outcomes reported within this document are very consistent with findings from other jurisdictions across the country. This issue is not unique to the DPS – law enforcement agencies across the country have reported reoccurring and consistent racial/ethnic disparities in traffic stop outcomes, particularly searches and seizures. As demonstrated by their ongoing data collection and responsiveness to the UCPI research team's recommendations from the *Year 1 Report*, DPS officials remain committed to both the data collection effort and the larger goals of reducing racial/ethnic disparities in traffic stops and post-stop outcomes, as well as providing legitimate and unbiased policing services to Arizona citizens. The willingness of the DPS to explore alternative data sources to better understand these racial/ethnic disparities should serve as a progressive and professional model for other law enforcement agencies across the country. Expedient implementation of the new recommendations provided above will further these goals. An update to this report will be delivered in November 2009, based on the statistical analyses of data collected during traffic stops in 2008, including a comparison of three months of data from the redesigned and expanded electronic data collection system.
It is expected that this new data collection effort will lead to a better understanding of the racial/ethnic disparities in traffic stop outcomes, and further will enable DPS administrators to make changes in procedures and training that will continue to reduce these disparities over time.

1. INTRODUCTION

OVERVIEW

This report documents the findings from statistical analyses of data collected during all officer-initiated traffic stops by the Department of Public Safety from January 1, 2007 – December 31, 2007. Although data collection was voluntarily initiated by DPS in 2003, as part of the 2006 settlement agreement in the class-action civil lawsuit *Arnold, et al. v. Arizona Department of Public Safety*, DPS agreed to conduct a comprehensive evaluation of stop data collected by DPS officers. Specifically, the settlement agreement required that DPS contract with an outside research team to analyze the collected traffic stop data for a period of three years. The data analyzed for this report represent the second year of data being collected as part of that three-year contract with the University of Cincinnati Policing Institute (hereafter, UCPI).

In addition to an annual comprehensive analysis of DPS traffic stop data, the DPS voluntarily contracted with the UCPI to conduct additional research methodologies to examine and provide context for the actions of DPS officers when interacting with minority racial/ethnic groups. Specifically, recognizing that there are a number of other, legitimate reasons that might account for racial/ethnic disparities in stop outcomes, DPS agreed to have the UCPI research team conduct focus group sessions with canine handlers, Highway Patrol officers who are actively engaged in search and seizure activity, and GIITEM officers. The purpose of these focus groups was to provide a better understanding and context in which to interpret the statistical findings, particularly the findings related to searches and search success rates. Topics discussed included the reasons why DPS officers conduct searches, the verbal, non-verbal, and behavioral cues perceived by officers as the most effective in predicting criminal behavior, impediments to criminal interdiction work, and perceptions of the usefulness and accuracy of the training received. The findings from that research that assist in understanding the statistical results presented here are highlighted where relevant.

The remainder of this introductory section summarizes the Year 1 Report as well as the progress the DPS has made on recommendations from that report, and concludes with an overview of the current report.

SUMMARY OF YEAR 1 REPORT

Background

In November 1979, the Arizona Department of Public Safety (DPS) enacted its first Bureau Order prohibiting the use of race or ethnicity as a predictor of criminal activity or as a factor for stopping, detaining or searching vehicles traversing Arizona's roadways. In November 1999, the DPS enacted its first General Order addressing the issue of racial profiling. The General Order entitled "Racial or Ethnic Profiling in Traffic Enforcement" renewed DPS' commitment to unbiased policing, and clarified the only circumstances in which officers can consider race/ethnicity when making law enforcement decisions.

In January 2003, DPS began voluntarily collecting data regarding traffic and pedestrian stops. In 2006, as part of a settlement agreement in a class-action lawsuit, DPS agreed to conduct a comprehensive evaluation of stop data being collected by Officers. The DPS contracted with Dr. Robin Engel and the University of Cincinnati Policing Institute to conduct this analysis over a three year period. In November 2007, the UCPI research team released its first of several reports, *Traffic Stop Data Analysis Study: Year 1 Final Report*.

The *Year 1 Final Report* was based on data from traffic stops conducted from January 1, 2006 – December 31, 2006. This report summarized the current status of the data collection effort, provided descriptive statistics of the initial stop and stop outcomes, utilized multivariate analysis of post-stop outcomes, compared 2006 data with three previous years of DPS traffic stop data, and specifically examined search and seizure rates (see Engel, Tillyer, Cherkauskas, & Frank, 2007). Highlights of these findings are summarized below.

Data Audit

The UCPI conducted a three-phase audit of the DPS traffic stop data to determine the accuracy and reliability of their current data collection system. The results of this data audit raised some concerns. The first phase of the data audit revealed that the text recognition software in use in 2006 was a major source of errors. Specifically, in 1000 randomly selected forms, 26.5% had at least one field with an error, the majority of which were situations where the scan form did not match the electronic copy. Second, the research team assessed the missing data and logical inconsistencies within the electronic data for all traffic stops conducted by DPS officers from January 1, 2006 – December 31, 2006; an overall error rate of 14.1% was calculated for this portion of the audit. Finally, the third phase of the data audit, designed to examine the data accuracy by comparing the number of stops in the electronic data with the number of stops in officers' activity logs, revealed that 18 of 19 districts/shifts fell within a desired parameter of 10% error in either dataset. In addition to the activity log data, additional comparison data were available for contacts in which a citation or warning was issued. Specifically, stop data were compared to violation data. Unfortunately, these comparisons suggested two consistent and problematic errors. In 6,694 stops, citations or warnings in the violation file were not recorded as resulting in a citation or warning in the stop data. Conversely, in 13,793 cases, citations and warnings in the stop data did not have corresponding violation information in the violation data file. Based on these findings, a series of recommendations regarding data collection were made to the DPS. These recommendations are summarized on page 7.

Traffic Stop Data

During 2006, 460,545 officer-initiated traffic stops were recorded by DPS officers. Department-wide, approximately 62.4% of the drivers stopped were White, while 24.6% were Hispanic, 5.2% Native American, 4.4% Black and 3.4% Other (Asian, Middle Eastern, other or unknown). The rate of stops for particular racial and ethnic groups varied dramatically across divisions, bureaus, districts/shifts, and counties. Some variation is to be expected given residential patterns related to race and travel patterns along interstates, highways, and major thoroughfares.

The crux of interpreting data regarding initial traffic stop behavior is dependent upon comparison data. That is, a group's representation in traffic stops is only meaningful when compared to the same group's "expected" representation in traffic stops, based on alternative data. Unfortunately, all available external benchmarks have limitations that restrict the level of confidence in the results. These limitations coupled with the availability of four years worth of data led to a decision to not utilize specific benchmarks for comparisons to traffic stop data. Rather, comparisons through trend analysis of the percentages of racial/ethnic groups stopped, warned, issued repair orders, cited, arrested, and searched by DPS officers over the course of four years of data collection were utilized.

Trend Analysis of Stops

The trend analysis revealed some fluctuation in stopping patterns over time. Specifically, statistical analyses identify some districts/shifts with an increase in their rate of stopping Hispanic, Native American, and Black drivers. It is possible that these changes over time are the result of a multitude of factors including: changes in the residential or driving population in those jurisdictions, changes in DPS manpower allocation and deployment, adjustments in the data collection procedures, and/or changes in officer behavior toward minority drivers. The organizational units identified with the highest amounts of fluctuation warrant increased monitoring and possible investigation by DPS to reduce potential on-going racial/ethnic disparities in traffic stops.

Multivariate Analysis of Stop Outcomes

The multivariate analyses of 2006 stop data demonstrated that legal variables (e.g., reason for stop, evidence seized) were the strongest predictors of drivers' likelihood of receiving warnings, repair orders, citations, and arrests. The results, however, also documented racial/ethnic disparities in post-stop outcomes motorists received even after controlling for other explanatory factors (e.g., other driver characteristics, vehicle characteristics, stop characteristics, and legal variables). For example, Hispanic, Black and drivers of other races/ethnicities were significantly less likely to be issued warnings or repair orders, but significantly more likely to be issued citations compared to Whites. Despite the fact that these racial/ethnic disparities were statistically significant, the odds ratios (ranging from 1.1 to 1.5) of the race/ethnicity effects in the models for warnings, repair orders, and citations indicate that these relationships were not particularly strong.

When examining multiple citations, however, more substantive racial/ethnic differences were evident. Specifically, after controlling for the reason for the stop, as well as other stop, vehicle, and driver characteristics, Hispanic, Native American, and Black drivers were all more likely to receive multiple citations when compared to White drivers at the rate of 2.3, 1.4, and 1.5 times more likely, respectively. The reasons for the reported racial/ethnic disparities in multiple citations, however, could not be determined with the data available. Statistically significant bivariate differences in the types of violations for which citations are issued were evident by race/ethnicity. Therefore, these results suggested that minority drivers were more likely to be issued citations for violations that are indirectly linked to income (e.g., equipment violations, license/registration violations, insurance violations). If

true, it is disparities in wealth (correlated in our society with race/ethnicity) that increase the likelihood of receiving multiple citations during traffic stops with police. Alternatively, it could be argued that minority drivers are significantly more likely to be issued multiple citations because of police bias.

Racial/ethnic disparities were also more substantive for arrests and searches. For the arrest model, drivers with contraband were almost 63 times *more* likely to be arrested compared to drivers without contraband. Despite the strength of the predictive power of the legal variables (e.g., reason for the stop and evidence seized), after taking these variables into consideration, Hispanic, Native American, and Black drivers were still 1.7, 2.2, and 1.6 times *more* likely to be arrested, respectively, compared to Whites. The multivariate model predicting searches was weak in overall predictive power; this indicates that other factors more central to explaining whether or not drivers are searched have not been included in the model. Nevertheless, even after controlling for the reason for the stop and other stop characteristics that can be measured with these data, Hispanic, Native American, and Black drivers were all more than two times more likely to be searched compared to Whites.

Search & Seizure

To address the specific concerns of potential bias in search and seizure activity, further analyses were conducted on these post-stop outcomes. Throughout the department in 2006, DPS officers conducted 21,218 searches of drivers, vehicles, and/or passengers during officer-initiated traffic stops. At the department level, the majority of searches conducted were Type I (mandatory) searches (67.8%), while 18.8% and 13.4% were Type II (discretionary) and Type III (solely consent), respectively. Analyses based on the type of search indicate statistically significant racial and ethnic disparities in searches across all three search type categories. Blacks were least likely to be searched for mandatory reasons, while Native Americans were most likely to be searched. For Type II searches, the opposite was true; Blacks were significantly more likely, and Native Americans significantly less likely, to be subject to Type II searches. In the case of consent searches (Type III searches), Black and Hispanic motorists were significantly more likely to be searched based on consent compared to Whites and Native Americans.

Searches resulted in the discovery of contraband in 5,014 cases. The overall search success rate was 23.6% (that is, 23.6% of searches resulted in the discovery of contraband). Search success rates across the department, however, varied by the reason for the search. Searches based solely on consent were the least likely to be successful in terms of discovering contraband (12.7% of searches resulted in contraband seizures, respectively). Searches most likely to produce seizures of contraband include those based on canine alerts (search success rate =42.8%), plain view (56.7%), and probable cause (65.9%). The overall Type II search success rate for DPS was 44.8%, but success rates varied significantly by race/ethnicity. Type II (discretionary) searches of Hispanic drivers were the least likely to be successful in the discovery of contraband, compared to all other racial/ethnic groups. Conversely, contraband was most likely to be discovered in Type II (discretionary) searches of Blacks and Whites. Therefore, although Hispanic motorists were significantly more likely than

Whites to be searched during officer-initiated traffic stops, they were significantly less likely to be found in possession of contraband.

Analyses of consent searches revealed racial/ethnic differences in those asked for consent to search as well as refusals to consent. Specifically, Hispanics were significantly more likely than other racial/ethnic groups to be asked for consent to search and significantly less likely than members of other racial/ethnic groups to refuse consent to search. Because consent searches are not solely dependent on officer's discretion (i.e., a citizen may refuse), analyses of consent search success rates are not recommended. They were, however, conducted at the request of DPS administrators. Results indicated that Type III (consent only) searches of Native American drivers (4.3%) and Hispanic drivers (9.4%) were less likely to be successful in the discovery of contraband, compared to Blacks and Whites (16.5% and 16.7%, respectively), when compared to Hispanics and Native Americans. It was also found that undocumented aliens (the majority of whom are Hispanic) were significantly more likely to be searched than those with legal residency status. Type II (discretionary) and Type III (consent only) searches of undocumented aliens were less likely to result in seizures of contraband than searches of those in the country legally.

Based on these findings, the UC research team concluded that racial and ethnic disparities exist for searches conducted during member-initiated traffic stops. It could not be determined with these data, however, if disparities were due to discrimination. Rather, the findings showed that racial and ethnic disparities in searches remained after statistically controlling for the legal and extralegal factors that could be measured with the available data. Findings from these analyses suggested that more advanced research was needed to understand the reported racial/ethnic disparities in search and seizure rates. This topic was directly addressed during the aforementioned focus group research.

Trend Analysis of Stop Outcomes

As with the initial traffic stop, further analyses were conducted on the four years of data collection by focusing on trends in traffic stop outcomes between 2003 and 2006 for all organizational units and racial/ethnic groups. These trend analyses revealed some differences in the rate of traffic stop outcomes for specific groups. For instance, White and Native American drivers had higher rates of warnings, while Hispanic drivers had noticeably lower rates of warnings. Hispanic and Native American drivers had considerably higher rates of receiving a repair order when compared to White and Black drivers across all four years. Hispanic and Black drivers had the highest rates of citations, followed by White drivers, and Native American drivers who had noticeably lower rates of citations, and experienced a significant decline from 2003 to 2004. Native American drivers had the highest rate of arrest, followed by Hispanic and Black drivers. White drivers had noticeably lower rates of arrest. Hispanic, Native American, and Black drivers all had search rates that exceeded White drivers across all four years.

Recommendations

Based on these findings, in the Year 1 Report, the UCPI made a series of recommendations to DPS administrators related to data collection, training and policy, including:

- Data Collection
  - Improving Data Quality
    - o The data audit indicated a number of recurring problems with data collection. The text recognition system in use at the time was identified as the primary source of errors. Analyses of these data indicated other inconsistencies and suggest that the quality of the information gathered needs to be substantially increased.
    - o The UC research team strongly recommended that a committee within DPS be formed to discuss alternative data collection options. The proposed DPS committee would work directly with the UC research team to develop and implement changes to the current data collection process and the information gathered.
    - o It was recommended that this committee consider alternative methods of data collection and transfer including, if fiscally feasible, an electronic data capture system.
  - Consider Addition of Relevant Data Fields
    - o It was further recommended that DPS investigate modifications to data collection to improve the collection of details that might explain better the racial/ethnic disparities, and that DPS officials should reconsider the inclusion of officer data for examination.

- Training
  - Focus on Consistency across the Department
    - o Through both informal conversations with DPS officials, and data analyses of 2006 traffic stops, it became readily apparent that similar situations are coded differently on the data collection forms. That is, there was questionable consistency across officers and organizational units regarding data collection.
    - o Therefore, it was further recommended that once the data collection committee altered the data collection system and possibly the information collected, that a second committee be developed to disseminate proper training material and establish a feedback system for direct and immediate supervisory oversight. It was strongly recommended that DPS fully train every officer and supervisor responsible for collecting traffic stop data on the use of the form.
  - Reaffirm Commitment to Data Collection
    - o It was also recommended that, in conjunction with training, the DPS administration reiterate its commitment to the data collection effort. It is crucial that patrol officers and supervisors understand the importance of collecting data completely and accurately.

- Policy

- Focus on Supervisor Accountability
  - It was recommended that the current data collection oversight mechanism be reviewed, and a new, more effective system be immediately implemented.
  - It was considered important to disseminate specific findings to commanders and supervisors at the bureau, district/shift, and squad levels with the goal being for DPS administrators and supervisors to collaboratively explore possible explanations for reported racial/ethnic disparities in post-stop outcomes and statistically significant increases in the percentages of minority drivers stopped, cited, arrested, and searched over time.

DPS RESPONSE TO YEAR 1 RECOMMENDATIONS

Based on these findings and recommendations, the DPS made numerous and widespread improvements to the data collection and training procedures. Specifically, the DPS took the following actions and implemented or altered the following programs:

1. The findings from the *Year 1 Final Report* were made publicly available and the entire document was posted on the DPS website (http://www.azdps.gov/agreement/agreement.asp).

2. Following the release of this report, Dr. Engel gave presentations to the DPS Executive Staff as well as other supervisory and management personnel across the department. These presentations provided supervisors and officers at the bureau, district, and squad levels with the results of the analysis, as well as the UCPI research team's recommendations based on the research.

3. The DPS formed a committee to explore new ways to collect the racial profiling data in the field. The committee, comprised of representatives from all four divisions within the Department, reviewed different formats used by other agencies as well as commercial products off the shelf to provide a more effective and efficient means of data collection. The committee recommended the department move to an electronic data collection form. Based on the recommendation of the committee, the first electronic data collection pilot program was developed. The program allowed officers in the field to use an electronic form and provide feedback on its strengths and weaknesses. Supervisors were also given the opportunity to use the system as well to monitor the officers assigned to them. The supervisors then provided information on how they would need to monitor an electronic version of the data collection forms. This feedback was instrumental in the development of the DPS's new electronic Warning/Equipment repair form, as well as the electronic data form used to capture the traffic stop data. The use of the redesigned electronic data collection form department-wide began October 1, 2008. The results from these data collected by the new software will be examined in the *Year 3 Traffic Stop Data Analysis Report*, scheduled to be released in November 2009.

4. Prior to the implementation of the new electronic data collection, a committee was formed to develop a training program to train officers on the proper procedures

needed to complete this form. This training was designed to ensure officers were selecting information based on the guidelines provided, and to ensure consistency across the state with the data collection. The committee developed a specialized training video that allowed officers from across the state to be trained in the exact same manner, and to ensure the information received by officers were both accurate and identical. The training curriculum presented in the video included the following: a review of the background of this data collection effort, a reaffirmation of the DPS commitment against bias-based policing, a renewed departmental emphasis and focus on the accuracy and importance of the data collection effort, and the specific guidelines to be used in order to properly record stop data.

5. The new electronic data collection will reduce the amount of errors in the data collected. With the new system, logical inconsistencies in the data will be eliminated as well. Some data fields will be locked unless prior data is inserted to unlock them. For example, officers will only be able to enter information on contraband seizures if the form indicates a search was conducted. Prior to officers receiving access to submit data forms, validation tests will need to be performed. The validation test checks all required data fields to ensure data was properly entered. If no information is provided for fields with required information, the officer will be given an error message and directed to the field(s) that need information prior to final submission. In addition, the electronic data collection software includes a help menu option for each of the included data fields. If an officer is unsure about how to record any portion of the required data collection information, he/she may utilize the help menu to immediately access the established department training guidelines for the proper procedure for filling out individual data fields. The electronic capture of these data is a dramatic improvement over the use of scannable forms for validity, accuracy and consistency.

6. The development of the new electronic data collection system also allows the DPS to institute quality assurance measures to ensure DPS Officers are completing the data collection form for every contact. The new system assigns a contact data number every time an officer completes a data sheet. Officers are now required to document this number in their time and activity weekly next to the primary document number. After a first line supervisor receives the officer's time and activity weekly, the supervisor can first ensure a document number is listed next to the primary document number for the stop. The supervisor can then check the database to see what was the last document number shown assigned to the officer. If the numbers do not match, the supervisor can take corrective actions on a weekly basis. Therefore, the new data collection system enhances the capability for supervisory oversight for accurate data collection.

7. The DPS voluntarily added additional fields recommended by the UCPI research team in addition to collecting the information electronically. Under the new electronic format, DPS will now be collecting the following data in addition to the 13 fields required by the settlement agreement. Specifically, the DPS added the following data fields:

- o What pre-stop indicators of criminal activity were observed
- o Vehicle year and condition
- o Whether vehicle impounded due to A.R.S. 28-3511
- o Subject demeanor
- o The number and type of violations observed prior to the stop
- o The number and type of violations resulting in a warning, repair order, citation or arrest
- o In the case of a search, if probable cause is the reason for search, the type of probable cause (e.g., K-9 alert, Plain View, Plain Smell, Admission, Search Warrant, and/or Officer Experience)
- o Drug seizure type (i.e., personal use vs. transportation).

Furthermore, a number of fields were revised to better capture information related to the stop. Specifically, the following changes were made:

- o Instead of a single category of whether a driver was an undocumented alien, this data field now includes categories for the officer to identify if the driver, passengers, both, or none were undocumented aliens.
- o Instead of a single data field for whether a search was performed (Yes, No, Refused), there are now separate data fields for whether: a consent search was requested, a consent search was accepted, if consent request granted whether the form was signed or refused, and whether the consent request was audio or video recorded.
- o The question regarding the search target (i.e., driver, vehicle, passenger, pedestrian) was expanded to include multiple data fields for each search target. Specifically, the data fields regarding whether a search was performed, the search authority, and whether contraband was seized are now available for each possible search target rather than confounded into all-encompassing data fields regarding any search that was conducted.

These additional fields allow the DPS to be more transparent in regards to the violators stopped as well as provide a more thorough analysis of the statistical data submitted by officers.

Due to the amount and types of errors with the data mentioned by the University of Cincinnati research team, the DPS Executive Staff believes the results of the new electronic data collection system and the results of the new data fields will present a clearer picture of what is occurring. The DPS Executive Staff will wait for the results of analyses that include the new data fields prior to addressing any further possible policy or procedural changes, including reconsideration of the inclusion of officer data for examination.

REPORT OUTLINE

The remainder of this report examining data collected from January 1, 2007 through December 31, 2007 is organized into five sections: 1) data audit of current data collection

effort, 2) description of traffic stop data, 3) post-stop outcomes, 4) search and seizure analyses, and 5) conclusions and policy recommendations. The general content for Sections 2 - 6 are described below.

Section 2

Section 2 outlines the method and results of the two-phase data audit and provides recommendations for continued data collection and auditing techniques. Phase I examines all 2007 traffic stops to assess the missing and logical inconsistencies for each field captured during a traffic stop and provides an overall assessment of the error rate within the electronic database. Phase II examines the data accuracy by comparing the number of stops in the electronic data with other independent sources of information.

Section 3

Section 3 describes the final police stop dataset that includes 485,183 officer-initiated traffic stops in 2007. Specifically, it provides descriptive statistics for the traffic stop data regarding the number of stops, characteristics of the stops (e.g., time, day, month, reason for the stop, vehicle registration, length of the stop), the reason for the stop (e.g., moving violation, equipment violation, non-moving violation, etc.), the characteristics of the vehicle (e.g., state of vehicle registration, vehicle type), and the characteristics of the drivers (e.g., gender, race, age, residency). The averages for this information are reported in tables at the department, division, bureau, district/shift levels, and in the case of drivers' racial/ethnic characteristics, the county level.

Typically descriptive statistics regarding the racial/ethnic characteristics of driver stopped are utilized in conjunction with some type of comparison data to determine whether minorities are being disproportionately stopped. That is, a group's representation in traffic stops is only meaningful when compared to the same group's "expected" representation in traffic stops, based on alternative data. Unfortunately, all available external benchmarks have limitations that restrict the level of confidence in the results of these comparisons. Internal benchmarking – which compares the racial/ethnic breakdown of traffic stops across officers assigned to the same, assignments, shifts, and districts – is also impossible with these data because of the small number of officers that have such similarities. In addition, data quality issues with previous years of DPS traffic stop data led the UCPI research team to conclude that internal comparisons through trend analysis would not be advisable either. Therefore, no department-wide conclusions can be drawn regarding whether racial/ethnic disparities in stopping behavior exist. Instead, this report focuses on whether racial/ethnic disparities are evident in post-stop outcomes.

Section 4

Post-stop outcomes (e.g., warning, repair order, citation, search, seizure of contraband, and arrest) are documented in Section 4. Information examining post-stop outcomes is presented for different drivers by race and gender across all organizational units. Information examining the types of violations for which citations and warnings are issued is also

presented. At the conclusion of Section 4, several multivariate analyses are presented that predict officer decision making after the traffic stop has been made. That is, Section 4 documents the outcomes drivers receive after traffic stops are made (e.g., warnings, repair orders, citations, arrests, searches, and seizures), and whether these outcomes differ significantly based on a multitude of factors.

Section 5

Section 5 focuses specifically on the post-stop outcomes of searches and seizures. This section describes the types of searches and seizures at the department, division, bureau, and district/shift levels. It further documents the search rates for minority motorists compared to Whites, and describes the racial/ethnic disparities in types of searches and seizures at multiple organizational levels.

Section 6

Section 6 summarizes the information presented in earlier sections of the report, and provides policy recommendations based on interpretations of the analysis of collected data. Note that the findings reported in this document must be interpreted cautiously. The data collected and presented in this report cannot be used to determine whether or not DPS officers have individually or collectively engaged in "racial profiling." In addition, the legality of prior or future individual traffic stops cannot be assessed with these data. This report is designed to give feedback to DPS administrators regarding the status of the data collection process, along with exploring trends and patterns in the data that may be utilized for training purposes.

2. DATA AUDIT

OVERVIEW

Data integrity is a crucial component to effective data analyses. Even the most sophisticated statistical analyses are meaningless if the data used to generate the analyses lack reliability and validity. Data "auditing" is an important oversight mechanism to maintain data quality. Improving data accuracy ensures that recommendations regarding policy and training changes are made based on the highest quality data possible. Typically data audits for traffic stop data collection efforts involve a number of different procedures to check for several types of inaccuracies. Types of traffic stop data inaccuracies include:

- Incorrect copying of information from one form to another (e.g., data transfer or entry errors)
- Missing information
- Invalid information
- Missing information on all officer-initiated stops
- Data contains misstatements of facts (e.g., Black motorist is recorded as White)

In addition to increasing data quality, a data auditing system can also help ensure officer compliance with the data collection protocol. Officers will likely be more diligent in their data collection if they know it is being reviewed for comprehensiveness and quality (Fridell, 2004).

To determine the extent of errors due to the data transfer process, Phase I of the Year 1 Data Audit (see Engel et al., 2007c) involved a manual comparison of 1,000 paper copies of traffic stop forms with information in the electronic database. These two data sources were compared for every field on the scan form to determine if information recorded by officers on the scan forms was accurately transferred to the electronic data files. Of the 1,000 traffic stops, 10 stops (1.0%) had scan forms with no corresponding electronic copies. Of the remaining 990 forms, 26.5% had at least one field with an error. The majority of errors found were "system errors" and occurred in situations where the scan form simply did not match the electronic copy. The Scantron imaging system simply does not accurately capture the information on the scan forms, and the electronic images are not properly corrected by data entry personnel. In contrast, only 0.8% of the stop forms were not readable and thus created data collection errors.

Based on the documented problems with this method of data transfer and the UCPI research team's recommendations, the DPS has revamped its entire data collection system from the scanning method to a more efficient and accurate electronic system (as described more fully in Section 1). Given the known inconsistencies in the data from the 2006 data review, and that no changes in the data collection system were made prior to the collection of 2007 data, there is no reason to believe the 2007 data analyzed in this report are any more reliable or valid compared to those reported in 2006. Therefore, the same type of data audit was not necessary for 2007 data.

Several (but not all) types of traffic stop inaccuracies were assessed in the UCPI research team's data audit of the 2007 data. This process was comprised of two phases: 1) Phase 1

assessed the missing data and logical inconsistencies within the electronic data; and 2) Phase 2 examined the data accuracy by comparing the number of stops in the electronic data with independent sources of information. This section outlines the method and results of the two phases of the 2007 data audit and provides options and recommendations for continued data collection and auditing techniques.

DATA AUDIT: PHASE 1

Description

Phase 1 assessed the missing data and logical inconsistencies within the electronic data for all traffic stops conducted by DPS officers from January 1, 2007 – December 31, 2007. This phase of the data audit was comprised of two analytical components. First, the percentage of missing information for each field of interest was determined. "Missing data" simply indicates that there was no information entered on the form by the officer (or that the information was entered by the officer, but was not properly recorded by the text recognition software). The result is data fields with no information available. Second, the percentage of invalid information was determined. "Invalid data" refers to collected information that contains logical inconsistencies (e.g., no search, but contraband seized; search conducted but no search target identified) or inaccurate information (e.g., badge numbers that do not correspond to known employees). These two components – missing data and invalid data – are combined to produce an overall error rate. One limitation of this data audit is the inability to assess to what degree, if any, the error rates in Phase 1 are due to the data transfer errors previously identified and documented in the Year 1 Data Audit.

Although the total number of stops provided by the DPS to the UCPI research team for 2007 was 531,504, this phase of the data audit only examines: 1) officer-initiated traffic stops (i.e., non-traffic, pedestrian, crash, and motorist assists were eliminated), 2) only original cases (i.e., duplicate entries discovered using the primary document number were eliminated), 3) only stops that resulted in outcomes other than voided citations (per DPS requests to remove), and 4) only stops with valid data for the type of contact and reason for the stop (0.24% of the total number of stops were missing on these items). Therefore, this data audit only examines cases that were retained for later statistical analyses (n=485,183). For further details regarding the elimination of cases for analyses, see Section 3.

Results

Table 2.1 reports the missing data rates, invalid data rates, and the overall error rates for all data fields of interest. Combining the missing and invalid rates, the overall error rate is calculated and reported for individual data fields, along with a combined total. Each of the fields are categorized into stop, driver, vehicle, and officer characteristics, and their individual missing, invalid and overall error rates are reported below. All of the fields analyzed in this data audit were assessed based on a codebook provided by the DPS. If information was entered on the traffic stop form that did not match the codebook, it would appear as invalid and contributed to the overall error rate. The steps undertaken to create these fields are provided in footnotes below.

The overall error rate (10.4%) calculated for Phase 1 of the data audit is based on all fields listed in the table. This error rate is smaller than the total of all individual fields due to the possibility that one form could have more than one error. In such a situation, those errors will be reflected in the individual fields, but only counted once in the overall error rate. The primary contributors to this rate are: location of the stop (5.2%), driver's zip code (4.7%), badge number (1.1%) and vehicle license plate (1.1%).   In addition, while the result of contact field is not missing any information, subsequent analyses performed (documented in Phase 2 of the data audit) did demonstrate inconsistencies in this field that are not captured in the data audit reported in Table 2.1.

Table 2.1: Analysis of Missing Data & Logical Inconsistencies from all 2007 Officer-Initiated Traffic Stops

	% Missing	% Invalid	% Overall Error Rate
Valid Forms (N = 485,183)			**10.35**
Stop Characteristics			
Document Type	0.00	0.00	0.00
Date of Contact	0.00	0.00	0.00
Time of Contact	0.00	0.00	0.00
Duration of Stop	<0.01	0.00	<0.01
Location of Stop[1]	2.43	2.80	5.23
Type of Contact *	0.00	0.00	0.00
Reason for the Contact*	0.00	0.00	0.00
Result of Contact	0.00	0.00	0.00
Search Refused	0.07	0.00	0.07
Valid Search[2]	<.01	0.60	0.60
Driver Characteristics			
Date of Birth	0.13	0.13	0.26
Gender	0.01	0.00	0.01
Race	<0.01	0.00	<0.01
UDA	0.07	0.00	0.07
Zip Code	<0.01	4.67	4.67
Vehicle Characteristics			
State of Vehicle Plate	0.89	0.18	1.07
Vehicle Type	0.33	0.23	0.56
Officer Characteristics			
Badge	0.00	1.08	1.08
Locator Code	0.00	0.44	0.44

*As described above, the 1,286 cases with missing data on the type of contact or reason for the stop were removed prior to this analysis of missing data.

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[1] "Location of Stop" was created by combining the following fields: direction, highway, and milepost. The DPS codebook outlines the following rules that apply to these fields: 1) If direction is identified, a highway and milepost must also be identified, 2) If the highway field contains an entry, the milepost field must also be completed, and 3) If the milepost field contains an entry, the highway field must also be completed. Based on these rules, the missing rate on location of the stop reflects the rate of missing information on direction. The missing rates for highway and milepost are included in the overall invalid rate for location of stop. When analyzing the entries for highway, any "0" was considered an "off-highway" stop and considered valid for this analysis. In addition, when highway was identified as "off-highway," there was no requirement for milepost to be identified. The invalid rate on location of stop reflects any violation of the aforementioned rules.

[2] "Valid Search" was created based on the search-related data available. Specifically, if a search was indicated, the search authority, search target, and contraband seized fields must contain a valid entry. Any deviation from these criteria resulted in an "invalid search." The missing rate for valid search reflects missing data for the "search performed" field.

DATA AUDIT: PHASE 2

Description

Phase 2 examines the data accuracy by comparing the content of the electronic data to other independent sources of information and addressing the question of whether all stops recorded in external sources of information are represented in the electronic data. This type of audit determines the extent to which officers are completing data collection forms for all stops. The method and results are reported below.

To determine whether information is being recorded for all eligible traffic stops, an external data source that records the same stops is necessary. Typical second sources of data include: computer aided dispatch (CAD) data, citation data, written warning data, videotapes, or other departmental data (Fridell, 2004). Currently, the DPS records its traffic stop data directly on the citation/warning/repair order forms, so these data sources were not usable for comparison purposes. Based on discussions with DPS personnel, it was determined that the most appropriate comparison data were officers' activity logs. The reporting standards are the same for the activity logs as for the stop form data collection. This data set was provided to the UCPI research team and the aggregate totals of stops in the DPS activity logs and electronic data were compared. In order to ensure the greatest degree of comparability between the two data sets, 8,102 records were removed from the 531,504 total documents in the electronic data set (stop records resulting in only a voided citation and stop records with more than one completed document) as they would not be reflected in the activity logs.

Results

Table 2.2 compares at the Highway Patrol Division and district/shift level the raw number of traffic stops included in DPS activity logs with the raw number of traffic stops included in the electronic data set. The "percent error" column represents the percentage of traffic stops that do not match across the two data sources. Positive error rates indicate the percent of stops that appear in the electronic stop data but not on the activity logs. Negative error rates indicate the percent of stops that appear in the activity logs but not in the electronic stop data.

The results are displayed in Table 2.2. In 11 of the 19 districts/shifts, there were greater numbers of stops in the activity logs compared to the electronic data set, while in the other 8 districts/shifts, there were greater numbers of stops in the electronic data set compared to the activity logs. As noted above, the DPS data collection is somewhat different from typical traffic stop data collection efforts where the traffic stop data are typically collected separately from the other documentation of the stop (i.e., citation, warning, etc.). The results of this phase of the data audit indicate that inclusion of information about the stop on the actual citation/warning forms increases the likelihood that such data will be collected. The Police Executive Research Forum (Fridell, 2004, 54) suggests that "correspondence of 90 percent or more between the two sources of information is quite acceptable." Using this standard, the results of this audit are positive. All nineteen of the districts/shifts fall within the parameter of 10% error in either dataset, with nearly half of the districts/shifts demonstrating a difference of 1% or less between the two datasets.

Table 2.2: Comparison of Number of Stops in Activity Logs and Electronic Data Set

	Total Number of Police-Citizen Interactions (2007)		
	In DPS Activity Logs	In Electronic Data Set	Percent Error
Highway Patrol Division	518,069	517,961	-0.02%
Northern Bureau			
District 1—Kingman	34,128	34,013	-0.34%
District 2—Flagstaff	33,374	33,732	1.07%
District 3—Holbrook	44,157	44,093	-0.14%
District 11—Globe	20,623	20,475	-0.72%
District 12—Prescott	33,337	33,594	0.77%
Metro West Bureau			
MW Shift 1	29,764	30,162	1.34%
MW Shift 2	30,895	31,603	2.29%
MW Shift 3	14,346	14,342	-0.03%
Southern Bureau			
District 4—Yuma	41,446	41,470	0.06%
District 6—Casa Grande	41,478	40,895	-1.41%
District 8—Tucson	44,059	43,750	-0.70%
District 9—Sierra Vista	34,476	34,393	-0.24%
Commercial Vehicle Enforcement Bureau			
District 15	6,443	6,868	6.60%
District 16	17,666	18,000	1.89%
Metro East Bureau			
ME Shift 1	13,113	12,830	-2.16%
ME Shift 2	28,054	28,217	0.58%
ME Shift 3	18,406	18,062	-1.87%
District 7—Metro Motorcycles	20,874	20,389	-2.32%
Canine	9,708	9,404	-3.13%

In addition to the availability of the activity log data, additional comparison data are available for contacts in which a citation or warning was issued. In traffic stops where a citation or warning was recorded, an additional data file documenting the specific number and types of warnings and citations issued was provided to the UCPI research team. One way to further examine the traffic stop data is to compare the two data sets (i.e., stop data and violation details for the stop data) for internal consistency. Unfortunately, these comparisons suggested multiple errors in one or both data sources. These inconsistencies are documented below for traffic stops that resulted in citations and warnings:

- Citations
  - 5,150 citations that were reported in the <u>violation</u> data file did not have "citation" indicated as an outcome in the original stop data file.

- o In contrast, 4,545 citations that were reported in the original stop data file have no corresponding citation information in the <u>violation</u> data.

- • <u>Warnings</u>
  - o 3,940 warnings that were reported in the <u>violation</u> data file did not have "warning" indicated as an outcome in the original stop data file.
  - o In contrast, 7,701 warnings that were reported in the original stop data file have no corresponding warning information in the <u>violation</u> data.

The research team proceeded with data analysis based on the assumption that if a citation or warning appears in either data set, it should be treated as a valid outcome. That is, even if the stop data – used as the basis for this report – indicated that a citation or warning was not issued, but information from the violation data indicated that one (or more) citations or warnings were issued for the stop, the stop outcome was changed in the stop data file by the research team. This resulted in changing 5,150 traffic stops that originally indicated no citation was issued, to indicate that at least one citation was issued. In addition, 3,940 stops that indicated no warning was issued were altered to indicate that at least one warning was issued.

The second data problem identified above is more problematic – that is, citations and warnings in the original stop data that did not have corresponding violation information in the violation data file. After consultation with DPS officials, the UCPI research team decided to retain the original information as presented in the stop data file.

RECOMMENDATIONS

The Police Executive Research Forum recommends less than a 10% error rate for traffic stop data (Fridell, 2004). Our research team recommends a more stringent standard of under 5%, with a goal of 2% missing/incorrect data. This analysis produced an error rate of 10.4% based on the fields listed in Table 2.1. While this is an improvement from the Year 1 error rate of 14.1%, it still indicates a need for steps to be taken to reduce the overall error rate. Furthermore, although comparisons between electronic stop data and activity logs indicate officers are generally recording information on the traffic stop forms when required, additional analyses examining the citation and warning violation data uncovered large discrepancies between violation data and traffic stop data. Specifically, the stop file includes citations and warnings which have no corresponding violation data, and the violation file includes stops indicating citations or warnings that were not included in the stop file.

Based on similar findings in Year 1, the UCPI research team made a number of recommendations designed to reduce data collection errors, including strategies that have been effective in other departments in improving data quality (see Engel et al., 2004, 2005; Engel, Frank, Tillyer, & Klahm, 2006). Specifically, the UCPI team recommended a shift to electronic data collection if fiscally possible, consistent training on the data collection protocol, and increased supervisory oversight. As described in Section 1, the DPS has taken significant action on these recommendations. Specifically, the department instituted an

electronic data collection system to replace the imaging software and paper forms in use during the 2007 data collection period. It is expected that the new electronic data collection will reduce the amount of errors with the data that is being collected. Specifically, because the new system can be designed to not accept invalid or incomplete information and alert users to problems, user-related errors should be significantly reduced.

In addition, electronic data collection provides more immediate access to data for oversight and auditing purposes. Specifically, the new electronic data collection system allows the Department to institute quality assurance measures to ensure Officers are completing the data collection form for every contact. The new system assigns a contact data number every time an officer completes a data sheet. The Officer is now required to document this number in their time and activity weekly next to the primary document number. After a first line supervisor receives the Officer's time and activity weekly, the supervisor can first ensure a document number is listed next to the primary document number for the stop. The supervisor can then check the database to see what was the last document number shown assigned to the officer. If the numbers do not match, the supervisor can take corrective actions on a weekly basis. Conducting these cross-checks between the electronic data and DPS activity logs on a routine basis should ensure that all traffic stops are being appropriately recorded by Officers. Furthermore, the internal consistency problems associated with the stop data and violation data should be improved by the simultaneous collection of violation information on the electronic stop data collection form.

Finally, as the UCPI team recommended, the DPS implemented a training program for all officers regarding the proper procedures for using the new software and completing the redesigned form. This training was designed to ensure officers were selecting information based on the guidelines provided, which should improve accuracy and consistency across the department.

The UCPI team is optimistic that data quality will be enhanced by DPS' actions and that the supervisory oversight recommendations made in the Year 1 report are addressed by the new data integrity checks undertaken by the DPS. Because the data utilized to conduct this year's data audit were collected prior to these changes by DPS, the UCPI team will await results from analyses of the 2008 data before determining whether further recommendations are necessary.

3. DESCRIPTION OF TRAFFIC STOP DATA

OVERVIEW

Section 3 describes the findings based on traffic stop data collected by DPS officers for the period of January 1, 2007 through December 31, 2007. This section is divided into three parts that report: 1) missing or invalid data for the traffic stops, 2) characteristics of traffic stops conducted in 2007, and 3) characteristics of vehicles and drivers stopped by DPS officers in 2007. The information reported is strictly descriptive in nature. This summary does not include analyses that examine causal influences, and any data presented at aggregate levels are solely for purposes of comparison across DPS organizational units.

The first section provides a summary in Table 3.1 of the percentages of missing or invalid data for each of the variables included in later analyses. The second section includes Tables 3.2 – 3.4, which report the characteristics of traffic stops for 2007 across the department, division, bureau, and district/shift levels. Table 3.2 reports the total number of stops, the percentage of stops by weekday and daytime hours, and the duration of the stop. Table 3.3 provides a monthly breakdown of traffic stops across the department, division, bureau, and district/shift levels in 2007. Table 3.4 reports the reasons for the stop across the department, division, bureau, and district/shift levels. The third section includes Tables 3.5 – 3.7, which report the characteristics of vehicles (the percentage of Arizona-registered vehicles and vehicle type) and drivers (e.g., age, gender, race/ethnicity, undocumented alien status, and residency) stopped by DPS officers in 2007 across the department, division, bureau, district/shift, and county levels.

DATA

Based on the data available, Arizona Department of Public Safety (DPS) officers completed 531,504 documents regarding their contacts with citizens during 2007. To properly examine issues surrounding racial/ethnic disparities, only officer-initiated traffic stops should be considered. Further, DPS collects traffic stop data on both citation and warning documents. It is imperative that only one source of information be used for each stop, so as not to duplicate stop information (i.e., one stop is entered multiple times into the data set). Therefore, the following numbers of traffic stops have been excluded from further analyses for the reasons noted:

- 14,300 non-driver or non-traffic enforcement contacts were removed
- 1,286 contacts with missing data on the type of contact (n=1244) or reason for the stop (n=42) were removed
- 26,005 citizen-initiated stops (specifically, 22,976 collisions and 3,029 motorist assists) were removed
- 6,938 contacts that had secondary documents issued containing duplicate information were removed[3]

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[3] If a primary document number was indicated on the form, the contact corresponds to another contact (and therefore results in multiple entries for the same traffic stop). In some cases, the primary document number did

- 1,164 that listed the only outcome as voided citation were removed

Therefore, **the analyses in this report are based on 485,183 officer-initiated traffic stops of drivers conducted during 2007**.[4]

Of the 485,183 officer-initiated traffic stops, Table 3.1 documents the missing data percentages for the variables used in analyses. The first column lists the variables, followed by the percent of missing or invalid data, and the remaining valid number of cases.

Table 3.1: Analysis of Missing Data from all 2007 Traffic Stops

	% Missing/Invalid	# Valid Cases
Valid Traffic Stops	--	485,183
Stop Characteristics		
Organizational Unit (division, bureau)	0.35	483,487
Organizational Unit (district/shift)	0.52	482,674
Date of Contact (month, weekday)	0.00	485,183
Time of Contact (daytime)	0.00	485,183
Location of Contact (county)	8.97	442,132
Duration of Stop	<0.01	485,162
Reason for the Contact[5]	0.00	485,183
Result of Contact/Stop Outcome (warning, repair order, citation, arrest, search)	0.00	485,183
Vehicle Characteristics		
State of Vehicle Registration	1.07	480,001
Vehicle Type	0.57	482,436
Citizen Characteristics		
Age	0.15	484,458
Gender	0.01	485,145
Race	<0.01	485,166
Zip Code (Arizona state residency, county residency)	<0.01	485,167

As demonstrated in Table 3.1 above, the variable with the highest percentage of missing/invalid data is location of stop (8.97%), followed by state of vehicle registration (1.07%). The remaining variables to be used in analyses have less than 1.0% of cases with

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not match another valid document number in the data set. In other cases, the primary document number matched multiple documents numbers. There are clearly errors associated with this item on the data collection form. Therefore, when making adjustments to correct for these errors, the UC team decided to eliminate all cases with primary document numbers under the assumption that they were double entries into the data set. Statistical analyses were initially performed with these cases included – the results with the cases excluded do not significantly differ form those when the cases were included. The results reported within this report are based on statistical analyses with these cases excluded.

[4] The reasons for not including cases are not mutually exclusive; therefore, the total number of cases excluded is less than the total of cases eliminated for the various reasons.

[5] Cases that were missing reason for the contact (n=42) were removed per the description above.

missing or invalid data. Percentages provided in Tables 3.2 – 3.7 (and in later sections) are based on data from the number of valid cases only.[6]

TRAFFIC STOP CHARACTERISTICS

Traffic Stop Descriptives

Table 3.2 documents specific information regarding traffic stops at the department, division, bureau, and district/shift levels, including: total number of stops, percent of stops occurring on weekdays, and during daytime hours, as well as the duration of the stops.

As shown in Table 3.2, stops by Highway Patrol Division officers accounted for the overwhelming majority of all DPS stops (99%). Within the Highway Patrol Division, the Northern Bureau and Southern Bureau conducted approximately two-thirds of all 480,453 stops. At the district/shift level, District 3 (Holbrook) performed the largest number of stops (41,713), while District 15 had the fewest stops (6,442).

The majority of the 485,183 stops for the department were initiated on a weekday (73.9%) and occurred during the daytime (67.2%). The overwhelming majority of stops lasted between zero and twenty minutes (0-10 minutes 20.1%; 11-20 minutes 65.1%). These trends are fairly consistent across divisions, bureaus, and districts/shifts. For each of the categories, the variation at the district/shift level is, as expected, most pronounced. Please refer to Table 3.2 for specific variation at these organizational levels.[7]

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[6] In an effort to utilize as much information as possible for statistical analyses, a number of assumptions regarding these data have been made. Specifically, for 22,610 cases (4.7%) that indicated a zero for citizen zip code, these were assumed to not be Arizona residents. Therefore, these cases are included and coded as non-Arizona residents. Furthermore, for 230 cases (0.05%) that did not indicate that a search was conducted, but a search target and search authority were listed, an assumption was made that a search was conducted. Likewise, of the 24,302 searches, 147 (0.6%) did not indicate any type of seizure (including "none"); an assumption was made by the research team that these missing cases indicated no seizures. These cases remain in the analyses. Therefore, while the data audit demonstrated larger percentages of missing data for some data fields, these assumptions regarding the likely source of the errors and their subsequent correction allow the cases to be included in the analyses.

[7] Beginning in Table 4.2 and continuing throughout the report, the Central and South Canine squads are collectively considered based on discussions with DPS officials, who indicated that these units often work in similar geographic areas but are significantly distinct from the area patrolled by the North squad.

Table 3.2: 2007 Traffic Stop Characteristics – Statewide, Division, Bureaus, & Districts/Shifts

	Total # of Stops	% Weekday	% Daytime	Duration of Stop (in Minutes)					
				% 0-10	% 11-20	% 21-30	% 31-45	% 46-60	% 60+
DPS Statewide	485,183	73.9	67.2	20.1	65.1	7.5	2.6	1.7	3.1
Criminal Investigations Division	3,034	67.7	44.6	26.0	55.5	10.3	4.6	1.2	2.3
Highway Patrol Division	480,453	74.0	67.3	20.1	65.1	7.5	2.5	1.7	3.1
Northern Bureau	156,692	70.0	73.9	26.5	67.1	3.0	1.0	0.6	1.8
D1-Kingman	32,351	71.7	72.7	11.1	81.6	3.5	1.0	0.7	2.0
D2-Flagstaff	31,662	71.0	72.9	37.7	55.4	3.3	0.8	0.7	2.1
D3-Holbrook	41,713	69.4	77.2	27.4	66.3	2.7	1.0	0.6	2.0
D11-Globe	18,854	67.7	73.1	47.4	46.9	3.1	0.6	0.5	1.4
D12-Prescott	31,908	69.6	72.0	17.2	77.0	2.5	1.6	0.6	1.1
Metro West Bureau	66,741	78.1	54.0	5.4	69.9	17.2	2.9	1.2	3.4
Shift #1	25,619	81.1	81.3	6.7	79.6	9.5	1.4	0.7	2.2
Shift #2	27,617	79.3	52.5	4.9	64.5	21.2	4.3	1.7	3.3
Shift #3	13,142	70.0	2.9	3.4	62.1	24.2	3.0	1.2	6.2
Southern Bureau	153,392	70.0	67.9	27.4	64.9	4.0	1.2	0.8	1.7
D4-Yuma	40,294	67.1	70.4	27.2	64.3	4.4	1.4	0.9	1.7
D6-Casa Grande	38,975	65.1	66.7	30.5	63.1	4.0	1.0	0.5	0.9
D8-Tucson	40,935	77.0	64.9	18.6	73.2	3.8	1.1	1.1	2.2
D9-Sierra Vista	32,903	70.6	70.1	34.8	57.4	3.9	1.1	0.7	2.1
Commercial Vehicle Bureau	24,210	88.6	91.4	1.3	12.1	26.7	23.3	18.6	18.0
District 15	6,442	86.7	95.3	1.5	14.2	17.0	19.4	17.3	30.5
District 16	17,622	89.3	90.0	1.2	11.2	30.3	24.7	19.2	13.5
Metro East Bureau	78,891	81.4	57.0	11.3	73.8	8.9	1.6	0.9	3.5
Shift #1	10,110	84.2	84.2	10.3	78.8	6.6	1.2	0.8	2.4
Shift #2	24,727	78.1	56.6	7.9	77.7	8.6	1.5	0.9	3.4
Shift #3	16,943	68.8	4.3	2.9	71.5	17.1	2.4	1.0	5.1
Metro Motors	17,778	94.6	77.6	11.9	79.6	4.5	0.9	0.6	2.6
Canine	9,287	84.7	85.0	35.9	51.3	5.4	2.1	1.5	3.7
Canine North	3,318	81.6	89.5	28.2	58.2	3.7	2.0	2.4	5.5
Canine Central & South	5,951	86.4	82.4	40.2	47.4	6.3	2.2	1.1	2.8

Traffic Stops By Month

Table 3.3 provides the temporal breakdown of traffic stop occurrences by month for 2007. At the department level, May accounted for the highest percentage of stops (9.3%), followed by July (8.6%), April, August, and November (8.4% each). The lowest percentage of traffic stops at the department level occurred in June and December (7.9% each). Overall, however, stop activity at the department level is fairly consistent across months, with a difference of only 1.4% between the busiest and slowest months. Table 3.3 also documents the slight variation in temporal trends at the division, bureau, and district/shift levels.

Table 3.3: 2007 Traffic Stops by Month - Statewide, Divisions, Bureaus, & Districts/Shifts

	% Jan	% Feb	% Mar	% Apr	% May	% Jun	% Jul	% Aug	% Sep	% Oct	% Nov	% Dec
DPS Statewide	8.3	8.1	8.3	8.4	9.3	7.9	8.6	8.4	8.1	8.3	8.4	7.9
Crim. Invest. Division	6.5	9.8	6.6	7.7	9.5	8.4	9.9	9.9	8.5	6.3	7.8	9.1
Highway Patrol Division	8.3	8.1	8.3	8.4	9.3	7.9	8.6	8.4	8.1	8.3	8.4	7.9
Northern Bureau	8.5	8.3	8.9	9.3	9.6	7.6	8.0	8.2	7.7	7.9	8.5	7.4
D1-Kingman	9.1	7.3	6.1	8.8	8.2	7.6	7.8	8.5	8.8	9.5	9.5	9.0
D2-Flagstaff	6.1	7.5	11.4	10.4	10.5	6.9	7.2	8.6	7.2	7.9	9.0	7.3
D3-Holbrook	9.3	9.8	9.7	8.9	9.6	8.2	8.4	8.0	7.0	6.7	7.3	7.0
D11-Globe	9.0	8.3	9.1	7.5	11.0	8.2	8.9	7.2	7.8	7.4	8.8	6.8
D12-Prescott	9.0	8.1	8.3	10.4	9.3	7.2	7.8	8.6	7.9	8.2	8.3	6.8
Metro West Bureau	9.5	7.7	7.8	8.2	9.8	7.8	8.6	8.0	8.1	8.1	7.9	8.5
Shift #1	9.0	6.7	7.1	7.4	11.4	8.6	9.4	9.5	8.4	7.6	7.5	7.5
Shift #2	9.8	8.7	7.7	8.7	9.4	7.4	8.5	7.0	7.8	8.0	7.8	9.3
Shift #3	9.8	7.5	9.3	8.6	7.2	7.4	7.5	7.6	8.2	9.3	8.9	8.7
Southern Bureau	7.5	8.1	7.8	8.1	9.6	8.7	9.0	8.9	8.1	8.2	8.4	7.8
D4-Yuma	7.0	7.1	7.4	7.0	8.9	9.8	8.8	9.7	8.5	8.9	9.3	7.7
D6-Casa Grande	8.2	9.2	7.7	9.0	10.6	9.2	8.4	8.2	7.6	7.7	6.8	7.4
D8-Tucson	7.4	7.6	7.4	8.8	9.6	8.6	9.9	8.1	7.4	8.9	8.6	7.7
D9-Sierra Vista	7.4	8.6	8.9	7.5	9.1	6.8	8.8	9.6	9.0	7.2	8.7	8.6
Commercial Vehicle Bureau	8.2	8.0	9.9	8.9	9.2	8.1	9.5	8.5	7.5	8.0	7.6	6.5
District 15	7.0	6.8	9.5	10.9	8.9	7.3	10.5	8.6	6.5	8.5	7.9	7.8
District 16	8.7	8.6	10.0	8.3	9.4	8.3	9.2	8.6	7.8	7.7	7.3	6.1
Metro East Bureau	8.7	8.1	8.1	7.1	7.6	7.2	8.6	8.0	9.0	9.6	8.9	8.9
Shift #1	9.5	7.9	8.2	7.7	7.9	7.5	8.8	8.4	8.1	9.2	6.9	9.9
Shift #2	9.5	8.5	8.7	7.8	6.9	8.0	9.0	7.8	9.4	8.9	7.6	8.0
Shift #3	9.7	7.3	7.3	7.5	7.9	7.3	6.4	7.6	9.1	10.0	9.2	10.7
Metro Motors	6.6	9.9	8.1	4.6	7.1	5.8	11.7	9.4	9.1	8.7	11.1	7.9
Canine	7.8	5.6	8.2	8.8	9.9	6.7	5.7	6.4	8.5	13.1	10.1	9.3
Canine North	10.6	5.8	10.4	12.6	9.4	6.3	8.8	5.7	6.4	8.6	7.8	7.6
Canine Central & South	6.2	5.4	6.9	6.7	10.1	7.0	4.0	6.7	9.8	15.5	11.4	10.3

Reason for the Stop

Table 3.4 reports the reasons for the stops by DPS officers, including: 1) moving violations, 2) non-moving violations, 3) equipment violations, 4) investigatory stops, 5) preexisting information, and 6) criminal offenses. Information for these categories is summarized at the department, division, bureau, and district/shift levels. Across the department in 2007, the most frequent reason for the stop was a moving violation (66.4%), followed distantly by equipment violations (19.6%), and non-moving violations (11.9%).

Greater variation in the reasons for stops is evident at the bureau level. For all bureaus except the Commercial Vehicle Enforcement Bureau, moving violations are the most common reason for the stop. In the Commercial Vehicle Bureau, equipment violations are the most frequent reason for the stop (50.5%); officers in this bureau also record the highest percentage of stops for investigatory purposes (13.5%) across bureaus. In the Metro West and Metro East Bureaus, the second most common reason for the stop is a non-moving violation, while in the Northern and Southern bureaus the second most common reason for the stop is an equipment violation.

The districts/shifts also exhibit variation in reasons for stops. For example, the range of stops for moving violations at the district level varied from a high of 84.1% (District 3) to a low of 19.2% (District 16). Note, however, that of the 19 districts/shifts, 17 reported moving violations as the reason for the stop for over 50% of drivers stopped. Districts/shifts also varied considerably in the other reasons for stops. For a complete description of the various categories of reasons for the stop at the lower organizational levels, please refer to Table 3.4.

Table 3.4: Reasons for the 2007 Traffic Stops – Statewide, Division, Bureaus, & Districts/Shifts

	% Moving	% Non-Moving	% Equipment	% Investigation	% Preexisting Info	% Criminal Offense
DPS Statewide	66.4	11.9	19.6	1.1	0.4	0.5
Criminal Investigations Division	61.3	14.5	21.6	1.5	0.3	0.8
Highway Patrol Division	66.5	11.9	19.6	1.1	0.4	0.5
Northern Bureau	78.2	3.9	16.6	0.4	0.4	0.5
D1-Kingman	77.5	4.3	17.3	0.4	0.4	0.2
D2-Flagstaff	72.5	4.0	22.3	0.4	0.5	0.2
D3-Holbrook	84.1	2.4	12.2	0.3	0.3	0.7
D11-Globe	81.7	3.0	12.8	0.6	0.8	1.0
D12-Prescott	74.6	5.7	18.3	0.5	0.2	0.6
Metro West	59.1	23.0	17.0	0.5	0.2	0.4
Shift #1	63.8	22.8	12.5	0.3	0.2	0.4
Shift #2	52.7	23.8	22.5	0.6	0.1	0.3
Shift #3	63.1	21.9	14.0	0.5	0.2	0.4
Southern Bureau	65.9	10.6	22.2	0.5	0.5	0.3
D4-Yuma	66.8	8.2	24.2	0.2	0.3	0.2
D6-Casa Grande	65.7	10.1	23.0	0.5	0.3	0.4
D8-Tucson	59.2	18.9	20.7	0.4	0.5	0.2
D9-Sierra Vista	73.4	3.6	20.6	1.1	1.0	0.3
Commercial Vehicle	21.9	12.9	50.5	13.5	1.1	0.1
District 15	29.1	12.1	32.6	23.5	2.6	0.1
District 16	19.2	13.2	57.1	9.8	0.6	0.0
Metro East	64.0	21.0	13.5	0.5	0.1	1.0
Shift #1	64.5	25.3	9.1	0.3	0.1	0.8
Shift #2	54.2	29.7	14.2	0.7	0.1	1.1
Shift #3	66.9	17.0	15.0	0.4	0.1	0.6
Metro Motors	73.1	14.5	10.2	0.2	0.1	1.8
Canine	66.8	12.4	19.8	0.7	0.1	0.1
Canine North	78.9	7.2	12.9	0.5	0.2	0.3
Canine Central & South	60.0	15.3	23.7	0.9	0.0	0.1

VEHICLE AND DRIVER CHARACTERISTICS

Tables 3.5 – 3.7 report the characteristics of vehicles and drivers stopped by DPS officers during 2007. The characteristics of the vehicle are reported at the department, division, bureau, and district/shift levels in Table 3.5 and include the percent of Arizona registered vehicles and vehicle type. The characteristics of the drivers are grouped as: 1) drivers' age and gender, 2) drivers' race/ ethnicity, and 3) drivers' residency. These characteristics are described at the department, division, bureau, and district/shift levels in Table 3.6 and at the county level in Table 3.7.

Vehicle Characteristics

Table 3.5 reports the characteristics of vehicles involved in DPS traffic stops in 2007, including the percent of Arizona registered vehicles and vehicle type (e.g., car, convertible, motorcycle, van or station wagon, SUV, pickup truck, truck or tractor trailer, and other). Each of these categories is reported at the department, division, bureau, and district/shift levels.

Vehicle Registration

At the department level, the majority of vehicles stopped (75.1%) were registered in the state of Arizona. The percent of Arizona-registered vehicles, however, varied considerably by bureau and district/shift. For example, at the bureau level, the percentage of Arizona-registered vehicles ranged from a high of 88.2% (Metro East Bureau) to a low of 41.2% (Commercial Vehicle Bureau). Similar variation existed at the district/shift level, with a range from 93.3% (Metro East Shift #2) to 33.3% (District 15) of Arizona-registered vehicles. Northern Canine officers also stopped a majority of vehicles registered outside of Arizona.

Vehicle Type

The most common vehicle types stopped at the department level were: cars (49.4%), followed by pickup trucks (23.4%), vans/station wagons (9.7%), SUVs (9.0%), and trucks/tractor trailers (6.7%). With the exception of the Commercial Vehicle Enforcement Bureau, these percentages are fairly similar at the bureau and district/shift level. Due to the nature of their assignment, Commercial Vehicle Enforcement Bureau officers stopped a much larger percentage of trucks and/or tractor trailers (85.5%) in comparison to officers in other bureaus.

Table 3.5: Vehicle Characteristics of 2007 Traffic Stops – Statewide, Divisions, Bureaus, & Districts/Shifts

					Vehicle Type				
	% Arizona Registration	% Car	% Convertible	% Motorcycle	% Van or Station Wagon	% SUV	% Pickup Truck	% Truck or Tractor Trailer	% Other
DPS Statewide	75.1	49.4	0.4	1.0	9.7	9.0	23.4	6.7	0.3
Criminal Investigations Division	80.3	60.0	0.4	4.1	9.4	5.0	18.0	2.7	0.2
Highway Patrol Division	75.0	49.4	0.4	1.0	9.7	9.1	23.4	6.7	0.3
Northern Bureau	64.7	47.1	0.4	0.9	10.6	12.0	25.4	3.2	0.3
D1-Kingman	50.9	50.4	0.4	1.2	9.6	14.0	20.6	3.4	0.4
D2-Flagstaff	61.4	48.3	0.3	0.4	12.2	11.6	24.6	2.2	0.4
D3-Holbrook	62.8	43.5	0.2	0.6	9.9	13.7	28.4	3.5	0.2
D11-Globe	88.1	42.6	0.3	1.4	13.7	7.0	31.6	3.0	0.4
D12-Prescott	70.6	50.1	0.6	1.3	9.1	11.1	23.7	3.8	0.3
Metro West Bureau	86.9	58.0	0.5	1.7	8.4	6.3	22.7	2.2	0.3
Shift #1	86.0	53.2	0.6	1.9	9.5	7.6	24.1	2.6	0.4
Shift #2	85.3	58.0	0.4	1.8	8.0	5.7	23.1	2.5	0.3
Shift #3	92.2	67.1	0.6	0.8	7.0	4.7	19.0	0.6	0.2
Southern Bureau	78.9	47.8	0.4	0.6	11.2	10.8	26.4	2.5	0.3
D4-Yuma	65.6	48.7	0.5	0.4	11.9	12.3	23.7	2.2	0.2
D6-Casa Grande	88.0	48.6	0.4	0.6	10.2	11.0	26.2	2.6	0.3
D8-Tucson	85.8	50.0	0.4	0.6	10.7	9.2	26.6	2.1	0.3
D9-Sierra Vista	75.9	43.1	0.2	0.7	12.2	10.5	29.7	3.3	0.2
Commercial Vehicle Bureau	41.2	6.2	0.0	0.5	2.3	0.9	3.4	85.5	1.1
District 15	33.3	9.4	0.1	1.0	2.6	1.7	4.7	78.8	1.8
District 16	43.9	4.8	0.0	0.3	2.2	0.6	2.9	88.3	0.8
Metro East Bureau	88.2	62.8	0.5	1.6	8.3	4.8	20.3	1.5	0.3
Shift #1	93.1	57.0	0.6	1.7	8.9	5.8	23.6	1.8	0.6
Shift #2	93.3	66.0	0.5	1.0	8.3	2.9	20.8	0.4	0.1
Shift #3	92.7	68.1	0.6	1.1	6.8	3.9	18.5	0.8	0.2
Metro Motors	92.6	59.2	0.5	3.7	9.4	5.0	21.1	0.8	0.2
Canine	52.2	57.6	0.0	0.1	7.8	9.9	17.1	6.9	0.6
Canine North	13.4	50.5	0.0	0.2	8.8	13.7	16.0	9.8	0.9
Canine Central & South	73.6	61.5	0.1	0.1	7.2	7.8	17.7	5.3	0.4

Driver Characteristics

Tables 3.6 – 3.7 report the characteristics of drivers stopped by DPS officers in 2007, including their average age, percent male, percent racial/ethnic groups (e.g., White, Black, Hispanic, Native American, Asian, Middle Eastern, and other), percent undocumented alien, percent motorists that reside in Arizona, and percent of motorists stopped in the county in which they reside. Table 3.6 reports this information at the department, division, bureau, and district/shift levels, while Table 3.7 presents these percentages for each of the 15 counties in Arizona.

Drivers' Age & Gender

The average age of drivers and the percent of drivers who were male are reported at the department, division, bureau, and district/shift level in Table 3.6 and at the county level in Table 3.7. At the department level, the average age of drivers stopped was 36.6 years, which is similar to the individual averages at the bureau, and district/shift levels (see Table 3.6). Of note, the average age of drivers stopped by the Commercial Vehicle Enforcement Bureau (42.8 years) is older compared to other bureau averages; whereas drivers stopped in the Metro West and East Bureaus tended to be somewhat younger (34.9 and 33.8 years, respectively) compared to the department and other bureau averages. The average age of stopped drivers also varied by county (see Table 3.7), with a high of 42.4 years in Gila County, and a low of 34.8 years in Maricopa County. These age differences are likely based on traffic patterns and DPS assignments.

Also shown in Table 3.6, across the department, 71.2% of the stopped drivers were male; likewise, males were more likely than females to be stopped at all levels within the department, particularly within the Commercial Vehicle Enforcement Bureau. The percent male also varied at the county level (see Table 3.7), from a high of 75.2% of drivers stopped in Mohave County to a low of 66.6% of drivers stopped in Graham County.

Drivers' Race & Ethnicity

DPS officers also recorded the racial/ethnic background of drivers. Officers visually determined the racial and ethnic composition of the drivers and these determinations were based solely on officers' perceptions. No drivers were asked for their racial or ethnic category. The reliability and validity of citizens' race involves two related concerns for data collected by the police. First, police may be reluctant to indicate drivers' race or may simply report that information inaccurately. Second, officers may "disengage," or initiate fewer traffic stops overall. Unfortunately, the validity of data collected by police officers often cannot be directly assessed.

The racial and ethnic descriptions of drivers stopped by officers are reported at the department, division, bureau, and district/shift levels in Table 3.6 and at the county level in Table 3.7. Officers recorded their perceptions of drivers' race/ethnicity in one of seven categories, with the percentage across the department indicated in parentheses:

- White (61.3%)
- Hispanic (25.4%)
- Native American (5.2%)
- Black (4.8%)
- Asian (1.8%)
- Middle Eastern (1.0%)
- Other/Unknown race/ethnicity (0.5%)

It should be noted that some variation in the racial and ethnic background of drivers stopped across division, bureau, and district/shift levels is to be expected due to differences in the demographic makeup of residents and travelers, as well as differences in traffic flow patterns in these locations. As shown in Table 3.6, variations in the racial/ethnic background of stopped drivers at the division, bureau and district/shift levels are evident. For example, at the division level, Criminal Investigations Division officers stop higher percentages of Hispanic and Black drivers compared to Highway Patrol Division officers. At the bureau level, the Northern Bureau reported the highest percentage of White drivers stopped (68.1%), while officers in the Commercial Vehicle Bureau stopped the lowest percent of White drivers (51.3%). Differences in racial composition of drivers stopped across bureaus are also pronounced for Hispanic, Native American, and Black drivers. For example, the largest percentages of Hispanic drivers were stopped in the Southern and Commercial Vehicle Bureaus (36.3 and 38.3%, respectively), while the lowest percent was in the Northern Bureau (11.9%). Native Americans accounted for 13.2% of drivers stopped in the Northern Bureau, but their percentage of drivers stopped in each of the other bureaus was 1.6% or smaller. Black drivers accounted for 7.2% of drivers stopped in the Metro East Bureau, compared to 2.9% of drivers in the Northern Bureau. The percentages of Asian, Middle Eastern, and other drivers stopped were extremely low across all organizational units.

As shown in Table 3.6, variations at the district/shift level in percentages of racial/ethnic groups stopped were also evident. The percentage of White drivers stopped at the district/shift level varied from a high of 79.6% in District 11 (Globe) to a low of 42.0% in the Canine District. The percentages of motorists stopped recorded as Hispanic varied from 44.7% of the stops in the Canine District, to only 10.1% of stops in District 2 (Flagstaff). Officers in District 16 (44.5%) also stopped a significantly higher percentage of Hispanic drivers. Percentages of drivers recorded as Native Americans varied from a high of 25.9% in District 3 (Holbrook), to a low of 0.3% in District 16. Finally, Black drivers represented 9.2% of stops by the Metro West Shift and 8.0% of stops by Metro East Shift 3, but only 1.7% of stops in District 11 (Globe).

Table 3.7 demonstrates these variations at the county level. The percentages of motorists recorded as Whites and Hispanics vary most dramatically. Specifically, the percentage of motorists stopped recorded as White ranged from a high of 78.7% in Gila County to a low of 18.8 in Santa Cruz County. Likewise, the percentage of motorists recorded as Hispanic varied from a high of 78.9% in Santa Cruz County, to a low of 9.0% in Apache County. Variation is also evident in the percentages of drivers recorded as Native American and Black, although to a lesser degree. Of note, Apache County, Navajo County, and Coconino County all have considerably higher percentages of Native Americans compared to other counties, while

Maricopa County had the highest percentages of stopped drivers recorded as Black (7.0%). The percentages of Asian, Middle Eastern, and other drivers stopped are extremely low across all Arizona counties. *It is important to note that the differences in the percentages of racial / ethnic groups stopped across counties do not necessarily indicate that DPS officers make stopping decisions based on race / ethnicity. These variations in stopping patterns may likely reflect differences in residential and driving patterns.*

Undocumented Alien Status

Tables 3.6 – 3.7 also report the percent of drivers stopped who officers indicated were of undocumented alien status. As shown in Table 3.6, DPS officers indicated that 0.6% of drivers stopped department-wide were undocumented aliens. At the bureau level, the highest percentage of undocumented aliens was stopped in the Metro East Bureau (1.3%), while the lowest percent was 0.1% in the Commercial Vehicle Bureau. At the district/shift level, Metro West Shift #3 (1.6%), Metro Motors (1.4%), and the Canine District (3.1%) all stopped larger percentages of undocumented aliens. As shown in Table 3.7, the percentage of drivers stopped who were undocumented aliens ranged from a low of 0.0% in Graham, Greenlee, and Yuma counties to a high of 0.9% in Maricopa and Mohave counties.

It is important to remember that, for the 2007 data collection period, the data field regarding undocumented aliens applied only to the driver. Therefore, this information falls short of indicating whether any passengers in the vehicle are considered by officers as being undocumented aliens. That is, situations where a legal-resident driver is transporting illegal aliens would not be captured using this method. As described in Section 1, however, one of the revisions included in the redesigned electronic data collection form now in use for 2008 data collection is an undocumented alien data field that does account for undocumented passengers. In addition, during the focus group session with DPS officers and sergeants, participants' comments suggested that the use of this data field is not uniform across the department. Many officers indicated they thought they had to choose between a racial category and the UDA data field. Therefore, it is possible that this data field is underutilized on the form even for drivers suspected to be undocumented aliens. The redesigned data collection form should allow for a more accurate representation of the frequency with which undocumented aliens are encountered by DPS officers.

Drivers' Residency

Finally, Tables 3.6 – 3.7 report drivers' residency based on reported residential zip codes. For every traffic stop, drivers' zip codes were recorded to determine the percentage of stops that occurred in locations (i.e., state and county) where the drivers actually resided. This is important information to collect because benchmarks based on Census data assume that the driving population is similar to the residential population of an area. As shown in Tables 3.6 – 3.7, however, this is an inaccurate assumption for these data. Specifically, at the department level, approximately 30% of drivers stopped statewide did not reside in the state of Arizona, and over 60% of drivers stopped did not reside in the county in which they were stopped.

The department averages of in-state (i.e., drivers who live in Arizona) and in-county residents (i.e., drivers stopped in the county in which they reside) are 72.2% and 39.9%, respectively. However, when examined at the division, bureau, and district/shift levels, it is obvious that the percentages of out-of-state residents stopped by DPS officers varied dramatically by location and assignment (see Table 3.6). For example, officers assigned to the Criminal Investigations Division stopped 76.8% Arizona residents, compared to 72.1% by officers in the Highway Patrol Division. Furthermore, Criminal Investigations Division officers are considerably less likely to stop in-county residents (10.9%) than Highway Patrol Division officers (40.0%).

Similar variation was evident at the bureau level. Officers working in Metro West and East Bureaus were more likely to stop in-state residents (86.1% and 87.0%, respectively). Of the drivers stopped by officers assigned to the Commercial Vehicle Enforcement Bureau, only 31.3% were Arizona residents. Of the geographic bureaus (i.e., excluding Commercial Vehicles), the Northern Bureau stopped the lowest percentage of Arizona residents (61.5%). Similarly, Metro West and East officers were the most likely to stop in-county residents (68.1 and 64.9%, respectively). Due to the nature of their assignment, Commercial Vehicle Enforcement Bureau officers were least likely to stop drivers in counties in which they are residents (13.6%).

At the district/shift levels, more dramatic differences in the percentages of non-residents stopped were reported. For example, the highest percentage of in-state drivers stopped at the district/shift level was in Metro East Shift #2 (93.3%), while the lowest percentage of in-state drivers was stopped in District 15 (28.8%). For the Canine squads, Canine officers in the Central and South were considerably more likely to stop Arizona residents (64.5%) compared to Canine officers in the North (only 15.5%). Similar differences exist for the percentages of drivers stopped in their county of residency. For example, officers assigned to Districts 15 and 16, as well as Canine officers, stop less than 15% in-county residents. Conversely, over 60% of drivers stopped by officers assigned to Metro West and East shifts are residents of the county in which the stop occurred.

Finally, Table 3.7 shows that variation in driver residency is also evident at the county level. Specifically, 84.2% of drivers stopped in Maricopa County were residents of Arizona, compared to 43.2% of drivers stopped in Mohave County. The differences in percentages of in-county residents were even more dramatic. For example, 74.8% of drivers stopped in Maricopa County were county residents, compared to only 3.7% of drivers stopped in La Paz County.

Table 3.6: Citizen Characteristics of 2007 Traffic Stops – Statewide, Division, Bureaus, & Districts/Shifts

	Ave. Citizen Age	% Male	% White	% Hispanic	% Native Am.	% Black	% Asian	% Mid. East.	% Other	% UDA	% AZ Resident	% County resident
DPS Statewide	36.6	71.2	61.3	25.4	5.2	4.8	1.8	1.0	0.5	0.6	72.2	39.9
Crim. Invest. Division	31.7	78.3	43.3	43.9	3.7	7.0	0.9	0.6	0.7	0.9	76.8	10.9
Highway Patrol Division	36.6	71.1	61.4	25.3	5.2	4.8	1.8	1.0	0.5	0.6	72.1	40.0
Northern Bureau	39.6	70.5	68.1	11.9	13.2	2.9	2.2	1.2	0.5	0.5	61.5	24.7
D1-Kingman	40.2	73.1	74.1	15.3	1.5	4.0	3.1	1.6	0.3	0.9	48.7	12.8
D2-Flagstaff	38.4	70.0	59.2	10.1	22.5	2.6	3.1	1.5	1.0	0.2	56.8	27.0
D3-Holbrook	40.2	68.6	58.4	10.7	25.9	2.7	1.3	0.7	0.3	0.3	60.5	24.0
D11-Globe	41.4	72.1	79.6	10.3	6.7	1.7	0.7	0.6	0.4	0.2	85.0	31.2
D12-Prescott	38.4	69.9	76.8	12.9	3.1	2.8	2.4	1.4	0.6	0.8	66.6	31.7
Metro West Bureau	35.2	70.4	60.8	27.7	0.9	7.2	1.9	0.9	0.5	1.0	86.1	68.1
Shift #1	36.2	69.3	64.9	24.9	0.8	6.2	1.8	0.8	0.5	1.0	85.5	64.5
Shift #2	35.4	71.1	59.9	28.6	0.9	7.2	1.8	1.0	0.6	0.6	84.6	67.5
Shift #3	32.9	71.0	54.7	31.4	1.1	9.2	2.2	1.0	0.3	1.6	90.7	76.8
Southern Bureau	37.7	69.0	55.5	36.3	1.6	4.2	1.3	0.7	0.4	0.3	75.7	34.8
D4-Yuma	37.6	69.7	54.0	37.4	1.0	4.4	2.0	1.0	0.3	0.2	64.1	29.0
D6-Casa Grande	37.9	69.1	59.3	30.8	3.0	4.6	1.3	0.7	0.4	0.6	84.0	24.1
D8-Tucson	37.6	68.6	51.1	42.0	1.1	3.7	1.1	0.6	0.5	0.3	81.5	50.8
D9-Sierra Vista	37.8	68.8	58.4	34.5	1.4	4.0	0.9	0.5	0.3	0.2	72.7	34.6
Comm. Vehicle Bureau	42.8	93.7	51.3	38.3	0.5	5.3	1.9	2.0	0.7	0.1	31.3	13.6
District 15	43.2	91.0	63.8	21.0	0.9	6.3	3.7	3.8	0.5	0.1	28.8	10.9
District 16	42.6	94.8	46.9	44.5	0.3	5.0	1.2	1.3	0.7	0.0	32.0	14.5
Metro East Bureau	33.8	70.2	63.1	24.3	1.4	7.5	1.8	1.2	0.7	1.3	87.0	64.9
Shift #1	35.1	67.9	70.3	19.7	1.0	6.2	1.4	1.1	0.3	1.2	92.7	73.4
Shift #2	33.4	68.6	67.2	20.7	1.4	7.4	1.9	1.2	0.3	1.2	93.3	71.9
Shift #3	32.2	68.8	64.8	21.0	2.0	8.0	2.5	1.2	0.5	0.3	91.8	70.4
Metro Motors	33.5	70.4	62.7	24.2	1.0	7.8	1.5	1.1	1.6	1.4	91.1	71.8
Canine	36.4	79.3	42.0	44.7	1.9	7.9	1.4	1.2	0.9	3.1	47.0	13.4
Canine North	37.0	80.6	56.4	25.4	1.5	11.7	1.8	2.0	1.2	3.8	15.5	3.5
Canine Central & South	34.5	78.5	34.1	55.3	2.2	5.9	1.1	0.8	0.7	2.7	64.5	18.9

Table 3.7: Citizen Characteristics of 2007 Traffic Stops – County

	Total # of Stops	Average Age	% Male	% White	% Hispanic	% Native Am.	% Black	% Asian	% Mid. East.	% Other	% UDA	% AZ Resident	% County resident
Arizona	485,183	36.6	71.2	61.3	25.4	5.2	4.8	1.8	1.0	0.5	0.6	72.2	39.9
Apache	17,784	41.0	70.0	56.3	9.0	30.4	2.1	1.2	0.8	0.2	0.1	58.6	24.7
Cochise	27.357	38.4	70.6	55.7	36.2	0.8	4.9	1.2	0.7	0.5	0.2	67.8	35.3
Coconino	36,110	39.0	71.6	61.0	11.0	19.2	3.1	3.1	1.6	1.0	0.3	51.0	25.2
Gila	12,868	42.4	73.3	78.7	10.8	7.4	1.6	0.5	0.5	0.3	0.2	81.1	20.5
Graham	3,051	36.1	66.6	63.7	24.7	8.6	2.1	0.4	0.5	0.0	0.0	80.5	41.5
Greenlee	2,475	38.0	74.4	62.7	32.0	2.5	2.2	0.2	0.3	0.0	0.0	70.0	29.3
La Paz	17,847	39.7	73.4	65.0	25.2	1.1	4.6	2.4	1.1	0.5	0.4	52.6	4.4
Maricopa	133,119	34.8	70.6	63.4	25.0	1.3	7.0	1.8	1.0	0.6	0.9	87.0	77.4
Mohave	25,691	39.8	75.2	70.2	16.9	1.5	5.1	3.7	2.2	0.4	0.9	43.3	15.7
Navajo	22,092	39.6	69.6	61.0	12.8	19.4	3.8	1.5	1.0	0.4	0.7	58.4	25.4
Pima	38,167	38.0	71.3	54.3	38.2	1.3	3.8	1.1	0.6	0.6	0.5	78.7	55.1
Pinal	42,941	38.2	71.0	57.9	31.9	2.8	4.9	1.3	0.8	0.4	0.7	79.4	22.6
Santa Cruz	4,360	38.7	73.0	18.8	78.9	0.1	1.0	0.5	0.6	0.1	0.1	70.5	44.6
Yavapai	35,993	38.7	71.6	74.3	14.7	2.8	3.5	2.7	1.5	0.6	0.7	63.6	29.4
Yuma	22,277	37.3	68.9	52.0	40.9	0.5	3.9	1.6	1.0	0.1	0.0	66.7	39.6

SECTION SUMMARY

Section 3 described the characteristics of traffic stops and stopped drivers at the department, division, bureau, and district/shift levels based on data collected from January 1, 2007 through December 31, 2007. The trends in these descriptive findings are summarized below.

- At the department level, 485,183 traffic stops were conducted in 2007. The majority of these stops had the following characteristics:
  - Conducted by Highway Patrol Division officers (99%)
  - Occurred on a weekday (73.9%)
  - Occurred during the daytime (67.2%)
  - Lasted between 0-20 minutes (0-10 minutes 20.1%; 11-20 minutes 65.1%)
  - May accounted for the largest percentage of traffic stops (9.3%); overall, stop activity at the department level was fairly consistent across months, with a difference of only 1.5% between the busiest and slowest months
  - Trends were generally consistent across divisions, bureaus, and districts/shifts

- At the department level, the most frequent reasons for the stop included:
  - Moving violations (66.4%)
  - Equipment violations (19.6%)
  - Non-moving violations (11.9%)

- Department-wide, DPS officers stopped vehicles and drivers with the following characteristics:
  - Vehicles:
    - Arizona-registered vehicle (75.1%)
    - Types of vehicles: cars (49.4%), pickup trucks (23.4%), vans/station wagons (9.7%), SUVs (9.0%), and trucks/tractor trailers (6.7%)
      - As expected, Commercial Vehicle Enforcement Bureau officers stopped a much larger percentage of trucks and/or tractor trailers (85.5%) compared to officers in other bureaus
  - Drivers:
    - Average age of 36.6 years
    - 71.2% male
    - White (61.3%), Hispanic (25.4%), Native American (5.2%), Black (4.8%), Asian (1.8%), Middle Eastern (1.0%), Other/unknown (0.5%)
    - 0.6% Undocumented alien status
    - 72.2% Arizona resident
    - 39.9% County resident

- Drivers' characteristics, particularly race and residency, varied considerably by bureau, district/shift, and county

- o The variation in residency of drivers stopped indicates that it is inappropriate to assume residential populations are similar to driving populations – i.e., Census data are not appropriate comparisons for benchmark analyses
- o Some variation in the racial and ethnic background of drivers stopped across bureaus, districts/shifts, and counties is to be expected due to differences in the demographic makeup of residents and travelers, along with differences in traffic flow patterns in these locations

4. ANALYSES OF TRAFFIC STOP OUTCOMES

OVERVIEW

In this section, differences in post-stop outcomes (e.g., warnings, citations, arrests, and searches) are examined in greater detail. Specifically, Section 4 includes: 1) a descriptive overview of traffic stop outcomes across DPS organizational units and Arizona counties, as well as by severity of outcomes, 2) a descriptive overview of the types of violations for which citations and warnings are issued, 3) differences in post-stop outcomes across types of drivers, and 4) multivariate statistical analyses predicting post-stop outcomes.

Initially, Figure 4.1 and Table 4.1 report the percent of each type of stop outcome at the department, division, bureau, and district/shift levels for 2007. Table 4.2 reports the same information at the county level. Table 4.3 displays the percentages of each of the most severe stop outcomes for motorists. Tables 4.4 and 4.5 report the percentages of the types of violations for which citations and warnings are issued. Thereafter, post-stop outcomes for officer-initiated traffic stops conducted during 2007 are examined by drivers' race/ethnicity and gender at the department, division, bureau, and district/shift levels. Figure 4.2 and Tables 4.6 and 4.7 document statistically significant differences across racial/ethnic and gender groups for warnings, citations, arrests, and searches across all organizational units. Figure 4.3 displays the racial/ethnic differences in most severe outcome received. These relationships are then further explored in multivariate statistical analyses presented in Tables 4.8 – 4.11. These multivariate analyses are designed to examine the independent effect of drivers' race/ethnicity over the likelihood of receiving warnings, repair orders, citations, arrests, searches, and seizures. A description of the multivariate analyses is provided, and the findings are explained that predict these officer actions. Further analysis of racial/ethnic differences in citations is provided by examining the racial/ethnic differences in the number of citations received (Figure 4.4) as well as differences in types of violations for which citations are issued (Figure 4.5).

TRAFFIC STOP OUTCOMES

Analyses of post-stop outcomes are an important consideration of any data collection effort because the potential exists for differential treatment based on the drivers' race, ethnicity, gender, and/or age *after* the initial stop has been made. Therefore, in addition to comparisons of traffic stop data, analyses of post-stop outcomes must be conducted. These analyses should examine racial/ethnic differences in outcomes and include warnings, citations, arrests, searches and/or seizures of contraband (Fridell, 2004, 2005). A major advantage of examining post-stop outcomes is that, unlike traffic stops where the comparison population is unknown and can only be estimated, the comparison population for post-stop outcomes is known (i.e., all stopped drivers). When examining post-stop outcomes, benchmark comparison are unnecessary if information is collected on all stopped drivers regardless of the outcomes they received. Because the comparison population (all stopped drivers) is known, more rigorous statistical and methodological techniques can be applied to understanding disparity in post-stop outcomes.

Within social science, studying a behavior, condition, or outcome invariably involves the collection of multiple pieces of information. Often several data sources are used in an effort

to collect as much information as possible regarding the topic of study with the assumption that more information on the topic will provide greater understanding. Regardless of the topic of study, it is believed that any outcome is the product of numerous factors/variables coalescing to produce the result. This approach to studying post-stop outcomes is grounded in the scientific method. In short, to understand a phenomenon, all potential, reasonable explanations need to be examined and factors that could contribute to the outcome need to be represented in the analysis.

Upon the discovery of a racial disparity in outcomes, several explanations could exist for such a scenario, including but not limited to racial bias. Just as with disparity in traffic stops, a number of other reasons beyond officer bias toward minorities could explain disparate outcomes. For each stop that occurs, there are a multitude of characteristics or variables that can be measured, such as the outcome of the stop (e.g., warning, citation, search, and/or arrest), the characteristics of the driver (e.g., race/ethnicity of the driver, age of the driver, etc.), legal considerations (e.g., the reason for the stop, seriousness of the offense, discovery of contraband, etc.), the characteristics of the officer (e.g., length of service, education level, etc.) and the characteristics of the geographic location where the stop occurred (e.g., crime rate of the neighborhood, racial composition of the neighborhood, etc.). Each of these factors has the potential to have some explanatory power in understanding the complex nature of police-citizen interactions and specifically, post-stop outcomes.

There are several methods for assessing post-stop outcomes described in *Traffic Stop Data Analysis Study Report: Final Literature Review and Review of Other Jurisdictions* (Engel et al., 2007a) including: multivariate analyses, outcome tests, propensity scores, trend analyses, spatial analyses, and hierarchical linear modeling. Due to data limitations, only multivariate analyses and outcome test analyses are conducted for this report. This section describes the use of multivariate analyses. Prior to these analyses, the frequency of post-stop outcomes and bivariate analyses of outcomes by racial/ethnic groups are presented.

Post-Stop Outcomes

As with previous analyses, the examination of post-stop outcomes is based on 485,183 officer-initiated traffic stops conducted in 2007. As described in Phase 2 of the data audit (Section 2), however, changes were made by the UC research team for some stops based on additional information from the violation data file. Specifically, 5,150 traffic stops that originally indicated no citation was issued were changed to indicate that at least one citation was issued. In addition, 3,940 stops that indicated no warning was issued were altered to indicate that at least one warning was issued. It is believed that these changes accurately reflect the outcomes for these stops. Note, however, that results reported for the multivariate statistical models (described in detail at the end of this section) did not significantly differ when these cases were altered.

Table 4.1 reports at the department, division, bureau, and district/shift level the percentage of *drivers* receiving each of the following stop outcomes: 1) DVER (Driver Vehicle Examination Report, used to inspect trucks/commercial carriers/drivers), 2) field interview, 3) repair order, 4) tribal order, 5) warning, 6) citation, 7) arrest, 8) warrant arrest, and 9)

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search. Table 4.2 documents the same information at the county level. Note that drivers may receive multiple outcomes (e.g., warnings and citations) during a single traffic stop. Therefore, the percentages across stop outcome categories may exceed 100%.

Tables 4.1 and 4.2, as well as Figure 4.1 report that the most frequent outcome for stopped drivers in 2007 was citations (45.2% of all drivers received at least one citation). In addition, 41.3% of drivers stopped were issued at least one warning, while 15.3% were issued repair orders. Occurring rarely were the most serious stop outcomes – specifically, arrests (2.5% of drivers stopped), warrant arrests (0.5%), and searches of the drivers, occupants, or vehicles (5.0% of the stops). A little over 5% of drivers were issued DVERs. Stops resulting in field interviews and tribal orders were statistically infrequent events across the department, and are not examined in detail within this report. Figure 4.1 displays the percentage of stops in 2007 that resulted in each of these outcomes.

Figure 4.1: Percentage of Traffic Stops Resulting in Various Outcomes: 2007 (n=485,183)
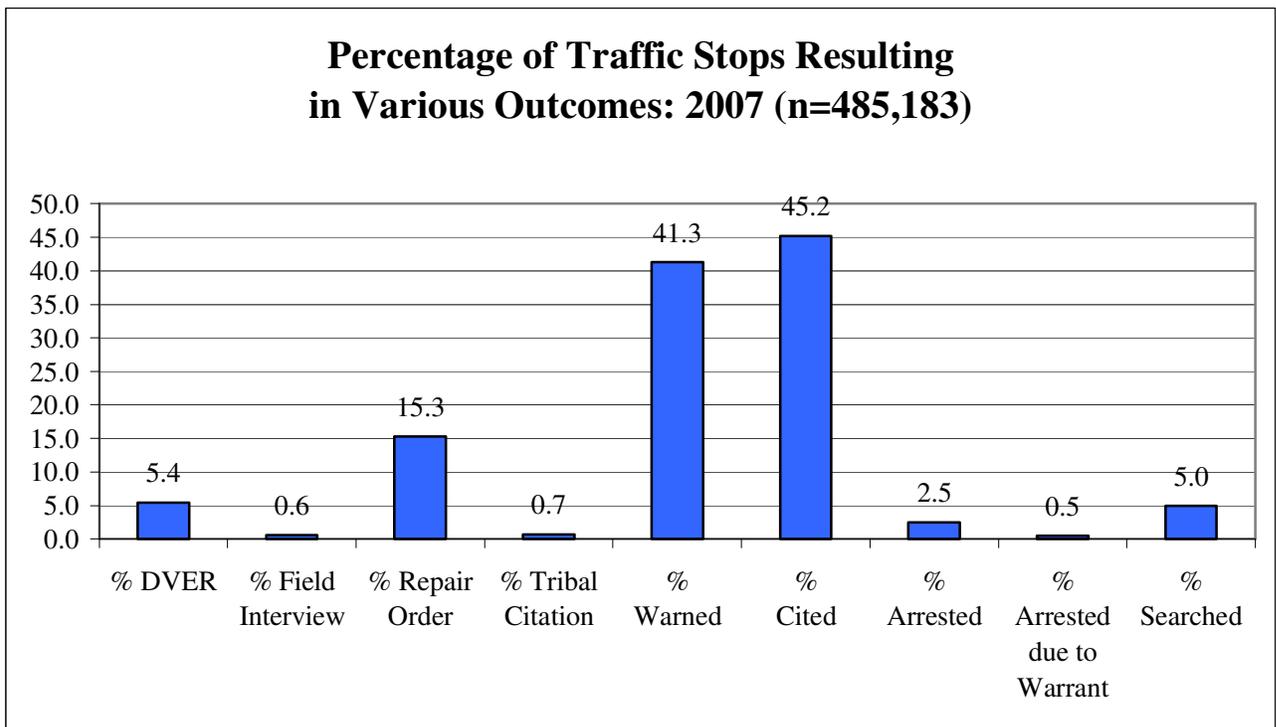
Post-Stop Outcomes by Organizational Level

Table 4.1 provides information about the outcomes of officer-initiated traffic stops at the division, bureau, and district/shift level. At the division level, officers assigned to the Criminal Investigations Division were more likely to issue repair orders and warnings, and more likely to conduct arrests, warrant arrests, and searches, while officers assigned to the Highway Patrol Division were more likely to issue citations and DVERs. At the bureau level, the Southern Bureau issued the highest percentage of repair orders (21.3%), while the

Commercial Vehicle Bureau issued the fewest (2.0%). At the bureau level, the Northern Bureau issued the highest percentage of warnings (46.2%), while the Commercial Vehicle Enforcement Bureau issued the fewest (6.1%). There was also variation at the bureau level in the percentages of drivers that were issued citations. Metro East had the highest percentage with 53.0% of stops resulting in citations, while the Commercial Vehicle Enforcement Bureau had the lowest, with 29.8% of stops resulting in a driver citation. These lower percentages of repair orders, warnings, and citations for the Commercial Vehicle Enforcement Bureau are likely due to their high percentage of stops resulting in DVERs (86.2%).

When compared to the bureau level, traffic stop outcomes at the district/shift level demonstrated greater variation, with warnings ranging from a high of 82.3% of stops by the Canine Unit to a low of only 4.0% of stops in District 16. The range of repair orders issued is narrower, with a high of 22.8% in District 6 (Yuma) and a low of 1.6% in District 15. Finally, the percentage of citations issued varies widely, with a range from 73.9% by Metro Motors to a low of 4.4% by the Canine Unit.

Table 4.1 also reports the percent of traffic stops that resulted in arrests and searches across organizational units. At the division level, Table 4.1 demonstrates noticeable differences in the patterns of arrest and searching between the Criminal Investigations and Highway Patrol Divisions. Most likely due to the nature of their assignment, officers assigned to the Criminal Investigations Division were at least three times as likely to arrest drivers they stopped, and over four times as likely to search drivers they stopped compared to Highway Patrol Division officers. At the bureau level, the Metro East Bureau conducted the highest percentages of arrests and searches (4.0% and 7.8%, respectively), while the Commercial Vehicle Bureau conducted the fewest (0.6% and 2.9%, respectively).

At the district/shift level, Metro East Shift #3 performed the highest percentage of arrests (6.6%), while the Canine unit performed the highest percentage of searches (18.4%). District 16 conducted the fewest number of arrests and searches (0.4% and 1.0%, respectively).

Table 4.1: 2007 Traffic Stop Outcomes – Statewide, Division, Bureaus, & Districts/Shifts

	Total # of Stops	% DVER	% Field Interview	% Repair Order	% Tribal Order	% Warned	% Cited	% Arrested	% Arrested due to Warrant	% Searched
DPS Statewide	485,183	5.4	0.6	15.3	0.7	41.3	45.2	2.5	0.5	5.0
Criminal Investigations Division	3,034	1.3	1.6	16.7	0.0	53.4	32.9	7.9	1.5	20.4
Highway Patrol Division	480,453	5.4	0.6	15.3	0.7	41.2	45.3	2.5	0.5	4.9
Northern Bureau	156,692	1.4	0.9	15.6	2.2	46.2	43.7	2.1	0.4	3.6
D1-Kingman	32,351	1.4	0.6	15.5	0.0	41.7	49.1	2.4	0.4	3.4
D2-Flagstaff	31,662	0.6	1.1	21.1	1.7	49.6	36.2	2.4	0.6	4.0
D3-Holbrook	41,713	1.5	1.3	13.3	6.9	46.4	45.5	1.8	0.4	3.3
D11-Globe	18,854	1.7	0.8	12.1	0.1	49.4	43.0	1.2	0.2	2.0
D12-Prescott	31,908	1.8	0.7	15.3	0.1	45.2	43.8	2.4	0.3	4.6
Metro West Bureau	66,741	0.9	0.4	13.1	0.0	39.7	51.4	3.5	0.7	6.5
Shift #1	25,619	0.7	0.2	11.2	0.0	39.6	53.8	1.9	0.8	4.2
Shift #2	27,617	1.5	0.5	15.9	0.0	34.9	52.9	2.9	0.6	6.2
Shift #3	13,142	0.2	0.7	10.7	0.0	50.3	43.5	7.8	0.7	11.6
Southern Bureau	153,392	1.3	0.5	21.3	0.0	43.1	42.6	1.9	0.6	4.4
D4-Yuma	40,294	1.2	0.3	22.8	0.0	44.3	42.0	1.7	0.2	3.4
D6-Casa Grande	38,975	1.3	0.8	21.6	0.0	49.2	34.2	1.6	0.5	4.4
D8-Tucson	40,935	0.6	0.3	19.0	0.0	42.9	44.0	2.3	1.1	5.9
D9-Sierra Vista	32,903	2.2	0.7	21.9	0.0	34.6	51.6	2.0	0.4	3.9
Commercial Vehicle Bureau	24,210	86.2	0.2	2.0	0.0	6.1	29.8	0.6	0.2	2.9
District 15	6,442	80.2	0.4	1.6	0.0	11.4	38.1	1.2	0.1	7.8
District 16	17,622	88.9	0.2	2.0	0.0	4.0	26.9	0.4	0.2	1.0
Metro East Bureau	78,891	0.2	0.4	9.3	0.0	39.7	53.0	4.0	0.8	7.8
Shift #1	10,110	0.2	0.1	6.1	0.0	39.0	57.0	2.5	1.1	5.1
Shift #2	24,727	0.1	0.3	8.1	0.0	35.8	57.5	3.8	1.1	6.0
Shift #3	16,943	0.1	0.7	12.5	0.0	40.8	48.8	6.6	0.7	9.7
Metro Motors	17,778	0.2	0.2	5.8	0.0	22.4	73.9	3.2	0.4	4.6
Canine	9,287	0.3	0.4	17.1	0.1	82.3	4.4	3.0	0.3	18.4
Canine North	3,318	0.3	0.4	11.7	0.1	86.2	5.7	3.3	0.2	13.5
Canine Central & South	5,951	0.3	0.4	20.2	0.1	80.3	3.7	2.9	0.3	21.2

NOTE: Stops may result in multiple outcomes; therefore the percentages across categories may exceed 100%.

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Post-Stop Outcomes by County

Table 4.2 documents the percentage of traffic stops that resulted in particular outcomes across 15 Arizona counties. At the county level, the percentage of particular post-stop outcomes varied dramatically. The percentage of stops resulting in repair orders ranged from a high of 27.7% in Santa Cruz County, to a low of 11.0% in Maricopa County. At the county level, Apache County had the highest percentage of drivers that were issued warnings (51.3%), while Greenlee County had the fewest (31.0%). The percentage of stops resulting in citations varied at the county level from a high of 58.1% in Greenlee County and a low of 32.0% in Pinal County. Likewise, arrests varied from a high of 3.2% in Maricopa County to a low of 1.1% in Yuma County. Finally, the percentage of searches conducted was highest in Santa Cruz County (7.2%), while the lowest percentage was 2.0% in Gila County.

It is important to note that some variation across geographic areas is to be expected based on spatial differences in traffic patterns and criminality. These analyses cannot determine whether or not the reported differences across counties reflect or exceed these expectations. That is, these analyses cannot determine whether the differences in post-stop outcomes across geographic areas are due to normal variations in driver behavior, or represent differential responding patterns across DPS organizational units.

Table 4.2: 2007 Traffic Stop Outcomes – County

	Total # of Stops	% DVER	% Field Interview	% Repair Order	% Tribal Order	% Warned	% Cited	% Arrested	% Arrested due to Warrant	% Searched
Arizona	485,183	5.4	0.6	15.3	0.7	41.3	45.2	2.5	0.5	5.0
Apache	17,784	4.0	1.2	13.7	11.2	51.3	38.1	1.3	0.4	2.4
Cochise	27,357	8.2	0.6	21.1	0.1	32.2	50.4	1.6	0.4	3.4
Coconino	36,110	3.8	1.0	18.1	1.4	48.4	38.0	2.2	0.5	4.3
Gila	12,868	5.3	0.7	14.0	0.2	49.7	39.6	1.2	0.2	2.0
Graham	3,051	2.9	0.4	16.3	0.1	40.7	48.4	2.5	0.6	5.0
Greenlee	2,475	4.8	0.6	13.4	0.0	31.0	58.1	2.0	0.4	3.3
La Paz	17,847	3.8	0.2	21.3	0.1	48.2	40.6	2.3	0.3	4.8
Maricopa	133,119	3.3	0.4	11.0	0.0	35.7	55.0	3.2	0.7	5.7
Mohave	25,691	6.7	0.6	13.7	0.0	38.6	48.0	2.2	0.3	3.6
Navajo	22,092	3.2	1.0	12.5	2.3	42.7	48.5	2.0	0.5	4.4
Pima	38,167	7.2	0.3	17.6	0.0	42.5	39.4	2.1	0.9	6.1
Pinal	42,941	6.4	0.7	19.7	0.0	48.3	32.0	1.5	0.4	4.9
Santa Cruz	4,360	7.6	0.9	27.7	0.2	36.5	38.3	1.3	0.3	7.2
Yavapai	35,993	4.9	0.6	14.0	0.0	45.4	43.3	2.1	0.3	4.7
Yuma	22,277	7.5	0.3	19.0	0.0	41.9	41.7	1.1	0.2	2.3

NOTE: Stops may result in multiple outcomes; therefore the percentages across categories may exceed 100%

Post Stop Outcomes by Severity

As noted previously, a single traffic stop often results in multiple outcomes. In terms of official sanctions by DPS, it is important to consider traffic stop outcomes as rank ordered by severity. In this section, the categories of outcomes described are rank ordered and the categories are mutually exclusive.[8] Each traffic stop is categorized based on the *most severe sanction* received by the motorist. The rank ordering is as follows (from least severe to most severe):

- Level 1: Warning
- Level 2: Repair Order or DVER
- Level 3: Citation or Tribal Order
- Level 4: Any Arrest

For example, if a driver received both a warning and a citation, they would be included in the citation category. Table 4.3 below displays the total number of traffic stops and the percentages of each of the most severe consequences for motorists. As documented, at the department level, for 36.0% a warning was the most severe outcome received. For 17.9% of all traffic stops, a repair order or DVER was the most severe outcome received. For 43.2% of stops, a citation was the most severe outcome a motorist received. Finally, 2.9% of all stops resulted in an arrest being the most severe outcome.

At the division level, a higher percentage of drivers stopped by the CID received a warning (47.5%) as the most severe outcome, as compared to citations (26.5%), whereas for drivers stopped by HPD officers, 43.2% were issued citations compared to 36.0% who were issued warnings. In addition, during stops by CID officers, over twice the percentage of drivers were arrested (8.9%) as the most severe outcome when compared to 2.8% by Highway Patrol Division. The overall department trends are fairly consistent at the bureau and district level with the exceptions of the Commercial Vehicle Bureau and Canine District. Specifically, the majority of stops (65.8%) by the Commercial Vehicle Bureau resulted in a repair order or DVER as the most severe outcome. The majority of stops by the Canine District (75.7%) resulted in a warning being the most severe outcome issued.

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[8] 1,657 contacts (0.3%) resulting only in field interviews were excluded due to their statistical infrequency. Therefore, the total number of stops analyzed for severity of outcomes is 483,526, rather than 485,183.

Table 4.3: 2007 Most Severe Traffic Stop Outcome Received – Statewide, Division, Bureaus, & Districts/Shifts

	Total # Stops	% Warning	% Repair Order or DVER	% Citation or Tribal Order	% Arrest
DPS Statewide	483,526	36.0	17.9	43.2	2.9
Criminal Investigations Division	3,006	47.5	17.0	26.5	8.9
Highway Patrol Division	478,831	36.0	18.0	43.2	2.8
Northern Bureau	155,984	40.3	15.1	42.3	2.3
D1-Kingman	32,236	35.6	14.7	47.1	2.6
D2-Flagstaff	31,493	43.4	19.5	34.4	2.7
D3-Holbrook	41,543	40.2	12.9	44.7	2.1
D11-Globe	18,749	43.8	12.5	42.3	1.4
D12-Prescott	31,760	40.1	15.3	42.0	2.6
Metro West Bureau	66,539	35.3	12.7	48.1	4.0
Shift #1	25,585	34.8	10.9	51.8	2.5
Shift #2	27,504	30.9	15.6	50.1	3.4
Shift #3	13,087	45.5	9.9	36.4	8.1
Southern Bureau	152,918	36.5	20.2	41.0	2.3
D4-Yuma	40,232	36.3	21.3	40.6	1.8
D6-Casa Grande	38,805	43.1	21.8	33.1	2.0
D8-Tucson	40,843	37.3	18.0	41.6	3.0
D9-Sierra Vista	32,753	27.8	19.8	50.1	2.3
Commercial Vehicle Bureau	24,175	4.1	65.8	29.4	0.7
District 15	6,431	7.8	53.8	37.2	1.3
District 16	17,600	2.5	70.4	26.6	0.5
Metro East Bureau	78,688	36.8	9.2	49.6	4.4
Shift #1	10,100	36.7	5.9	54.2	3.2
Shift #2	24,666	33.9	8.0	53.6	4.5
Shift #3	16,867	37.4	12.5	43.3	6.9
Metro Motors	17,751	20.1	5.6	70.9	3.4
Canine	9,258	75.7	16.8	4.1	3.3
Canine North	3,308	79.4	11.6	5.4	3.5
Canine Central & South	5,932	73.7	19.8	3.3	3.2

Citations & Warnings by Types of Violations

In addition to data regarding the traffic stop, if a citation or warning was issued, information linking to the original stop regarding the number of citations/warnings issued and the specific violations was collected. Tables 4.4 – 4.5 report the percentages of the types of violations for which citations (Table 4.4) and warnings (Table 4.5)[9] are issued. The types of violations included are not an exhaustive list of all possible violations; rather they represent the most frequent types of violations for which citations and warnings are issued. Furthermore, multiple violations may be included on citation and warning forms. Therefore, the percentages across violation categories may exceed 100%.

As shown in Table 4.4, at the department level, there are 214,879 citations for which we have corresponding violation data. The most common types of violations were speeding (53.9%), insurance (21.0%), and drivers' license (15.4%). These were the three most common types of violations across most organizational units.

As shown in Table 4.5, at the department level, there are 192,520 warnings for which we have corresponding violation data. Over half of all violations were for speeding (57.1%), 18.2% were for registration/license plate violations, and violations related to drivers' license and insurance violations were 2.9% and 2.8%, respectively.

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[9] The following violations were excluded from the warning table due to less than 0.1% of department-wide warnings being issued for those violations: speeding greater than 85 mph, DUI or reckless driving, and drug offenses.

Table 4.4: 2007 Violations for Citations Issued – Statewide, Division, Bureaus, & Districts/Shifts

	Total # of Citation Violations	% Speeding	% Speeding over 85 mph	% Registration / License Plate	% Drivers License	% Seat belt / Child restraint	% Required Equipment	% Insurance	% DUI / Reckless driving	% Drug offense
DPS Statewide	214,879	53.9	8.2	10.0	15.4	8.1	1.3	21.0	2.0	0.3
Criminal Investigations Division	971	14.8	1.9	11.5	43.3	7.1	0.8	29.2	4.0	7.1
Highway Patrol Division	213,005	54.1	8.3	10.0	15.3	8.1	1.3	20.9	2.0	0.3
Northern Bureau	67,196	68.1	10.9	3.4	9.7	5.8	0.5	12.7	1.3	0.5
D1-Kingman	15,604	64.8	4.8	3.4	9.0	7.4	0.3	12.3	1.0	0.5
D2-Flagstaff	11,190	63.4	14.4	4.0	12.6	4.8	0.4	16.8	1.2	0.9
D3-Holbrook	18,683	69.6	12.2	2.3	7.2	5.1	0.2	7.6	1.1	0.2
D11-Globe	7,979	82.8	5.1	3.3	7.7	5.8	0.3	9.6	1.0	0.0
D12-Prescott	13,670	65.3	16.7	4.4	13.0	5.7	1.5	18.4	2.3	0.8
Metro West Bureau	33,506	38.5	6.6	19.8	24.9	6.1	3.2	32.3	3.3	0.0
Shift #1	13,531	46.0	8.5	18.7	20.0	6.0	2.5	27.8	0.9	0.0
Shift #2	14,223	34.6	5.6	20.4	26.9	7.6	4.4	34.2	2.0	0.0
Shift #3	5,551	30.1	4.8	21.5	32.1	2.4	2.0	38.2	12.3	0.0
Southern Bureau	63,561	64.0	9.2	7.4	11.8	10.6	0.6	19.4	1.5	0.4
D4-Yuma	16,242	65.2	14.7	5.0	9.3	9.1	1.1	19.9	1.2	0.4
D6-Casa Grande	13,154	65.3	5.1	6.0	14.5	9.7	0.4	16.5	1.6	0.0
D8-Tucson	17,487	47.9	2.7	14.6	15.6	14.5	0.6	27.0	2.1	0.7
D9-Sierra Vista	16,537	79.0	13.8	3.3	8.2	8.7	0.3	13.1	1.1	0.4
Commercial Vehicle Bureau	7,133	18.4	3.5	5.0	5.8	17.2	0.8	8.0	0.4	0.2
District 15	2,422	12.7	1.9	3.3	4.8	17.1	0.8	6.6	0.7	0.5
District 16	4,673	21.0	4.3	5.9	6.4	17.3	0.8	8.6	0.3	0.0
Metro East Bureau	41,316	34.7	4.5	17.5	23.6	8.1	2.0	29.8	3.1	0.1
Shift #1	5,681	32.6	2.1	22.9	22.8	4.4	1.8	36.3	1.4	0.0
Shift #2	14,089	25.6	3.4	22.1	27.7	10.3	1.9	33.2	2.4	0.0
Shift #3	8,193	45.3	7.4	11.7	23.6	7.7	2.1	25.1	8.2	0.0
Metro Motors	12,946	39.2	4.8	14.1	19.1	7.6	2.2	26.7	1.4	0.0
Canine	372	27.7	15.1	5.1	36.8	5.6	1.6	14.0	2.7	10.5
Canine North	176	38.1	25.6	2.3	25.6	1.1	1.1	5.7	0.6	19.9
Canine Central & South	190	18.4	5.8	7.9	46.8	9.5	2.1	20.5	4.7	2.1

Table 4.5: 2007 Violations for Warnings Issued – Statewide, Division, Bureaus, & Districts/Shifts

	Total # of Warning Violations	% Speeding	% Registration / License Plate	% Drivers License	% Seat belt / Child restraint	% Required Equipment	% Insurance
DPS Statewide	192,520	57.1	18.2	2.9	0.3	2.0	2.8
Criminal Investigations Division	1,538	38.1	15.0	4.9	1.0	6.7	2.3
Highway Patrol Division	190,427	57.2	18.3	2.9	0.2	1.9	2.8
Northern Bureau	69,633	73.5	10.7	2.5	0.2	1.6	1.8
D1-Kingman	12,804	66.4	12.5	3.0	0.2	1.5	2.6
D2-Flagstaff	15,046	75.5	10.4	1.7	0.1	1.1	1.5
D3-Holbrook	18,719	82.5	8.8	3.2	0.1	0.5	1.3
D11-Globe	9,045	74.3	9.1	2.4	0.3	3.8	3.4
D12-Prescott	13,904	65.2	12.9	2.1	0.1	1.9	0.8
Metro West Bureau	25,659	40.9	29.7	3.7	0.3	2.2	3.6
Shift #1	9,787	48.0	27.5	4.0	0.3	0.7	4.8
Shift #2	9,333	32.8	34.1	3.0	0.2	2.8	2.6
Shift #3	6,418	41.5	26.9	4.4	0.2	3.6	3.3
Southern Bureau	63,305	56.2	19.6	2.9	0.3	1.7	3.4
D4-Yuma	17,062	63.1	18.6	2.5	0.1	2.2	3.9
D6-Casa Grande	18,570	55.8	18.5	3.2	0.2	1.6	3.2
D8-Tucson	16,862	41.0	26.3	2.5	0.6	0.9	3.1
D9-Sierra Vista	10,695	69.4	12.5	3.6	0.4	2.4	3.7
Commercial Vehicle Bureau	1,381	54.2	16.4	4.4	2.3	1.4	5.1
District 15	693	66.2	12.3	3.6	1.7	0.9	5.1
District 16	643	43.2	20.1	5.3	3.1	1.7	5.1
Metro East Bureau	30,254	36.2	23.3	3.0	0.3	3.0	3.2
Shift #1	3,854	40.1	24.4	3.0	0.2	0.9	3.0
Shift #2	8,480	25.9	31.0	2.3	0.2	4.1	4.1
Shift #3	6,695	43.8	19.7	3.9	0.0	5.4	2.8
Metro Motors	3,861	32.9	28.6	2.1	0.6	2.5	1.7
Canine	7,353	40.8	14.3	3.5	0.4	1.1	3.6
Canine North	2,719	61.0	12.3	0.8	0.1	0.7	0.2
Canine Central & South	4,624	28.9	15.4	5.1	0.7	1.4	5.6

Differences in Stop Outcomes across Types of Drivers

Analysis of racial/ethnic differences in post-stop outcomes is an important component of any traffic stop data analysis study because the potential for racial bias in police decision-making is not limited to the initial stopping decision. Differential treatment based on the drivers' race/ethnicity *after* the initial stop must also be examined. The remainder of this subsection examines racial/ethnic differences in warnings, repair orders, citations, arrests, and searches (Figure 4.2, and Tables 4.6 – 4.7), along with the severity of outcomes (Figure 4.3). For racial/ethnic comparisons across organizational units, drivers' race is collapsed into four categories – White, Hispanic, Native American, and Black. Traffic stops where the driver's race was Asian, Middle Eastern, other or unknown, or where the race/ethnicity of the driver was not included on the data collection form (3.3% of the cases) are excluded from these analyses because their total numbers were too small to make racial/gender comparisons across organizational units.

Racial/Ethnic Differences in Warnings, Repair Orders, Citations, Arrests & Searches

It is important to consider racial/ethnic differences in *any* outcomes received. For the comparisons reported below, the outcomes are not mutually exclusive. Drivers could receive multiple outcomes, and therefore when summed, the percentage of outcomes exceed one hundred percent. Tables 4.6 – 4.7 report the following information by organizational unit: the total number of stops, the percentage of drivers issued warnings, repair orders, and citations, as the well as the percentage of drivers arrested and searched by race/ethnicity and gender categories.[10]

Table 4.6 illustrates the variation in post-stop outcomes (i.e., warnings, repair orders, citations, arrests, and searches) by drivers' race and gender for the department, division, and bureau levels in 2007. At the department level (also graphically displayed in Figure 4.2), Hispanic drivers were the least likely to be issued warnings (33.6% of stops) compared to White (44.6%), Black (41.3%), and Native American (41.3%) drivers. Native Americans were the most likely to be issued repair orders (25.2% of stops) compared to Black (10.9%), White (13.9%), and Hispanic (18.6%) drivers. Hispanics received the highest percentage of citations (48.9%), followed closely by 48.1% of Blacks, while Native Americans (42.7%) and Whites (43.4%) were significantly less likely to be cited than Hispanics and Blacks. Hispanic, Native American and Black drivers were all significantly more likely than White

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[10] In Tables 4.6 – 4.7, the asterisks indicate statistically significant differences in the outcomes received by racial and gender groups based on bivariate chi-square associations. Chi-square statistics are based on the differences between groups and the sample size. Because this statistical technique is sensitive to sample size, smaller differences between groups can result in statistically significant differences when the sample size is large. Therefore, depending on the sample size used in the chi-square test, statistical significance is reported at the 0.05, 0.01, or 0.001 level. For example, if the 0.05 level is used, a finding is statistically significant if we are 95% confident that the difference between groups is not due to chance; in contrast, a 0.001 level is interpreted as 99.9% confident that the result is not due to chance. Also note that these analyses are based on only the relationship between two variables (e.g., drivers' race and citations). For each chi-square test, the comparison is between one outcome (e.g., citation) and one explanatory variable (e.g., drivers' race). These analyses do not take into account any other factors that might influence the outcome of the stop.

drivers to be arrested and searched. Specifically, Native Americans were the most likely to be arrested (5.4%), followed by Blacks (4.2%), Hispanics (3.9%), and Whites (2.1%). Hispanics were the most likely to be searched (8.6% of stops) compared to Blacks (7.5%), Native Americans (6.9%), and Whites (3.3%).[11]

Figure 4.2: Racial/Ethnic Differences in Stop Outcome Received
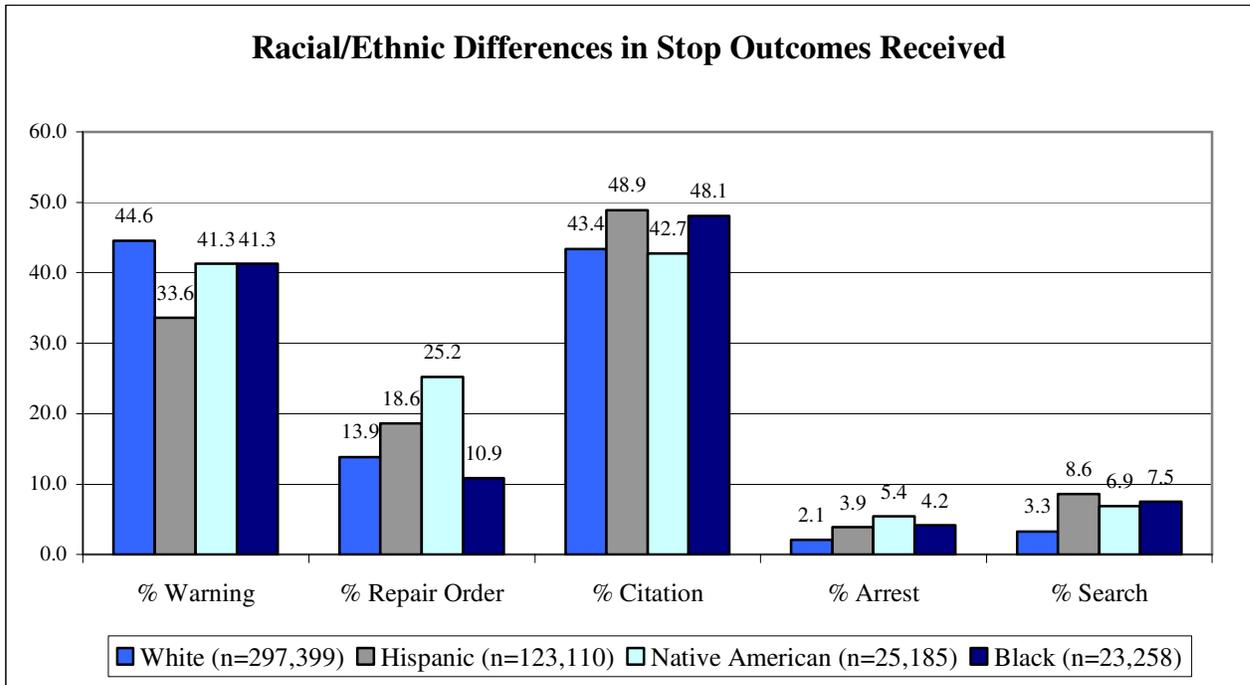
Division and bureau level differences in stop outcomes by racial/ethnic characteristics are also displayed in Table 4.6. At the division level, differences are evident between the Criminal Investigation Division and the Highway Patrol Division. Specifically, of stops conducted by CID officers, Native Americans, not Hispanics, were the least likely to be warned by CID officers. Whites, however, were still the most likely to be issued warnings by both HPD and CID officers. Whites were the least likely to be issued repair orders by CID officers, while Hispanics were the most likely. Whites were also the least likely to be

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[11] These racial/ethnic differences in stop outcomes are statistically significant based on a 0.001 level chi-square analysis. That is, the differences noted are likely due to chance no more than 0.1% of the time. Based solely on the statistical significance, these results suggest that a difference exists in the likelihood of receiving various stop outcomes depending on the race of the driver. It is important to recognize, however, that chi-square analyses do not consider other variables when determining statistical significance. That is, the chi-square test does not measure other factors potentially associated with the likelihood of receiving particular stop outcomes; rather, it only considers the race/ethnicity of the driver. Consequently, the results of these analyses should be interpreted with caution and the multivariate models (reported later in this section) should be examined prior to reaching conclusions regarding the relationship between race of the driver and post-stop outcomes. This caution also applies to the additional findings at lower organizational units reviewed below.

issued repair orders by HPD officers, but Native Americans, not Hispanics, were the most likely to receive repair orders from HPD officers. Citations by Highway Patrol Division officers exhibit the same racial/ethnic differences as at the department level. For CID officers, however, Native Americans and Hispanics were the most likely to be issued citations. Finally, both CID and Highway Patrol officers exhibited the same trends as the department for arrests and searches of different racial/ethnic groups.

At the bureau level, Hispanics were the least likely to be warned across all five bureaus. In addition, Hispanics were the most likely to be issued citations in three of the five bureaus. Other racial/ethnic variation in warnings, repair orders, and citations at the bureau level is shown in Table 4.6. In all bureaus – except the Commercial Vehicle Bureau where the overrepresentation is limited to Blacks – the trends in racial/ethnic disparities for arrests and searches are similar to the department-wide pattern. That is, Hispanic, Native American and Black drivers were significantly more likely than White drivers to be arrested and searched. For the Commercial Vehicle Bureau, Hispanics were the least likely to be arrested and Native Americans were the least likely to be searched compared to the other racial/ethnic categories. Native Americans and Blacks, however, still had higher arrest rates, and Blacks had higher search rates than Whites.

Gender differences for 2007 stop outcomes are also displayed in Table 4.6. At the department level, male drivers were more likely to be issued repair orders (15.6% of stops), cited (45.4% of stops), arrested (3.3%), and searched (5.9%) compared to female drivers (14.6% repair orders, 44.9% cited, 1.8% arrested, and 2.9% searched). In contrast, female drivers were significantly more likely to be issued warnings (45.3%) compared to male drivers (39.6%). At the division level, the patterns in gender differences for CID and HPD were very similar to the overall department.

At the bureau level, the patterns in gender differences are quite similar to the overall department trend. That is, in each of the bureaus, male drivers were more likely to be issued repair orders, cited, arrested, and searched compared to female drivers; female drivers were more likely than males to be issued warnings. The exception to this pattern was the Commercial Vehicle Enforcement, who issued citations to more females (44.9%) than males (28.8%). In addition, the Commercial Vehicle Enforcement bureau did not exhibit any statistical significance between males and females for repair orders, arrests, or searches.

Table 4.6: 2007 Stop Outcomes by Race and Gender for Department, Division, and Bureaus (p. 1 of 2)

	Drivers	Total # of stops	% drivers warned	% drivers issued repair order	% drivers cited	% drivers arrested	% drivers searched
DPS Dept	White	297,399	44.6***	13.9***	43.4***	2.1***	3.3***
	Hispanic	123,110	33.6	18.6	48.9	3.9	8.6
	Native American	25,185	41.3	25.2	42.7	5.4	6.9
	Black	23,258	41.3	10.9	48.1	4.2	7.5
	Male	345,403	39.6***	15.6***	45.4**	3.3***	5.9***
	Female	139,742	45.3	14.6	44.9	1.8	2.9
Criminal Investigation Division	White	1,314	62.2***	14.4**	25.3***	5.6***	15.3***
	Hispanic	1,332	45.3	19.4	39.6	11.0	23.3
	Native American	111	43.2	17.1	39.6	14.4	19.8
	Black	211	51.2	17.1	35.5	12.8	35.5
	Male	2,375	52.0**	16.5	33.9*	9.7***	22.8***
	Female	659	58.4	17.6	29.3	5.6	12.0
Highway Patrol Division	White	294,977	43.7***	13.9***	43.4***	2.1***	3.2***
	Hispanic	121,375	32.6	18.6	48.9	3.8	8.4
	Native American	25,024	40.2	25.3	42.7	5.4	6.8
	Black	22,968	40.4	10.9	48.2	4.1	7.2
	Male	341,787	38.7***	15.6***	45.4**	3.2***	5.8***
	Female	138,628	44.6	14.6	44.9	1.7	2.8
Northern Bureau	White	106,692	48.7***	13.9***	42.0***	1.7***	2.5***
	Hispanic	18,698	37.6	16.6	52.6	3.4	7.8
	Native American	20,702	42.1	26.8	41.3	4.8	5.8
	Black	4,480	48.5	12.0	43.2	3.1	6.0
	Male	110,478	45.5***	15.7**	44.2***	2.7***	4.3***
	Female	46,204	48.0	15.1	42.5	1.4	2.0

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups. *** $p \le .001$ ** $p \le .01$ * $p \le .05$

Table 4.6: 2007 Stop Outcomes by Race and Gender for Department, Division, and Bureaus (p. 2 of 2)

	Drivers	Total # of stops	% drivers warned	% drivers issued repair order	% drivers cited	% drivers arrested	% drivers searched
Metro West Bureau	White	40,576	43.8***	13.5***	46.9***	2.7***	4.1***
	Hispanic	18,515	30.2	13.4	60.9	6.4	11.3
	Native American	621	34.0	12.2	59.3	11.6	15.3
	Black	4,816	41.3	9.5	52.8	5.3	8.7
	Male	46,963	38.0***	13.9***	52.3***	4.6***	7.7***
	Female	19,771	43.8	11.0	49.3	2.4	3.6
Southern Bureau	White	85,172	46.7***	18.6***	40.6***	1.8***	2.8***
	Hispanic	55,645	37.8	26.6	44.6	2.8	6.6
	Native American	2,436	39.5	23.2	44.9	5.7	9.9
	Black	6,411	43.3	15.8	46.4	3.4	6.1
	Male	105,899	41.9***	22.4***	42.8*	2.7***	5.3***
	Female	47,479	45.6	19.0	42.2	1.4	2.5
Commercial Vehicle Enforcement Bureau	White	12,416	8.5***	2.5***	30.5***	0.7***	2.8***
	Hispanic	9,261	3.2	1.4	26.6	0.6	2.3
	Native American	120	15.0	1.7	40.0	0.8	1.7
	Black	1,295	5.2	1.7	38.0	2.0	5.3
	Male	22,690	5.0***	2.0	28.8***	0.7	2.9
	Female	1,520	23.6	2.2	44.9	1.0	2.9
Metro East Bureau	White	49,775	41.5***	9.1***	51.5***	3.4***	5.1***
	Hispanic	19,148	34.7	10.4	57.2	6.5	14.5
	Native American	1,135	35.6	11.9	53.7	11.8	14.6
	Black	5,936	41.2	8.0	52.4	5.1	8.8
	Male	55,394	38.8***	9.7***	53.6***	5.2***	9.2***
	Female	23,490	41.9	8.5	51.6	2.6	4.5

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups. *** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$

Table 4.7 displays the differences in stop outcomes by driver race and gender at the district/shift level for 2007. Statistically significant differences in warnings between racial/ethnic groups were evident for all nineteen districts/shifts. For twelve of the nineteen districts/shifts, Hispanics were the least likely racial/ethnic group to be issued warnings, while in the other seven, Native American drivers received the lowest percentage of warnings.

Eighteen of the nineteen districts/shifts exhibited statistically significant differences in repair orders between racial/ethnic groups. Specifically, Black drivers were the least likely to be issued repair orders in the majority of districts (n=12 districts). Native Americans and Hispanics were the most likely to be issued repair orders in nine and six districts, respectively.

For citations, sixteen districts/shifts reported statistically significant differences between racial/ethnic groups. In nine of these sixteen districts/shifts, Hispanic drivers had the highest percentage of citations while Native Americans had the highest percentages of citations in six districts/shifts. Whites were the least likely to be cited in 12 of the 16 districts/shifts with statistically significant racial/ethnic differences.

All nineteen districts/shifts had statistically significant differences between racial/ethnic groups for percentages of drivers arrested. In sixteen of those districts, Native Americans were the most likely to be arrested, followed either by Hispanics or Blacks, while in every district but District 16, Whites were the least likely racial/ethnic group to be arrested. All nineteen districts/shifts also had statistically significant differences between racial/ethnic groups for percentages of drivers searched. In all but two of the nineteen districts/shifts (Districts 15 and 16), Whites were the least likely racial/ethnic group to be searched, while Native Americans (n=9 districts) and Hispanics (n=8 districts) were the most likely to be searched.

Table 4.7 also reports differences in stop outcomes by gender at the district/shift level. Of the nineteen districts/shifts, seventeen reported statistically significant differences in the likelihood of male and female motorists receiving warnings. Specifically, female drivers were significantly more likely than male drivers to receive warnings. In thirteen of the nineteen districts/shifts, statistically significant differences in the likelihood of male and female drivers receiving repair orders were evident. In all but two of these districts, male drivers were significantly more likely than female drivers to be issued repair orders. Twelve of the nineteen districts/shifts reported statistically significant gender differences in the likelihood of receiving a citation. In all but two of these districts (Districts 15 and 16), male drivers were significantly more likely than female drivers to be issued citations. For arrests, seventeen of the nineteen districts/shifts had statistically significant gender differences, and male drivers were more likely than female drivers to be arrested. Additionally, in eighteen of the nineteen districts/shifts, it was also significantly more likely for a search to be conducted in stops of male drivers when compared to stops of female drivers.

Table 4.7: 2007 Stop Outcomes by Race and Gender for Districts/Shifts (p. 1 of 5)

	Drivers	Total # of stops	% drivers warned	% drivers issued repair order	% drivers cited	% drivers arrested	% drivers searched
District 1 Kingman	White	23,976	43.1***	15.8***	47.5***	2.2***	2.9***
	Hispanic	4,948	36.0	18.0	53.3	3.9	5.9
	Native American	491	35.4	19.1	55.4	4.7	6.1
	Black	1,292	47.6	10.3	47.0	3.4	5.3
	Male	8,713	41.1***	16.0***	49.3	2.8***	3.9***
	Female	23,635	43.2	13.9	48.7	1.9	2.1
District 2 Flagstaff	White	18,745	55.0***	17.1***	33.0***	1.4***	2.3***
	Hispanic	3,203	41.0	19.9	47.5	3.5	8.5
	Native American	7,129	40.5	37.4	35.0	5.9	6.8
	Black	822	52.7	12.5	39.5	4.7	7.3
	Male	22,175	49.7	20.4***	36.6*	3.1***	4.7***
	Female	9,484	49.5	22.6	35.2	1.7	2.3
District 3 Holbrook	White	24,344	49.5***	9.7***	44.2***	1.2***	1.9***
	Hispanic	4,459	39.3	12.7	54.1	2.1	6.3
	Native American	10,804	43.4	22.1	43.9	4.3	5.2
	Black	1,139	46.3	11.9	45.6	2.0	6.4
	Male	28,632	45.4***	13.1	46.5***	2.4***	4.1***
	Female	13,079	48.7	13.7	43.3	1.3	1.8
District 11 Globe	White	15,012	50.9***	11.9***	41.6***	1.0***	1.5***
	Hispanic	1,946	41.9	13.2	49.9	4.0	6.0
	Native American	1,260	46.3	16.0	44.9	2.1	2.5
	Black	318	46.2	10.1	46.2	2.2	1.9
	Male	13,587	48.3***	12.4	43.9***	1.6***	2.4***
	Female	5,267	52.3	11.4	40.8	0.9	1.2

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups. *** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$

Table 4.7: 2007 Stop Outcomes by Race and Gender for Districts/Shifts (p. 2 of 5)

	Drivers	Total # of stops	% drivers warned	% drivers issued repair order	% drivers cited	% drivers arrested	% drivers searched
District 12 Prescott	White	24,485	47.3***	15.1***	41.8***	2.4***	3.4***
	Hispanic	4,109	33.0	18.0	55.5	3.8	11.9
	Native American	993	38.6	20.1	46.9	5.7	8.1
	Black	903	49.7	14.7	36.9	2.8	6.8
	Male	22,312	44.2***	16.3***	43.9	3.1***	5.6***
	Female	9,594	47.5	12.8	43.7	1.3	2.3
Metro West Shift #1	White	16,621	42.6***	11.7***	50.4***	1.6***	2.5***
	Hispanic	6,387	32.4	11.7	60.9	4.4	7.9
	Native American	214	35.5	9.8	59.3	8.9	11.2
	Black	1,591	37.7	6.8	59.8	4.5	7.4
	Male	17,749	38.7***	12.6***	53.8	2.9***	4.9***
	Female	7,866	41.8	8.1	53.7	1.6	2.5
Metro West Shift #2	White	16,555	39.5***	16.2***	48.0***	2.4***	4.1***
	Hispanic	7,898	23.8	16.8	63.3	5.0	10.5
	Native American	250	30.4	15.6	57.6	8.8	12.4
	Black	1,986	38.1	12.6	52.7	4.3	7.7
	Male	19,629	32.8***	16.6***	54.2***	3.9***	7.4***
	Female	7,985	40.1	14.2	49.7	1.8	3.4
Metro West Shift #3	White	7,193	56.4***	11.9***	36.2***	5.7***	7.7***
	Hispanic	4,121	38.9	9.4	56.2	12.2	18.2
	Native American	150	38.0	9.3	62.7	20.0	26.0
	Black	1,215	51.6	7.9	43.8	8.1	12.1
	Male	9,328	47.9***	10.9	45.4***	9.3***	13.7***
	Female	3,814	56.0	10.2	39.0	5.2	6.4

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups. *** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$

Table 4.7: 2007 Stop Outcomes by Race and Gender for Districts/Shifts (p. 3 of 5)

	Drivers	Total # of stops	% drivers warned	% drivers issued repair order	% drivers cited	% drivers arrested	% drivers searched
District 4 Yuma	White	21,773	48.2***	19.2***	40.3***	1.5***	2.3***
	Hispanic	15,052	38.9	29.9	42.8	1.9	4.7
	Native American	383	38.6	31.6	44.4	7.3	9.1
	Black	1,776	44.1	14.5	48.5	3.5	6.1
	Male	28,100	43.3***	24.1***	42.3	2.1***	4.1***
	Female	12,187	46.5	19.9	41.3	1.0	1.8
District 6 Casa Grande	White	23,100	51.7***	19.2***	33.9	1.5***	2.3***
	Hispanic	11,998	44.3	26.9	34.3	2.6	7.9
	Native American	1,153	45.1	25.2	35.2	4.2	6.9
	Black	1,790	52.2	18.9	33.3	3.0	5.9
	Male	26,922	47.7***	22.7***	34.6*	2.4***	5.4***
	Female	12,053	52.4	19.3	33.3	1.1	2.2
District 8 Tucson	White	20,903	47.8***	16.7***	40.0***	2.4***	3.7***
	Hispanic	17,171	37.3	22.7	48.1	3.6	8.1
	Native American	437	35.2	19.2	51.5	11.2	19.9
	Black	1,506	42.6	14.0	47.9	4.5	7.9
	Male	28,064	41.7***	20.2***	44.3	3.5***	6.9***
	Female	12,866	45.5	16.5	43.5	2.0	3.7
District 9 Sierra Vista	White	19,231	37.7***	19.2***	49.7***	1.9***	2.9***
	Hispanic	11,337	30.0	28.1	52.9	2.8	5.5
	Native American	459	30.1	14.8	63.6	2.8	8.3
	Black	1,318	31.0	15.4	59.8	2.4	4.0
	Male	22,638	33.6***	22.6***	51.3	2.7***	4.7***
	Female	10,265	36.6	20.6	52.1	1.2	2.3

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups. *** p ≤ .001 ** p ≤ .01 * p ≤.05

Table 4.7: 2007 Stop Outcomes by Race and Gender for Districts/Shifts (p. 4 of 5)

	Drivers	Total # of stops	% drivers warned	% drivers issued repair order	% drivers cited	% drivers arrested	% drivers searched
District 15	White	4,111	13.8***	1.6	36.7	1.1***	6.8***
	Hispanic	1,356	7.0	1.8	39.1	1.3	8.6
	Native American	57	19.3	1.8	38.6	1.8	3.5
	Black	406	7.6	2.0	40.6	3.7	11.6
	Male	5,861	9.2***	1.6	37.4***	1.2	8.1*
	Female	581	33.6	1.9	44.9	1.9	5.2
District 16	White	8,256	5.7***	2.9***	27.4***	0.4**	0.8***
	Hispanic	7,847	2.3	1.3	24.4	0.4	1.1
	Native American	58	6.9	1.7	43.1	0.0	0.0
	Black	882	3.7	1.5	36.8	1.2	2.4
	Male	16,713	3.3***	2.1	25.8***	0.5	1.0
	Female	909	16.3	1.9	45.8	0.4	1.3
Metro East Shift #1	White	7,103	42.9***	5.9***	53.1***	2.4***	3.1***
	Hispanic	1,994	27.1	7.9	67.9	5.3	11.4
	Native American	101	25.7	5.0	70.3	10.9	10.9
	Black	624	34.1	4.2	63.5	3.4	5.9
	Male	3,242	35.8***	7.1***	59.4***	3.9***	6.4***
	Female	6,868	45.8	3.8	51.7	1.5	2.3
Metro East Shift #2	White	16,610	39.4***	8.5***	53.5***	3.6***	4.5***
	Hispanic	5,119	23.2	6.9	71.0	7.1	11.0
	Native American	336	30.1	6.5	63.1	9.8	11.0
	Black	1,827	37.7	8.0	56.0	4.5	6.2
	Male	16,960	33.8***	8.4**	59.2***	5.3***	7.3***
	Female	7,764	40.2	7.3	53.7	2.6	3.2

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups. *** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$

Table 4.7: 2007 Stop Outcomes by Race and Gender for Districts/Shifts (p. 5 of 5)

	Drivers	Total # of stops	% drivers warned	% drivers issued repair order	% drivers cited	% drivers arrested	% drivers searched
Metro East Shift #3	White	10,987	44.1***	13.6***	44.9***	5.4***	8.1***
	Hispanic	3,562	28.8	10.2	62.1	10.0	13.1
	Native American	331	35.6	13.6	51.1	20.5	22.7
	Black	1,356	43.7	10.5	47.0	8.0	11.1
	Male	11,663	39.4***	12.0***	50.3***	7.8***	10.8***
	Female	5,279	43.8	13.8	45.4	4.7	7.2
Metro Motors	White	11,143	25.7***	6.0**	70.5***	2.3***	2.8***
	Hispanic	4,310	13.6	5.9	82.3	6.1	9.2
	Native American	186	16.7	9.1	76.9	6.5	7.5
	Black	1,391	24.6	3.8	73.0	4.1	5.6
	Male	12,506	21.2***	6.1**	74.8***	4.2***	5.7***
	Female	5,269	25.2	5.0	71.7	1.6	2.2
All Canine	White	3,904	85.8***	13.3***	4.4	2.3***	9.8***
	Hispanic	4,147	79.6	20.7	4.3	3.9	27.0
	Native American	180	70.6	25.6	8.3	5.6	16.1
	Black	737	82.9	14.8	5.3	4.7	19.4
	Male	7,363	82.0	17.5	4.3	3.6***	20.0***
	Female	1,924	83.5	15.8	5.1	2.1	12.3
Canine North	White	1,872	89.2***	8.5***	5.7	2.9**	9.6***
	Hispanic	843	82.9	16.4	5.6	3.8	20.0
	Native American	50	80.0	8.0	12.0	4.0	8.0
	Black	388	83.0	13.4	5.9	6.4	20.9
	Male	2,675	85.3**	12.6***	5.8	3.5	14.4**
	Female	643	89.9	7.6	5.4	3.6	9.8
Canine Central & South	White	2,029	82.7***	17.7***	3.2	1.7***	9.9***
	Hispanic	3,289	78.9	21.8	3.8	4.0	28.8
	Native American	130	66.9	32.3	6.9	6.2	19.2
	Black	349	82.8	16.3	4.6	2.9	17.8
	Male	4,673	80.3	20.2	3.3**	3.7***	23.3***
	Female	1,278	80.3	20.0	4.9	1.3	13.6

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups. *** $p \le .001$ ** $p \le .01$ * $p \le .05$

Tables 4.6 – 4.7 illustrate the wide variation in outcomes across racial/ethnic and gender groups at the department, division, bureau, and district/shift levels for 2007. It is important to reiterate, however, that the relationships reported in the previous tables are bivariate in nature and thus do not statistically control for other relevant legal and extralegal factors that might influence officer decision-making. *Therefore, the information provided in Tables 4.6 – 4.7 cannot determine whether or not differences in outcomes across racial/ethnic and gender groups are due to officer bias.*

Racial/Ethnic Differences in Most Severe Outcome Received

As noted previously, a single traffic stop often results in multiple outcomes. In terms of official sanctions by DPS, it is important to consider traffic stop outcomes as rank ordered by severity. For the analysis reported in Figure 4.3, the categories of outcomes described are rank ordered and mutually exclusive. The rank ordering is as follows (from least severe to most severe):

- Level 1: Warning
- Level 2: Repair Order or DVER
- Level 3: Citation or Tribal Order
- Level 4: Any Arrest

Figure 4.2 below displays the total number of traffic stops for each racial/ethnic group and their percentages of the most severe consequences for traffic stops. As shown, racial/ethnic differences (all of which are statistically significant) are evident across the department for the most severe outcome received. Specifically, Hispanics were significantly less likely than other racial/ethnic groups to have a warning be the most severe outcome received. Hispanics and Native Americans were significantly more likely than Whites and Blacks to have repair orders or DVERs as the most severe outcome received. Hispanics and Blacks were significantly more likely than Whites and Native Americans to have a citation as the most severe outcome received. Finally, for the most severe outcome—arrest—Hispanics, Native Americans, and Blacks were all significantly more likely than Whites to have arrest as the most serious outcome received.

Figure 4.3: Racial/Ethnic Differences in Most Severe Outcome Received
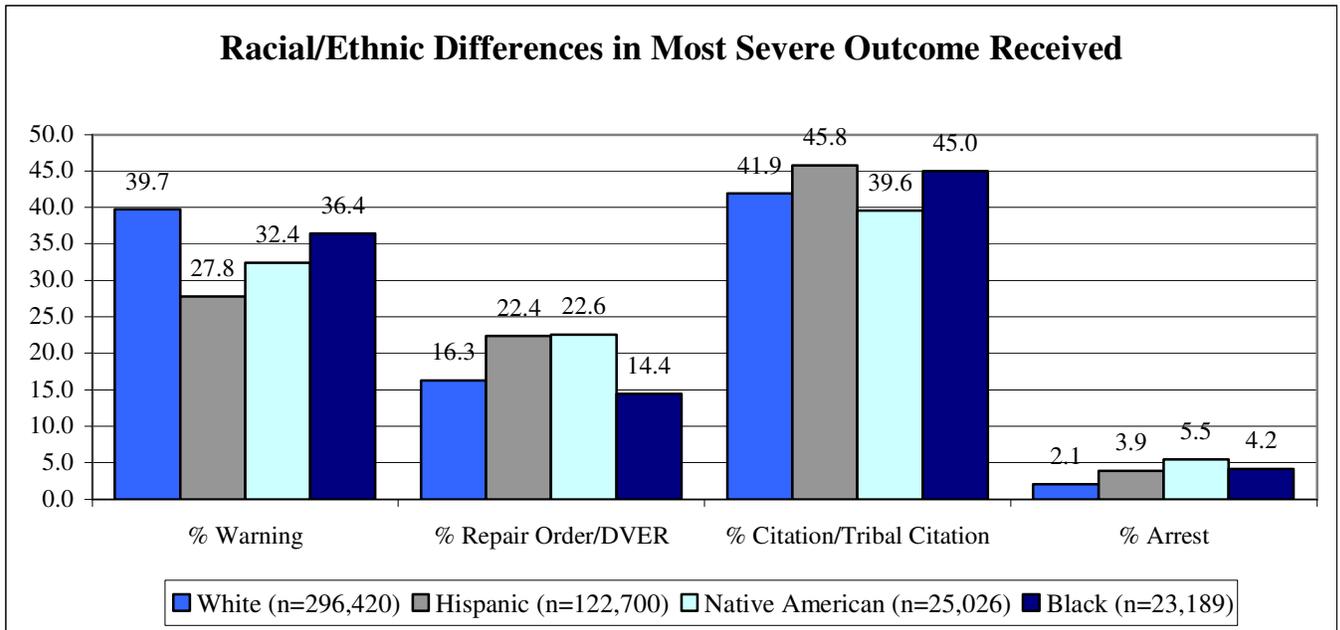
It is plausible that racial/ethnic and gender differences in post-stop outcomes exist due to legal and extralegal reasons other than race, ethnicity, and gender. To explore these possibilities, more advanced statistical analyses that control for other legally relevant variables are presented below. The information reported in Tables 4.1 - 4.7 is included in this report solely to provide details to DPS administrators regarding differences in post-stop outcomes at the department, division, bureau, and district/shift levels. Although this information will allow DPS administrators to identify potential problems and target specific districts/shifts for policy interventions, it should not be the sole information used to examine whether or not discriminatory practices exist.

MULTIVARIATE ANALYSES

A multivariate statistical model is one that takes many different factors into account when attempting to explain a particular behavior. Unlike a bivariate model, which simply assesses the relationship between two variables, a multivariate model examines many variables simultaneously, and therefore provides a more thorough and accurate interpretation of the data. In other words, the individual impact of one variable on the outcome can be measured while considering all of the other variables simultaneously.

When a multivariate analysis includes other likely factors that influence stop outcomes and disparity remains, then we can have more confidence in the possibility that racial bias is at work (Fridell, 2004, 2005). Importantly, however, it still cannot be said with certainty that racial disparity in stop outcomes reflects officer bias. Although multivariate analysis is a stronger analytical strategy than traffic stop comparisons to benchmark data or bivariate analysis, it is not without its limitations. The key weakness of multivariate statistical analysis

is that it can only statistically control for those variables that are measured. This is called "specification error" or the error in a statistical model due to the inability to specify all of the factors that might have an influence over the outcome (in this case, officers' behavior). Due to issues associated with specification error, the results from the multivariate models must be interpreted with caution. Researchers generally note the explanatory factors that are not (or could not be) measured, and speculate about their possible impact on the results. Despite these limitations, researchers can generally be more confident in the findings of multivariate models that examine traffic stop dispositions because at least some legal and extralegal factors that contribute to officer decision-making are statistically controlled.

In Tables 4.8 - 4.11, the results of six multivariate models are presented. These multivariate analyses examine the associations between drivers' characteristics and six post-stop outcomes (i.e., warnings, repair orders, citations, arrests, searches, and seizures) when other characteristics likely associated with these outcomes are statistically controlled.

Many factors other than drivers' race/ethnicity are likely to influence officers' decision making once a traffic stop has been made. For example, other driver characteristics (e.g., drivers' gender, age, residency), vehicle characteristics (e.g., registration, type of vehicle), stop characteristics (e.g., time of day, day of the week, season), reasons for the stop (moving violations, non-moving violations, equipment violations, etc.), and other legal variables (e.g., evidence found during a search) have all been hypothesized to influence post-stop outcomes. Multivariate analyses allow the examination of the effects of each of these predictor variables, while controlling for the influence of the remaining variables.

For example, the influence of drivers' race can be examined while holding constant the predictive power of drivers' age, reason for the stop, time of day, etc.[12] The multivariate analyses below examine the following specific variables for their influence over post-stop outcomes:

- Driver characteristics: race/ethnicity (dichotomous variables – White, Hispanic, Native American, Black, Other; White is the excluded comparison category), gender (1=male), age (in years), county residency where stop occurred (1=yes), Arizona residency (1=yes).

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[12] Other characteristics are also believed to potentially influence officer decision making, including officer characteristics (e.g., sex, race, experience, education, assignment), organizational characteristics (e.g., number of officers assigned to district, % canine handlers assigned to area, % minority officers assigned to district, etc.), and community characteristics where the stop occurred (e.g., residential population, poverty, factors related to traffic patterns, etc.). The inclusion of community characteristics, organizational characteristics, and individual officer characteristics in the analyses introduces additional statistical complexity with the use of data at two levels of aggregation. Therefore, the application of a specialized statistical program called hierarchical linear and nonlinear modeling (HLM) would be required. Unfortunately, due to data limitations, the UC research team is currently unable to examine these possibilities. Specifically, the UC research team does not have access to employee demographic information and organizational demographic information. Analyses using DPS data from 2003 demonstrate that these variables do lend to an explanation of racial/ethnic disparities in post-stop outcomes (Engel, 2004, 2005). The community characteristics can only currently be assessed at the county level – with only 15 counties in the state of Arizona, there are too few areas to examine statistically in a hierarchical linear model.

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- Vehicle characteristics: registration (1= Arizona registration), type of vehicle (dichotomous variables – cars, truck/tractor trailer, van/station wagon, and other; car is the excluded comparison category)[13]
- Stop characteristics: time of day (1=night), day of the week (1=weekend), season (dichotomous variables – spring, summer, fall, winter; winter is excluded comparison category)
- Legal variables: reason for the stop (dichotomous variables – moving violations, non-moving violations, equipment violations, investigatory stop, externally generated information stop, and criminal offense; moving violations is the excluded comparison category), evidence found during a search (evidence=1)

Understanding and Interpreting Multivariate Analyses

Table 4.8 presents the results of two logistic regression models predicting warnings and repair orders issued to drivers during officer-initiated traffic stops in 2007. Table 4.9 presents results for a multinomial logistic regression analysis predicting citations (including multiple citations). Table 4.10 presents results for a logistic regression analysis predicting arrests, while Table 4.11 presents the analyses predicting searches and seizures. These models demonstrate what factors likely influence officer decision making when other factors are equal. The effects of drivers' race/ethnicity over the likelihood of being issued warnings, repair orders, citations, arrests or searches are isolated. A statistically significant finding on race/ethnicity would indicate that Hispanic, Native American, and/or Black motorists are significantly more likely to be given warnings, repair orders, citations, arrested, or searched compared to Whites in similar situations (e.g., traveling during the same times, stopped for the same initial reasons, etc.). In addition, the Exp(b) is calculated and reported as a measure of the log odds – this is loosely translated into the number of times more likely drivers with the given characteristic are to receive the particular outcome compared to others.

For each of the models reported in Tables 4.8 – 4.11, several independent variables were included that could potentially influence officer actions. As shown in the left hand column, the predictor variables include: 1) driver characteristics, 2) vehicle characteristics, 3) stop characteristics, and 4) legal variables. It is believed that each of these variables has the potential to influence officer behavior, and therefore must be statistically controlled to examine our variables of interest (i.e., drivers' race/ethnicity).

Each of the independent variables is assessed relative to their effect upon the post-stop outcome being examined. It is important to note, though, that some variables are excluded from the model for comparison purposes. For example, the drivers' race is captured in the model as Hispanic, Native American, Black, and Other. White is excluded from the model for comparison purposes. That is, the influence of the other race/ethnic variables that are reported in the models is in comparison to Whites. Thus, the coefficients reported in the

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[13] Additional vehicle characteristics (e.g., age and color) are collected on the data collection form but not currently scanned into the electronic dataset. These variables as well as vehicle condition, which can serve as a proxy for socioeconomic status are among the additional data fields included in the redesigned electronic data collection form.

models should be interpreted as compared to Whites – that is, the likelihood of Black drivers being issued a citation compared to White drivers. The other dichotomous variables in the models are simply compared against their opposite (e.g., male drivers are compared to female drivers).

The first column in each model reported in Tables 4.8 – 4.11 displays the variable coefficient, or predicted log-odds, for each independent variable. The coefficient represents an additive expression of a particular variable. In the "coefficient" column, there are two things to examine: 1) the presence of an asterisk following the coefficient indicating a statistically significant relationship, and 2) the presence of a negative sign preceding the number. The asterisk reveals whether or not a significant relationship exists between the independent variable (e.g., male drivers) and the dependent variable (e.g., issuing a warning). If an asterisk is not present, the relationship is not considered statistically significant. Due to the extremely large sample size, the statistical significance of the relationships is assessed at the 0.001 level. The asterisks indicate that the relationships between variables are due to chance less than 0.1% of the time. The sign of the coefficient (i.e., positive or negative) indicates the direction of the relationship. For example, a positive sign on the "driver male" variable would indicate that male drivers are *more* likely than female drivers to receive a particular outcome, while a negative sign would indicate that males are *less* likely than females to receive a particular outcome.

Because the interpretation of log-odds is not intuitively straightforward, this type of coefficient is usually exponentiated to allow for interpretation in terms of odds (Liao, 1994). The second column—the odds ratio—represents this antilog transformation of the coefficient into the multiplicative odds of the outcome variable based on the predictor variable, all else being equal. In cases where the coefficient is negative, the odds ratio is inverted by dividing by 1 for ease of interpretation. The odds ratio indicates the <u>strength</u> of the relationship. For example, an odds ratio of 3.0 indicates that the presence of the variable (e.g., being a male driver) leads to three times the likelihood of receiving the outcome (e.g., receiving a citation). The strength of the relationship is one of the most important considerations. Even if the relationship between variables is statistically significant, it may not be substantively important. This is due to the large sample size – that is, there is such a large number of traffic stops, even the slightest differences might be considered statistically significant, but not substantively important. That is, the strength of the relationship may not be very large, and therefore, the odds ratio is important to consider when determining the amount of influence particular factors have over the post-stop outcomes.

<u>In summary:</u>

1) Check the sign in the coefficient column – if positive then the variable contributes positively to the outcome, if negative, the variable contributes negatively (e.g., positive sign indicates Hispanics are more likely to receive an outcome, minus sign indicates Hispanics are less likely to receive outcome).
2) If there is an asterisk following the coefficient, it is a statistically significant relationship (i.e., due to chance less than 0.1% of the time).

3) The odds ratio indicates the strength of the relationship – 1.5 indicates Hispanics are 1.5 times more likely to receive the outcome. As a rule of thumb, with a large sample (over 450,000 traffic stops), only odds ratios over 1.5 should be considered substantively important.

Multivariate Findings

Warnings & Repair Orders

Table 4.8 reports results for logistic regression models predicting whether or not drivers received warnings (first two columns) or repair orders (last two columns).[14]

The statistical model predicting warnings explains over 15% of the variance (Nagelkerke R-Square = 0.154). That is, about 15% of the variation in whether or not drivers receive warnings can be predicted with this group of factors. Specifically, during officer-initiated traffic stops in 2007, Hispanic, Black, and drivers of other race/ethnicity were significantly *less* likely to receive warnings compared to Whites. The odds ratios of these coefficients indicate that all of these relationships, though statistically significant, are not particularly strong (odds ratios ranging from 1.1 to 1.3). Likewise, although gender, age, and residency significantly predict warnings, their influence is relatively weak. In contrast, the strongest predictors of whether or not drivers receive warnings were the legal reasons for the stop. For example, drivers stopped for criminal offenses were 20.6 times less likely to receive a warning compared to those stopped for moving violations.

The statistical model predicting repair orders is much stronger – explaining over 62% of the variance (Nagelkerke R-Square = 0.623). The strength of this model is driven almost entirely by the reason for the stop. As expected, drivers stopped for equipment violations were 120 times more likely to receive a repair order compared to those stopped for moving violations. Likewise, drivers of trucks/tractor trailers were 15 times more likely to be issued repair orders compared to drivers of cars. In terms of racial/ethnic differences, Hispanic, Black, and drivers of other races were significantly less likely compared to Whites to be issued repair orders. In contrast, Native American drivers were significantly more likely to be issued repair orders compared to Whites. The strength of these relationships ranges between 1.2 to 1.5 times more/less likely to result in repair orders.

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[14] Forty-one percent of drivers were issued warnings. Only 36.0% of drivers, however, were issued warnings as their most severe outcome. A multivariate model exploring warnings as most severe outcome indicated no substantive differences in the effects of race/ethnicity on the likelihood of receiving a warning. Over fifteen percent of drivers were issued repair orders. Approximately 13.8% of drivers were issued repair orders as their most severe outcome. A multivariate model exploring repair orders as most severe outcome indicated no substantive differences in the effects of race/ethnicity on the likelihood of receiving a warning. These results are not presented in tabular form, but are available from the authors upon request.

Table 4.8: Multivariate Logistic Analyses Predicting WARNINGS and REPAIR ORDERS during officer-initiated traffic stops in 2007

Variables	WARNINGS (n=477,844)		REPAIR ORDERS (n=477,844)	
	Coefficient	Odds ratio Exp(b) or 1/Exp(b)	Coefficient	Odds Ratio Exp (b) or 1/Exp (b)
Intercept	-0.42*	1.50	-3.94*	51.40
Driver Characteristics				
Hispanic	-0.27*	1.31	-0.20*	1.22
Native American	0.02	--	0.35*	1.41
Black	-0.09*	1.09	-0.31*	1.37
Other Race	-0.27*	1.31	-0.43*	1.54
Male	-0.12*	1.13	-0.05*	1.05
Age	0.02*	1.02	0.01*	1.01
County resident	-0.17*	1.18	-0.14*	1.15
AZ resident	-0.17*	1.18	0.14*	1.16
Vehicle Characteristics				
Arizona registration	0.08*	1.08	-0.11*	1.12
Truck/Tractor Trailer	-1.05*	2.85	-2.71*	15.03
Van/Station Wagon	0.01	--	-0.04	--
Other Vehicle Type	0.27*	1.31	-0.64*	1.89
Stop Characteristics				
Night-time	0.25*	1.28	0.30*	1.35
Weekend	-0.01	--	0.09*	1.09
Spring	-0.01	--	0.03	--
Summer	0.03*	1.03	0.06	--
Fall	0.02	--	0.08*	1.08
Legal variables				
Reason for stop: non-moving violation	0.05*	1.05	0.79*	2.21
Reason for stop: equipment violation	-1.59*	4.88	4.79*	120.19
Reason for stop: investigation	-2.02*	7.54	1.15*	3.17
Reason for stop: pre-existing information	-1.71*	5.50	0.38	--
Reason for stop: criminal offense	-3.03*	20.65	-1.78*	5.95
Evidence found during search	-0.75*	2.14	-1.38*	3.98
Model Chi-square	58136.61*		212446.49*	
Nagelkerke R Square	0.154		0.623	

NOTE: Asterisks indicate statistically significant relationships * $p \leq .001$

Citations

Prior to a multivariate analysis of citations, the *number* of citations issued during a single traffic stop was examined. The number of citations issued during an individual traffic stop ranged from zero to six citations. The majority of citizens stopped did not receive a citation (54.8%), followed by one citation (32.8%), two citations (8.4%), three (2.9%), four (0.8%), five (0.4%) and six (< 0.001%). Collectively, 12.6% of drivers stopped by DPS officers were issued multiple citations, and 4.1% received 3 or more citations. Replicating a finding from the analysis of 2006 traffic stop data (see Engel et al., 2007c), Figure 4.4 demonstrates racial/ethnic differences in the percentages of drivers receiving multiple citations. Specifically, 19.9% of Hispanic drivers, 15.7% of Blacks, and 11.5% of Native Americans received multiple citations, compared to only 9.8% of Other minorities and 9.4% of Whites.

Figure 4.4: Racial/Ethnic Differences in Multiple Citations (n=485,166)
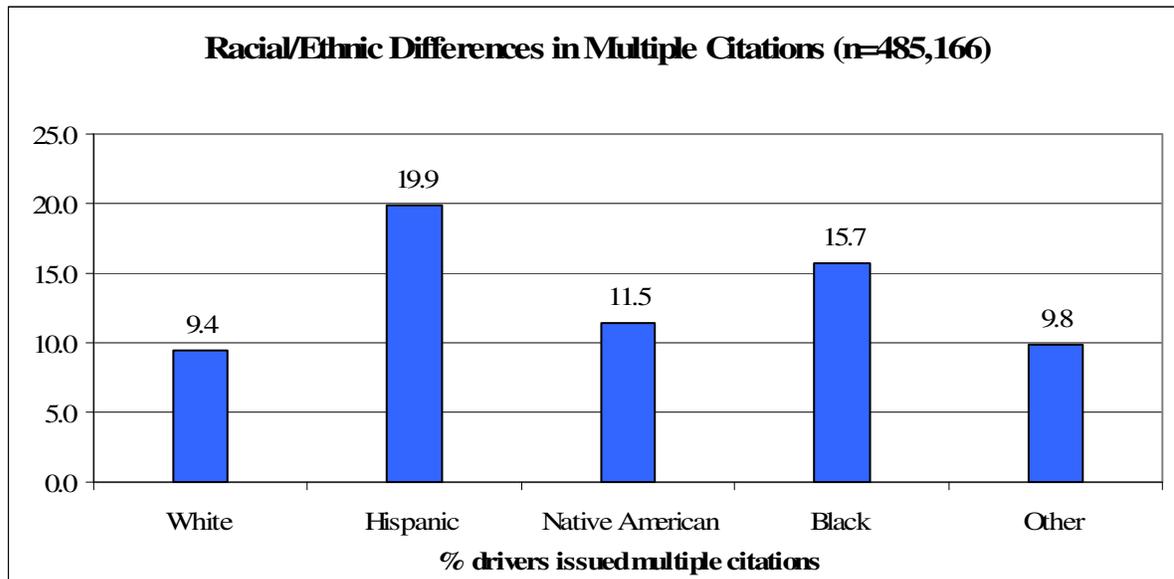
Based on these factors, the analysis technique for modeling citations differs from the other logistic regression models presented above because simply examining whether or not drivers received citations can mask possible racial/ethnic disparities in the severity of the outcome (measured as receiving multiple citations). Table 4.9 presents the results of a multivariate analysis using multinomial logistic regression. Multinomial logistic regression is an extension of binary logistic regression whereby the model estimates the effect of predictor variables on a dependent variable with multiple response categories (0, 1, 2, 3 or more citations) instead of a dichotomous dependent variable (0=no citation, 1=at least one citation). Therefore, instead of predicting the likelihood of simply receiving a citation or not, multinomial logistic regression predicts the likelihood of receiving one, two, and 3 or more citations, each compared to the likelihood of receiving no citation (Liao, 1994).[15]

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[15] The dependent variable "Number of citations" is polytomous. That is, it includes a series of categories as possible outcomes (0 citations, 1 citation, 2 citations, and 3 or more citations). Although multinomial logistic regression predicts the likelihood of belonging to multiple categories of the dependent variable, it does not

The citation models presented in Table 4.9 explain 17.4% of the variance in the number of citations issued. Under Model 1, the likelihood of receiving one citation is influenced primarily by the legal reasons for the stop. Drivers stopped for criminal offenses were 7.1 times more likely to receive one citation compared to drivers stopped for moving violations, while drivers stopped for equipment violations were 4.6 times less likely to receive one citation compared to drivers stopped for moving violations. Although the coefficients for Hispanic, Black, and Other drivers are statistically significant, the size of these odds ratios indicates that the race/ethnicity variables are not substantively important predictors of the likelihood of receiving one citation compared to no citation.

Turning to Model 2, again, the strongest predictors of the likelihood of receiving two citations compared to none are the legal reasons for the stop and the seizure of evidence during a search. Drivers stopped for criminal offenses were 9.7 times more likely than drivers stopped for moving violations to receive two citations compared to none. Similarly, drivers with evidence seized were 5.3 times more likely than those without evidence seized to receive two citations compared to none. The coefficients for each of the race/ethnicity variables are statistically significant, although the size of the odds ratios indicates that only the effect of Hispanic and Black are substantively important. Specifically, Hispanics are 2.1 times more likely than Whites to receive two citations compared to none, while Blacks are 1.6 times more likely than Whites to receive two citations compared to none.

In Model 3, the strongest predictors of the probability of receiving three citations compared to none are the legal reasons for the stop and the seizure of evidence during a search. Drivers stopped for criminal offenses were 13.8 times more likely than drivers stopped for moving violations to receive three citations compared to none. Similarly, drivers with evidence seized were 12.7 times more likely than those without evidence seized to receive three citations compared to none. Even after taking into consideration the reasons for the stop and other vehicle and stop characteristics, however, important racial/ethnic effects are evident in Model 3. Specifically, Hispanic motorists were 3.4 times more likely than White motorists to receive three citations compared to none, even after taking into consideration the reason for the stop, along with vehicle and stop characteristics. Likewise, Black drivers were 1.9 times more likely than White drivers to be issued three citations compared to none. Drivers who reside in the county where stopped and Arizona residents were each 1.9 times significantly more likely than non-county and non-Arizona residents, respectively, to receive three citations compared to none.

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account for the ordered nature of those categories. Sequential response logit models and ordinal logistic models do account for the ordered nature of outcome categories and were also used to model the probability of citations (Liao, 1994). The results (not shown), however, did not differ significantly from those produced by multinomial logistic regression. The results from the multinomial logistic regression model are presented for ease of interpretation.

Table 4.9. Multinomial Logistic Analyses Predicting CITATIONS during officer-initiated traffic stops in 2007[16] (n=477,844)

Variables	MODEL 1 ONE CITATION		MODEL 2 TWO CITATIONS		MODEL 3 THREE OR MORE CITATIONS	
	Coeff.	Odds ratio	Coeff.	Odds ratio	Coeff.	Odds ratio
Intercept	0.35*	1.42	-1.44*	4.23	-2.78*	16.08
Driver Characteristics						
Hispanic	0.09*	1.09	0.73*	2.08	1.22*	3.39
Native American	-0.04	--	0.21*	1.24	0.38*	1.46
Black	0.05*	1.06	0.47*	1.60	0.65*	1.91
Other Race	0.30*	1.35	0.30*	1.35	0.24*	1.27
Male	0.09*	1.10	0.30*	1.35	0.53*	1.71
Age	-0.01*	1.01	-0.03*	1.03	-0.04*	1.04
County resident	0.08*	1.08	0.43*	1.54	0.62*	1.87
AZ resident	0.24*	1.27	0.46*	1.58	0.65*	1.93
Vehicle Characteristics						
Arizona registration	-0.18*	1.20	-0.03	--	-0.08	
Truck/Tractor Trailer	-0.31*	1.36	-0.23*	1.25	-0.03	
Van/Station Wagon	0.00	--	-0.01	--	-0.08	
Other Vehicle Type	-0.51*	1.67	-0.18	--	-0.38	
Stop Characteristics						
Night-time	-0.40*	1.48	-0.19*	1.20	-0.07*	1.07
Weekend	0.05*	1.05	-0.07*	1.08	-0.06*	1.07
Spring	0.01	--	0.00	--	0.04	
Summer	-0.03	--	-0.09*	1.09	-0.05	
Fall	-0.03	--	-0.10*	1.11	-0.16*	1.18
Legal variables						
Reason for stop: non-moving violation	-0.52*	1.68	0.36*	1.43	0.70*	2.01
Reason for stop: equipment violation	-1.53*	4.63	-1.17*	3.22	-1.03*	2.79
Reason for stop: investigation	-1.61*	4.99	-0.83*	2.30	-0.53*	1.70
Reason for stop: pre-existing information	-0.95*	2.58	-0.06	--	0.18*	1.19
Reason for stop: criminal offense	1.95*	7.06	2.27*	9.67	2.62*	13.76
Evidence found during search	0.52*	1.69	1.67*	5.33	2.54*	12.70
Model Chi-square	78835.50*					
Nagelkerke R Square	0.174					

[16] The excluded reference category is no citation.

In summary, across the models, the strongest predictors of the number of citations issued to drivers were legal reasons. As the number of citations issued increased, the importance of these legal variables also increased. For example, traffic stops where evidence was found were 1.7 times more likely to result in one citation issued, but 12.7 times more likely to result in three or more citations issued. Likewise, the impact of drivers' race/ethnicity increased as the number of citations increased. While Hispanic drivers were only 1.1 times more likely than White motorists to receive one citation, they were 3.4 times more likely to receive three or more citations. Similarly, Black motorists were only 1.1 times more likely than Whites to be issued one citation, but 1.9 times more likely to receive three or more citations.

The reasons for the reported racial/ethnic disparities in multiple citations cannot be determined with these data. It could be argued that Hispanic, Native American, and Black drivers – all members of racial/ethnic groups that have historically been victims of discrimination resulting in social and economic disparities – are more likely to drive vehicles that have equipment violations, have expired licenses, expired registrations, no insurance, etc. If true, it is disparities in wealth (correlated in our society with race/ethnicity) that increase the likelihood of receiving multiple citations during traffic stops with police. Alternatively, it could be argued that minority drivers are significantly more likely to be issued multiple citations because of some type of police bias (either overt or subconscious). The results of these analyses provide support for both hypotheses – it cannot, however, be determined with these analyses which (if either) hypothesis is accurate.

As noted previously, the multivariate models can only measure the influence of variables for which data is collected. There are a number of factors that may explain the racial/ethnic disparities reported in the findings from the multivariate analyses but which were not included on the data collection form in 2007. For example, the differences in citation rates may be due to socio-economic status rather than race/ethnicity per se. Drivers' socio-economic status, however, is not captured on the traffic stop forms. The closest proxy indicator of wealth routinely collected – age of vehicle – was not included in the data set for analyses. In addition, the behavior of the driver (e.g., demeanor, compliance with officer requests, suspicious indicators, etc.) is not systematically captured on the traffic stop form. *Therefore, conclusions regarding the reasons for racial/ethnic disparities in traffic stop outcomes are speculative.* As described in Section 1, however, the redesigned electronic data collection system includes new data fields that capture information regarding vehicle age and condition, driver demeanor, and indicators of suspicion. Analyses based on this data next year may shed some additional light on the reasons for racial/ethnic disparities in outcomes.

In an effort to better understand factors that influence whether or not drivers receive citations, additional analyses with the currently available data were performed. Some of the possible explanations noted above could be partially examined when citation rates were further examined across racial/ethnic groups. As noted in the second phase of the data audit in Section 2, in addition to data regarding the traffic stop, if a citation was issued, information linking to the original stop regarding the number of citations issued

and the specific violations was collected. The following analyses examine the types of citations, along with the number of citations issued to racial /ethnic groups.

Figure 4.4 below examines the *types* of violations for which citations are issued by race/ethnicity. Each of the violation categories shows statistically significant racial/ethnic differences. Specifically, Whites were significantly more likely (59.8%) to be issued citations for speeding violations compared to Hispanics (43.9%), Native Americans (33.6%), and Blacks (47.9%). Black drivers were significantly more likely (9.8%) than other racial/ethnic groups to be issued citations for speeding over 85 mph. Black drivers were also significantly more likely to be issued citations for violations related to vehicle registration and/or license plate. Alternatively, Hispanic drivers were significantly more likely than other racial/ethnic groups to be issued citations for violations related to drivers' license, seat belts/child restraints, required equipment, and insurance. Finally, Native Americans were significantly more likely than other racial groups to be issued citations for DUI/reckless driving, while Whites were least likely to be issued citations for this reason.

These results provide support for the proposition that minority drivers are more likely to be issued citations for violations that are indirectly linked to income. Infractions for registrations / license plates, drivers' licenses, equipment, and insurance all have an economic component. These results also provide support for the proposition that officers make enforcement decisions based on drivers' behaviors. Higher percentages of minority drivers issued citations for seat belt and child restraint violations are consistent with the public health literature that finds minorities are significantly less likely than Whites to use such safety devices (Braver, 2003; Everett et al., 2001; Harper et al., 2000; Lerner et al., 2001; Wells et al., 2002). Recognizing these disparities, public health officials have specifically targeted campaigns for child restraint and seatbelt usage toward minority groups (Cruz & Mickalide, 2000). Differences in DUI citation rates are also supported by some literature that suggests racial/ethnic differences in offending rates (Baker et al., 1998; Braver, 2003; Harper et al., 2000; Royal, 2000). Likewise, differences in the percentage of Black motorists receiving citations for the highest speeding infractions are supported by observational studies of speeding that have reported differential speeding offending rates for minority drivers (Engel et al., 2004, 2006; Lange et al., 2005; Smith et al., 2003).

It must also be noted, however, that the alternative hypothesis – racial bias by DPS officers – is also possible based on these findings. In an effort to try to disentangle these possibilities, the redesigned electronic data collection form has been modified to capture the primary reasons for the stop as well as subsequent violations discovered during the course of the stop for all traffic stops, regardless of the disposition imposed.

Figure 4.2: Racial/Ethnic Differences in Citation Violations (n=206,693)

Racial/Ethnic Differences in Citation Violations (n=206,693)

	White	Hispanic	Native American	Black
% speeding	59.8	43.9	33.6	47.9
% speeding over 85 mph	8.1	7.8	5.4	9.8
% Registration / License Plate	10.3	10.0	5.2	13.3
% Drivers License	8.2	31.2	17.5	19.9
% Seat belt / Child restraint	6.8	11.2	9.9	6.9
% Required Equipment	1.0	2.2	0.6	1.0
% Insurance	17.8	28.8	18.4	24.4
% DUI / Reckless driving	1.8	2.3	3.3	2.0
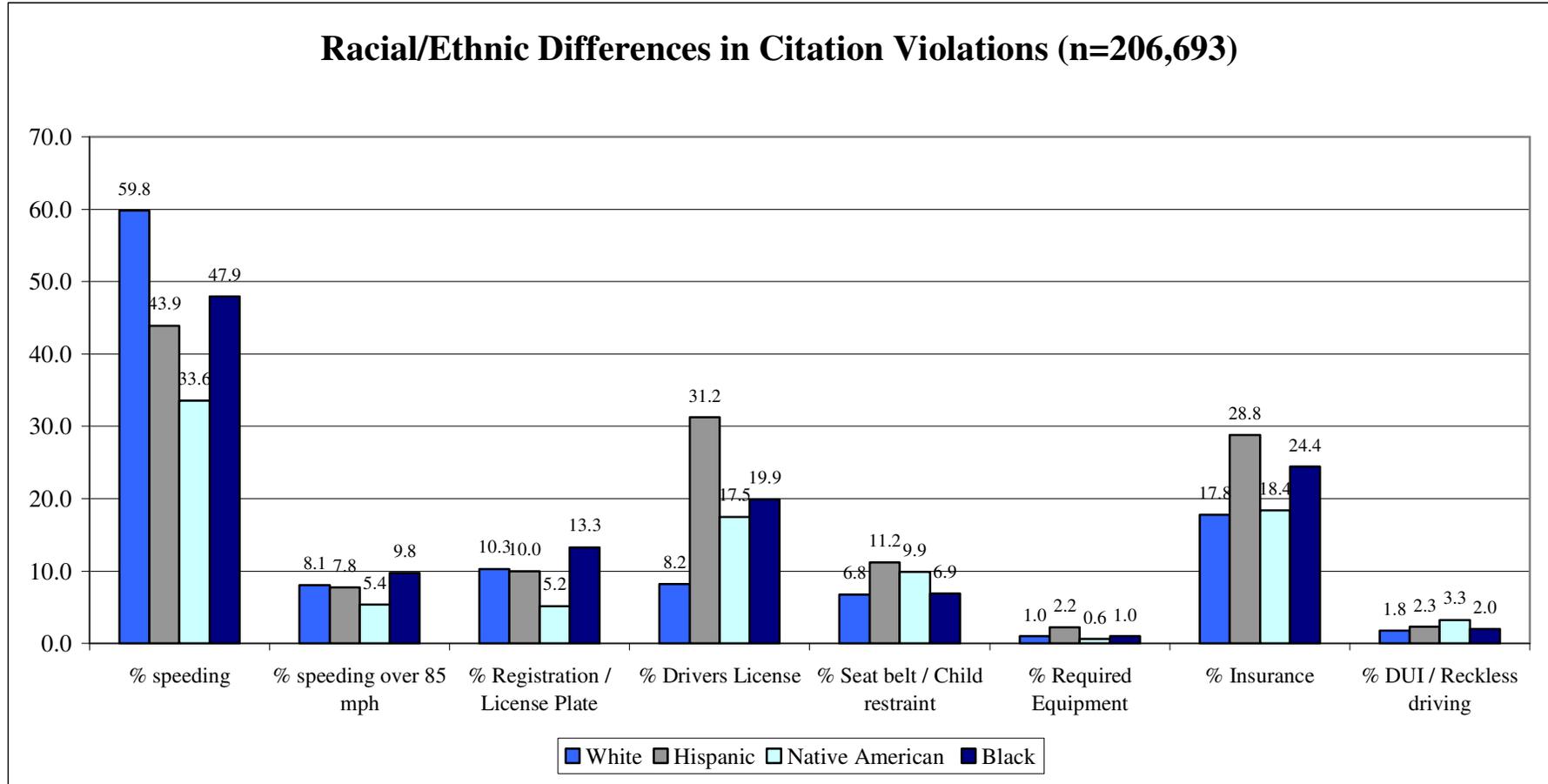
NOTE: Violations for drug offenses were excluded from this figure due to their statistical infrequency across all racial/ethnic groups.

Arrests

The arrest model displayed in Table 4.10 is a logistic regression model similar to the models reported for warnings and DVER. The arrest model demonstrates that 21.2% of the variance in arrest can be explained by the included variables. As expected, the strongest factor associated with arrest is the discovery of contraband – drivers with contraband were over 65 times more likely to be arrested compared to drivers without contraband. While this finding is intuitive, it is important to include this type of legal variable in the model predicting arrest so that the effect of other extralegal variables can be examined after this legal variable is statistically controlled. Indeed, the strength of the race/ethnicity coefficients remains even after legal variables (e.g., reason for the stop and evidence seized) are taken into consideration. Hispanic, Native American, and Black drivers were all significantly more likely to be arrested compared to White drivers given the same reasons for the stop, vehicle characteristics, and stop characteristics. Specifically, Hispanic, Native American, and Black drivers were 1.7, 2.7, and 1.7 times more likely to be arrested, respectively, compared to Whites.[17]

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[17] In addition to modeling the likelihood of "any arrest" we also examined a model that excluded low-discretion warrant arrests. The only notable difference between the two models was a slightly larger coefficient for seizure of evidence. In other words, in cases of non-warrant arrests, evidence seized during a search was an even stronger predictor of arrest than in the model presented in Table 4.10. There were, however, no differences in the race/ethnicity effects between the two models.

Table 4.10 Multivariate Logistic Analyses Predicting ARRESTS during officer-initiated traffic stops in 2007

Variables	Coefficient	Odds Ratio Exp (b) or 1/Exp (b)
	ARRESTS (n=477,844)	
Intercept	-5.04	155.12
Driver Characteristics		
Hispanic	0.52*	1.69
Native American	0.99*	2.70
Black	0.51*	1.67
Other Race	-0.10	--
Male	0.67*	1.95
Age	-0.01*	1.01
County resident	0.20*	1.22
AZ resident	0.26*	1.30
Vehicle Characteristics		
Arizona registration	0.32*	1.38
Truck/Tractor Trailer	-1.15*	3.17
Van/Station Wagon	-0.16*	2.27
Other Vehicle Type	-0.55	--
Stop Characteristics		
Night-time	0.71*	2.03
Weekend	0.27*	1.30
Spring	0.11*	1.11
Summer	0.02	--
Fall	-0.05	--
Legal variables		
Reason for stop: non-moving violation	0.21*	1.24
Reason for stop: equipment violation	-0.25*	1.28
Reason for stop: investigation	1.15*	3.15
Reason for stop: pre-existing information	1.83*	6.24
Reason for stop: criminal offense	1.62*	5.07
Evidence found during search	4.18*	65.38
Model Chi-square	23315.89*	
Nagelkerke R Square	.212	

Additional analyses were also performed to better understand factors that influence whether or not drivers were arrested. Some of the possible explanations for disparity noted above could be partially examined when arrest rates are examined across types of violations. As noted above, racial/ethnic differences exist in the types of violations for which drivers are issued citations. Therefore, if particular types of violations are more likely to result in arrest, and these types of violations also differ systematically by race/ethnicity, then racial/ethnic disparities in arrest rates may be partially accounted for by alternative factors. The following analyses examine arrest rates by the types of violations (as indicated on the citation and warning forms).

Figure 4.3 shows the percent of drivers arrested by the types of violations for which they were cited or warned.[18] As shown, significant differences in arrest rates exist across violation types. Specifically, drivers cited or warned for violations related to drivers' license, equipment, and insurance were significantly more likely to be arrested than drivers cited or warned for speeding. For example, nearly 10% of traffic stops involving drivers' license violations resulted in arrests, compared to less than 1% of traffic stops involving speeding infractions. As noted above, Hispanics drivers were significantly more likely than Whites to have drivers' license, equipment, and insurance violations, which show the three highest arrest rates across types of violations. These results suggest that racial/ethnic disparities in arrest rates may be partially accounted for by factors related to violation type; which, in turn, are likely related to socioeconomic status.

Figure 4.3: Arrest Rates by Violation Type
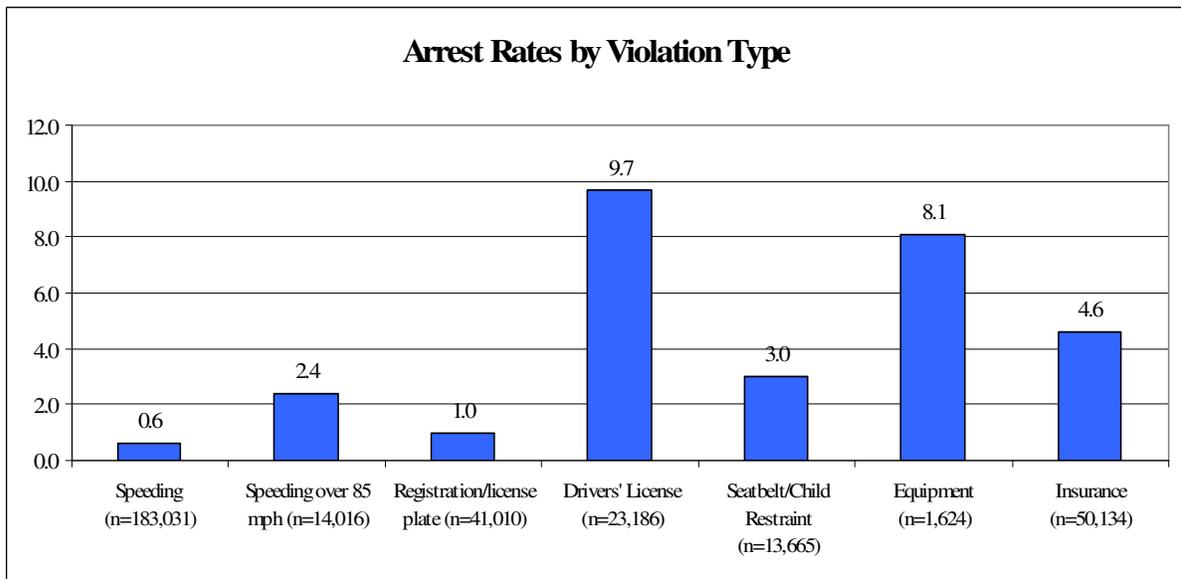
Searches & Seizures

Table 4.11 documents the logistic regression models predicting searches and contraband seizures. Both of these models are relatively weak and explain little overall variation in the outcomes. The search model explains only 8.6% of the variation in whether or not searches are conducted. Nevertheless, the search model – though weak – does suggest that racial/ethnic disparities exist in whether or not searches are conducted. These racial/ethnic disparities may (or may not) be explained by other factors not included in this model. Hispanic, Native American, and Black drivers were all significantly more likely to be searched during officer-initiated traffic stops compared to Whites. Specifically, Hispanic, Native American, and Black drivers were 2.5, 2.2, and 2.2 times more likely to be searched compared to Whites given the same vehicle characteristics, stop characteristics, and reasons for the stop. In addition, drivers stopped for reasons of investigation, pre-existing

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[18] The majority of stops based on DUI or drug offense violations (88.6% and 60.5% respectively) resulted in an arrest. Therefore, these two types of violations were excluded from this analysis.

information or criminal offenses, were all significantly more likely to be searched than those stopped for moving violations.

Finally, the seizure model reported in Table 4.11, which explains a very minimal (only 4.7%) amount of the variance, is simply too weak to provide any substantive interpretation. While Hispanic drivers are less likely to be discovered with contraband when compared to White drivers, and drivers stopped for criminal offenses are more likely to be discovered with contraband when compared to those stopped for moving violations, the strength of these relationships is only marginal. Indeed, none of the variables considered in the statistical model can be considered strong predictors of whether or not contraband is discovered during searches. Given the inability of the multivariate statistical models to provide a clear understanding of DPS search and seizure patterns, additional analyses examining searches and seizures are conducted and reported in Section 5.

The weak overall ability of these models to predict whether or not drivers are searched and contraband is found indicates that they are likely misspecified. It is expected that other factors more central to explaining these outcomes have not been included in the data collection. Indeed, officers who participated in the focus group sessions indicated a number of factors, not included on the data collection form, that influence their decision to search or request consent to search as well as the likelihood of finding contraband. Specifically, officers participating in the focus group session described a myriad of pre-stop and during-the-stop indicators of criminal activity that raise their level of suspicion and interest in conducting a search. In addition, participants stressed the need to consider multiple indicators within the context of the situation and the importance of the totality of circumstances when developing their level of suspicion. Focus group participants also indicated a number of reasons that searches may not produce contraband seizures including:

- Searches conducted due to policy or officer safety that officers have little or no discretion over conducting and generally do not expect to uncover contraband
- Driver or occupants involved in other illegal behavior for which DPS officers do not have jurisdiction (i.e., undocumented aliens)
- Drug traffickers' use of sophisticated hidden compartments
- Motorist admits illegal behavior or has trace amounts of contraband that officers cannot or do not record as contraband
- Officer inexperience or misinterpretation of cues of suspicion
- Criminal activity is not current (e.g., drugs have recently been delivered and are no longer in the vehicle)

Table 4.11: Multivariate Logistic Analyses Predicting SEARCHES and SEIZURES during officer-initiated traffic stops in 2007

Variables	SEARCHES (n=477,844)		SEIZURES (n=23,598)	
	Coefficient	Odds Ratio Exp (b) or 1/Exp (b)	Coefficient	Odds Ratio Exp (b) or 1/Exp (b)
Intercept	-3.55*	34.67	-0.23	--
Driver Characteristics				
Hispanic	0.90*	2.46	-0.56*	1.75
Native American	0.81*	2.24	-0.20	--
Black	0.79*	2.20	0.02	--
Other Race	-0.04	--	-0.34	--
Male	0.75*	2.12	0.05	--
Age	-0.02*	1.02	-0.01*	1.01
County resident	0.00	--	-0.37*	1.44
AZ resident	0.01	--	-0.06	--
Vehicle Characteristics				
Arizona registration	0.13*	1.14	-0.30*	1.35
Truck/Tractor Trailer	-0.65*	1.92	0.05	--
Van/Station Wagon	-0.17*	1.19	-0.01	--
Other Vehicle Type	-0.30	--	0.22	--
Stop Characteristics				
Night-time	0.43*	1.53	-0.05	--
Weekend	0.13*	1.13	-0.03	--
Spring	0.07*	1.08	0.12	--
Summer	0.04	--	0.02	--
Fall	0.15*	1.16	-0.16	1.18
Legal variables				
Reason for stop: non-moving violation	0.38*	1.46	-0.20*	1.22
Reason for stop: equipment violation	0.10*	1.11	-0.09	--
Reason for stop: investigation	1.44*	4.20	0.25	--
Reason for stop: pre-existing information	2.18*	8.86	0.19	--
Reason for stop: criminal offense	1.76*	5.83	0.54*	1.71
Model Chi-square	13590.70*		716.85	
Nagelkerke R Square	.086		.047	

NOTE: Asterisks indicate statistically significant relationships * $p \leq .001$

SECTION SUMMARY

This summary highlights the findings of racial/ethnic disparities in post stop outcomes for drivers stopped in 2007. When reviewing these results, it is important to remember that the bivariate analyses only consider two variables at a time (e.g., the race of the driver and the post-stop outcome). As a result, the interpretation of these findings should be made with caution and cannot determine the existence of racial bias. The multivariate analyses are better suited to make substantive claims about the results of the post-stop outcomes due to their consideration of more than one factor simultaneously. Nevertheless, the multivariate analyses are limited by the type and amount of data collected. Thus, multivariate analyses can demonstrate racial/ethnic disparities that exist after statistically controlling for other factors measured with these data that might influence officer decision making.

Bivariate Analyses – Differences in Outcomes across Types of Drivers

- At the department level, statistically significant racial/ethnic differences are evident for the most severe outcome received.
    - Specifically, Hispanics were significantly less likely than other racial/ethnic groups to have a warning be the most severe outcome received.
    - Hispanics and Native Americans were significantly more likely than Whites and Blacks to have repair orders or DVERs as the most severe outcome received.
    - Hispanics and Blacks were significantly more likely than Whites and Native Americans to have a citation as the most severe outcome received
    - For the most severe outcome—arrest—Hispanics, Native Americans, and Blacks were all significantly more likely than Whites to have arrest as the most serious outcome received.

- At the department level, Hispanic drivers were the least likely to be given a warning (33.6%) when compared to White (44.6%), Native American (41.3%), and Black (41.3%) drivers.

- Native Americans were the most likely to be issued a repair order (25.2%) when compared to White (13.9%), Hispanic (18.6%), and Black (10.9%) drivers.

- Hispanics received the highest percentage of citations (48.9%), followed closely by 48.1% of Blacks, while Native Americans (42.7%) and Whites (43.4%) were significantly less likely to be cited than Hispanics and Blacks.

- Hispanic, Native American and Black drivers were all significantly more likely than White drivers to be arrested and searched.
    - Specifically, Native Americans were the most likely to be arrested (5.4%), followed by Blacks (4.2%), Hispanics (3.9%), and Whites (2.1%).
    - Hispanics were the most likely to be searched (8.6% of stops) compared to Blacks (7.5%), Native Americans (6.9%), and Whites (3.3%).

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- These patterns and trends varied somewhat at the bureau level and more so at the district/shift level.

- Statistically significant differences in the *types* of violations for which citations are issued are also evident by race/ethnicity:
    - Specifically, Whites were significantly more likely to be issued citations for speeding violations compared to Hispanics, Native Americans, and Blacks.
    - Black drivers were significantly more likely than other racial/ethnic groups to be issued citations for speeding over 85 mph and for violations related to vehicle registration and/or license plate.
    - Alternatively, Hispanic drivers were significantly more likely than other racial/ethnic groups to be issued citations for violations related to drivers' license, seat belts/child restraints, required equipment, and insurance.
    - Finally, Native Americans were significantly more likely than other racial groups to be issued citations for DUI/reckless driving, while Whites were least likely to be issued citations for this reason.

- These results provide suggest that minority drivers are more likely to be issued citations for violations that are indirectly linked to income. These results also provide support for the proposition that officers make enforcement decisions based on drivers' behaviors, not their demographic characteristics.

Multivariate Analyses of Traffic Stop Outcomes

- Multivariate statistical models take many different factors into account simultaneously when attempting to explain a particular behavior, and therefore provide a more thorough and accurate interpretation of the data.

- Warnings
    - Hispanic, Black, and drivers of other race/ethnicity were significantly *less* likely compared to Whites to receive warnings.
    - The odds ratios of these coefficients indicate that all of these relationships, though statistically significant, are substantively not particularly strong.
    - In addition, although gender, age, and residency significantly predict warnings, their influence was relatively weak.
    - In contrast, the strongest predictors of whether or not drivers receive warnings were the legal reasons for the stop.

- Repair Orders
    - Drivers stopped for equipment violations were 120 times *more* likely to receive a repair order compared to those stopped for moving violations.
    - Drivers of trucks/tractor trailers were 15 times *more* likely to be issued repair orders compared to drivers of cars.
    - In terms of racial/ethnic differences:

- Hispanic, Black, and drivers of other races were significantly *less* likely, while Native Americans were significantly more likely, compared to Whites to be issued repair orders.
- The strength of these relationships range between 1.2 to 1.5 times more/less likely, indicating they are not very strong explanatory factors.

- Citations
  - Bivariate analyses of race and multiple citations indicated that Hispanics, as well as Blacks and Native Americans, were significantly more likely than Whites to be issued multiple citations. Therefore, to disentangle the impact of race/ethnicity on the likelihood of receiving citations a multinomial logistic regression analysis compared the probability of receiving one, two, and 3 or more citations compared to none.
  - The strongest predictors of the number of citations issued to drivers were legal reasons. As the number of citations issued increased, the importance of these legal variables also increased.
    - For example, traffic stops where evidence was found were 1.7 times more likely to result in one citation issued, but 12.7 times more likely to result in three or more citations issued.
  - The impact of drivers' race/ethnicity also increased as the number of citations increased.
    - While Hispanic drivers were only 1.1 times more likely than White motorists to receive one citation, they were 3.4 times more likely to receive three or more citations.
    - Similarly, Black motorists were only 1.1 times more likely than Whites to be issued one citation, but 1.9 times more likely to receive three or more citations.
  - The reasons for the reported racial/ethnic disparities in multiple citations, however, cannot be determined with these data.
    - It could be argued that Hispanic, Native American, and Black drivers are more likely to drive vehicles that have equipment violations, have expired licenses, expired registrations, no insurance, etc. If true, it is disparities in wealth (correlated in our society with race/ethnicity) that increase the likelihood of receiving multiple citations during traffic stops with police. Indeed, a bivariate examination of the types of violations for which citations are issued by race/ethnicity provides support for this proposition.
    - Alternatively, it could be argued that minority drivers are significantly more likely to be issued multiple citations because of police bias.

- Arrests
  - The strongest factor associated with arrest is the discovery of contraband – drivers with contraband were 65 times *more* likely to be arrested compared to drivers without contraband.
  - More important, is the strength of the race coefficients after legal variables such as reason for the stop and evidence seized (as well as other variables related to the stop, vehicle, and driver) are taken into consideration.

- Hispanic, Native American, and Black drivers were 1.7, 2.7, and 1.7 times significantly more likely to be arrested, compared to Whites.

- Searches
  - o The search model – though weak in predictive power– suggests that important racial/ethnic disparities exist in whether or not searches are conducted.
  - o Hispanic, Native American, and Black drivers are 2.5, 2.2, and 2.2 times significantly *more* likely to be searched compared to Whites given the same vehicle characteristics, stop characteristics, and reasons for the stop.

- Seizures
  - o The multivariate model predicting seizure is too weak to provide any substantive interpretation.
  - o Whether racial/ethnic disparities exist for seizure rates will be explored using the outcome test in Section 5.

- Racial / ethnic differences in stop outcomes may (or may not) be explained by factors unmeasured by these data (e.g., the severity of the traffic offense, drivers' compliance with officers' requests, demeanor, indicators of suspicion, drivers' socioeconomic status, etc.) or officer bias toward specific minority groups. The reasons for the racial/ethnic disparities in stop outcomes reported cannot be determined with these data. Therefore, no definitive conclusions regarding racial/ethnic disparities in traffic stop outcomes based on the multivariate analyses should be made.

5. SEARCH & SEIZURE ANALYSES

OVERVIEW

The material presented in this section is focused specifically on searches conducted during officer-initiated traffic stops. As reported in Section 4, 5.0% of all member-initiated traffic stops during 2007 resulted in a search of the driver, vehicle or passenger.[19] Additionally, the results of the multivariate analysis in Section 4 indicate that after controlling for other relevant legal and extralegal factors captured on the data collection form, Hispanic, Black and Native American drivers are at least two times more likely than Whites to be searched. The purpose of the analyses presented in this section is to further examine searches and seizures conducted by DPS officers. Searching motorists is a statistically infrequent event; however, it involves a physical and psychological intrusion upon those subjected to searches. Therefore, these police actions merit further statistical exploration.

Section 5 begins with a description of searches and seizures at the department, division, bureau, and district/shift levels. This information is documented in Tables 5.1 – 5.2, as well as Figures 5.1 – 5.3. Thereafter, searches are categorized into three types and statistically examined. Type I searches involve little or no officer discretion. Type II searches are discretionary searches guided by case law or legal statutes. Type III searches are based solely on drivers' consent to request to search. Figure 5.4 reports the search rates for each of the three types of searches at the department and bureau level. Figure 5.5 and Table 5.3 document at the department and bureau level the racial/ethnic and gender differences in search rates by these three types of searches.

Finally, search success rates are explored in detail. Table 5.4 and Figure 5.6 report the search success rates by the reason for search at the department, division and bureau level. Search success rates for Type II searches are examined in Figures 5.7 – 5.8 and Table 5.5. Thereafter, an examination of consent searches (Type III) is provided. Racial and ethnic differences in request for consent to search and refusal to consent are examined in Figures 5.9 and 5.10. Table 5.6 reports the results of a multivariate analysis of Type III searches. Search success rates for Type III searches are examined in Figures 5.11 – 5.12 and Table 5.7. Figures 5.13 and 5.14 explore the search and search success rates based on different types of violations. Finally, Figures 5.15 and 5.16 provide an overview of search rates and search success rates for undocumented aliens. Section 5 concludes with a summary of the main findings.

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[19] Only searches captured on the contact forms with drivers were included for analyses. It is assumed that passengers searched would be captured on these forms. If forms for passengers were included, there would be multiple searches included in the data base for a single traffic stop. The research team assumed that if a passenger is searched and contraband is found on that passenger, this information is captured on the drivers' contact data form.

DESCRIPTION OF SEARCHES AND SEIZURES

Searches

This section provides a descriptive overview of the searches conducted by DPS officers during traffic stops in 2007. Table 5.1 and Figure 5.1 describe the frequency of each reason for a search at the department, division, bureau, and district/shift level. Figure 5.2 displays the search targets involved in DPS searches during traffic stops.

Reasons for the Search

Table 5.1 below reports the total number of traffic stops, the percentage of stops that result in a search, and the total number of searches at the department, division, bureau, and district/shift levels. This table also documents the percentage of searches for each reason indicated on the data collection forms (e.g., consent, incident to arrest, probable cause, Terry, vehicle inventory, plain view, warrant, and canine alert) by each organizational unit.[20]

As shown in Table 5.1, DPS officers conducted a total of 24,302 searches of drivers, vehicles, and/or passengers during officer-initiated traffic stops in 2007 (5.0% of the 485,183 officer-initiated traffic stops). Variation in these percentages is evident at the different organizational levels. Motorists stopped by the Criminal Investigations Division (20.4%) were over 4 times as likely to be searched compared to those stopped by the Highway Patrol Division (4.9%). It is important to note, however, that the overwhelming majority of searches were conducted by officers assigned to the Highway Patrol Division. At the bureau level, the Commercial Vehicle Bureau and the Metro East Bureau conducted the smallest and largest percentages of searches (2.9% and 7.8%, respectively). At the district/shift level, the percent of traffic stops resulting in searches range from a low of 1.0% in District 16 to a high of 18.4% in the Canine District.

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[20] Officers may have indicated that a search was conducted for multiple reasons. As a result, the sum of percentages across search categories reported in Table 5.1 may exceed 100%. The last column in Table 5.1 indicates the percentage of searches that were conducted based solely on drivers' consent. This column partially duplicates information provided in the "consent" column, but excludes searches that were conducted based on consent and any other (i.e., non-consent) reason.

Table 5.1: Reasons for 2007 Traffic Stop Searches – Statewide, Division, Bureaus, & Districts/Shifts

	Total # of Stops	% Stops resulting in Searches	Total # of Searches	% Consent	% Incident to Arrest	% Probable Cause	% Terry	% Vehicle Inventory	% Plain View	% Warrant	% Canine Alert	% Consent Only
DPS Statewide	485,183	5.0	24,302	17.5	49.0	13.0	9.6	35.1	4.4	0.3	3.1	14.5
Crim. Invest. Division	3,034	20.4	620	37.6	32.6	17.1	11.9	14.5	2.6	0.0	4.4	30.6
Highway Patrol Division	480,453	4.9	23,573	17.1	49.4	13.0	9.5	35.6	4.4	0.3	3.1	14.1
Northern Bureau	156,692	3.6	5,630	15.6	51.2	17.6	9.8	32.7	3.6	0.2	2.0	12.4
D1-Kingman	32,351	3.4	1,113	23.1	45.7	19.4	14.0	24.5	2.7	0.2	1.2	17.3
D2-Flagstaff	31,662	4.0	1,255	13.3	57.5	14.0	7.1	31.2	2.0	0.2	2.8	11.3
D3-Holbrook	41,713	3.3	1,394	14.0	49.2	19.9	7.0	30.9	3.3	0.2	2.7	12.3
D11-Globe	18,854	2.0	383	19.6	55.6	10.4	2.9	26.1	12.8	0.0	1.8	14.4
D12-Prescott	31,908	4.6	1,476	12.4	50.7	19.2	13.1	43.4	3.6	0.3	1.3	9.4
Metro West Bureau	66,741	6.5	4,279	6.4	58.1	7.6	12.5	44.3	2.9	0.3	1.9	5.1
Shift #1	25,619	4.2	1,045	7.9	54.4	12.2	8.7	45.6	2.2	0.1	0.7	6.8
Shift #2	27,617	6.2	1,704	8.3	52.2	7.3	11.3	42.0	4.8	0.6	3.9	6.7
Shift #3	13,142	11.6	1,513	3.0	67.4	4.7	16.7	46.2	1.3	0.0	0.5	1.9
Southern Bureau	153,392	4.4	6,790	20.2	46.1	11.8	8.1	40.3	2.8	0.3	1.9	16.4
D4-Yuma	40,294	3.4	1,388	23.1	46.7	17.0	18.2	37.6	2.7	0.4	3.8	14.4
D6-Casa Grande	38,975	4.4	1,714	28.5	36.5	11.4	4.9	32.0	4.7	0.2	0.8	25.9
D8-Tucson	40,935	5.9	2,386	15.4	49.2	9.3	6.0	46.1	1.5	0.3	0.8	13.3
D9-Sierra Vista	32,903	3.9	1,287	15.0	52.5	11.4	5.6	43.5	3.0	0.2	3.3	11.4
Comm. Vehicle Bureau	24,210	2.9	698	28.9	14.9	36.0	7.4	11.2	9.6	2.1	6.6	25.1
District 15	6,442	7.8	502	28.5	11.8	40.0	9.2	10.6	11.2	2.2	5.2	25.5
District 16	17,622	1.0	182	27.5	23.1	26.4	2.7	13.2	6.0	2.2	8.2	23.6
Metro East Bureau	78,891	7.8	6,162	21.0	49.2	11.1	9.0	29.9	7.4	0.3	5.7	18.3
Shift #1	10,110	5.1	506	2.2	54.3	9.1	10.7	48.2	7.9	0.2	0.2	1.4
Shift #2	24,727	6.0	1,492	4.2	68.2	8.0	14.3	49.1	1.9	0.3	0.6	3.2
Shift #3	16,943	9.7	1,633	1.8	66.9	6.1	8.7	26.4	21.6	0.2	0.3	1.4
Metro Motors	17,778	4.6	817	4.4	66.0	14.6	6.0	43.9	2.2	0.4	1.5	3.3
Canine	9,287	18.4	1,712	67.4	6.3	17.4	5.6	4.4	0.9	0.3	19.0	59.9
Canine North	3,318	13.5	448	56.3	9.4	36.4	15.6	3.6	0.2	0.0	32.1	41.3
Canine Central & South	5,951	21.2	1,261	71.3	5.2	10.7	2.1	4.8	1.2	0.4	14.4	66.4

As shown in Table 5.1 and graphically displayed in Figure 5.1, nearly half of all searches across the department were conducted incident to arrest (49.0%). Other slightly less common reasons for search included vehicle inventory (35.1%), consent (17.5%) consent *only* (14.5%), probable cause (13.0%) and Terry (9.6%). The least common reasons for searches included: plain view (4.4%), canine alert (3.1%), and search warrant (0.3%).

Figure 5.1: Reasons for 2007 Traffic Stop Searches (n=24,302)
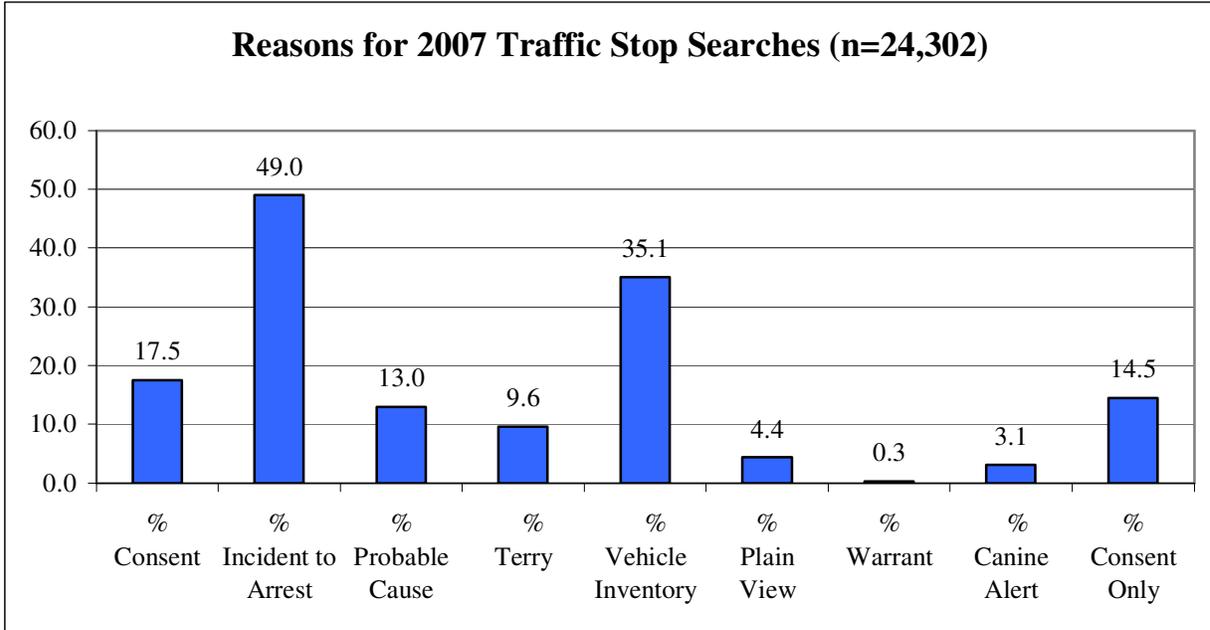
Table 5.1 above also illustrates the variation in the different reasons for searches across divisions, bureaus and district/shifts. For example, at the division level, consent was a more common reason for the Criminal Investigations Division (37.6%) compared to Highway Patrol (17.1%). At the bureau level, incident to arrest and vehicle inventory are the most common reasons for searches for all bureaus except the Commercial Vehicle Bureau, where the most common reason is probable cause (36.0%), followed closely by consent (28.9%). Table 5.1 provides a description of further variation at these lower organizational units.

Canine officers are examined separately in Table 5.1 due to the unique nature of their assignment. The differences between these and other officers are readily apparent. Consent is the most frequent reason for search by Canine officers; overall 67.4% of searches are conducted for this reason, and over half (59.9%) are conducted solely for this reason. The next most common reasons for searches by Canine officers were Canine alerts (19.0%) and probable cause (17.4%). There were also some differences between canine handlers assigned to the North compared to those assigned in Central/South regions. Northern canine handlers were more likely to indicate probable cause, Terry, and canine alert as reasons for searches compared to Central/South handlers. In contrast, Central/South handlers were more likely to indicate consent and only consent as reasons for searches compared to handlers assigned to the North. Differences between the squads were less substantive for searches conducted incident to arrest, vehicle inventories, and those based on plain view or a warrant.

Search Target

Figure 5.2 below documents the percentages of drivers, vehicles, and passengers searched at the department, division, and bureau level. Searches frequently involve multiple targets; therefore, the cumulative percentages exceed 100%. At the department level, 64.6% of searches were conducted of drivers, 83.2% involved vehicles, and 10.9% were performed on passengers. These percentages are consistent across divisions and bureaus, with the exception of the Commercial Vehicle Enforcement Bureau, where 86.4% of searches involved vehicles, but only 34.1% of searches were conducted of drivers.

Figure 5.2: Traffic Stops Resulting in Searches by Search Target

Traffic Stops Resulting in Searches by Search Target
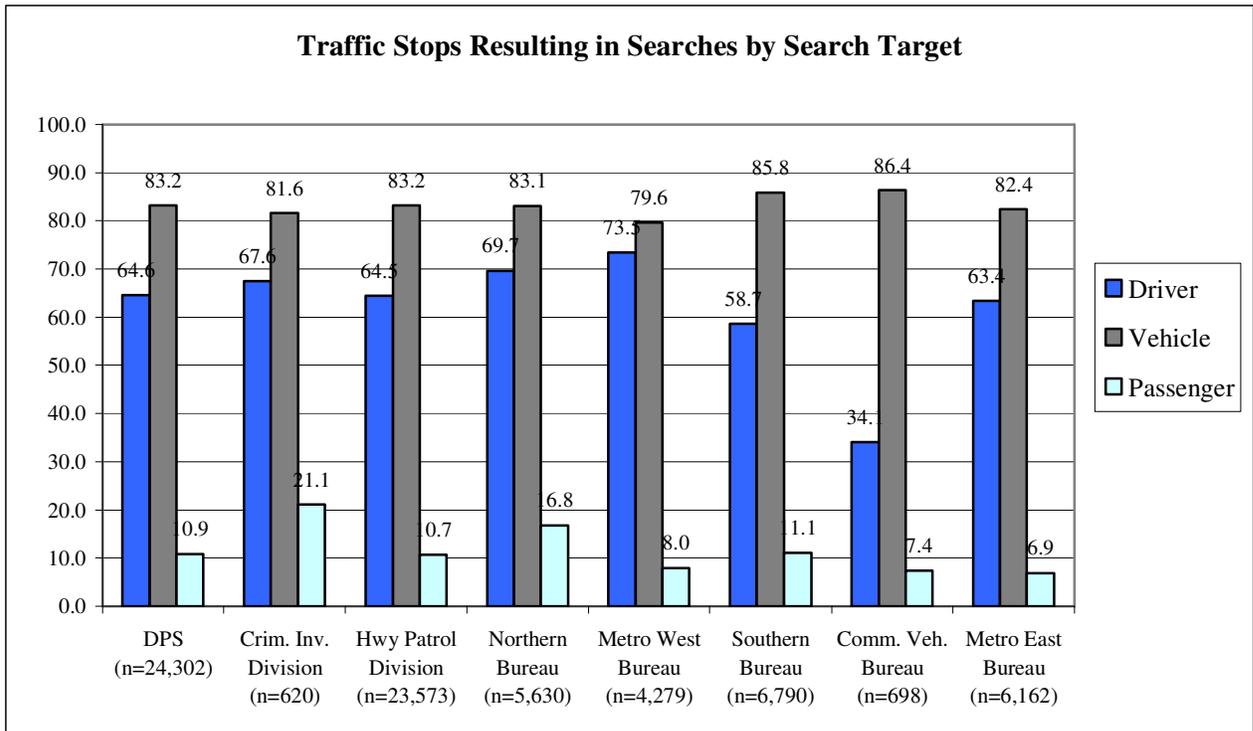
Seizures

Table 5.2 below reports the total number of seizures at the department, division, bureau, and district/shift levels, and further documents the types of evidence and/or contraband confiscated during searches conducted by DPS officers. In 2007, there were 5,179 seizures of contraband resulting from the 24,302 conducted searches during 485,183 officer-initiated traffic stops.

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Table 5.2: 2007 Traffic Stop Seizures – Statewide, Division, Bureaus, & Districts/Shifts

	Total # of Seizures	% Alcohol	% Drugs	% Vehicle	% Weapon	% Currency	% Other Contraband	% Other Property
DPS Statewide	5,179	21.0	52.3	11.3	6.4	3.9	32.5	8.5
Criminal Investigations Division	216	23.1	53.2	4.2	10.2	1.4	31.9	4.2
Highway Patrol Division	4,940	20.9	52.3	11.7	6.3	4.1	32.4	8.7
Northern Bureau	1,509	26.4	52.1	9.7	5.2	2.1	34.7	6.4
D1-Kingman	313	24.0	49.5	5.8	7.0	2.2	36.1	11.8
D2-Flagstaff	324	20.7	55.2	16.4	3.4	2.8	32.7	3.4
D3-Holbrook	404	34.9	47.5	8.7	4.0	1.7	33.7	4.2
D11-Globe	91	12.1	47.3	24.2	8.8	3.3	39.6	8.8
D12-Prescott	375	27.7	57.9	4.3	5.9	1.6	35.2	6.4
Metro West	642	18.5	47.4	16.4	10.1	4.4	23.5	6.9
Shift #1	132	13.6	56.8	10.6	10.6	3.8	27.3	12.1
Shift #2	325	19.4	39.7	21.8	9.2	5.8	23.1	6.5
Shift #3	180	20.6	53.9	11.1	11.1	2.2	21.7	3.9
Southern Bureau	1,498	23.0	54.1	11.1	5.1	2.9	33.8	6.4
D4-Yuma	408	21.6	57.6	11.8	4.2	2.7	38.0	4.7
D6-Casa Grande	315	19.4	63.8	10.2	6.0	3.2	24.4	4.8
D8-Tucson	450	21.8	49.6	11.8	4.9	3.6	34.7	11.3
D9-Sierra Vista	321	29.9	46.7	10.3	5.6	2.2	36.8	3.1
Commercial Vehicle	252	12.3	19.0	3.6	5.6	2.0	31.7	49.6
District 15	196	12.8	46.7	4.1	7.1	2.0	29.1	54.6
District 16	52	11.5	19.4	1.9	0.0	0.0	42.3	34.6
Metro East	1,033	13.3	61.3	14.4	7.2	8.9	32.8	6.8
Shift #1	61	18.0	44.3	8.2	14.8	1.6	34.4	11.5
Shift #2	221	25.8	53.4	4.5	6.8	2.7	28.1	7.2
Shift #3	154	13.6	63.6	13.6	7.8	2.6	18.8	9.1
Metro Motors	182	17.0	57.1	10.4	7.7	2.7	32.4	3.3
Canine	415	4.1	68.9	22.7	5.8	18.3	40.5	6.5
Canine North	221	2.7	64.3	17.6	5.4	24.0	60.2	7.2
Canine Central & South	194	5.7	74.2	28.4	6.2	11.9	18.0	5.7

Note: Searches may produce seizures of multiple types of contraband; therefore the percentages across the categories may exceed 100%.

As reported in Table 5.2 and graphically displayed in Figure 5.3, across the department, the most frequent type of contraband seized was drugs (52.3%). Approximately 32.5% of searches resulted in seizures categorized as "other contraband," while alcohol was seized in 21.0% of the seizures. Less common types of contraband seized were vehicle (11.3%), other property (8.5%), weapon (6.4%) and currency (3.9%). Table 5.2 also documents the differences in the types of evidence seized across bureaus and district/shifts. The trends displayed at the department level are fairly consistent across the bureau and district/shift levels, with the exception of the Commercial Vehicle Bureau, where the most common type of contraband seized was "other property" (49.6%).

Figure 5.3. Seizures in 2007: Types of Evidence Seized (n=5,179)
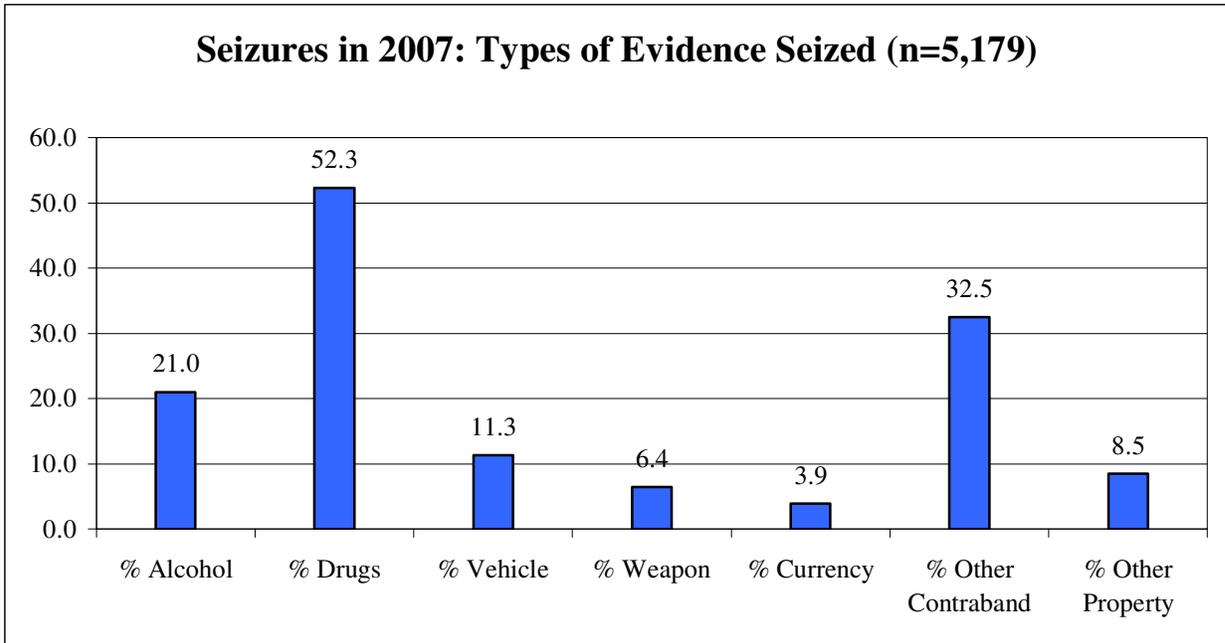
TYPES OF SEARCHES

While examining the specific reasons for a search is instructive, this information is more easily understood when collapsed into discrete categories, or types of searches. These types of searches, although based on different reasons, have similar characteristics that warrant them being considered collectively. For the analyses reported in Figures 5.4 – 5.5 and Table 5.3 below, searches were divided into three categories based on the presumed level of officer discretion. The first search category – Type I – includes searches that involve little to no officer discretion. Specifically, Type I searches include those that are required by DPS policy (e.g., incident to arrest, vehicle inventory) or otherwise involve very little officer discretion (e.g., plain view, warrant). The second search category – Type II – includes searches that are discretionary, yet guided by case law or legal statutes. Specifically, Type II searches include those based on probable cause, Terry, or canine alert. The third search category – Type III – includes searches based solely on drivers' consent to an officer's request to search. If a search was based on multiple reasons, it was assigned to the search category with the least officer discretion (e.g., if a search is based on a canine alert [Type II]

and consent [Type III], it was defined as a Type II search). Therefore, the analyses below examining the search rates for Type I, II, and III searches are mutually exclusive.[21]

Figure 5.4 below displays the number of total searches and the search rates for each of the three types of searches at the department and bureau level. At the department level, the majority of searches conducted were Type I (low discretion) searches (70.2%), while 15.3% and 14.5% were Type II (guided by case law/legal statute) and Type III (solely consent) searches, respectively. Similar percentages of the three types of searches were reported for most of the bureaus as well. The Commercial Vehicle Enforcement Bureau, however, conducted a considerably larger percentage of Type II searches compared to the department average and other bureaus. The Canine Unit conducted over half of its searches based solely on consent, and also conducted a larger percentage of Type II searches compared to the department average and other bureaus.

Figure 5.4: Traffic Stops Resulting in Searches by Type of Search:
Type I = low discretion, Type II = discretionary / guided by case law or legal statute, Type III = solely consent
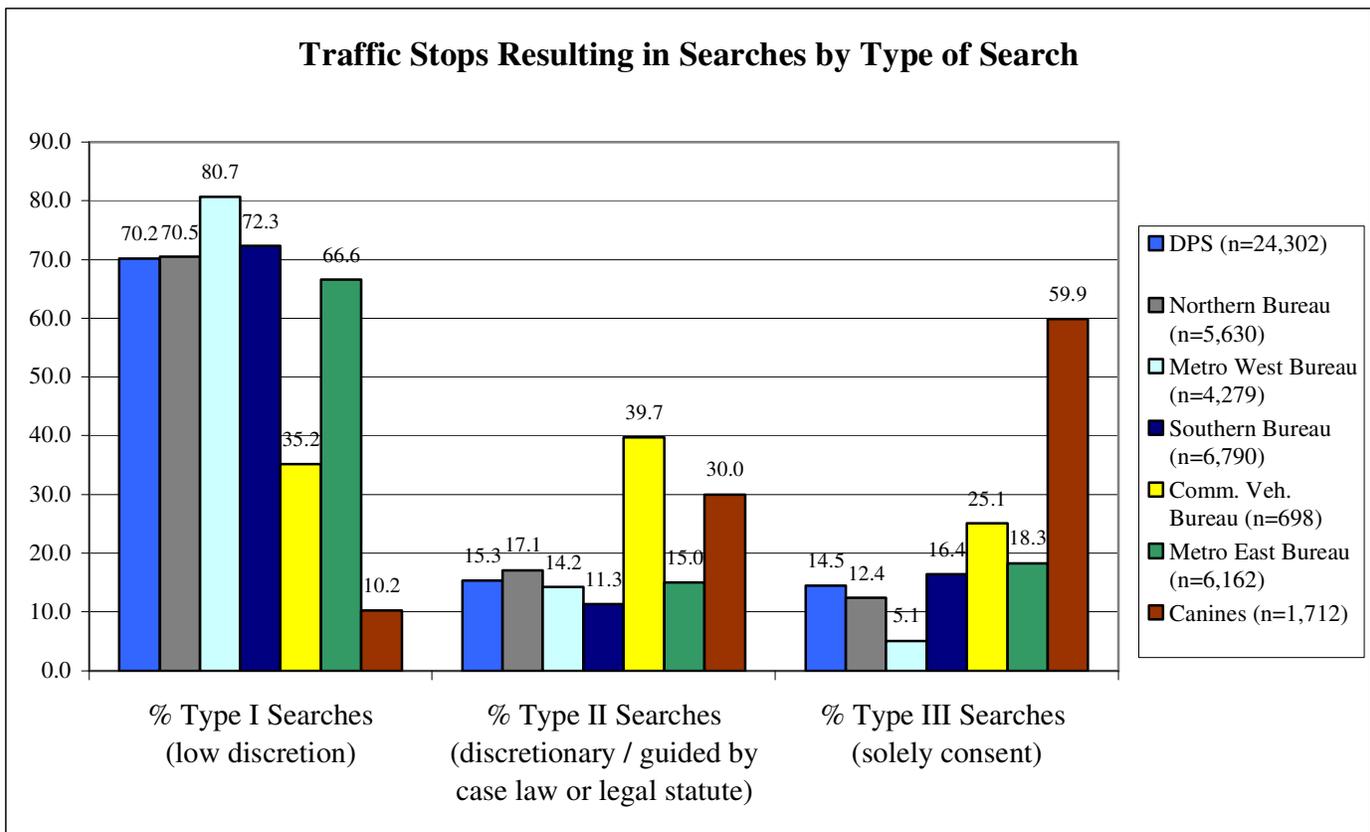
While examining search rates across the types of searches is important, it is also instructive to consider differences in the types of search rates based on drivers' characteristics. Figure 5.5 and Table 5.3 below report the percentage of stops that resulted in each type of search

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[21] These three types of searches were modified slightly from the categorization used for the Year 1 report based on discussions with DPS that suggested that some searches that were included as discretionary in Year 1 (e.g., plain view) in practice involve very little officer discretion. Type III searches remain the same.

across different types of drivers. Figure 5.5 graphically displays the racial/ethnic differences in the three types of search rates at the department level, while Table 5.3 reports the racial/ethnic and gender differences in the three types of search rates for drivers at the department and bureau level.

Both Table 5.3 and Figure 5.5 indicate that Blacks were least likely to be searched for Type I reasons (low discretion), while Native Americans were most likely to be searched for these reasons. For Type II searches, the opposite is true: Blacks were significantly more likely, and Native Americans significantly less likely, to be subject to Type II searches. For both Type I and Type II searches, Whites and Hispanics had similar percentages in the middle of the two extremes. In the case of solely consent searches (Type III searches), Black and Hispanic motorists were significantly more likely to be searched based on consent compared to Whites and Native Americans. As shown in Table 5.3, these patterns of racial/ethnic differences were fairly consistent for each of the bureaus and Canine District.

Figure 5.5: Racial/Ethnic Differences in Types of Searches:
Type I = low discretion, Type II = discretionary / guided by case law or legal statute, Type III = solely consent
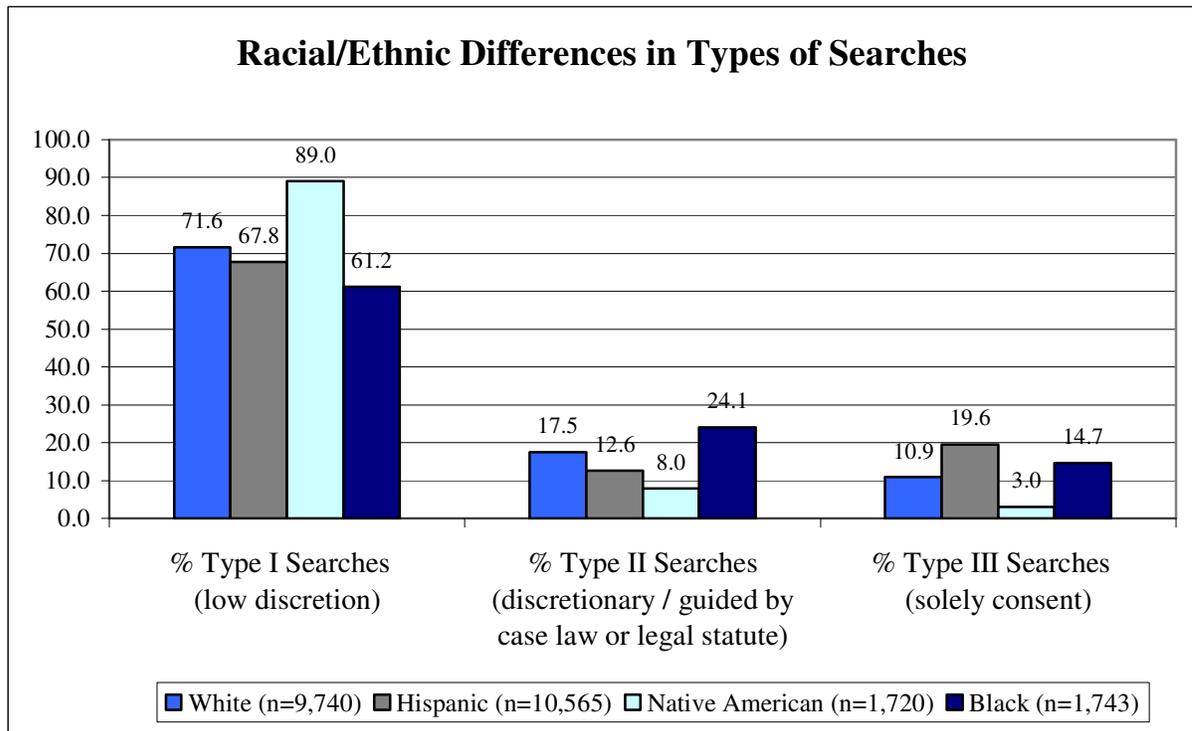
NOTE: Differences across the four racial/ethnic groups presented in this figure are statistically significant at $p \leq .001$

As shown in Table 5.3, gender differences in reasons for searches were also evident at the department level. Specifically, female drivers were significantly more likely to be searched for low discretion reasons (Type I) compared to male drivers, whereas male drivers were more often subjected to Type II and Type III searches. This pattern of gender differences is also evident for each of the bureaus as well as the Canine District, although the gender differences are not statistically significant for the Commercial Vehicle Enforcement Bureau or the Canine District. As noted in Section 4, caution must be used when interpreting these

findings. The findings presented are bivariate (i.e., they do not take into account other extralegal and legal factors that might have a significant influence over search decisions).

Table 5.3: Reasons for Search by Driver Characteristics for Department and Bureaus:
Type I = low discretion, Type II = discretionary / guided by case law or legal statute, Type III = solely consent (p.1 of 2)

	Drivers	Total # of Searches	% Type I Searches	% Type II Searches	% Type III Searches
DPS	White	9,740	71.6***	17.5***	10.9***
	Hispanic	10,565	67.8	12.6	19.6
	Native American	1,720	89.0	8.0	3.0
	Black	1,743	61.2	24.1	14.7
	Male	20,256	69.0***	16.0***	15.1***
	Female	4,030	76.4	11.8	11.9
Northern Bureau	White	2,632	66.7***	21.3***	12.0***
	Hispanic	1,452	67.3	13.4	19.3
	Native American	1,192	91.5	7.5	1.0
	Black	269	39.4	36.1	24.5
	Male	4,707	69.6***	17.5	12.9*
	Female	920	74.9	15.2	9.9
Metro West Bureau	White	1,624	78.1***	17.1***	4.9
	Hispanic	2,086	83.4	11.4	5.2
	Native American	93	89.2	8.6	2.2
	Black	415	75.7	18.6	5.8
	Male	3,566	79.5***	15.0**	5.5**
	Female	709	86.5	10.6	3.0
Southern Bureau	White	2,344	74.7***	12.7***	12.6***
	Hispanic	3,678	70.6	9.7	19.8
	Native American	239	83.7	7.5	8.8
	Black	386	69.7	17.1	13.2
	Male	5,584	71.1***	11.7*	17.2
	Female	1,200	78.1	9.5	12.4***
Commercial Vehicle Enforcement Bureau	White	345	38.3	41.2	20.6
	Hispanic	214	32.7	38.3	29.0
	Native American	2	100.0	0.0	0.0
	Black	69	37.7	31.9	30.4
	Male	655	33.6***	40.9**	25.5
	Female	43	60.5	20.9	18.6

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups.
*** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$.

Table 5.3. Reasons for Search by Driver Characteristics for Department and Bureaus:
Type I = low discretion, Type II = discretionary / guided by case law or legal statute, Type III = solely consent (p.2 of 2)

	Drivers	Total # of Searches	% Type I Searches	% Type II Searches	% Type III Searches
Metro East Bureau	White	2,540	76.7***	13.9***	9.4***
	Hispanic	2,773	57.2	14.3	28.5
	Native American	164	82.3	11.0	6.7
	Black	520	60.2	26.3	13.5
	Male	5,103	65.5***	15.9***	18.6
	Female	1,056	72.0	11.0	17.0
Canine	White	381	11.5	39.1***	49.3***
	Hispanic	1,120	8.6	24.1	67.3
	Native American	29	20.7	48.3	31.0
	Black	143	9.8	49.7	40.6
	Male	1,475	10.4	30.6	58.9*
	Female	237	8.4	25.7	65.8
Canine North	White	180	15.6	47.2*	37.2**
	Hispanic	169	7.7	41.4	50.9
	Native American	4	25.0	75.0	0.0
	Black	81	11.1	59.3	29.6
	Male	385	10.6	47.8	41.6
	Female	63	19.0	41.3	39.7
Canine Central & South	White	201	8.0	31.8***	60.2***
	Hispanic	948	8.8	21.1	70.1
	Native American	25	20.0	44.0	36.0
	Black	62	8.1	37.1	54.8
	Male	1,087	10.4*	24.7	64.9**
	Female	174	4.6	20.1	75.3

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups.

*** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$

SEARCH SUCCESS RATES

Although multivariate analyses (like those performed in Section 4) are the most common form of testing for disparities in stop outcomes, more recently, the discussion regarding bias-based policing has also focused on examining outcomes in the form of search "hit" rates. If drivers were searched strictly based on legal factors and suspicions unrelated to race, it has been argued that one would expect similar percentages of searches resulting in seizures across racial groups. This has been described as the "outcome test" (Knowles, Persico & Todd, 2001; Ayres, 2001). Originally applied by Becker (1957) to examine economic disparate treatment of minorities, the basic notion of the outcome test is to analyze whether outcomes are systematically different across groups. Ayres (2001) has argued that the "outcome test" can be used to successfully examine racial disparities in police practices, including searches. When applied to police searches, the outcome test is essentially a comparison of the successfulness of those searches – or a statistical comparison of the percentage of searches that result in seizures across racial/ethnic groups. This is also referred to as a statistical comparison of "search success rates" or "hit rates." Racial/ethnic comparisons of hit rates are calculated by dividing the number of searches in which officers seize some type of contraband (e.g, drugs, illegal weapons, etc.) by the number of total searches (Fridell, 2004, 2005; Ramirez et al., 2000).

As with other analytical techniques, limitations exist which limit the conclusions that can be drawn from the outcome test (Engel, 2008; Engel & Tillyer, 2008). The outcome test is only appropriate for an analysis of traffic stops that result in a discretionary search; therefore, mandatory and consent searches should not be considered. In addition, any racial/ethnic disparities in hit rates discovered using this method do not necessarily imply officer bias. Notwithstanding the limitations of the outcome test, it does provide an alternative method to assess post-stop outcomes. Nevertheless, it is recommended that no definitive conclusions about racial bias be drawn from these comparisons based on the limitations of this technique (for details, see Engel, 2008; Engel & Tillyer, 2008).

Search Success Rates by Reasons for Search

As noted above, based on DPS policies, officers have little discretion over some types of searches (e.g., vehicle inventories, searches incident to arrest, searches based on plain view or a preexisting warrant). Furthermore, it is likely that different reasons for searches might lead to varying rates of contraband seizures. Figure 5.6 and Table 5.4 explore this possibility. Specifically, Figure 5.6 illustrates the overall search success rate and the success rates for each specific type of search at the department level, while Table 5.4 reports the same information at the department, division, and bureau levels.

As shown in Figure 5.6 and Table 5.4, department-wide, the overall search success rate is 21.3% -- that is, 21.3% of all searches conducted during officer-initiated traffic stops resulted in the seizure of contraband. This rate, however, varies dramatically across search types. Figure 5.6 documents the following range: 66.9% of probable cause searches result in seizures compared to only 11.1% of searches based solely on consent. Other than probable cause, searches that were the most likely to produce seizures of contraband included those

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based on: canine alert (49.0%), warrant (33.3%), and plain view (31.4%). Across the department, searches based partially or solely on consent as well as vehicle inventories were least likely to be successful in terms of discovering contraband.

Figure 5.6: Search Success Rates by Reason for Search (n=24,302 searches)

Search Success Rates by Reason for Search
(n=24,302 searches)

Reason	Rate
Overall	21.3
Consent	16.4
Incident to Arrest	20.8
Probable Cause	66.9
Terry	21.5
Inventory	16.0
Plain View	31.4
Warrant	33.3
Canine Alert	49.0
Consent Only	11.1
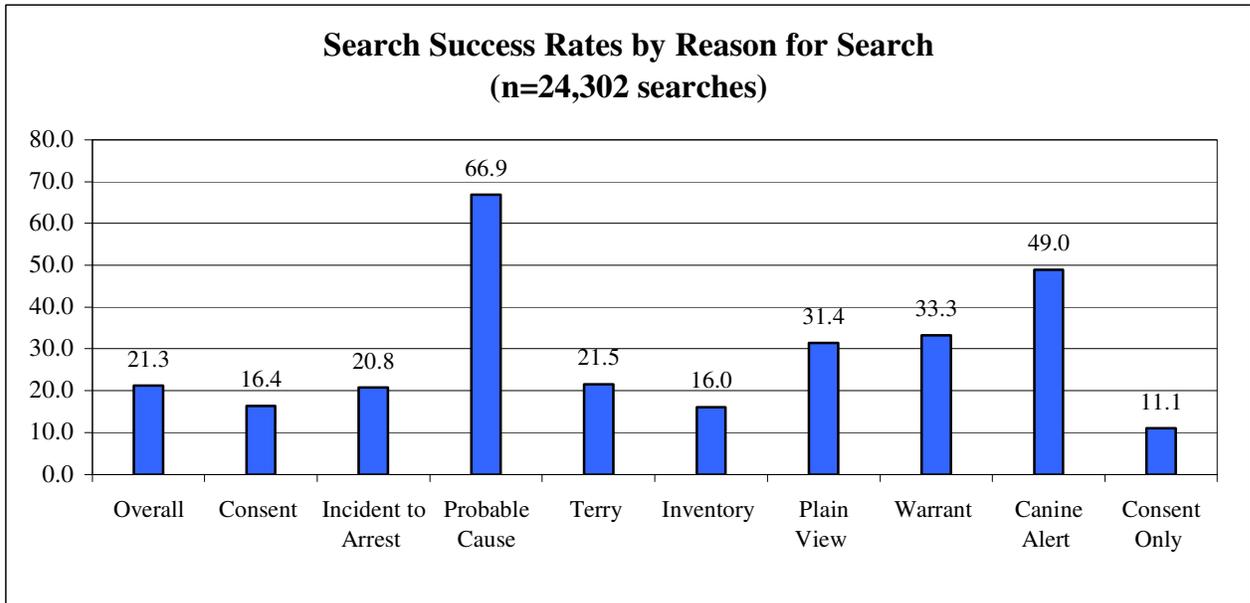
As documented in Table 5.4 below, these patterns remain relatively consistent across the divisions and bureaus within the department. Notable differences are evident within the Canine District. Canine handlers working in the North varied dramatically in their search success rates from those working in the Central/South. Across all types of searches, canine handlers assigned to the North squad were significantly more likely to report contraband seizures (49.3% of all searches) compared to handlers assigned to Central/South squads (15.4% of contraband seizures). Because the search success rates vary by the reason for the search, it would seem likely that differences in search success rates within the Canine district could be due to disproportionate use of particular types of searches. However, when the search success rates are examined within search reason categories, it becomes clear that compared to handlers assigned to Central/South squads, handlers assigned to the North squad report more success in terms of contraband seizures during officer-initiated traffic stops across almost all search reasons. Of particular interest is that 75.7% of the searches based on canine alerts resulted in seizures for North canine handlers, compared to 41.2% of searches based on canine alerts for Central/South canine handlers.

Canine handlers from across the state who participated in the focus group sessions were directly asked about these differences in search success rates and offered several plausible explanations, including:

1. Participants noted that some squads have more inexperienced officers than others, and those who are still honing their interdiction skills are not likely to be as proficient in seizing contraband as more experienced officers.

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2. Participants noted that some locations within the department have more experience with litigation and courtroom testimony than others. Furthermore, officers noted that county courts across the state operate differently in terms of what they consider prosecutable and the likelihood of plea bargaining. These participants suggested that this experience has caused them to be more cautious in their search decisions and raise the thresholds of reasonable suspicion.

3. Participants noted that policies and procedures related to search and seizure (e.g., documentation of trace amounts of drugs, debris, etc.) are inconsistently applied across the department and may contribute to differences in search success rates.

4. Participants described supervisory differences in philosophy as a potential explanation for differing search success rates across the department. In particular, participants described supervisory differences in training, preferred search authority, and canine deployment tactics.

5. Participants described variation in search success rates due to geographic-related differences, including differences in: population demographic characteristics; proximity to the border and frequency of encounters with undocumented aliens; points in time in the drug-trafficking process; and traffic volume.

Table 5.4: Search Success Rates by Reasons for Search for Department, Division, and Bureau

	# of Searches	# of Seizures	Overall Search Success Rate	Consent Success Rate	Incident to Arrest Success Rate	Probable Cause Success Rate	Terry Success Rate	Inventory Success Rate	Plain View Success Rate	Warrant Success Rate	Canine Alert Success Rate	Consent Only Success Rate
DPS Statewide	24,302	5,179	21.3	16.4	20.8	66.9	21.5	16.0	31.4	33.3	49.0	11.1
Crim. Invest. Division	620	216	34.8	24.0	40.6	78.3	20.3	26.7	75.0*	--	51.9	17.4
Highway Patrol Division	23,573	4,940	21.0	16.0	20.5	66.5	21.4	15.9	30.7	33.3	48.9	10.7
Northern Bureau	5,630	1,509	26.8	19.6	24.1	72.4	25.9	18.9	53.7	27.3*	54.5	15.0
Metro West Bureau	4,279	642	15.0	17.5	15.4	51.8	13.8	12.7	33.1	18.2*	28.4	10.6
Southern Bureau	6,790	1,498	22.1	16.6	25.7	70.5	25.4	17.6	42.0	31.6	52.3	10.6
Comm. Veh. Enf. Bureau	698	252	36.1	16.3	35.6	63.7	50.0	10.3	50.7	46.7*	21.7	12.6
Metro East Bureau	6,162	1,033	16.8	12.5	15.2	61.1	17.7	13.9	11.7	37.5	54.1	8.0
Canine	1,712	415	24.2	11.9	49.1	67.4	55.2	31.6	81.3*	60.0*	56.4	7.5
Canine North	448	221	49.3	30.2	83.3	82.2	65.7	68.8*	100.0*	--	75.7	18.9
Canine Central & South	1,261	194	15.4	6.8	27.3	49.6	26.9	21.7	80.0*	60.0*	41.2	5.0

Note: Search success rates are measured as the percent of searches that resulted in a seizure of contraband; thus all search success rate entries in the table are percentages.

* Twenty or fewer searches conducted for this reason; interpret percentage with caution.

Type II (Discretionary) Search Success Rates by Race/Ethnicity & Gender

As noted previously, utilizing the outcome test to examine racial/ethnic disparities in search success rates requires that the analyses be limited to only non-consent discretionary searches. Therefore, information regarding the Type II (discretionary searches guided by case law or legal statutes) search success rates is further summarized below. Figure 5.7 displays the overall Type II search success rates across the department, bureaus, and canine squads. Department-wide, 45.7% of Type II searches are successful in recovering contraband. The search success rate across the bureau level is similar to or higher than the departmental average, with the exception of lower success rates in Metro West and Metro East Bureaus (25.1% and 43.7%, respectively). The Type II search success rate is significantly higher for the Canine North squad (68.6%) compared to Central and South (40.3%).

Figure 5.7: Type II (Discretionary) Search Success Rates by Organizational Unit
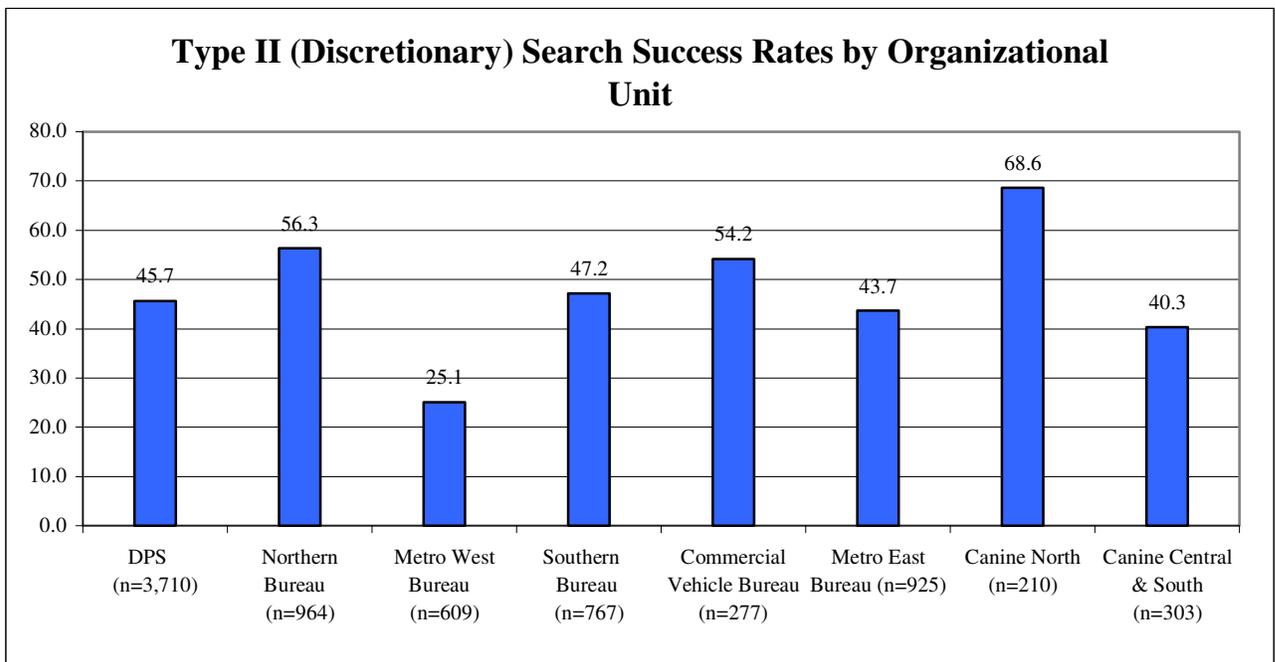
Figure 5.8 and Table 5.5 display the total number of Type II searches and the Type II search success rates based on drivers' characteristics. As shown, there were significant racial/ethnic differences in the Type II search success rates at the department and bureau level. Specifically, Type II (discretionary) searches of Hispanic drivers were the least likely to be successful in the discovery of contraband, compared to all other racial/ethnic groups. Native Americans, Blacks and Whites had higher and fairly similar search success rates, when compared to Hispanics and drivers of other races/ethnicities. Only 37.5% of Type II (discretionary) searches of Hispanics resulted in discoveries of contraband, compared to 52.9% for Native Americans, 50.4% for Whites, 50.0% of Blacks, and 46.4% of drivers of other races/ethnicities.

Figure 5.8: Racial/Ethnic Differences in Type II (Discretionary) Search Success Rates

**Racial/Ethnic Differences in
Type II (Discretionary) Search Success Rates**

% Type II Searches Resulting in Seizure

■ White (n=1,703) ■ Hispanic (n=1,335) □ Native American (n=138) ■ Black (n=420) □ Other (n=112)
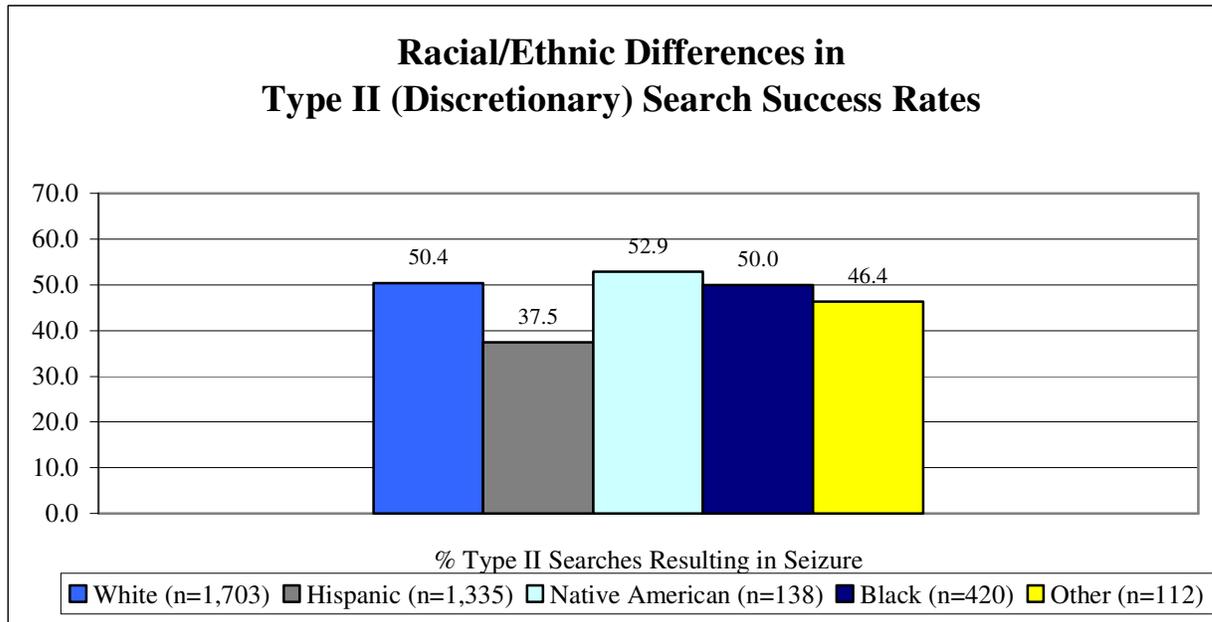
NOTE: Differences across the five racial/ethnic groups presented in this figure are statistically significant at $p \leq .001$

As shown in Table 5.5, the Type II search success rates at the bureau level show similar statistically significant racial/ethnic differences for the Northern, Southern, and Metro East bureaus. For these three bureaus, discretionary search success rates of Hispanics were significantly lower than searches of Whites, Native Americans, and Blacks. Racial/ethnic differences in the Type II search success rates in the Metro West Bureau, Commercial Vehicle Enforcement Bureau, and Canine squads are not statistically significant.

Differences in Type II search success rates for male and female drivers are also shown in Table 5.5. At the department level, discretionary searches of females (52.1%) were significantly more likely to produce seizures of contraband than searches of males (44.8%). At the bureau level, similar trends in gender differences are evident for the Northern and Metro West Bureaus, while gender differences in the other bureaus and Canine squads are not statistically significant.

Based on the results in Figure 5.8 and Table 5.5, it appears that when drivers were subjected to Type II searches, Native American, White and Black motorists were significantly more likely to be found in possession of contraband compared to Hispanics. That is, although Hispanic motorists were significantly more likely to be searched for discretionary reasons during officer-initiated traffic stops, they were significantly less likely to be found in possession of contraband compared to other racial groups.

Table 5.5: Type II Search Success Rates by Driver Characteristics for Department, Bureaus, & Canines (p.1 of 2)

	Drivers	Total # of Searches	Total # of Type II Searches	Type II Search Success Rate
DPS	White	9,740	1,703	50.4***
	Hispanic	10,565	1,335	37.5
	Native American	1,720	138	52.9
	Black	1,743	420	50.0
	Male	20,256	3,236	44.8**
	Female	4,030	474	52.1
Northern Bureau	White	2,632	561	62.0***
	Hispanic	1,452	195	41.5
	Native American	1,192	89	49.4
	Black	269	97	59.8
	Male	4,707	824	55.0*
	Female	920	140	64.3
Metro West Bureau	White	1,624	277	24.9
	Hispanic	2,086	238	25.2
	Native American	93	8	37.5
	Black	415	77	24.7
	Male	3,566	534	23.4**
	Female	709	75	37.3
Southern Bureau	White	2,344	298	53.4***
	Hispanic	3,678	355	38.9
	Native American	239	18	77.8
	Black	386	66	56.1
	Male	5,584	653	45.9
	Female	1,200	114	54.4
Commercial Vehicle Enforcement Bureau	White	345	142	57.0
	Hispanic	214	82	45.1
	Nat. Amer.	2	0	--
	Black	69	22	63.6
	Male	655	268	54.5
	Female	43	9	44.4

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups. *** $p \le .001$ ** $p \le .01$ * $p \le .05$

Table 5.5. Type II Search Success Rates by Driver Characteristics for Department, Bureaus, & Canines (p.2 of 2)

	Drivers	Total # of Searches	Total # of Type II Searches	Type II Search Success Rate
Metro East Bureau	White	2,540	354	46.0*
	Hispanic	2,773	397	39.0
	Native American	164	18	50.0
	Black	520	137	51.8
	Male	5,103	809	44.0
	Female	1,056	116	41.4
Canine North	White	180	85	67.1
	Hispanic	169	70	61.4
	Native American	4	3	100.0
	Black	81	48	79.2
	Male	385	184	69.6
	Female	63	26	61.5
Canine Central & South	White	201	64	43.8
	Hispanic	948	200	38.5
	Native American	25	11	45.5
	Black	62	23	43.5
	Male	1,087	268	41.0
	Female	174	35	34.3

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups. *** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$

Examining Consent Searches

As demonstrated earlier, consent search success rates are the least successful type of search in terms of producing seizures of contraband. Examining whether these success rates vary by race/ethnicity, however, is complex. As noted above, it is ill-advised to utilize the outcome test to assess racial/ethnic bias in consent searches, because ultimately it is the citizen, not the officer who has final discretion over whether or not these types of searches are conducted. Citizens always have the right to refuse. As such, the underlying assumptions of the outcome test that officers have full discretion over whether or not to conduct searches is violated. Despite these limitations, DPS administrators have requested such comparisons for internal purposes; therefore, following an examination of racial/ethnic differences in requests for consent and refusals to consent, racial/ethnic differences in search success rates for Type III (solely consent) searches are provided with the above noted caveats.

Of the 485,166 officer-initiated traffic stops with valid race information, 1.0% of drivers (n=4,752) were asked for consent to search.[22] As demonstrated in Figure 5.9 below, an examination of the drivers' race/ethnicity indicates that certain racial/ethnic groups were significantly more likely than others to be asked for consent to search. Specifically, 2.1% of Hispanic drivers and 1.7% of Black drivers were asked for consent to search, compared to only 0.5% of White drivers. Native American (0.4%) and drivers of other races (0.8%) also showed significantly lower rates of being asked for consent to search.

Figure 5.9: Requests for Consent to Search (n=485,166)
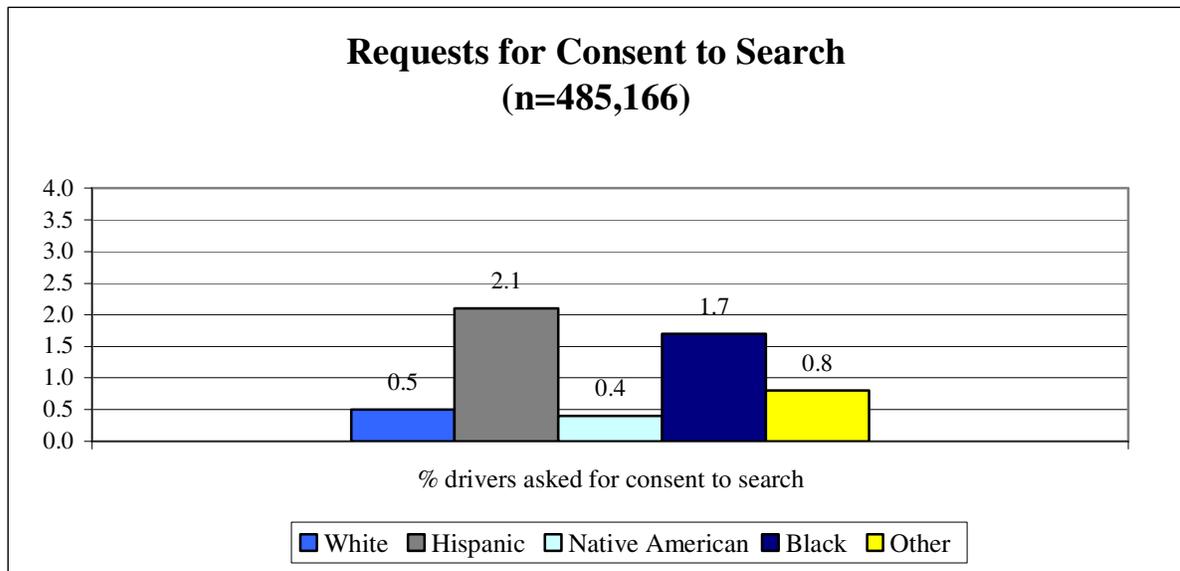
NOTE: Differences across the racial/ethnic groups presented in this figure are statistically significant at p ≤ .001

Of the 4,752 drivers with valid race information who were asked for consent to search, 406 (8.6%) refused to give consent. Again, as documented in Figure 5.10 below, the percentage

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[22] The number of drivers asked for consent was estimated by summing the number of consent searches conducted and the number of search refusals.

of refusals varied significantly across racial/ethnic groups. Hispanic drivers were significantly less likely to refuse consent when asked, compared to all other racial/ethnic groups. That is, Hispanic motorists were significantly more likely to be asked for consent to search and significantly less likely to refuse to give consent when asked, compared to other racial/ethnic groups. Specifically, only 4.8% of Hispanic drivers asked for consent to search refused to give consent, compared to 13.5% and 12.6%, respectively, of White and Black drivers who were asked for consent and refused.

These findings are consistent with the perceptions of the focus group participants, who agreed that the rates for granting consent vary somewhat across racial/ethnic groups. Nearly all the focus group participants that commented on this topic indicated that they believed Hispanics, particularly Mexican nationals, are less likely than other racial/ethnic groups to refuse officers' requests for consent. The primary reason participants thought this was the case was due to cultural experiences with law enforcement in Mexico, where motorists can be searched without the same legal standards.

Figure 5.10: Racial/Ethnic Differences in Refusal to Consent to Search (n=4,752)
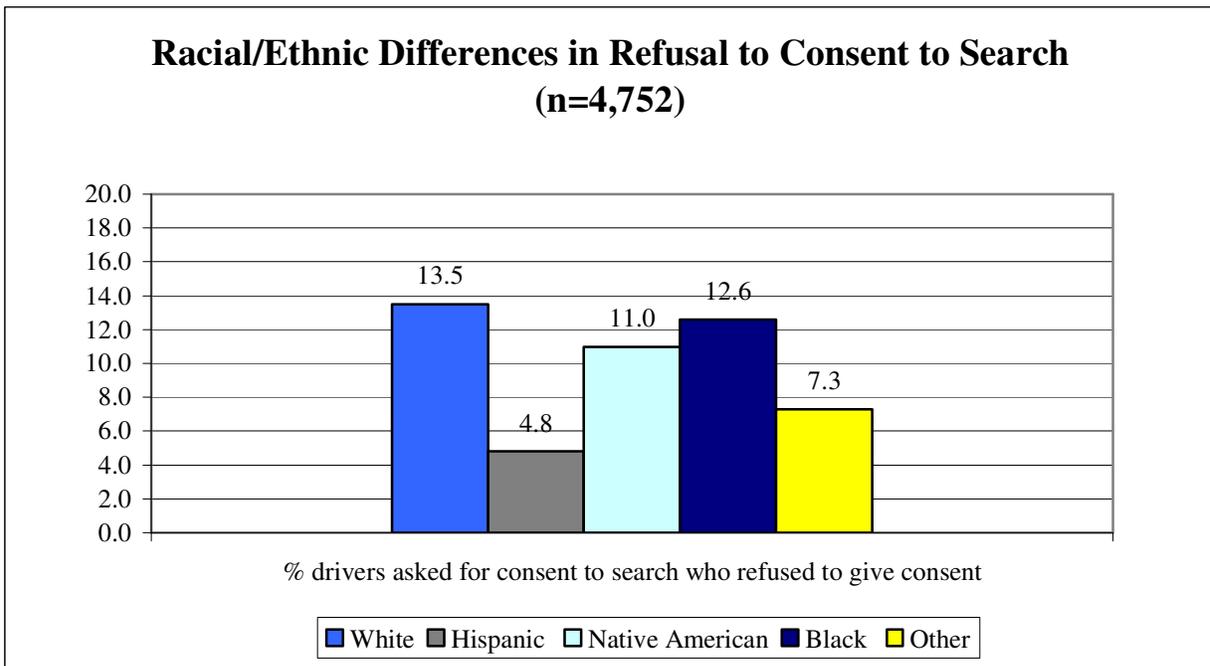
Racial/Ethnic Differences in Refusal to Consent to Search (n=4,752)

% drivers asked for consent to search who refused to give consent

☐ White ☐ Hispanic ☐ Native American ☐ Black ☐ Other

NOTE: Differences across the racial/ethnic groups presented in this figure are statistically significant at $p \leq .001$

To more fully explore the racial/ethnic disparities evident in consent search rates, Table 5.6 below presents a multivariate analysis of consent searches. Like the overall search model presented in Section 4, the model for Type III searches presented in Table 5.6 is also weak in predictive power. Specifically, this model explains only 8.9% of the variation in whether or not consent searches are conducted. Although this model is weak, the results do suggest that statistically significant racial/ethnic disparities exist in whether or not consent searches are conducted. Hispanic and Black drivers were 3.9 and 2.9 times more likely to be searched based on consent compared to Whites given the same vehicle characteristics, stop characteristics, and reasons for the stop that can be measured with these data. Other

variables that substantively predict the likelihood of consent searches are driver gender, county residency, and reasons for the stop. Specifically, males were two times more likely than females to be searched based on consent, while residents of the counties they were stopped in were 2.8 times less likely than non-county residents to be searched based on consent. Finally, drivers stopped for investigatory reasons or preexisting information were 2.0 and 3.7 times more likely to be searched based on consent compared to those stopped for moving violations.

Table 5.6: Multivariate Logistic Analyses Predicting TYPE III (Consent Only) SEARCHES during officer-initiated traffic stops in 2007

Variables	CONSENT SEARCHES (n=477,844)	
	Coefficient	Odds Ratio Exp (b) or 1/Exp (b)
Intercept	-4.78*	
Driver Characteristics		
Hispanic	1.37*	3.93
Native American	-0.37	--
Black	1.05*	2.87
Other Race	0.22	--
Male	0.72*	2.04
Age	-0.02*	1.02
County resident	-1.03*	2.80
AZ resident	-0.15	--
Vehicle Characteristics		
Arizona registration	-0.20*	1.22
Truck/Tractor Trailer	-0.50*	1.65
Van/Station Wagon	-0.11	--
Other Vehicle Type	0.05	--
Stop Characteristics		
Night-time	-0.37*	1.45
Weekend	-0.26*	1.30
Spring	0.19*	1.20
Summer	0.05	--
Fall	0.15	--
Legal variables		
Reason for stop: non-moving violation	0.36*	1.44
Reason for stop: equipment violation	0.34*	1.40
Reason for stop: investigation	0.71*	2.02
Reason for stop: pre-existing information	1.30*	3.68
Reason for stop: criminal offense	0.05	--
Model Chi-square	3556.23*	
Nagelkerke R Square	.089	

More importantly, however, the weak overall ability of this model to predict the likelihood of consent searches indicates that this model is likely misspecified. That is, other factors more central to explaining whether or not drivers are searched based on consent have likely not been included in the data collection. First and foremost, this analysis is unable to model the effect of refusal to consent, which we know varies by race/ethnicity based on the analyses

presented in Figure 5.10. Specifically, Hispanics were the least likely to refuse consent when requested; therefore, it is not surprising that they are significantly more likely to be searched based on consent. Additionally, focus group participants noted a number of pre-stop and during-the-stop indicators or cues of suspicion that influenced their decision to request consent to search. These indicators, however, were not documented on the data collection form, and therefore, cannot be included in the multivariate model. The redesigned electronic data collection form that the department is now using for the last quarter of 2008 data collection does include a data field designed to capture some of this information.

As noted previously, the inclusion of consent searches in outcome test analyses is especially problematic because, as with mandatory searches, the decision of whether or not to search is not entirely based on the officers' decision (Fridell, 2004; Engel, 2008). Although officers initially decide whom to *request* a consent search from, ultimately it is citizens, not officers, who decide whether or not consent searches are conducted. Citizens have the right to refuse search requests, and if the officer has no probable cause to conduct the search, their denial of the police request must be honored. As demonstrated in Figure 5.10, rates of refusal are *not* equivalent across racial/ethnic groups. Hispanic drivers, in particular, are more likely to give consent when requested compared to other racial / ethnic groups. Despite these limitations, DPS administrators requested analyses of consent search success rates by race and gender for purposes of internal comparisons. These rates are provided below. It is important to note, however, because of the limitations described above, *no definitive conclusions about racial bias should be drawn from these comparisons*.

Figure 5.11 below displays the overall Type III (consent only) search success rates across the department, bureaus, and canine squads. Department-wide, 11.1% of consent only searches were successful in recovering contraband. The search success rates across the bureau level were fairly similar to the departmental average. The consent only search success rate was significantly higher for the Canine North squad (18.9%) compared to Canine Central/South (5.0%).

Figure 5.11: Type III (Consent Only) Search Success Rates by Organizational Unit

Type III (Consent Only) Search Success Rates by Organizational Unit
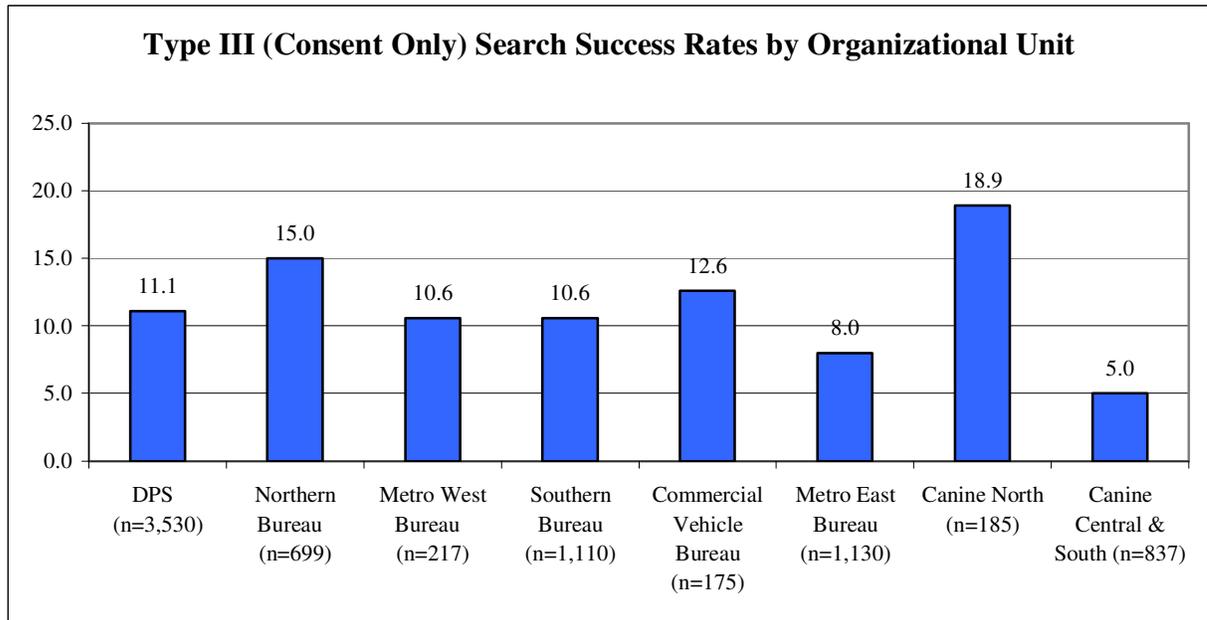
Figure 5.12 and Table 5.7 display the total number of Type III (consent only) search success rates based on drivers' characteristics. As shown, there were significant racial/ethnic differences in the Type III search success rates at the department and bureau level. Specifically, department-wide, Type III (consent only) searches of Native American drivers (23.5%) were the most likely to be successful in the discovery of contraband, compared to all other racial/ethnic groups. Blacks and Whites have similar search success rates (16.0% and 14.0%, respectively). Consent only searches of Hispanics (8.8%), however, were the least likely to be successful in terms of recovering contraband. At the bureau level, racial/ethnic differences in Type III search success rates are only statistically significant in the Northern Bureau. While the search success rates for other bureaus also indicate racial/ethnic differences, these differences may not reach statistical significance due to the small numbers of consent searches for some racial/ethnic groups at the bureau level.

Figure 5.12: Racial/Ethnic Differences in Type III (Consent Only) Search Success Rates
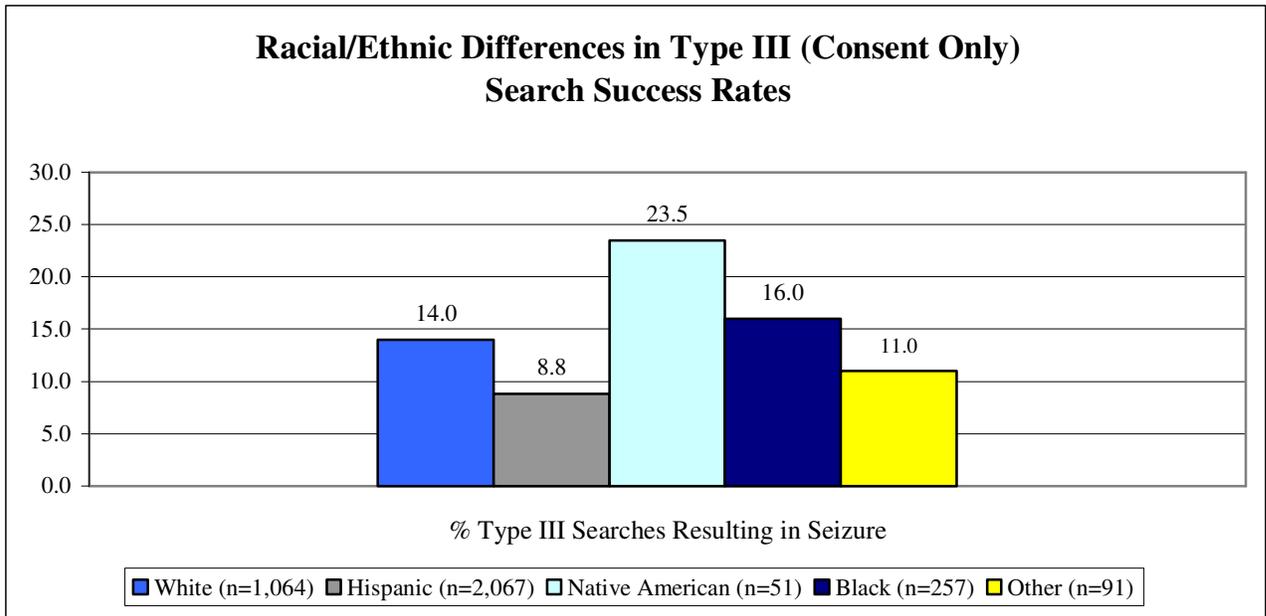
Racial/Ethnic Differences in Type III (Consent Only) Search Success Rates

% Type III Searches Resulting in Seizure

White (n=1,064) Hispanic (n=2,067) Native American (n=51) Black (n=257) Other (n=91)

NOTE: Differences across the racial/ethnic groups presented in this figure are statistically significant at p ≤ .001

At the request of DPS, Table 5.7 presents the total number of searches based on both consent only and any consent (i.e., consent and some other reason). The first column notes the total number of all searches for each racial/ethnic group. The second and third columns include the total number of searches based only on consent, and the search success rate for those searches, while the fourth and fifth columns include the total number of searches based on any consent and the search success rates for those searches. The department-level findings for searches based on only consent are the same as what was presented above in Figure 5.12. Due to small numbers of solely consent searches of specific racial/ethnic groups at the bureau level, however, only three of the bureaus exhibit statistically significant racial/ethnic differences in search success rates. For searches based on any consent, the overall search success rates are higher across all racial groups. Searches of Hispanics based on any consent are still significantly less likely to produce seizures of contraband than searches of Whites, Blacks, or Native Americans. As shown in Table 5.7, these racial/ethnic differences in search success rates based on any consent are also statistically significant in four of the five bureaus.

Table 5.7: Type III Search Success Rates by Driver Characteristics for Department, Bureaus, & Canines (p.1 of 2)

	Drivers	Total # of Searches	Total # of Consent Only Searches	Consent Only Search Success Rate	Total # of Any Consent Searches	Any Consent Search Success Rate
DPS	White	9,740	1,064	14.0***	1,322	21.0***
	Hispanic	10,565	2,067	8.8	2,411	12.6
	Native American	1,720	51	23.5	76	31.6
	Black	1,743	257	16.0	343	23.9
	Male	20,256	3,052	10.6**	3,682	15.6***
	Female	4,030	478	14.6	579	21.9
Northern Bureau	White	2,632	315	15.9***	405	22.2***
	Hispanic	1,452	280	10.0	338	13.3
	Native American	1,192	12	50.0	24	45.8
	Black	269	66	25.8	83	26.5
	Male	4,707	608	13.7**	767	18.1**
	Female	920	91	24.2	109	29.4
Metro West Bureau	White	1,624	79	13.9	100	23.0*
	Hispanic	2,086	108	7.4	130	10.8
	Native American	93	2	50.0	2	50.0
	Black	415	24	8.3	37	24.3
	Male	3,566	196	10.7	246	17.1
	Female	709	21	9.5	28	21.4
Southern Bureau	White	2,344	295	14.6	376	22.3***
	Hispanic	3,678	728	9.2	867	13.5
	Native American	239	21	9.5	29	27.6
	Black	386	51	9.8	74	20.3
	Male	5,584	961	10.0	1,184	184**
	Female	1,200	149	14.8	186	43
Commercial Vehicle Enforcement Bureau	White	345	71	15.5	83	22.9
	Hispanic	214	62	9.7	75	10.7
	Native American	2	0	--	0	--
	Black	69	21	19.0	22	22.7
	Male	655	167	11.4*	190	14.7*
	Female	43	8	37.5	12	41.7

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups. *** p ≤ .001 ** p ≤ .01 * p ≤ .05

Table 5.7: Type III Search Success Rates by Driver Characteristics for Department, Bureaus, & Canines (p.2 of 2)

	Drivers	Total # of Searches	Total # of Consent Only Searches	Consent Only Search Success Rate	Total # of Any Consent Searches	Any Consent Search Success Rate
Metro East Bureau	White	2,540	238	10.5	276	15.2***
	Hispanic	2,773	790	6.6	881	10.1
	Native American	164	11	9.1	14	7.1
	Black	520	70	12.9	94	25.5
	Male	5,103	950	7.9	1,086	12.2
	Female	1,056	180	8.3	207	14.0
Canine North	White	180	67	10.4	88	21.6*
	Hispanic	169	86	22.1	115	30.4
	Native American	4	0	--	0	--
	Black	81	24	25.0	40	45.0
	Male	385	160	18.8	215	29.3
	Female	63	25	20.0	37	35.1
Canine Central & South	White	201	121	5.8	124	6.5
	Hispanic	948	665	4.8	717	6.7
	Native American	25	9	11.1	10	10.0
	Black	62	34	5.9	37	8.1
	Male	1,087	706	5.1	759	6.7
	Female	174	131	4.6	140	7.1

NOTE: Asterisks indicate statistically significant chi-square associations across 4 racial groups and 2 gender groups. *** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$

Understanding Racial/Ethnic Disparities in Searches and Seizures

There are a number of legitimate factors that may explain the racial/ethnic disparities reported in the findings regarding search and seizure rates. Unfortunately, the 2007 DPS data collection design does not allow for examination of some of the most intuitive explanations. For example, the differences in search rates may be due to socio-economic status rather than race/ethnicity per se. Drivers' socio-economic status, however, is not captured on the traffic stop forms. The closest proxy indicator of wealth routinely collected – age of vehicle – was not captured on the form. In addition, the behavior of the driver (e.g., demeanor, compliance with officer requests, suspicious indicators, misstatement of facts / lying to officers, etc.) is not systematically captured on the traffic stop form. Therefore, any conclusions regarding racial/ethnic disparities in searches and seizures based on the bivariate and outcome test analyses must be tempered. It is important to note that the redesigned data collection form in use for the last quarter of 2008 data collection does include data fields for vehicle condition, demeanor, and pre-stop indicators of suspicion. These fields will allow for a more thorough analysis of search and seizure rates in the Year 3 report.

In the interim, in an effort to better understand factors that influence whether or not drivers are searched and whether searches are successful in recovering contraband, additional analyses based on the currently available data were performed. Some of the possible explanations noted above can be partially examined by analyzing search and seizure rates across types of violations. As noted in Section 4, racial/ethnic differences existed in the types of violations for which drivers were issued citations. Most notably:

- Whites were significantly more likely to be issued citations for speeding violations, compared to Hispanics, Native Americans, and Blacks.
- Black drivers were significantly more likely than other racial/ethnic groups to be issued citations for speeding over 85 mph, and for violations related to vehicle registration and/or license plate.
- Alternatively, Hispanic drivers were significantly more likely than other racial/ethnic groups to be issued citations for violations related to drivers' license, seat belts/child restraints, required equipment, and insurance.

Therefore, if particular types of violations are more likely to prompt officers to search vehicles, and these types of violations also differ systematically by race/ethnicity, then racial/ethnic disparities in search and seizure rates may be partially accounted for by alternative factors. The following analyses examine search and seizure rates by the types of violations for which citations and warnings were issued.

Figure 5.13 shows the percent of drivers searched by the types of violations for which they were cited or warned.[23] As shown, significant differences in search rates exist. Specifically, drivers who were cited or warned for violations related to drivers' license,

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[23] The overwhelming majority of stops (approximately 90% or higher) based on DUI or drug offense violations resulted in a search. Indeed, a citation for a drug offense violation is presumably contingent upon a search being conducted. Therefore, these two types of violations were excluded from these analyses.

equipment, insurance, and to a lesser degree seatbelt/child restraint, were significantly more likely to be searched compared to drivers who were cited or warned for speeding and registration violations. For example, 19.2% of stops that resulted in a warning or citation for a drivers' license violation resulted in searches, compared to only 1.2% of stops that resulted in a warning or citation for speeding. As noted above, analyses in Section 4 showed that Hispanics were significantly more likely than Whites to be cited for drivers' license, equipment, insurance, and seatbelt/child restraint violations. These results suggest that racial/ethnic disparities in search rates may be related to the reason for the stop and the type of violation for which they were cited or warned, which in turn may be related to socioeconomic status.

Figure 5.13: Percent Searched by Citation and Warning Violations
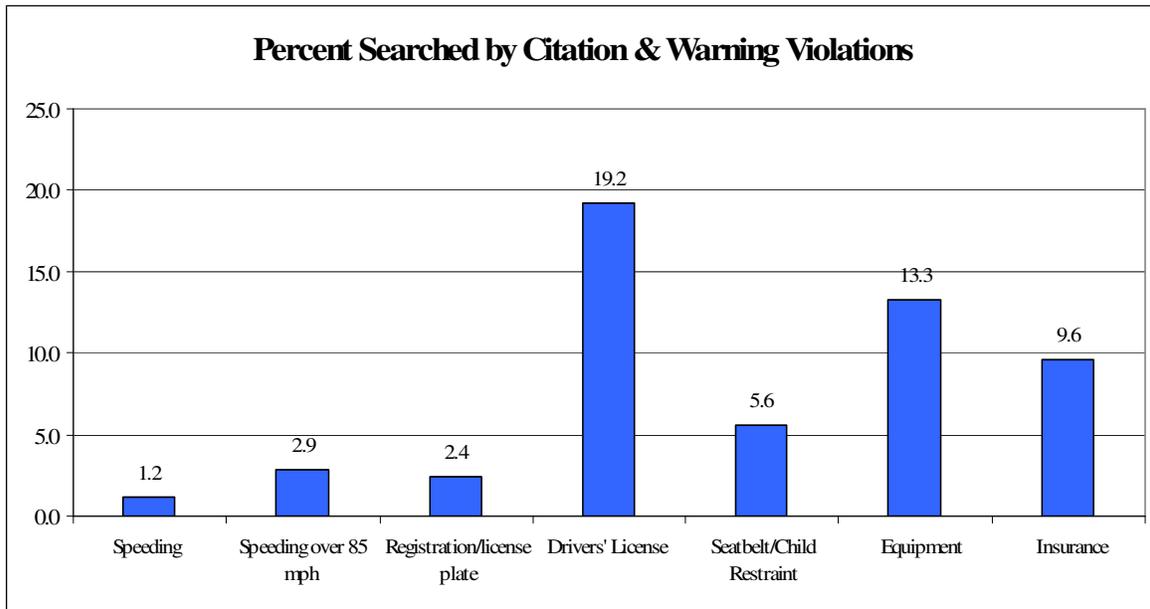
Percent Searched by Citation & Warning Violations

NOTE: Differences across the violation types presented in this figure are statistically significant at p ≤ .001

Figure 5.14 shows the search success rates (i.e., the percent of searches resulting in discovery of contraband) by the types of violations for which drivers were cited or warned. As shown, significant differences in search success rates exist across violation types. Specifically, stops that resulted in a citation or warning for violations related to drivers' license and insurance were significantly *less* likely to result in contraband seizures (13.1% and 14.4%, respectively) compared to searches during stops of drivers who were cited or warned for violations related to speeding, registration, seatbelts, and equipment (range = 19% to 24%).

As noted above, analyses in Section 4 showed that Hispanic drivers were significantly more likely to be cited for violations related to drivers' license and insurance, the two lowest search success rates. Hispanics, however, were also more likely to be cited for violations related to seatbelts and equipment, which have two of the higher search success rates. Therefore, the evidence is mixed on whether differences in violation types may partially account for racial/ethnic disparities in search success rates.

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Figure 5.14: Search Success Rates by Citation and Warning Violations
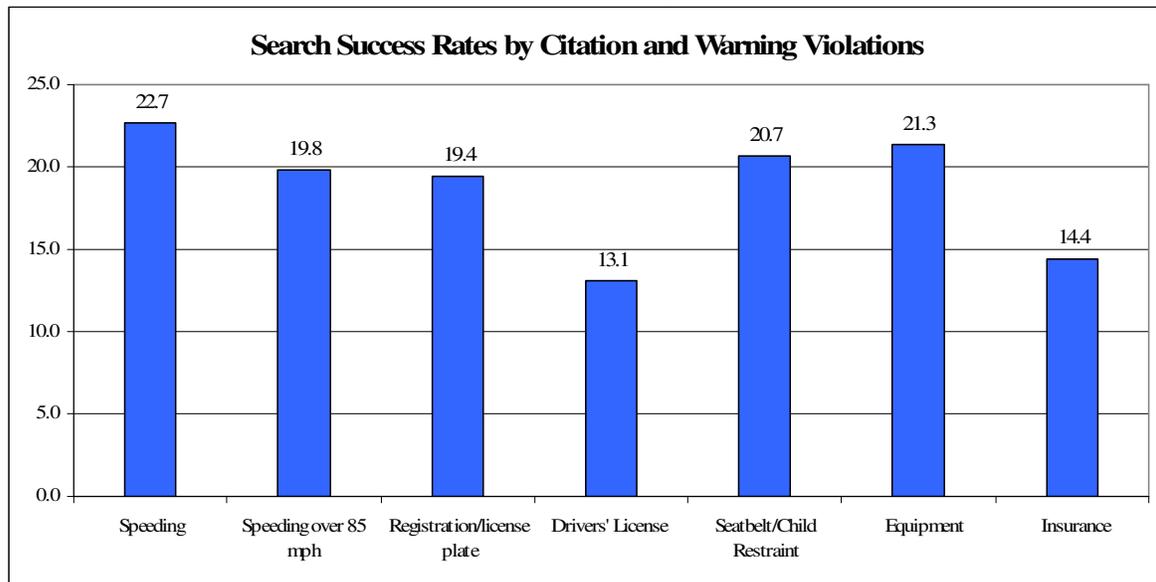
NOTE: Differences across the violation types presented in this figure are statistically significant at p ≤ .001

Undocumented Aliens

Focus groups with DPS officers and sergeants, as well as troopers from other state police agencies, have suggested that racial/ethnic disparities in search success rates may be partially explained by a number of factors. For example, officers from the DPS as well as other jurisdictions have suggested that, in particular, Hispanic hit rates might be lower than White hit rates for the following reasons: 1) the use of incorrect cues of suspicion by officers, 2) a lack of officer training specific to Hispanic citizens, 3) a possible language barrier between officers and Hispanic motorists, 4) possible documentation issues on traffic stop forms that do not account for issues regarding searches of Hispanics, 5) specific types of vehicle characteristics associated with Hispanic motorists, and 6) the extensive and effective use of hidden compartments by this ethnic group (Engel et al., 2007b, Engel et al., 2008).

One of these reasons – possible documentation problems associated with traffic stop forms that do not account for issues regarding searches and seizures of Hispanic undocumented aliens – can be partially examined empirically with data collected by DPS. DPS officers and troopers in other jurisdictions have suggested that some Hispanic motorists are more likely to display cues of nervousness and deception because they are illegal immigrants. These cues of suspicion are perhaps misinterpreted by officers, resulting in searches of Hispanic motorists that are less productive in terms of contraband seizures. Officers in other jurisdictions have requested that undocumented aliens be captured on the traffic stop forms to account for this possibility.

On the DPS traffic stop form, there is a place to indicate if the person receiving the citation, warning, repair order, etc. is considered by the officer to be an undocumented alien. The analyses in this report are limited to data collected specifically on the driver,

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and not passengers; therefore, this information falls short of indicating whether any passengers in the vehicle are considered by officers as being undocumented aliens. Situations where a legal-resident driver is transporting illegal aliens would not be captured using this method. As described in Section 1, however, one of the revisions included in the redesigned electronic data collection form now in use is an undocumented alien data field that does account for undocumented passengers. In addition, during the focus group session with DPS officers and sergeants, participants' comments suggested that the use of this data field is not uniform across the department. Many officers indicated they thought they had to choose between a racial category and the UDA box. This confusion likely has resulted in this field being underutilized on the form even for drivers suspected to be undocumented aliens. The redesigned data collection form should allow for a more accurate representation of the frequency with which undocumented aliens are encountered. Nevertheless, if officers across the country are correct in their assessment that Hispanic hit rates are significantly lower than other racial groups because Hispanic motorists demonstrate cues of suspicion due to nervousness surrounding immigration status rather than other illegal activity (but are subsequently searched by officers with no contraband found, resulting in a lower hit rate), analyses of these data should lend some support to this hypothesis.

Of the 485,183 officer-initiated traffic stops, 2,945 (0.6%) of the drivers were considered by officers to be undocumented aliens. The overwhelming majority of these individuals (96.6%) were reported as Hispanic. Of these 2,945 undocumented aliens, 963 (32.7%) were searched, compared to only 4.8% of drivers with legal resident status.

The reasons the types of searches conducted for undocumented aliens are compared to searches of legal residents in Figure 5.15 below. As demonstrated, undocumented aliens were more likely to be searched for low discretion reasons (81.3% of all searches) compared to legal residents (69.5% of all searches). In contrast, undocumented aliens were less likely to be searched for discretionary reasons (11.4% of all searches) compared to legal residents (15.6% of all searches). Likewise, searches based solely on consent represented 7.3% of the searches of undocumented aliens, compared to 14.8% of the searches of legal residents.

Figure 5.15: Differences in Types of Searches for Legal Residents and Undocumented Aliens
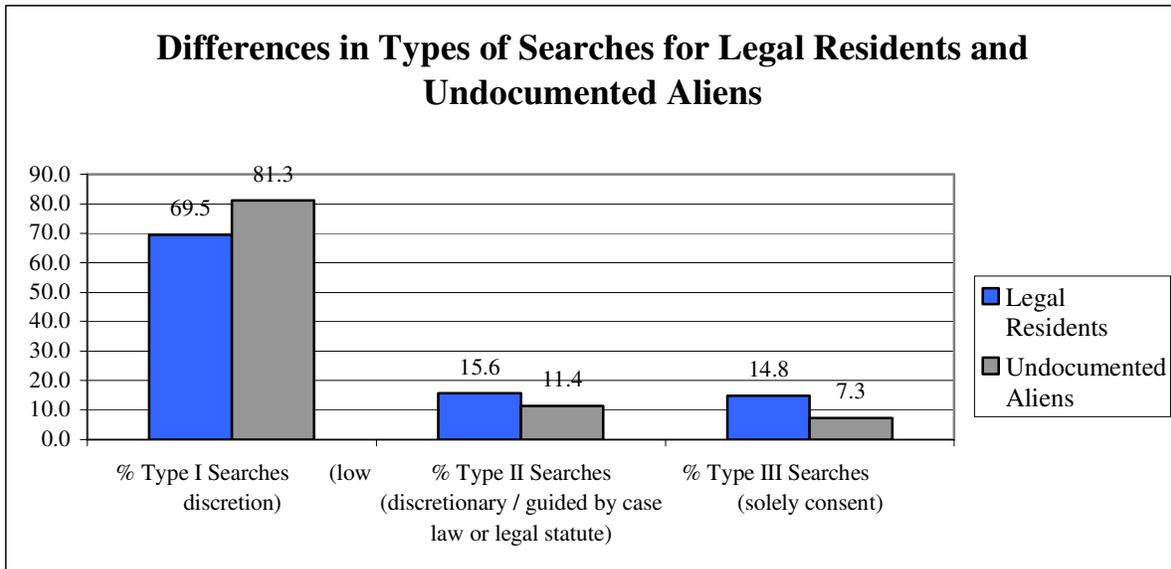
Although undocumented aliens are significantly more likely to be searched for low discretion reasons compared to legal residents, when discretionary searches are examined directly, undocumented aliens are significantly less likely to be found in possession of contraband compared to legal residents. Only 28.2% of the discretionary searches of undocumented aliens resulted in contraband seizures, compared to 45.5% of discretionary searches of drivers in the country legally. These differences in search success rates across these two groups were reversed when consent only searches are examined. Specifically, 24.3% of consent only searches of undocumented aliens resulted in seizure contrabands, compared to 10.9% of consent searches of those in the country legally. These differences are documented in Figure 5.16 below.

Figure 5.16: Differences in Search Success Rates for Legal Residents and Undocumented Aliens
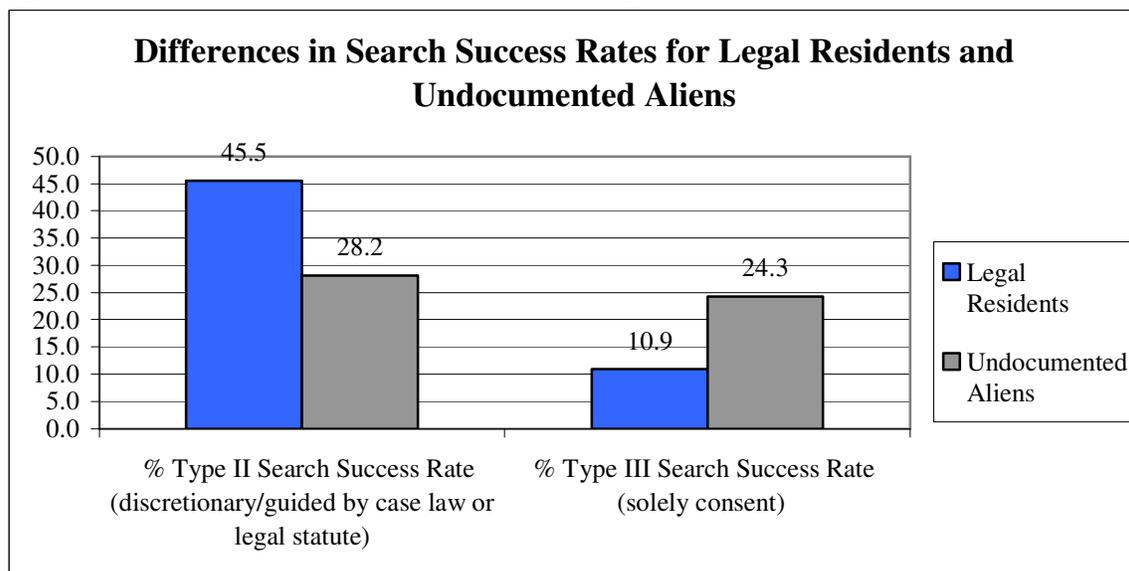
Some have argued that undocumented aliens should be considered "contraband" – i.e., they are in country illegally, and therefore should be counted as a "hit" for search rates. When these individuals are included in the counts for contraband seizures, the Type II (discretionary) search success rates for Hispanic drivers increased from 37.5% to 43.3%. Likewise the consent only search success rate for Hispanic drivers increases from 8.8% to 11.3% when undocumented aliens are included as a type of contraband. These search success rates would likely increase further if information regarding undocumented alien passengers was also collected on the form, as it now is based on the 2008 data collection redesign.[24]

In summary, undocumented aliens (the majority of whom are Hispanic) were significantly more likely to be searched, but, when compared to legal residents, were less likely to be found in possession of contraband when searched for discretionary reasons, yet more likely to be found in possession of contraband when searched based on consent only. When undocumented aliens are included as a "form of contraband," the Type II (discretionary) search success rate for Hispanic motorists increases by nearly 6%, but still remain about 7% below the Type II search success rate for White motorists. Likewise, the Type III (consent only) search success rate for Hispanic motorists increases by 2.5% when undocumented aliens are considered contraband, but remains about 3% below the Type III search success rate for White motorists.

SECTION SUMMARY

- *Description of Searches and Seizures*

  - Department-wide in 2007, DPS officers conducted 24,302 searches of drivers, vehicles, and/or passengers during officer-initiated traffic stops.

  - Incident to arrest (49.0%) and vehicle inventory (35.1%) were the most common reasons for searches, followed by consent (17.5%), consent only (14.5%), and probable cause (13.0%).

  - At the department level, 64.6% of searches were conducted of drivers, 83.2% involved vehicles, and 10.9% were performed on passengers.

  - Department-wide in 2007, DPS officers successfully seized contraband during 5,179 of 24,302 searches. The most frequent type of contraband seized was drugs (52.3%), followed by other contraband (32.5%), and alcohol (21.0%).

- *Types of Searches*

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[24] It is possible that some officers consider undocumented alien passengers as an "other" form of contraband on the data collection form, but the actual content of the "other" category is not known to the UC research team.

- At the department level, the majority of searches conducted were Type I (low discretion) searches (70.2%), while 15.3% and 14.5% were Type II (discretionary) and Type III (solely consent), respectively.
    - Commercial Vehicle Enforcement Bureau and Canine District conducted a considerably larger percentage of Type II searches compared to the department average and other bureaus.
    - Canine District conducted over half of its searches based solely on consent.

- Analyses based on the type of search indicate statistically significant racial and ethnic disparities in searches across all three search type categories:
    - Blacks were least likely to be searched for Type I reasons, while Native Americans were most likely to be searched for these reasons.
    - For Type II searches, Blacks were significantly more likely, and Native Americans significantly less likely, to be subject to Type II searches.
    - In the case of consent (Type III) searches, Black and Hispanic motorists were significantly more likely to be searched based on consent compared to Whites and Native Americans.

- *Search Success Rates*

    - The overall search success was 21.3%, but varied by the reason for search:
        - Searches based partially (16.4%) or solely (11.1%) on consent as well as vehicle inventories (16.0%) were least likely to be successful in terms of discovering contraband.
        - Searches most likely to produce seizures of contraband include those based on probable cause (66.9%), canine alerts (49.0%), warrant (33.3%), and plain view (31.4%).
        - Within the Canine District, canine handlers assigned to the North squad were significantly more likely to report contraband seizures (49.3% of all searches) compared to handlers assigned to Central/South squads (15.4% of contraband seizures). This was consistent across nearly all types of searches. Of particular note, for canine alerts, 75.7% of the searches resulted in seizures for North canine handlers, compared to 41.2% for Central/South canine handlers.

- *Type II (discretionary) Searches*

    - The overall Type II search success rate for DPS was 45.7%, but success rates varied significantly by race/ethnicity:
        - Type II searches of Hispanic drivers (37.5%) were the least likely to be successful in the discovery of contraband, compared to Native Americans (52.9%), Whites (50.4%), and Blacks (50.0%).

- *Type III (solely consent) Searches*

- Analyses of consent searches revealed racial/ethnic differences in those asked for consent to search as well as refusals to consent:
  - o Specifically, Hispanics were significantly more likely than other racial/ethnic groups to be asked for consent to search and significantly less likely than members of other racial/ethnic groups to refuse consent to search.

- A multivariate model predicting Type III searches indicated that, although the predictive power of the model is weak, there are statistically significant racial/ethnic disparities in whether or not consent searches are conducted.
  - o Hispanic and Black drivers were 3.9 and 2.9 times more likely to be searched based on consent compared to Whites given the same vehicle characteristics, stop characteristics, and reasons for the stop.
  - o The weak overall ability of this model to predict the likelihood of consent searches indicates that this model is likely misspecified. That is, other factors (e.g., refusal to consent, demeanor, indicators of suspicion) more central to explaining whether or not drivers are searched based on consent have likely not been included in the data collection.

- Because consent searches are not solely dependent on officer's discretion (i.e., a citizen may refuse), analyses of consent search success rates are not recommended. They were, however, conducted, at the request of DPS administrators.
  - o Results indicated racial/ethnic differences:
    - Type III searches of Native American drivers (23.5%) were the most likely to be successful in the discovery of contraband, compared to all other racial/ethnic groups.
    - Blacks and Whites have similar search success rates (16.0% and 14.0%, respectively).
    - Consent searches of Hispanics (8.8%) were the least likely to be successful in terms of recovering contraband.

- One possible explanation for racial/ethnic disparities in search and seizure rates is differences in types of violations. That is, if particular types of violations are more likely to prompt officers to search vehicles, and these types of violations also differ systematically by race/ethnicity, then racial/ethnic disparities in search and seizure rates may be partially accounted for by alternative factors. The analysis show some support for this hypothesis.

- Undocumented aliens (the majority of whom are Hispanic) were significantly more likely to be searched than legal residents, but were less likely to be found in possession of contraband when searched for discretionary reasons and more likely to be found in possession of contraband when searched based on consent.
  - o When undocumented aliens are included as a "form of contraband," both the Type II and Type III search success rates for Hispanic motorists increase but still remain lower than the search success rates for White motorists.

- The information presented in this section cannot determine the legality of and/or the presence of discrimination in individual searches conducted by DPS officers.

- As noted above, caution must be used when interpreting the findings in this section for two reasons:
    - Tests of statistical significance are influenced by sample size. For large samples, smaller differences are more likely to be reported as statistically significant. The strength of these relationships, however, may not be substantively meaningful despite their statistical significance.
    - The majority of the findings presented above are bivariate in nature (i.e., they do not take into account other extralegal and legal factors that might have a significant influence over search decisions).

6. CONCLUSIONS AND RECOMMENDATIONS

OVERVIEW

This report documents the findings from statistical analyses of data collected during all officer-initiated traffic stops conducted by the Arizona Department of Public Safety from January 1, 2007 through December 31, 2007, which represent the second year of data analysis for the *Traffic Stop Data Analysis Study*. As noted throughout this report, it is impossible with these data to determine the motivating factors behind traffic stops conducted by individual DPS officers. Rather, this data collection effort and subsequent data analyses can only examine patterns and trends in traffic stops and post-stop outcomes to determine if racial disparities exist after considering a host of additional legal and extralegal factors that might influence officer decision making. While it cannot be determined if DPS officers are engaging in the behavior commonly referred to as "racial profiling," analyses can demonstrate if patterns of racial disparities exist in stop and post-stop outcomes that warrant further scrutiny.

This conclusion section first provides a review of the major findings in this report. The findings from this report can be generally examined as three separate, but related issues: 1) the initial stopping decision, 2) post-stop outcomes received by motorists (e.g., warnings, repair orders, citations, arrests, and searches), and 3) specific examinations of searches and seizures. Regarding the initial stopping decision, no department-wide conclusions can be drawn regarding whether racial/ethnic disparities in stopping behavior exist. Regarding post-stop outcomes, it is the conclusion of this report that, even after controlling for other explanatory factors, racial/ethnic disparities exist for warnings, repair orders, citations, arrests, and searches. The levels of unexplained racial/ethnic disparities are greatest for the most intrusive outcomes – arrests and searches. Further analyses of searches and seizures illustrate that although Hispanic, Black, and Native American drivers are significantly more likely to be searched compared to Whites, Hispanics (and to a lesser degree Native Americans) are significantly less likely than Whites to be found in possession of contraband. Following the review of findings, several recommendations related to data collection, policy and training are provided to DPS administrators based on these analyses.

THE INITIAL STOP

During 2007, 485,183 valid member-initiated traffic stops were recorded by DPS officers. Department-wide, approximately 61.3% of the drivers stopped were White, while 25.4% were Hispanic, 5.2% Native American, 4.8% Black and 3.3% Other (Asian, Middle Eastern, other or unknown). The rate of stops for particular racial and ethnic groups varied dramatically across divisions, bureaus, districts/shifts, and counties. Some variation, however, is to be expected given residential patterns related to race/ethnicity, along with racial/ethnic differences in travel patterns on interstates, highways, and major thoroughfares. The percentages of drivers stopped within particular racial/ethnic categories are extremely similar to those reported in the Year 1 report.

The crux of interpreting data regarding initial traffic stop behavior is dependent upon comparison data. That is, a group's representation in traffic stops is only meaningful

when compared to the same group's "expected" representation in traffic stops, based on alternative data. Unfortunately, all available external benchmarks have limitations that restrict the level of confidence in the results of these comparisons. In addition, data quality issues with previous years of DPS traffic stop data led the UCPI research team to conclude that internal comparisons through trend analysis would not be advisable either. Therefore, no department-wide conclusions can be drawn regarding whether racial/ethnic disparities in stopping behavior exist. Internal benchmarking – which compares the racial/ethnic breakdown of traffic stops across officers assigned to the same, assignments, shifts, and districts – is also impossible with these data because of the small number of officers that have such similarities. Instead, this report focuses on whether racial/ethnic disparities are evident in post-stop outcomes.

POST-STOP OUTCOMES

Citations were the most frequent stop outcome for drivers in 2007 (45.2% of all stopped drivers received at least one citation). In addition, 41.3% of drivers stopped were issued at least one warning, while 15.3% were issued repair orders. Occurring rarely were the most serious stop outcomes – specifically, arrests (2.5% of drivers stopped), warrant arrests (0.5%), and searches of the drivers, occupants, or vehicles (5.0% of the stops). Slightly more than 5% of drivers were issued DVERs. Stops resulting in field interviews and tribal orders were statistically infrequent events across the department, and were not examined in detail within this report.

Analyses of post-stop outcomes are an important consideration of any data collection effort because the potential exists for differential treatment based on the drivers' characteristics *after* the initial stop has been made. Bivariate and multivariate analyses of post-stop outcomes examined racial/ethnic differences in warnings, repair orders, citations, arrests, searches and, seizures of contraband.

Bivariate Analyses:

Initially, bivariate analyses demonstrated that post-stop outcomes differed across racial/ethnic groups. Across the department, statistically significant racial/ethnic differences were reported for the most severe outcome received.

- o <u>Warnings</u>: 39.7% of White drivers received a warning as the most severe outcome for the traffic stop, compared to 27.8% of Hispanic drivers, 32.4% of Native American drivers, and 36.4% of Black drivers.
- o <u>Repair Orders</u>: 16.3 % of White drivers received a repair order as the most severe outcome for the traffic stop, compared to 22.4 % of Hispanic drivers, 22.6% of Native American drivers and 14.4 % of Black drivers
- o <u>Citations</u>: 41.9% of White drivers received a warning as the most severe outcome for the traffic stop, compared to 45.8% of Hispanic drivers, 39.6% of Native American drivers and 45.0% of Black drivers.

- Arrests: 2.1% of White drivers were arrested (the most severe outcome during traffic stops), compared to 3.9% of Hispanic drivers, 5.4% of Native American drivers, and 4.2% of Black drivers.

In addition, racial/ethnic differences were found across all outcomes (regardless of the most severe). Measures include whether or not any outcome was received, regardless of its severity compared to other outcomes during the same stop.
- Warnings: 44.6% of White drivers received at least one warning during traffic stops, compared to 33.6% of Hispanic drivers, 41.3% of Native American drivers and 41.3% of Black drivers.
- Repair Orders: 13.9% of White drivers received at least one repair order during traffic stops, compared to 18.6% of Hispanic drivers, 25.2% of Native American drivers and 10.9% of Black drivers.
- Citations: 43.4% of White drivers received at least one citation during traffic stops, compared to 48.9% of Hispanic drivers, 42.6% of Native American drivers and 48.1% of Black drivers.
- Arrests: 2.1% of White drivers were arrested during traffic stops, compared to 3.9% of Hispanic drivers, 5.4% of Native American drivers and 4.2% of Black drivers.
- Searches: 3.3% of White drivers were searched during traffic stops, compared to 8.6% of Hispanic drivers, 6.9% of Native American drivers, and 7.5% of Black drivers.

Statistically significant differences in the *types* of violations for which citations are issued are evident by race/ethnicity:
- White drivers were significantly more likely to be issued citations for speeding violations compared to Hispanic, Native American, and Black drivers.
- Black drivers were significantly more likely than other racial/ethnic groups to be issued citations for speeding over 85 mph and for violations related to vehicle registration and/or license plate.
- Hispanic drivers were significantly more likely than other racial/ethnic groups to be issued citations for violations related to drivers' license, seat belts/child restraints, required equipment, and insurance.
- Native American drivers were significantly more likely than other racial groups to be issued citations/arrested for DUI/reckless driving, while White drivers were least likely.

These results suggest that minority drivers are more likely to be issued citations for violations that are indirectly linked to income. In addition, the severity of offenses was not evenly distributed across racial/ethnic groups (e.g., Black drivers were more likely to be stopped for speeding at the highest levels over the limit, and Native American drivers were more likely to be stopped for DUI / reckless driving). This provides support for the proposition that officers make enforcement decisions based on drivers' behaviors rather than their demographic characteristics – and demonstrates the need to perform multivariate statistical analyses.

Multivariate Analyses:

Multivariate analyses were modeled to understand the independent effect of drivers' racial/ethnic backgrounds in relation to the post-stop outcomes after taking into account other legal and extralegal factors known to influence officer decision making. As a result, multivariate analyses provide a more thorough understanding and interpretation of the data.

Results from the multivariate analyses demonstrated that, even after controlling for other explanatory factors (e.g., other driver characteristics, vehicle characteristics, stop characteristics, and legal variables), racial/ethnic disparities exist for warnings, repair orders, citations, arrests, and searches.

- Warnings: The strongest predictors of whether or not drivers receive warnings were the legal reasons for the stop.
  - Hispanic, Black, and drivers of other race/ethnicity were significantly *less* likely compared to Whites to receive warnings.
  - Compared to White drivers, Hispanic, Black, and Other drivers were 1.3, 1.1, and 1.3 times *less* likely, respectively, to receive warnings.
  - The odds ratios of these coefficients indicate that all of these relationships, though statistically significant, are substantively *not* strong.
- Repair Orders: Drivers stopped for equipment violations were 120 times *more* likely to receive a repair order compared to those stopped for moving violations.
  - Drivers of trucks/tractor trailers were 15 times *more* likely to be issued repair orders compared to drivers of cars.
  - Hispanic, Black, and drivers of other races were significantly *less* likely, while Native Americans were significantly more likely, compared to Whites to be issued repair orders.
  - The strength of these race/ethnicity relationships range between 1.2 to 1.5 times more/less likely, indicating they are not very strong explanatory factors.
- Citations: The strongest predictors of the number of citations issued to drivers were legal reasons. As the number of citations issued increased, the importance of these legal variables also increased.
  - Traffic stops where evidence was found were 1.7 times more likely to result in one citation issued, but 12.7 times more likely to result in three or more citations issued.
  - The impact of drivers' race/ethnicity also increased as the number of citations increased.
  - While Hispanic drivers were only 1.1 times more likely than White motorists to receive one citation, they were 3.4 times more likely to receive three or more citations.

- ▪ Similarly, Black motorists were only 1.1 times more likely than Whites to be issued one citation, but 1.9 times more likely to receive three or more citations.
- ▪ The reasons for the reported racial/ethnic disparities in multiple citations, however, cannot be determined with these data.
  - o Arrests: The strongest factor associated with arrest is the discovery of contraband – drivers with contraband were 65 times *more* likely to be arrested compared to drivers without contraband.
    - ▪ It is important to estimate the influence of drivers' race/ethnicity on the likelihood of arrest after legal variables (such as reason for the stop and evidence seized) are taken into consideration.
    - ▪ Hispanic, Native American, and Black drivers were 1.7, 2.7, and 1.7 times significantly more likely to be arrested, compared to Whites.
  - o Searches: The search model – though weak in predictive power– indicated that the reason for the stop and other legal variables were the strongest predictors of the likelihood of a search.
    - ▪ Racial/ethnic disparities also existed in whether or not searches were conducted.
    - ▪ Compared to White drivers, Hispanic, Black, and Native American drivers are 2.5, 2.2, and 2.2 times *more* likely to be searched given similar vehicle characteristics, stop characteristics, and reasons for the stop.

In summary, important racial and ethnic disparities in traffic stop outcomes were found even after taking into consideration other legal and extra-legal factors known to influence police decision making during traffic stops. In comparison to findings reported in the Year 1 Report (based on data from 2006), these bivariate and multivariate results based on data from 2007 are very similar, with only minor variation in the strength of relationships, but no substantive differences in the racial/ethnic disparities discovered.

It is important to note, however, that racial/ethnic differences in post-stop outcomes may be explained by other characteristics that are also believed to potentially influence officer decision making, but were not available for analysis at this time and/or are not included in the current data collection system (e.g., more specific measures of the severity of traffic offenses, motorists' compliance with officer requests, drivers' socioeconomic status, officers' characteristics, organizational characteristics, etc.). Because of the potential influence of unmeasured variables, the reasons for the racial/ethnic disparities in post-stop outcomes cannot be determined with these data. Therefore, no definitive conclusions regarding racial/ethnic disparities in traffic stop outcomes based on the multivariate analyses should be made.

SEARCHES & SEIZURES

Although the reasons for the stop were the strongest predictors of decisions to search, some differences in the likelihood of conducting searches are still attributable to drivers' characteristics (most notably, drivers' race and ethnicity). Therefore, additional analyses were conducted to better understand the racial/ethnic disparities in officers' search decisions during traffic stops.

Across the DPS in 2007, officers reported 24,302 searches of drivers, vehicles, and/or passengers during officer-initiated traffic stops. These searches were classified as belonging in one of three categories based on their lowest level of discretion):

- Type I = Mandatory; required by departmental policy; little to no discretion (e.g., incident to arrest, inventory, plain view)
- Type II = Discretionary; guided by case law and/or legal statue; low/medium discretion (e.g., probable cause, canine alert, etc.)
- Type III = Consent only, high discretion

The majority of searches conducted were classified as Type I (low discretion) searches (70.2%), while 15.3% and 14.5% were Type II (guided by case law/legal statute) and Type III (solely consent) searches, respectively.

Analyses based on the type of search indicated statistically significant racial and ethnic disparities in searches across all three search type categories:

- Of the 9,740 White drivers searched:
  - 71.6% were Type I searches
  - 17.5% were Type II searches
  - 10.9% were Type III searches
- Of the 10,565 Hispanic drivers searched:
  - 67.8% were Type I searches
  - 12.6% were Type II searches
  - 19.6% were Type III searches
- Of the 1,743 Black drivers searched:
  - 61.2% were Type I searches
  - 24.1% were Type II searches
  - 14.7% were Type III searches
- Of the 1,720 Native American drivers searched:
  - 89.0% were Type I searches
  - 8.0% were Type II searches
  - 3.0% were Type III searches

In summary, Black drivers were *least* likely to be searched for low discretion reasons (Type I), while Native Americans were *most* likely to be searched for these reasons. For Type II searches, the opposite is true; Blacks were significantly more likely, and Native Americans significantly less likely, to be subject to Type II searches. In the case of solely consent searches (Type III searches), Black and Hispanic motorists were

significantly more likely to be searched based on consent compared to Whites and Native Americans.

Of the 24,302 searches, DPS officers successfully seized contraband during 5,179 searches; thus, the overall search success rate is 21.3%. Search success rates across the department varied considerably by the reason for the search.

- o Search success rates by type of search (i.e., the % of searches that resulted in discoveries of contraband):
  - Probable Cause = 66.9%
  - Canine Alert = 49.0%\
  - Warrant = 33.3%
  - Plain View = 31.4%
  - Terry = 21.5%
  - Incident to Arrest = 20.8%
  - Consent = 16.4%
  - Inventory = 16.0%
  - Solely Consent = 11.1%

Search success rates also varied by organizational unit. Of particular importance are dramatic differences in the rates of contraband seizures between canine handlers assigned to the North squad versus those assigned to the Central and South squads.

- o Across all types of searches, canine handlers assigned to the North squad were significantly more likely to report contraband seizures (49.3% of all searches) compared to handlers assigned to Central/South squads (15.4% of contraband seizures).
- o Canine handlers from across the state who participated in the focus group sessions were directly asked about these differences in search success rates and offered several plausible explanations, including differences in: officer experience, experience with litigation and courtroom testimony, policies and procedures related to search and seizure, supervisory philosophy and training, canine deployment tactics, and geographic factors (e.g., proximity to border, traffic volume, etc.).

The overall Type II (discretionary / guided by legal statue and case law) search success rate for DPS was 45.7%, but success rates varied significantly by race/ethnicity:

- o Type II Outcome Test:
  - White: 50.4% of Type II searches resulted in contraband seizures
  - Hispanic: 37.5% of Type II searches resulted in contraband seizures
  - Black: 50.0% of Type II searches resulted in contraband seizures
  - Native American: 52.9% of Type II searches resulted in contraband seizures
  - In summary, discretionary searches of Hispanic drivers are the least likely to result in discoveries of contraband – in contrast,

contraband seizures for Whites, Blacks, and Native Americans are not statistically significantly different from one another.

- Analyses of consent searches revealed racial/ethnic differences in those asked for consent to search as well as refusals to consent:
  - o Specifically, Hispanics were significantly more likely than other racial/ethnic groups to be asked for consent to search and significantly less likely than members of other racial/ethnic groups to refuse consent to search.

- A multivariate model predicting consent searches revealed that, although this model is weak in predictive power, the results do suggest that statistically significant racial/ethnic disparities exist in whether or not consent searches are conducted.
  - o Hispanic and Black drivers were 3.9 and 2.9 times more likely to be searched based on consent compared to Whites given the same vehicle characteristics, stop characteristics, and reasons for the stop that can be measured with these data.
  - o The weak overall ability of this model to predict the likelihood of consent searches indicates that this model is likely misspecified. That is, other factors more central to explaining whether or not drivers are searched based on consent have likely not been included in the data collection (e.g., refusal to consent, which varies by race/ethnicity; pre-stop and during-the-stop indicators of suspicion, etc).
  - o The redesigned electronic data collection form now in use for the last quarter of 2008 data collection does include a data field designed to capture information related to pre-stop indicators.

- Because consent searches are not solely dependent on officer's discretion (i.e., a citizen may refuse), analyses of consent search success rates are not recommended. They were, however, conducted, at the request of DPS administrators.
  - o Results indicated racial/ethnic differences. Specifically, Type III searches of Native American drivers (23.5%) were the most likely to be successful in the discovery of contraband, compared to all other racial/ethnic groups. Blacks and Whites have similar Type III search success rates (16.0% and 14.0%) respectively, while consent-only searches of Hispanic drivers (8.8%) were the least likely to be successful in the discovery of contraband

- Finally, undocumented aliens (the majority of whom are Hispanic) were significantly more likely to be searched than those with legal residency status.
  - o During Type II (discretionary) searches, undocumented aliens were significantly less likely to be found in possession of contraband compared to legal residents. In contrast, during consent-only searches,

> undocumented aliens were significantly more likely than legal residents to have searches result in seizure contrabands.
>   o When considering undocumented aliens as a form of contraband, both the Type II and III search success rates for Hispanics increase, though they remain below the rates of White drivers. These search success rates would likely increase further if information regarding undocumented alien passengers was also collected on the form. This change has been made for the 2008 data collection.

Based on these findings, it is the conclusion of this report that some racial and ethnic disparities exist for searches and seizures conducted during officer-initiated traffic stops. Again, these results are comparable to those reported in the Year 1 Report, with no substantive differences in the racial/ethnic disparities discovered. These findings, however, do not address the legality of individual searches. The data collected and reported within this document only examine trends and cannot address questions of whether or not individual searches conducted by DPS officers were legally justified or based on discrimination.

RECOMMENDATIONS

In summary, it is the conclusion of this report that, even after controlling for other explanatory factors, racial/ethnic disparities exist for warnings, repair orders, citations, arrests, and searches. The levels of unexplained racial/ethnic disparities are greatest for the most intrusive outcomes – arrests and searches. Further analyses of searches and seizures illustrate that Hispanic, Black, and Native American drivers were significantly more likely to be searched compared to Whites. For discretionary searches, Hispanics were significantly less likely than Whites to be found in possession of contraband. It is important to reiterate, however, that statistical data alone cannot determine whether or not officers are engaging in racial profiling. It is the limitations of this standard traffic stop data collection that served as an impetus for conducting additional focus group research with DPS officers and redesigning the DPS data collection form to gather more relevant information. Officers participating in the focus groups were able to provide invaluable context and alternative explanations for findings that are simply beyond the capability of statistical analyses. Although it is unlikely that any traffic stop data collection protocol can accurately capture all possible explanations for disparities, the additional data fields DPS has incorporated into data collection as of October 1, 2008, should allow for analyses in the Year 3 Report that can shed additional light on the reported racial/ethnic disparities in stop outcomes received by drivers stopped by the DPS. With these limitations in mind, and based on the findings presented in this report, a series of recommendations to DPS administrators related to data collection, training and policy are provided below.

Data Collection

Recommendation #1: The UCPI team recommends that the established video training on the data collection protocol be incorporated into academy training and/or the FTO time period.

The data audit conducted for the 2007 data confirms the same types of data collection inconsistencies and errors reported in the Year 1 Report based on 2006 data. The recurring nature of these problems reinforces the need for DPS to transition to an electronic data collection system that will eliminate the majority of errors associated with the previous scan system. Although DPS already required all current officers to view the training video associated with the new data collection form and method of collection, it will be critical to ensure that new officers are systematically trained on the data collection protocol as well.

Recommendation #2: It is recommended that the field supervisors be held directly accountable for ensuring the proper collection of traffic stop data by their subordinates. Further it is recommended that a standardized tracking procedure be utilized to confirm that all field supervisors are actively monitoring subordinates' data collection.

Continual supervisory oversight and routine data audits are necessary to ensure the accuracy and validity of these data. Although the electronic data capture will eliminate data entry errors, it will not ensure that officers are completing the form during every traffic stop. As described in Section 1, the supervisory oversight process in place should allow for any errors of this kind to be detected through a weekly comparison of electronic data and activity logs.

Recommendation 3: It is recommended that DPS administrators prioritize the full implementation of the electronic data collection system in the districts/shifts where it is still incomplete. In addition, it is recommended that DPS explore handheld options that would allow officers assigned to Metro Motors to collect information electronically.

During 2008, DPS began the transition from collecting all information regarding traffic stops on scannable paper forms into an electronic system via MDCs. Based on information from DPS regarding the implementation of this electronic system, approximately 100 Highway Patrol officers remain without patrol cars that are MDC equipped. In addition, officers assigned to the Metro Motorcycle District do not use MDCs because they patrol in motorcycles rather than patrol cars. During stops, officers without MDC capability record the traffic stop data on a data collection worksheet (the content of which is identical to the electronic data capture system) and later enter the data into a computer.

The data collection changes instituted by the DPS in the past year have resulted in one of the most comprehensive data collection systems currently in use by any state police agency. This effort should be applauded, but also continually supported. The continued collection and monitoring of traffic stops for better understandings of the existence and reasons for racial/ethnic disparities will demonstrate that the Arizona Department of Public Safety is a progressive leader for professional state police agencies across the country to model.

Supervisory Oversight

Recommendation #4: It is recommended that DPS continue to focus on supervisory oversight for traffic stops and specifically discretionary searches, which is necessary to ensure officer compliance with existing departmental rules and regulations.

Field supervisory oversight is a key component for police organizations striving to provide legitimate, unbiased, and effective police services to the public. Effective field supervision is critical for the successful monitoring and provision of police services. Comments regarding best practices for criminal interdiction and traffic stops made during focus groups with DPS officers suggested that they perceived several supervisory-related impediments to criminal interdiction work. For example, officers suggested that some supervisors focused on the quantity of traffic stops, rather than the quality of those stops. It was also suggested that some supervisors' encouraged their subordinates to engage in specific types of stops that match their personal enforcement preferences rather than the priorities of the department. Finally, it was repeatedly noted that there was inconsistent supervisory support for criminal interdiction. Some participants perceived strong support from their supervisors while others indicated little support, and most participants agreed that due to the amount of discretion afforded to supervisors, there was little consistency across supervisors in terms of support for interdiction. These inconsistencies across field supervisors should be addressed by DPS officials. More uniformity in field supervision will result if field supervisors are held accountable for ensuring their officers' compliance with existing rules and regulations.

Recommendation #5: The UCPI team also recommends that DPS make some modifications to the current process of supervisory oversight of the video recordings of traffic stops. The UCPI team also recommends prioritizing the purchase and installation of video recording equipment in all patrol cars as soon as fiscally possible.

To provide enhanced supervisory oversight of officer-initiated traffic stops, it is important that supervisors be required to *systematically* examine recordings that are *randomly* selected, a system which DPS already has in place. Specifically, the current DPS policy for supervisory review of videotapes of traffic stops allows for supervisors to review recordings for evaluation, training, or administrative purposes at their discretion. Furthermore, at least quarterly, each supervisor is required to review each officer's use of the mobile camera equipment, and review a minimum of three randomly recorded events

submitted by the officers. Following the review, the supervisor is required to complete the Mobile Video Program Supervisor Review form and submit it on a quarterly basis to the commander/manager. The UCPI team recommends expanding the current Supervisor Review form to allow for a more in-depth audit of officers' compliance with department policies and procedures. For example, the form might include a checklist of items related to: 1) courteous treatment of motorists (e.g., explaining the reason for the stop and the action to be taken, officer demeanor, etc.), 2) officer safety (e.g., approach of vehicle, safe road position, etc.), and 3) proper search protocol if applicable (e.g., use of required written consent form).

Currently, in Highway Patrol, approximately 32% of the patrol vehicles assigned to officers full-time are equipped with video cameras. The UCPI team recommends that DPS prioritize the purchase and installation of video recording equipment in all patrol cars as soon as fiscally possible. The financial implications of this commitment are beyond the purview of the research team. Video records of traffic stops, however, are an invaluable tool for officer accountability and supervisory oversight and should be a priority for the DPS.

Recommendation #6: It is recommended that the specific findings documented in this report be disseminated immediately to DPS supervisory personnel with a very clear mandate to begin exploring the reasons for the racial/ethnic disparities reported, and attempt to reduce them if believed to be based on illegitimate factors.

Better understanding of the racial/ethnic disparities in post-stop outcomes is necessary to ultimately reduce these disparities. Across the department, Hispanic, Native American, and Black motorists are significantly more likely to be issued citations, arrested, and searched compared to Whites, even after statistically controlling for reasons for the stop, vehicle, and stop characteristics. These racial/ethnic disparities in citations, arrests, and searches cannot be explained by factors currently collected on the current data forms. It continues to be important for DPS administrators to better understand and examine these trends. Field supervisory staff must be made aware of racial/ethnic disparities in citation, arrest, search, and seizure rates within their jurisdictions.

There are several possible explanations for these elevated rates that can only be determined based on local knowledge of the area and additional information that is not included in the data collection. In addition, racial/ethnic disparities in outcomes may be explained by other factors that were not included on the 2007 data collection form, but are now being collected as part of the redesigned electronic data collection system. Analyses in the Year 3 report may shed additional light on the reasons for the existence of these racial/ethnic disparities.

Further Examination of Racial/Ethnic Disparities

Recommendation #7: The UCPI team does not make any specific recommendations related to the racial/ethnic disparities in search success rates until more complete

analyses are able to be performed with the data collected in 2008 under the new data collection process. However, 2008 data collection will only include 3 months of data collected under the changed system. Therefore it is the recommendation of the UCPI team that data analyses be continued beyond the three year period required by the current contract.

The analyses of 2007 data indicated that even after considering the reason for the stop and other stop characteristics that can be measured with these data, Hispanic, Native American, and Black drivers were all more than twice as likely to be searched compared to White drivers. The higher rates of Hispanic searches specifically, however, do not produce comparable rates of seizures. Although Hispanic motorists were significantly more likely to be searched during officer-initiated traffic stops compared to Whites, they were significantly less likely to be found in possession of contraband. There are a number of reasons that might account for these racial/ethnic disparities, including legitimate explanations, or possibly officer discrimination / bias. In an effort to better understand racial/ethnic disparities in search and seizure rates, the UC research team conducted focus groups with canine handlers and officers assigned to the Highway Division that are actively engaged in search and seizure activity. The purpose of these focus groups was to provide a better understanding and context for criminal interdiction work in which to interpret the statistical findings related to searches and seizures.

Despite the high degree of confidence that focus group participants described in their ability to detect criminal activity, actual contraband seizure rates vary from approximately 50% or higher for searches initiated due to probable cause and canine alerts to less than 20% for searches conducted partially or solely based on consent. Focus group participants offered a number of possible explanations for this disparity between their perceived success in detecting criminal activity and the actual success in recovering contraband. One such explanation was the prevalence of undocumented aliens, who might exhibit similar cues of suspicion as drug traffickers or other criminals based on nervousness related to their illegal immigration status. The revised data collection system should include the ability to document the presence of *all* undocumented aliens. Specifically, the undocumented alien data field has been modified from previously just including undocumented drivers to now refer to drivers, passengers, and any combination of the two. Documenting the presence of any undocumented aliens will allow for more thorough analyses and a better understanding of racial/ethnic disparities in search success rates.

Although next year's analysis will include data from the redesigned electronic data collection system, it will only be for a 3 month period of 2008. Continuing the data collection analyses by an external research team after 2009 will allow for analyses of data that should be of higher quality and will include additional relevant variables that may explain the observed racial/ethnic disparities in post-stop outcomes. Additionally, ongoing data collection and analysis will allow for an assessment of the relative effectiveness of any policies, procedures, and training related to bias-based policing.

Recommendation #8: The UCPI team recommends that the DPS consider empirically investigating the predictive power of indicators of suspicion that officers utilize.

Another possible alternative explanation for the disconnect between actual contraband seizure rates and the focus group participants' confidence in their ability to detect criminal activity is the use of ineffective indicators of suspicion. Several participants indicated that it is not effective criminal interdiction to make a stop or initiate a search based on one indicator. Instead, focus group participants considered the totality of the circumstances (e.g., multiple indicators of suspicion) as paramount in determining whether to conduct a search. The predictive power of individual indicators of suspicion, either singularly or in combination with other indicators, however, is largely based on anecdotal evidence. A systematic examination of the predictive power of indicators of suspicion could develop empirical support for what indicators are the most successful and what combinations of indicators are the most powerful predictors of contraband seizures. A study of this nature would not necessarily involve new data collection, but could be conducted retrospectively. That is, archived DPS search reports (of non-mandatory searches) could be systematically coded for: pre-stop indicators present, during-the-stop indicators present, whether the search resulted in a contraband seizure, and the type and amount of contraband seized. The results of this research could be invaluable in future criminal interdiction training by developing empirical support for the most effective indicators of suspicion and the combinations of indicators that are most likely to produce successful searches.

Recommendation #9: The UCPI team recommends that the DPS consider requiring officers heavily involved in criminal interdiction (e.g., Canine handlers) to systematically record any search situations where no contraband is seized but criminal activity is detected.

Many focus group participants lamented that often searches justified by the circumstances (e.g., multiple indicators of suspicion) do not result in contraband seizures even when evidence of other criminal activity is detected. Participants described several situations that they argued justified the search, despite the lack of contraband seized. For example, participants suggested it is fairly common to encounter situations where a motorist admits illegal behavior or has drug debris or paraphernalia in the vehicle. Participants expressed frustration at having no place to indicate "admission of illegal activity" on the data collection form. If a motorist admits using drugs in the vehicle, but there is no contraband, this search is recorded as "unsuccessful" in terms of a seizure, despite having evidence that criminal activity was verified (and that officers' interpretations of the cues of suspicion were accurate). In addition, a few participants also noted that searches might be unsuccessful due to organized decoy vehicles. Participants explained that sometimes organized drug traffickers employ the use of a decoy vehicle with some drug odor to attract the attention of law enforcement and divert their attention from the vehicles carrying drugs. Although officers are aware of this tactic by drug traffickers, they indicated that sometimes they still end up in these scenarios.

It is recommended that officers heavily involved in criminal interdiction be required to systematically record the specific types of criminal activity detected that did not result in the discovery of contraband (e.g., admission, drug debris, etc.). With this type of information available, this possible explanation of the racial/ethnic disparities in searches and seizures can be empirically examined.

Recommendation #10: Based on the continuing trends of racial/ethnic disparities in search success rates, the UCPI team reiterates its recommendation based on the focus group findings that the DPS institute changes in training related to educating officers about the complexities of interactions with members of different racial/ethnic groups.

Focus group participants also offered possible explanations for racial/ethnic disparity in search success rates. In particular, they were asked to describe factors that may contribute to the comparatively lower Hispanic search success rates that were reported in Year 1 and are replicated in this Year 2 report. One of these explanations focused on the cultural differences in behavior that might lead to misinterpretation of indicators of suspicion. Specifically, the UCPI research team recommends that officers receive training in at least survival Spanish, if not more advanced language training. Furthermore, based on officer experiences and empirical research that supports the existence of cultural differences in behavior (for review, see Engel & Johnson, 2006), it is recommended that DPS consider developing training curricula that directly addresses cultural and racial differences in verbal and nonverbal behaviors, and the impact that these differences may have on the accuracy of indicators of suspicion and/or deception. Changes in training to address this issue, however, must be carefully considered by DPS personnel. There are a number of concerns surrounding training curriculum that identifies behavioral differences across racial/ethnic groups. It is critical that changes in criminal interdiction training designed to address these divergences provide accurate information regarding the potential differences in behaviors across racial/ethnic groups through descriptions regarding how these behavioral differences are best interpreted, as well as the use of tactics that provide more effective, efficient, and equitable services during traffic stops with all racial/ethnic groups.

Recommendation #11: The UCPI team reiterates its recommendations based on the focus group findings that DPS administrators review the manner in which members of the canine unit are trained and supervised. It is the specific recommendation of the UCPI research team that the procedures followed by canine handlers assigned to the northern unit should be used as the model for the other canine handlers in the central and south regions.

DPS administrators must closely examine the differences in searches and search success rates across divisions, bureaus and district/shifts and attempt to determine if these differences are due to legitimate factors. Of particular note are the obvious differences

within the Canine District that were described by canine handlers in the focus group sessions but are also evident in the statistical findings documented in this report.

It was clear from the focus groups with canine officers assigned to different geographic areas that there are obvious differences in the criminal interdiction philosophies of the supervisors of this unit. Most importantly, these philosophical differences result in different procedures followed by canine officers. These differences in procedures are evident in the statistical analyses of searches and seizures conducted by this unit. Given the high profile and liability of the canine unit, it is essential that instruction and procedures be consistently followed across the state. It is essential that both the procedures used in canine deployment and other interdiction practices by canine handlers be uniform. Further these procedures must conform to the known best practices in criminal interdiction work and law enforcement more generally. Based on information from the focus groups as well as the UCPI research team's experience riding along with members of the Canine unit across the state, the northern canine squad's procedures are the most consistent with best practices in criminal interdiction used in other agencies across the country.

In conclusion, the racial/ethnic disparities in traffic stop outcomes reported within this document are very consistent with findings from other jurisdictions across the country. This issue is not unique to the DPS – law enforcement agencies across the country have reported reoccurring and consistent racial/ethnic disparities in traffic stop outcomes, particularly searches and seizures. As demonstrated by their ongoing data collection and responsiveness to the UCPI research team's recommendations from the *Year 1 Report*, DPS officials remain committed to both the data collection effort and the larger goals of reducing racial/ethnic disparities in traffic stops and post-stop outcomes, as well as providing legitimate and unbiased policing services to Arizona citizens. The willingness of the DPS to explore alternative data sources to better understand these racial/ethnic disparities should serve as a progressive and professional model for other law enforcement agencies across the country. Expedient implementation of the new recommendations provided above will further these goals.

An update to this report will be delivered in November 2009, based on the statistical analyses of data collected during traffic stops in 2008, including a comparison of three months of data from the redesigned and expanded electronic data collection system. It is expected that this new data collection effort will lead to a better understanding of the racial/ethnic disparities in traffic stop outcomes, and further will enable DPS administrators to make changes in procedures and training that will continue to reduce these disparities over time.

7. REFERENCES

Anwar, S., & Fang, H. (2006). An alternative test of racial prejudice in motor vehicles searches: Theory and evidence. *American Economic Review*, 127-151.

Ayres, I. (2001). *Pervasive Prejudice? Unconventional Evidence of Racial and Gender Discrimination.* Chicago: The University of Chicago Press.

Baker, S. P., Braver, E. R., Chen, L., Pantula, J. F. & Massie, D. (1998). Motor vehicle occupant deaths among Hispanic and Black children and teenagers. *Archives of Pediatric & Adolescent Medicine, 152,* 1209-1212.

Becker, G.S. (1957). *The Economics of Discrimination*. Chicago: University of Chicago Press.

Braver, E. R. (2003). Race, Hispanic origin, and socioeconomic status in relation to motor vehicle occupant death rates and risk factors among adults. *Accident Analysis & Prevention*, *35,* 295-309.

Cole, D. (1999). *No Equal Justice: Race and Class in the American Criminal Justice System.* New York: The New Press.

Cruz, T.H. & Mickalide, A.D. (2000). The National SAFE KIDS Campaign Child Safety Seat Distribution Program: A Strategy for Reaching Low-Income, Underserved, and Culturally Diverse Populations. *Health Promotion Practice,* 1, 148-158

Engel, R.S. (2008). A critique of the "outcome test" in racial profiling research. *Justice Quarterly, 25,* 1-36.

Engel, R.S. (2005). Arizona Department of Safety Traffic Stop Data Report, January 2003- December 2003, Focus on I-17. Report submitted to the U. S. District Attorney's Office (District of Arizona) in the matter of *U.S. v. Bustamante*.

Engel, R.S. (2004). Arizona Department of Safety Traffic Stop Data Report, January 2003 - December 2003. Report submitted to the U. S. District Attorney's Office (District of Arizona) in the matter of *U. S. v. Gayle* and the Coconino County, Arizona Prosecutor's Office in the matter of *Arizona v. Palacios*.

Engel, R. S., Calnon, J. M., Tillyer, R., Johnson, R. R. Liu, L. & Wang, X. (2005). Project on Police-Citizen Contacts, Year 2 Final Report. Submitted to the Pennsylvania State Police, Harrisburg, PA.

Engel, R. S., Calnon, J. M., Liu, L., & Johnson, R. R. (2004). Project on Police-Citizen Contacts, Year 1 Final Report. Report submitted to the Pennsylvania State Police, Harrisburg, PA.

Engel, R.S., Cherkauskas, J.C., & Beck, S. (2008). Identifying Best Practices in

Criminal Interdiction Activities for the Nebraska State Patrol. Submitted to the Nebraska State Patrol, Lincoln, NE.

Engel, R.S., Cherkauskas, J.C., Tillyer, R. (2007a). *Traffic Stop Data Analysis Study Report: Final Literature Review and Review of Other Jurisdictions.* Submitted to the Arizona Department of Public Safety, Phoenix, AZ.

Engel, R.S., Frank, J., Tillyer, R., Klahm, R. (2006). *Cleveland Division of Police Traffic Stop Data Study: Final Report.* Report submitted to the Cleveland Division of Police.

Engel, R.S. & Johnson, R. (2006). Toward a better understanding of racial and ethnic disparities in search and seizure rates for state police agencies. *Journal of Criminal Justice, 34,* 605-617.

Engel, R.S. & Tillyer, R. (2008). Searching for equilibrium: The tenuous nature of the outcome test. *Justice Quarterly, 25,* 54-71.

Engel, R.S., Tillyer, R. & Cherkauskas, J.C. (2007b). *Understanding Best Search and Seizure Practices: Final Report*. University of Cincinnati, Submitted to the Ohio State Highway Patrol, Columbus, OH.

Engel, R.S., Tillyer, R., Cherkauskas, J.C., & Frank, J. (2007c). Traffic Stop Data Analysis Study: Year 1 Final Report. Submitted to the Arizona Department of Public Safety, Phoenix, AZ.

Everett, S. A., Shults, R. A., Barrios, L. C., Sacks, J. J., Lowry, R. & Oeltmann, J. (2001). Trends and subgroup differences in transportation-related risk and safety behaviors among high school students, 1991–1997. *Journal of Adolescent Health, 28,* 228–34.

Fridell, L. (2005). *Understanding Race Data from Vehicle Stops: A Stakeholder's Guide.* Washington, D.C.: Police Executive Research Forum.

Fridell, L. (2004). *By the Number: A Guide for Analyzing Race Data from Vehicle Stops.* Washington, D.C.: Police Executive Research Forum.

Harper, J. S., Marine, W. M., Garrett, C. J., Lezotte, D. & Lowenstein, S. R. (2000). Motor vehicle crash fatalities: a comparison of Hispanic and non-Hispanic motorists in Colorado. *Annals of Emergency Medicine, 36,* 589-596.

Harris, D. A. (2002). *Profiles in Injustice: Why Racial Profiling cannot work.* New York: The New Press.

Knowles, J., Persico, N., & Todd, P. (2001). Racial bias in motor vehicle searches: Theory and evidence. *The Journal of Political Economy*, *109*, 203-229.

Lange, J.E., Johnson, M.B., & Voas, R.B. (2005). Testing the racial profiling hypothesis for seemingly disparate traffic stops on the New Jersey Turnpike. *Justice Quarterly, 22,* 193-223.

Lerner, E. B., Dietrich, V. K. J., Billittier, A. J., Moscati, R. M., Connery, C. M., & Stiller, G. (2001). The influence of demographic factors on seatbelt use by adults injured in motor vehicle crashes. *Accident Analysis and Prevention*, *33*, 659-662.

Liao, T.F. (1994). *Interpreting Probability Models: Logit, Probit, and Other Generalized Linear Models*. Thousand Oaks, CA: Sage.

Ramirez, D., McDevitt, J., & Farrell, A. (2000). *A Resource Guide on Racial Profiling Data Collection Systems: Promising Practices and Lessons Learned*. Washington, D.C.: U.S. Department of Justice.

Royal, D. (2000). *Racial and ethnic group comparisons, National Surveys of Drinking and Driving Attitudes and Behavior – 1993, 1995, and 1997*. Washington, DC: National Highway Traffic Safety Administration.

Smith, W.R., Tomaskovic-Devey, D., Zingraff, M.T., Mason, H.M., Warren, P.Y., & Wright, C.P. (2003). *The North Carolina Highway Traffic Study*. Final Report to the National Institute of Justice, U.S. Department of Justice. [On-line]. Available: http://www.chass.ncsu.edu/justice/reports/hwy_traffic_study_03.htm

Wells, J. K., Williams, A. F., & Farmer, C. F. (2002). Seat belt use among African Americans, Hispanics and Whites. *Accident Analysis and Prevention, 34*, 523-529.