Project on Police-Citizen Contacts:
Year 2 Final Report (May 2003 – April 2004)

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Prepared Exclusively for:
Colonel Jeffrey Miller, Commissioner of the Pennsylvania State Police

Report Prepared By:

Robin S. Engel, Ph.D., Associate Professor of Criminal Justice
University of Cincinnati

Jennifer M. Calnon, M.A., Research Assistant
Social Science Research Institute, The Pennsylvania State University

Rob Tillyer, M.A., Research Associate
Center for Criminal Justice Research, University of Cincinnati

Richard Johnson, M.S., Project Director
Center for Criminal Justice Research, University of Cincinnati

Lin Liu, Ph.D., Associate Professor of Geography
University of Cincinnati

Xuguang Wang, M.S., Research Assistant
Department of Geography, University of Cincinnati

Please direct all questions and correspondence regarding this report to: Robin S. Engel, Ph.D., Division of Criminal Justice, University of Cincinnati, PO Box 210389, Cincinnati, OH 45221, email: robin.engel@uc.edu

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EXECUTIVE SUMMARY

OVERVIEW

This report documents the findings from statistical analyses of data collected during all member-initiated traffic stops with the Pennsylvania State Police from May 1, 2003 – April 30, 2004. These data represent the second year of data collection for the Project on Police-Citizen Contacts. The purpose of this data collection effort was to help the Pennsylvania State Police determine if there are racial and ethnic disparities in traffic stops and post-stop outcomes. The Pennsylvania State Police have a clear policy prohibiting “biased-based” policing and voluntarily collected information to ensure this policy is being followed by Troopers. To determine if racial disparities exist, data were collected during 315,705 member-initiated traffic stops department wide from May 1, 2002 – April 30, 2003. These traffic stop data were then compared with benchmarks created to approximate the “expected rates” of traffic stops for different racial and ethnic groups. Based on these comparisons, disproportionality ratios were created for all 67 counties in Pennsylvania. In addition, statistical analyses were performed to determine if there were racial / ethnic disparities in traffic stop dispositions (e.g., warnings, citations, and arrests). Additional analyses examined racial/ethnic disparities in the rates of search and seizures, with racial group comparisons of search success rates (i.e., searches successful based on the discovery of contraband or other property seized). This Executive Summary briefly documents the methodology and findings based on these analyses.

ASSESSING RACIAL / ETHNIC DISPARITIES IN TRAFFIC STOPS

To estimate the amount of racial/ethnic disparity in traffic stops conducted by the Pennsylvania State Police, five different benchmark/traffic stop comparisons were made at the county level: 1) all traffic stops in all 67 counties compared to residential Census driving-age populations, 2) traffic stops in all 67 counties of motorists who reside in the county where the stop was made compared to residential Census driving-age populations, 3) all traffic stops in all 67 counties compared to traffic flow models created from residential Census data and traffic stop data, 4) daytime traffic stops in 27 counties compared to daytime roadway usage observations in those 27 counties, and 5) daytime traffic stops for speeding in 27 counties compared to daytime speeding observations for those 27 counties. The disproportionality ratios created for these five comparisons varied across benchmarks and across counties using the same benchmark. Despite the fluctuations in the disproportionality ratios, consistent patterns emerged. As the benchmarks that were used represented a closer approximation to actual traffic patterns, the disproportionality ratios decreased dramatically. This suggests that as we are better able to approximate the true driving population, comparisons of traffic stops made by PSP Troopers to these estimates show less and less disparity. One benchmark comparison (the traffic flow model) even suggests that in most counties, PSP Troopers are actually *less* likely to stop minority motorists than Caucasians, compared to minorities’ representation in the driving population.

Further exploration of the initial disproportionality ratios created from comparisons of all traffic stops to residential populations suggests that the racial/ethnic disparities are likely due to legitimate factors. First, most of the counties with high disproportionality ratios also have very small minority population, which results in artificially inflated disproportionality ratios. Second, many of the counties with high levels of racial/ethnic disparities in traffic stops also contain a major interstate or thoroughfare that alters the racial composition of the driving population compared to the residential population. Third, stops in these counties are above the departmental average for stops involving out-of-state, out-of-county, and out-of-municipality residents. This suggests that the residential populations used to determine the disproportionality ratios are not appropriate. Fourth, the percentage of stops of minorities in these counties during daylight hours is similar to the percentage of minorities stopped during evening hours when it is more difficult to assess the characteristics of the driver. Fifth, comparisons of traffic stops to estimates created from the traffic flow model suggest there are no racial/ethnic disparities, or the disparities are in the reverse direction as predicted (i.e., Caucasian motorists are more likely to be stopped compared to minority motorists). Finally, racial group comparisons of roadway usage and speeding observations to residential Census data indicate that residential Census data dramatically underestimates or overestimate the percentage of minority drivers.

Additional findings based on multiple analyses of traffic stops department wide also do not support the suggestion that PSP Troopers make stops based on drivers' race / ethnicity. First, the percentage of daylight stops of minority citizens department wide was roughly equivalent to the percentage of nighttime stops, when determining the characteristics of drivers is more difficult, if not impossible, prior to the stop. Second, although the rates for stops of non-Caucasian drivers are higher in some counties than their proportion in the population, findings from the roadway usage observations indicate that residential and driving populations often differ dramatically and therefore at least partially explain racial disparities in traffic stops. Third, observations of speeding behavior suggest that minority drivers (Blacks and non-Caucasians) are more likely to speed, and more likely to do so aggressively, compared to Caucasian drivers. Since the majority of PSP traffic stops are for speeding violations (72%), the speeding behavior of minority drivers likely puts them at an increased risk for traffic stops compared to Caucasian drivers. Finally, contrary to profiling allegations that suggest minorities are stopped for less serious reasons, minority drivers stopped for speeding were found to be traveling at higher speeds compared to Caucasian drivers stopped for speeding.

Based on all of the findings in the Year 1 and Year 2 Final Reports, it is the conclusion of this research team that there continues to be no consistent evidence that Pennsylvania State Troopers make stopping decisions based on drivers' race and/or ethnicity.

ASSESSING POST-STOP OUTCOMES

A second line of inquiry in this report was whether or not there were racial / ethnic differences in the outcomes motorists receive as the result of a traffic stop (e.g., warnings, citations, arrests, and searches). To properly examine this research question, hierarchical non-linear multivariate models were estimated in an effort to determine the relative influence of drivers' race/ethnicity on post-stop outcomes while statistically controlling for other relevant legal and extralegal factors. Findings from the Year 1 Report indicated that while there were no statistically significant differences in warnings and citations, Black and Hispanic drivers were significantly more likely than Caucasian drivers to be arrested and searched. Specifically, after controlling for other relevant legal and extralegal factors, the findings in the Year 1 report indicated that Black and Hispanic motorists were 1.5 and 1.8 times more likely to be arrested, and 3.0 and 2.7 times more likely to be searched, compared to Caucasians, respectively.

The findings based on the second year of data (May 1, 2003 – April 30, 2004) shows improvement in the racial/ethnic disparities in post-stop outcomes. There continues to be no statistically significant racial/ethnic differences in the likelihood of being issued a warning or a citation as the result of a traffic stop. That is, after controlling for other legal and extralegal factors, Caucasian and non-Caucasian motorists are equally likely to receive a warning or citation. Unlike the findings from the Year 1 Report, data collected in Year 2 also demonstrates no statistically significant differences in the likelihood of arrest across racial/ethnic groups. That is, data from Year 2 demonstrate that after statistically controlling for other legal and extralegal factors, Caucasian and non-Caucasian motorists are equally likely to be arrested by Pennsylvania State Troopers during member-initiated traffic stops. The most coercive police action (i.e., arrest) is now equally applied across racial/ethnic groups. This suggests substantial improvement over the Year 1 findings.

Based on the findings in the Year 2 Final Report, it is the conclusion of this research team that there is no consistent evidence of racial/ethnic disparities in traffic stop dispositions including warnings, citations, and arrests.

EXAMINING SEARCHES & SEIZURES

Multivariate hierarchical non-linear models were also estimated to determine the relative influence of drivers' race/ethnicity on PSP Troopers' decisions to conduct searches. The findings suggest that as with the Year 1 Report, racial/ethnic differences in the likelihood of conducting searches remain a cause for concern. While it appears that the reasons for the stop and other legal characteristics are 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). The odds ratios indicate that the differences in outcomes based on drivers' characteristics merit further consideration. After controlling for other relevant legal and extralegal factors, findings from the Year 2 data indicated that the odds of being searched are 3.1 and 3.0 times higher for Black and Hispanic drivers compared to Caucasian drivers, respectively. Furthermore, when considering only stops for speeding (where the exact severity of the offense can be directly measured as the amount over the speed limit) Black and Hispanic drivers were 3.8 and 3.9 times more likely to be searched compared to Caucasians, respectively. As noted within this report, however, caution must be used when interpreting these findings because not all factors that might influence officer decision-making have been included in the statistical models. It is possible that some unmeasured legal and extralegal factors might account for some of the racial and gender disparities reported in traffic stop outcomes. Of particular concern is the inability to measure citizens' inconsistent stories when questioned by Troopers, along with any non-compliance and verbal resistance displayed by citizens during traffic stops.

Despite these limitations, the disproportionate searching of Black and Hispanic drivers merits further consideration. Section VI of this report is dedicated to examining issues surrounding searches and seizures during member-initiated traffic stops. The findings showed that PSP searches of minority drivers were less successful in recovering contraband compared to searches of Caucasian drivers. Specifically, department wide, 30.0% of the searches of Caucasian drivers resulted in the seizure of contraband, compared to 21.2% of the searches of Black drivers, 14.2% of the searches of Hispanic drivers, and only 9.4% of the searches of drivers of other racial groups. The racial/ethnic disparity in search success rates is similar to the patterns reported for other state police and highway patrol agencies across the country. The findings also showed that Hispanic and other non-Caucasian drivers were significantly more likely to be searched based on discretionary reasons compared to Caucasian and Black drivers. These findings, however, do not address the legality of individual searches. That is, the data collected and reported within this document only examine trends and cannot address questions of whether or not individual searches conducted by PSP Troopers are legally justified or based on discrimination.

When examining the reasons for searches, the largest percentage was conducted based solely on the drivers' consent (45.6% of all searches). Consent only searches, however, were the least productive in terms of discovering contraband compared to other reasons to search (e.g., mandatory and suspicion searches). Department wide, 14.5% of searches based solely on consent resulted in the discovery of contraband. This consent search success rate is similar to the rates reported by other state police and highway patrol agencies. A substantial proportion of motorists did not give their consent to be searched when asked by Troopers for consent (32.5% of motorists asked for consent). Of those who refused to give consent, however, nearly half (48.9%) were searched based on a different reason. The search success rates of those who gave consent and those who refused consent, but were subsequently searched anyway, were statistically equivalent (16.1% compared to 17.5%, respectively). In addition, Caucasians were significantly less likely to give their consent to be searched compared to drivers of other races/ethnicities. That is, racial minorities were more likely to comply with officers' requests to search their persons and/or vehicles compared to Caucasians.

Based on the findings in the Year 2 Final Report, it is the conclusion of this research team that racial and ethnic disparities exist for searches conducted during member-initiated traffic stops. It cannot be determined with these data, however, if these disparities are due to discrimination. Rather, the findings show that racial and ethnic disparities in searches remain after statistically controlling for the legal and extralegal factors that can be measured with these data.

POLICY RECOMMENDATIONS

Based on findings and recommendation in the Year 1 Report, the Pennsylvania State Police implemented or continued a series of initiatives designed to address racial/ethnic disparities in traffic stop dispositions. In addition to these initiatives, the following recommendations are also provided:

1) Supervisory staff be made aware of, and held accountable for, racial/ethnic disparities in search and seizure rates within their jurisdictions.

2) PSP administrators should examine Trooper compliance with the waiver or rights and consent to search form (Form SP 7-0027). Internal order OM 7-2, dated 6/24/87 requires that "the member requesting a consent to search shall ensure that the Waiver of Rights and Consent to Search form is prepared." Current practices, however, suggest that the consent to search form is not routinely used by Troopers in the field. Mandatory use of this form may reduce the racial/ethnic disparities in the rate of consent searches. As noted within this report, Caucasians are significantly more likely than minorities to refuse consent when asked. It is possible that minority drivers are less likely than Caucasians to be aware of their rights to refuse. Therefore, the use of Form SP 7-0027 should be considered mandatory for all consent searches and supervisory oversight regarding the proper use of this form should be reestablished.

3) As noted in the Year 1 Report, PSP administrators should give further consideration to how officers are trained to identify "suspicious" behavior. It is currently unknown what motorists' behaviors prompt PSP Troopers to ask for consent to search and/or to conduct searches based on more discretionary reasons. It is further unknown what factors lead to successful versus non-successful searches. Gaining this type of information is critical to produce effective change within the police organization. PSP administrators were encouraged in the Year 1 Report to implement research projects designed to elicit this type of information. A research project specifically designed to examine the verbal and non-verbal behaviors of motorists that make Troopers "suspicious," and the accuracy of those "suspicion" cues is scheduled to begin July 1, 2005 and will conclude September 30, 2006.

4) Finally, it is recommended that the Pennsylvania State Police continue to collect and analyze traffic stop data. By comparing the multiple years of traffic stop data, it will be possible to determine the relative effectiveness of any new policies and training on the rates of searches and seizures of minority motorists. The Pennsylvania State Police are currently considering a proposal to extend data collection to April 30, 2006.

I. INTRODUCTION

OVERVIEW

This report documents the findings from statistical analyses of data collected during all member-initiated traffic stops by the Pennsylvania State Police from May 1, 2003 – April 30, 2004. These data represent the second year of data collection for the Project on Police-Citizen Contacts. Only the analyses of consent searches (pages 182-185 in Section VI) are based on a subset of these data (i.e., analyses of consent searches are based on data collected from October 1, 2003 – April 30, 2004). Analyses of consent searches are limited to 7 months of data because of changes to the data collection instrument (based on findings reported in the Year 1 Final Report) that were implemented October 1, 2003. The changes to the Contact Data Report (i.e., the traffic stop data collection form) are documented on pages 23-25 in Section II.

DATA COLLECTION FOR THE PENNSYLVANIA STATE POLICE

In January 2002, the Pennsylvania State Police (PSP) contracted with Dr. Robin Engel, Principal Investigator, and her research team to design, collect, and analyze data for the "Project on Police-Citizen Contacts" (PPCC). PSP administrators formed an internal committee of approximately 15 individuals who worked with the academic research team to draft a data collection instrument for use by Troopers during all member-initiated traffic stops.

It should be noted that the Pennsylvania State Police teamed with external research partners to ***voluntarily*** implement a data collection effort designed to examine traffic stop patterns and post-stop outcomes for citizens stopped by PSP Troopers. Furthermore, the Pennsylvania State Police have ***voluntarily*** continued the collection of data during all member-initiated traffic stops for three years (May 1, 2002 – April 30, 2005). A one-year contract extension is currently pending for a fourth year of data collection and analyses (May 1, 2005 – April 30, 2006).

Preliminary statistical analyses and interpretation based on the first three months of data collection (May, June, and July, 2002) were provided in the first quarter report, delivered on October 1, 2002. More detailed and sophisticated statistical analyses, data interpretations, and policy recommendations based on the first six months of data (May – October, 2002) were provided in the second quarter report delivered on January 15, 2003. Similar analyses to those completed for the six-month report were produced based on nine months of data (May 2002 – January 2003) for the third quarter report, delivered April 1, 2003. The Year 1 Final Report, based on data collected from May 1, 2002 – April 30, 2003 documented the final results from the roadway observation and speeding study, comparisons of various benchmarks for traffic stop data, and final multivariate analyses of post-stop outcomes. The Year 1 Final Report was delivered in February 2004, and was made publicly available in May 2004 on the Pennsylvania State Police's website at http://www.psp.state.pa.us/.

The results from the Year 1 Final Report suggested that while there was no consistent evidence to suggest that Pennsylvania State Troopers made traffic decisions based on drivers' race and/or ethnicity, there were documented racial/ethnic disparities in the post-stop outcome these motorists received, compared to Caucasians. Specifically, the multiple benchmarks used for the Year 1 Final Report showed that the majority of racial and ethnic disparities in traffic stops could be partially explained by racial/ethnic differences in traffic patterns and law violating behavior. After the stop was made; however, racial and ethnic disparities in the dispositions that motorists received were readily apparent. After controlling for other relevant legal and extralegal factors, Black and Hispanic motorists were 1.5 and 1.8 times more likely to be arrested, and 3.0 and 2.7 times more likely to be searched, compared to Caucasians, respectively. Furthermore, analyses of search consent rates showed that although Black and Hispanic motorists were searched at higher rates compared to Caucasians, success of those searches (measured as the discovery of contraband) was lower than the search success rates of Caucasian motorists. That is, the search "hit rate" of minority motorists was lower than the "hit rate" of Caucasians. Based on these findings, the Year 1 Final Report recommended a series of policy and training recommendations, including:

1) The establishment of new department policies regarding biased-based policing.
2) In-service training focusing on searches and seizures.
3) The continuation of the traffic stop data collection project.
4) The addition of data collection on information related to search decisions.
5) The installation and use of digital recorders in every patrol car.
5) A redirected focus on officer training and supervisor accountability.
6) Further examination of the factors that lead officers to initiate searches.
7) Reconsideration of policies regarding consent and other types of discretionary searches.

The response from the Pennsylvania State Police was swift and comprehensive. Specifically, the Pennsylvania State Police began or continued the following initiatives:

1. A formal policy was adopted by PSP in March 2003 that made all traffic and pedestrian stop dispositions based on race and/or ethnicity (including searches and seizures) an explicit element of the ban against biased-based policing. Specifically, the policy states:

> Biased-based profiling is strictly prohibited and will not be tolerated by the Department. Biased-based profiling, commonly referred to as 'racial profiling,' is any traffic stop, field contact, vehicle search, asset seizure, forfeiture, or enforcement action based on a common trait of a group. Common traits include, but are not limited to: race, ethnic background, gender, sexual orientation, religion, economic status, age, or cultural group. Traffic stops, field contacts, vehicle searches, asset seizures, forfeitures, and enforcement actions shall be conducted in accordance with existing law and Department directives and regulations.
>
> Members shall obey the law and enforce it without any consideration of class, creed, or condition. Commanders, Directors, and supervisors shall ensure each traffic stop, field contact, vehicle search, asset seizure,

> forfeiture, or enforcement action effected by members is conducted fairly, professionally, and in accordance with existing law, Department directives, and regulations.
>
> Traits such as race, ethnic background, gender, and age should be taken into consideration when searching for the suspect of a specific crime where race, ethnic background, gender, or age is part of the reported description. In such cases, members shall not focus the search solely for individuals who share the race, ethnic background, gender, or age of the suspect, and ignore the other elements of the description (e.g., height, weight, clothing, etc.) (Pennsylvania State Police, 2003).

2. The Deputy Commissioner of Administration ordered new mandatory training for all Troopers. PSP trainers were given specialized instruction at the training academy from February 21, 2003 – March 3, 2003. These trainers then conducted in-service training that was completed by all Troopers by July 31, 2003. The new training included the following information:

   > A refresher on constitutional criminal procedure with a focus on searches and seizures of persons and vehicles was provided. A specialized segment on biased-based policing was included, which emphasized that citations, arrest, and searches based on race / ethnicity were strictly prohibited. The training also highlighted findings from data collected by the Bureau of Justice Statistics that found minority drivers who reported being stopped and searched by the police were significantly less likely to be in possession of contraband, compared to white drivers (see Engel & Calnon, 2004a). Similar findings from other studies regarding lower search success rates of minority drivers compared to white drivers were also included in the training. That is, the new training included a component that demonstrated to Troopers the racial differences in search success rates nationwide, and thus demonstrated the factual outcomes of officer behaviors. Troopers were made aware that the generalized targeting of minority drivers in an effort to disrupt the flow of drug trafficking, and/or confiscate weapons (initially recommended in the 1980s by the DEA through such programs as "Operation Pipeline") is actually an ineffective and inefficient use of police resources that leads to poor police-community relations. Troopers were also instructed that they may only use race / ethnicity as a consideration in conducting searches if these factors are part of a more specific suspect description.

3. The traffic stop data collection effort was continued through April 30, 2005, with a contract pending for data collection and analyses through April 30, 2006. Results from data collection efforts will be made publicly available on an annual basis.

4. The Contact Data Reports were redesigned to include additional information regarding searches and their use department wide began October 1, 2003. The results from the additional information collected regarding the requests of consent searches are highlighted in Section VI of the current report.

5. The department is continuing the process of installing digital in-car cameras in all marked patrol vehicles to record what happens during a vehicle stop. This process should be completed within two years. Under Pennsylvania law, police

officers using in-car cameras equipped with audio recording capabilities must inform all individuals identifiably present that the vehicle stop has been recorded. Individuals have the right to request that this recording be preserved for use in any criminal or civil proceeding. These recording devices will likely protect both citizens and Troopers from potential abuse. The use of these recorders could provide administrators with important information to be used for training purposes.

6. Officers and supervisors were retrained on the use of the Contact Data Reports where necessary. Furthermore, Colonel Miller and Lieutenant Colonel Brown emphasized a renewed focus on the accuracy and importance of this data collection effort. Their efforts are apparent through the reduction in the rate of missing data on the Contact Data Reports, which decreased from 4.3% missing data in the first year of data collection to 1.8% missing data for the second year.

7. The Pennsylvania State Police is currently in contract negotiations with the University of Cincinnati to provide additional research designed to further examine the factors that lead officers to initiate searches. A review of the design and methodology of this proposed additional research is further described in Section VII of this report.

8. PSP administrators will await the additional information provided from the abovementioned research project prior to reconsideration of the policies regarding consent and other types of discretionary searches.

ISSUES INVOLVED IN POLICE STOP DATA COLLECTION

As documented in the Year 1 Final Report, there are four core areas of concern in all traffic stop data collection efforts: 1) data collection of traffic stop data by police (i.e., the numerator), 2) comparison of traffic stop data to benchmarks (i.e., the denominator), 3) the creation and interpretation of disproportionality indices and ratios (i.e., the numerator divided by the denominator), and 4) examinations of post-stop outcomes (i.e., disposition data). Each of these four areas has special considerations and research issues that must be addressed to provide data and analyses that are accurate and valid. These issues, and the responses of the Pennsylvania State Police and academic research team regarding these issues, were documented in the Year 1 Final Report (see Engel, et al., 2004) and are replicated below. In addition, a final concern regarding the appropriate interpretation of traffic stop data has been added to this report.

Data Collection of Traffic Stop Data (i.e., "The Numerator")

One of the most consistent problems with racial profiling data is the questionable validity of the actual stop data that is collected by individual officers. The importance of maintaining reliable and valid traffic stop data cannot be understated. Regardless of the sophistication of the statistical analyses and benchmark comparisons utilized by researchers, the research study is virtually meaningless if the traffic stop data itself is not valid. It is imperative that police departments initiate data collection efforts that incorporate considerable forethought and planning. The following factors are among the most important to consider: 1) selecting the mechanism for data collection, 2) developing the data collection instrument, 3) conducting a pilot test, 4) training Troopers to use the data collection instruction, 5) minimizing officer disengagement, and 6) developing a data auditing system. Each of these factors and the response from PSP are described below.

1. Selecting the mechanism for data collection

As previously noted, a group of approximately 15 high-ranking PSP officials from across departmental units were selected to serve as members of the Police/Citizen Contact Policy Committee. These committee members met several times over the course of a year to identify the best mechanism for collecting traffic stop data. There were several possibilities, including the use of MDTs, palm pilots, hand written forms, and scannable forms. Ultimately, PSP administrators decided to utilize scannable forms and contract with an outside academic research team to collect, audit, and analyze the data. Scannable forms were selected because of the time-intensive and costly nature of using hand-entered forms and the lack of computer technology to allow for direct data entry by all officers. Thus, recognizing the size and complexity of the data collection task, the research team recommended and the committee approved the use of scannable forms.

A scanner (i.e., the Scanmark ES 2800) and data collection forms were purchased from Scantron, Inc. The data scanner reads each individual form and enters the information into a compiled data file. This data collection procedure was believed to be the least intrusive and most cost-effective option for PSP prior to the collection of data through individual mobile data terminals (MDTs) scheduled to be installed in every police cruiser during 2005 – 2006.

2. Developing the data collection instrument

The specific data collection instrument utilized by PSP troopers was developed over the course of three months through a series of meetings by the Police/Citizen Contact Policy Committee. Committee members sought to develop a form that would include the relevant data items while limiting officer disengagement due to the possible cumbersome task of actually collecting the data.

The committee was guided in their decisions by examining data collection forms used in other departments and data collection guidelines developed for the National Institute of Justice. The specific elements included on the form represent a compromise between what is needed to assess patterns of officer decision-making, and the logistical issues associated with collecting information. The form was devised to capture the most possible information without interfering with Troopers' duties and/or lengthening traffic stops for citizens.

PSP Troopers of all ranks were instructed to fill out these forms after every *member-initiated* traffic stop. Traffic stops based on citizens' initiation or as the result of police check-points (e.g., DUI, seat belts, etc.) are not included in the data. In addition, contact with citizens resulting from traffic accidents was also excluded from the data collection effort.

The police contact form ultimately utilized by Troopers gathered information regarding: 1) the stop (e.g., date/time, location, type of roadway, reasons for the stop, and the duration of the stop), 2) the driver (e.g., gender, age, race/ethnicity, zip code of residency), 3) the vehicle (e.g., state of registration, number of passengers), 4) the outcome of the stop (e.g., citation, written warning, arrest, search, property seized during the search), and 5) identification information (e.g., location of the stop – county and municipality, and the Troopers' station and employee identification). This data collection instrument was slightly revised after 17 months of data collection. The initial and redesigned data collection instruments are further described in Section II of this report.

The gender and racial/ethnic characteristics of drivers stopped were determined through officers' perceptions. That is, drivers were not asked to identify their gender, race, or ethnicity. The use of officers' perceptions of drivers' race/ethnicity is an acceptable method for examining racially based policing. Officers may incorrectly perceive drivers' actual race and/or ethnicity. This possible misperception, however, is irrelevant for data collection analyses that seek to explain officer-decision making. Accusations of racial profiling are based on the presumption that officers treat minority citizens differently. Therefore, proper data collection efforts must identify officers' *perceptions* of the race/ethnicity of the driver, not the driver's actual race/ethnicity. Other information about the driver (year of birth and residential zip code) was gathered from drivers' licenses.

3. Conducting a pilot test

Data collection pilot tests are simply a "dry run" for the data collection effort. They ensure that the research design is feasible, and the data collected is both reliable and valid. Pilot tests are typically conducted by a selected group of officers in a more limited geographic area. Based on findings from the pilot test, the data collection instrument is changed and officer training is modified (if needed).

The Police/Citizen Contact Policy Committee developed an initial data collection instrument that was pilot tested in the Chambersburg Station for four weeks in February 2002. Based on data results and informal feedback from the Troopers involved in the pilot test, the data collection form was enhanced, Troopers were trained, and the data collection effort was expanded department-wide in April 2002. The data collected during the first four weeks in April 2002 served as a department-wide pilot test. Data collected during this period were analyzed and PSP administrators were provided immediate feedback. Once the training of officers was modified, the data collection process began May 1, 2002.

4. Training Troopers to use the data collection instrument

Following the first pilot test in Chambersburg, PSP's 89 Troop Education Officers attended "Train-the-Trainer" sessions for three days in mid-March. The Troop Education Officers (TEO's) were trained at the State Police Academy in Hershey and the four Regional Training Centers. The TEO's were provided with a lesson plan, a videotape, and a copy of Special Order 2002-27, "PSP Contact Data Collection." Once the training of the TEO's was complete, they were directed to return to their respective Troops and train all Troop members by 3/31/02. The implemented Roll Call training consisted of:

1. Viewing Part 1 of the video, which consisted of Commissioner Evanko providing the purpose and rationale behind the data collection project. Barbara Christie, Chief Counsel for PSP, discussing the legal principles involved in conducting traffic stops, searching of vehicles, bias-based profiling, and relevant case law pertinent to traffic stops and vehicle searches.
2. Members were then instructed on the use and completion of the Contact Data Report form (included in Section II) by incorporating the content of Special Order 2002-27 into the training.
3. Viewing of Part 2 of the video, which featured Dr. Robin Engel discussing her role in the project, the manner in which the data would be collected and analyzed, an explanation of the need for the various codes on the data collection form (e.g., station code, zip code, etc), the role of PSU undergrads in the project, and addressing member concerns relative confidentiality of identities of members reporting data, etc.

5. Minimizing officer disengagement

Officer disengagement refers to a reduction in officers' activities due to changes in work conditions. Officer disengagement is a potential problem accompanying any change in reporting procedures. The extent and severity of officer disengagement after officer-citizen contact data collection efforts have been implemented, however, have not been adequately assessed in previous studies. It has been generally acknowledged that officer disengagement likely accompanies most data collection efforts initially; however, it is substantially reduced within four to six months, as the data collection becomes part of the officers' daily routines.

Officer disengagement can likely be minimized through a number of mechanisms. First, it is essential that rank-and-file officers are involved in the initial decision-making regarding the data collection effort. Second, issues of confidentiality of the data must be addressed. Third, continual supervisory oversight and holding officers accountable for their activities is essential. Finally, there must be a commitment from department administrators for the data collection effort itself.

Sergeant Bruce Edwards, President of the Pennsylvania State Troopers' Association, was involved in the initial meetings of the Police/Citizen Contact Policy Committee. In addition, the Principal Investigator, Dr. Robin Engel, met with union officials and their membership to discuss their concerns. A compromise was made between PSP administrators and union officials regarding the capture and dissemination of Troopers' unique identifiers on the forms. Ultimately, Troopers' employee identification numbers were included in the data collection forms but confidentiality was promised and maintained to Troopers by the Principal Investigator and academic research team. Specific procedures were designed and implemented by the academic research team for handling confidential data that were initially approved by the by The Pennsylvania State University Institutional Review Board in January 2002, and subsequently approved by the University of Cincinnati Institutional Review Board in August 2003. These procedures conformed to the requirements used by the universities to protect human subjects.

The identity of PSP Troopers was protected in the following ways. The forms filled out by individual PSP Troopers were collected at the station level and mailed weekly to a post office box rented by the academic research team. Once the individual forms were received and scanned by project personnel, they were stored in a locked file cabinet, within a locked project office at the Pennsylvania State University until the electronic datasets were corrected for errors and considered ready for analysis. At that point, the actual scan forms containing Troopers' employee identification numbers were destroyed.

After the information was scanned into a database, the employee identification number was used to combine these data with demographic information about each Trooper (e.g., Troopers' sex, race, length of service, rank, education, and current assignment). After the data was scanned and the files were merged, the employee numbers were deleted from the new data file. The original data with employee identification numbers was destroyed. This entire procedure was conducted under the direct supervision of the Principal Investigator.

Using this procedure, individual officers' identities cannot be disclosed. As with analyses prepared for the Year 1 Report, only aggregate comparisons will be produced (e.g., differences in behavior patterns between male and female officers, majority and minority officers, particular units, etc.) and are reported for the department as a whole.

Individual Troopers were made aware of these procedures through the Pennsylvania State Troopers' Association and were documented on the training video. It is believed that the promise of confidentiality and adherence to confidentiality procedures increased the validity of the data collection effort and reduced officer disengagement, although the precise impact cannot be measured.

Officer disengagement was also likely reduced due to continual supervisory oversight of the data collection effort. Field supervisors were required to review and sign every data collection card. In addition, PSP administrators continually emphasized the importance of the data collection effort to Area and Troop Commanders. Officer disengagement was also likely limited due to the data auditing system described in detail below.

Despite these efforts, some officer disengagement is to be expected. The extent of officer disengagement can be estimated with measures of officer productivity. Assuming that officers continue their ratio of the number of stops to the number of citations issued, the extent of officer disengagement can be estimated by comparing the number of citations issued before and after the data collection effort. These analyses should be conducted at aggregate levels (e.g., troop, shift, etc.) to determine if officer disengagement is concentrated in particular areas of the organization.

Major W. John Pudliner (Ret.) initially assessed the level of officer disengagement. Major Pudliner's analyses, based on a comparison of the number of citations issued monthly in 2002 to the average number of citations issued monthly for the past five years, suggested that some amount of officer disengagement did exist. His report indicated that Troopers' activity (in the form of citations) were significantly lower in several Areas and Troops during the first three months of the data collection effort. To our knowledge, the level of officer disengagement has not since been reassessed. We recommend that this type of data analysis now be conducted for the full two-year period.

6. Developing a data auditing system

Maintaining data quality ensures reliable and valid results. It is essential for any data collection effort, but particularly important for data collected through official sources (i.e., the police). There are five general ways that traffic stop data may be inaccurate: 1) the information is incorrectly recorded, 2) some stops are not recorded, 3) data is missing due to random and non-random errors, 4) data is intentionally missing, and 5) data contains misstatements of facts (Fridell, 2003). Data "auditing" can be used to check for these types of inaccuracies and to maintain quality control.

The data auditing procedures used by the research team included: 1) rejection of improperly completed forms by the scanner, 2) routine identification and correction of data errors and inconsistencies in the compiled data sets, and 3) continual feedback to PSP administrators regarding the levels of errors and missing data.

Throughout the data collection effort, PSP administrators were delivered biweekly status reports indicating the number of forms received from each station, the percentage of forms rejected by the scanner, and the percentage of forms with missing data and/or other errors. With this information, PSP administrators were able to provide continuous feedback to Area, Troop, and Station Commanders regarding their officers' compliance with departmental directives. These procedures are further described in Section II.

One typical method of data auditing – conducting cross-checks of traffic stop data with other data sources – was not possible. The data collected by PSP Troopers could not be linked to any other existing data because it did not include unique identifiers. For example, the traffic stop form could not be connected to a citation form, arrest report, etc., that may have resulted from that stop, to check for the accuracy of the data.

Data Collection of Benchmarks (i.e., “The Denominator”)

The second important issue facing researchers examining police traffic stops is determining how often minorities are stopped by police; however, this is not particularly meaningful until those percentages are compared to some “expected probability” of these actions toward minorities (Rojek, Rosenfeld, and Decker, 2002). These expected probabilities are often referred to as “benchmarks,” “base rates,” “baselines,” or “denominators.” Studies examining racial disparities compare police stop data with the “expected” rate of stops of minorities assuming that no racial discrimination or prejudice exists by police.

The most frequent type of data used to determine expected probabilities is Census population figures. Though readily available, comparisons based on Census data are limited. First, several researchers have suggested that there is ample reason to suspect that residential populations do not necessarily represent the driving population in those areas. Second, the Census does not include measures of driving behavior that may account for racial disparity in stops. That is, merely demonstrating a difference between the percent of minorities stopped and the percent living in a particular area does not necessarily mean police officers have acted inappropriately. Indeed, an alternative explanation is that disparities may reflect differences in legally relevant behavior by members of particular demographic groups (Walker, Spohn, and DeLone, 2000).

Some researchers have defended the use of population figures as an appropriate comparison group, suggesting that no research has indicated that there are racial differences in traffic violations or travel routines (ACLU; 2000; Lamberth, 1996, Verniero & Zoubek, 1999). Research in the travel, transportation, and accident analysis literatures, however, does show considerable racial and ethnic differences in a variety of driving-related behaviors including:

- Frequency of driving personal vehicle/use of public transit (Krovi & Barnes 2000; Meehan & Ponder, 2002; Polzin, Chu, & Rey, 2000; Rosenbloom, 1998)
- Seat belt use (Baker et al., 1998; Braver, 2003; Everett et al., 2001; Glassbrenner 2003; Harper et al., 2000; Lerner et al., 2001; Nachiondo & Robinson, 1996; Wells, Williams, & Farmer, 2002)
- Vehicle ownership (FHA, 1995; Ross & Dunning, 1997)
- Possession of driver’s license/driving without license (Chu et al., 2000; Polzin, Chu, & Rey, 2000)
- Fatal accident involvement (Baker et al., 1998; Braver, 2003; Campos-Outcalt et al., 1997; CDC, 2000; Missouri Dept of Health, 1998; Schiff & Becker, 1996; Voas et al., 2000)
- Alcohol-related accident involvement and driving under the influence (Abdel-Aty & Abdelwahab, 2000; Braver, 2003; Caetano & Clark, 2000; Everett et al., 2001; Harper et al., 2000; Jones & Lacey, 1998; Royal, 2000; Voas et al., 1998; Voas et al., 2000)
- Amount and severity of speeding (Lange et al., 2002, 2005; Smith et al., 2000, 2003)

Together, these research findings suggest that drivers' behavior may at least partially account for racial disparity in police stops and stop outcomes.

Relying solely on Census data as a benchmark comparison for traffic stops means that it is reasonable to assume that people drive where they live and that different demographic groups do not drive differently. The evidence for these assumptions, however, is lacking. Therefore, although collecting data on driving behavior is more costly—in terms of expenditures and time—than relying on demographic proxies, the acknowledged weaknesses of Census data have caused some researchers to initiate observational studies of roadway usage and driving behavior in order to determine both who is driving where and how they are driving. Indeed, many researchers involved in traffic stop data collection efforts have become more cautious in their conclusions based on population benchmarks. They note that further research needs to measure differences in driving behavior as an alternative explanation for racial disparity (Cordner et al., 2001; Cox, Pease, Miller, & Tyson, 2001; Lansdowne, 2000; Zingraff et al., 2000; Rojek et al., 2002).

This study supplements comparisons based on Census data with observational surveys of roadway usage and driver violating behavior. Although a number of different driving behaviors are illegal, this study focuses on one particular violating behavior—speeding. This selection can be justified for many reasons. First, a national survey revealed that people reported speeding as the most frequent reason (64%) for being stopped by police (Boyle et al., 1998). Second, in terms of methodological considerations, speeding is easier to measure than many other illegal driving behaviors; furthermore, with radar technology, it can be measured reliably and objectively. Third, for many police agencies, particularly large state agencies and highway patrols, the majority of traffic stops are for speeding. Therefore, the most cost-effective type of benchmark data collection should focus on the most frequent violating behavior for which police officers are making stops. Of the traffic stops analyzed for this report, over 72% were made for speeding infractions.

In an effort to better examine and interpret the police-citizen contact data, this study utilized several different benchmark measures. Specifically, the police-citizen contact data collected by Troopers for Year 2 are compared to five related benchmarks: 1) Census data of residential driving-age populations (i.e., individuals 15 years or older) where the traffic stops occurred, 2) Census data of residential driving-age populations for only stops of motorists who reside in the county where the traffic stop occurred, 3) traffic flow model created from residential Census populations and traffic stop data, 4) systematic observations of roadway usage, and 5) systematic observations of traffic violating behavior (i.e., speeding). Four of the five benchmarks were also utilized in the Year 1 Final Report. The creation of the traffic flow model is an addition to the Year 2 Final Report. In Section IV, each of these benchmark measures is more fully described, and comparisons of traffic stops to the benchmarks are reported.

The Creation and Interpretation of Disproportionality Indices and Ratios

Using traffic stop data as the numerator and benchmarks as the denominator, "disproportionality" or "disparity" indices can be created. These indices are used to estimate the differences between the "actual" and "expected" rates of traffic stops for different racial, ethnic, gender, and age groups. Disproportionality indices greater than one indicate that the rate of stops for particular groups are *greater than expected* based on the benchmark. Disproportionality indices less than one indicate that the rates of traffic stops for particular groups are *less than expected* based on the benchmark. The larger the absolute size of the disproportionality index, the larger the disparity between the actual and expected rate of stops.

While the disproportionality index provides a general comparison between minority and majority groups, it is not easily interpretable. Alternatively, a disproportionality ratio can be created, which provides a clear interpretation of the likelihood of a minority driver receiving an outcome when compared to a majority driver. As with the disproportionality index, a ratio of one indicates no disparity, while values above one suggest a disproportionate outcome for the minority group. The larger the absolute size of the disproportionality ratio, the larger the disparity between the actual and expected rate of stops. The creation of disproportionality ratios in the Year 2 Final Report represents an improvement over the sole use of disproportionality indices in the Year 1 Final Report.

There are several issues involved with the use of disproportionality indices and ratios. First, there is an obvious connection between the validity of disproportionality indices and ratios and the type of benchmark used to make the comparison. As described above, not all benchmarks are of equal validity. Therefore, disproportionality indices and ratios based on Census data, for example, must be interpreted with extreme caution.

Second, the stability of the disproportionality indices and ratios is based in part on the size of the denominator. This is especially a concern when Census figures are used to estimate the expected rate of stops. For example, in 19 (28.4%) of the 67 counties in PA, the residential population of Blacks is less than one percent. Likewise, in 36 counties (53.7%) the residential population of Hispanics is less than one percent. Thus, a small number of traffic stops of Blacks and Hispanics in these counties would dramatically raise the disproportionality indices and ratios because the denominator is so small.

Third, there is no scientifically accepted standard for the interpretation of the size of disproportionality indices and ratios. That is, there is no generally accepted statistical test that can be performed to determine if disproportionality indices and ratios are "too big" or "too small." Likewise, there is no generally accepted "rule of thumb" used by researchers regarding the appropriate size of disproportionality indices and ratios. For this study, we examined the size of the disproportionality indices and ratios created for each county in relationship to other counties, particularly adjacent counties. That is, we looked for outliers, or counties that had unexplainably high disproportionality indices and ratios. In addition, we compared disproportionality indices and ratios for the same county created through different benchmarks. Our specific findings and more information related to disproportionality indices and ratios are provided in Section IV.

Examinations of Post-Stop Outcomes (i.e., disposition data)

Concerns of biased-based policing do not end with the initial traffic stop. Indeed, post-stop outcomes are an important consideration of any profiling 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 benchmark comparisons of traffic stop data, analyses of post-stop outcomes (e.g., warnings, citations, arrest, searches, and seizures) must be conducted. These analyses should examine differences in outcomes for different types of drivers.

Those who believe that officers target minority drivers suggest that there is a perception among law enforcement officials that minority drivers – and more specifically, young Black and Hispanic males – are more likely to be transporting drugs, unregistered weapons, or other contraband (Harris, 2002; Ramirez et al., 2000). Some crime statistics support this proposition. For example, the National Crime Victimization Survey consistently finds that Blacks have higher rates of violent offending compared to Caucasians (Lauritsen & Sampson, 1998). In addition, research based on official arrest statistics consistently shows that young minority males are significantly more likely to be arrested for drug offenses and violent crime (for review, see LaFree, 1995; Lockwood, Pottieger, & Inciardi, 1995). It has been argued, however, that minorities are disproportionately represented in official crime statistics because these data are measured through arrests. If officers are more likely to stop, question, and search young minority males, then arrest statistics may become what Harris (1999, 2002) has described as a "self-fulfilling prophecy." Thus, it is important to examine all individuals stopped by police to determine the proportion of those individuals who are searched, and subsequently the proportion of those searched individuals who were discovered to be carrying or transporting contraband. If drivers were searched strictly based on legal factors and suspicions unrelated to race, one would expect similar percentages of searches resulting in seizures across racial groups. This has been described as the "outcome test" (Ayres, 2001). The outcome test is a simple comparison across groups of the percentage of searches that result in seizures. This is also referred to as the "search success rate" or "hit rate." Statistically assessing search success rates will allow PSP administrators to identify potential problems and institute policy interventions.

It is also important to consider multiple factors that might simultaneously influence officer decision-making. A multivariate statistical model is one that takes many different factors into account when attempting to explain a particular behavior. Unlike a bivariate model, it does not simply assess the relationship between two variables. Rather, a multivariate model examines many variables simultaneously, and therefore provides a more thorough and accurate interpretation of the data. For example, without controlling for the behavior of drivers, it is impossible to say whether higher rates of citations issued to particular drivers are justified based on legal considerations. A multivariate model can provide this information because it statistically controls for the existence of other variables in the model.

The multivariate statistical analyses conducted, however, can only statistically control for those variables that we can measure. For example, drivers' compliance with officers' requests are likely to be strong predictors of officers' behavior. The compliance of drivers, however, is not captured on the data collection instrument, and therefore cannot be statistically controlled in the multivariate analyses. 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.

Furthermore, caution is also warranted due to the extremely large samples of roadway observations and traffic stops. Sample size has direct implications for the finding of statistically significant results. Significance testing used with multivariate regression techniques determines the likelihood that observed relationships between variables are not due to chance; i.e., that they are true relationships. Typically, a 5% threshold is used, indicating that only 5 times in 100 is an observed relationship is due to chance. Significance testing in large samples, however, can be more sensitive to very small or artificial relationships between variables, thus detecting statistically significant differences that are not substantively or practically significant (Allison, 1999). It is for this reason that we have increased the significance threshold to 0.1% for our analyses that rely on large sample sizes (i.e., only 1 time in 1000 is relationship due to chance). Furthermore, we focus on the magnitude of the regression coefficients (which indicates the strength of the relationship), rather than just their statistical significance. A further description of the multivariate analyses and associated caveats are described in Section V.

In summary, this report also examines the outcomes drivers receive after traffic stops are made (e.g., warnings, citations, searches and arrests), and whether these outcomes differ significantly across racial, ethnic, and gender groups. Based on these findings (and previous findings documented in the Year 1 Final Report), additional analyses that focus specifically on searches and seizures are included in the Year 2 Final Report. These analyses include examinations of search success rates and consent only searches.

Appropriate Interpretations of Traffic Stop Data

The final, and perhaps most important, issue involved in traffic stop data analyses is the interpretation of the analyses and conclusions offered by the analyst. Current research examining racial profiling suggests that in many jurisdictions, police officers disproportionately stop non-Caucasian drivers compared to some benchmark. Some studies have inappropriately characterized these disparities as "proof" of discrimination, while other studies correctly acknowledge that a disparity exists and that inferences as to the cause of the disparities cannot be adequately made with the data available (for review, see Engel et al., 2002). Even when racial / ethnic disparities are demonstrated in traffic stops, the cause of these disparities is not known (and can never be known) based on the current data available. Without examining alternative explanations of racial disparities in traffic stops, one cannot claim that officers have made stopping decisions based on the drivers' race/ethnicity. The term racial profiling implies racial bias or discrimination demonstrated by police. Traffic stop studies, however, cannot measure these concepts. As noted by Engel, Calnon & Bernard (2002: 250), "the problem with interpreting these findings is that the mere presence of disparity in the aggregate rate of stops does not in itself demonstrate racial prejudice, any more than racial disparity in prison populations demonstrates racial prejudice by sentencing judges." As we further explained:

> Ultimately, the lack of a reliable and valid base rate is related to the fact that these studies have no coherent theoretical framework to guide the data collection efforts or to interpret their results. Specifically, these studies fail to measure any explanatory factors beyond the simple aggregate rate of stops. This diverges from almost all other research on policing conducted in the last 30 years, which focuses on explaining police behavior. In contrast, the data collection efforts to examine racial profiling have totally neglected the need to explain how and why officers make decisions (Engel et al., 2002: 250-251).

Lorie Fridell (2004a) has addressed the concern over how to interpret findings from traffic stop data analyses by documenting what police administrators and other stakeholders can expect from traffic stop studies. As she notes, "because the data will never 'prove' or 'disprove' racially biased policing, we contend that vehicle stop data collection and analysis should never be viewed – either by police or resident stakeholders – as a 'pass-fail test' (Farrell, 2004)" (Fridell 2004a: 2). Rather, she argues that "it should be viewed as a diagnostic tool to help pinpoint the decisions, geographic areas, and procedures that should get priority attention when the agency, in concert with concerned residents, identifies its next steps for addressing the problem or perception of racial profiling" (Fridell, 2004a).

Most of the current traffic stop studies now appropriately acknowledge that it cannot be determined with traffic stop data if disparities are due to discrimination because of the inability to measure alternative factors that might account for these disparities. Scholars have noted that measuring alternative, race-neutral factors, including racial differences in driving patterns, location, frequency, and/or degree of law-violating behavior, as well as spatial characteristics such as high police presence, might explain racial / ethnic disparities (e.g., Cordner et al., 2001; Cox et al., 2001; Criminal Justice Training Commission, 2001; Engel et al., 2004; Farrell et al., 2004; Fridell, 2004a; Lansdowne, 2000; Rojek et al., 2002; Smith et al., 2003; TDPS, 2000; Zingraff et al., 2000). The majority of current social scientific opinion clearly indicates that traffic stop data alone cannot be used to directly measure racial profiling.

Unfortunately, a handful of empirical studies that reported differences in the frequency of police contact with Caucasian and non-Caucasian citizens have been held up as scientific evidence indicating that discrimination exists due to racist attitudes of police officers (e.g., State of New Jersey v. Soto, 1996, Lamberth, 1996; ACLU, 2000; Spitzer, 1999). More recently, however, state and federal courts have rejected the findings of social science research as definitive measures of discrimination (e.g., Chavez v. Illinois State Police, 2001; U.S. v. Alcaraz-Arellano, 2004; U.S. v. Barlow, 2002; U.S. v. Duque Nava, 2004; U.S. v. Hare, 2004; U.S. v. Lindsey, 2003; U.S. v. Mesa-Roche, 2003; U.S. v. Parada, 2003;U.S. v. Stanley, 2003). At this time, social science research studies based on traffic stop data collections simply cannot determine whether or not racial profiling exists. As noted above, differences reported in aggregate rates only tell us that differences exist; researchers have not measured why they exist. While it is possible that some racial/ethnic disparities observed in traffic stops may be the result of individual officers targeting racial/ethnic minorities, it is important to note that this is a hypothesis that has not been adequately tested in any traffic stop study because the data necessary to test such a hypothesis are unavailable. That is, researchers have not measured the factors related to individual officer decision-making. To examine the theory that officers' racist attitudes influence their decision making, researchers would need to measure officers' actions, officers' attitudes, *and* the social influences that might mediate the relationship between attitudes and behavior. None of the previous research in this area has included surveys of officers or debriefing protocols in their data collection efforts. As noted by Engel et al. (2002: 263), "until researchers incorporate the collection of attitudinal data into their data collection strategies, they must stop attributing officers' prejudicial attitudes as the cause of their behavior."

In addition, studies measuring disparity have not established a threshold value above which the racial/ethnic disproportionality is considered illegitimate or unjustified (Cox et al., 2001; Decker et al., 2002, Farrell et al., 2003). That is, there is no scientifically accepted standard for the interpretation of the size of the disparity, or a generally accepted statistical test that can be performed to determine if the disparity is "too big" or "too small." The use of standard deviations to determine discriminatory effect (e.g., Castaneda v. Partida, 1977) is not appropriate for traffic stop data because of the inability to accurately capture an appropriate benchmark.

Given that it is not currently possible to accurately measure "similarly situated persons" and that all of the factors that could possibly influence officers' decision making during traffic stops cannot be measured, the statistical findings in this report must be cautiously interpreted. Analyses of traffic stop data can only report patterns and trends in racial /ethnic disparities. These analyses cannot determine if individual police officers are engaging in the behavior commonly referred to as "racial profiling." Any such conclusion would be based on the analyst's opinion and not the data themselves.

REPORT OUTLINE

The following Year 2 Final Report is divided into seven sections: 1) introduction, 2) traffic stop data collection methodology, 3) description of traffic stop data, 4) traffic stop benchmark comparisons, 5) description and analyses of post-stop outcomes, 6) focus on search and seizures, and 7) conclusions and policy recommendations. The general content and summary of findings for Sections II - VII are described below.

Section II

The description of the study's methodology (Section II) focuses on the details regarding the collection of traffic stop data by the Pennsylvania State Police and briefly describes the final police stop dataset that includes 315,705 member-initiated traffic stops.

Section III

Section III provides descriptive statistics for the traffic stop data collected for the entire 12-month period (May 1, 2003 – April 30, 2004). This description of data includes the number of stops, characteristics of the stops (e.g., time, day, month, reason for the stop, roadway type, vehicle registration, number of passengers, length of the stop), the reason for the stop (e.g., speeding, moving violation, equipment or inspection violation, etc.), and the characteristics of the drivers (e.g., sex, race, age, residency). The averages for this information are reported in tables at the department, area, and troop levels and, where appropriate, the station level. Comparisons are made between the data collected for Year 1 and Year 2.

Section IV

Section IV compares the rate of stops of racial groups to available benchmark information, including: 1) residential driving-age population Census data, 2) residential driving-age population Census data for stops of motorists who reside in the county where the stop occurred, 3) traffic flow model, based on residential driving-age population Census data and traffic stop data, 4) observations of roadway usage, and 5) observations of drivers' speeding behaviors. Based on these data, comparisons are made at the county level (and municipality level, where appropriate). To aid in the interpretation of the benchmark comparisons, several maps and tables are included in this section. Disproportionality indices and ratios are created to examine the differences in the percentage of minority drivers stopped by Troopers compared to their expected rate of stops as determined through the five different benchmarks. Comparisons in the disproportionality ratios are made across the five benchmarks for year 2, and between the findings reported for Year 1 and Year 2.

Section V

The post-stop outcomes (e.g., warning, citation, arrest, search, and seizure of contraband) are documented in Section V. Information examining all of the post-stop outcomes is presented for different drivers by racial, gender, and age groups. In addition, Trooper differences in stop outcomes are examined in detail. At the conclusion of Section V, several hierarchical multivariate analyses are presented that predict officer decision making after the traffic stop has been made. That is, Section V documents the outcomes drivers receive after traffic stops are made (e.g., warnings, citations, searches and arrests), and whether these outcomes differ significantly across racial, ethnic, and gender groups.

Section VI

Section VI focuses specifically on the post-stop outcomes of searches and seizures. This focus is conducted due, in part, to the findings from the Year 1 Report that illustrated the largest racial/ethnic disparities in outcomes produced by PSP occurred as the result of searches. Section VI documents the search rates for minority motorists compared to Caucasians, and further describes the racial/ethnic disparities in searches and seizures at multiple geographic and organization levels. Comparisons of search success rates are made, followed by analyses specifically of consent searches.

Section VII

Section VII summarizes the information presented, and provides policy recommendations based on interpretations 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 PSP Troopers 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 PSP 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.

Appendix A

Appendix A described the creation of the traffic flow model used as a benchmark comparison to traffic stop data. Specifically, the information provided in Appendix A describes the creation of the traffic flow model, with an example to illustrate the methodology employed. Further, the underlying assumptions and limitations of the traffic flow model are documented in this appendix.

Appendix B

Appendix B documents the methodology and findings of the observational road usage and speeding surveys. The criteria for the selection of sampled counties for observation are specified, and the training procedures for data collection are documented. The observation and speeding data collected at the state, county, and municipality levels are also described. The information provided in Appendix B is replicated directly from Section IV of the Year 1 Final Report (Engel et al., 2004).

II. TRAFFIC STOP & BENCHMARK DATA COLLECTION METHODOLOGY

OVERVIEW

This section documents the methodology utilized for the data collection effort. Specifically, the collection of the police-citizen contact data as well as the census and observation based benchmarks are described below. The limitations of this data collection effort are also discussed. **Figures 2.1** & **2.2** (the original and revised Contact Data Reports) and **Table 2.1** (a summary of the year's submitted contact reports) are described and included in the text.

CONTACT DATA

The original police contact form utilized by Troopers during all member-initiated traffic stops conducted from May 1, 2002 – September 30, 2003 gathered information regarding: 1) the stop (e.g., date/time, location, type of roadway, reasons for the stop, and the duration of the stop), 2) the driver (e.g., gender, age, race/ethnicity, zip code of residency), 3) the vehicle (e.g., state of registration, number of passengers), 4) the outcome of the stop (e.g., citation, written warning, arrest, search, property seized during the search), and 5) identification information (e.g., location of the stop – county and municipality, and the Troopers' station and employee identification).

A committee of PSP administrators developed and engaged in the training of Troopers for this data collection effort. A month long pilot test was implemented department-wide in April 2002. Area and Troop Commanders were given feedback regarding the most frequent errors on the forms, including items that were left blank. Data was collected for the full research project beginning on May 1, 2002. The original Contact Data Report was used from May 1, 2002 – September 30, 2003. This form is displayed as **Figure 2.1** below.

Figure 2.1. Pennsylvania State Police Contact Data Report, May 1, 2002 – September 30, 2003.

SP7-0045(3-2002)

CONTACT DATA REPORT

PENNSYLVANIA STATE POLICE

1. TIME OF STOP: MONTH DAY

J F M A M J J A S O N D

1–31

0 1 2 3 4 5 6 7 8 9

2. LOCATION OF STOP:

COUNTY

MUNICIPALITY

3. ROADWAY TYPE:
- Interstate
- State Highway
- County/Local Road
- Other

4. REASON FOR STOP: *(Mark All That Apply)*

P S
- Speeding
- Other Moving Violation
- Equipment/Inspection
- Pre-Existing Info.
- Registration
- License

AMOUNT OVER LIMIT

0 1 2 3 4 5 6 7 8 9

P S
- Special Traffic Enf. Program
- Other ______

5. REGISTRATION DISPLAYED:
- PA
- Other
- None

6. YEAR OF BIRTH:

7. DRIVER ZIP CODE:

8. DRIVER GENDER & RACE/ETHNICITY:
- Male
- Female

- White
- Black
- Native American
- Asian/Pac. Isl.
- White Hispanic
- Black Hispanic
- Mid. Eastern
- Unknown

9. NUMBER OF PASSENGERS:

0 1 2 3 4 5+

10. RESULT OF STOP: *(Mark All That Apply)*

	Citation	Warning	Other Arrest
DRIVER	1 2 3+	1 2 3+	
PASSENGER(S)	1 2 3+	1 2 3+	

11. SEARCH INITIATED: Yes No

REASON FOR SEARCH *(Mark All That Apply)*
- Consent
- Odor of Drugs/Alcohol
- Plain View Contraband
- Incident to Arrest
- K-9 Alert
- Inventory
- Reasonable Suspicion/ Probable Cause
- Other ______

12. PROPERTY SEIZED: *(Mark All That Apply)*
- None
- Cash
- Drugs
- Vehicle
- Weapons
- Stolen Property
- Alcohol
- Other ______

13. DURATION OF STOP IN MINUTES:
- 1-15
- 16-30
- 31-60
- 61+

14. EMPLOYEE NUMBER:

15. STATION LOCATION CODE:

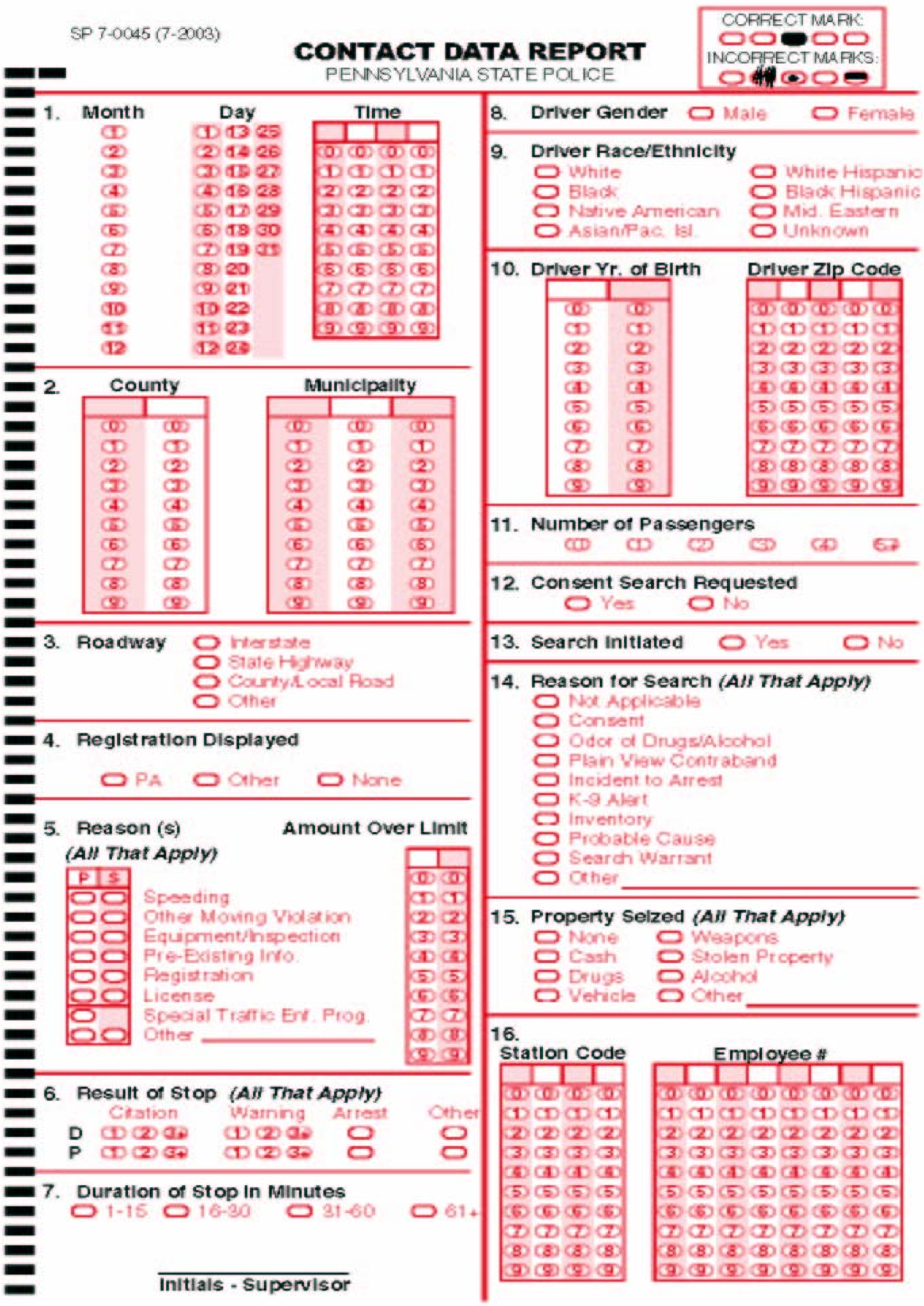
SUPV. INITIALS

Beginning October 1, 2003, a slightly modified Contact Data Report replaced the original form used by troopers. The modifications were based, in part, on findings from the Year 1 report (see Engel et al., 2004). Specifically, the modified form added the following information:

1) Result of the stop (passenger): other
2) Consent search requested (yes or no)
3) Reason for the search: not applicable
4) Reason for the search: search warrant

This modified Contact Data Report form is displayed as **Figure 2.2** below.

Figure 2.2. Pennsylvania State Police Contact Data Report, May 1, 2002 – September 30, 2003.



SP 7-0045 (7-2003)

CONTACT DATA REPORT

PENNSYLVANIA STATE POLICE

CORRECT MARK:

INCORRECT MARKS:

1. Month Day Time

2. County Municipality

3. Roadway
- Interstate
- State Highway
- County/Local Road
- Other

4. Registration Displayed
- PA
- Other
- None

5. Reason (s) (All That Apply) Amount Over Limit

P S
- Speeding
- Other Moving Violation
- Equipment/Inspection
- Pre-Existing Info.
- Registration
- License
- Special Traffic Enf. Prog.
- Other

6. Result of Stop (All That Apply)

Citation Warning Arrest Other

D 1 2 3+ 1 2 3+

P 1 2 3+ 1 2 3+

7. Duration of Stop in Minutes
- 1-15
- 16-30
- 31-60
- 61+

Initials - Supervisor

8. Driver Gender
- Male
- Female

9. Driver Race/Ethnicity
- White
- Black
- Native American
- Asian/Pac. Isl.
- White Hispanic
- Black Hispanic
- Mid. Eastern
- Unknown

10. Driver Yr. of Birth Driver Zip Code

11. Number of Passengers

0 1 2 3 4 5+

12. Consent Search Requested
- Yes
- No

13. Search Initiated
- Yes
- No

14. Reason for Search (All That Apply)
- Not Applicable
- Consent
- Odor of Drugs/Alcohol
- Plain View Contraband
- Incident to Arrest
- K-9 Alert
- Inventory
- Probable Cause
- Search Warrant
- Other

15. Property Seized (All That Apply)
- None
- Cash
- Drugs
- Vehicle
- Weapons
- Stolen Property
- Alcohol
- Other

16. Station Code Employee #

Biweekly reports were provided to PSP administrators that document (by area, troop, and station) missing data rates and other problems with the data collected. This feedback has provided an opportunity to address and correct data collection problems without directly identifying Troopers. The year's compilation of these reports is presented in **Table 2.1.**

Maintaining data quality is essential for traffic stop data collection efforts. The Police Executive Research Forum (PERF) has devised a set of guidelines to aid police departments in the collection of traffic and pedestrian stop data **(**for details, see Fridell, Lunney, Diamond, & Kubu, 2001). PERF recommends a missing data rate of less than 10%. Our research team recommended a more stringent standard of less than 5% missing data, which was met by PSP Troopers. Of the 315,705 forms included in the final data set, only 1.8% had one or more items missing. Adding the rejection and missing data rates, only 2.9% of the total forms received by the research team were problematic.

As shown in **Table 2.1**, the level of missing data varied somewhat across individual stations. Hollidaysburg station led the department with the lowest missing data rate (0.3%) while Meadville station had the highest (6.6%).

Two data items were considered extremely important and warranted further inquiry: drivers' race and employee identification number. It was believed that if Troopers were failing to comply with the data collection effort, the percentage of missing and invalid information recorded for these two items would likely be high. As reported in **Table 2.1**, 0.2 % of the total forms included in the data set were missing drivers' race. This percentage includes forms that had no race information recorded, more than one racial category recorded, or indicated that the race of the driver was "unknown." Again, the percentage of forms missing drivers' race information varied across stations, ranging from a low of 0.0% for 14 of the stations and a high of 0.5% for Corry and Honesdale stations.

In addition, only 0.2% of forms had missing or invalid employee identification numbers. This percentage varied across stations from 0.0% for 6 of the stations to 1.5% for Lamar station.

The employee identification number was used to link the data collected during traffic stops to individual trooper characteristics (e.g., sex, race, experience, rank, and education). The employee identification number was used to link this information on a rolling basis and was then deleted from the data sets to ensure confidentiality. As specified in contract with PSP, this report will not document findings regarding Trooper differences where ten or fewer Troopers could be identified. That is, information will not be provided that identifies multiple officers' characteristics that could possibly lead to an individual Trooper being identified.

The remarkably low missing data rates documented in **Table 2.1** were likely due, in part, to the following factors documented in the Year 1 Final Report (see Engel et al., 2004):

1) Troopers were guaranteed confidentiality.

2) Two pilot tests were conducted and most Troopers were trained on the use of the forms.
3) PSP administrators were provided routine and prompt feedback regarding the status the data collection effort and the percentage of missing data.
4) Supervisors were held accountable for their subordinates and required to review and sign all forms before they were sent to project staff.
5) A firm commitment to the data collection effort was initially established by Colonel Evanko's administration and has continued under the leadership of Colonel Miller.

Table 2.1. Scan Form Report for May, 2003 - April, 2004 (p.1 of 5)

		Total # Received		% Rejected Initially	% Missing Any Data	% Missing Race	% Missing Emp ID #	% Missing Supv Sign	Total # in Dataset
PSP Department		**315,705**		**1.1%**	**1.8%**	**0.2%**	**0.2%**	**0.0%**	**315,705***
AREA I		107,435		1.8%	1.9%	0.2%	0.3%	0.0%	107,435
Troop H		21,236		1.1%	2.1%	0.2%	0.3%	0.0%	21,236
Troop J		9,604		0.9%	1.6%	0.2%	0.2%	0.0%	9,604
Troop L		10,235		1.6%	1.7%	0.1%	0.3%	0.0%	10,235
Troop T		66,360		2.2%	1.9%	0.2%	0.2%	0.0%	66,360
Troop H									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Carlisle	2120	4,890	25	0.5%	1.6%	0.0%	0.5%	0.0%	4,890
Chambersburg	2130	3,669	48	1.3%	2.1%	0.2%	0.3%	0.0%	3,669
Gettysburg	2160	2,070	36	1.7%	1.4%	0.1%	0.2%	0.0%	2,070
Harrisburg	2110	3,913	50	1.3%	2.6%	0.2%	0.2%	0.0%	3,913
Lykens	2140	924	5	0.5%	2.5%	0.1%	0.2%	0.0%	924
Newport	2150	1,513	11	0.7%	1.2%	0.1%	0.4%	0.0%	1,513
York	2170	4,257	56	1.3%	2.6%	0.3%	0.3%	0.0%	4,257
TROOP J									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Avondale	4220	3,648	28	0.8%	0.9%	0.1%	0.1%	0.0%	3,648
Embreeville	4230	2,647	4	0.2%	1.2%	0.1%	0.3%	0.0%	2,647
Ephrata	4250	1,230	12	1.0%	2.4%	0.2%	0.2%	0.0%	1,230
Lancaster	4210	2,079	45	2.2%	2.7%	0.3%	0.4%	0.0%	2,079
TROOP L									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Frackville	4330	1,295	26	2.0%	2.1%	0.0%	0.5%	0.0%	1,295
Hamburg	4340	1,706	18	1.1%	1.4%	0.2%	0.2%	0.0%	1,706
Jonestown	4320	3,018	52	1.7%	1.4%	0.0%	0.2%	0.0%	3,018
Reading	4310	2,886	50	1.7%	2.0%	0.1%	0.3%	0.0%	2,886
Schuylkill Haven	4370	1,330	22	1.7%	1.5%	0.1%	0.2%	0.0%	1,330
TROOP T									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Bowmansville	2260	9,035	220	2.4%	2.1%	0.4%	0.2%	0.0%	9,035
Everett	2240	9,316	104	1.1%	1.0%	0.1%	0.1%	0.0%	9,316
Gibsonia	2220	8,117	114	1.4%	1.6%	0.1%	0.2%	0.0%	8,117
King of Prussia	2270	7,271	223	3.1%	1.8%	0.1%	0.4%	0.0%	7,271
New Stanton	2290	7,642	202	2.6%	1.6%	0.1%	0.3%	0.0%	7,642
Newville	2250	10,962	136	1.2%	1.2%	0.1%	0.2%	0.0%	10,962
Pocono	2280	5,496	100	1.8%	1.6%	0.1%	0.6%	0.0%	5,496
Somerset (T)	2230	8,521	328	3.8%	4.2%	0.4%	0.1%	0.0%	8,521

* The total number of stops included in the data set for the whole department is larger than the sum of forms for each area, troop, or station because some forms were used for special projects and other forms had invalid station codes.

Table 2.1. Scan Form Report for May, 2003 - April, 2004 (p.2 of 5)

		Total # Received		% Rejected Initially	% Missing Any Data	% Missing Race	% Missing Emp ID #	% Missing Supv Sign	Total # in Dataset
PSP Department		**315,705**		**1.1%**	**1.8%**	**0.2%**	**0.2%**	**0.0%**	**315,705***
AREA II		39,167		1.1%	1.7%	0.2%	0.3%	0.0%	39,167
Troop F		21,384		1.1%	1.5%	0.1%	0.4%	0.0%	21,384
Troop P		8,786		0.7%	1.8%	0.2%	0.2%	0.0%	8,786
Troop R		8,997		1.7%	2.1%	0.3%	0.3%	0.0%	8,997
TROOP F									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Coudersport	2420	1,767	13	0.7%	0.8%	0.0%	0.1%	0.0%	1,767
Emporium	2430	1,311	3	0.2%	0.8%	0.0%	0.0%	0.0%	1,311
Lamar	2440	3,594	46	1.3%	2.9%	0.1%	1.5%	0.0%	3,851
Mansfield	2450	1,621	26	1.6%	2.1%	0.3%	0.5%	0.0%	1,621
Milton	2460	2,290	21	0.9%	1.5%	0.2%	0.1%	0.0%	2,290
Montoursville	2410	5,186	42	0.8%	1.4%	0.1%	0.2%	0.0%	5,186
Selinsgrove	2470	4,112	60	1.5%	0.8%	0.2%	0.1%	0.0%	4,112
Stonington	2480	1,503	22	1.5%	0.8%	0.1%	0.1%	0.0%	1,503
TROOP P									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Laporte	3220	1,611	15	0.9%	1.2%	0.3%	0.1%	0.0%	1,611
Shickshinny	3240	1,124	10	0.9%	1.9%	0.4%	0.0%	0.0%	1,124
Towanda	3250	1,885	14	0.7%	2.6%	0.3%	0.1%	0.0%	1,885
Tunkhannock	3260	1,465	12	0.8%	1.9%	0.1%	0.4%	0.0%	1,465
Wyoming	3210	2,701	12	0.4%	1.4%	0.1%	0.2%	0.0%	2,701
TROOP R									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Blooming Grove	3340	2,867	54	1.9%	1.7%	0.2%	0.1%	0.0%	2,867
Dunmore	3310	2,089	43	2.1%	1.5%	0.1%	0.2%	0.0%	2,089
Gibson	3350	1,296	26	2.0%	3.2%	0.4%	0.5%	0.0%	1,296
Honesdale	3330	2,745	28	0.1%	2.3%	0.5%	0.3%	0.0%	2,745

* The total number of stops included in the data set for the whole department is larger than the sum of forms for each area, troop, or station because some forms were used for special projects and other forms had invalid station codes.

Table 2.1. Scan Form Report for May, 2003 - April, 2004 (p.3 of 5)

		Total # Received		% Rejected Initially	% Missing Any Data	% Missing Race	% Missing Emp ID #	% Missing Supv Sign	Total # in Dataset
PSP Department		**315,705**		**1.1%**	**1.8%**	**0.2%**	**0.2%**	**0.0%**	**315,705***
AREA III		62,770		0.6%	1.3%	0.1%	0.2%	0.0%	62,770
Troop A		18,464		0.6%	1.0%	0.1%	0.1%	0.0%	18,464
Troop B		22,187		0.7%	1.8%	0.2%	0.3%	0.0%	22,187
Troop G		22,119		0.5%	1.1%	0.1%	0.2%	0.0%	22,119
TROOP A									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Ebensburg	1120	3,228	18	0.6%	0.4%	0.0%	0.0%	0.0%	3,228
Greensburg	1110	5,699	41	0.7%	1.0%	0.1%	0.3%	0.0%	5,699
Indiana	1130	4,229	26	0.6%	1.6%	0.2%	0.2%	0.0%	4,229
Kiski Valley	1140	3,019	10	0.3%	0.9%	0.0%	0.1%	0.0%	3,019
Somerset (A)	1160	2,289	15	0.7%	1.1%	0.0%	0.1%	0.0%	2,289
TROOP B									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Belle Vernon	1220	3,553	16	0.5%	0.6%	0.0%	0.1%	0.0%	3,553
Pittsburgh	1230	6,828	54	0.8%	2.7%	0.3%	0.3%	0.0%	6,828
Uniontown	1240	3,884	18	0.5%	1.4%	0.2%	0.2%	0.0%	3,884
Washington	1210	5,260	56	1.1%	1.7%	0.2%	0.2%	0.0%	5,260
Waynesburg	1250	2,662	16	0.6%	1.5%	0.2%	0.3%	0.0%	2,662
TROOP G									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Bedford	2320	3,335	24	0.7%	1.4%	0.1%	0.0%	0.0%	3,335
Hollidaysburg	2310	3,223	10	0.3%	0.3%	0.0%	0.2%	0.0%	3,223
Huntingdon	2330	2,490	10	0.4%	0.4%	0.0%	0.0%	0.0%	2,490
Lewistown	2340	2,727	12	0.4%	2.2%	0.4%	0.7%	0.0%	2,727
McConnellsburg	2350	2,386	14	0.6%	1.4%	0.2%	0.2%	0.0%	2,386
Philipsburg	2380	2,756	14	0.5%	0.9%	0.1%	0.2%	0.0%	2,756
Rockview	2370	5,202	18	0.4%	1.2%	0.0%	0.3%	0.0%	5,202

* The total number of stops included in the data set for the whole department is larger than the sum of forms for each area, troop, or station because some forms were used for special projects and other forms had invalid station codes.

Table 2.1. Scan Form Report for May, 2003 - April, 2004 (p.4 of 5)

	Station Code	Total # Received	# Rejected Initially	% Rejected Initially	% Missing Any Data	% Missing Race	% Missing Emp ID #	% Missing Supv Sign	Total # in Dataset
PSP Department		**315,705**		**1.1%**	**1.8%**	**0.2%**	**0.2%**	**0.0%**	**315,705***
AREA IV		57,546		0.6%	1.7%	0.1%	0.2%	0.0%	57,546
Troop C		24,368		0.6%	1.5%	0.1%	0.2%	0.0%	24,368
Troop D		16,646		0.4%	1.5%	0.1%	0.2%	0.0%	16,646
Troop E		16,532		0.8%	2.2%	0.2%	0.2%	0.0%	16,532
TROOP C									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Clarion	1320	5,523	32	0.6%	1.6%	0.1%	0.2%	0.0%	5,523
Clearfield	1330	5,590	24	0.4%	0.9%	0.1%	0.1%	0.0%	5,590
Dubois	1340	3,491	15	0.4%	1.3%	0.1%	0.1%	0.0%	3,491
Kane	1350	1,927	14	0.8%	2.4%	0.2%	0.4%	0.0%	1,927
Punxsutawney	1310	3,295	15	0.5%	1.1%	0.2%	0.2%	0.0%	3,295
Ridgway	1360	2,429	18	0.7%	2.0%	0.2%	0.4%	0.0%	2,429
Tionesta	1370	2,113	20	1.0%	2.3%	0.2%	0.1%	0.0%	2,113
TROOP D									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Beaver	1440	2,661	9	0.3%	2.0%	0.1%	0.1%	0.0%	2,661
Butler	1410	5,570	16	0.3%	1.2%	0.1%	0.2%	0.0%	5,570
Kittanning	1420	3,295	20	0.6%	1.1%	0.0%	0.2%	0.0%	3,295
Mercer	1430	2,787	12	0.4%	1.5%	0.2%	0.1%	0.0%	2,787
New Castle	1460	2,333	15	0.6%	2.3%	0.3%	0.3%	0.0%	2,333
TROOP E									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Corry	1520	1,114	9	0.8%	2.0%	0.5%	0.4%	0.0%	1,114
Erie	1510	4,534	15	0.3%	1.3%	0.1%	0.1%	0.0%	4,534
Franklin	1530	2,450	11	0.5%	0.8%	0.1%	0.1%	0.0%	2,450
Girard	1540	4,375	48	1.1%	1.9%	0.1%	0.1%	0.0%	4,375
Meadville	1550	2,692	28	1.0%	6.6%	0.2%	0.5%	0.0%	2,692
Warren	1560	1,367	14	1.0%	0.7%	0.2%	0.2%	0.0%	1,367

* The total number of stops included in the data set for the whole department is larger than the sum of forms for each area, troop, or station because some forms were used for special projects and other forms had invalid station codes.

Table 2.1. Scan Form Report for May, 2003 - April, 2004 (p.5 of 5)

		Total # Received		% Rejected Initially	% Missing Any Data	% Missing Race	% Missing Emp ID #	% Missing Supv Sign	Total # in Dataset
PSP Department		**315,705**		**1.1%**	**1.8%**	**0.2%**	**0.2%**	**0.0%**	**315,705***
AREA V		45,690		1.2%	1.9%	0.2%	0.3%	0.0%	45,690
Troop K		12,888		0.9%	1.4%	0.2%	0.2%	0.0%	12,888
Troop M		17,298		1.3%	1.9%	0.2%	0.3%	0.0%	17,298
Troop N		15,504		1.3%	2.4%	0.2%	0.2%	0.0%	15,504
TROOP K									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Media	4120	4,793	44	0.9%	1.7%	0.4%	0.4%	0.0%	4,793
Philadelphia	4110	3,645	24	0.7%	1.0%	0.2%	0.3%	0.0%	3,645
Skippack	4130	4,450	48	1.1%	1.4%	0.2%	0.0%	0.0%	4,450
TROOP M									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Belfast	4460	2,976	44	1.5%	1.5%	0.0%	0.2%	0.0%	2,976
Bethlehem	4410	2,726	36	1.3%	2.7%	0.3%	0.4%	0.0%	2,726
Dublin	4420	4,117	42	1.0%	1.5%	0.1%	0.2%	0.0%	4,117
Fogelsville	4450	4,737	48	1.0%	2.1%	0.2%	0.3%	0.0%	4,737
Trevose	4430	2,742	50	1.8%	2.2%	0.2%	0.4%	0.0%	2,742
TROOP N									
Station Name	**Station Code**	**Total # Received**	**# Rejected Initially**	**% Rejected Initially**	**% Missing Any Data**	**% Missing Race**	**% Missing Emp ID #**	**% Missing Supv Sign**	**Total # in Dataset**
Bloomsburg	3120	3,349	32	1.0%	1.2%	0.2%	0.3%	0.0%	3,349
Fern Ridge	3130	2,609	20	0.8%	3.2%	0.4%	0.2%	0.0%	2,609
Hazleton	3110	2,965	56	1.9%	1.4%	0.2%	0.2%	0.0%	2,965
Lehighton	3140	2,558	36	1.4%	1.7%	0.2%	0.4%	0.0%	2,558
Swiftwater	3160	4,023	60	1.5%	4.0%	0.2%	0.2%	0.0%	4,023
Canine Section	8470	2,280	26	1.1%	1.9%	0.1%	0.2%	0.0%	2,280
Special Project	0008	474	7	1.5%	0.4%	0.2%	0.2%	0.0%	474

* The total number of stops included in the data set for the whole department is larger than the sum of forms for each area, troop, or station because some forms were used for special projects and other forms had invalid station codes.

COMPARISONS TO YEAR 1

- For the period covered in this report 315,705 data cards were processed, compared to 327,289 in the Year 1 Report.

- The percentage of data cards missing any type of data dropped from 4.3% for Year 1 to 1.8% for Year 2.

- The percentage of data cards missing information on the driver's race dropped from 1.7% for Year 1 to 0.2% for Year 2.

- The percentage of data cards missing valid employee numbers also decreased from 0.3% for Year 1 to 0.2% for Year 2.

III. DESCRIPTION OF TRAFFIC STOP DATA

OVERVIEW

This section describes the findings based on a compilation of the second full year of data from the Contact Data Reports received for the period of May 1, 2003 through April 30, 2004. The characteristics of traffic stops and the characteristics of drivers are reported in a strictly descriptive nature based upon reports from Troopers. This summary does not include analyses that examine causal influences. **Tables 3.1 – 3.7** report the specific data presented by category across the department, area, troop, and station levels. Data for these aggregate levels are presented for comparison purposes only.

TRAFFIC STOP CHARACTERISTICS

Based on the valid data available, 315,705 traffic stops were initiated by Pennsylvania State Troopers (PSP) during the period beginning May 1, 2003 and ending April 30, 2004. Area I accounted for roughly one-third of the total stops (107,464). **Table 3.1** documents the specific details of the traffic stops including: day, time, shift, roadway type, state registration, number of passengers, and duration of the stops. This information is reported at the department, area, and troop levels in **Table 3.1**, and at the station level in **Table 3.2**.

As shown in **Table 3.1**, the majority of the stops for the department were initiated on a weekday (69.9%) and occurred during the daytime (71.3%). The 7 a.m. – 3 p.m. shift conducted 47.4% of the stops, followed closely by the 3 p.m. – 11 p.m. shift accounting for 43.4% of the stops. The remaining 9.2% of traffic stops were recorded during the 11 p.m. – 7 a.m. shift. Approximately 96% of the stops occurred on an interstate (49.2%) or state highway (46.7%). Local and county roadways only accounted for 3.9% of stops. The majority of vehicles stopped (74.0%) were registered in Pennsylvania and had on average 0.7 passengers. Over 90% of the stops lasted between 1-15 minutes in duration, while 99% of the stops were completed within 30 minutes. Please refer to **Table 3.1** for specific variation across areas and troops, and **Table 3.2** for variation across stations. For each of the categories, the variation at the station level is most pronounced.

Table 3.1. Traffic Stop Characteristics By Department, Area & Troop

	Total # of Stops	% Weekday	Time of Stop % Daytime	Shift % 7-3	% 3-11	% 11-7	Roadway Type % Inter.	% State	% Local	% Other	Regist. % PA	Passengers Avg/vehicle	Duration of Stop (minutes) % 1-15	% 16-30	% 31-60	% 61+
PSP Dept.	315,705	69.9	71.3	47.4	43.4	9.2	49.2	46.7	3.9	0.2	74.0	0.7	90.2	8.8	0.8	0.3
Area I	107,464	70.0	73.0	47.6	43.8	8.5	74.0	23.2	2.7	0.1	66.4	0.7	89.7	9.3	0.8	0.3
Troop H	21,236	71.9	66.3	44.3	43.9	11.8	48.8	43.8	7.0	0.3	76.6	0.6	86.5	12.0	1.0	0.5
Troop J	9,604	73.1	67.5	47.4	39.4	13.2	0.5	91.8	7.6	0.1	89.5	0.6	84.8	12.6	2.3	0.3
Troop L	10,236	71.7	71.9	49.0	42.8	8.2	46.6	47.1	5.9	0.3	77.2	0.6	79.2	19.5	1.0	0.3
Troop T	66,388	68.6	76.1	48.5	44.6	6.9	96.9	3.0	0.1	0.1	61.4	0.8	93.0	6.4	0.4	0.2
Area II	39,171	68.0	73.9	49.9	42.8	7.3	30.7	66.6	2.7	0.1	73.7	0.7	86.5	12.7	0.6	0.1
Troop F	21,386	66.6	73.0	48.7	44.1	7.2	24.2	73.0	2.7	0.1	74.1	0.7	94.4	5.1	0.4	0.1
Troop P	8,786	67.7	72.0	46.8	43.8	9.4	17.2	80.5	2.1	0.1	85.8	0.6	87.6	11.7	0.5	0.2
Troop R	8,999	71.8	77.8	55.6	38.6	5.8	59.2	37.5	3.1	0.2	61.0	0.7	66.9	32.0	1.1	0.1
Area III	62,772	70.8	69.7	46.6	44.1	9.3	31.1	63.9	4.7	0.2	83.3	0.6	93.8	5.3	0.7	0.3
Troop A	18,464	70.5	72.3	49.4	43.4	7.3	0.7	92.4	6.6	0.3	94.7	0.5	93.9	5.1	0.6	0.3
Troop B	22,187	72.4	70.6	47.5	40.9	11.6	58.2	36.5	5.1	0.1	79.4	0.5	93.0	5.8	0.8	0.4
Troop G	22,121	69.5	66.5	43.4	47.9	8.7	29.3	67.7	2.8	0.2	77.7	0.7	94.5	4.9	0.5	0.1
Area IV	57,557	68.1	69.5	45.8	44.6	9.6	38.7	57.2	3.9	0.1	72.6	0.7	91.7	7.1	0.8	0.3
Troop C	24,374	67.0	70.4	46.5	45.9	7.6	46.7	51.8	1.5	0.0	60.6	0.8	92.8	6.3	0.6	0.2
Troop D	16,650	68.3	69.5	46.2	43.2	10.6	21.0	73.4	5.4	0.2	85.3	0.6	93.0	5.8	1.0	0.2
Troop E	16,533	69.4	68.2	44.5	44.1	11.4	44.8	49.0	6.0	0.2	77.4	0.7	88.9	9.6	1.0	0.5
Area V	45,690	71.6	69.4	47.3	40.6	12.1	44.2	49.6	6.1	0.2	77.4	0.6	88.1	10.8	0.9	0.3
Troop K	12,888	72.0	64.9	44.5	38.3	17.1	26.5	64.3	9.0	0.2	87.8	0.5	89.6	9.0	1.1	0.3
Troop M	17,298	74.2	68.3	46.6	42.4	11.0	37.9	55.7	6.3	0.1	82.6	0.5	85.5	13.5	0.8	0.3
Troop N	15,504	68.4	74.5	50.3	40.5	9.3	65.8	30.6	3.5	0.2	63.1	0.8	89.7	9.3	0.8	0.2

Table 3.2. Traffic Stop Characteristics By Station (p.1 of 4)

	Total # of Stops	% Weekday	Time of Stop % Daytime	Shift % 7-3	% 3-11	% 11-7	Roadway Type % Inter.	% State	% Local	% Other	Regist. % PA	Passengers Avg/vehicle	Duration of Stop (minutes) % 1-15	% 16-30	% 31-60	% 61+
AREA I																
TROOP H																
Carlisle	4,890	64.2	69.5	48.9	44.1	7.0	73.4	19.6	6.9	0.2	65.2	0.7	88.6	10.3	0.9	0.3
Chambersburg	3,669	70.9	63.1	43.6	40.2	16.2	38.5	45.4	15.7	0.4	77.5	0.6	89.0	9.5	0.9	0.6
Gettysburg	2,070	70.8	75.0	47.9	44.4	7.6	6.8	88.1	5.0	0.1	70.6	0.6	77.9	16.2	3.6	2.3
Harrisburg	3,913	78.9	72.9	44.3	43.6	12.2	53.3	40.8	5.3	0.6	81.5	0.5	88.3	11.0	0.6	0.1
Lykens	924	74.1	73.3	49.4	44.4	6.3	0.4	97.0	2.3	0.3	97.4	0.5	92.3	7.3	0.1	0.3
Newport	1,513	72.4	73.1	50.5	41.4	8.1	0.6	96.8	2.5	0.2	90.0	0.6	83.5	15.5	0.9	0.2
York	4,257	75.1	51.1	34.8	47.7	17.5	73.7	21.0	4.9	0.4	78.2	0.5	84.4	14.6	0.6	0.4
TROOP J																
Avondale	3,648	70.7	68.6	46.6	41.0	12.5	0.3	90.9	8.6	0.3	83.0	0.6	83.3	12.3	3.9	0.5
Embreeville	2,647	72.0	63.0	43.7	44.2	12.1	0.2	94.1	5.7	0.0	94.7	0.5	88.5	10.1	1.2	0.1
Ephrata	1,230	77.2	74.9	53.1	33.6	13.3	1.8	91.1	7.0	0.1	92.7	0.6	94.5	4.0	0.9	0.7
Lancaster	2,079	76.5	66.7	50.1	33.9	16.0	0.6	90.9	8.5	0.1	92.5	0.5	77.1	21.1	1.6	0.2
TROOP L																
Frackville	1,295	73.0	64.6	49.2	36.1	14.8	49.3	46.3	4.3	0.1	75.2	0.6	85.8	12.8	1.2	0.2
Hamburg	1,706	66.3	78.8	55.2	39.2	5.6	81.7	12.5	5.8	0.0	60.9	0.8	89.7	8.9	1.1	0.3
Jonestown	3,018	69.8	76.1	49.5	42.9	7.6	70.8	21.8	7.3	0.1	62.5	0.7	55.2	42.9	1.3	0.6
Reading	2,887	78.8	67.4	45.1	45.6	9.4	18.2	73.6	7.2	1.0	95.4	05	88.8	10.3	0.9	0.0
Schuylkill Haven	1,330	66.8	70.6	48.1	47.9	4.0	6.1	92.0	1.9	0.0	94.3	0.5	92.9	6.9	0.2	0.0
TROOP T																
Bowmansville	9,035	65.5	77.8	51.8	43.3	4.9	99.9	0.0	0.0	0.0	74.7	0.81	93.8	6.0	0.2	0.1
Everett	9,316	69.2	70.0	44.0	44.9	11.1	99.9	0.0	0.0	0.0	49.1	0.9	94.1	4.8	0.7	0.5
Gibsonia	8,117	70.2	87.8	58.2	38.5	3.4	90.9	8.9	0.1	0.0	58.6	0.7	76.5	22.6	0.8	0.2
King of Prussia	7,271	68.9	74.9	51.9	34.1	14.0	99.3	0.3	0.4	0.0	77.0	0.5	94.0	5.6	0.4	0.1
New Stanton	7,642	69.4	76.0	50.1	44.8	5.1	83.7	15.7	0.1	0.6	71.7	0.7	95.1	4.6	0.3	0.1
Newville	10,962	66.0	72.5	43.7	51.4	4.9	99.9	0.1	0.0	0.0	60.7	0.9	95.6	3.7	0.5	0.2
Pocono	5,496	70.9	77.6	46.9	52.5	0.6	99.9	0.1	0.0	0.0	72.2	0.8	98.6	1.1	0.3	0.0
Somerset (T)	8,521	70.9	74.8	43.9	46.3	9.9	99.8	0.2	0.0	0.0	34.5	0.7	97.4	2.1	0.4	0.1

Table 3.2. Traffic Stop Characteristics By Station (p.2 of 4)

	Total # of Stops	% Weekday	Time of Stop % Daytime	Shift % 7-3	Shift % 3-11	Shift % 11-7	Roadway Type % Inter.	Roadway Type % State	Roadway Type % Local	Roadway Type % Other	Regist. % PA	Passengers Avg/vehicle	Duration of Stop (minutes) % 1-15	Duration of Stop (minutes) % 16-30	Duration of Stop (minutes) % 31-60	Duration of Stop (minutes) % 61+
AREA II																
TROOP F																
Coudersport	1,767	65.9	66.6	35.6	55.8	8.6	0.1	95.7	4.2	0.1	86.1	0.8	86.0	13.5	0.5	0.1
Emporium	1,311	68.3	80.6	54.2	41.7	4.2	0.0	94.3	5.5	0.2	91.4	0.7	98.4	1.5	0.1	0.0
Lamar	3,594	61.5	73.7	52.6	41.7	5.6	81.1	17.1	1.7	0.0	45.1	0.8	97.6	2.1	0.3	0.1
Mansfield	1,621	70.8	67.4	42.4	54.2	3.5	0.2	99.0	0.9	0.0	65.3	0.8	96.7	3.2	0.1	0.1
Milton	2,290	72.6	75.9	53.9	40.2	5.9	59.0	40.0	1.0	0.0	60.0	0.7	93.1	6.5	0.4	0.1
Montoursville	5,188	67.0	71.8	51.5	39.7	8.8	17.4	78.2	4.4	0.0	82.2	0.7	93.6	5.2	1.0	0.2
Selinsgrove	4,112	64.1	75.5	45.6	46.4	8.1	1.1	98.7	1.3	0.0	81.0	0.6	96.7	2.9	0.2	0.1
Stonington	1,503	69.5	70.7	47.6	42.8	9.6	1.1	96.2	3.5	0.3	98.8	0.6	89.0	10.6	0.1	0.3
TROOP P																
Laporte	1,611	69.6	74.8	45.1	48.8	6.1	0.0	99.7	0.3	0.1	82.4	0.7	95.1	4.7	0.1	0.1
Shickshinny	1,124	59.9	74.1	54.8	31.6	13.6	1.0	97.6	1.4	0.0	96.2	0.5	89.6	10.1	0.2	0.2
Towanda	1,885	71.1	69.7	41.4	52.5	6.1	0.3	98.9	0.6	0.1	84.7	0.6	91.5	7.5	0.8	0.2
Tunkhannock	1,465	65.9	64.9	40.0	45.2	14.8	0.1	96.9	2.9	0.1	94.7	0.5	92.1	6.8	0.6	0.4
Wyoming	2,701	68.3	75.1	52.0	39.1	8.9	55.4	40.4	4.1	0.2	79.6	0.5	77.2	22.0	0.7	0.2
TROOP R																
Blooming Grove	2,867	74.7	78.0	55.8	39.5	4.7	57.7	37.6	4.4	0.2	58.9	0.7	34.9	62.6	2.3	0.2
Dunmore	2,091	75.0	76.5	55.1	39.8	5.2	86.9	11.0	2.0	0.1	63.0	0.7	77.6	21.7	0.6	0.1
Gibson	1,296	63.8	75.4	58.2	29.2	12.6	73.2	23.1	3.4	0.2	36.3	0.8	86.0	13.3	0.5	0.1
Honesdale	2,745	70.1	79.8	54.7	41.1	4.2	33.0	64.4	2.4	0.2	73.3	0.7	83.0	16.6	0.4	0.0
AREA III																
TROOP A																
Ebensburg	3,228	65.7	72.5	50.4	44.4	5.2	0.1	97.3	2.5	0.0	93.2	0.6	96.6	2.6	0.1	0.7
Greensburg	5,699	74.8	72.1	53.0	37.4	9.6	1.0	92.6	6.4	0.1	97.8	0.4	97.9	1.9	0.2	0.0
Indiana	4,229	67.4	76.2	48.1	45.8	6.1	0.4	94.3	5.2	0.1	93.8	0.5	94.4	3.3	1.9	0.5
Kiski Valley	3,019	69.2	69.1	47.7	46.8	5.6	0.3	85.1	13.6	1.0	95.5	0.6	83.1	16.5	0.4	0.0
Somerset (A)	2,289	74.0	70.0	43.3	47.7	9.0	1.7	91.3	6.7	0.4	90.0	0.6	93.6	5.1	0.4	0.9

Table 3.2. Traffic Stop Characteristics By Station (p.3 of 4)

	Total # of Stops	% Weekday	Time of Stop % Daytime	Shift % 7-3	% 3-11	% 11-7	Roadway Type % Inter.	% State	% Local	% Other	Regist. % PA	Passengers Avg/vehicle	Duration of Stop (minutes) % 1-15	% 16-30	% 31-60	% 61+
TROOP B																
Belle Vernon	3,553	74.8	75.9	48.7	43.1	8.2	66.1	31.8	2.1	0.1	76.4	0.5	94.4	3.7	0.5	1.3
Findlay	6,828	69.1	73.8	49.9	43.5	6.5	73.8	24.0	2.1	0.1	80.3	0.5	96.1	3.5	0.3	0.1
Uniontown	3,884	73.1	57.3	37.1	40.8	22.1	0.9	90.2	8.5	0.4	94.5	0.5	93.5	6.0	0.4	0.2
Washington	5,260	72.7	72.6	51.3	35.1	13.6	76.5	14.1	9.5	0.0	76.1	0.5	92.6	6.9	0.3	0.1
Waynesburg	2,662	75.7	70.4	47.2	42.9	9.9	55.8	40.9	3.1	0.2	65.2	0.6	83.4	11.8	4.2	0.6
TROOP G																
Bedford	3,335	71.2	67.1	45.9	48.3	5.9	39.0	59.0	2.0	0.0	75.5	0.6	95.4	3.7	0.6	0.3
Hollidaysburg	3,225	70.7	63.9	37.2	54.3	8.6	59.4	32.3	7.0	1.3	83.7	0.7	94.9	4.3	0.6	0.2
Huntingdon	2,490	69.7	57.4	38.3	47.6	14.1	0.0	97.8	2.0	0.2	96.9	0.6	88.3	9.9	1.4	0.4
Lewistown	2,727	65.6	55.4	31.9	55.6	12.4	0.1	96.6	3.2	0.2	92.4	0.6	90.9	8.6	0.4	0.1
McConnellsburg	2,386	77.6	79.6	53.9	39.9	6.2	72.0	26.4	1.4	0.2	39.8	0.7	97.3	2.3	0.4	0.0
Philipsburg	2,756	66.8	67.3	45.1	41.7	13.2	4.1	92.9	3.1	0.0	87.5	0.6	94.7	5.1	0.1	0.1
Rockview	5,202	67.1	71.6	48.6	46.6	4.8	27.6	71.2	1.2	0.0	70.5	0.7	97.0	2.7	0.3	0.0
AREA IV																
TROOP C																
Clarion	5,523	70.3	70.1	48.1	43.0	8.8	74.5	23.9	1.6	0.0	44.4	0.9	93.8	5.3	0.8	0.2
Clearfield	5,590	66.9	67.4	44.3	48.1	7.7	65.3	34.0	0.6	0.0	50.5	0.9	95.2	4.5	0.1	0.1
Dubois	3,491	68.5	80.2	51.7	46.1	2.2	81.5	17.4	1.1	0.0	44.1	0.9	97.4	2.4	0.1	0.1
Kane	1,927	69.4	66.8	42.4	52.8	4.8	0.3	95.3	4.4	0.1	74.5	0.8	89.0	10.0	0.7	0.2
Punxsutawney	3,301	60.4	72.6	48.8	42.8	8.5	18.9	78.7	2.4	0.0	81.4	0.7	94.7	4.3	0.7	0.4
Ridgway	2,429	64.8	70.0	46.0	44.5	9.5	3.7	95.3	1.0	0.1	79.9	0.7	85.5	12.0	1.8	0.7
Tionesta	2,113	67.2	66.0	39.9	47.7	12.4	2.2	97.0	1.0	0.1	89.5	0.7	85.2	13.5	1.0	0.4
TROOP D																
Beaver	2,661	73.2	68.2	42.3	40.7	17.0	0.1	97.3	2.7	0.0	82.1	0.5	90.5	8.8	0.4	0.3
Butler	5,574	69.5	71.6	45.7	46.7	7.6	26.0	66.5	7.5	0.1	91.3	0.6	92.0	5.6	2.1	0.3
Kittanning	3,295	65.6	63.0	46.4	41.1	12.5	0.1	96.7	3.0	0.2	97.0	0.5	95.7	3.7	0.4	0.3
Mercer	2,787	65.2	69.5	45.0	45.4	9.7	69.6	26.6	3.6	0.3	61.0	0.8	91.3	7.5	1.0	0.2
New Castle	2,333	67.5	75.1	53.0	38.0	9.1	4.8	85.6	9.3	0.3	87.4	0.6	96.3	3.5	0.2	0.0

Table 3.2. Traffic Stop Characteristics By Station (p.4 of 4)

	Total # of Stops	% Weekday	Time of Stop % Daytime	Shift % 7-3	Shift % 3-11	Shift % 11-7	Roadway Type % Inter.	Roadway Type % State	Roadway Type % Local	Roadway Type % Other	Regist. % PA	Passengers Avg/vehicle	Duration of Stop (minutes) % 1-15	% 16-30	% 31-60	% 61+
TROOP E																
Corry	1,114	74.2	67.2	46.8	42.7	10.5	1.4	93.2	5.4	0.1	91.4	0.5	94.4	4.3	1.2	0.1
Erie	4,535	70.9	74.2	50.1	40.6	9.4	64.8	27.7	7.4	0.1	62.0	0.7	82.2	16.0	1.4	0.4
Franklin	2,450	68.9	58.4	37.0	52.9	10.1	0.9	87.7	11.1	0.5	95.9	0.6	89.3	10.0	0.7	0.3
Girard	4,375	70.0	69.4	45.5	41.5	13.0	61.5	33.8	4.7	0.1	75.3	0.7	90.0	8.1	1.1	0.8
Meadville	2,692	64.5	70.4	44.9	40.3	14.8	64.0	32.1	3.6	0.3	75.8	0.8	92.6	6.1	0.5	0.8
Warren	1,367	68.7	59.0	33.8	56.5	9.7	1.2	96.6	2.2	0.0	93.5	0.5	94.7	4.8	0.4	0.2
AREA V																
TROOP K																
Media	4,793	71.6	55.9	35.8	40.5	23.7	37.4	57.9	4.3	0.4	79.6	0.6	85.7	12.0	1.7	0.6
Philadelphia	3,645	71.3	65.5	45.4	37.5	17.2	43.2	53.6	3.1	0.1	88.7	0.4	89.8	9.3	0.8	0.2
Skippack	4,450	73.1	74.2	53.3	36.8	10.0	1.0	80.0	18.9	0.2	96.0	0.4	93.7	5.5	0.7	0.1
TROOP M																
Belfast	2,976	79.0	72.1	51.0	41.7	7.3	23.9	72.3	3.8	0.0	80.6	0.6	89.1	10.5	0.4	0.1
Bethlehem	2,726	75.3	67.0	47.9	36.1	16.0	2.4	90.6	6.8	0.3	93.4	0.5	91.3	8.1	0.5	0.1
Dublin	4,117	74.4	68.4	43.2	49.8	7.0	0.5	87.0	12.5	0.1	96.0	0.4	87.3	12.2	0.4	0.1
Fogelsville	4,737	71.9	66.8	46.2	41.3	12.4	69.6	25.3	4.9	0.2	70.9	0.6	80.3	18.3	1.1	0.1
Trevose	2,742	71.8	67.7	46.2	40.0	13.8	90.0	8.4	1.5	0.2	74.1	0.5	82.1	15.9	1.4	0.6
TROOP N																
Bloomsburg	3,349	65.7	75.7	50.9	36.0	13.1	94.1	4.5	1.4	0.0	50.6	0.9	96.8	2.4	0.8	0.1
Fern Ridge	2,609	65.4	70.8	43.3	50.4	6.3	80.9	16.1	2.6	0.4	51.9	0.9	95.0	4.4	0.3	0.3
Hazleton	2,965	64.2	74.7	47.1	44.5	8.5	77.5	17.6	4.5	0.1	63.4	0.8	86.1	13.1	0.7	0.1
Lehighton	2,558	71.6	77.2	55.9	38.7	5.3	1.2	93.5	5.2	0.1	95.4	0.6	83.4	15.3	0.9	0.4
Swiftwater	4,023	73.6	74.2	53.1	35.8	11.1	64.9	31.2	3.7	0.2	59.9	0.7	87.1	11.5	1.1	0.3
Canine Unit	2,280	79.8	80.0	52.7	44.2	3.1	80.2	13.8	5.8	0.2	51.7	0.9	80.4	14.4	3.6	1.6

Table 3.3 provides the temporal breakdown of traffic stop occurrences by month. At both the department and area level, August accounted for the highest percentage of stops: 10.4% across the department, and between 8.3% and 10.2% in the 5 areas. July (10.2%) and May (9.8%) were the next highest months in terms of traffic stops across the department. Not surprisingly, traffic stop activity at the department level showed a considerable decrease in the winter months of December (5.7%) and January (5.3%).

Table 3.3. Monthly Breakdown of Traffic Stops by Department, Area, Troop, & Station (p.1 of 3)

	Total # of Stops	% May	% June	% July	% Aug.	% Sept.	% Oct.	% Nov.	% Dec.	% Jan.	% Feb.	% Mar.	% April
PSP Dept.	315,705	9.8	7.9	10.2	10.4	7.8	7.8	8.7	5.7	5.3	8.1	9.1	9.1
AREA I	107,464	6.1	8.1	8.8	8.9	9.5	8.9	10.3	10.0	8.1	7.7	8.0	5.6
Troop H	21,236	9.4	10.5	12.0	8.3	8.4	8.6	9.6	9.5	6.5	4.9	4.8	7.5
Carlisle	4,890	10.4	14.9	14.9	8.1	4.6	3.9	6.6	10.3	7.5	4.7	5.8	8.2
Chambersburg	3,669	13.8	8.1	10.9	9.1	13.4	7.3	5.2	8.6	6.0	5.9	5.7	5.9
Gettysburg	2,070	10.7	5.5	13.9	6.3	5.7	13.1	14.6	9.9	4.9	4.0	4.2	7.2
Harrisburg	3,913	7.3	5.9	8.4	6.4	6.8	12.5	18.2	9.4	7.3	4.6	4.6	8.8
Lykens	924	6.3	10.1	10.9	8.3	11.3	3.5	8.6	8.9	11.3	7.1	7.0	6.8
Newport	1,513	4.7	12.7	9.1	9.8	12.3	15.9	6.4	19.0	3.6	3.4	1.5	1.8
York	4,257	8.2	13.6	13.2	10.1	9.0	7.8	7.8	6.1	5.8	5.1	4.1	9.4
Troop J	9,604	4.9	7.3	7.3	8.6	10.2	6.0	10.9	9.8	9.0	10.3	9.5	6.2
Avondale	3,648	6.6	9.7	8.5	9.8	6.6	3.7	10.7	8.7	7.7	10.7	10.0	7.3
Embreeville	2,647	4.8	6.9	4.9	8.3	12.2	6.4	12.3	8.7	9.3	9.3	9.9	7.1
Ephrata	1,230	2.0	3.4	6.1	7.6	14.4	8.2	11.6	14.8	10.0	11.1	7.2	3.6
Lancaster	2,079	3.8	6.0	8.7	7.4	11.5	8.3	9.0	10.1	10.5	10.6	9.7	4.5
Troop L	10,236	4.2	7.4	10.6	7.8	10.4	7.9	10.9	12.4	7.4	6.6	8.8	5.6
Frackville	1,295	3.2	6.1	9.3	10.5	11.8	9.3	10.2	11.1	7.1	10.0	7.0	4.2
Hamburg	1,706	5.6	7.5	12.4	6.3	13.8	9.6	11.2	12.1	4.9	5.2	5.3	6.0
Jonestown	3,018	4.3	6.0	10.9	8.2	7.9	8.8	12.6	11.5	9.6	6.5	8.2	5.5
Reading	2,887	4.7	8.9	9.9	6.3	10.2	5.7	9.8	13.5	6.5	5.8	11.8	7.0
Schuylkill Haven	1,330	2.3	8.0	10.3	9.5	10.8	7.4	9.7	13.8	7.7	7.4	9.6	3.5
Troop T	66,388	5.4	7.5	7.8	9.4	9.6	9.5	10.4	9.8	8.6	8.4	8.6	4.9
Bowmansville	9,035	5.6	6.9	7.9	9.1	8.3	6.3	8.8	9.9	9.0	9.6	11.9	6.7
Everett	9,316	6.3	8.9	8.0	9.7	8.0	9.5	9.7	11.9	8.2	8.1	8.4	3.6
Gibsonia	8,117	4.1	6.7	8.7	9.7	9.2	12.3	11.3	8.7	8.2	5.9	9.7	5.7
King of Prussia	7,271	8.8	8.7	8.8	9.1	7.7	7.8	9.6	9.8	8.4	7.5	8.3	5.6
New Stanton	7,642	1.7	6.8	6.5	9.2	13.5	11.6	10.0	10.0	10.8	9.6	7.5	2.8
Newville	10,962	5.9	7.0	8.5	8.7	9.4	8.8	11.2	9.6	8.9	8.5	8.6	4.9
Pocono	5,496	5.3	7.7	6.9	9.3	9.7	11.7	12.1	8.6	7.8	10.0	6.0	4.9
Somerset (T)	8,521	5.7	7.8	6.7	10.3	11.4	9.4	11.2	9.7	7.7	8.2	7.2	4.8

Table 3.3. Monthly Breakdown of Traffic Stops by Department, Area, Troop, & Station (p.2 of 3)

	Total # of Stops	% May	% June	% July	% Aug.	% Sept.	% Oct.	% Nov.	% Dec.	% Jan.	% Feb.	% Mar.	% April
AREA II	39,171	5.0	8.5	10.3	8.4	10.6	7.1	10.2	11.4	7.5	7.2	9.1	4.8
Troop F	21,386	5.2	8.5	10.7	9.2	10.2	6.9	9.2	12.3	6.5	7.8	8.3	5.2
Coudersport	1,767	6.1	6.6	10.8	8.9	10.4	7.3	6.2	10.8	5.8	8.5	9.8	8.9
Emporium	1,311	5.8	5.9	9.2	10.5	12.1	9.7	9.1	10.1	9.0	9.4	5.7	3.5
Lamar	3,594	2.5	10.0	15.9	10.3	8.2	4.4	5.8	15.1	7.0	7.0	10.7	3.1
Mansfield	1,621	3.0	8.0	7.0	9.5	9.7	9.5	13.1	14.8	8.7	10.1	5.0	1.7
Milton	2,290	6.0	8.0	11.6	8.6	8.3	6.9	8.8	14.5	5.5	8.3	8.3	5.3
Montoursville	5,188	5.8	9.0	10.6	10.2	8.8	6.3	10.5	13.2	5.7	6.5	7.9	5.6
Selinsgrove	4,112	7.0	8.1	8.9	5.9	12.0	6.3	9.8	9.3	6.9	9.0	8.9	7.9
Stonington	1,503	4.1	10.3	8.1	11.1	17.4	11.2	11.4	8.1	4.5	5.7	6.1	1.9
Troop P	8,786	5.1	9.2	11.0	6.9	9.4	7.1	9.9	9.9	9.6	6.7	11.0	4.1
Laporte	1,611	3.4	8.0	7.9	6.8	9.9	8.4	13.5	13.2	8.9	7.2	7.9	4.7
Shickshinny	1,124	3.0	8.4	10.0	7.7	11.6	3.1	8.0	10.4	9.0	6.3	17.1	5.5
Towanda	1,885	6.2	10.6	13.8	4.9	7.1	10.0	11.8	5.4	11.3	5.7	9.0	4.2
Tunkhannock	1,465	7.4	9.1	7.6	7.9	13.2	6.1	12.1	9.7	5.2	6.3	10.9	4.5
Wyoming	2,701	4.9	9.4	13.2	7.5	7.6	6.6	6.2	11.0	11.5	7.6	11.7	2.7
Troop R	8,999	4.5	7.8	8.6	8.0	12.8	7.3	12.9	10.6	7.8	6.0	9.2	4.6
Blooming Grove	2,867	8.0	12.2	9.3	8.1	12.1	6.4	7.2	9.5	5.0	7.5	10.0	4.8
Dunmore	2,091	4.1	6.4	7.3	9.9	9.9	8.5	12.5	10.0	10.2	6.5	8.8	6.0
Gibson	1,296	1.3	3.2	12.5	10.0	12.7	5.9	12.1	10.0	11.9	6.2	7.4	6.8
Honesdale	2,745	2.6	6.5	6.9	5.5	15.6	8.2	19.4	12.5	7.1	4.0	9.4	2.3
AREA III	62,772	4.9	7.9	9.5	10.2	9.7	7.0	9.4	11.0	8.3	8.4	8.3	5.3
Troop A	18,464	4.1	7.4	9.7	9.2	9.4	6.3	9.5	11.6	8.1	10.8	8.8	5.0
Ebensburg	3,228	4.4	6.7	9.0	6.5	11.6	7.8	10.3	13.9	9.5	8.0	8.1	4.4
Greensburg	5,699	4.6	5.8	8.6	8.4	10.2	4.6	9.3	11.9	7.4	13.3	11.2	4.7
Indiana	4,229	4.2	8.0	13.0	10.4	9.0	8.3	10.7	9.7	5.8	8.2	7.0	5.6
Kiski Valley	3,019	3.9	8.5	9.0	11.7	8.0	6.0	8.6	9.2	9.0	11.7	9.0	5.4
Somerset (A)	2,289	2.3	9.8	8.3	9.3	7.1	4.9	8.4	14.6	10.6	12.6	7.0	5.0
Troop B	22,187	4.8	7.3	9.0	12.0	9.8	6.6	8.6	10.4	8.6	9.2	8.8	5.1
Belle Vernon	3,553	3.2	5.8	8.4	13.5	12.6	6.6	6.6	9.9	8.0	11.7	9.5	4.3
Findlay	6,828	3.6	7.0	8.3	9.2	7.8	6.9	11.2	14.0	8.8	9.9	9.4	4.0
Uniontown	3,884	6.2	7.5	11.2	13.5	9.4	4.7	5.6	8.4	9.1	8.1	9.4	7.0
Washington	5,260	6.6	10.8	7.6	10.6	11.2	6.5	7.8	8.3	8.9	8.3	8.0	5.3
Waynesburg	2,662	4.1	3.1	11.2	17.4	9.2	8.5	11.0	8.8	7.6	7.4	6.6	5.3
Troop G	22,121	5.6	8.8	9.9	9.4	9.9	8.0	10.1	11.2	8.1	5.6	7.5	5.8
Bedford	3,335	4.7	10.0	9.7	7.7	7.5	7.3	9.2	11.6	9.5	4.7	10.4	7.6
Hollidaysburg	3,225	4.2	10.2	7.3	8.8	15.1	8.3	9.2	12.1	7.4	6.9	6.1	4.6
Huntingdon	2,490	6.5	8.5	13.1	10.5	3.4	5.5	8.4	11.4	9.0	5.5	10.1	8.2
Lewistown	2,727	7.2	7.9	10.9	9.1	8.9	12.3	13.0	10.5	6.6	6.3	3.7	3.6
McConnellsburg	2,386	6.1	8.1	8.5	15.0	8.7	9.2	11.7	12.3	7.9	3.6	4.9	4.1
Philipsburg	2,756	4.9	6.3	14.0	10.4	9.2	8.5	8.7	9.2	8.9	5.7	9.1	5.1
Rockview	5,202	6.0	9.6	8.0	7.2	12.6	6.7	10.6	11.4	7.6	6.1	7.7	6.7

Table 3.3. Monthly Breakdown of Traffic Stops by Department, Area, Troop, & Station (p.3 of 3)

	Total # of Stops	% May	% June	% July	% Aug.	% Sept.	% Oct.	% Nov.	% Dec.	% Jan.	% Feb.	% Mar.	% April
AREA IV	57,557	4.3	7.3	8.6	9.3	10.0	7.5	9.9	10.5	7.4	8.6	10.2	6.4
Troop C	24,374	4.2	6.0	8.7	9.0	10.6	8.0	10.9	11.5	6.9	9.2	9.7	5.2
Clarion	5,523	4.8	3.6	9.9	10.2	8.9	8.7	12.6	10.9	6.1	8.3	9.7	6.4
Clearfield	5,590	5.4	7.9	9.6	9.2	11.1	7.8	8.4	10.8	6.4	9.8	9.1	4.5
Dubois	3,491	4.0	5.0	7.7	7.6	12.5	9.4	12.1	12.4	7.4	8.6	8.2	5.3
Kane	1,927	2.2	4.8	7.2	9.4	10.7	9.2	10.0	13.9	8.5	12.4	8.6	3.2
Punxsutawney	3,301	3.6	5.2	7.1	8.5	13.7	6.2	11.4	11.2	6.9	8.5	11.8	5.9
Ridgway	2,429	3.9	9.4	9.8	10.4	6.4	7.5	9.3	9.6	6.0	10.7	12.2	4.8
Tionesta	2,113	3.5	7.5	7.6	6.8	10.9	6.6	13.3	13.6	9.2	7.3	8.8	4.9
Troop D	16,650	5.2	8.2	9.6	10.0	9.6	7.3	8.6	10.1	8.4	7.6	9.1	6.4
Beaver	2,661	3.6	7.3	9.4	11.2	9.1	8.8	9.0	10.3	8.3	7.3	9.8	5.9
Butler	5,574	4.2	7.9	7.4	7.8	10.8	9.3	7.9	11.9	10.3	8.0	9.3	5.3
Kittanning	3,295	7.7	9.7	11.3	9.3	7.7	5.3	8.1	9.4	7.8	7.3	7.7	8.6
Mercer	2,787	5.5	8.0	11.3	11.2	11.8	6.6	9.5	7.3	7.7	6.1	8.4	6.5
New Castle	2,333	5.4	8.3	10.3	13.7	7.2	4.6	9.4	9.6	5.7	8.9	10.8	6.1
Troop E	16,533	3.6	8.1	7.6	8.8	9.6	7.1	9.9	9.4	7.0	8.8	12.0	8.1
Corry	1,114	2.2	5.2	5.8	6.9	18.1	8.6	15.1	15.9	3.1	6.9	7.3	4.8
Erie	4,535	4.7	9.0	7.6	8.4	8.2	4.4	8.2	6.8	6.4	12.7	13.7	10.0
Franklin	2,450	4.2	10.5	10.9	13.2	9.6	6.9	7.1	11.2	6.2	6.5	8.4	5.1
Girard	4,375	1.6	6.2	7.0	9.0	9.1	7.5	12.8	8.6	11.0	10.1	9.8	7.2
Meadville	2,692	5.0	9.0	5.7	5.2	7.2	9.6	11.1	11.4	3.9	4.9	15.6	11.4
Warren	1,367	3.5	7.5	8.6	10.9	13.5	9.4	4.5	7.5	6.9	5.3	16.6	5.7
AREA V	45,690	5.6	9.2	8.9	8.3	10.0	8.0	11.3	9.0	7.3	6.7	9.0	6.7
Troop K	12,888	5.7	7.8	7.5	6.8	11.1	10.4	10.7	8.8	8.4	6.3	9.2	7.4
Media	4,793	5.3	8.1	6.4	8.0	14.7	10.5	10.4	10.4	6.9	5.2	7.7	6.4
Philadelphia	3,645	5.0	6.5	7.2	5.9	9.2	10.5	12.5	7.5	8.0	6.8	.12.2	8.8
Skippack	4,450	6.6	8.4	8.9	6.2	9.0	10.2	9.5	8.1	10.4	7.2	8.3	7.2
Troop M	17,298	6.2	9.7	9.2	8.2	10.1	6.4	10.7	9.0	7.3	7.2	8.4	7.4
Belfast	2,976	6.6	9.9	9.0	7.9	11.2	5.2	10.4	8.3	6.5	11.1	7.2	6.9
Bethlehem	2,726	5.0	13.4	14.8	11.9	6.8	7.9	6.3	7.6	6.4	6.1	6.2	7.7
Dublin	4,117	7.4	9.7	7.6	7.3	11.6	6.7	10.1	9.9	5.8	5.2	9.9	8.7
Fogelsville	4,737	6.3	9.8	9.5	7.6	8.8	4.7	11.9	8.9	9.0	6.7	8.8	8.0
Trevose	2,742	5.0	5.8	6.0	7.0	12.2	9.1	14.4	9.8	8.4	8.1	9.2	4.9
Troop N	15,504	4.7	9.7	9.8	9.8	9.0	7.8	12.4	9.3	6.3	6.3	9.4	5.3
Bloomsburg	3,349	4.4	13.0	6.3	6.2	6.7	7.3	13.3	12.3	8.9	7.5	11.0	3.2
Fern Ridge	2,609	3.7	13.9	20.7	10.6	3.7	5.5	12.0	7.2	3.5	3.1	9.1	7.1
Hazleton	2,965	4.7	11.5	8.2	13.6	10.6	6.9	8.5	9.6	6.1	7.2	8.9	4.3
Lehighton	2,558	6.3	5.4	7.3	11.0	8.5	8.1	10.5	10.	6.7	7.1	11.7	7.4
Swiftwater	4,023	4.7	5.7	8.4	8.7	13.6	10.1	16.1	7.6	5.9	6.3	7.3	5.5
Canine Unit	2,280	5.0	9.4	5.5	7.1	5.8	13.2	9.7	14.3	7.2	9.0	6.9	7.1

Tables 3.4 and **3.5** report the reasons for the stop preceding and subsequent to the stop initiated by the Troopers. The reasons for the stop include: speeding, other moving violations, equipment violations, pre-existing information, registration violations, license violations, special traffic enforcement programs, and other reasons. The tables also report the average speed over the limit observed for traffic stops involving speeding violations. Information for all of these categories are summarized at the department, area, and troop level in **Table 3.4,** and at the station level in **Table 3.5**.

Across the department, speeding was the most frequent violation observed prior to the stop (72.0%). There is slight variation across areas in the frequency of speeding stops, with Area I reporting speeding as the reason preceding the stop for 77.1% of their drivers stopped, compared to Area V's 61.1% of drivers stopped. The troops varied in speeding stops from a high of 83.0% (Troop L) to a low of 50.2% (Troop K). Note, however, that half of the troops reported speeding as the reason preceding the stop for over 70% of drivers' stopped (8 of 16 troops). The differences at the troop level are mirrored at the station level. For example, Everett station reported speeding as the reason preceding the stop for 92.1% of their drivers, compared to only 42.5% of drivers stopped by Troopers in the Dublin station. Similar to the troop level, about half of the stations reported speeding as the reason preceding the stop for over 70% of the traffic stops (43 out of 89 stations).

The average speed over the limit was recorded at 19.1 mph across the department. At the area level, the average speed over the limit ranged from a high of 21.4 in Area V to a low of 11.0 in Area IV. At the troop level, the range between average speeds over the limit was somewhat larger, with an average speed of 23.7 over the limit in Troop K, compared to an average speed of 16.9 in Troop C. More dramatic differences are displayed at the station level. For example, the average speed over the limit ranged from highs of 27.0 (Trevose), 24.8 (Media), and 23.8 (Belfast) to lows of 14.1 (Tionesta), 14.8 (Emporium), and 15.4 (Coudersport).

One interesting result arising from the speeding data is that at the troop level, Troop K had the lowest percentage of speeding as the reason for the stop (50.2%); however, Troop K reported the highest average speed over the limit (23.7 mph).

Other moving violations were the next most common reason preceding the traffic stop across the department at 16.1%. The areas varied on the percentage of stops based on moving violations from a high of 20.5% in Area V to a low of 11.0% in Area IV. Similarly, there was variation across the troops from 27.8% of stops in Troop K to 9.3% of stops in Troop C.

At the department level, the third ranking reason for stops was equipment inspections (9.4%), followed by traffic enforcement (4.8%). The rank ordering of these two categories at the departmental level was mirrored at the area level where equipment inspections ranked third in all five of the areas.

For a complete breakdown of the categories at the various levels, please refer to **Tables 3.4 and 3.5**.

The differences across the department in the average speed over the limit for which drivers are stopped are an important aspect to consider when determining disparities in traffic stops. It appears that the “norms” of what is considered “speeding” and violations that are “worthy” of Troopers’ attention vary dramatically from one location to another. Thus, traveling 18 miles per hour over the posted speed limit is very likely to initiate a traffic stop in some stations (e.g., Tionesta, Emporium and Coudersport), while much less likely in others (e.g., Trevose and Media). There are several possible legitimate explanations for these differences. The most obvious are differences in roadway types, differences in workloads and manpower, and differences in traffic patterns. The important thing to note is that if particular types of drivers are more likely to speed (as has been found in three studies – see Engel et al., 2004; Lange et al., 2002, 2005; Smith et al., 2003), their risk of being stopped for speeding violations differs across the state. Given that traffic patterns and types of drivers are not evenly distributed across the state, this could be one explanation for any racial /ethnic disparities in stop rates.

Table 3.4. Reason for Stop By Department, Area, & Troop

	Total # of Stops	% Speeding		Amt. over Limit	% Mov. Viol.		% Equip./ Inspect.		% Preexist. Info.		% Regist.		% License		% Spec. Traf. Enf.	% Other	
		P	S	P	P	S	P	S	P	S	P	S	P	S	P	P	S
PSP Dept	315,705	72.0	0.3	19.1	16.1	2.2	9.4	3.2	0.1	0.3	1.8	2.9	0.3	3.8	4.8	0.8	1.8
AREA I	107,464	77.1	0.2	19.4	15.0	1.3	6.3	2.2	0.1	0.2	1.3	2.0	0.2	2.7	2.4	0.5	1.1
Troop H	21,236	69.4	0.3	19.1	17.3	1.2	10.0	2.4	0.1	0.1	2.2	1.9	0.3	3.2	3.0	0.9	1.1
Troop J	9,604	60.4	0.6	21.6	16.3	1.1	18.7	3.0	0.2	0.1	3.5	3.3	0.5	5.4	4.8	0.9	0.6
Troop L	66,388	83.0	0.2	19.2	13.8	1.4	2.7	2.0	0.0	0.1	0.6	1.8	0.1	1.9	0.9	0.3	1.2
Troop T	10,236	70.7	0.3	18.9	16.8	1.5	9.7	2.7	0.1	0.6	2.0	2.5	0.3	3.9	8.0	1.2	1.2
AREA II	39,171	71.0	0.2	18.6	17.4	2.2	9.1	3.7	0.2	0.2	1.4	2.7	0.4	3.7	5.7	1.0	2.4
Troop F	21,386	76.5	0.1	18.0	13.9	1.6	7.3	3.0	0.1	0.1	1.3	2.2	0.3	3.2	4.6	0.7	3.2
Troop P	8,999	61.3	0.2	19.6	23.9	1.4	13.0	2.7	0.2	0.2	1.0	2.4	0.4	2.5	8.4	2.4	0.6
Troop R	8,786	67.6	0.3	19.6	19.4	4.3	9.4	6.2	0.2	0.4	1.8	4.4	0.5	5.9	5.6	0.2	2.1
AREA III	62,772	68.4	0.2	19.2	18.3	2.2	10.7	4.0	0.1	0.3	2.2	3.9	0.3	4.8	4.4	0.5	1.2
Troop A	18,464	62.5	0.2	19.3	19.6	2.0	14.1	4.1	0.1	0.9	3.2	4.1	0.4	4.7	6.0	0.8	0.8
Troop B	22,121	76.5	0.1	17.5	14.5	2.4	7.6	4.9	0.1	0.1	1.2	4.9	0.2	5.5	3.2	0.4	1.9
Troop G	22,187	65.4	0.2	21.1	21.0	2.1	10.9	3.1	0.2	0.1	2.5	2.9	0.3	4.3	4.4	0.5	1.0
AREA IV	57,557	76.6	0.4	17.6	11.0	3.5	9.7	3.7	0.2	0.4	1.8	3.6	0.2	4.4	4.4	0.4	3.1
Troop C	24,374	81.8	0.2	16.9	9.3	4.1	7.5	3.3	0.1	0.5	0.7	3.2	0.2	4.0	3.3	0.3	3.6
Troop D	16,533	75.4	0.3	17.9	11.8	2.1	9.7	2.7	0.2	0.4	2.4	3.4	0.2	4.0	4.1	0.4	1.9
Troop E	16,650	70.3	0.5	18.7	12.9	4.0	12.9	5.3	0.1	0.3	2.9	4.3	0.2	5.4	6.3	0.5	3.4
AREA V	45,690	61.1	0.5	21.4	20.5	2.3	14.7	3.2	0.1	0.2	2.8	3.1	0.3	4.2	10.6	1.7	2.0
Troop K	12,888	50.2	0.5	23.7	27.8	1.8	16.7	3.5	0.1	0.2	4.2	4.3	0.5	5.9	8.2	3.5	4.6
Troop M	15,504	73.2	0.4	18.6	16.0	2.9	8.6	2.8	0.1	0.1	1.5	1.5	0.2	2.5	12.3	0.9	0.4
Troop N	17,298	58.3	0.5	23.0	19.1	2.0	18.7	3.2	0.1	0.2	2.9	3.6	0.2	4.4	10.9	1.1	1.4

* P=prior to stop, S=subsequent to stop

Table 3.5. Reason for Stop By Station (p.1 of 4)

	Total # of Stops	% Speeding		Amt. over limit	% Mov. Viol.		% Equip./ Inspect.		% Preexist. Info.		% Regist.		% License		% Spec. Traf. Enf.	% Other	
		P	S	P	P	S	P	S	P	S	P	S	P	S	P	P	S
AREA I																	
TROOP H																	
Carlisle	4,890	80.2	0.8	17.7	11.3	1.2	6.1	2.4	0.1	0.1	1.7	1.2	0.2	2.8	0.8	0.4	1.1
Chambersburg	3,669	65.4	0.5	18.0	15.3	1.2	14.1	3.0	0.1	0.3	3.5	2.2	0.4	3.2	3.5	0.9	1.0
Gettysburg	2,070	69.0	0.2	17.8	15.4	0.9	13.6	2.8	0.3	0.1	1.5	1.5	0.2	2.4	11.5	2.3	0.6
Harrisburg	3,913	63.4	0.3	20.4	24.3	1.0	8.2	2.3	0.0	0.0	3.1	1.2	0.3	2.3	1.2	0.3	0.3
Lykens	924	47.0	1.0	19.0	31.8	2.9	18.2	4.7	0.1	0.0	1.5	9.7	0.8	8.4	0.9	0.5	6.3
Newport	1,513	81.8	0.3	19.7	12.5	0.9	4.2	1.3	0.1	0.2	0.9	1.9	0.1	3.8	3.6	0.1	0.5
York	4,257	66.6	0.2	21.4	19.2	1.1	11.1	1.8	0.2	0.0	2.0	1.6	0.4	3.6	2.8	1.8	1.2
TROOP J																	
Avondale	3,648	51.9	0.5	22.1	20.9	1.3	22.9	3.2	0.3	0.1	2.9	4.3	0.4	6.7	4.3	1.0	0.9
Embreeville	2,647	57.8	0.6	22.5	16.0	1.5	19.6	3.9	0.2	0.2	5.4	3.2	0.5	4.8	2.8	0.2	0.3
Ephrata	1,230	83.2	0.2	20.7	11.1	0.5	3.7	2.0	0.2	0.0	1.9	2.3	0.7	5.0	10.3	0.4	0.4
Lancaster	2,079	64.9	0.7	20.5	11.7	0.7	19.1	2.2	0.1	0.2	3.2	2.6	0.5	4.1	5.0	2.1	0.9
TROOP L																	
Frackville	1,295	60.7	0.4	18.1	18.2	2.1	16.9	4.6	0.8	0.4	3.3	5.9	0.5	7.7	5.1	1.9	1.2
Hamburg	1,706	79.7	0.3	21.2	11.2	2.8	8.4	2.8	0.1	2.6	0.9	2.1	0.1	2.8	17.7	2.1	1.6
Jonestown	3,018	76.7	0.2	18.0	13.4	0.8	7.5	2.8	0.1	0.2	1.6	2.0	0.1	2.8	1.3	1.1	1.2
Reading	2,887	67.5	0.3	18.9	18.5	1.0	10.4	1.8	0.0	0.0	2.4	1.9	0.5	4.3	11.6	1.1	0.9
Schuylkill Haven	1,330	62.4	0.2	18.6	27.0	2.0	7.5	3.0	0.2	0.5	2.0	2.0	0.5	3.2	5.9	0.2	1.1
TROOP T																	
Bowmansville	9,035	74.5	0.8	16.9	22.8	0.9	1.8	1.0	0.0	0.0	0.4	1.0	0.1	1.9	0.9	0.1	0.1
Everett	9,316	92.1	0.1	18.1	5.3	0.9	2.5	1.8	0.0	0.1	0.8	2.4	0.0	2.6	0.1	0.7	1.7
Gibsonia	8,117	85.9	0.2	16.4	10.5	2.0	2.2	4.5	0.1	0.2	0.9	4.9	0.1	2.9	0.5	0.4	3.3
King of Prussia	7,271	83.5	0.5	22.8	13.4	4.5	3.7	1.3	0.1	0.1	0.7	1.2	0.3	1.7	0.3	0.2	0.2
New Stanton	7,642	73.8	0.4	19.9	22.9	0.6	2.7	1.8	0.0	0.0	0.4	1.5	0.1	2.0	0.0	0.1	0.7
Newville	10,962	82.5	0.3	19.0	12.1	0.9	4.6	2.1	0.1	0.2	0.7	1.3	0.1	1.7	2.3	0.1	0.7
Pocono	5,496	91.3	0.7	18.1	6.2	0.9	2.1	1.2	0.0	0.4	0.2	0.8	0.1	1.4	3.7	0.1	0.1
Somerset (T)	8,521	82.1	0.1	23.1	16.0	0.9	1.7	1.7	0.0	0.0	0.4	0.8	0.1	1.0	0.0	0.4	2.1

Table 3.5. Reason for Stop By Station (p.2 of 4)

	Total # of Stops	% Speeding		Amt. Over limit	% Mov. Viol.		% Equip./ Inspect.		% Preexist. Info.		% Regist.		% License		% Spec. Traf. Enf.	% Other	
		P	S	P	P	S	P	S	P	S	P	S	P	S	P	P	S
AREA II																	
TROOP F																	
Coudersport	1,767	62.7	0.3	15.4	15.9	2.2	18.8	2.7	0.2	0.5	1.9	5.0	0.3	5.7	1.1	0.7	11.8
Emporium	1,311	47.5	0.2	14.8	37.3	6.9	13.6	3.4	0.1	0.2	1.1	3.2	0.3	4.7	3.7	0.8	1.3
Lamar	3,594	84.6	0.1	18.0	9.6	1.3	2.3	2.1	0.1	0.3	1.0	1.3	0.2	1.7	1.8	2.0	1.5
Mansfield	1,621	79.2	0.1	16.3	13.2	1.9	6.0	4.4	0.1	0.3	1.0	3.1	0.2	3.5	0.2	0.2	4.6
Milton	2,290	65.5	0.0	18.7	30.7	0.6	2.5	2.6	0.1	0.0	0.7	0.8	0.4	2.1	1.6	0.1	0.1
Montoursville	5,188	82.0	0.1	18.6	9.6	1.1	6.9	2.5	0.1	0.0	1.2	1.5	0.3	3.6	10.3	0.2	5.0
Selinsgrove	4,112	85.9	0.1	18.9	7.6	0.3	3.9	3.6	0.2	0.1	1.5	0.8	0.3	0.9	2.4	0.5	0.7
Stonington	1,503	67.8	0.1	17.8	8.12	3.7	19.8	5.0	0.1	0.2	2.9	7.1	0.5	9.3	11.5	1.0	2.9
TROOP P																	
Laporte	1,611	68.7	0.1	17.6	23.6	6.8	6.3	4.8	0.0	1.0	0.5	5.8	0.2	6.3	4.2	0.4	2.7
Shickshinny	1,124	69.8	1.4	19.3	17.0	2.9	10.1	5.4	0.2	0.4	1.3	2.5	0.5	3.8	13.0	0.2	3.8
Towanda	1,885	73.4	0.3	18.4	11.1	6.6	10.3	5.6	0.4	0.5	2.8	6.5	0.6	8.1	3.8	0.2	1.6
Tunkhannock	1,465	58.5	0.0	19.2	29.3	3.8	7.5	11.9	0.5	0.0	2.0	3.0	0.9	4.6	2.5	0.3	1.5
Wyoming	2,701	66.9	0.3	22.1	18.5	2.0	11.4	4.9	0.0	0.0	2.0	3.7	0.5	5.6	6.4	0.2	1.8
TROOP R																	
Blooming Grove	2,867	59.4	0.1	19.5	20.3	0.6	19.3	1.8	0.1	0.5	0.7	2.7	0.2	1.9	4.5	5.7	0.5
Dunmore	2,091	69.5	0.1	20.6	26.4	1.6	3.1	2.1	0.4	0.2	1.5	1.3	0.2	3.2	7.8	1.1	0.7
Gibson	1,296	67.2	0.4	18.7	24.0	2.3	7.3	3.6	0.2	0.0	0.9	2.3	0.8	2.1	18.5	1.9	0.6
Honesdale	2,745	54.1	0.2	19.4	25.8	1.8	16.6	3.6	0.1	0.0	1.0	2.8	0.5	3.0	8.2	0.2	0.7
AREA III																	
TROOP A																	
Ebensburg	3,228	60.6	0.1	17.8	22.9	1.8	13.4	5.8	0.1	0.4	2.4	2.9	0.2	2.7	0.5	0.0	0.1
Greensburg	5,699	61.8	0.3	21.3	17.9	1.6	15.8	1.5	0.1	0.9	4.3	2.3	0.7	3.6	6.2	0.5	0.5
Indiana	4,229	65.3	0.1	18.6	18.9	1.2	12.5	4.0	0.1	0.0	2.9	5.5	0.3	5.3	5.8	0.3	1.8
Kiski Valley	3,019	60.1	0.0	19.8	24.2	3.1	12.2	7.2	0.1	2.8	2.5	4.9	0.4	6.8	11.5	2.6	0.1
Somerset (A)	2,289	64.8	0.1	17.6	14.7	3.2	16.2	4.4	0.2	0.9	3.0	6.4	0.4	6.5	6.1	1.4	1.4

Table 3.5. Reason for Stop By Station (p.3 of 4)

	Total # of Stops	% Speeding		Amt. over limit	% Mov. Viol.		% Equip./ Inspect.		% Preexist. Info.		% Regist.		% License		% Spec. Traf. Enf.	% Other	
		P	S	P	P	S	P	S	P	S	P	S	P	S	P	P	S
AREA III (cont.)																	
TROOP B																	
Belle Vernon	3,553	77.3	0.0	21.2	12.4	1.5	10.7	1.8	0.1	0.0	1.8	1.0	0.1	1.9	4.1	0.3	0.1
Findlay	6,828	79.3	0.1	22.3	11.7	3.2	6.2	4.2	0.1	0.2	2.2	3.0	0.3	4.9	6.4	0.4	1.1
Uniontown	3,884	54.7	0.5	20.0	22.8	0.9	17.4	2.5	0.3	0.1	3.6	2.9	0.6	4.3	5.3	0.8	2.4
Washington	5,260	47.8	0.2	21.0	39.5	2.4	10.2	2.8	0.2	0.1	2.5	4.0	0.4	5.3	3.1	0.4	0.6
Waynesburg	2,662	63.9	0.2	18.5	17.2	1.8	15.1	3.0	0.4	0.1	2.9	2.6	0.5	4.0	1.3	0.4	0.3
TROOP G																	
Bedford	3,335	73.2	0.2	17.2	13.5	1.9	10.6	4.9	0.1	0.3	1.7	3.4	0.2	4.0	4.7	0.8	2.1
Hollidaysburg	3,225	63.6	0.0	18.0	23.6	1.7	11.4	6.1	0.1	0.1	2.1	8.0	0.2	9.7	0.7	0.3	1.2
Huntingdon	2,490	71.7	0.0	16.3	14.9	4.6	11.2	4.5	0.0	0.1	1.5	6.3	0.2	6.8	1.5	0.1	2.2
Lewistown	2,727	74.6	0.1	18.5	14.3	1.7	9.5	3.7	0.1	0.0	1.1	3.6	0.4	4.7	1.8	0.3	1.4
McConnellsburg	2,386	82.3	0.2	17.7	8.5	1.6	7.2	2.8	0.2	0.1	1.0	3.3	0.2	2.4	3.7	0.5	1.6
Philipsburg	2,756	90.6	0.0	15.7	7.0	5.2	1.6	11.9	0.0	0.1	0.2	9.8	0.0	9.2	3.3	0.3	0.9
Rockview	5,202	79.6	0.2	18.5	16.0	1.4	3.9	2.1	0.0	0.0	0.9	2.1	0.1	3.0	5.0	0.3	2.9
AREA IV																	
TROOP C																	
Clarion	5,523	87.2	0.4	18.3	7.4	5.9	4.2	3.5	0.1	0.5	0.5	4.0	0.1	4.4	5.5	0.4	5.9
Clearfield	5,590	84.1	0.3	16.5	9.7	6.1	5.0	2.8	0.1	0.5	0.5	1.8	0.2	2.0	0.1	0.1	2.4
Dubois	3,491	88.6	0.0	17.1	5.4	2.0	4.3	1.2	0.3	0.2	0.7	1.7	0.1	2.6	1.0	0.3	3.5
Kane	1,927	71.5	0.3	16.6	17.4	1.4	9.1	0.9	0.1	0.0	1.2	1.2	0.7	2.5	2.5	0.2	1.0
Punxsutawney	3,301	76.5	0.0	17.3	7.9	1.8	14.2	4.0	0.2	0.2	1.6	4.4	0.2	5.9	2.4	0.2	2.6
Ridgway	2,429	72.5	0.4	15.9	14.3	5.4	11.6	4.9	0.1	0.9	0.7	5.4	0.6	6.6	4.3	0.7	5.5
Tionesta	2,113	78.9	0.2	14.1	8.4	2.8	11.4	7.1	0.1	1.9	0.4	5.2	0.1	5.8	10.2	0.1	2.7
TROOP D																	
Beaver	2,661	69.3	0.3	18.7	11.0	2.5	17.3	7.1	0.1	0.0	4.2	3.6	0.2	4.9	2.5	0.3	2.2
Butler	5,574	66.9	0.7	18.9	13.6	2.9	14.8	3.4	0.1	0.2	3.3	3.8	0.1	3.9	6.1	0.7	1.5
Kittanning	3,295	73.0	0.6	20.3	15.7	6.4	9.3	4.9	0.2	0.8	1.5	4.0	0.2	5.9	9.6	0.8	2.5
Mercer	2,787	77.7	0.4	17.6	8.5	3.6	9.5	6.4	0.2	0.2	2.5	6.4	0.4	6.6	5.8	0.2	2.5
New Castle	2,333	67.1	0.5	17.5	15.1	5.7	12.7	6.8	0.0	0.0	3.0	4.4	0.4	7.4	6.8	0.3	12.0

Table 3.5. Reason for Stop By Station (p.4 of 4)

	Total # of Stops	% Speeding		Amt. over limit	% Mov. Viol.		% Equip./ Inspect.		% Preexist. Info.		% Regist.		% License		% Spec. Traf. Enf.	% Other	
		P	S	P	P	S	P	S	P	S	P	S	P	S	P	P	S
AREA IV (cont.)																	
TROOP E																	
Corry	1,114	79.3	0.2	17.1	11.8	1.4	7.0	3.7	0.2	0.2	1.6	3.3	0.3	5.7	2.2	0.9	3.2
Erie	4,535	78.6	0.3	18.8	14.3	0.7	4.8	1.2	0.1	0.1	1.7	1.5	0.1	2.3	6.6	0.5	0.8
Franklin	2,450	64.1	0.3	16.9	12.7	4.3	20.7	4.2	0.2	0.3	2.5	6.1	0.3	8.4	1.1	0.0	0.6
Girard	4,375	76.5	0.4	17.9	10.1	1.4	9.5	2.3	0.3	1.1	3.1	3.7	0.2	4.0	5.2	0.5	1.7
Meadville	2,692	75.6	0.5	17.2	10.4	4.6	9.8	4.2	0.3	0.2	2.2	4.5	0.1	3.3	2.3	0.4	3.5
Warren	1,367	77.6	0.0	17.9	9.7	1.1	9.3	2.5	0.3	0.3	2.9	2.5	0.3	2.1	2.6	0.7	4.0
AREA V																	
TROOP K	12,888	50.2	0.5	23.7	27.8	1.8	16.7	3.5	0.0	0.2	4.2	4.3	0.5	5.9	8.2	3.5	4.6
Media	4,793	49.3	0.3	24.8	35.5	1.4	11.3	3.1	0.1	0.0	4.2	2.2	0.6	3.7	6.0	0.3	0.4
Philadelphia	3,645	51.7	1.2	23.3	26.4	2.4	17.4	3.3	0.1	0.0	3.2	4.1	0.6	6.0	12.0	0.7	2.2
Skippack	4,450	49.9	0.3	22.8	20.6	1.8	22.0	4.2	0.1	0.7	5.1	6.5	0.4	8.1	7.6	9.2	11.1
TROOP M																	
Belfast	2,976	78.8	0.2	23.8	11.2	2.0	7.7	4.4	0.0	0.0	1.7	2.9	0.2	4.3	4.8	0.1	0.4
Bethlehem	2,726	47.2	0.4	21.1	18.8	1.3	28.2	2.7	0.1	0.0	5.4	3.3	0.2	5.8	7.4	1.3	2.0
Dublin	4,117	42.5	0.4	20.8	15.3	2.4	36.4	3.1	0.3	0.5	3.3	6.6	0.2	5.7	24.5	0.7	2.8
Fogelsville	4,737	67.1	0.9	22.4	22.6	2.5	7.5	3.7	0.1	0.0	1.9	1.9	0.2	2.2	8.8	2.4	0.9
Trevose	2,742	55.6	0.3	27.0	27.5	1.5	13.8	2.0	0.1	0.1	3.0	3.0	0.3	4.9	4.5	0.6	0.4
TROOP N																	
Bloomsburg	3,349	86.4	0.1	16.7	11.0	6.3	1.6	2.7	0.1	0.1	0.7	1.6	0.1	1.8	18.9	0.6	0.1
Fern Ridge	2,609	80.3	0.1	18.8	11.0	2.6	7.2	1.7	0.1	0.0	1.2	1.1	0.1	2.9	20.7	1.3	0.5
Hazleton	2,965	64.5	0.4	19.2	23.7	0.4	10.2	1.7	0.2	0.0	1.8	2.2	0.2	3.6	7.4	1.3	0.6
Lehighton	2,558	68.4	0.2	18.9	12.3	1.5	17.1	2.5	0.1	0.1	2.2	1.8	0.0	3.3	8.4	0.1	0.5
Swiftwater	4,023	67.3	0.9	19.8	20.1	3.0	8.8	4.9	0.1	0.4	1.5	1.1	0.4	1.6	7.6	1.0	0.5
Canine																	

DRIVERS' CHARACTERISTICS

Drivers' Age & Gender

The characteristics of drivers stopped by PSP Troopers are described at the department, area, and troop levels in **Table 3.6**, and at the station level in **Table 3.7**. At the department level, the average age of drivers stopped was 33.2, and 70.1% of the drivers stopped by Troopers were male. At the area, troop, and station level, the average age of drivers stopped was quite similar, with the largest difference in average age occurring at the station level. For example, the average age of drivers stopped by Troopers was 39.0 in Laporte, compared to 29.6 in Hollidaysburg (see **Table 3.7**). Males were consistently more likely than females to be stopped at all levels within the department. The highest percentage of male drivers stopped occurred in Somerset (T) station (77.3%), while the lowest percentage of male drivers stopped by Troopers occurred in Newport (63.5%).

Drivers' Race & Ethnicity

The racial / ethnic background of drivers was also recorded by Troopers. PSP Troopers visually determined the racial and ethnic composition of drivers. That is, no motorists were asked for their racial or ethnic category. These determinations were based solely on Troopers' perceptions. For data collected directly by police, the reliability and validity of citizens' race involves two related concerns. First, police may be reluctant to indicate drivers' race, or may simply report inaccurately. Second, Troopers may "disengage," or initiate fewer traffic stops overall. Both of these behaviors represent an effort by Troopers to protect themselves from criticism, departmental discipline, and potential lawsuits. From the Troopers' perspective, this is a reasonable response to data collection efforts that are specifically designed to identify Troopers who "racially profile."

Unfortunately, the validity of the data collected by police officers often cannot be directly assessed. There are strategies, however, to increase validity and reliability of this type of data collection. For the data collection effort with the PSP, for example, confidentiality has been contractually promised to each Trooper. Although Troopers' employee numbers are initially reported on the data collection forms, the research team is required to strip this information from all data files after Troopers' demographic information has been successfully merged with the contact data. Through the procedures included in the contract and approved by the University of Cincinnati Institutional Review Board, PSP legal team, and PSP union officials, individual Troopers cannot be identified in data analyses, thus protecting Troopers from internal discipline and potential civil and criminal liability based on the data collection effort. The Principal Investigator advised all PSP Troopers of this confidentiality agreement in a training video. Other initiatives designed to increase compliance and data accuracy are described in the Year 1 Final Report (Engel et al., 2004).

The racial and ethnic descriptions of drivers stopped by Troopers are reported at the department, area, and troop levels in **Table 3.6**, and the station level in **Table 3.7**. The Contact Data Report captures Troopers' perceptions of drivers' race / ethnicity in one of eight categories, with the percentage across the department indicated in brackets:

- White (85.3%)
- Black (7.7%)
- White Hispanic (2.7%)
- Black Hispanic (0.3%)
- Native American (0.0%)
- Middle Eastern (1.8%)
- Asian/Pacific Islander (1.7%)
- Unknown race / ethnicity or missing data (0.6%)

In **Tables 3.6** and **3.7**, missing data is collapsed with the category "unknown race." It is important to note that the percentages of unknown or missing drivers' race/ethnicity are extremely low, with only two stations (i.e., Kane and Lamar) reporting greater than 3% of traffic stops with unknown or missing drivers' race / ethnicity. This remarkably low percentage of missing data is directly attributable to PSP administrators' continued emphasis on Troopers' compliance with the data collection effort. As described in the Year 1 Final Report methodology section, multiple supervisors ensured the accuracy of the data forms and minimized errors by reviewing each form individually. Supervisors were given feedback every two weeks regarding the error rates for their individual areas, troops, and stations, with particular emphasis placed on missing race / ethnicity information. This continual feedback, combined with direct supervisory oversight, top administrators' emphasis of the importance of this data collection effort, and the efforts of individual Troopers has resulted in one of the most reliable data collection efforts in the country.

It should be noted that some variation in the racial and ethnic background of drivers stopped across areas, troops, and stations 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.

As shown in **Table 3.6**, at the area level, variations in the racial /ethnic background of drivers was evident. For example, Area III reported the highest number of White drivers stopped (91.6%), while Area V stopped the lowest percent of Caucasian drivers (78.5%). Differences in racial composition of drivers stopped across areas are also pronounced for Black drivers. For example, Black drivers accounted for 11.0% of drivers stopped in Area V, compared to 4.1% of drivers in Area II. This pattern is repeated across the other racial groups, although less noticeable in the White Hispanic, Middle Eastern, and Asian/Pacific Islander categories where the percentages of drivers stopped are all extremely low.

At the troop level (see **Table 3.6**), the variation increased across all racial / ethnic categories when compared to the departmental averages. The percentage of White drivers stopped at the troop level varied from a high of 95.9% of drivers in Troop P, to a low of 75.4% in Troop K. Black drivers represented 16.2% of stops in Troop K, while only 2.2% of stops in Troop P. Similarly, White Hispanics varied from 7.1% of the stops by Troopers in Troop J, compared to only 0.4% of stops by Troopers in Troop A.

As expected, at the station level (see **Table 3.7**), this pattern of racial /ethnic variation in the percentage of drivers stopped is even more pronounced. For example, White drivers ranged from 98.9% of stops in Warren to only 64.7% of stops in Philadelphia. In addition, Troopers in Philadelphia stopped the highest percentage of Black drivers compared to all other stations (23.5%), while there were four stations with less than 1% of stops of Black drivers. Please refer to **Table 3.7** for the breakdown across the other racial categories.

Drivers' Residency

Tables 3.6 and **3.7** also report drivers' residency based on zip codes. For every traffic stop, Troopers recorded the drivers' zip code to determine the percentage of stops that occurred in locations 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** and **3.7** however, this is an inaccurate assumption. Specifically, statewide, 95.5 of the drivers stopped by Troopers did not reside in the municipality where they were stopped, 65.5% did not reside in the county where they were stopped, and 26.5% did not reside in Pennsylvania.

When examined at the area, troop, and station levels, it becomes obvious that the percentages of out-of-state and out-of-county residents stopped by Troopers varied dramatically by location. For example, Troopers working in Area I consistently stopped the highest percent of out-of-state drivers (32.2%) and out-of-county drivers (75.8%). Conversely, Troopers working in Area III stopped the lowest percent of out-of-state drivers (17.2%) and out-of-county drivers (54.6%). The differences between areas stopping out-of-municipality drivers only varied from 93.9 (Area III) to 97.7 (Area I).

More dramatic differences in the percentages of non-residents stopped by Troopers are uncovered at the troop and station levels. For example, the percentage of drivers who did not live in the municipality where they were stopped ranged from 99.6% of drivers stopped in Troop T to 92.0% of drivers stopped in both Troop A and Troop E. At the station level, Somerset (T) station had a 100% stopping percentage for out-of-municipality drivers, compared to 87.7% of drivers stopped by Troopers assigned to the Girard station.

Likewise, drivers stopped in a different county than the one in which they resided ranged from 90.9% of drivers stopped in Troop T, compared to only 37.4% of drivers stopped in Troop J. At the station level, Troopers assigned to the Everett station stopped the highest percentage of out-of-county drivers (99.4%), while Troopers assigned to the Uniontown station stopped the lowest percent of out-of-county drivers (21.9%).

Finally, the highest percentage of out-of-state drivers stopped at the Troop level was in Troop C (39.8%), whereas Troop A (5.5%) had the lowest percentage of out of state drivers. At the station level, the highest percentages of non-PA residents were stopped in Somerset (T) (64.5%), Gibson (63.2%), and McConnellsburg (60.1%) stations. In contrast, only 1.3%, 2.5%, and 2.7% of drivers stopped in Stonington, Lykens, and Greensburg stations, respectively, were non-PA residents.

Given that only 4.5% of stopped drivers resided in the municipality where they were stopped department wide, Census benchmark comparisons at the municipality level are inappropriate. Likewise, Census benchmark comparisons based on residential populations at the county level for counties where a majority of traffic stops were of out-of-county residents are also inappropriate comparisons. These issues will be further discussed in Section IV of this report and can also be found in Section V of the Year 1 Final Report (see Engel et al., 2004).

Table 3.6. Characteristics of Drivers Stopped By Department, Area & Troop

	Total # of Stops	Average Age	% Male	% White	% Black	% White Hisp.	% Black Hisp.	% Native American	% Middle Eastern	% Asian	% Missing/ Unknown	% stopped out of state	% stopped out of county	% stopped out of municipality
PSP Dept.	315,705	33.2	70.1	85.3	7.7	2.7	0.3	0.0	1.8	1.7	0.6	26.5	65.5	95.5
Area I	107,464	33.0	70.5	81.0	10.0	3.4	0.4	0.0	2.3	2.3	0.7	32.2	75.8	97.7
Troop H	21,236	32.2	68.7	87.0	6.6	3.1	0.3	0.0	1.2	1.3	0.6	24.1	55.9	94.4
Troop J	9,604	32.2	69.1	80.7	9.1	7.1	0.5	0.0	0.9	1.5	0.3	10.9	37.4	95.2
Troop L	10,236	33.5	71.2	84.2	6.1	5.6	0.9	0.0	1.9	1.2	0.2	23.3	55.4	94.1
Troop T	66,388	33.3	71.1	78.6	11.8	2.6	0.4	0.1	2.9	2.9	0.8	39.3	90.9	99.6
Area II	39,171	34.0	70.0	91.0	4.1	1.7	0.2	0.0	1.1	1.2	0.9	26.9	65.2	95.1
Troop F	21,386	33.8	69.3	90.3	4.5	1.7	0.1	0.0	1.3	1.3	0.8	26.4	69.7	96.3
Troop P	8786	33.6	70.4	95.9	2.2	0.9	0.1	0.0	0.3	0.4	0.3	15.0	53.6	94.8
Troop R	8,999	35.0	71.2	87.9	5.0	2.6	0.2	0.0	1.4	1.6	1.5	39.5	65.9	92.4
Area III	62,772	33.0	69.1	91.6	5.2	0.7	0.1	0.0	1.0	1.1	0.3	17.2	54.6	93.9
Troop A	18,464	33.2	68.3	94.9	3.4	0.4	0.0	0.0	0.5	0.6	0.2	5.5	44.4	92.0
Troop B	22,187	33.1	70.0	90.4	6.9	0.6	0.0	0.0	1.0	1.0	0.3	21.2	51.4	94.0
Troop G	22,121	32.8	68.9	90.1	5.0	1.2	0.2	0.0	1.5	1.6	0.4	22.9	66.3	95.2
Area IV	57,557	33.6	69.9	89.0	5.3	1.5	0.3	0.0	1.9	1.3	0.8	27.6	61.6	94.3
Troop C	24,374	34.5	72.7	85.5	6.0	2.5	0.4	0.0	2.8	1.8	1.1	39.8	75.7	95.6
Troop D	16,650	32.5	68.6	91.9	5.0	0.8	0.1	0.0	1.1	0.8	0.4	15.1	54.8	94.6
Troop E	16,533	33.2	67.0	91.3	4.4	0.9	0.1	0.1	1.5	1.1	0.7	22.3	47.5	92.0
Area V	45,690	32.8	70.1	78.5	11.0	5.3	0.5	0.0	1.9	2.3	0.6	23.4	61.2	95.1
Troop K	12,888	33.5	68.3	75.4	16.2	3.3	0.3	0.0	1.5	2.9	0.6	13.0	49.8	95.3
Troop M	17,298	32.7	70.4	80.5	8.3	6.5	0.6	0.0	2.0	1.9	0.5	18.4	59.1	95.6
Troop N	15,504	32.4	71.3	78.9	9.7	5.6	0.5	0.1	2.3	2.3	0.8	37.8	72.9	94.4

Table 3.7. Characteristics of Drivers Stopped By Station (p.1 of 4)

	Total # of Stops	Average Age	% Male	% White	% Black	% White Hispanic	% Black Hispanic	% Native American	% Middle Eastern	% Asian	% Missing/ Unknown	% stopped out of state	% stopped out of county	% stopped out of municipality
Area I, Troop H														
Carlisle	4,890	32.9	68.9	86.3	7.0	2.7	0.3	0.1	1.8	1.5	0.4	36.4	74.4	98.1
Chambersburg	3,669	31.6	65.9	89.1	5.9	3.0	0.2	0.1	0.8	1.0	0.3	22.0	35.9	92.1
Gettysburg	2,070	32.9	68.3	87.0	5.5	4.7	0.2	0.0	1.5	0.9	0.5	29.0	56.3	94.8
Harrisburg	3,913	33.4	71.9	85.1	7.5	4.1	0.4	0.0	1.2	1.5	0.5	19.7	64.2	92.7
Lykens	924	33.2	66.5	97.0	1.3	0.5	0.2	0.0	0.7	0.2	0.2	2.5	28.8	88.9
Newport	1,513	30.2	63.5	91.1	3.6	1.3	0.2	0.0	1.7	2.1	0.2	11.6	78.4	97.6
York	4,257	30.9	70.7	84.2	8.7	3.4	0.4	0.0	0.9	1.2	1.4	22.7	41.9	93.8
Area I, Troop J														
Avondale	3,648	32.9	69.4	77.0	10.3	10.1	0.3	0.0	0.7	1.5	0.2	17.3	38.5	95.6
Embreeville	2,647	31.4	66.6	78.8	11.9	5.8	0.3	0.0	1.2	1.8	0.3	6.1	37.1	96.0
Ephrata	1,230	31.3	67.5	84.2	6.4	5.1	1.5	0.1	0.9	2.0	0.2	7.3	42.0	96.5
Lancaster	2,079	32.2	73.0	87.7	5.0	4.7	0.7	0.0	0.7	1.0	0.7	8.0	33.2	92.7
Area I, Troop L														
Frackville	1,295	34.5	73.1	91.0	3.8	2.5	0.3	0.0	1.2	1.1	0.2	25.6	55.6	93.4
Hamburg	1,706	34.5	69.9	75.7	9.3	6.6	1.5	0.0	4.0	2.8	0.4	40.1	83.2	97.9
Jonestown	3,018	33.4	74.1	81.3	8.4	5.8	0.5	0.0	2.6	1.3	0.1	37.8	76.6	97.0
Reading	2,887	32.9	69.3	84.1	4.9	8.2	1.6	0.0	0.7	0.6	0.2	5.0	28.5	88.3
Schuylkill Haven	1,330	32.8	68.8	95.1	1.7	1.6	0.2	0.1	0.8	0.5	0.1	6.1	29.5	96.1
Area I, Troop T														
Bowmansville	9,035	31.0	66.8	76.5	12.6	3.9	0.7	0.1	2.5	3.2	0.9	27.3	93.5	99.8
Everett	9,316	33.8	71.3	74.4	14.6	2.9	0.2	0.0	3.9	3.9	0.1	50.8	99.4	99.9
Gibsonia	8,117	34.3	70.0	82.8	10.0	1.8	0.2	0.0	2.3	2.0	0.9	42.1	83.0	99.1
King of Prussia	7,271	34.5	73.7	80.4	9.9	2.8	1.1	0.0	2.5	3.0	0.4	23.5	79.0	99.1
New Stanton	7,642	32.7	69.6	85.8	9.0	1.1	0.1	0.1	1.9	1.7	0.6	29.8	75.6	99.3
Newville	10,962	32.8	71.5	76.4	13.3	2.9	0.4	0.0	3.5	3.3	0.4	39.9	97.3	99.9
Pocono	5,496	32.5	68.1	85.8	7.2	2.0	0.4	0.0	2.1	2.5	0.1	29.2	96.1	99.9
Somerset (T)	8,521	35.1	77.3	72.0	14.9	3.0	0.2	0.1	3.8	3.6	2.9	64.5	98.4	100.0

Table 3.7. Characteristics of Drivers Stopped By Station (p.2 of 4)

	Total # of Stops	Average Age	% Male	% White	% Black	% White Hispanic	% Black Hispanic	% Native American	% Middle Eastern	% Asian	% Missing/ Unknown	% stopped out of state	% stopped out of county	% stopped out of municipality
Area II, Troop F														
Coudersport	1,767	35.9	71.4	97.7	1.0	0.6	0.1	0.0	0.4	0.3	0.0	15.2	61.0	89.9
Emporium	1,311	37.0	76.5	98.7	0.6	0.3	0.0	0.0	0.3	0.1	0.0	9.6	78.7	95.0
Lamar	3,594	33.4	72.4	77.5	8.3	3.9	0.3	0.1	3.2	3.6	3.4	54.5	88.0	99.3
Mansfield	1,621	34.7	68.1	93.3	3.0	0.6	0.1	0.1	1.1	0.5	1.7	35.9	61.4	96.2
Milton	2,290	32.1	67.6	82.1	8.4	3.8	0.3	0.0	2.9	2.5	0.2	40.6	89.4	99.0
Montoursville	5,188	33.2	68.1	92.7	4.4	1.2	0.1	0.0	0.7	0.8	0.3	18.3	54.6	96.1
Selinsgrove	4,112	33.4	68.0	93.1	4.0	0.9	0.1	0.0	1.0	0.9	0.2	19.7	79.0	97.1
Stonington	1,503	33.9	64.5	97.4	0.9	0.9	0.1	0.0	0.3	0.4	0.1	1.3	33.9	91.8
Area II, Troop P														
Laporte	1,611	39.0	74.3	98.1	0.7	0.5	0.1	0.0	0.1	0.5	0.3	17.3	84.5	96.6
Shickshinny	1,124	32.3	67.1	96.0	2.3	1.1	0.1	0.0	0.4	0.2	0.4	4.3	34.3	94.0
Towanda	1,885	34.5	70.9	97.8	1.1	0.5	0.1	0.0	0.3	0.2	0.3	15.5	34.3	92.3
Tunkhannock	1,465	32.7	73.0	97.3	0.6	1.1	0.1	0.0	0.3	0.3	0.4	6.8	69.2	96.2
Wyoming	2,701	30.7	67.7	92.4	4.8	1.3	0.1	0.0	0.5	0.7	0.2	22.3	48.3	95.1
Area II, Troop R														
Blooming Grove	2,867	35.1	69.7	88.1	5.9	3.0	0.1	0.1	0.7	0.9	1.5	41.8	67.9	88.8
Dunmore	2,091	33.9	73.7	85.8	6.0	3.6	0.4	0.1	1.5	1.9	0.8	36.7	66.7	96.1
Gibson	1,296	33.5	75.0	79.6	7.8	1.8	0.5	0.1	4.6	4.4	1.7	63.2	79.4	97.1
Honesdale	2,745	36.3	69.0	93.2	2.0	1.8	0.2	0.0	0.7	0.7	1.9	28.1	56.9	91.2
Area III, Troop A														
Ebensburg	3,228	33.5	67.9	95.6	2.5	0.5	0.1	0.0	0.7	0.4	0.1	6.4	50.4	91.3
Greensburg	5,699	33.3	64.6	95.8	2.9	0.3	0.0	0.1	0.4	0.5	0.1	2.7	26.0	91.8
Indiana	4,229	32.0	70.1	94.7	3.2	0.3	0.0	0.0	0.7	1.0	0.3	6.7	54.8	92.3
Kiski Valley	3,019	33.0	69.9	90.8	7.3	0.5	0.0	0.0	0.6	0.6	0.3	4.8	64.0	94.0
Somerset (A)	2,289	35.2	72.9	97.8	1.4	0.2	0.0	0.0	0.1	0.3	0.3	10.0	36.4	90.5
Area III, Troop B														
Belle Vernon	3,553	34.0	74.0	89.8	7.0	0.7	0.1	0.1	1.2	1.1	0.0	24.2	62.4	95.1
Findlay	6,828	32.7	70.9	87.9	8.6	0.7	0.1	0.0	1.3	1.4	0.5	20.6	53.3	95.0
Uniontown	3,884	32.5	67.5	93.6	5.7	0.2	0.0	0.0	0.2	0.2	0.2	4.9	21.9	90.3
Washington	5,260	33.6	69.2	90.6	6.6	0.6	0.0	0.0	1.0	1.0	0.5	24.7	57.0	94.5
Waynesburg	2,662	32.7	67.3	92.2	4.5	0.9	0.0	0.0	1.2	1.1	0.2	36.0	63.8	94.6

Table 3.7. Characteristics of Drivers Stopped By Station (p.3 of 4)

	Total # of Stops	Average Age	% Male	% White	% Black	% White Hispanic	% Black Hispanic	% Native American	% Middle Eastern	% Asian	% Missing/ Unknown	% stopped out of state	% stopped out of county	% stopped out of municipality
Area III, Troop G														
Bedford	3,335	32.8	69.4	93.0	3.9	1.0	0.0	0.1	1.0	1.1	0.2	24.0	57.5	94.9
Hollidaysburg	3,225	29.6	66.2	93.0	4.1	0.7	0.1	0.0	0.6	1.4	0.2	16.8	55.3	88.2
Huntingdon	2,490	33.2	68.2	97.3	1.9	0.4	0.0	0.0	0.1	0.2	0.1	3.8	55.7	97.4
Lewistown	2,727	30.9	68.4	90.5	4.2	1.7	0.2	0.1	1.0	1.6	1.1	9.8	64.8	93.1
McConnellsburg	2,386	35.5	72.1	77.7	14.1	1.8	0.1	0.1	3.3	2.8	0.3	60.1	88.2	96.1
Philipsburg	2,756	34.7	69.5	94.5	2.8	0.6	0.1	0.0	1.2	0.7	0.3	12.8	68.9	97.5
Rockview	5,202	33.2	69.1	86.4	5.4	2.0	0.4	0.0	2.8	2.6	0.6	30.1	73.2	98.3
Area IV, Troop C														
Clarion	5,523	34.2	71.3	77.6	10.2	4.1	0.8	0.1	3.9	2.9	0.5	55.4	84.8	97.8
Clearfield	5,590	33.3	72.6	82.7	7.6	2.4	0.7	0.0	4.3	2.2	0.2	49.6	74.6	96.7
Dubois	3,491	33.9	72.1	78.9	8.8	4.5	0.5	0.0	4.0	2.7	0.6	55.7	87.8	98.5
Kane	1,927	36.3	76.3	89.9	1.0	0.6	0.1	0.1	1.0	0.7	6.8	29.5	62.1	93.2
Punxsutawney	3,301	34.7	72.5	93.7	3.0	1.1	0.2	0.0	1.0	0.8	0.4	18.8	67.9	95.5
Ridgway	2,429	34.6	73.6	93.8	1.4	1.2	0.0	0.0	1.1	0.6	2.0	20.9	57.9	87.8
Tionesta	2,113	37.9	73.6	97.9	1.0	0.2	0.0	0.0	0.4	0.4	0.4	11.2	79.8	93.2
Area IV, Troop D														
Beaver	2,661	31.9	67.9	92.3	6.3	0.4	0.0	0.0	0.7	0.3	0.1	19.2	51.4	96.2
Butler	5,574	32.2	68.6	95.5	2.6	0.4	0.0	0.0	0.7	0.7	0.3	8.7	53.0	93.2
Kittanning	3,295	31.8	67.5	93.6	4.6	0.3	0.1	0.0	0.6	0.5	0.3	3.5	49.1	96.1
Mercer	2,787	32.5	71.8	81.2	8.8	3.0	0.4	0.1	3.5	2.3	0.9	39.5	75.4	98.0
New Castle	2,333	34.7	67.1	93.0	5.7	0.3	0.0	0.0	0.6	0.2	0.5	12.9	46.7	89.9
Area IV, Troop E														
Corry	1,114	33.7	70.7	97.1	1.7	0.3	0.2	0.0	0.4	0.4	0.5	7.8	41.8	94.4
Erie	4,535	33.7	66.7	89.1	5.4	1.0	0.3	0.1	1.9	2.0	0.4	38.2	53.6	94.1
Franklin	2,450	33.3	66.2	97.8	1.1	0.5	0.0	0.1	0.3	0.2	0.2	4.7	37.2	89.3
Girard	4,375	33.5	65.7	87.7	6.3	1.6	0.2	0.0	1.8	1.0	1.4	22.8	40.3	87.7
Meadville	2,692	32.2	66.9	88.8	6.1	0.8	0.0	0.1	2.4	1.0	1.0	24.8	68.3	96.1
Warren	1,367	32.6	71.0	98.9	0.4	0.2	0.1	0.0	0.0	0.4	0.3	6.7	32.7	93.5

Table 3.7. Characteristics of Drivers Stopped By Station (p.4 of 4)

	Total # of Stops	Average Age	% Male	% White	% Black	% White Hispanic	% Black Hispanic	% Native American	% Middle Eastern	% Asian	% Missing/ Unknown	% stopped out of state	% stopped out of county	% stopped out of municipality
Area V, Troop K														
Media	4,793	33.0	68.7	74.8	17.7	2.9	0.2	0.0	1.5	2.5	0.8	21.4	54.9	95.9
Philadelphia	3,645	32.9	71.7	64.7	23.5	4.0	0.6	0.0	1.9	4.8	0.7	12.4	65.9	95.3
Skippack	4,450	34.5	65.2	84.8	8.5	3.3	0.2	0.1	1.1	1.9	0.3	4.4	31.1	94.5
Area V, Troop M														
Belfast	2,976	30.7	69.5	80.0	8.7	7.3	0.7	0.0	1.9	1.1	0.3	20.7	67.8	98.2
Bethlehem	2,726	32.6	68.9	79.5	7.3	7.8	0.6	0.1	2.3	2.0	0.9	8.3	48.5	93.7
Dublin	4,117	33.6	68.5	91.8	2.6	3.4	0.4	0.1	0.7	0.9	0.3	5.1	54.7	94.5
Fogelsville	4,737	33.8	72.7	76.5	8.8	8.6	0.8	0.1	2.6	2.4	0.4	29.3	66.4	97.1
Trevose	2,742	32.0	71.8	71.7	16.4	5.3	0.5	0.0	2.3	3.3	0.6	26.8	54.5	93.6
Area V, Troop N														
Bloomsburg	3,349	31.2	69.2	77.6	10.6	4.6	0.6	0.1	3.1	3.4	0.3	50.2	91.7	99.1
Fern Ridge	2,609	31.6	73.6	74.7	10.6	7.9	0.6	0.0	3.4	2.6	0.7	49.3	83.2	92.2
Hazleton	2,965	31.6	72.4	76.7	9.6	7.0	0.7	0.1	2.0	2.5	1.6	38.8	74.8	96.3
Lehighton	2,558	33.3	69.6	93.4	2.4	2.7	0.1	0.0	0.4	0.8	0.4	5.4	45.9	90.6
Swiftwater	4,023	34.0	71.7	75.0	13.3	5.8	0.6	0.1	2.2	2.1	1.0	39.8	66.4	93.1
Canine Unit	2,280	29.7	81.0	69.7	17.9	6.7	0.5	0.0	2.1	1.9	1.3	48.5	81.9	96.6

SUMMARY

Section III describes the characteristics of traffic stops and stopped drivers at the department, area, troop, and station levels, based on data collected from May 1, 2003 through April 30, 2004. The trends in these descriptive findings are summarized below.

- At all jurisdictional levels, the majority of traffic stops had the following characteristics:
  - Occurred on a weekday (69.9%)
  - Occurred during the daytime (71.3%)
  - Occurred on an interstate (49.2%) or state highway (46.7%)
  - Involved a vehicle registered in Pennsylvania (74.0%)
  - Involved vehicles with an average of 0.7 passengers
  - Lasted between 1-15 minutes (90.2%)

- July and August accounted for the largest percentages of traffic stops.

- At the department level, the most frequent violation observed prior to traffic stops was speeding (72.0%), followed by moving violations (16.1%), equipment inspections (9.4%), and special traffic enforcement programs (4.8%).

- The departmental average speed over the limit was recorded at 19.1, but the range varies considerably across area, troop, and station.

- Department wide, Troopers recorded the following drivers' characteristics:
  - Average age of 33.2 years
  - 70.1% were male
  - White (85.3%), Black (7.7%), Hispanic (3.0%), Middle Eastern (1.8%), Asian/Pacific Islander (1.8%), unknown race/ethnicity or missing data (0.6%)
  - Non-Pennsylvania resident (26.5%), non-resident of county in which they were stopped (65.5%), and non-resident of municipality in which they were stopped (95.5%)

- Drivers' characteristics, particularly race and residency, varied considerably by area, troop, and station.

- The dramatic variation in residency of drivers stopped indicates that it is inappropriate to assume municipality, county, or state residential populations are similar to the driving populations in those areas.

COMPARISONS TO DATA COLLECTED FOR YEAR 1

Overall, the descriptive characteristics of traffic stops and drivers stopped during the second year of data collection are very similar to the first year of data collection (see Engel et al., 2004). The following differences are noted:

- There were 11,415 fewer stops department-wide during Year 2 of data collection as compared to Year 1.

- Slightly fewer stops were made on weekdays and during the day during Year 2 (69.9% and 71.3%, compared to 71.8% and 72.4% in Year 1).

- Fewer stops were made on interstates (49.2% compared to 54.5%) and more stops were made on state highways during Year 2 (46.7% compared to 41.6%).

- Slightly more drivers stopped by troopers had Pennsylvania registrations in Year 2 (74.0%) compared to Year 1 (71.1%).

- July and August were the busiest months for traffic stops in Year 2, compared to the month of May in Year 1.

- A slightly smaller percentage of stops were made for speeding in Year 2 (72.0% compared to 74.6% in Year 1), but the average amount over the limit at which drivers were stopped rose slightly from 18.8 in Year 1 to 19.1 in Year 2.

- In Year 2, a larger percentage of stops were made for moving violations (16.1 compared to 13.6 in Year 1) and fewer stops were made for special traffic enforcement programs (4.8% compared to 8.9% in Year 1).

- The following small changes are noted in the characteristics of drivers stopped:
  - Average driver age decreased one year from 34.2 in Year 1 to 33.2 in Year 2.
  - The percentage of male drivers stopped was consistent across Years 1 & 2 (70.9% of stops in Year 1 and 70.1% of stops in Year 2).
  - A somewhat larger percentage of drivers stopped were White (83.7% in Year 1 to 85.3% in Year 2). Other racial groups' percentages were relatively consistent, with the exception of the unknown/missing category that decreased from 1.7% in Year 1 to just 0.6% in Year 2.
  - Overall, drivers stopped were even less likely to be state, county, and municipality residents of the location at which they were stopped in Year 2 as compared to Year 1 (non-PA 26.5% down from 29.5%, non-county 65.5% down from 67.9%, and non-municipality 95.5% down very slightly from 95.9%).

IV. TRAFFIC STOP BENCHMARK COMPARISONS

OVERVIEW

In this section, PSP traffic stop data is directly compared to multiple benchmarks and disproportionality ratios are calculated at the county level. There are five different comparisons made: 1) all traffic stops are compared to county level Census data for the driving age population[1], 2) traffic stops of drivers who reside in the county where the stop occurred are compared to county level Census data, 3) all traffic stops are compared to a weighted spatial traffic model, 4) daytime traffic stops are compared to daytime roadway observation data, and 5) daytime speeding traffic stops are compared to daytime speeding observation data. The first three comparisons are made for Black, Hispanic, and a collapsed category including all non-Caucasian drivers. The last two comparisons, based on observation data, are made only for two racial/ethnic groups: Black drivers and all non-Caucasian drivers (including drivers who are Black, Hispanic, Middle Eastern, Asian, American Indian, and/or Pacific Islanders). Disproportionality ratios are not created for Hispanic drivers using observation data, because as noted in Section II, observation techniques for identifying Hispanic drivers are less reliable.[2]

First, Census-based benchmark comparisons are displayed at the county level in **Table 4.1**. Additionally, **Table 4.1** includes the disproportionality indices for comparison purposes with the disproportionality ratios. The disproportionality ratios calculated in these tables are also graphically displayed for each of the 67 counties in **Figure 4.1** (Black disproportionality ratios), **Figure 4.3** (Hispanic disproportionality ratios), and **Figure 4.5** (all non-Caucasian disproportionality ratios). These figures are graphically displayed and compared with findings produced form the traffic model (located within the section detailing the traffic model). The data reported in **Tables 4.2** more closely examine the residency and race of drivers stopped in the state overall and by county. Specifically, these analyses suggest that Census-based benchmark comparisons to all traffic stops conducted by PSP are not accurate across all counties.

Second, based on the limited nature of the analyses presented in **Table 4.1**, an alternative Census-based comparison is created. **Table 4.3** displays the disproportionality ratios when the numerator (i.e., % of traffic stops) is limited to only stops of drivers who reside in the county where they were stopped, and the denominator is Census-based driving populations.

Third, a weighted traffic flow model is used that calculates a benchmark based on a combination of the stop data and the Census data. This model produces estimates of the

[1] The driving age population is defined as any individual over the age of 15 at the time of the Census. Although 16 years of age is the driving age for residents of Pennsylvania, the U.S. Census reports data for ages 15 or 17. For the Year 1 Report, the demographics for ages 16+ were estimated based on the 15 and 17 year old data. In contrast, for the Year 2 Report, all calculations and analysis involving driving age and/or Census is for 15 years of age and older. While using the 15-year cut off requires the inclusion of some citizens that are not eligible to drive, it eliminates the need to estimate data at 16 years old.

[2] It is likely that if our observers have misestimated the driving population of Hispanics, they have underestimated (by classifying Hispanics as Caucasian) rather than overestimated their representation in the driving population. Therefore, the disproportionality indices for Hispanics based on observational data would likely be artificially inflated. For further discussion of this issue, see Strengths and Limitations in Section II.

driving population for each county in Pennsylvania. Specific information regarding the creation and limitations of the traffic flow model are presented in **Appendix A**. **Table 4.4** displays the disproportionality ratios calculated by the traffic model. **Figure 4.2** (Black), **Figure 4.4** (Hispanic), and **Figure 4.6** (all non-Caucasian) visually display the disproportionality ratios for the traffic model.

Fourth, additional comparisons are made to subsets of the traffic stop data for 27 of the 67 counties where roadways were independently observed by the PSU research team during the first year of data collection (see Section II for the discussion of the selection of these counties). For these counties, the percentage of minority stops during daylight hours is compared to the percentage of minority drivers observed on the roadways during daylight hours. Disproportionality ratios based on the roadway observation denominator are presented in **Table 4.5**.

Fifth, disproportionality ratios based on comparisons of drivers stopped for speeding and drivers observed speeding are presented in **Table 4.6**. As with the observation-based analyses described above, the PSU research team conducted observations of speeding violations in 27 counties in 2002. Details regarding the methodology for the observation and speeding data collection study are provided in the Year 1 Report, and are repeated again in the current document in **Appendix B**.

Table 4.7 provides a comprehensive comparison for each county of the disproportionality ratios created with the five different benchmarks. **Figure 4.7** provides a visual comparison of the five different benchmarks and their varying disproportionality ratios.

This section concludes with three tables that highlight potential reasons for the differences between the benchmarks. **Tables 4.8** provides the reason for the stop by racial group to demonstrate the differing rates across racial groups. **Table 4.9** focuses specifically on drivers stopped for speeding by race, and **Table 4.10** examines the raw difference between the disproportionality ratios based on Census populations versus the disproportionality ratios based on the observed populations and speeding populations.

MEASUREMENT OF DISPROPORTIONALITY & COMPARISON OF METHODS

As described in Sections I and II, the crux of the interpretation of traffic stop data is dependent upon comparison data (Engel et al., 2002). 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. The most frequent comparison groups used by researchers in traffic stop studies have been: 1) Census data, 2) adjusted Census data, 3) observations of roadway usage, 4) official accident data, 5) assessments of traffic violating behavior, 6) citizen surveys of roadway usage and driving patterns, and 7) internal departmental comparisons. Each of these benchmarks has associated strengths and weaknesses (for a more thorough review of these techniques, see Engel & Calnon, 2004b). The best approach for comparisons to traffic stop data is to measure several benchmarks and compare the results to one another. While none of the benchmark methodologies are without flaws, some are inherently stronger than others are, and those benchmarks should be given more weight when comparing the results from different benchmarks. For example, Census data are widely regarded as the weakest benchmark measure, while observations that are based on methodologically sound data collection efforts are considered more valid indicators of actual roadway usage.

There are several different statistical methods used to compare traffic stop data to benchmark data (see Fridell, 2004). Most traffic stop studies use one of two methods: a disproportionality index and/or a disproportionality ratio. Both of these methods are utilized in this report and further described below.

Disproportionality Index (DI)

Using traffic stop data as the numerator and a benchmark as the denominator, a "disproportionality" or "disparity" index can be created. Disproportionality indices estimate the differences between the "actual" and "expected" rates of traffic stops for different demographic groups and are calculated as follows (e.g., Cox et al., 2001, Rojek et al., 2002):

$$\textbf{DI} = \frac{\text{the proportion of a group's actual rates of police actions}}{\text{the proportion of the group's expected rates of the same actions}}$$

The numerator—the actual proportion of the group—is typically based on all traffic stops, but it can be limited to only daylight stops, stops of just county residents (this presumably should mirror population statistics more closely than stops of everyone), or stops made for speeding violations only. More frequently, however, benchmark comparisons have focused on changing the denominator based on the group's representation in one of several types of comparison populations listed above. Indices greater than 1.0 indicate that a group is stopped *more* often than would be expected based on its percentage in the benchmark population; indices less than 1.0 indicate that a group is stopped *less* often than would be expected by their representation in the benchmark population. The larger the size of the disproportionality index, the larger the disparity between the actual and expected rate of stops.

There are several issues involved with the use of disproportionality indices. First, there is an obvious connection between the perceived validity of disproportionality indices and the type of benchmark used to make the comparison. A benchmark with a higher degree of validity will produce disproportionality indices with more validity. As described above, not all benchmarks are of equal validity. Therefore, disproportionality indices based on Census data, for example, must be interpreted with extreme caution.

Second, the stability of the disproportionality indices is based in part on the size of the denominator. This is especially a concern when Census figures are used to estimate the expected rate of stops. For example, as will be shown below, in nearly 2/3 of the counties in Pennsylvania, the residential population of Blacks and/or Hispanics is less than one percent. Thus, a small number of traffic stops of Black or Hispanic motorists in these counties would dramatically raise the disproportionality indices because the denominator is very small. In other words, in jurisdictions with unstable or small denominators (benchmarks), the numerator has a larger influence on the resulting disproportionality index.

Third, there is no scientifically accepted standard for the interpretation of the size of disproportionality indices. That is, there is no generally accepted statistical test that can be performed to determine if disproportionality indices are “too big” or “too small.” Likewise, there is no generally accepted “rule of thumb” used by researchers regarding the appropriate size of disproportionality indices. Consequently, one of the shortcomings of the disproportionality index is the difficult in interpreting the level of disproportionality based on the method described above.

As noted above, studies expressing disproportionality in terms of all of these indices have not established a threshold value above which the disproportionality is considered illegitimate or unjustified (Cox et al., 2001; Decker et al., 2002, Farrell et al., 2003). The main reason for this is that the sources of disparity are numerous—officer bias, institutional/organizational norms, legally relevant offending behavior, etc. (Engel & Calnon, 2004a; Farrell et al., 2003; Walker et al., 2000). To date, it has not been possible for researchers to measure the legitimacy of all possible explanations for disparity. One recent study of traffic stops singled out jurisdictions with disproportionality indices above the statewide average for further analysis (Farrell et al., 2003). Often, researchers have further analyzed traffic patterns (e.g., commuters, tourists, etc.) to try to explain why particular jurisdictions have disproportionality indices that appear to be outliers in comparison to other jurisdictions (Cox et al., 2001; Decker et al., 2002). In an attempt to address the shortcomings of the disproportionality index, creation of a disproportionality ratio (described below) is the preferred method.

Disproportionality Ratio (DR)

Developing out of the concerns regarding the interpretability of the disproportionality index, a more effective method of reporting the results is to calculate a disproportionality ratio.[3] To calculate this value, the disproportionality index must be available for both the minority population of interest and the majority population of interest. Once those values are determined, the disproportionality ratio is calculated as follows:

$$\textbf{DR} = \frac{\text{the minority disproportionality index}}{\text{the majority disproportionality index}}$$

The resulting value is the disproportionality ratio and is interpreted as the likelihood of being stopped if you are part of the racial group of interest. For example, if the disproportionality ratio is 3.0, this indicates that the group of interest is three times more likely to be stopped in comparison to the majority group.

The differences between the disproportionality index and ratio are due to differences in the calculations of each statistic. While the disproportionality index is strictly calculated through

[3] We use the term disproportionality ratio in place of the often mentioned ‘odds ratio’ because the ratios may be greater than one.

the use of one racial group, (i.e., Black drivers stopped divided by what is predicted by the benchmark), the disproportionality ratio actually compares the difference between the disproportionality index of the minority group against the majority group.[4]

As with the disproportionality index, the validity of the benchmark, which underlies the analysis, remains a concern. This is due to the fact that the disproportionality ratio is based on the disproportionality index and so while the disproportionality ratio is preferred to the disproportionality index for reasons of interpretability, the validity of the benchmark is still unresolved. Furthermore, the statistical instability of the denominator is not rectified, and jurisdictions with small values may be unduly affected by a small change in the number of stops. Finally, there is no agreed upon value that unequivocally provides a threshold for a determination of disparity. Notwithstanding these concerns, the disproportionality ratio is a superior measure to the disproportionality index due to its clearer interpretative value. Both disproportionality indices and disproportionality ratios are calculated and included in the analyses reported below.

Comparison #1:
All traffic stops compared to Census-based driving-age residential populations

In the first comparison, U.S. Census data were utilized for benchmark comparisons to traffic stop data. The municipality and county of the stop is recorded for each member-initiated traffic stop by PSP Troopers. These codes are merged with demographic information provided by the U.S. Census. In Pennsylvania, there are 67 counties and 2,567 municipalities. Municipalities are political subdivisions of counties and incorporate cities, boroughs, towns, and townships (U.S. Census Bureau, 2002).

Estimates of population figures provided by the Census are the most widely used benchmark measure for studies of police-citizen contacts. Most of these comparisons have been made at state and city levels. However, the sole use of state level populations is inappropriate because of the geographic clustering of racial and ethnic populations. Even county or city level estimates may be inappropriate comparisons in areas where commuters, tourists, or long distance travelers are the primary users of interstates and highways patrolled by the Pennsylvania State Police. Ultimately, examining traffic stop data at lower levels of aggregation is necessary. While data collection efforts in local municipalities can focus at the census tract, or even block level, data collection efforts in state police organizations must focus on larger units of analysis. The Project on Police-Citizen Contacts examines police behavior at the county and municipality levels. The analyses and benchmark comparisons

[4] Consequently, if the disproportionality index for Caucasian drivers is less than one, indicating they are less likely to be stopped than expected, it will increase the disproportionality ratio for minority drivers. Conversely, if the Caucasian disproportionality index is greater than one, showing an overrepresentation in stops of Caucasian drivers, then the disproportionality ratio for Black drivers would be lower than the Black disproportionality index. In other words, due to the fact that the Caucasian disproportionality index is above one, it pushes the Black disproportionality ratio lower in comparison to the Black disproportionality index.

for this report are based on estimates of driving-age residential populations (i.e., individuals 15 years or older).

Although the types of benchmarks are increasing, the most frequently used is still Census data. In order for these data to provide valid comparisons to stop data, the residents of an area, reported in the Census data, must roughly represent the drivers in that area. Much empirical evidence suggests that this is unlikely, particularly in urban areas. As noted in Section I, for example, in comparison to Caucasians, Blacks are less likely to have a driver's license, more likely to live in households without a vehicle, and more likely to rely on public transit for travel than personal vehicles (BTS, 1997; FHA, 1995; Krovi & Barnes, 2000; Meehan & Ponder, 2002; Polzin, Chu, & Rey, 2000; Rosenbloom, 1998; Ross & Dunning, 1997). These findings suggest that the residential population in the Census data does not necessarily accurately represent the driving population in the same geographical area.

The level of aggregation for population statistics is a second difficulty with Census benchmarks. State-level population figures do not account for the geographic clustering of racial groups that is typical of most states, while lower levels of aggregation like county and city may also be problematic in areas that have interstate highways and are frequented by tourists or commuters. Ultimately, benchmarks that more precisely measure the local driving populations are necessary for appropriate comparisons with traffic stop data.

A third concern, noted above, is the instability of disproportionality ratios when the denominator is small, as is often the case when using population statistics. If a county has less than 1% population of a particular minority group, a small change in the population could produce a dramatic difference in the disproportionality ratio. As mentioned, the disproportionality ratio is calculated from the disproportionality index. If the population value entered into the disproportionality index is unstable, then the resulting disproportionality ratio will be unstable. For example, if 5% of the stops in County A were of Black motorists, but the residential population of County A is 0.5% Black, the disproportionality index = 0.05 / 0.005 = 10. However, if the residential population changes slightly (e.g., if the population is increased by one-tenth of a percent, for example, from 0.5% Black to 0.6% Black), the resulting decrease in the disproportionality index would be large (0.05 / 0.006 = 8.3, compared to 10.0). Thus, disproportionality indices created with very small denominators are more likely to be unstable and should be interpreted cautiously. This instability in the disproportionality index is transferred to the disproportionality ratio. Using the example above, the change in the disproportionality index from 10 to 8 also changes the numerator of the disproportionality ratio. For example, if the denominator of the disproportionality ratio (i.e., the majority disproportionality index) is 2, using the minority disproportionality index of 10 would produce a disproportionality ratio of 5. If the numerator of the disproportionality ratio is changed to 8, however, the resulting disproportionality ratio is 4. Using this example, a one-tenth of a percent change in the Black population of County A results in 25% change in the value of the disproportionality ratio. To summarize, in counties with small minority populations, there is instability in the disproportionality indices that are also reflected in the calculation of disproportionality ratios. Therefore, disproportionality ratios created for counties with small residential populations are likely to be unstable and must be interpreted with caution.

The disproportionality ratios based on driving-age population are presented with the above noted limitations in mind, and as a reference point for other, more appropriate benchmark comparisons. The first two columns of **Table 4.1** show the county's total population 15 and over and the total number of PSP stops in the county. The third column reports the Caucasian disproportionality index, which is necessary for the calculation of the disproportionality ratios of minority drivers. As previously discussed, a value above 1 would indicate that Caucasian drivers experience some disparity in frequency of stops from what is expected. The next four columns provide the following data for Blacks: Percent representation in the county's total population 15 and over, percent representation in PSP stops in the county, the population-based disproportionality index, and the disproportionality ratio. The next group of four columns shows the same data for Hispanics, and the last four columns display the same data for all non-Caucasians.

Focusing on the driving-age population benchmark, **Table 4.1** illustrates the tremendous variability in the counties' disproportionality ratios for Black, Hispanic, and all non-Caucasian drivers. Additionally, as the actual values increase, the difference between the disproportionality index and the disproportionality ratio also becomes larger. For example, disproportionality indices less than 5 generally do not vary more than 0.5 when converted into disproportionality ratios. Conversely, when the disproportionality indices are much higher (over 10), the impact on the disproportionality ratio is also greater. This demonstrates that the disproportionality ratio is relative to within race group comparisons, as well as between minority and majority group comparisons. Recall that the disproportionality ratio is calculated by dividing the disproportionality index of the minority by the disproportionality index of the majority. This comparison between the minority and majority populations produces a more interpretable result and explains the larger difference between the disproportionality index and the disproportionality ratio as the values increase.

Table 4.1: County Disproportionality Ratios based on Census Data for Population 15 & over (p.1 of 4)

County Name	Total Pop > 15	Total # PSP Stops	Caucasian DI	Blacks % Pop > 15	Blacks % PSP Stops	Blacks Pop >15 DI	Blacks Disparity Ratio	Hispanics % Pop > 15	Hispanics % PSP Stops	Hispanics Pop >15 DI	Hispanics Disparity Ratio	Non-Caucasians % Pop > 15	Non-Caucasians % PSP Stops	Non-Caucasians Pop >15 DI	Non-Caucasians Disparity Ratio
Adams	72,470	1,949	0.9	1.1	5.2	4.9	5.3	3.2	4.8	1.5	1.7	5.2	12.4	2.4	2.6
Allegheny	1,048,512	11,920	1.0	11.0	8.9	0.8	0.8	0.8	1.1	1.3	1.2	14.4	13.1	0.9	0.9
Armstrong	58,957	1,567	1.0	0.8	2.2	2.9	3.0	0.4	0.2	0.5	0.5	1.7	3.1	1.9	1.9
Beaver	147,645	5,600	0.9	5.3	9.5	1.8	1.9	0.7	1.5	2.3	2.5	6.8	14.0	2.0	2.2
Bedford	40,245	9,817	0.8	0.3	11.5	37.0	45.6	0.5	2.5	5.3	6.6	1.5	20.0	12.9	15.9
Berks	297,158	5,131	0.9	3.3	7.1	2.1	2.4	8.6	10.2	1.2	1.3	12.7	20.7	1.6	1.8
Blair	105,235	3,136	1.0	1.1	4.3	4.0	4.2	0.5	0.6	1.3	1.4	2.3	7.0	3.0	3.1
Bradford	49,677	1,903	1.0	0.3	1.1	4.0	4.0	0.6	0.6	1.0	1.0	2.1	2.1	1.0	1.0
Bucks	470,438	8,283	0.9	3.0	9.1	3.0	3.4	2.3	4.7	2.1	2.3	8.1	17.7	2.2	2.4
Butler	138,490	5,874	1.0	0.8	3.1	4.1	4.2	0.6	0.5	0.9	1.0	2.3	5.2	2.3	2.3
Cambria	126,579	3,273	1.0	2.7	2.6	1.0	1.0	0.9	0.6	0.7	0.7	4.4	4.3	1.0	1.0
Cameron	4,829	1,296	1.0	0.3	0.6	2.5	2.5	0.4	0.3	0.7	0.7	1.2	1.3	1.1	1.1
Carbon	48,238	7,217	0.9	0.5	6.9	13.0	14.9	1.3	3.8	2.8	3.3	2.7	15.0	5.5	6.3
Centre	115,439	7,990	1.0	2.8	4.5	1.6	1.6	1.7	1.7	1.0	1.0	9.5	10.4	1.1	1.1
Chester	338,510	8,912	0.9	6.1	10.9	1.8	2.0	3.6	7.6	2.1	2.3	12.1	21.9	1.8	2.0
Clarion	34,329	6,678	0.8	0.8	8.9	11.1	13.6	0.4	4.3	11.4	14.0	2.0	19.3	9.4	11.5
Clearfield	67,882	7,309	0.9	1.8	7.5	4.2	4.9	0.6	3.1	5.3	6.2	3.0	16.7	5.5	6.4
Clinton	31,232	3,767	0.8	0.5	8.6	16.8	21.4	0.6	4.3	7.6	9.7	2.0	19.7	9.9	12.5
Columbia	53,258	3,360	0.8	0.8	10.6	13.5	16.9	0.9	5.1	5.8	7.2	2.6	22.3	8.6	10.7
Crawford	72,225	3,122	0.9	1.5	5.6	3.7	4.0	0.6	0.7	1.3	1.4	3.1	9.3	3.0	3.3
Cumberland	174,910	13,585	0.8	2.4	11.4	4.8	5.7	1.3	3.2	2.5	3.0	5.9	20.0	3.4	4.0

Table 4.1: County Disproportionality Ratios based on Census Data for Population 15 & over (p.2 of 4)

County Name	Total Pop > 15	Total # PSP Stops	Caucasian DI	Blacks				Hispanics				Non-Caucasians			
				% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio	% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio	% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio
Dauphin	200,685	5,780	1.1	15.2	8.0	0.5	0.5	3.7	3.6	1.0	0.9	21.5	14.8	0.7	0.6
Delaware	437,634	4,857	0.9	13.3	17.7	1.3	1.4	1.5	3.0	2.0	2.2	18.8	24.7	1.3	1.4
Elk	28,274	2,367	1.0	0.1	1.2	10.8	11.3	0.3	1.1	3.4	3.6	1.1	3.6	3.3	3.5
Erie	223,155	9,775	1.0	5.3	6.0	1.1	1.2	1.9	1.6	0.8	0.9	8.5	11.1	1.3	1.4
Fayette	120,932	4,498	1.0	3.1	5.8	1.8	1.9	0.4	0.2	0.6	0.6	4.2	6.4	1.5	1.5
Forest	4,205	1,172	1.0	2.5	0.6	0.2	0.2	1.3	0.0	0.0	0.0	4.7	1.1	0.2	0.2
Franklin	103,647	5,964	0.9	2.1	8.0	3.8	4.2	1.6	3.3	2.1	2.3	4.8	15.0	3.1	3.5
Fulton	11,346	5,257	0.8	0.6	13.2	22.1	27.9	0.3	2.5	8.7	11.1	1.6	22.3	13.6	17.2
Greene	33,337	2,603	1.0	4.6	4.3	0.9	1.0	1.0	1.0	1.0	1.0	6.4	7.7	1.2	1.2
Huntingdon	37,515	2,589	1.1	5.9	2.2	0.4	0.3	1.2	0.5	0.4	0.4	7.8	3.0	0.4	0.4
Indiana	74,448	4,348	1.0	1.6	2.9	1.8	1.8	0.5	0.3	0.6	0.6	3.4	4.9	1.5	1.5
Jefferson	37,227	4,931	0.9	0.1	6.0	60.4	69.2	0.4	3.2	7.7	8.9	1.2	13.4	11.1	12.7
Juniata	18,081	1,125	0.9	0.2	4.3	20.4	22.2	1.5	2.9	1.9	2.1	2.2	9.5	4.3	4.7
Lackawanna	175,232	2,628	0.9	1.1	6.1	5.7	6.4	1.2	3.8	3.2	3.6	3.4	13.8	4.1	4.7
Lancaster	365,749	8,775	0.9	2.5	10.1	4.1	4.6	5.2	4.9	1.0	1.1	9.1	19.5	2.1	2.4
Lawrence	76,803	3,280	1.0	3.0	5.9	2.0	2.0	0.5	0.6	1.1	1.1	4.3	7.5	1.7	1.8
Lebanon	96,710	2,754	0.8	1.1	9.7	9.2	11.1	4.4	8.0	1.8	2.2	6.4	22.2	3.5	4.2
Lehigh	249,873	7,826	0.9	3.0	8.3	2.8	3.0	9.1	8.5	0.9	1.0	14.0	21.5	1.5	1.7
Luzerne	264,521	7,576	0.9	1.6	6.1	3.8	4.2	1.1	3.8	3.6	4.0	3.6	12.8	3.6	4.0
Lycoming	97,219	5,104	1.0	3.7	4.2	1.1	1.1	0.6	1.2	1.9	1.9	5.4	6.6	1.2	1.3
McKean	37,054	1,929	0.9	2.2	1.0	0.4	0.5	1.1	0.7	0.6	0.6	4.4	3.5	0.8	0.9

Table 4.1 County Disproportionality Ratios based on Census Data for Population 15 & over (p.3 of 4)

County Name	Total Pop > 15	Total # PSP Stops	Caucasian DI	Blacks				Hispanics				Non-Caucasians			
				% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio	% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio	% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio
Mercer	97,424	3,012	0.9	4.7	9.2	2.0	2.3	0.6	3.6	5.6	6.5	6.3	18.1	2.9	3.3
Mifflin	36,974	1,645	0.9	0.4	4.2	11.7	12.7	0.5	1.4	2.8	3.1	1.4	8.5	6.1	6.7
Monroe	107,977	5,832	0.9	5.4	12.3	2.3	2.6	6.2	6.7	1.1	1.2	13.3	23.0	1.7	2.0
Montgomery	598,592	13,280	0.9	7.2	13.0	1.8	2.0	2.0	4.3	2.2	2.4	13.8	22.2	1.6	1.8
Montour	14,618	517	0.8	0.8	10.1	13.1	16.2	0.9	4.3	5.0	6.2	3.1	21.4	6.8	8.4
Northampton	215,635	3,762	0.9	2.5	8.5	3.5	3.9	6.1	7.7	1.3	1.4	10.1	19.6	1.9	2.2
Northumberland	77,972	1,966	1.0	1.6	2.4	1.5	1.5	1.0	1.6	1.6	1.7	3.1	5.9	1.9	1.9
Perry	34,517	1,371	0.9	0.4	3.7	10.3	11.2	0.7	1.4	2.1	2.3	1.6	8.8	5.4	5.8
Philadelphia	1,194,552	55	1.0	40.5	49.1	1.2	1.2	7.9	3.6	0.5	0.4	53.7	52.7	1.0	1.0
Pike	35,944	2,784	1.0	3.2	5.9	1.9	1.9	4.7	3.1	0.7	0.7	9.4	10.5	1.1	1.2
Potter	14,241	1,772	1.0	0.3	1.0	4.1	4.1	0.5	0.6	1.3	1.3	2.0	2.3	1.2	1.2
Schuylkill	124,777	3,245	1.0	2.4	3.6	1.5	1.6	1.1	2.4	2.1	2.2	4.1	7.7	1.9	1.9
Snyder	30,116	4,127	1.0	0.8	4.0	5.2	5.5	0.9	0.9	1.0	1.1	2.3	6.8	2.9	3.1
Somerset	65,547	8,349	0.8	1.9	10.9	5.8	7.1	0.7	2.4	3.4	4.2	3.1	18.9	6.1	7.5
Sullivan	5,566	1,596	1.0	2.5	0.6	0.3	0.2	1.2	0.6	0.5	0.5	5.0	1.8	0.4	0.4
Susquehanna	33,524	1,295	0.8	0.2	7.9	32.9	40.8	0.6	2.3	3.6	4.5	1.7	19.2	11.4	14.1
Tioga	33,537	1,639	1.0	0.6	2.9	5.0	5.2	0.5	0.6	1.3	1.4	2.0	5.2	2.6	2.7
Union	34,753	1,389	1.0	8.0	8.9	1.1	1.2	4.3	4.3	1.0	1.0	13.7	17.8	1.3	1.4
Venango	46,348	2,671	1.0	1.0	2.0	2.1	2.1	0.5	0.9	2.0	2.0	2.3	4.3	1.9	2.0
Warren	35,268	1,531	1.0	0.2	0.4	2.2	2.2	0.4	0.3	0.7	0.7	1.4	0.9	0.7	0.6
Washington	165,782	9,098	1.0	3.0	6.3	2.1	2.2	0.5	0.6	1.1	1.2	4.5	8.5	1.9	2.0

Table 4.1 County Disproportionality Ratios based on Census Data for Population 15 & over (p.4 of 4) [5]

County Name	Total Pop > 15	Total # PSP Stops	Caucasian DI	Blacks % Pop > 15	Blacks % PSP Stops	Blacks Pop >15 DI	Blacks Disparity Ratio	Hispanics % Pop > 15	Hispanics % PSP Stops	Hispanics Pop >15 DI	Hispanics Disparity Ratio	Non-Caucasians % Pop > 15	Non-Caucasians % PSP Stops	Non-Caucasians Pop >15 DI	Non-Caucasians Disparity Ratio
Wayne	38,405	2,729	1.0	1.7	2.0	1.2	1.2	1.6	2.1	1.3	1.3	4.2	5.5	1.3	1.3
Westmoreland	303,491	18,849	0.9	1.8	7.9	4.3	4.8	0.5	1.1	2.4	2.6	3.3	12.3	3.7	4.2
Wyoming	22,304	1,453	1.0	0.4	0.6	1.3	1.3	0.6	1.2	2.0	2.0	1.9	2.5	1.3	1.4
York	303,687	4,860	0.9	3.2	8.8	2.7	3.0	2.6	3.6	1.4	1.5	7.1	14.9	2.1	2.3

[5] The disproportionality ratios are calculated from disproportionality indices with multiple decimal places. For display purposes, the disproportionality indices have been rounded to the tenth place. As a result, the displayed disproportionality ratios are slightly different than if they were calculated using only the tenth place due to rounding.

The county comparisons for traffic stops of Black motorists to the residential Black driving age population from the Census (**Table 4.1)** shows disproportionality ratios ranging from a low of 0.2 in Forest and Sullivan counties to a high of 69.2 in Jefferson County and 45.6 in Bedford. The mean of the disproportionality ratio is 7.1, the median is 3.0, and the standard deviation is 11.6. The large standard deviation (11.6) demonstrates that there is a tremendous amount of variation in the disproportionality ratios for the 67 counties; likewise the value explains the large difference between the mean and the median. Theoretically, a disproportionality ratio of 1.0 suggests there is no racial disproportionality in traffic stops. Using the results generated from the residential Census-based driving age population, 88% of the Pennsylvania counties have disproportionality ratios above 1.0, 66% have ratios larger than 2.0, and 50% have ratios above 3.0.

Comparisons of driving-age Hispanic residential populations and traffic stops are also reported in **Table 4.1**. As with Blacks, there is wide variation among the disproportionality ratios for Hispanics, although the range is substantially smaller. For the Hispanic population, disproportionality ratios range from 0.0 in Forest County to 14.0 in Clarion County. The mean disproportionality ratio is 2.6, while the median is 1.5 and the standard deviation is 2.7. Over three-quarters of the counties (76%) have disproportionality ratios above 1.0, 44% have ratios above 2.0, and 23% have ratios above 3.0.

Finally, the non-Caucasian comparisons in **Table 4.1** show disproportionality ratios that range from 0.2 in Forest County to 17.2 in Fulton County. The mean disproportionality ratio is 3.7, while the median is 2.0, and the standard deviation is 3.9. Of the 67 Pennsylvania counties, 86% have non-Caucasian disproportionality ratios greater than 1.0, while half (50%) have ratios above 2.0, and 36% have ratios larger than 3.0.

In order to more closely examine the relationship between drivers' race/ethnicity and residency for every county, comparisons are made between the percent of minority drivers stopped who did not reside in the state, county, and municipality where the stop occurred and the percent of Caucasian drivers stopped who did not reside in the state, county, and municipality where the stop occurred (see **Table 4.2**). As this table demonstrates, counties with higher residential population-based disproportionality ratios (see **Table 4.1**) have stops of minorities that include considerably higher percentages of non-PA residents, non-county residents, and non-municipality residents, as compared to the percentages of non-resident Caucasians in the same areas. For example, in Jefferson County, where the Black disproportionality ratio is 69.2, out-of-state Black drivers represent 84.5% of the Black drivers stopped, whereas, out-of-state Caucasian drivers account for only 30.0% of the Caucasian drivers stopped.

Table 4.2 Residency Comparisons of Drivers Stopped by Race for Pennsylvania Counties (p.1 of 3)

County Name	% Stops of non-PA residents				% Stops of non-county residents				% Stops of non-municipality residents			
	Caucasians	Black	Hispanic	Non-Cau	Caucasians	Black	Hispanic	Non-Cau	Caucasians	Black	Hispanic	Non-Cau
Adams	26.3	53.5	23.4	45.6	54.8	73.3	39.4	63.9	95.5	90.1	84.0	89.6
Allegheny	18.2	46.2	86.5	53.1	57.2	89.6	95.2	91.1	96.4	70.6	38.5	4.0
Armstrong	52.2	71.4	33.3	12.2	96.9	94.3	66.7	75.5	8.6	33.3	12.2	93.9
Beaver	32.0	57.3	79.1	62.3	71.7	81.6	91.9	86.0	98.0	98.9	100.0	99.2
Bedford	36.9	67.5	81.7	69.7	81.1	99.2	98.8	99.1	97.7	99.9	100.0	99.9
Berks	14.3	36.7	20.0	30.9	48.8	64.4	36.2	53.5	93.8	84.7	64.2	75.9
Blair	14.9	36.6	40.0	40.4	53.9	73.9	90.0	80.3	88.4	88.1	100.0	92.7
Bradford	14.7	42.9	36.4	40.0	33.5	66.7	45.5	62.5	92.1	100.0	90.9	97.5
Bucks	13.5	35.3	31.4	34.6	54.9	81.1	59.5	80.1	94.4	98.0	97.2	97.8
Butler	9.1	35.0	46.7	40.7	53.6	85.8	73.3	83.7	93.2	97.8	90.0	96.7
Cambria	5.8	15.1	55.0	23.2	49.2	66.3	100.0	75.4	91.0	96.5	100.00	97.9
Cameron	9.3	37.5	75.0	35.3	78.7	100.0	100.0	78.7	95.0	100.0	100.0	100.0
Carbon	24.6	44.7	47.3	48.2	82.8	96.4	93.1	95.4	96.8	98.2	97.8	98.5
Centre	19.3	60.1	79.9	64.5	69.7	91.3	94.2	88.6	97.8	100.0	100.0	99.8
Chester	15.0	21.1	16.5	19.9	51.8	65.6	39.5	57.7	96.9	98.2	94.7	97.0
Clarion	39.2	86.4	95.5	89.5	79.0	98.7	99.7	98.9	96.3	100.0	100.0	99.8
Clearfield	39.3	86.9	92.5	90.4	71.2	99.6	99.1	99.3	96.1	100.0	100.0	100.0
Clinton	47.0	83.9	87.6	82.5	85.4	98.8	98.1	98.4	99.0	100.0	100.0	100.0
Columbia	42.8	68.9	75.0	74.4	90.0	98.6	93.6	97.6	98.8	100.0	99.4	99.9
Crawford	19.6	36.0	60.9	49.1	64.6	90.3	91.3	90.7	95.7	98.9	100.0	99.3
Cumberland	34.4	53.1	65.0	58.4	85.7	96.4	97.5	96.5	99.1	99.8	99.5	99.7
Dauphin	16.1	26.1	21.4	17.8	65.5	58.0	54.8	60.3	94.1	88.0	87.1	89.0
Delaware	18.1	30.7	42.8	30.9	50.8	65.5	80.0	66.8	95.5	97.1	97.9	97.1

Table 4.2 Residency Comparisons of Drivers Stopped by Race for Pennsylvania Counties (p.2 of 3)

County Name	% Stops of non-PA residents				% Stops of non-county residents				% Stops of non-municipality residents			
	Caucasians	Black	Hispanic	Non-Cau	Caucasians	Black	Hispanic	Non-Cau	Caucasians	Black	Hispanic	Non-Cau
Elk	16.7	57.1	68.0	62.8	54.5	96.4	84.0	94.2	86.4	100.0	96.0	98.8
Erie	26.7	52.0	42.6	57.5	43.7	65.3	46.5	67.7	91.0	90.3	89.0	92.1
Fayette	5.1	5.0	44.4	7.3	23.4	14.7	55.6	18.8	90.6	83.8	100.0	85.0
Forest	11.1	71.4	0.0	69.2	86.4	100.0	0.0	100.0	93.9	100.0	0.0	100.0
Franklin	24.0	48.8	48.5	51.1	55.9	81.6	69.9	81.1	94.8	96.2	93.9	96.4
Fulton	45.8	67.8	85.0	70.6	93.2	99.7	99.2	99.6	97.7	99.9	99.2	99.8
Greene	33.3	64.6	80.0	70.4	61.1	97.3	96.0	96.0	94.2	100.0	100.0	100.0
Huntingdon	4.3	14.3	33.3	18.2	55.7	92.9	75.0	90.9	97.5	100.0	100.0	100.0
Indiana	6.1	11.3	30.8	12.7	53.8	80.6	69.2	72.6	92.3	96.0	92.3	94.8
Jefferson	30.0	84.5	89.7	86.8	74.9	98.7	98.7	98.6	96.9	99.7	100.0	99.7
Juniata	7.7	35.4	34.4	30.8	68.2	93.8	59.4	82.2	95.9	97.9	100.0	99.1
Lackawanna	33.6	57.9	58.4	62.7	66.7	84.9	75.2	84.5	96.5	97.5	95.0	97.5
Lancaster	18.2	25.9	30.1	29.6	69.7	86.9	69.4	83.3	97.2	99.4	98.8	99.2
Lawrence	15.1	26.0	66.7	30.6	55.8	62.0	88.9	65.7	92.7	91.1	94.4	92.2
Lebanon	31.8	66.0	54.3	62.1	71.8	96.6	76.3	89.2	95.9	99.6	94.1	97.5
Lehigh	18.8	40.4	32.5	37.8	64.6	76.2	62.5	69.7	96.2	96.8	94.9	95.9
Luzerne	23.0	56.6	41.1	54.2	57.9	84.3	62.0	79.2	95.9	96.1	90.6	95.0
Lycoming	15.3	33.5	61.0	45.0	52.7	54.2	79.7	66.0	96.2	91.5	96.6	93.8
McKean	27.2	73.7	61.5	69.1	60.9	89.5	76.9	92.6	93.4	100.0	92.3	98.5
Mercer	30.5	61.5	91.6	72.8	72.7	89.2	97.2	93.2	98.0	97.5	100.0	98.7
Mifflin	8.4	15.9	17.4	18.7	58.6	82.6	60.9	83.5	89.8	94.2	78.3	93.5
Monroe	30.9	50.1	51.0	54.7	60.8	62.5	68.4	68.7	90.3	93.7	91.6	93.6

Table 4.2 Residency Comparisons of Drivers Stopped by Race for Pennsylvania Counties (p.3 of 3)

County Name	% Stops of non-PA residents				% Stops of non-county residents				% Stops of non-municipality residents			
	Caucasians	Black	Hispanic	Non-Cau	Caucasians	Black	Hispanic	Non-Cau	Caucasians	Black	Hispanic	Non-Cau
Montgomery	11.8	13.3	20.0	15.2	55.4	69.1	64.2	66.1	96.6	94.1	85.9	93.2
Montour	35.7	67.3	59.1	69.1	92.8	100.0	90.9	97.3	99.5	100.0	100.0	100.0
Northampton	15.2	28.8	35.5	33.3	60.3	78.8	76.2	76.9	97.9	99.4	99.3	99.1
Northumberland	8.3	44.7	40.6	46.1	44.5	80.9	62.5	75.7	93.4	97.9	96.9	97.4
Perry	9.5	31.4	15.8	28.3	75.5	96.1	84.2	95.0	97.4	98.0	100.0	99.2
Philadelphia	0.0	11.1	100.0	17.2	61.5	25.9	100.0	31.0	61.5	25.9	100.0	31.0
Pike	40.5	47.3	37.9	46.8	67.2	66.7	66.7	69.3	89.5	77.0	81.6	80.2
Potter	14.4	50.0	27.3	46.3	61.2	66.7	45.5	63.4	89.8	94.4	90.9	92.7
Schuylkill	17.9	57.6	36.4	49.0	46.6	89.0	81.8	84.5	95.3	100.0	98.7	99.6
Snyder	17.6	49.7	26.3	49.6	78.0	93.9	81.6	93.2	97.0	98.8	94.7	98.6
Somerset	42.7	76.4	86.7	77.3	77.2	99.4	99.5	99.3	96.7	100.0	100.0	100.0
Sullivan	16.8	60.0	50.0	44.8	84.6	100.0	90.0	93.1	96.5	100.0	100.0	100.0
Susquehanna	56.7	89.2	86.7	89.1	74.3	98.0	100.0	98.8	96.3	99.0	100.0	99.6
Tioga	33.1	81.3	70.0	78.8	59.1	93.8	90.0	94.1	95.7	97.9	100.0	98.8
Union	32.1	68.3	86.4	77.3	87.0	96.7	98.3	98.0	98.4	99.2	100.0	99.6
Venango	7.5	55.6	64.0	59.5	40.3	75.9	76.0	79.3	90.0	100.0	92.0	97.4
Warren	7.3	66.7	75.0	57.1	35.4	83.3	100.0	71.4	93.0	83.3	100.0	92.9
Washington	23.0	36.9	74.1	44.8	62.3	72.4	90.7	77.9	96.5	95.3	96.3	96.1
Wayne	26.3	53.7	54.4	60.8	55.4	88.9	71.9	83.8	90.7	98.1	96.5	98.0
Westmoreland	19.3	52.4	69.8	57.1	58.3	83.4	91.7	85.7	95.7	95.1	99.0	96.4
Wyoming	6.5	12.5	27.8	24.3	69.6	75.0	83.3	83.8	96.4	87.5	100.0	97.3
York	20.6	48.9	22.3	42.3	44.6	74.0	40.0	66.5	94.0	97.9	94.9	97.1

Table 4.2 shows that a large percentage of drivers stopped by PSP do not reside in the location where they are stopped. This is especially true for Black and Hispanic drivers. Thus, differences in traffic patterns, particularly in counties with interstates, possibly explain many of the racial/ethnic disparities produced by comparisons between traffic stops and residential Census populations. To explore this issue more fully, Comparison #2 (described in detail below) reports the disproportionality ratios created for only drivers who reside in the county where the traffic stop occurred.

Comparison #2: Traffic Stops of county residents compared to Census-based driving-age residential populations

Traffic patterns on the Interstates may be a partial explanation for the large disparities in some counties between the percentage of minority drivers stopped and their representation in the population. To explore this possibility, analyses examining the drivers' residency (based on their zip codes) were conducted. In Pennsylvania, there are 67 counties, 2,567 municipalities, and 2,111 residential zip codes. Zip codes primarily identify regions and metropolitan areas within the United States for the purposes of mail distribution, but do not necessarily conform to other jurisdictional boundaries (USPS, 2003). Residential zip codes do not exactly match municipality and county geographic boundaries. Therefore, these measures are to be interpreted as estimates of drivers' municipality and county residences. Residential zip codes are analyzed to determine if county and municipality level census data comparisons are appropriate.

The following analyses are restricted to only those drivers who reside in the county where the traffic stop occurred. When the calculation of disproportionality ratios is restricted in this manner, the comparison of traffic stops to residential Census population is more accurate. Note, however, that restricting the analyses to only drivers who reside in the county where the stop occurs does not allow for the possibility that driving *behavior* differs by demographic characteristics. Furthermore, since these analyses eliminate traffic stops of non-county residents, considerations of residency and race relationships (e.g., targeting of out-of-state minority drivers) cannot be examined.

Table 4.3 displays county-level disproportionality ratios for stops of only county residents (i.e., only drivers who live in the county where the stop occurred), compared to county driving-age population statistics. The first two columns display the number and percentage of PSP stops in each county of *only* county residents. The following column reports the Caucasian disproportionality index, which is used in the calculation of the minority disproportionality ratios. The remainder of **Table 4.3** is divided into Black, Hispanic, and non-Caucasian groups, and reports the percent of population under 15, percent of traffic stops, disproportionality index, and disproportionality ratio for each racial/ethnic group.

Table 4.3 illustrates that the disproportionality ratios based on stops of only county residents are dramatically smaller than those based on stops of all drivers, regardless of residency. This finding supports the claim that the Census-based disproportionality ratios created for all traffic stops can be misleading and inaccurate.

For Black drivers, the average county disproportionality ratio is 1.5, the median is 1.4, and the standard deviation is 1.1. Dramatic differences appear when these ratios are compared to the disproportionality ratios created for all traffic stops reported above (e.g., the mean, median, and standard deviation for the Census-based disproportionality ratios created using all traffic stops were 7.1, 3.0, and 11.6, respectively. Furthermore, the range of Black, Hispanic, and non-Caucasian disproportionality ratios is considerably smaller than those based on driving-age residential populations. For example, the disproportionality ratios for Black drivers ranged from 0.0 in four counties (i.e., Cameron, Forest, Montour, and Sullivan) to a high of 5.3 in Mifflin County. Of the 67 Pennsylvania counties, 63% have disproportionality ratios above 1.0, while 23% have ratios above 2.0, and only 9% have ratios greater than 3.0. Recall from the previous section that 50% of the counties had disproportionality ratios created for all stops of Black drivers that were greater than 3.0.

Further, the counties with the largest disproportionality ratios using all traffic stops compared to Census-based populations exhibited the largest decreases. For example, the disproportionality ratio for Jefferson County decreased from 69.2 to 3.7 when only drivers who reside in the county where the stop occurred were considered.

Table 4.3: Disproportionality Ratios for Blacks, Hispanics, and non-Caucasians for within county residents ONLY (p. 1 of 4)

County Name	# PSP Stops of Cnty Res.	% of Stops in Cnty of Cnty Res.	Cau DI	Blacks				Hispanics				Non-Caucasians			
				% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio	% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio	% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio
Adams	857	44.0	0.9	1.1	3.2	2.9	3.1	3.2	6.7	2.1	2.2	5.2	10.2	2.0	2.1
Allegheny	5,159	43.3	1.0	11.0	11.0	1.0	1.0	0.8	0.3	0.4	0.4	14.4	14.2	1.0	1.0
Armstrong	736	47.0	1.0	0.8	1.4	1.8	1.8	0.4	0.3	0.7	0.7	1.7	1.6	1.0	1.0
Beaver	1,470	26.3	1.0	5.4	6.7	1.2	1.3	0.7	0.5	0.7	0.7	6.8	7.5	1.1	1.1
Bedford	1,498	15.3	1.0	0.3	0.6	1.9	1.9	0.5	0.2	0.4	0.4	1.5	1.1	0.7	0.7
Berks	2,574	50.2	0.9	3.3	5.1	1.5	1.6	8.6	13.0	1.5	1.6	12.7	19.2	1.5	1.6
Blair	1,389	44.3	1.0	1.1	2.5	2.4	2.4	0.5	0.1	0.3	0.3	2.3	3.1	1.3	1.3
Bradford	1,253	65.8	1.0	0.3	0.6	2.0	2.0	0.6	0.5	0.8	0.8	2.1	1.2	0.6	0.6
Bucks	3,360	40.6	1.0	3.0	4.2	1.4	1.4	2.3	2.4	1.1	1.1	8.1	8.7	1.1	1.1
Butler	2,630	44.8	1.0	0.8	1.0	1.3	1.3	0.5	0.3	0.6	0.6	2.3	1.9	0.8	0.8
Cambria	1,623	49.6	1.0	2.7	1.8	0.7	0.6	0.9	0.0	0.0	0.0	4.4	2.2	0.5	0.5
Cameron	273	21.1	1.0	0.3	0.0	0.0	0.0	0.4	0.0	0.0	0.0	1.2	0.0	0.0	0.0
Carbon	1,107	15.3	1.0	0.5	1.6	3.1	3.1	1.3	1.7	1.3	1.3	2.7	4.5	1.7	1.7
Centre	2,260	28.3	1.1	2.8	1.4	0.5	0.5	1.7	0.4	0.2	0.2	9.5	4.2	0.4	0.4
Chester	4,168	46.8	0.9	6.1	8.0	1.3	1.4	3.6	9.8	2.7	3.0	12.2	19.8	1.6	1.8
Clarion	1,135	17.0	1.0	0.8	0.7	0.9	0.9	0.4	0.1	0.2	0.2	2.0	1.2	0.6	0.6
Clearfield	1,758	24.1	1.0	1.8	0.1	0.1	0.1	0.6	0.1	0.2	0.2	3.0	0.5	0.2	0.1
Clinton	439	11.7	1.0	0.5	0.9	1.8	1.8	0.6	0.7	1.2	1.2	2.0	2.7	1.4	1.4
Columbia	279	8.3	1.0	0.8	1.8	2.3	2.4	0.9	4.0	4.4	4.6	2.6	6.5	2.5	2.6
Crawford	1,027	32.9	1.0	1.5	1.7	1.1	1.1	0.6	0.2	0.3	0.3	3.1	2.6	0.9	0.9
Cumberland	1,651	12.2	1.0	2.4	3.3	1.4	1.4	1.3	0.7	0.5	0.5	5.9	5.8	1.0	1.0

Table 4.3: Disproportionality Ratios for Blacks, Hispanics, and non-Caucasians for within county residents ONLY (p. 2 of 4)

County Name	# PSP Stops of Cnty Res.	% of Stops in Cnty of Cnty Res.	Cau DI	Blacks				Hispanics				Non-Caucasians			
				% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio	% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio	% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio
Dauphin	2,036	35.2	1.1	15.2	9.5	0.6	0.6	3.7	4.7	1.3	1.2	21.5	16.7	0.8	0.7
Delaware	2,200	45.3	1.0	13.3	13.5	1.0	1.0	1.5	1.3	0.9	0.9	18.8	18.1	1.0	1.0
Elk	1,038	43.9	1.0	0.1	0.1	0.9	0.9	0.3	0.4	1.2	1.3	1.1	0.5	0.4	0.4
Erie	5,226	53.5	1.0	5.3	3.9	0.7	0.7	1.9	1.6	0.8	0.8	8.5	6.7	0.8	0.8
Fayette	3,459	76.9	1.0	3.1	6.4	2.0	2.1	0.4	0.1	0.3	0.3	4.2	6.7	1.6	1.6
Forest	157	13.4	1.0	2.5	0.0	0.0	0.0	1.3	0.0	0.0	0.0	4.7	0.0	0.0	0.0
Franklin	2,401	40.3	1.0	2.1	3.7	1.7	1.8	1.6	2.5	1.5	1.6	4.8	7.0	1.5	1.5
Fulton	284	5.4	1.0	0.6	0.7	1.2	1.2	0.3	0.4	1.2	1.2	1.6	1.8	1.1	1.1
Greene	944	36.3	1.1	4.6	0.3	0.1	0.1	1.0	0.1	0.1	0.1	6.4	0.8	0.1	0.1
Huntingdon	1,120	43.3	1.1	5.9	0.4	0.1	0.1	1.2	0.3	0.2	0.2	7.8	0.6	0.1	0.1
Indiana	1,969	45.3	1.0	1.6	1.2	0.8	0.8	0.5	0.2	0.4	0.4	3.4	3.0	0.9	0.9
Jefferson	1,073	21.8	1.0	0.1	0.4	3.7	3.7	0.4	0.2	0.5	0.5	1.2	0.8	0.7	0.7
Juniata	341	30.3	1.0	0.2	0.9	4.2	4.4	1.5	3.8	2.5	2.6	2.2	5.6	2.5	2.6
Lackawanna	805	30.6	1.0	1.1	3.0	2.8	2.9	1.2	3.1	2.5	2.7	3.3	7.0	2.1	2.2
Lancaster	2,414	27.5	1.0	2.5	4.8	1.9	2.0	5.1	5.4	1.1	1.1	9.2	11.8	1.3	1.3
Lawrence	1,421	43.3	1.0	3.0	5.1	1.7	1.7	0.5	0.1	0.3	0.3	4.3	5.9	1.4	1.4
Lebanon	669	24.3	1.0	1.1	1.3	1.3	1.3	4.4	7.8	1.8	1.8	6.4	9.9	1.5	1.6
Lehigh	2,691	34.4	0.9	3.0	5.8	1.9	2.0	9.0	9.3	1.0	1.1	14.0	18.9	1.4	1.4
Luzerne	2,966	39.1	1.0	1.6	2.5	1.5	1.6	1.1	3.7	3.5	3.6	3.6	6.8	1.9	2.0
Lycoming	2,369	46.4	1.0	3.7	4.1	1.1	1.1	0.6	0.5	0.8	0.8	5.4	4.9	0.9	0.9
McKean	724	37.5	1.0	2.2	0.3	0.1	0.1	1.1	0.4	0.4	0.4	4.4	0.7	0.2	0.2

Table 4.3: Disproportionality Ratios for Blacks, Hispanics, and non-Caucasians for within county residents ONLY (p. 3 of 4)

County Name	# PSP Stops of Cnty Res.	% of Stops in Cnty of Cnty Res.	Cau DI	Blacks % Pop > 15	Blacks % PSP Stops	Blacks Pop >15 DI	Blacks Disparity Ratio	Hispanics % Pop > 15	Hispanics % PSP Stops	Hispanics Pop >15 DI	Hispanics Disparity Ratio	Non-Caucasians % Pop > 15	Non-Caucasians % PSP Stops	Non-Caucasians Pop >15 DI	Non-Caucasians Disparity Ratio
Mercer	705	23.4	1.0	4.7	4.3	0.9	0.9	0.6	0.4	0.7	0.7	6.3	5.2	0.8	0.8
Mifflin	641	39.0	1.0	0.4	1.9	5.2	5.3	0.5	1.4	2.8	2.9	1.4	3.6	2.6	2.7
Monroe	2,180	37.4	0.9	5.4	12.3	2.3	2.5	6.2	5.7	0.9	1.0	13.3	19.3	1.4	1.6
Montgomery	5,614	42.3	0.9	7.2	9.5	1.3	1.4	2.0	3.7	1.9	2.0	13.8	17.8	1.3	1.4
Montour	32	6.2	0.9	0.8	0.0	0.0	0.0	0.9	6.3	7.4	7.9	3.1	9.4	3.0	3.2
Northampton	1,368	36.4	1.0	2.5	5.0	2.0	2.1	6.1	5.0	0.8	0.9	10.1	12.5	1.2	1.3
Northumberland	1,056	53.7	1.0	1.6	0.9	0.5	0.5	1.0	1.1	1.2	1.1	3.2	2.7	0.8	0.8
Perry	312	22.8	1.0	0.4	0.6	1.8	1.8	0.7	1.0	1.5	1.5	1.6	1.9	1.2	1.2
Philadelphia	30	32.4	0.7	40.5	66.7	1.6	2.3	7.9	0.0	0.0	0.0	53.7	66.7	1.2	1.7
Pike	903	38.8	1.0	3.2	6.1	1.9	1.9	4.7	3.2	0.7	0.7	9.4	10.0	1.1	1.1
Potter	687	50.4	1.0	0.3	0.9	3.5	3.5	0.5	0.9	1.8	1.8	2.0	2.2	1.1	1.1
Schuylkill	1,634	21.0	1.0	2.4	0.8	0.3	0.3	1.1	0.9	0.8	0.7	4.1	2.4	0.6	0.6
Snyder	866	18.1	1.0	0.8	1.2	1.5	1.5	0.9	0.8	0.9	0.9	2.3	2.2	0.9	0.9
Somerset	1,515	15.2	1.0	1.9	0.3	0.2	0.2	0.7	0.1	0.1	0.1	3.1	0.7	0.2	0.2
Sullivan	243	20.6	1.0	2.5	0.0	0.0	0.0	1.2	0.4	0.4	0.3	5.0	0.8	0.2	0.2
Susquehanna	267	38.6	1.0	0.2	0.7	3.1	3.1	0.6	0.0	0.0	0.0	1.7	1.1	0.7	0.7
Tioga	632	11.0	1.0	0.6	0.5	0.8	0.8	0.5	0.2	0.3	0.3	2.0	0.8	0.4	0.4
Union	153	57.9	1.1	8.0	2.6	0.3	0.3	4.3	0.7	0.2	0.1	13.7	3.3	0.2	0.2
Venango	1,546	64.1	1.0	1.0	0.8	0.9	0.9	0.5	0.4	0.8	0.8	2.3	1.6	0.7	0.7
Warren	982	36.4	1.0	0.2	0.1	0.6	0.6	0.4	0.0	0.0	0.0	1.4	0.4	0.3	0.3
Washington	3,308	42.8	1.0	3.0	4.8	1.6	1.6	0.5	0.2	0.3	0.3	4.5	5.2	1.2	1.2

Table 4.3: Disproportionality Ratios for Blacks, Hispanics, and non-Caucasians for within county residents ONLY (p. 4 of 4)

County Name	# PSP Stops of Cnty Res.	% of Stops in Cnty of Cnty Res.	Cau DI	Blacks				Hispanics				Non-Caucasians			
				% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio	% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio	% Pop > 15	% PSP Stops	Pop >15 DI	Disparity Ratio
Wayne	1,168	38.1	1.0	1.7	0.5	0.3	0.3	1.6	1.4	0.8	0.8	4.2	2.1	0.5	0.5
Westmoreland	7,187	30.0	1.0	1.8	3.5	1.9	1.9	0.5	0.2	0.5	0.5	3.3	4.6	1.4	1.4
Wyoming	436	52.0	1.0	0.4	0.5	1.1	1.1	0.6	0.7	1.1	1.1	1.9	1.4	0.7	0.7
York	2,526	54.5	1.0	3.2	4.4	1.4	1.4	2.6	4.2	1.6	1.6	7.1	9.6	1.4	1.4

In summary, the results displayed in **Table 4.3** (based on an analysis of only traffic stops of drivers who reside in the county) are more appropriate than Census-based comparisons to all traffic stops (regardless of the residency of the driver). The results suggest that initial disproportionality ratios reported in **Table 4.1** were artificially inflated. Analyses of traffic stops made of only county residents show much less racial disparity. Nevertheless, these analyses are limited because the values used to create the disproportionality ratios only captured the residential population, and not the actual driving population. Thus, additional analyses are necessary to approximate the true driving population.

Comparison #3: Traffic Flow Model

Due to the limitations associated with the preceding comparisons, a "traffic flow model" was developed in an attempt to more accurately model the expected racial and ethnic composition of drivers on Pennsylvania roadways. One of the major problems within racial profiling research has been the inability to develop an accurate baseline against which stop data can be compared. As mentioned previously, one significant concern of benchmarking methods, particularly those using Census data, is the failure to account for drivers from other jurisdictions. This is a crucial consideration, as citizens do not drive only within their own "home" area. A person may cross multiple jurisdictions in the course of their daily activities. To develop an accurate benchmark, the cross-jurisdictional nature of driving patterns must be incorporated into any baseline. In an attempt to overcome previous shortcomings in creating an accurate benchmark, a traffic flow model was developed based on the spatial interaction of the surrounding jurisdictions.

To our knowledge, only three other studies have employed a similar methodology. Zingraff, Mason, Smith, Tomaskovic-Devey, Warren, and McMurray (2000) used a weighted estimation of drivers from surrounding jurisdictions to improve upon the accuracy of their benchmark. Eck, Liu, and Bostaph (2003) developed a method for estimating vehicle miles driven in every neighborhood in Cincinnati. They argue that it is the miles driven, not the number of drivers, which affect the likelihood of being stopped. However, this method is difficult to implement for a statewide study. Additionally, Novak (2004) used a traffic model to address the shortcomings of previous attempts at a reliable benchmark. His method integrated available Census data with the stop data to create a new benchmark that more accurately represents the driving population within each jurisdiction. These three studies exemplify the move towards a more complex, but likely more reliable benchmark.

In a similar vein, a spatial interaction traffic model has been developed that attempts to overcome the shortcomings of using Census data. The traffic model uses two types of data to improve on the sole use of Census data as the benchmark. Both traffic stop data generated by PSP and residential Census population data are used in combination to create a new weighted baseline that theoretically should provide a more accurate depiction of the driving population compared to the use of residential Census data alone. Specific details regarding the creation of the traffic flow model, its underlying assumptions, and potential limitations are thoroughly documented in **Appendix A**.

Table 4.4 reports the disproportionality ratios at the county level based on the traffic flow model. The first column displays the Caucasian disproportionality index, which is necessary for the calculation of disproportionality ratios. The remainder of the table is broken into Black, Hispanic, and all non-Caucasian groups and reports the percent of population under 15, percent of stops, disproportionality index, and disproportionality ratio for each of the racial/ethnic groups based on the traffic model estimates.

While findings from the analyses examining only county residents (Comparison #2) suggested that the use of residential Census data as a benchmark for all traffic stops was inaccurate, the results from the analyses utilizing the traffic flow model are even more persuasive. Notwithstanding the limitations of the traffic flow model described in **Appendix A**, the traffic model reports disproportionality ratios that are substantially less than either of the other two Census-based comparisons. For example, for Black drivers, the mean disproportionality ratio is 0.51, the median is 0.53, and the standard deviation is 0.29. That is, the disproportionality ratios created based on the traffic flow model are substantially smaller compared to those developed based on comparisons to straight residential Census populations. Furthermore, the theoretical goal of 1.0 for the disproportionality ratio (indicating no racial/ethnic disparities in traffic stops) is obtained by 97% (65) of the 67 counties.

The results for Hispanic drivers reported in **Table 4.4** are similar to those reported for Black drivers, with the disproportional ratio distribution mean of 0.34, median of 0.27, and standard deviation of 0.28. Furthermore, the range of disproportionality ratios for Hispanic drivers is small. Likewise, the results for non-Caucasians (also displayed in **Table 4.4**) are similar and also produce a small range of disproportionality ratios for the counties. In fact, a majority of counties have disproportionality ratios below 1.0, indicating that the minority group is actually less likely to be stopped in comparison to the majority population. In other words, theoretically if biased existed, it would be operating in the reverse direction for minority populations based on the results from the traffic flow model (i.e., compared to minority drivers, Caucasian drivers are *more* likely to be stopped for traffic offenses compared to their representation in the traffic flow model).

Table 4.4: Black, Hispanic, and Non-Caucasian Disproportionality Ratios based on the Traffic Model (p. 1 of 4)

County Name	Caucasian DI	Blacks				Hispanics				Non-Caucasians			
		% Benchmark	% PSP Stops	Pop >15 DI	Disparity Ratio	% Benchmark	% PSP Stops	Pop >15 DI	Disparity Ratio	% Benchmark	% PSP Stops	Pop >15 DI	Disparity Ratio
Adams	1.1	10.3	5.1	0.5	0.4	8.2	4.9	0.6	0.5	21.1	12.4	0.6	0.5
Allegheny	1.0	11.6	8.8	0.8	0.7	2.7	1.0	0.4	0.4	16.1	12.9	0.8	0.8
Armstrong	1.1	8.4	2.3	0.3	0.2	1.5	0.2	0.1	0.1	11.5	3.2	0.3	0.3
Beaver	1.1	14.1	9.5	0.7	0.6	5.7	1.5	0.3	0.2	21.0	13.9	0.7	0.6
Bedford	1.1	15.7	11.5	0.7	0.7	8.5	2.4	0.3	0.3	25.9	19.8	0.8	0.7
Berks	1.0	9.2	7.2	0.8	0.8	9.1	10.2	1.1	1.2	18.7	20.6	1.1	1.1
Blair	1.1	10.2	4.3	0.4	0.4	5.5	0.6	0.1	0.1	17.7	6.9	0.4	0.3
Bradford	1.1	6.8	1.1	0.2	0.1	6.5	0.6	0.1	0.1	14.6	2.1	0.1	0.1
Bucks	1.0	13.8	9.1	0.7	0.6	5.7	4.7	0.8	0.8	21.9	17.7	0.8	0.8
Butler	1.1	9.0	3.1	0.3	0.3	3.0	0.5	0.2	0.1	13.5	5.1	0.4	0.3
Cambria	1.1	7.8	2.6	0.3	0.3	3.1	0.6	0.2	0.2	12.2	4.3	0.4	0.3
Cameron	1.1	7.6	0.5	0.1	0.1	5.4	0.3	0.1	0.1	13.7	1.2	0.1	0.1
Carbon	1.1	14.8	6.9	0.5	0.4	9.5	3.8	0.4	0.3	25.6	14.8	0.6	0.5
Centre	1.2	13.9	4.5	0.3	0.3	8.8	1.8	0.2	0.2	24.2	10.3	0.4	0.4
Chester	1.0	12.8	10.9	0.9	0.9	5.7	7.5	1.3	1.4	20.1	21.8	1.1	1.1
Clarion	1.2	16.9	8.9	0.5	0.5	12.9	4.2	0.3	0.3	30.7	18.9	0.6	0.5
Clearfield	1.2	17.0	7.5	0.4	0.4	12.5	3.1	0.2	0.2	30.5	16.6	0.5	0.5
Clinton	1.1	16.3	8.6	0.5	0.5	13.0	4.2	0.3	0.3	30.3	19.6	0.6	0.6
Columbia	1.1	16.9	10.7	0.6	0.6	12.1	5.0	0.4	0.4	30.2	21.8	0.7	0.6
Crawford	1.1	10.2	5.6	0.5	0.5	5.6	0.7	0.1	0.1	17.2	8.7	0.5	0.5

Table 4.4: Black, Hispanic, and Non-Caucasian Disproportionality Ratios based on the Traffic Model (p. 2 of 4)

County Name	Caucasian DI	Blacks % Benchmark	Blacks % PSP Stops	Blacks Pop >15 DI	Blacks Disparity Ratio	Hispanics % Benchmark	Hispanics % PSP Stops	Hispanics Pop >15 DI	Hispanics Disparity Ratio	Non-Caucasians % Benchmark	Non-Caucasians % PSP Stops	Non-Caucasians Pop >15 DI	Non-Caucasians Disparity Ratio
Cumberland	1.1	14.1	11.6	0.8	0.8	9.2	3.2	0.3	0.3	24.6	20.1	0.8	0.8
Dauphin	1.1	13.9	7.9	0.6	0.5	6.5	3.6	0.6	0.5	22.0	14.7	0.7	0.6
Delaware	1.0	18.5	17.6	0.9	0.9	4.8	3.0	0.6	0.6	26.0	24.7	0.9	0.9
Elk	1.2	10.6	1.2	0.1	0.1	6.8	1.0	0.2	0.1	19.0	3.6	0.2	0.2
Erie	1.1	11.0	6.1	0.6	0.5	5.8	1.6	0.3	0.3	17.7	10.5	0.6	0.6
Fayette	1.0	5.4	5.8	1.1	1.1	1.0	0.2	0.2	0.2	7.3	6.4	0.9	0.9
Forest	1.2	9.6	0.6	0.1	0.1	3.6	0.0	0.0	0.0	14.6	1.0	0.1	0.1
Franklin	1.1	12.6	8.1	0.6	0.6	8.2	3.2	0.4	0.4	22.0	14.9	0.7	0.6
Fulton	1.1	16.5	13.4	0.8	0.8	9.0	2.4	0.3	0.3	27.2	22.2	0.8	0.8
Greene	1.1	11.4	4.3	0.4	0.3	5.7	0.9	0.2	0.1	18.2	7.5	0.4	0.4
Huntingdon	1.1	7.5	2.2	0.3	0.3	3.1	0.4	0.1	0.1	11.7	2.9	0.2	0.2
Indiana	1.1	8.5	2.9	0.3	0.3	2.9	0.3	0.1	0.1	12.8	4.9	0.4	0.4
Jefferson	1.2	16.0	6.0	0.4	0.3	10.8	3.0	0.3	0.2	28.1	13.2	0.5	0.4
Juniata	1.1	13.5	4.2	0.3	0.3	5.2	2.9	0.6	0.5	20.4	9.5	0.5	0.4
Lackawanna	1.1	11.2	6.1	0.5	0.5	9.5	3.7	0.4	0.4	22.2	13.3	0.6	0.5
Lancaster	1.0	13.9	10.1	0.7	0.7	7.0	4.9	0.7	0.7	22.5	19.3	0.9	0.8
Lawrence	1.1	9.7	5.9	0.6	0.6	4.1	0.5	0.1	0.1	14.8	7.5	0.5	0.5
Lebanon	1.1	13.4	9.8	0.7	0.7	12.4	7.9	0.6	0.6	27.0	22.2	0.8	0.8
Lehigh	1.0	10.4	8.3	0.8	0.8	10.3	8.4	0.8	0.8	21.2	21.2	1.0	1.0
Luzerne	1.1	11.0	6.2	0.6	0.5	7.4	3.7	0.5	0.5	19.4	12.6	0.6	0.6

Table 4.4: Black, Hispanic, and Non-Caucasian Disproportionality Ratios based on the Traffic Model (p. 3 of 4)

County Name	Caucasian DI	Blacks				Hispanics				Non-Caucasians			
		% Benchmark	% PSP Stops	Pop >15 DI	Disparity Ratio	% Benchmark	% PSP Stops	Pop >15 DI	Disparity Ratio	% Benchmark	% PSP Stops	Pop >15 DI	Disparity Ratio
Lycoming	1.1	10.0	4.1	0.4	0.4	4.4	1.1	0.2	0.2	15.9	6.4	0.4	0.4
McKean	1.1	10.8	0.8	0.1	0.1	8.3	0.7	0.1	0.1	19.8	3.1	0.2	0.1
Mercer	1.1	15.0	9.3	0.6	0.6	8.8	3.3	0.4	0.3	25.1	17.6	0.7	0.6
Mifflin	1.1	12.3	4.2	0.3	0.3	4.8	1.4	0.3	0.3	18.9	8.5	0.4	0.4
Monroe	1.1	14.7	12.2	0.8	0.8	14.0	6.7	0.5	0.4	29.8	22.8	0.8	0.7
Montgomery	1.0	15.5	13.1	0.8	0.8	4.7	4.3	0.9	0.9	23.1	22.2	1.0	1.0
Montour	1.1	16.6	10.3	0.6	0.6	12.2	4.4	0.4	0.3	30.2	21.4	0.7	0.6
Northampton	1.0	9.4	8.5	0.9	0.9	9.6	7.6	0.8	0.8	19.2	19.6	1.0	1.0
Northumberland	1.2	11.5	2.3	0.2	0.2	6.8	1.6	0.2	0.2	19.3	5.7	0.3	0.3
Perry	1.1	12.2	3.8	0.3	0.3	5.5	1.4	0.3	0.2	19.5	8.8	0.4	0.4
Philadelphia	0.8	30.6	50.0	1.6	2.0	11.5	3.7	0.3	0.4	44.7	53.7	1.2	1.4
Pike	1.2	11.4	5.8	0.5	0.4	12.0	3.2	0.3	0.2	24.2	10.5	0.4	0.4
Potter	1.2	8.0	0.9	0.1	0.1	6.6	0.6	0.1	0.1	15.3	2.1	0.1	0.1
Schuylkill	1.1	8.5	3.7	0.4	0.4	7.1	2.3	0.3	0.3	16.3	7.7	0.5	0.4
Snyder	1.1	11.2	4.0	0.4	0.3	5.8	0.9	0.2	0.1	18.8	6.6	0.4	0.3
Somerset	1.1	15.8	11.0	0.7	0.6	8.9	2.4	0.3	0.2	26.1	18.5	0.7	0.7
Sullivan	1.2	9.8	0.6	0.1	0.1	5.1	0.6	0.1	0.1	16.4	1.8	0.1	0.1
Susquehanna	1.1	14.3	8.1	0.6	0.5	13.4	2.3	0.2	0.1	30.1	18.8	0.6	0.5
Tioga	1.2	11.3	2.8	0.3	0.2	7.2	0.6	0.1	0.1	20.0	4.8	0.2	0.2
Union	1.1	15.4	8.8	0.6	0.5	11.6	4.2	0.4	0.3	28.2	17.6	0.6	0.5
Venango	1.2	11.2	2.0	0.2	0.2	7.1	0.9	0.1	0.1	19.5	4.3	0.2	0.2

Table 4.4: Black, Hispanic, and Non-Caucasian Disproportionality Ratios based on the Traffic Model (p. 4 of 4)[6]

County Name	Caucasian DI	Blacks				Hispanics				Non-Caucasians			
		% Benchmark	% PSP Stops	Pop >15 DI	Disparity Ratio	% Benchmark	% PSP Stops	Pop >15 DI	Disparity Ratio	% Benchmark	% PSP Stops	Pop >15 DI	Disparity Ratio
Warren	1.1	7.6	0.4	0.1	0.0	2.5	0.3	0.1	0.1	10.8	0.9	0.1	0.1
Washington	1.1	10.2	6.3	0.6	0.6	3.6	0.6	0.2	0.2	15.1	8.5	0.6	0.5
Wayne	1.2	10.4	2.0	0.2	0.2	10.2	2.0	0.2	0.2	21.8	5.3	0.2	0.2
Westmoreland	1.1	10.8	7.9	0.7	0.7	4.7	1.1	0.2	0.2	17.0	12.1	0.7	0.7
Wyoming	1.1	7.0	0.6	0.1	0.1	4.5	1.3	0.3	0.3	12.3	2.6	0.2	0.2
York	1.0	10.7	8.9	0.8	0.8	5.5	3.6	0.6	0.6	17.2	15.0	0.9	0.9

[6] There are slight differences in percent stopped between this traffic model and the other analyses. This is due to the necessity of eliminating some of the stops that were missing zip codes in the calculation of the traffic model.

The differences between the disproportionality ratios created from residential Census populations and the traffic flow models are graphically displayed in **Figures 4.1 – 4.6** below.

Figure 4.1 graphically displays the differences in Black residential driving-age populations and PSP traffic stops of Black drivers by county. As **Figure 4.1** illustrates, counties with higher disproportionality ratios (i.e., counties with higher than expected rates of Black motorists stopped based on their representation in the driving-age residential population) tend to have major interstates and highways. Thus, there appears to be a clustering of counties with high disproportionality ratios around I-80, I-76, and other major highways. Also, illustrated in this map are counties with Black driving-age residential populations under 1% (see shaded counties). These counties are likely to have unstable and inflated disproportionality ratios due to their small minority residential populations.

Specifically, the high disproportionality ratios for some counties can be partially explained by their very small Black residential driving-age populations. Since the population figures represent the denominator in the creation of disproportionality indices and the disproportionality indices underlie the disproportionality ratio, counties with very small percentages of Black populations have unstable ratios. In fact, all the counties with high disproportionality ratios have Black residential populations below 1% as indicated in **Figure 4.1** by the shaded areas.

Figure 4.2 graphically displays the disproportionality ratios created from the traffic flow model. One of the obvious differences between the Census-based results (**Figure 4.1**) and the traffic model result (**Figure 4.2**) that is demonstrated visually is the significant decrease in the number of counties with high disproportionality ratios. The traffic flow model addresses the limitation of the Census-based approach by increasing the percent Black driving in each county. The maps graphically display a much different picture of stopping disparity between Caucasians and Blacks, as only two counties in **Figure 4.2** have disproportionality ratios above 1.0.

Figure 4.1: Black Disproportionality Ratios created with Residential Census Data

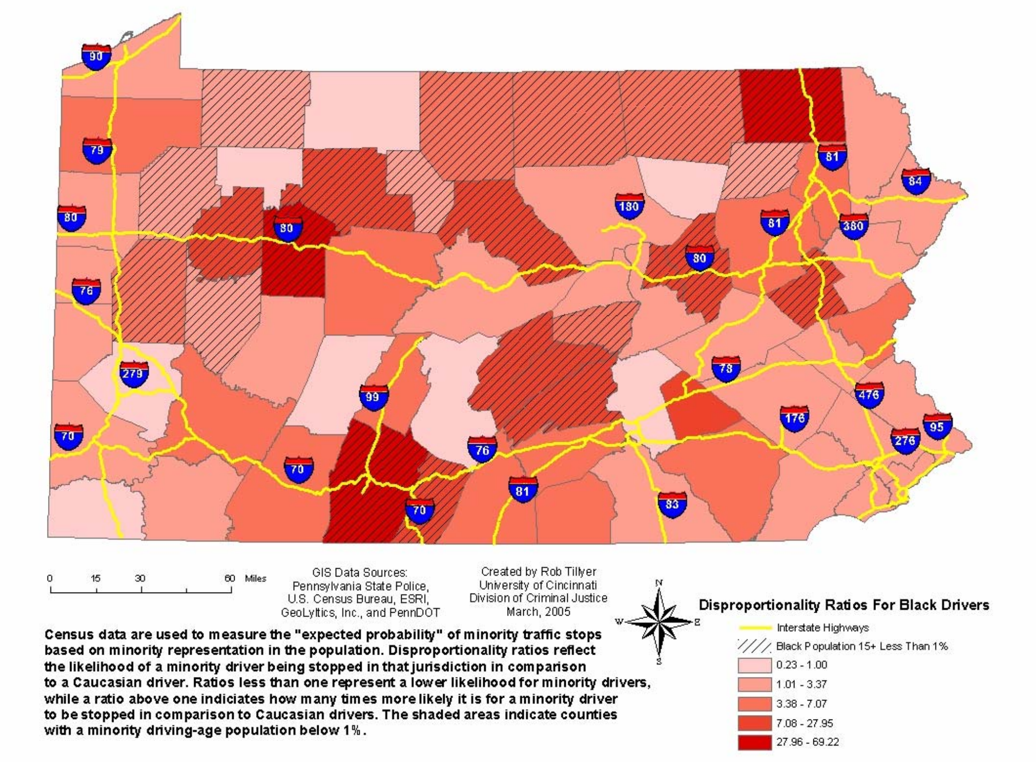


Figure 4.2: Black Disproportionality Ratios created with Traffic Flow Model Data

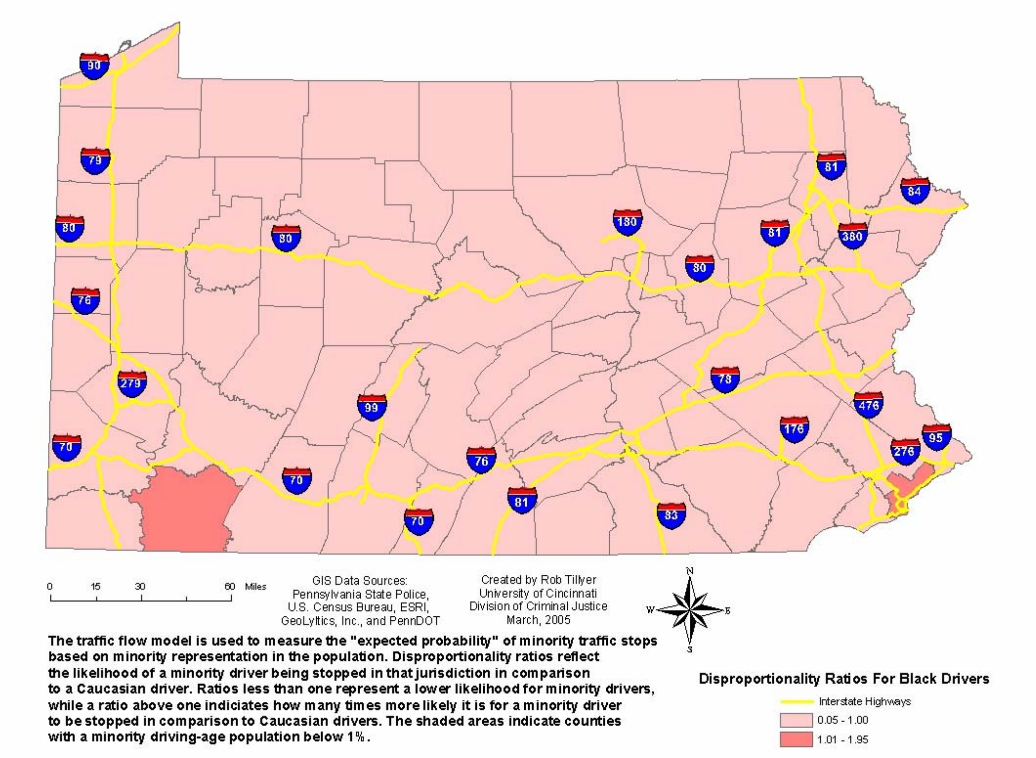


Figure 4.3 displays the disproportionality ratios for traffic stops of Hispanic drivers compared to Hispanic residential Census populations. The pattern of disproportionality is similar to that observed for Blacks – clustering around major interstates and thoroughfares. Indeed, there is considerable overlap between the counties with high disproportionality ratios for Blacks and Hispanics. Once again, counties with less than 1.0 percent Hispanic residential population are shaded in Figure 4.3. The disproportionality indices for these counties are likely unstable due to the small Hispanic residential populations used as a benchmark.

In contrast, **Figure 4.4** displays the disproportionality ratios for traffic stops of Hispanic drivers compared to the Hispanic traffic flow model. Similar to the findings of traffic flow model for Black disproportionality ratios, the traffic flow model for Hispanics produces only two counties that have disproportionality ratios above 1.0. This is in stark contrast to the findings from the residential Census based comparisons graphically displayed in **Figure 4.3**.

Figure 4.3: Hispanic Disproportionality Ratios created with Residential Census Data

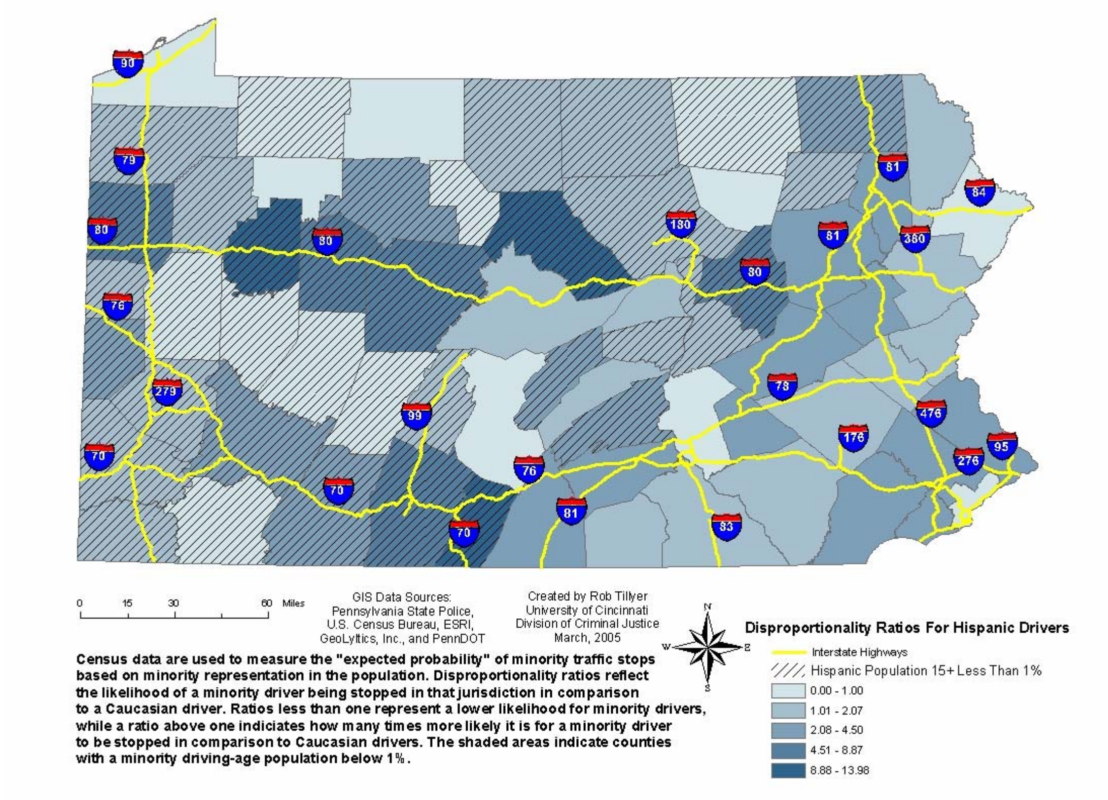
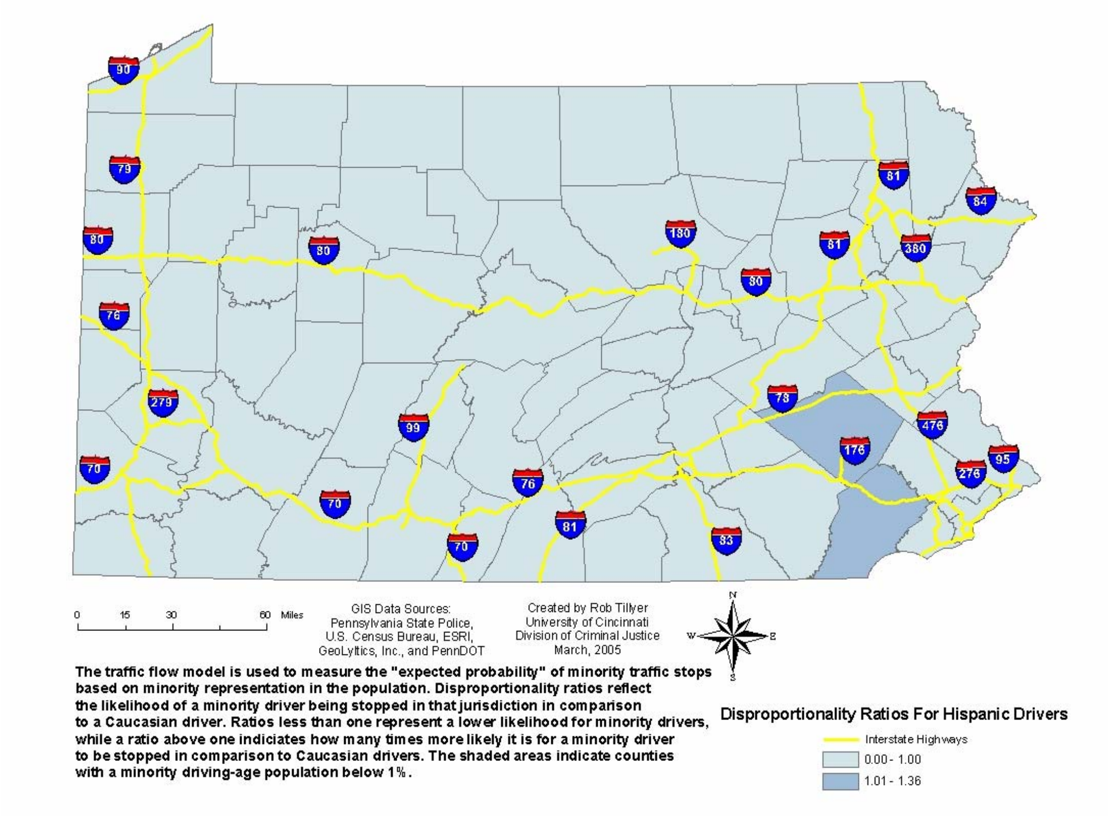


Figure 4.4: Hispanic Disproportionality Ratios created with Traffic Flow Model Data



The differences in all non-Caucasian residential populations and traffic stops of all non-Caucasian drivers are graphically displayed in **Figure 4.5.** Likewise, the disproportionality ratios created from the traffic flow models of all non-Caucasian drivers are displayed in **Figure 4.6**. Similar to the findings in the previous two sets of maps, there is a significant reduction in the number of counties that have disproportionality ratios above 1.0 when created based on comparisons to the traffic flow model.

Figure 4.5: Non-Caucasian Disproportionality Ratios by Census Data

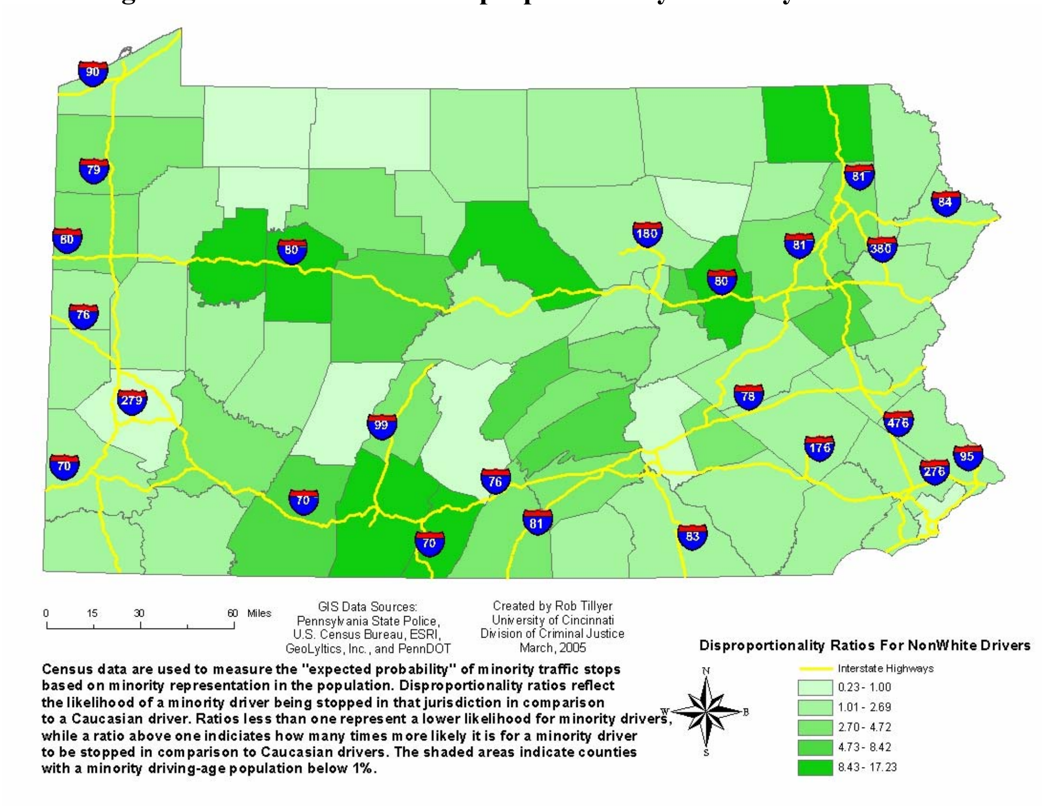
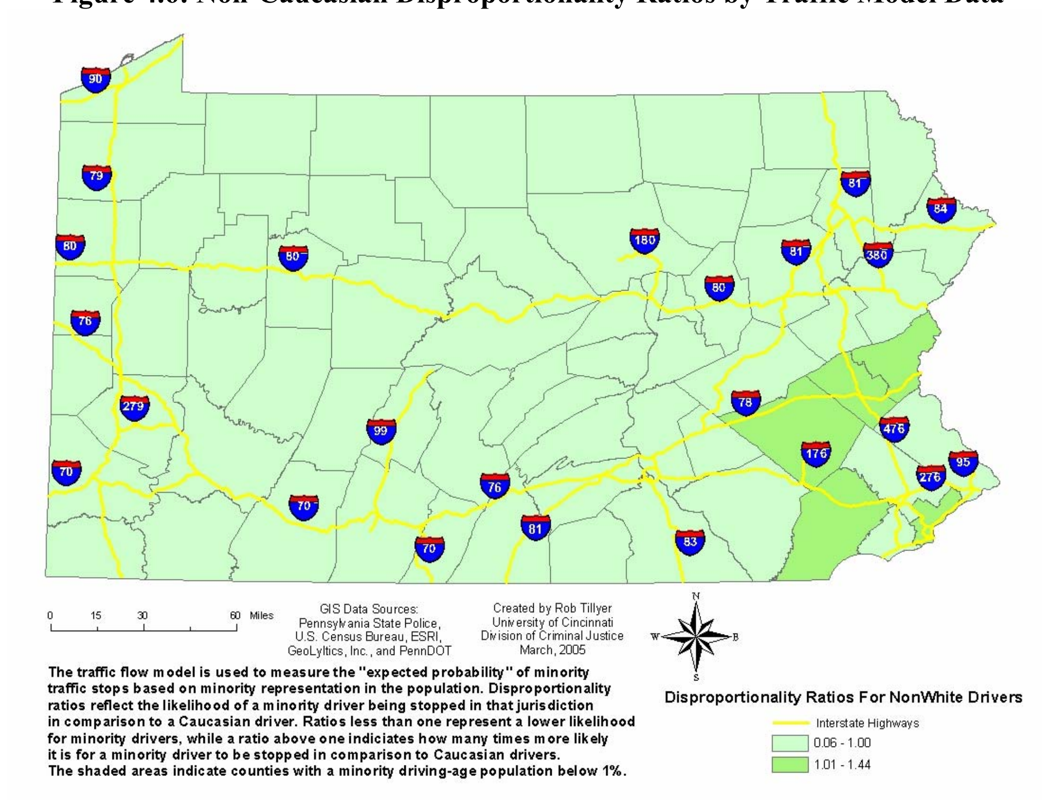


Figure 4.6: Non-Caucasian Disproportionality Ratios by Traffic Model Data



Although the results from the traffic model are encouraging, these results must be interpreted with caution based on the potential significant limitation of the traffic model described in **Appendix A**. Specifically, the traffic flow model is created based on the underlying assumption that no racial bias exists in traffic stops. The limitations of this assumption cannot be underemphasized, and may likely be a primary reason for the large differences between the results shown in the previous comparisons and the results found using the flow traffic model. Therefore, the final two comparisons of traffic stop data (described in detail below) are based on observations of traffic patterns and observations of traffic violating behavior in a sample of the counties across Pennsylvania.

Comparison # 4: Daytime traffic stops compared to daytime roadway observations

The tables and figures previously presented clearly suggest that, in many areas, residential population comparisons to traffic stop data are inappropriate. As noted in Section II, the limited utility of Census-based benchmarks has prompted the collection of other types of benchmark data, including observational surveys of roadway usage. From March 2002 – June 2003, observations of roadway usage and traffic law violating behavior were conducted in 27 of the 67 counties in Pennsylvania. Details regarding the methodology for the observation and speeding data collection study were thoroughly documented in the Year 1 Report (see Engel et al., 2004), and are repeated again **Appendix B** of this document. The analyses reported below are based on a comparison of traffic stop data to the roadway usage observations. Note that comparisons are not made for Hispanic traffic stops because of our observers' inability to reliably determine the ethnicity of the drivers. Rather, a collapsed category of non-Caucasian is used in addition to comparisons for Black drivers.

Table 4.5 displays the Black and non-Caucasian disproportionality ratios for each observed municipality within the observed 27 counties. To ensure the closest match between the numerator and the denominator, the numerator (i.e., traffic stops) includes only those traffic stops that occurred during daylight hours on the particular roadway types observed (e.g., interstate, state highway, county or local roads). For each observed municipality within the 27 counties, a disproportionality ratio is created. In addition, a county level summary measure is produced based on the percentages of stops and observations countywide.

As **Table 4.5** shows, the Black disproportionality ratios range from a high of 6.7 in Franklin County to a low of 1.1 in Bedford County. The range for Black observation-based disproportionality ratios is significantly more truncated than the population-based disproportionality ratios previously displayed in **Table 4.1**, which ranged from a low of 0.2 to a high of 69.2. Interestingly, Bedford County had the highest disproportionality ratio when using the Census-based data (69.2); however, the observation-based analysis gives Bedford the lowest disproportionality ratio (1.1). The mean disproportionality ratio for the 27 counties is 2.7, the median is 2.3, and the standard deviation is 1.4. By examining the disproportionality ratios in ascending order, all of the observed counties have disproportionality ratio above 1.0, 60% of the counties have disproportionality ratio above 2.0, and 30% of the counties have ratios greater than 3.0.

The non-Caucasian disproportionality ratios demonstrate similar results to those of the Black disproportionality ratios. The disproportionality ratios range from a low of 1.1 in Bedford County to a high of 7.4 in Franklin County. Once again, this is a substantially different result than the Census-based analysis (see **Table 4.1**). The observation-based analysis provides a distribution of disproportionality ratios with a mean of 2.8, a median of 2.4, and a standard deviation of 1.5. The standard deviations for both Black and non-Caucasian distribution are small in comparison to other benchmarks, which suggests little variability across counties when using observations as the benchmark. The non-Caucasian disproportionality ratio shows no counties below the value of 1.0, 67% of the counties had ratios greater that 2.0, and 37% of the counties had disproportionality ratios greater than 3.0.

As reported in **Table 4.5**, both the Black and non-Caucasian disproportionality ratios are lower than the Census-based analysis. Note, however, that the observation-based benchmark does produce disproportionality ratios slightly higher than the county only analysis, and substantially higher than the traffic model.

Due to our observation sampling design, the total number of cars passing on particular roadways was not calculated. Therefore, the drivers' characteristics reported represent the characteristics of the drivers observed and not the total population of drivers. It is likely that particular observed roadways (e.g., Interstates) have larger volumes of traffic than other types of roadways observed (e.g., state highways and local roads). However, when drivers' characteristics are averaged at the county level, the differences in traffic volume are assumed to be equivalent. Because minority drivers were more likely to be observed traveling on Interstates rather than state highways and local roads (8.7% of drivers observed, compared to 4.0%, respectively) and because the volume of traffic on these roadways is likely to be higher, the non-weighted averaging of disproportionality ratios at the county level likely under-represents the percent of minority motorists within those counties. Therefore, disproportionality ratios based on these county-level percentages of observed minority drivers over estimate the disparity between observed and stopped drivers. That is, the differences reported between the percentage of minority drivers stopped by police and the percentage of minority drivers observed in particular counties could be even smaller than reported in **Table 4.5**.

Table 4.5 Municipality & County Disproportionality Ratios for 27 Observed Counties (p. 1 of 6)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Allegheny County		8.3	12.4	2.6	5.6	3.2	2.2	3.5	2.4
Franklin Park	I	7.0	10.7	2.6	3.3	2.7	3.2	2.9	3.5
Harmar Twp	I	8.3	13.6	3.3	5.8	2.5	2.3	2.8	2.6
Marshall Twp	I	9.0	18.0	2.8	3.2	3.2	5.6	3.8	6.6
Monroeville Brgh	I	11.2	15.8	2.8	7.2	4.0	2.2	4.4	2.4
Ohio Twp	I	7.0	7.8	4.3	8.3	1.6	0.9	1.6	0.9
Robinson Twp	I	4.0	7.1	1.7	4.7	2.4	1.5	2.4	1.5
West Deer Twp	I	12.1	15.2	1.8	4.5	6.7	3.4	7.6	3.8
Bedford County		11.1	19.2	10.2	17.3	1.1	1.1	1.1	1.1
E. Providence Twp	I	14.4	24.8	10.2	17.3	1.4	1.4	1.6	1.6
Bucks County		8.6	16.8	7.0	12.5	1.2	1.3	1.3	1.4
Bensalem Twp	I	14.8	26.9	10.7	16.1	1.4	1.7	1.6	1.9
Lwr Makefield Twp	I	14.6	25.6	14.8	20.0	1.0	1.3	1.1	1.4
Middletown Twp	I	14.8	26.0	8.2	14.1	1.8	1.8	2.1	2.2
Milford Twp	SH	3.4	7.3	2.2	4.3	1.5	1.7	1.6	1.8
Richland Twp	SH	1.9	9.7	1.9	7.1	1.0	1.4	1.0	1.4
West Rockhill Twp	SH	6.1	17.4	1.8	10.7	3.4	1.6	3.7	1.8
Centre County		4.6	10.4	1.7	3.5	2.7	3.0	2.9	3.2
Benner Twp	SH	3.3	8.1	1.3	1.7	2.5	4.8	2.7	5.1
Boggs Twp	I	18.2	36.9	3.3	5.2	5.5	7.1	8.3	10.7
Marion Twp	I	8.3	19.5	3.8	11.1	2.2	1.8	2.4	1.9
Potter Twp	SH	4.9	8.6	0.3	0.7	16.3	12.3	17.8	13.4
Rush Twp	I	9.6	29.1	2.5	5.0	3.8	5.8	5.3	8.1
Rush Twp	SH	2.9	4.9	1.3	6.4	2.2	0.8	2.3	0.8
Snow Shoe Twp	I	6.7	25.5	1.5	2.2	4.5	11.6	5.9	15.2
Spring Twp	SH	3.6	6.9	1.4	2.1	2.6	3.3	2.7	3.5
Worth Twp	SH	2.6	4.2	0.3	0.3	8.7	14.0	9.0	14.6
Chester County		9.9	20.4	4.9	9.0	2.0	2.3	2.3	2.6
Charlestown Twp	SH	4.6	9.1	3.7	6.9	1.2	1.3	1.3	1.4
East Whiteland Twp	SH	10.9	18.7	7.1	11.4	1.5	1.6	1.7	1.8
London Grove Twp	SH	11.1	26.3	3.9	10.6	2.8	2.5	3.5	3.0

Table 4.5 Municipality & County Disproportionality Ratios for 27 Observed Counties (p. 2 of 6)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Chester County (cont.)									
Lower Oxford Twp	SH	10.0	22.0	3.0	7.3	3.3	3.0	4.0	3.6
New Garden Twp	SH	9.6	21.1	6.6	11.4	1.5	1.9	1.6	2.1
S. Coventry Twp	SH	4.4	11.8	1.4	2.5	3.1	4.7	3.5	5.2
Valley Twp	SH	10.5	18.0	4.7	7.7	2.2	2.3	2.5	2.6
West Nantmeal Twp	SH	11.6	22.4	6.6	13.8	1.8	1.6	2.0	1.8
Clarion County		8.4	18.6	5.4	12.3	1.6	1.5	1.7	1.6
Clarion Twp	I	10.8	23.5	5.4	12.3	2.0	1.9	2.3	2.2
Clinton County		8.8	19.9	6.8	15.4	1.3	1.3	1.4	1.4
Lamar Twp	I	9.3	21.5	6.8	15.4	1.4	1.4	1.6	1.6
Columbia County		9.5	21.1	2.6	5.7	3.7	3.7		
Hemlock Twp	I	15.4	32.3	2.7	6.4	5.7	5.0	7.9	7.0
Mifflin Twp	I	10.6	22.6	2.8	6.0	3.8	3.8	4.6	4.6
Scott Twp	I	3.4	11.4	1.9	4.0	1.8	2.9	1.9	3.1
South Centre Twp	I	7.7	22.2	2.8	5.6	2.8	4.0	3.3	4.8
Dauphin County		7.0	13.4	2.1	4.0	3.4	3.4	3.8	3.8
Jackson Twp	SH	1.8	3.6	0.3	1.1	6.0	3.3	6.2	3.4
Londonderry Twp	I	12.9	22.4	3.9	7.7	3.3	2.9	3.9	3.5
Lower Paxton Twp	I	6.1	11.6	3.2	5.6	1.9	2.1	2.0	2.2
Lower Swatara Twp	I	7.5	14.3	4.5	7.1	1.7	2.0	1.8	2.2
Middle Paxton Twp	SH	2.0	6.1	2.1	5.2	1.0	1.2	1.0	1.2
Reed Twp	SH	3.8	10.4	1.1	1.1	3.5	9.5	3.8	10.4
Susquehanna Twp	I	5.8	11.2	1.4	2.6	4.1	4.3	4.6	4.7
Susquehanna Twp	SH	3.6	6.0	2.3	4.5	1.6	1.3	1.6	1.4
Washington Twp	SH	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0
Wiconisco Twp	SH	1.7	3.4	0.0	0.0	--	--	--	--
Delaware County		15.6	21.9	11.6	15.4	1.3	1.4	1.5	1.6
Chadds Ford Twp	SH	11.8	18.1	1.6	5.3	7.4	3.4	8.6	4.0
Concord Twp	SH	10.7	17.3	10.9	13.8	1.0	1.3	1.0	1.3
Middletown Twp	SH	16.7	21.7	8.2	11.4	2.0	1.9	2.3	2.1
Radnor Twp	I	9.8	16.9	11.8	16.3	0.8	1.0	0.8	1.1
Tinicum Twp	I	23.1	31.1	18.7	23.1	1.2	1.3	1.4	1.5

Table 4.5 Municipality & County Disproportionality Ratios for 27 Observed Counties (p. 3 of 6)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Erie County		5.6	10.4	1.0	1.9	5.3	5.5	5.9	6.1
Amity Twp	SH	1.9	5.2	0.2	2.3	9.5	2.3	9.8	2.3
Fairview Twp	SH	1.6	2.6	0.2	0.6	8.0	4.3	8.2	4.5
Franklin Twp	I	7.3	14.6	0.9	1.6	8.1	9.1	9.6	10.8
Girard Twp	SH	1.6	1.6	0.6	1.7	2.7	0.9	2.7	1.0
Harborcreek Twp	SH	1.5	3.3	0.7	1.4	2.1	2.4	2.2	2.4
McKean Twp	I	8.1	15.0	1.3	1.8	6.2	8.3	7.3	9.8
McKean Twp	SH	0.0	0.0	1.6	2.5	0.0	0.0	0.0	0.0
Summit Twp	I	8.1	15.1	3.4	5.3	2.4	2.8	2.7	3.2
Summit Twp	SH	1.5	2.5	1.0	1.5	1.5	1.7	1.5	1.7
Union Twp	SH	2.6	2.6	0.0	0.1	--	26.0	--	26.4
Franklin County		7.6	13.7	1.3	2.1	5.9	6.5	6.7	7.4
Antrim Twp	I	8.2	14.0	1.7	3.2	4.8	4.4	5.4	4.9
Fannett Twp	SH	0.0**	0.0**	0.3	0.5	0.0	0.0	0.0	0.0
Greene Twp	SH	3.5	6.9	1.1	2.5	3.2	2.8	3.3	2.9
Guilford Twp	I	8.3	16.7	2.2	3.3	3.8	5.1	4.4	5.9
Guilford Twp	SH	3.9	9.4	1.5	2.5	2.6	3.8	2.8	4.0
Hamilton Twp	SH	3.1	9.4	1.7	2.1	1.8	4.5	2.0	4.8
Peters Twp	SH	4.8	9.5	1.2	1.6	4.0	5.9	4.3	6.5
St. Thomas Twp	SH	0.9	1.9	0.9	0.9	1.0	2.1	1.0	2.1
Southampton Twp	SH	3.7	7.4	0.7	0.8	5.3	9.3	5.7	9.9
Fulton County		13.9	23.3	10.7	18.9	1.3	1.2	1.4	1.3
Brush Creek Twp	I	17.9	28.2	11.0	19.2	1.6	1.5	1.8	1.7
Wells Twp	I	12.0	22.6	10.5	18.6	1.1	1.2	1.2	1.3
Indiana County		2.6	4.5	0.9	1.9	2.9	2.4	3.0	2.5
Armstrong Twp	SH	2.3	3.0	1.1	1.6	2.1	1.9	2.1	1.9
Blairsville Brgh	SH	2.8	5.6	1.5	2.9	1.9	1.9	1.9	2.0
Burrell Twp	SH	4.4	6.5	1.4	1.8	3.1	3.6	3.3	3.8
Cherryhill Twp	SH	2.8	2.8	0.1	1.5	28.0	1.9	28.5	1.9
E. Wheatfield Twp	SH	3.3	8.2	3.9	8.1	0.8	1.0	0.8	1.0
Pine Twp	SH	1.8	2.4	0.6	1.1	3.0	2.2	3.0	2.2
White Twp	SH	2.0	3.9	0.7	1.4	2.9	2.8	2.9	2.9

Table 4.5 Municipality & County Disproportionality Ratios for 27 Observed Counties (p. 4 of 6)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Jefferson County		5.9	13.4	5.1	11.1	1.2	1.2	1.2	1.2
Washington Twp	I	10.1	23.2	5.1	11.1	2.0	2.1	2.3	2.4
Juniata County		3.7	9.0	1.3	2.7	2.8	3.4	3.0	3.7
Beale Twp	SH	0.0**	5.9**	0.0	0.3	--	19.7	--	20.8
Delaware Twp	SH	0.0	5.9	1.1	1.9	0.0	3.1	0.0	3.2
Fermanagh Twp	SH	4.0	14.7	2.0	3.1	2.0	4.7	2.3	5.4
Walker Twp	SH	5.4	11.4	1.3	3.2	4.2	3.6	4.6	3.9
Lackawanna County		6.1	13.4	3.4	6.4	1.8	2.1	2.0	2.3
Abington Twp	I	0.0**	0.0**	2.2	6.5	0.0	0.0	0.0	0.0
Clifton Twp	I	4.6	24.6	3.3	6.8	1.4	3.6	1.8	4.8
City of Scranton	I	3.6	8.4	2.9	4.7	1.2	1.8	1.3	1.9
Dunmore Brgh	I	9.2	17.8	3.5	7.8	2.6	2.3	3.0	2.6
Roaring Brook Twp	I	10.7	27.8	2.9	4.6	3.7	6.0	5.0	8.1
Scott Twp	I	0.0	4.4	11.3	16.4	0.0	0.3	0.0	0.3
Throop Brgh	SH	0.0	2.4	0.6	2.3	0.0	1.0	0.0	1.0
Lehigh County		7.7	19.9	3.9	7.2	2.0	2.8	2.3	3.2
City of Allentown	I	10.7	26.4	4.3	8.2	2.5	3.2	3.1	4.0
City of Bethlehem	SH	10.7	26.2	4.4	9.7	2.4	2.7	3.0	3.3
Lw. Macungie Twp	I	8.0	25.0	3.4	6.6	2.4	3.8	2.9	4.7
N. Whitehall Twp	SH	3.1	10.9	1.4	2.1	2.2	5.2	2.4	5.7
N. Whitehall Twp	C/L	0.0	7.7	1.0	1.6	0.0	4.8	0.0	5.1
S. Whitehall Twp	SH	5.8	13.5	2.3	5.8	2.5	2.3	2.8	2.5
Up. Macungie Twp	I	8.4	23.1	5.5	8.7	1.5	2.7	1.8	3.2
Weisenberg Twp	I	10.2	26.3	5.4	9.7	1.9	2.7	2.3	3.3
McKean County		0.9	3.9	0.5	1.1	1.7	3.7	1.8	4.1
Corydon Twp	SH	0.0	0.0	0.6	1.1	0.0	0.0	0.0	0.0
Eldred Twp	SH	0.0	0.0	1.1	2.0	0.0	0.0	0.0	0.0
Hamlin Twp	SH	1.7	5.5	0.5	1.4	3.4	3.9	3.8	4.4
Keating Twp	SH	0.0	0.0	0.3	0.6	0.0	0.0	0.0	0.0
Lafayette Twp	SH	0.0	1.7	1.1	2.1	0.0	0.8	0.0	0.8
Sergeant Twp	SH	0.0	13.2	0.0	0.0	--	--	--	--
Wetmore Twp	SH	0.0	2.5	0.0	0.0	--	--	--	--

Table 4.5 Municipality & County Disproportionality Ratios for 27 Observed Counties (p. 5 of 6)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Mercer County		8.7	17.1	2.6	5.2	3.3	3.3	3.8	3.8
Deer Creek Twp	I	13.4	23.7	2.1	5.8	6.4	4.1	8.0	5.1
E. Lackawan. Twp	I	14.8	31.5	4.7	8.6	3.1	3.7	4.3	5.0
Findley Twp	I	10.8	22.1	2.6	4.4	4.2	5.0	5.1	6.2
Jackson Twp	I	10.2	14.4	2.3	3.7	4.4	3.9	5.0	4.4
Lackawannock Twp	I	8.6	19.0	3.9	6.4	2.2	3.0	2.6	3.4
Springfield Twp	I	8.1	11.3	2.1	4.2	3.9	2.7	4.2	2.9
Wolf Creek Twp	I	11.0	26.2	2.3	5.3	4.8	4.9	6.2	6.4
Montgomery County		12.1	21.0	5.3	10.8	2.3	1.9	2.6	2.2
Limerick Twp	SH	14.5	24.1	4.7	8.7	3.1	2.8	3.7	3.4
Lower Merion Twp	I	24.8	40.0	7.2	14.8	3.4	2.7	4.9	3.9
Lwr Providence Twp	SH	13.5	22.3	5.7	12.6	2.4	1.8	2.7	2.0
Plymouth Twp	I	11.9	20.8	5.8	11.8	2.1	1.8	2.3	2.0
Upper Merion Twp	I	8.8	16.7	5.0	7.9	1.8	2.1	2.0	2.4
Upper Salford Twp	C/L	6.7	10.0	2.0	3.5	3.4	2.9	3.6	3.1
Whitemarsh Twp	I	11.2	21.5	5.4	11.9	2.1	1.8	2.3	2.0
Worcester Twp	C/L	11.5	24.4	6.2	14.0	1.9	1.7	2.1	2.0
Montour County		9.3	21.2	4.1	8.1	2.2	2.6	2.6	3.1
Liberty Twp	I	12.8	24.4	4.4	9.1	2.9	2.7	3.5	3.2
Valley Twp	I	7.6	23.5	4.0	7.2	1.9	3.3	2.3	4.0
Susquehanna County		7.8	19.1	4.0	11.5	2.0	1.7	2.2	1.9
Lenox Twp	I	6.8	18.1	2.7	11.4	2.5	1.6	2.7	1.7
New Milford Twp	I	10.2	24.5	5.2	11.6	2.0	2.1	2.4	2.6
Tioga County		2.4	4.6	1.0	2.2	2.5	2.1	2.6	2.2
Charleston Twp	SH	0.0	0.0	0.8	1.7	0.0	0.0	0.0	0.0
Delmar Twp	SH	0.0	0.0	0.0	0.0	--	--	--	--
Liberty Twp	SH	3.3	6.5	2.1	2.9	1.6	2.2	1.7	2.4
Mansfield Brgh	SH	1.6	1.6	0.4	0.5	4.0	3.2	4.0	3.2
Richmond Twp	SH	2.6	4.7	0.8	2.5	3.3	1.9	3.4	2.0
Tioga Twp	SH	6.1	11.7	1.2	3.3	5.1	3.5	5.7	4.0

Table 4.5 Municipality & County Disproportionality Ratios for 27 Observed Counties (p. 6 of 6)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Washington County		6.1	8.3	3.5	5.9	1.7	1.4	1.8	1.5
Amwell Twp	I	5.3	10.9	1.8	2.7	2.9	4.0	3.2	4.4
Cecil Twp	I	6.0	7.3	5.1	8.1	1.2	0.9	1.2	0.9
Chartiers Twp	I	6.4	8.9	2.1	3.3	3.0	2.7	3.2	2.9
Donegal Twp	I	8.5	11.9	3.9	5.6	2.2	2.1	2.3	2.3
Fallowfield Twp	I	8.3	11.8	3.2	5.6	2.6	2.1	2.8	2.3
North Strabane Twp	I	7.4	9.9	3.6	6.7	2.1	1.5	2.1	1.5
Somerset Twp	I	8.0	12.2	2.6	6.4	3.1	1.9	3.3	2.0
South Strabane Twp	I	5.9	8.2	4.7	7.6	1.3	1.1	1.3	1.1
Westmoreland County		7.7	11.8	2.2	4.8	3.5	2.5	3.8	2.7
Derry Twp	SH	4.4	6.4	2.2	4.1	2.0	1.6	2.1	1.6
Donegal Twp	SH	0.0**	0.0**	0.7	2.8	0.0	0.0	0.0	0.0
E. Huntingdon Twp	SH	2.9	3.7	1.5	2.4	1.9	1.5	2.0	1.6
Hempfield Twp	I	4.4	7.8	2.1	5.6	2.1	1.4	2.1	1.4
Hempfield Twp	SH	3.1	4.0	1.8	2.4	1.7	1.7	1.8	1.7
Mount Pleasant Twp	SH	1.8	2.6	1.0	4.0	1.8	0.7	1.8	0.6
Penn Twp	I	9.2	14.1	5.3	11.0	1.7	1.3	1.8	1.3
Salem Twp	SH	5.5	7.4	2.9	3.5	1.9	2.1	2.0	2.2
York County		7.9	13.2	5.0	9.1	1.6	1.4	1.7	1.5
Fairview Twp	I	9.3	16.3	4.1	8.2	2.3	2.0	2.5	2.2
Manchester Twp	I	7.7	20.2	6.4	10.4	1.2	1.9	1.4	2.2
Newberry Twp	I	15.3	18.1	5.6	10.2	2.7	1.8	3.1	2.0
Shrewsbury Twp	I	13.6	18.7	5.0	8.9	2.7	2.1	3.1	2.4
Springfield Twp	I	11.5	17.5	6.3	12.6	1.8	1.4	1.9	1.5
Warrington Twp	SH	0.0	6.5	0.8	2.3	0.0	2.8	0.0	3.1
York Twp	I	7.3	11.1	4.9	6.1	1.5	1.8	1.6	1.9

* I = interstate, SH = state highway, C/L = county / local road

** Percentages in these municipalities are based on less than 20 total stops; interpret disproportionality measures with caution.

Comparison #5: Daytime traffic stops for speeding compared to daytime observations of speeding

Although observational surveys of roadway usage do appear to better approximate the driving population than residential statistics from the Census, benchmarks based on surveys of road usage and Census data both do not consider driving behavior that may account for racial disparity in stops. That is, merely demonstrating a difference between the percent of minorities stopped and the percent living or driving in a particular area does not necessarily mean police officers have acted inappropriately. An alternative explanation is that remaining disparities may at least partially reflect differences in legally relevant behavior by members of particular demographic groups, rather than police behavior (Walker et al., 2000). As noted in the Year 1 Report, our observations indicate that Black drivers were statistically significantly more likely to speed, and excessively speed, compared to Caucasians (Engel et al., 2004). The methodology for the observations of speeding is detailed in the Year 1 Report (Engel et al., 2004) and is repeated in **Appendix B** of this document.

Table 4.6 displays the information relevant to the final disproportionality ratio calculated for this study—driver-violating behavior (i.e., speeding). In order to make the calculation of the disproportionality ratio as comparable as possible, the observed component of the disproportionality ratio was based on only PSP stops for speeding at least 10 miles per hour over the posted speed limit on the specific roadway types observed in each municipality. Similarly, the expected values were based on only RADAR observations of drivers that were exceeding the posted speed limit by at least 10 miles per hour within the observed municipalities.[7]

[7] Nine of the observed municipalities did not include speeding observations, including: 1) Allegheny County, West Deer Twp, 2) Centre County, Snow Show Twp; 3) Chester County, West Nantmeal Twp; 4) Dauphin County, Susquehanna Twp; 5) Franklin County, Guildford Twp; 6) Franklin County, Milton Twp; 7) Lehigh County, City of Allentown; 8) Washington County, Donegal Twp, and 9) Westmoreland County, Salem Twp.

Table 4.6 Municipality & County Disproportionality Ratios for 27 Observed Counties Based on Speeding (p. 1 of 6)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Allegheny County		7.8	12.0	2.4	5.3	3.2	2.3	3.5	2.4
Franklin Park	I	6.9	10.8	2.7	2.7	2.6	4.0	2.8	4.4
Harmar Twp	I	7.0	11.9	7.7**	7.7**	0.9	1.5	1.0	1.6
Marshall Twp	I	15.6	25.0	1.9	3.0	8.2	8.3	10.6	10.8
Monroeville Brgh	I	11.7	17.1	2.6	7.9	4.5	2.2	5.0	2.4
Ohio Twp	I	6.9	7.9	2.7	5.9	2.6	1.3	2.6	1.4
Robinson Twp	I	3.8	7.1	2.2	5.0	1.7	1.4	1.8	1.5
Bedford County		12.0	20.8	12.2	20.8	1.0	1.0	1.0	1.0
E. Providence Twp	I	14.6	25.3	12.2	20.8	1.2	1.2	1.3	1.3
Bucks County		10.0	19.8	8.1	14.4	1.2	1.4	1.3	1.5
Bensalem Twp	I	14.7	27.0	9.4	15.0	1.6	1.8	1.8	2.1
Lwr Makefield Twp	I	14.5	26.5	15.6	17.4	0.9	1.5	1.0	1.7
Middletown Twp	I	13.8	26.1	6.9	12.0	2.0	2.2	2.4	2.6
Milford Twp	SH	3.1	6.5	0.0**	0.0**	--	--	--	--
Richland Twp	SH	0.0**	0.0**	0.0	9.2	--	0.0	--	0.0
West Rockhill Twp	SH	5.4	17.6	1.7	15.9	3.2	1.1	3.2	1.1
Centre County		5.1	11.2	1.0	3.6	5.0	3.2	5.4	3.4
Benner Twp	SH	3.7	8.4	0.0	1.5	--	5.6	--	6.0
Boggs Twp	I	18.4	39.5	0.0**	0.0**	--	--	--	--
Marion Twp	I	8.6	18.9	6.5	15.2	1.3	1.2	1.4	1.3
Potter Twp	SH	5.1	9.8	0.0	0.0	--	--	--	--
Rush Twp	I	9.8	28.6	6.7**	20.0**	1.5	1.4	1.7	1.7
Rush Twp	SH	2.7	4.7	0.0	1.9	--	2.5	--	2.6
Spring Twp	SH	4.7	8.7	0.0	3.0	--	2.9	--	3.1
Worth Twp	SH	3.2	4.8	0.0	0.0	--	--	--	--
Chester County		10.7	20.1	5.3	9.5	2.0	2.1	2.3	2.4
Charlestown Twp	SH	0.0**	0.0**	0.0**	0.0**	--	--	--	--
East Whiteland Twp	SH	11.3	17.2	4.6	9.3	2.5	1.8	2.7	2.0
London Grove Twp	SH	11.0	23.0	7.1	12.9	1.5	1.8	1.8	2.0
Lower Oxford Twp	SH	10.8	20.0	2.2	4.4	4.9	4.5	5.9	5.4
New Garden Twp	SH	10.0	19.4	10.3	14.6	1.0	1.3	1.0	1.4

Table 4.6 Municipality & County Disproportionality Ratios for 27 Observed Counties Based on Speeding (p. 2 of 6)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Chester County (cont.)									
S. Coventry Twp	SH	10.0**	10.0**	0.0	2.0	--	5.0	--	5.4
Valley Twp	SH	10.3	17.9	4.2	8.4	2.5	2.1	2.7	2.4
Clarion County		8.8	19.8	8.8	23.1	1.0	0.9	1.0	0.8
Clarion Twp	I	10.8	24.0	8.8	23.1	1.2	1.0	1.2	1.1
Clinton County		9.5	21.2	14.2	29.6	0.7	0.7	0.6	0.7
Lamar Twp	I	9.8	22.4	14.2	29.6	0.7	0.8	0.7	0.7
Columbia County		10.9	23.2	5.1	8.3	2.2	2.8	2.6	3.3
Hemlock Twp	I	18.4	35.6	5.6	9.4	3.3	3.8	4.6	5.3
Mifflin Twp	I	11.2	23.3	6.9	9.9	1.6	2.4	1.9	2.8
Scott Twp	I	5.3	13.7	3.4	6.8	1.6	2.0	1.7	2.2
South Centre Twp	I	9.4	25.6	4.2	7.0	2.2	3.7	2.8	4.6
Dauphin County		7.3	14.1	2.8	5.6	2.6	2.5	2.9	2.8
Jackson Twp	SH	2.6	2.6	0.0**	0.0**	--	--	--	--
Londonderry Twp	I	12.7	22.4	3.7	10.2	3.4	2.2	4.0	2.5
Lower Paxton Twp	I	5.1	12.1	2.6	4.7	2.0	2.6	2.1	2.8
Lower Swatara Twp	I	12.0	18.9	0.0**	0.0**	--	--	--	--
Middle Paxton Twp	SH	1.3	6.7	3.6	6.1	0.4	1.1	0.4	1.1
Reed Twp	SH	4.1	11.2	0.0**	0.0**	--	--	--	--
Washington Twp	SH	0.0**	0.0**	0.0	0.0	--	--	--	--
Wiconisco Twp	SH	3.3	3.3	0.0	0.0	--	--	--	--
Delaware County		14.3	20.7	15.8	19.9	0.9	1.0	0.9	1.1
Chadds Ford Twp	SH	5.3**	5.3**	3.8	5.7	1.4	0.9	1.4	0.9
Concord Twp	SH	11.3	14.4	9.5	9.5	1.2	1.5	1.3	1.6
Middletown Twp	SH	14.4	18.6	14.6	17.5	1.0	1.1	1.0	1.1
Radnor Twp	I	9.7	16.0	22.6	27.7	0.4	0.6	0.4	0.5
Tinicum Twp	I	18.3	28.3	18.8	22.6	1.0	1.3	1.1	1.4
Erie County		5.7	10.8	1.0	1.5	5.7	7.2	6.4	8.0
Amity Twp	SH	2.1	4.8	0.0	4.4	--	1.1	--	1.1
Fairview Twp	SH	2.1	2.6	3.0	3.0	0.7	0.9	0.7	0.9
Franklin Twp	I	7.4	15.4	0.0	0.0	--	--	--	--
Girard Twp	SH	0.0	0.0	0.0	0.0	--	--	--	--

Table 4.6 Municipality & County Disproportionality Ratios for 27 Observed Counties Based on Speeding (p. 3 of 6)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Erie County (cont.)									
Harborcreek Twp	SH	1.5	2.2	0.0**	0.0**	--	--	--	--
McKean Twp	I	8.1	15.4	3.6	3.6	2.3	4.3	2.6	5.0
McKean Twp	SH	0.0	0.0	0.0**	0.0**	--	--	--	--
Summit Twp	I	7.3	14.5	0.0**	0.0**	--	--	--	--
Summit Twp	SH	2.5	2.5	0.0	0.0	--	--	--	--
Franklin County		8.1	15.0	0.7	1.4	11.4	10.5	13.2	12.1
Antrim Twp	I	8.4	14.0	8.3**	8.3**	1.0	1.7	1.1	1.8
Fannett Twp	SH	0.0**	0.0**	0.0	0.0	--	--	--	--
Greene Twp	SH	1.7	6.9	0.0	0.0	--	--	--	--
Guilford Twp	SH	0.0	1.9	0.9	2.6	0.0	0.7	0.0	0.7
Peters Twp	SH	6.9	13.8	0.0	0.0	--	--	--	--
St. Thomas Twp	SH	0.0	0.0	0.0	0.0	--	--	--	--
Southampton Twp	SH	0.0**	9.1**	0.0**	0.0**	--	--	--	--
Fulton County		14.3	24.4	12.8	22.0	1.1	1.1	1.2	1.1
Brush Creek Twp	I	18.5	29.3	12.1	20.6	1.5	1.4	1.7	1.6
Wells Twp	I	11.9	22.6	19.6	34.8	0.6	0.6	0.5	0.5
Indiana County		2.6	4.7	0.8	2.1	3.3	2.2	3.4	2.3
Armstrong Twp	SH	1.9	2.9	0.0**	0.0**	--	--	--	--
Blairsville Brgh	SH	2.2	5.4	0.0	1.3	--	4.2	--	4.3
Burrell Twp	SH	4.8	7.3	1.2	1.2	4.0	6.1	4.3	6.5
Cherryhill Twp	SH	3.3	3.3	0.0**	0.0**	--	--	--	--
E. Wheatfield Twp	SH	3.1	8.5	1.4	7.0	2.2	1.2	2.3	1.2
Pine Twp	SH	2.0	2.7	0.0	0.0	--	--	--	--
White Twp	SH	1.7	3.5	1.0	2.0	1.7	1.8	1.7	1.8
Jefferson County		6.5	14.8	6.4	16.7	1.0	0.9	1.0	0.9
Washington Twp	I	10.4	23.5	6.4	16.7	1.6	1.4	1.8	1.5
Juniata County		4.5	10.5	4.4	4.9	1.0	2.1	1.0	2.3
Beale Twp	SH	0.0**	7.1**	0.0**	0.0**	--	--	--	--
Delaware Twp	SH	0.0	3.6	0.0	2.3	--	1.6	--	1.6
Fermanagh Twp	SH	2.9	14.3	8.1	8.1	0.4	1.8	0.4	1.9
Walker Twp	SH	6.5	13.0	3.9	4.4	1.7	3.0	1.9	3.3

Table 4.6 Municipality & County Disproportionality Ratios for 27 Observed Counties Based on Speeding (p. 4 of 6)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Lackawanna County		6.3	14.6	6.3	12.2	1.0	1.2	1.0	1.2
Abington Twp	I	0.0**	0.0**	3.2	10.6	0.0	0.0	0.0	0.0
Clifton Twp	I	5.7	26.4	15.7	23.5	0.4	1.1	0.4	1.2
City of Scranton	I	4.0	7.9	3.9	5.5	1.0	1.4	1.1	1.5
Dunmore Brgh	I	9.3	19.2	5.8	13.7	1.6	1.4	1.7	1.5
Roaring Brook Twp	I	10.3	25.2	9.2	11.7	1.1	2.2	1.4	2.6
Scott Twp	I	0.0**	0.0**	10.8	17.1	0.0	0.0	0.0	0.0
Throop Brgh	SH	0.0**	0.0**	0.0**	9.1**	--	0.0	--	0.0
Lehigh County		8.4	20.1	5.3	8.4	1.6	2.4	1.8	2.7
City of Bethlehem	SH	11.4	24.1	7.7	10.9	1.5	2.2	1.7	2.6
Lw. Macungie Twp	I	8.2	23.3	5.4	10.8	1.5	2.2	1.8	2.5
N. Whitehall Twp	SH	10.7	21.4	3.6	4.5	3.0	4.8	3.6	5.8
N. Whitehall Twp	C/L	0.0**	0.0**	0.4	0.4	0.0	0.0	0.0	0.0
S. Whitehall Twp	SH	4.8	13.7	1.8	1.8	2.7	7.6	3.1	8.7
Up. Macungie Twp	I	8.3	22.9	8.1	13.2	1.0	1.7	1.2	2.0
Weisenberg Twp	I	10.3	26.6	5.2	8.7	2.0	3.1	2.5	3.8
McKean County		0.8	4.1	0.4	0.8	2.1	5.2	2.3	5.6
Corydon Twp	SH	0.0	0.0	0.0**	0.0**	--	--	--	--
Eldred Twp	SH	0.0**	0.0**	0.0**	0.0**	--	--	--	--
Hamlin Twp	SH	1.5	5.0	0.5	1.1	3.0	4.5	3.3	5.1
Keating Twp	SH	0.0	0.0	0.0**	0.0**	--	--	--	--
Lafayette Twp	SH	0.0	2.3	0.0**	0.0**	--	--	--	--
Sergeant Twp	SH	0.0	13.9	0.0**	0.0**	--	--	--	--
Wetmore Twp	SH	0.0	1.6	0.0**	0.0**	--	--	--	--
Mercer County		9.1	18.1	4.1	8.2	2.2	2.2	2.5	2.5
Deer Creek Twp	I	12.9	22.6	4.2	7.0	3.1	3.2	3.7	3.9
E. Lackawan. Twp	I	12.1	27.3	7.7	12.8	1.6	2.1	1.9	2.6
Findley Twp	I	9.1	19.8	4.0	4.0	2.3	5.0	2.7	6.0
Jackson Twp	I	10.7	15.5	5.9	9.8	1.8	1.6	1.9	1.7
Lackawannock Twp	I	9.4	19.5	0.0**	12.5**	--	1.6	--	1.7
Springfield Twp	I	8.7	13.0	3.7	3.7	2.4	3.5	2.6	3.9
Wolf Creek Twp	I	11.0	25.5	2.5	8.3	4.4	3.1	5.5	3.8

Table 4.6 Municipality & County Disproportionality Ratios for 27 Observed Counties Based on Speeding (p. 5 of 6)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Montgomery County		9.8	18.5	5.5	10.7	1.8	1.7	2.0	1.9
Limerick Twp	SH	15.9	26.2	3.4	7.3	4.7	3.6	5.9	4.5
Lower Merion Twp	I	23.0	37.2	6.3	14.4	3.7	2.6	5.0	3.6
Lwr Providence Twp	SH	12.1	21.0	4.3	10.8	2.8	1.9	3.2	2.2
Plymouth Twp	I	12.2	21.5	5.6	8.3	2.2	2.6	2.5	3.0
Upper Merion Twp	I	6.5	13.9	3.0	4.3	2.2	3.2	2.4	3.6
Upper Salford Twp	SH	0.0**	0.0**	0.0	3.7	--	0.0	--	0.0
Whitemarsh Twp	I	10.5	21.3	8.7	14.5	1.2	1.5	1.3	1.6
Worcester Twp	C/L	3.2	9.7	7.7	15.4	0.4	0.6	0.4	0.6
Montour County		11.5	24.7	6.5	14.0	1.8	1.8	2.0	2.0
Liberty Twp	I	15.5	25.8	3.9	11.8	4.0	2.2	4.7	2.6
Valley Twp	I	9.9	28.6	9.5	16.7	1.0	1.7	1.2	2.0
Susquehanna County		9.1	23.2	8.8	15.8	1.0	1.5	1.2	1.7
Lenox Twp	I	6.9	18.8	10.0	20.0	0.7	0.9	0.7	0.9
New Milford Twp	I	10.4	27.0	7.4	11.1	1.4	2.4	1.8	3.1
Tioga County		3.0	5.5	2.7	3.8	1.1	1.4	1.2	1.5
Charleston Twp	SH	0.0	0.0	0.0**	0.0**	--	--	--	--
Delmar Twp	SH	0.0	0.0	0.0**	0.0**	--	--	--	--
Liberty Twp	SH	3.5	7.1	4.4	4.4	0.8	1.6	0.8	1.7
Mansfield Brgh	SH	0.0	0.0	0.0**	0.0**	--	--	--	--
Richmond Twp	SH	3.3	5.9	16.7**	16.7**	0.2	0.4	0.2	0.3
Tioga Twp	SH	8.4	14.5	2.3	3.7	3.7	3.9	4.2	4.5
Washington County		6.2	8.4	4.3	8.2	1.4	1.0	1.4	1.0
Amwell Twp	I	7.0	13.3	0.0	0.0	--	--	--	--
Cecil Twp	I	6.6	8.6	4.0	9.2	1.7	0.9	1.6	0.9
Chartiers Twp	I	6.3	8.9	2.0	3.4	3.2	2.6	3.3	2.8
Fallowfield Twp	I	8.7	12.7	0.0	7.7	--	1.6	--	1.7
North Strabane Twp	I	6.7	10.0	5.7	8.1	1.2	1.2	1.2	1.3
Somerset Twp	I	10.3	13.8	6.2	11.6	1.7	1.2	1.7	1.2
South Strabane Twp	I	5.8	7.5	6.9	12.3	0.8	0.6	0.8	0.6

Table 4.6 Municipality & County Disproportionality Ratios for 27 Observed Counties Based on Speeding (p. 6 of 6)[8]

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices		Disproportionality Ratios	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Westmoreland County		8.4	13.3	2.0	4.2	4.3	3.1	4.7	3.5
Derry Twp	SH	5.1	7.6	3.4	6.7	1.5	1.1	1.5	1.1
Donegal Twp	SH	0.0**	0.0**	2.0	5.9	0.0	0.0	0.0	0.0
E. Huntingdon Twp	SH	3.1	4.2	0.0	0.0	--	--	--	--
Hempfield Twp	I	5.8	11.0	0.0**	0.0**	--	--	--	--
Hempfield Twp	SH	2.7	3.4	4.4	4.4	0.6	0.8	0.6	0.8
Mount Pleasant Twp	SH	2.9	4.3	0.0	1.9	--	2.3	--	2.3
Penn Twp	I	10.4	15.9	0.0**	9.1**	--	1.7	--	1.9
York County		9.3	14.7	7.3	12.1	1.3	1.2	1.3	1.3
Fairview Twp	I	9.1	16.2	4.2	5.8	2.2	2.8	2.5	3.2
Manchester Twp	I	9.4	21.9	5.8	5.8	1.6	3.8	2.0	4.5
Newberry Twp	I	15.7	18.0	8.9	16.3	1.8	1.1	1.8	1.1
Shrewsbury Twp	I	12.6	18.6	10.0	13.0	1.3	1.4	1.4	1.5
Springfield Twp	I	12.2	17.5	10.3	19.0	1.2	0.9	1.2	0.9
Warrington Twp	SH	0.0**	0.0**	0.0	0.0	--	--	--	--
York Twp	I	6.7	9.6	7.0	9.3	1.0	1.0	1.0	1.0

* I = interstate, SH = state highway, C/L = county / local road
** Percentages in these municipalities are based on less than 20 total stops; interpret disproportionality measures with caution.

[8] Nine of the observed municipalities did not include speeding observations of 10 or more miles per hour over the posted limit and are not included in this table. These municipalities include: 1) Allegheny County, West Deer Twp, 2) Centre County, Snow Show Twp; 3) Chester County, West Nantmeal Twp; 4) Dauphin County, Susquehanna Twp; 5) Erie County, Union Twp; 6) Franklin County, Hamilton Twp; 7) Lehigh County, City of Allentown; 8) Washington County, Donegal Twp, and 9) Westmoreland County, Salem Twp.

If differences in speeding behavior account for differences in the rates of police stops, then we would expect that the disproportionality ratios would be close to 1.0. **Table 4.6** illustrates the disproportionality ratios for the 27 counties that had observers monitor speeding of the drivers. For Black drivers, the mean disproportionality ratio is 2.6, the median is 1.8, and the standard deviation is 2.6. The majority of the counties had disproportionality ratios between 1 and 3, with the low of 0.6 in Clinton County and the high of 13.2 in Franklin County. While the range of disproportionality ratios is still quite varied, there are only 4 counties below a disproportionality ratio of 1.0, and just 6 counties above a disproportionality ratio of 3.0.

For non-Caucasian drivers, the pattern is much the same as for Black drivers. **Table 4.6** shows that the mean disproportionality ratio is 2.6, the median is 2.0, and the standard deviation is 2.5. Clinton County also has the lowest disproportionality ratio at 0.7, and Franklin County the highest at 12.2. Similar to the dispersion displayed by the Black drivers in the 27 counties, the disproportionality ratios for the non-Caucasian drivers produced only 3 counties below 1.0, and 6 above a disproportionality ratio of 3.0.

When comparing the disproportionality ratios calculated based on the roadway usage observations (**Table 4.5**) versus speeding observations (**Table 4.6**), for Black drivers the range of disproportionality ratios is more truncated for the observations (a low of 1.1 to a high of 6.7) in comparison to the speeding model (a low of 0.6 to a high of 13.2). The pattern is consistent when examining the non-Caucasian disproportionality ratios – the roadway usage observations ranged from a low of 1.1 to a high of 7.4, while the speeding model produced a range from 0.7 to 12.2. Furthermore, the standard deviation of the roadway usage observation model for Black drivers was only 1.4, while the speeding model produced a standard deviation of 2.6.

Summary of Disproportionality Ratios

Using different available benchmarks, disproportionality ratios can produce vastly different results, which can lead to misinterpretations of the data. The degree to which disproportionality ratios vary differs by method and by county. **Table 4.7** illustrates this variability by comparing the five disproportionality ratios calculated for Black, Hispanic, and non-Caucasian drivers for the counties in Pennsylvania. It is important to note that the first three models based on Census driving-age residential population data, stops of county residents only, and the traffic flow model, respectively, include all three of the race groups and all counties. The final two models based on roadway usage observation data and speeding observations only are calculated for Black and non-Caucasian drivers within 27 counties where observations were initiated.

The comparisons across disproportionality measures are documented in **Table 4.7**. As shown, for the overwhelming majority of Pennsylvania counties, the differences between the disproportionality ratios based on Census data and the four other disproportionality measures are fairly large. The largest discrepancies exist between the Census-based model and the traffic flow model. For example, Black drivers in Jefferson County have a disproportionality ratio of 69.2 in Model #1 (Census-based model) versus a ratio of 0.3 in Model #3 (traffic flow model). That is, if straight residential Census populations are used as the benchmark, the results show that Black drivers traveling in Jefferson County are 69.2 times *more* likely than Caucasians to be stopped by PSP Troopers. In contrast, when the traffic flow model is used as the benchmark, Black drivers in Jefferson County are actually *less* likely than Caucasians to be stopped by PSP Troopers. While Jefferson County represents an example at the extreme, this pattern of significantly lower disproportionality ratios produced by the traffic flow model compared to residential Census populations is consistent across Black, Hispanic, and non-Caucasian populations in every county.

The following general patterns are observed when comparing the disproportionality ratios developed from the five different benchmarks:

- The larger the disproportionality ratios, the larger the differences in the ratios across models
- The Census-based results are by far the most varied and produce the most extreme values (**Table 4.1**)
- The findings from the observations (Model #4) and the results of the speeding analysis (Model #5) are fairly similar
- In most counties, the analysis of county only residents (Model #2) shows disproportionality ratios below those produced on the observations (Model #4) and the results from the speeding model (Model #5) (see **Table 4.3** for the county only results)
- By far the lowest disproportionality ratios are produced by the traffic model (**Table 4.4**)

Table 4.7: Comparison of Disproportionality Ratios for the Five Methods by County (p.1 of 4)

County Name	Black					Hispanic			Non-Caucasian				
	Census-Based Model	County Only Model	Traffic Model	Obs Model	Speed Model	Census-Based Model	County Only Model	Traffic Model	Census-Based Model	County Only Model	Traffic Model	Obs Model	Speed Model
Adams	5.3	3.1	0.4	--	--	1.7	2.2	0.5	2.6	2.1	0.5	--	--
Allegheny	0.8	1.0	0.7	3.5	3.5	1.2	0.4	0.4	0.9	1.0	0.8	2.4	2.4
Armstrong	3.0	1.8	0.2	--	--	0.5	0.7	0.1	1.9	1.0	0.3	--	--
Beaver	1.9	1.3	0.6	--	--	2.5	0.7	0.2	2.2	1.1	0.6	--	--
Bedford	45.6	1.9	0.7	1.1	1.0	6.6	0.4	0.3	15.9	0.7	0.7	1.1	1.0
Berks	2.4	1.6	0.8	--	--	1.3	1.6	1.2	1.8	1.6	1.1	--	--
Blair	4.2	2.4	0.4	--	--	1.4	0.3	0.1	3.1	1.3	0.3	--	--
Bradford	4.0	2.0	0.1	--	--	1.0	0.8	0.1	1.0	0.6	0.1	--	--
Bucks	3.4	1.4	0.6	1.3	1.3	2.3	1.1	0.8	2.4	1.1	0.8	1.4	1.5
Butler	4.2	1.3	0.3	--	--	1.0	0.6	0.1	2.3	0.8	0.3	--	--
Cambria	1.0	0.6	0.3	--	--	0.7	0.0	0.2	1.0	0.5	0.3	--	--
Cameron	2.5	0.0	0.1	--	--	0.7	0.0	0.1	1.1	0.0	0.1	--	--
Carbon	14.9	3.1	0.4	--	--	3.3	1.3	0.3	6.3	1.7	0.5	--	--
Centre	1.6	0.5	0.3	2.9	5.4	1.0	0.2	0.2	1.1	0.4	0.4	3.2	3.4
Chester	2.0	1.4	0.9	2.3	2.3	2.3	3.0	1.4	2.0	1.8	1.1	2.6	2.4
Clarion	13.6	0.9	0.5	1.7	1.0	14.0	0.2	0.3	11.5	0.6	0.5	1.6	0.8
Clearfield	4.9	0.1	0.4	--	--	6.2	0.2	0.2	6.4	0.1	0.5	--	--
Clinton	21.4	1.8	0.5	1.4	0.6	9.7	1.2	0.3	12.5	1.4	0.6	1.4	0.7
Columbia	16.9	2.4	0.6	4.4	2.6	7.2	4.6	0.4	10.7	2.6	0.6	4.5	3.3
Crawford	4.0	1.1	0.5	--	--	1.4	0.3	0.1	3.3	0.9	0.5	--	--
Cumberland	5.7	1.4	0.8	--	--	3.0	0.5	0.3	4.0	1.0	0.8	--	--
Dauphin	0.5	0.6	0.5	3.8	2.9	0.9	1.2	0.5	0.6	0.7	0.6	3.8	2.8

Table 4.7: Comparison of Disproportionality Ratios for the Five Methods by County (p.2 of 4)

County Name	Black					Hispanic			Non-Caucasian				
	Census-Based Model	County Only Model	Traffic Model	Obs Model	Speed Model	Census-Based Model	County Only Model	Traffic Model	Census-Based Model	County Only Model	Traffic Model	Obs Model	Speed Model
Delaware	1.4	1.0	0.9	1.5	0.9	2.2	0.9	0.6	1.4	1.0	0.9	1.6	1.1
Elk	11.3	0.9	0.1	--	--	3.6	1.3	0.1	3.5	0.4	0.2	--	--
Erie	1.2	0.7	0.5	1.5	6.4	0.9	0.8	0.3	1.4	0.8	0.6	1.6	8.0
Fayette	1.9	2.1	1.1	--	--	0.6	0.3	0.2	1.5	1.6	0.9	--	--
Forest	0.2	0.0	0.1	--	--	0.0	0.0	0.0	0.2	0.0	0.1	--	--
Franklin	4.2	1.8	0.6	6.7	13.2	2.3	1.6	0.4	3.5	1.5	0.6	7.4	12.1
Fulton	27.9	1.2	0.8	1.4	1.2	11.1	1.2	0.3	17.2	1.1	0.8	1.3	1.1
Greene	1.0	0.1	0.3	--	--	1.0	0.1	0.1	1.2	0.1	0.4	--	--
Huntingdon	0.3	0.1	0.3	--	--	0.4	0.2	0.1	0.4	0.1	0.2	--	--
Indiana	1.8	0.8	0.3	3.0	3.4	0.6	0.4	0.1	1.5	0.9	0.4	2.5	2.3
Jefferson	69.2	3.7	0.3	1.2	1.0	8.9	0.5	0.2	12.7	0.7	0.4	1.2	0.9
Juniata	22.2	4.4	0.3	3.0	1.0	2.1	2.6	0.5	4.7	2.6	0.4	3.7	2.3
Lackawanna	6.4	2.9	0.5	2.0	1.0	3.6	2.7	0.4	4.7	2.2	0.5	2.3	1.2
Lancaster	4.6	2.0	0.7	--	--	1.1	1.1	0.7	2.4	1.3	0.8	--	--
Lawrence	2.0	1.7	0.6	--	--	1.1	0.3	0.1	1.8	1.4	0.5	--	--
Lebanon	11.1	1.3	0.7	--	--	2.2	1.8	0.6	4.2	1.6	0.8	--	--
Lehigh	3.0	2.0	0.8	2.3	1.8	1.0	1.1	0.8	1.7	1.4	1.0	3.2	2.7
Luzerne	4.2	1.6	0.5	--	--	4.0	3.6	0.5	4.0	2.0	0.6	--	--
Lycoming	1.1	1.1	0.4	--	--	1.9	0.8	0.2	1.3	0.9	0.4	--	--
McKean	0.5	0.1	0.1	1.8	2.3	0.6	0.4	0.1	0.9	0.2	0.1	4.1	5.6
Mercer	2.3	0.9	0.6	3.8	2.5	6.5	0.7	0.3	3.3	0.8	0.6	3.8	2.5
Mifflin	12.7	5.3	0.3	--	--	3.1	2.9	0.3	6.7	2.7	0.4	--	--

Table 4.7: Comparison of Disproportionality Ratios for the Five Methods by County (p.3 of 4)

County Name	Black					Hispanic			Non-Caucasian				
	Census-Based Model	County Only Model	Traffic Model	Obs Model	Speed Model	Census-Based Model	County Only Model	Traffic Model	Census-Based Model	County Only Model	Traffic Model	Obs Model	Speed Model
Monroe	2.6	2.5	0.8	--	--	1.2	1.0	0.4	2.0	1.6	0.7	--	--
Montgomery	2.0	1.4	0.8	2.6	2.0	2.4	2.0	0.9	1.8	1.4	1.0	2.2	1.9
Montour	16.2	0.0	0.6	2.6	2.0	6.2	7.9	0.3	8.4	3.2	0.6	3.1	2.0
Northampton	3.9	2.1	0.9	--	--	1.4	0.9	0.8	2.2	1.3	1.0	--	--
Northumberland	1.5	0.5	0.2	--	--	1.7	1.1	0.2	1.9	0.8	0.3	--	--
Perry	11.2	1.8	0.3	--	--	2.3	1.5	0.2	5.8	1.2	0.4	--	--
Philadelphia	1.2	2.3	2.0	--	--	0.4	0.0	0.4	1.0	1.7	1.4	--	--
Pike	1.9	1.9	0.4	--	--	0.7	0.7	0.2	1.2	1.1	0.4	--	--
Potter	4.1	3.5	0.1	--	--	1.3	1.8	0.1	1.2	1.1	0.1	--	--
Schuylkill	1.6	0.3	0.4	--	--	2.2	0.7	0.3	1.9	0.6	0.4	--	--
Snyder	5.5	1.5	0.3	--	--	1.1	0.9	0.1	3.1	0.9	0.3	--	--
Somerset	7.1	0.2	0.6	--	--	4.2	0.1	0.2	7.5	0.2	0.7	--	--
Sullivan	0.2	0.0	0.1	--	--	0.5	0.3	0.1	0.4	0.2	0.1	--	--
Susquehanna	40.8	3.1	0.5	2.2	1.2	4.5	0.0	0.1	14.1	0.7	0.5	1.9	1.7
Tioga	5.2	0.8	0.2	2.6	1.2	1.4	0.3	0.1	2.7	0.4	0.2	2.2	1.5
Union	1.2	0.3	0.5	--	--	1.0	0.1	0.3	1.4	0.2	0.5	--	--
Venango	2.1	0.9	0.2	--	--	2.0	0.8	0.1	2.0	0.7	0.2	--	--
Warren	2.2	0.6	0.0	--	--	0.7	0.0	0.1	0.6	0.3	0.1	--	--
Washington	2.2	1.6	0.6	1.8	1.4	1.2	0.3	0.2	2.0	1.2	0.5	1.5	1.0

Table 4.7: Comparison of Disproportionality Ratios for the Five Methods by County (p.4 of 4)

County Name	Black					Hispanic			Non-Caucasian				
	Census-Based Model	County Only Model	Traffic Model	Obs Model	Speed Model	Census-Based Model	County Only Model	Traffic Model	Census-Based Model	County Only Model	Traffic Model	Obs Model	Speed Model
Wayne	1.2	0.3	0.2	--	--	1.3	0.8	0.2	1.3	0.5	0.2	--	--
Westmoreland	4.8	1.9	0.7	3.8	4.7	2.6	0.5	0.2	4.2	1.4	0.7	2.7	3.5
Wyoming	1.3	1.1	0.1	--	--	2.0	1.1	0.3	1.4	0.7	0.2	--	--
York	3.0	1.4	0.8	1.7	1.3	1.5	1.6	0.6	2.3	1.4	0.9	1.5	1.3

Overall Assessment of Benchmarks Comparisons

Given the documented discrepancies between driver residency and driving behavior, we would expect that the county disproportionality ratios would be most inaccurate when based solely on residential population statistics. It is argued that accuracy of the ratios improve as the benchmark selected represents a closer approximation to the actual drivers at risk of being stopped for a traffic offense. Drivers' risk of being stopped for traffic offenses depends on a number of factors, including: 1) where they drive, 2) when they drive, 3) how often they drive, 4) what they drive, 5) how they drive, and 6) who they are. That is, an accurate benchmark must take into consideration driving location, time of travel, driving quantity, vehicle types and conditions, driving behavior, and drivers' characteristics. All of these factors are believed to have the potential to influence motorists' likelihood of being stopped for traffic offenses, and therefore must be measured to assess similarly situated people for purposes of accurate statistical comparisons. No benchmark has been able to successfully measure all of these factors. Nevertheless, some benchmarks are more valid than others. Based on drivers' risk of being stopped by police and the creation of the five benchmarks described above, we would expect that disproportionality ratios created based solely on residential Census populations to be the least accurate. Residential Census data comparisons to only drivers who are stopped in the county where they reside would likely be more accurate than comparisons to all traffic stops. Estimates based on the traffic flow model are likely to be more valid in comparison to either of the first two models based on straight residential population data. Yet, based on the underlying limitations of the traffic flow model (detailed in **Appendix A**), we would expect that the ratios based on the observations of roadway usage are more accurate than any of the preceding comparisons, and finally that the ratios based on driving behavior (i.e., speeding) would be the most accurate.

Although we believe the disproportionality ratios based on roadway usage observations and speeding observations are likely the most valid of the benchmarks used in these analyses, there are a number of limitations of these benchmarks as well. For example, the roadway usage and speeding observations can only be compared to traffic stops that occur in daylight hours; and for comparisons to speeding observations, only those traffic stops for that are made for speeding. It is possible that levels of disparity in traffic stops could vary from day to night and for different types of traffic offenses. Observation benchmarks cannot assess differences in racial disparities that may exist in the excluded data. That is, it is possible that greater racial disparities in traffic stops exist for stops during non-daylight hours and for other types of traffic offenses. These racial disparities would not be calculated in the disproportionality ratios based on roadway usage and speeding observations.

We believe this is unlikely, however, for several reasons. First, allegations of racial profiling are based on the notion that officers make stopping decisions based solely or partially on drivers' race /ethnicity. If this notion is accurate, then one would expect *less, not more* racial disparities during non-daylight hours because officers would be less likely to see the race of the driver prior to the traffic stop. Second, if there were differences in "profiling" behavior by Troopers that differed during daylight and non-daylight hours, then one would expect differences in the percentage of minority drivers stopped during daylight and non-daylight hours. This pattern, however, is *not* detected in traffic stops made by PSP troopers. Department wide, approximately

14% of traffic stops during daylight hours were of minority drivers, compared to 15% of stops during non-daylight hours (a non-statistically significant difference).

Third, while it is possible that racial disparities are greater for traffic stops based on traffic violations other than speeding, these disparities should be evident through differences in racial percentages of drivers stopped for non-speeding behavior. One of the often-heard criticisms of police stop practices is that minority drivers are stopped with greater frequency for less serious, more discretionary, and less objective reasons than are Caucasian drivers. In order to explore this possibility, **Tables 4.8** and **4.9** compare the reasons for stops made by Troopers by drivers' race, gender, and age. **Table 4.8** reports the initial reason for the stop. That is, the data in this table consider only the information available to the Troopers *prior* to the stop. **Table 4.9** includes the reasons for the stop recorded by Troopers both *prior to and subsequent to* the stop. That is, these data include information for what Troopers discovered after the traffic stop was initiated.

Tables 4.8 and **4.9** illustrate that Black drivers and those of other races represent significantly higher percentages of those drivers who were stopped for speeding by Troopers, as compared to Caucasians. Contrary to claims that officers may be racially profiling by stopping minority drivers for less serious types of traffic infractions, the results displayed in these tables illustrate that PSP Troopers are more likely to stop minority drivers for speeding infractions. That is, Black drivers are not more likely to be stopped for less serious or more discretionary reasons, such as moving violations and equipment/ inspection violations. In contrast, Black drivers are more likely to be initially stopped for speeding than Caucasian drivers are. Hispanic drivers, however, are slightly more likely to be stopped for moving violations, equipment and/or inspection problems, and as a result of special traffic enforcement programs, compared to other racial groups. Given that equipment and inspection problems are more likely to occur on vehicles that are older and in poor condition, this difference may be the result of disparities in wealth by ethnicity.

Tables 4.8 and **4.9** also show differences in reasons for stop by driver gender, age, and residency status. Males are more likely than females to be stopped for moving violations, equipment or inspection problems, preexisting information, license, and other reasons. In contrast, female drivers are more likely to be stopped for speeding. Drivers under 25 years old are more likely to be stopped for speeding and license violations. Drivers 25 years or older, in contrast, are more likely to be stopped for moving violations, equipment or inspection violations, registration, other reasons, and as a result of special traffic enforcement programs. Out of state drivers are more likely to be stopped for speeding, whereas Pennsylvania residents are more likely to be stopped for moving violations, equipment or inspection violations, registration, and license violations. Similar patterns are evident for municipality and county residents.

Table 4.8: Reasons for Stop (prior to stop) by Driver Race, Gender, Age & Residency

Driver Characteristics	Total # of Stops	% Speeding	% Moving Violation	% Equip/ Inspection	% Pre-exist. Info.	% Registration	% License	% Spec. Traf. Enf.	% Other
Caucasian Driver	268,940	71.4*	16.4*	9.7*	0.1	1.8*	0.2*	4.8*	0.7*
Black Driver	24,179	74.4	14.8	8.1	0.1	2.2	0.4	4.4	0.9
Hispanic Driver	9,371	68.1	16.6	11.9	0.2	2.3	0.6	5.7	1.3
Other Driver	12,211	84.2	11.5	3.4	0.1	0.7	0.0	5.4	0.7
Male Driver	220,848	70.9*	16.6*	9.9*	0.1*	1.9	0.3*	4.8	0.8*
Female Driver	94,358	74.5	15.0	8.3	0.1	1.8	0.2	4.7	0.7
Driver under 25 years old	109,879	75.5*	13.8*	8.6*	0.1	1.5*	0.3	4.3*	0.6*
Driver 25 years old or older	205,704	70.1	17.3	9.9	0.1	2.0	0.2	5.0	0.9
Driver is not resident of municipality where stopped	301,545	73.5*	15.7*	8.5*	0.1*	1.7*	0.2*	4.8*	0.7*
Driver is municipality resident	14,160	39.9	24.6	28.5	0.3	5.1	0.8	4.0	1.5
Driver is not resident of county where stopped	206,761	78.7*	14.3*	5.6*	0.1*	1.1*	0.2*	4.8	0.6*
Driver is county resident	108,944	59.2	19.7	16.8	0.2	3.2	0.4	4.7	1.0
Driver is out of state resident	83,761	82.3*	13.8*	2.9*	0.1*	0.6*	0.1*	4.9	0.7
Driver is PA resident	231,944	68.3	17.0	11.8	0.1	2.3	0.3	4.7	0.8

NOTE: Asterisks identify statistically significant chi-square bivariate associations. * p<.001

Table 4.9: Reasons for Stop (prior to and subsequent to stop) by Driver Race, Gender, Age & Residency

Driver Characteristics	Total # of Stops	% Speeding	% Moving Violation	% Equip/ Inspection	% Pre-exist. Info.	% Registration	% License	% Spec. Traf. Enf.	% Other
Caucasian Driver	268,940	71.7*	18.7*	13.3*	0.4*	4.9*	3.7*	4.8*	0.0
Black Driver	24,179	74.8	17.0	11.4	0.4	4.9	7.3	4.4	0.0
Hispanic Driver	9,371	68.3	19.0	15.5	0.4	4.6	9.4	5.7	0.0
Other Driver	12,211	84.5	13.7	5.4	0.1	2.5	1.6	5.4	0.0
Male Driver	220,848	71.2*	19.1*	13.7*	0.4*	4.8	4.4*	4.8	0.0
Female Driver	94,358	74.8	16.9	11.1	0.3	4.7	3.3	4.7	0.0
Driver under 25 years old	109,879	75.9*	16.3*	12.3*	0.4	4.6	4.9*	4.3*	0.0
Driver 25 years old or older	205,704	70.4	19.5	13.2	0.4	4.8	3.6	5.0	0.0
Driver is not resident of municipality where stopped	301,545	73.8*	18.0*	11.9*	0.4*	4.5*	3.8*	4.8*	0.0
Driver is municipality resident	14,160	40.3	26.8	33.5	0.7	10.2	8.6	4.0	0.0
Driver is not resident of county where stopped	206,761	79.0*	16.5*	8.5*	0.3*	3.4*	2.9*	4.8	0.0
Driver is county resident	108,944	59.5	22.1	21.2	0.5	7.3	6.2	4.7	0.0
Driver is out of state resident	83,761	82.5*	15.9*	5.1*	0.2*	2.1*	1.8*	4.9	0.0
Driver is PA resident	231,944	68.6	19.3	15.7	0.4	5.7	4.9	4.7	0.0

NOTE: Asterisks identify statistically significant chi-square bivariate associations. * $p<.001$

A final limitation of the use of observation disproportionality ratios is based on the sampling of roadways for observation. As noted in Section IV, in the 27 sampled counties, observations could only be conducted on a limited number of roadways within each county. The need to sample roadways for observation is a research issue facing all traffic research (for example, see Pennsylvania Bureau of Planning and Research, Transportation Planning and Information Division, 2003). The observations were focused on roadways that produced the most traffic stop activity. Thus, the county averages of driver characteristics are only estimates of the county driving population at the highest risk of police detection and do not include all possible roadways on which traffic stops may have occurred. Likewise, the drivers' characteristics reported represent the characteristics of the drivers observed and not the total population of drivers. In addition, our sampling design did not record the total number of cars passing on particular roadways. Therefore, our county level summary measures are not weighted by traffic counts.

Racial Comparisons of Behavior in Traffic Stop Data

It has also been suggested that even if minority drivers are stopped for the same reasons as Caucasian drivers, the infractions are often less severe for minority drivers compared to Caucasian drivers. The most direct test of this hypothesis is to examine those drivers who are stopped for speeding, and compare the average miles per hour over the speed limit for racial and ethnic groups. The data in **Table 4.6** suggest that racial differences in speeding behavior are a plausible explanation for racial differences in traffic stops for speeding. As shown in **Table 4.10** below, traffic stop data conducted by Troopers indicates that compared to Caucasian drivers, minority drivers are stopped for higher average amounts over the speed limit. The first column in **Table 4.10** documents the average speed over the posted speed limit that drivers of different racial categories were stopped for by PSP Troopers. That is, Caucasian drivers were stopped for speeding an average of 18.9 miles per hour over the posted speed limit, compared to 20.4, 20.2 and 20.1 miles per hour over the posted speed limit for Blacks, Hispanics, and drivers of other races, respectively. The remaining columns in **Table 4.10** document the percentage of each racial group stopped at each level of severity. For example, 5.0% of Caucasian drivers stopped for speeding were exceeding the speed limit by over 30 miles per hour, compared to 8.5% of Black drivers stopped for speeding. A T-test comparison of means for statistical significance indicates statistically significant differences between racial groups for 15, 20, 25, and 30 miles per hour over the speed limit. The differences in racial groups speeding become larger at higher amounts over the speed limit. Overall, these analyses suggest that Caucasian drivers are significantly more likely to be stopped for speeding at *lower* speeds compared to minority drivers.

Table 4.10 Drivers Stopped for Speeding – Racial Comparisons of Severity

Driver's Race	Avg amt over limit (in mph)	% stopped ≥ 10 mph over limit	% stopped ≥ 15 mph over limit	% stopped ≥ 20 mph over limit	% stopped ≥ 25 Mph over limit	% stopped ≥ 30 mph over limit
Caucasian	18.92	98.0	82.6	41.5	16.0	5.0
Black	20.36	98.1	85.6	52.0	25.0	8.5
Hispanic	20.17	98.0	86.5	50.4	22.8	8.0
Other	20.09	98.6	88.0	50.1	21.7	6.6

The analyses displayed in **Table 4.10** support the findings from our observation study (see Engel et al., 2004), which indicate that minority drivers were observed to be more likely to exceed the speed limit and to do so more aggressively. This suggests that some of the differences in the rates of traffic stops for minority drivers compared to Caucasian drivers may be based on legally relevant behavior.

SUMMARY

The findings in this section have demonstrated the importance of examining alternative, race-neutral explanations for disparities in traffic stops. These findings are summarized below:

- A large majority of drivers stopped do not reside in the location where they are stopped. Thus, relying on Census-based driving age population figures appears to underestimate the number of minorities driving on Pennsylvania roadways, particularly in counties with significant interstate travel and low percentages of minorities in residential population statistics. The inexact nature of the Census-based analysis produces disproportionality ratios that are highly varied. Therefore, the disproportionality ratios based on residential Census population benchmarks are likely invalid.

- Drivers' residency and interstate travel are important race-neutral explanations for disparity, particularly in counties with the largest population-based disproportionality ratios.

- The traffic flow model produced significantly smaller disproportionality ratios in comparison to any other benchmark. While these results are likely more valid than disproportionality ratios created based on straight residential Census populations, there are important limitations involved in the creation of the traffic flow model that limit its applicability.

- Disproportionality ratios based on observed roadway usage are often dramatically smaller than those based on residential populations. The most dramatic examples of these differences are evident in the counties with very high population-based disproportionality ratios based on very small percentages of minority residents.

- Racial differences in speeding behavior can at least partially account for the differences between racial groups' representation in police stops. That is, when drivers' speeding behavior is used in the calculation of the disproportionality ratios, most counties have considerably smaller results than those based on population statistics alone.

- The percentage of minority drivers stopped in the daylight and non-daylight hours were statistically equivalent across the majority of counties.

- Caucasian drivers are significantly more likely to be stopped for speeding at *lower* speeds compared to minority drivers.

Based on these findings, it is the conclusion of this report that as found in the Year 1 Report, there continues to be no consistent evidence to suggest that Pennsylvania State Troopers make stopping decisions based on drivers' race or ethnicity. While it is possible that some racial disparities observed in traffic stops may be the result of individual Troopers targeting racial minorities, it is important to note that this hypothesis cannot be directly tested with the data available. That is, we cannot determine if Troopers are making traffic stops based on the drivers' race / ethnicity, as we have not measured the factors related to individual officer decision making. Rather, we can only examine trends in the traffic stop data and benchmark comparisons. Our examination of these trends show that police traffic stops generally differ from residential patterns for racial minorities, but more closely mirror observed roadway usage and driving behavior. The traffic model also supported this finding. Therefore, the evidence suggests that the racial disparities reported between stopped drivers and residential populations are at least partially explained by racial differences in drivers' residency, roadway usage, and speeding behavior. These three factors were addressed by the traffic model, the observation model, and the speeding model, respectively.

COMPARISON TO YEAR 1

One of the goals of the Year 2 Report is to highlight any differences in the stopping patterns of the Pennsylvania State Police in comparison to the Year 1 Report. While specific administrative or procedural changes made within the Pennsylvania State Police are not within the scope of this section, there are noticeable differences in methodology and slight differences in findings that are important to emphasize.

In regard to changes in the research methodology used, there are two primary alterations from the Year 1 Report. First, a new benchmark has been included in the analysis. The traffic flow model is a weighted spatial model that attempts to model traffic patterns and provide an estimate of the racial composition of the drivers on Pennsylvania roads. As discussed in **Appendix A**, as with all benchmarks, there are limitations to the findings produced by the traffic flow model, and therefore the results must be interpreted with some caution. Notwithstanding these concerns, the traffic model is a new type of benchmark that attempts to provide a proxy for the true driving population. The traffic flow model is an attempt to address the shortcomings of using Census-based data due to the significant limitations of assuming that the residential population mirrors those driving on the roads within a jurisdiction. As **Table 4.7** demonstrates, the traffic model produced disproportionality ratios that are substantially lower than any of the other four benchmarking methods.

Second, a different, more interpretable reporting mechanism is used. The disproportionality ratio is a new addition to this report, and is an improvement over the use of the disproportionality index. The disproportionality ratio is a more interpretable and comparable measure of disparity in comparison to the disproportionality index. Both the disproportionality ratio and the disproportionality index were included in the preceding tables to allow for a clear understanding of how the disproportionality ratio is calculated. The primary advantage of the disproportionality ratio is that it is highly interpretable, and from jurisdiction to jurisdiction, there is a comparable method to analyze the results of the various benchmarks. For example, if a county or municipality has a ratio of 2.0, it is interpreted as that group is twice as likely to be stopped in comparison to the majority group. Furthermore, due to the fact that the disproportionality ratio is comparable across jurisdictions, specific pockets of disparity are easier to identify. For example, if a county has a ratio of 2.0, the municipalities within that county can be analyzed to determine if each municipality is contributing equally or if one municipality is heavily influencing the county ratio. It is possible that one of the municipalities has a ratio of 5.0, and it is that municipality that is significantly contributing to the county ratio. Despite the fact that the disproportionality ratio is reliant on the disproportionality index and thus still suffers from the limitations of the benchmark used, the disproportionality ratio is a significant improvement over the disproportionality index by increasing the interpretability of the results.

In addition to the methodological alterations in the Year 2 Report, it is important to compare the findings between Year 1 and Year 2. Due to the changes in reporting procedure (disproportionality ratio instead of disproportionality index), any comparisons between Year 1 and Year 2 must be between disproportionality indices. In general, the characteristics of the Year 2 traffic stops are similar to those patterns of Year 1; for example, using Model #1 (Census-based data) and Black drivers, Year 1's disproportionality indices ranged from 0.29 to 64.40, while Year 2 ranges from 0.24 to 60.37. In both cases, Jefferson County had the highest disproportionality index and Forest County was at the low end of the range. This type of slight difference is consistent throughout the various models. Another example will further exemplify the slight differences. Franklin County had the highest disproportionality index for non-Caucasians in Year 1 at 10.33, and Year 2 data produced a disproportionality index of 10.47. This type of difference can result from rounding the values and in essence, they are statistical comparable.

Similar to the results of the disproportionality indices, the reason for the stop data also mirrored the results from the Year 1 analysis. For example, speeding was still statistically significant at the .001 level and Blacks and those of other races are still more likely than Caucasians to be stopped for speeding.

In some cases, there was a slightly more pronounced difference as demonstrated by an example from Model #2. For Hispanic drivers, the highest disproportionality index in Year 1 was in Luzerne County at 3.5, whereas in Year 2, the highest disproportionality index was 7.35 in Montour County. The primary reason for this difference is located in the fact that there were **no** stops of Hispanics in Montour County in Year 1, and Montour County has less than 1% Hispanic population. In Year 2, there were only **two** stops of Hispanic drivers, but due to the low population of Hispanics in that jurisdiction, the disproportionality index is significantly affected by a slight alteration in the number of stops. As demonstrated by **Figure 4.1** and **4.3**, jurisdictions with less than 1% minority population produce disproportionality indices and ratios that are unstable.

Despite a few minor differences, overall the findings regarding traffic stops made by PSP Troopers were relatively consistent across the two-year time period. Similar to the findings for Year 1, the findings from Year 2 demonstrate no consistent evidence to suggest that Pennsylvania State Troopers make stopping decisions based on drivers' race or ethnicity.

V. ANALYSES OF POST-STOP OUTCOMES

OVERVIEW

In this section, differences in post-stop outcomes (e.g., warnings, citations, arrests, searches, and seizures) are examined. That is, once traffic stops are made, differences in the outcomes of those stops for different types of citizens are examined. Section V is divided into three components: frequencies of post-stop outcomes, stop outcomes based on Trooper characteristics, and multivariate analyses predicting stop outcomes.

First, the frequencies of post-stop outcomes are assessed. Table 5.1 illustrates the number of stops and percentage of drivers' post-stop outcomes by area, troop, and station. Tables 5.2 and 5.3 report comparisons of post-stop outcomes by drivers' race and gender for each area and troop. Finally, Table 5.4 reports racial differences in post-stop outcomes at the station level.

Second, the differences in stop outcomes based on citizens' characteristics and Troopers' characteristics (e.g., race, sex, experience, rank, and education) are explored in Tables 5.5 – 5.9. Finally, these relationships are further explored in hierarchical multivariate statistical analyses presented in Tables 5.9 and 5.10 that predict four different officer actions (i.e., warnings, citations, arrests, searches) for all traffic stops and only stops for speeding.

DESCRIPTION OF POST-STOP OUTCOMES

The disposition of traffic stops (e.g., warnings, citations, arrests, searches, and evidence seized) is collected on the Contact Data Report. **Table 5.1** documents the following information at the department, area, troop, and station levels: 1) the total number of number of traffic stops, 2) percentages of *drivers* issued formal warnings, citations and/or arrested, 3) percentages of *passengers* issued formal warnings, citations and/or arrested, 4) the total number of vehicle and/or person searches during traffic stops, and 5) percentages of searches resulting in the seizure of contraband.

Table 5.1 documents the collection of data from May 1, 2003 through April 30, 2004. During this time period, Pennsylvania State Troopers stopped 315,705 drivers for which we have valid data. In 84.9% of the stops a citation was issued and 26.0% of the stops produced a warning. Much less frequent were stops that resulted in a search and/or arrest. Specifically, the department-wide rates of searches and arrests were 0.8% and 0.6%, respectively.

Table 5.1 also reports differences in post-stop outcomes across areas, troops, and stations. For example, Troopers assigned to Area IV issued the most warnings to stopped drivers (36.5%), while Troopers in Area I issued the least (17.6%). The range of drivers issued citations varied from a high of 89.7% of drivers stopped in Area I to 77.6% of drivers stopped in Area IV. All areas had 0.7% or less of their stops result in an arrest. Area V had the highest search rate (1.0% of stopped drivers), compared to the other four areas, which ranged in their search rates from 0.4% to 0.7% of drivers.

Differences in dispositions are also evident at the troop level. For example, Troop D warned the highest percent of drivers (40.8%), while Troop T only warned 12.2% of all drivers stopped. The percent of drivers cited ranged from 92.5% in Troops R and T, to 74.1% in Troop D. Only one troop arrested more than 1% of the drivers stopped (Troop H – 1.1%), while only three troops searched more than 1% of the persons/vehicles stopped (Troop H – 1.4%, Troop J – 1.5%, and Troop K – 2.1%).

At the station level, larger variations in post-stop outcomes were apparent. For example, the percentage of drivers issued citations ranged from a high of 97.8% in Milton station, to a low of 61.4% in Franklin station. Likewise, the percentage of drivers issued formal warnings ranged from 59.5% in Dublin station, to 6.3% of drivers in Selinsgrove and Somerset (T) stations. The percentage of drivers arrested ranged from 3.3% in Belle Vernon station to 0.0% in Bowmansville, Clearfield, Gibsonia, Greensburg, Milton, and New Castle stations. Finally, the rate of drivers/vehicles searched varied from a high of 3.4% of traffic stops in Media station to a low of 0.0% of traffic stops in Laporte station.

Table 5.1 also reports the percentage of searches that resulted in seizures of contraband. The term "hit rate" or "success rate" refers to the percentage of searches that were successful in the seizure of evidence and/or contraband. The Pennsylvania State Police conducted 2,388 searches department-wide during this twelve-month period, of which 25.7% resulted in a contraband seizure. The search success rates vary across areas, troops, and stations. For example, the search success rates vary from a high of 28.9% in Area I to 21.6% in Area II. At the troop level, there was greater variation. For example, compare the 37.5% search success rate in Troop G to the 14.3% search success rate in Troop C. Although the percentage of searches that resulted in a seizure also varied widely across stations, in many stations the percentages are based on a very small number of searches and, therefore, may be misleading. Thus, it is only appropriate to make comparisons of search success rates at the area and troop levels. Search and seizure rates are more fully explored in Section VI of this report.

Table 5.1. Stop Outcomes for Drivers and Passengers by Department, Area, Troop, & Station (p.1 of 4)

	Total # of Stops	% Drivers Warned	% Drivers Cited	% Drivers Arrested	% Pass. Warned	% Pass. Cited	% Pass. Arrested	% Person or Veh.Searched	Total # of Searches	% Searches Resulting in Seizure
PSP Dept	315,705	26.0	84.9	0.5	0.3	0.1	0.1	0.8	2,388	25.7
AREA I	107,464	17.6	89.7	0.4	0.2	0.1	0.1	0.7	712	28.9
TROOP H	21,236	22.7	84.3	1.1	0.3	0.2	0.2	1.4	292	30.5
Carlisle	4,890	15.7	90.6	0.3	0.2	0.2	0.1	1.1	52	13.5
Chambersburg	3,669	29.7	77.9	3.1	0.6	0.1	0.6	3.1	115	41.7
Gettysburg	2,070	44.2	63.0	0.3	0.1	0.1	0.0	0.5	10	20.0
Harrisburg	3,913	18.1	89.1	0.1	0.1	0.2	0.0	0.5	19	0.0
Lykens	924	36.0	83.8	0.2	0.3	0.1	0.1	0.8	7	28.6
Newport	1,513	12.6	91.5	1.1	0.1	0.1	0.0	0.4	6	50.0
York	4,257	19.3	85.9	1.6	0.4	0.3	0.2	1.9	83	32.5
TROOP J	9,604	30.7	88.3	0.7	0.3	0.2	0.1	1.5	145	28.3
Avondale	3,648	37.4	90.3	0.3	0.2	0.2	0.0	1.5	53	24.5
Embreeville	2,647	32.5	84.7	0.6	0.6	0.2	0.1	1.4	36	30.6
Ephrata	1,230	17.1	92.7	1.1	0.4	0.2	0.3	1.1	14	35.7
Lancaster	2,079	24.9	87.1	1.6	0.2	0.4	0.3	2.0	42	28.6
TROOP L	10,236	29.3	84.3	0.6	0.2	0.1	0.1	0.7	71	25.4
Frackville	1,295	39.2	78.7	0.6	0.6	0.4	0.1	1.7	22	31.8
Hamburg	1,706	30.0	90.9	0.3	0.1	0.1	0.0	0.1	2	0.0
Jonestown	3,018	24.8	82.5	0.9	0.1	0.0	0.0	1.1	34	29.4
Reading	2,887	25.5	85.3	0.3	0.1	0.1	0.0	0.3	8	0.0
Schuylkill Haven	1,330	37.3	82.9	0.8	0.0	0.2	0.2	0.4	5	20.0
TROOP T	66,388	12.2	92.5	0.1	0.2	0.1	0.0	0.3	204	28.4
Bowmansville	9,035	7.2	96.9	0.0	0.7	0.2	0.0	0.1	11	9.1
Everett	9,316	11.2	93.9	0.3	0.1	0.1	0.0	0.2	22	31.8
Gibsonia	8,117	22.0	87.2	0.0	0.3	0.2	0.0	0.3	23	26.1
King of Prussia	7,271	15.5	90.5	0.1	0.0	0.0	0.0	0.1	5	80.0
New Stanton	7,642	15.1	90.5	0.1	0.2	0.1	0.0	0.1	10	10.0
Newville	10,962	10.9	92.7	0.1	0.0	0.1	0.0	0.5	56	23.2
Pocono	5,496	11.2	92.2	0.1	0.0	0.1	0.0	0.1	4	0.0
Somerset (T)	8,521	6.3	95.2	0.2	0.0	0.1	0.0	0.8	72	36.1

Table 5.1. Stop Outcomes for Drivers and Passengers by Department, Area, Troop, & Station (p.2 of 4)

	Total # of Stops	% Drivers Warned	% Drivers Cited	% Drivers Arrested	% Pass. Warned	% Pass. Cited	% Pass. Arrested	% Person or Veh.Searched	Total # of Searches	% Searches Resulting in Seizure
AREA II	39,171	19.7	89.3	0.2	0.2	0.1	0.0	0.4	171	21.6
TROOP F	21,386	17.9	89.9	0.1	0.1	0.1	0.0	0.3	70	20.0
Coudersport	1,767	49.8	65	0.2	0.8	0.2	0.1	0.4	7	14.3
Emporium	1,311	30.1	84.4	0.1	0.3	0.0	0.0	0.1	1	0.0
Lamar	3,594	12.9	91.5	0.1	0.0	0.0	0.0	0.3	9	33.3
Mansfield	1,621	26.5	85.3	0.2	0.2	0.1	0.1	0.1	1	100.0
Milton	2,290	9.0	97.8	0.0	0.1	0.1	0.0	0.4	9	0.0
Montoursville	5,188	10.6	94	0.1	0.1	0.1	0.0	0.5	25	20.0
Selinsgrove	4,112	6.3	97.5	0.1	0	0.1	0.0	0.3	13	23.1
Stonington	1,503	42.7	78.4	0.7	0.3	0.2	0.0	0.3	5	20.0
TROOP P	8,786	25.5	84.6	0.4	0.1	0.1	0.0	0.6	49	18.4
Laporte	1,611	33.7	81.7	0.1	0.1	0.0	0.0	0.0	0	0.0
Shickshinny	1,124	24.3	84.3	0.7	0.4	0.0	0.1	0.1	1	0.0
Towanda	1,885	29.9	80.8	0.2	0.1	0.3	0.1	1.0	19	10.5
Tunkhannock	1,465	31.5	78.4	1.4	0.3	0.3	0.1	0.5	8	37.5
Wyoming	2,701	14.7	92.6	0.1	0.1	0.1	0.0	0.8	21	19.0
TROOP R	8,999	18.2	92.5	0.3	0.2	0.1	0.0	0.6	52	26.9
Blooming Grove	2,867	17.5	94.8	0.2	0.2	0.1	0.0	0.5	15	33.3
Dunmore	2,091	20.4	90.2	0.1	0.4	0.0	0.0	0.5	11	0.0
Gibson	1,296	25.2	92.1	0.5	0.1	0.2	0.0	0.3	4	25.0
Honesdale	2,745	14.0	92.2	0.4	0.2	0.1	0.0	0.8	22	36.4
AREA III	62,772	29.1	84.2	0.6	0.4	0.1	0.1	0.6	382	26.4
TROOP A	18,464	29.4	87	0.4	0.3	0.1	0.0	0.4	78	26.9
Ebensburg	3,228	20.8	86.3	1.0	0.6	0.2	0.0	0.4	12	50.0
Greensburg	5,699	28.0	93.5	0.0	0.1	0.1	0.0	0.2	10	10.0
Indiana	4,229	27.3	89.3	0.3	0.0	0.1	0.0	0.5	21	19.0
Kiski Valley	3,019	37.8	81.3	0.1	0.6	0.1	0.1	0.4	12	25.0
Somerset (A)	2,289	38.2	75.2	1.6	0.3	0.3	0.2	1.0	23	30.4

Table 5.1. Stop Outcomes for Drivers and Passengers by Department, Area, Troop, & Station (p.3 of 4)

	Total # of Stops	% Drivers Warned	% Drivers Cited	% Drivers Arrested	% Pass. Warned	% Pass. Cited	% Pass. Arrested	% Person or Veh.Searched	Total # of Searches	% Searches Resulting in Seizure
TROOP B	22,187	23.7	87.4	0.8	0.4	0.2	0.1	0.8	173	17.9
Belle Vernon	3,553	21.3	91.9	3.3	0.1	0.1	0.1	0.3	12	16.7
Pittsburgh	6,828	13.6	95.7	0.2	0	0.1	0.1	0.8	54	7.4
Uniontown	3,884	40.6	70	0.5	1.1	0.2	0.1	1.4	53	18.9
Washington	5,260	22	86.9	0.2	0.4	0.2	0.1	0.7	36	27.8
Waynesburg	2,662	31.6	86.6	1	0.7	0.2	0.1	0.7	18	27.8
TROOP G	22,121	34.3	78.6	0.6	0.4	0.1	0.1	0.6	131	37.4
Bedford	3,335	35.7	72.7	1.1	0.7	0.1	0.1	0.3	10	60.0
Hollidaysburg	3,225	41.4	77.9	0.8	0.7	0	0.2	1.9	61	45.9
Huntingdon	2,490	35.2	76.9	2.2	1.3	0.1	0.1	0.4	11	27.3
Lewistown	2,727	36.8	73.6	0.4	0	0.1	0.1	0.7	19	31.6
McConnellsburg	2,386	28.6	81.4	0.1	0	0	0	0.4	9	22.2
Philipsburg	2,756	47.5	77.2	0.1	0	0	0	0.2	6	50.0
Rockview	5,202	23	85.8	0.1	0.1	0.2	0	0.3	15	6.7
AREA IV	57,557	36.5	77.6	0.4	0.6	0.1	0.1	0.5	306	22.9
TROOP C	24,374	34.1	80.0	0.3	0.7	0.1	0.0	0.4	105	14.3
Clarion	5,523	38.5	76.2	0.2	1.2	0.1	0.0	0.8	43	9.3
Clearfield	5,590	23.1	90.2	0.0	1.2	0.0	0.0	0.3	16	12.5
Dubois	3,491	21.8	86.3	0.1	0.9	0.2	0.0	0.3	10	10.0
Kane	1,927	37.9	80.4	1.6	0.2	0.1	0.1	0.6	11	18.2
Punxsutawney	3,301	37.4	75.9	0.2	0.2	0.1	0.0	0.2	8	50.0
Ridgway	2,429	38.2	80.3	0.5	0.2	0.2	0.0	0.5	11	9.1
Tionesta	2,113	58.4	58.5	0.8	0.0	0.2	0.0	0.3	6	16.7
TROOP D	16,650	40.8	74.1	0.5	0.5	0.3	0.1	0.7	118	27.1
Beaver	2,661	49.0	65.0	0.5	0.4	0.3	0.0	0.4	11	18.2
Butler	5,574	37.1	77.5	0.8	0.5	0.2	0.1	0.5	29	34.5
Kittanning	3,295	42.9	70.8	0.8	0.2	0.3	0.3	1.0	34	44.1
Mercer	2,787	35.4	80.7	0.2	0.9	0.4	0.0	1.3	37	13.5
New Castle	2,333	43.5	73.0	0.0	0.2	0.1	0.0	0.3	7	0.0

Table 5.1. Stop Outcomes for Drivers and Passengers by Department, Area, Troop, & Station (p.4 of 4)

	Total # of Stops	% Drivers Warned	% Drivers Cited	% Drivers Arrested	% Pass. Warned	% Pass. Cited	% Pass. Arrested	% Person or Veh.Searched	Total # of Searches	% Searches Resulting in Seizure
TROOP E	16,533	35.9	77.6	0.5	0.4	0.1	0.1	0.5	83	27.7
Corry	1,114	43.3	72.9	0.7	1.9	0.1	0.1	0.3	3	0.0
Erie	4,535	24.2	83.9	0.1	0.5	0.2	0.0	0.2	11	9.1
Franklin	2,450	59.4	61.4	0.4	0.2	0.0	0.1	0.4	11	18.2
Girard	4,375	28.6	85.4	0.6	0.1	0.0	0.1	0.7	29	24.1
Meadville	2,692	46.2	69.5	1.0	0.4	0.0	0.1	0.8	22	50.0
Warren	1,367	29.3	80.8	0.7	0.3	0.1	0.1	0.5	7	28.6
AREA V	45,690	30	83.1	0.6	0.3	0.1	0.1	1.0	468	22.2
TROOP K	12,888	34.3	82.0	1.0	0.4	0.2	0.1	2.1	274	24.5
Media	4,793	31.6	78.9	1.5	0.6	0.1	0.2	3.4	161	26.1
Philadelphia	3,645	31.6	86.3	0.8	0.4	0.2	0.2	1.8	65	26.2
Skippack	4,450	39.5	81.8	0.7	0.1	0.2	0.0	1.1	48	16.7
TROOP M	17,298	36.4	77.4	0.5	0.5	0.1	0.0	0.8	141	19.9
Belfast	2,976	26.7	82.7	0.3	0.3	0.1	0.1	0.5	14	14.3
Bethlehem	2,726	33.7	80.1	0.5	0.3	0.2	0.0	0.7	19	31.6
Dublin	4,117	59.5	65.0	0.3	0.9	0.0	0.0	0.4	18	16.7
Fogelsville	4,737	32.2	79.6	0.5	0.1	0.1	0.0	1.1	53	18.9
Trevose	2,742	22.5	84	0.8	0.9	0.1	0.1	1.3	37	18.9
TROOP N	15,504	19.4	90.4	0.2	0.1	0.1	0.0	0.3	53	17.0
Bloomsburg	3,349	12.9	97.4	0.2	0.0	0.1	0.0	0.1	2	0.0
Fern Ridge	2,609	12.7	95.7	0.7	0.1	0.2	0.0	0.3	8	12.5
Hazleton	2,965	15.5	89.9	0.1	0.1	0.2	0.0	0.4	11	9.1
Lehighton	2,558	37.5	81.1	0.2	0.1	0.0	0.0	0.3	8	12.5
Swiftwater	4,023	20.4	87.3	0.1	0.3	0.1	0.1	0.6	24	25.0
Canine Unit	2,280	89.9	11.1	2.3	2.2	0.0	1.1	13.8	314	29.9

DIFFERENCES IN POST-STOP OUTCOMES ACROSS TYPES OF DRIVERS

Table 5.2 illustrates the variation in post-stop outcomes (i.e., the percentage of drivers warned, cited, arrested, and/or searched) by drivers' race and gender for the department and areas. Likewise, **Table 5.3** documents variation in outcomes at the troop level. In addition, these tables report search success rates by racial and gender groups across the department, areas, and troops. For these comparisons, drivers' race is collapsed into four categories – Caucasian, Black, Hispanic, and other – where Hispanic includes both Caucasian Hispanic and Black Hispanic, and the other category includes Native American, Middle Eastern, and Asian. Traffic stops where Troopers classified drivers' race as "unknown" or left the race missing on the forms (0.8% of the total number of forms collected) are excluded from these analyses.

The asterisks in **Tables 5.2 and 5.3** 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 larger. Therefore, statistical significance is only indicated at the 0.001 level. That is, a finding is significant if we are 99.9% confident that the difference between groups 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).

Table 5.2. Stop Outcomes by Race and Gender for Department and Areas

	Drivers	Total # of stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched	# of drivers searched	% searches resulting in seizure
PSP Dept	Caucasian	268,940	26.7*	84.3*	0.5*	0.6*	1,518	30.0*
	Black	24,179	24.1	86.3	0.6	2.2	532	21.2
	Hispanic	9,371	23.3	88.2	0.8	2.9	275	14.2
	Other race	11,211	15.1	91.8	0.1	0.5	53	9.4
	Male	220,848	25.7*	85.3*	0.6*	1.0*	2,116	25.6
	Female	94,358	26.5	83.8	0.2	0.3	266	26.7
AREA I	Caucasian	86,924	18.1*	89.4*	0.4*	0.5*	452	34.1*
	Black	10,720	17.2	89.7	0.6	1.4	151	25.2
	Hispanic	4,119	19.2	91.2	0.8	2.1	85	12.9
	Other race	4,991	10.2	94.5	0.1	0.4	22	13.6
	Male	75,610	17.4	90.0*	0.5*	0.8*	625	28.6
	Female	31,651	18.1	89.2	0.1	0.3	82	31.7
AREA II	Caucasian	35,574	20.3*	88.9*	0.2	0.4*	133	24.8
	Black	1,608	13.6	93.5	0.2	1.5	24	8.3
	Hispanic	735	17.4	93.2	0.4	1.6	12	8.3
	Other race	917	9.6	95.1	0.1	0.1	1	0.0
	Male	27,363	19.5	89.8*	0.2	0.6*	151	21.2
	Female	11,745	20.0	88.3	0.2	0.2	20	25.0
AREA III	Caucasian	57,437	29.6*	83.8*	0.7	0.5*	292	30.5
	Black	3,266	28.4	86.4	0.4	2.1	67	17.9
	Hispanic	518	22.0	89.8	0.4	2.9	15	0.0
	Other race	1,355	16.9	92.6	0.1	0.6	18	0.0
	Male	43,289	29.0	84.5	0.8*	0.8*	326	27.3
	Female	19,359	29.4	83.5	0.3	0.3	55	21.8
AREA IV	Caucasian	51,162	37.9*	76.5*	0.5	0.4*	225	27.1
	Black	3,041	30.6	83.5	0.4	1.7	52	15.4
	Hispanic	1,037	19.9	90.1	0.3	2.0	21	4.8
	Other race	1,871	19.3	90.0	0.0	0.4	7	0.0
	Male	40,176	36.3	78.4*	0.6*	0.7*	267	21.7
	Female	17,322	37.0	75.7	0.1	0.2	39	30.8
AREA V	Caucasian	35,792	30.8*	82.3*	0.5*	0.7*	235	26.8
	Black	5,017	29.4	84.8	0.9	3.1	158	18.4
	Hispanic	2,638	28.1	85.9	0.8	2.5	66	18.2
	Other race	1,962	21.5	88.7	0.1	0.4	8	0.0
	Male	31,999	29.3*	84.2*	0.7*	1.3*	426	22.5
	Female	13,638	31.9	80.6	0.2	0.3	42	19.0

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

The results in **Table 5.2** show that across the department, Caucasian drivers are significantly *more* likely to be issued warnings compared to the other racial groups (26.7% of Caucasian drivers, compared to 24.1% of Black drivers, 23.3% of Hispanic drivers, and 15.1% of drivers of other races). In contrast, Caucasian drivers were significantly *less* likely to be issued citations (84.3%) compared to Black drivers (86.3%), Hispanic drivers (88.2%) and drivers of other races (91.8%). In addition, Caucasian drivers were significantly *less* likely to be arrested and searched compared to Black and Hispanic drivers. In fact, the percentage of Black drivers searched is 3.7 times higher than the percentage of Caucasian drivers searched, while the percentage of Hispanic drivers searched is 4.8 times higher than the percentage of Caucasian drivers. Statistically significant differences in warnings, citations, and searches across racial/ethnic groups are consistent across all five areas. Statistically significant differences in arrests for racial/ethnic groups were found only in Areas I and V.

Gender differences are also evident in post-stop outcomes. Across the department, male drivers were significantly *less* likely to be issued warnings, but *more* likely to be issued citations, arrested, and searched compared to female drivers. These statistically significant differences in post-stop outcomes between male and female drivers were found in all five areas with the following exceptions: 1) Only in Area V were there significant differences between male and female drivers issued warnings, 2) Area II reported no significant differences between male and female drivers arrested, and 3) Area III reported no significant differences between male and female drivers cited.

Table 5.3 documents similar differences in post-stop outcomes by drivers' race / ethnicity and gender at the troop level. Note that search success rates for racial and gender groups are not reported at the troop level due to the small number of searches conducted in some of the categories. Of the 16 PSP troops, 12 troops had statistically significant differences among racial groups for warnings, 12 troops had statistically significant differences among racial groups for citations, 14 troops had statistically significant differences among racial groups for searches, while only 2 troops had statistically significant differences among racial groups for arrests.

Differences in post-stop outcomes between male and female drivers were also found at the troop level. Of the 16 troops, only 3 troops had statistically significant differences in warnings issued for male and female drivers. In addition, 6, 12, and 14 troops reported significant differences between male and female drivers for citations, arrests, and searches, respectively.

Table 5.3 Stop Outcomes by Race and Gender for Troops (p.1 of 3)

	Drivers	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched
Area I, Troop H	Caucasian	18,454	22.9	83.9*	1.0	1.2*
	Black	1,399	23.2	84.3	1.4	3.3
	Hispanic	726	21.8	87.3	1.7	3.4
	Other	535	18.5	89.3	0.2	1.5
	Male	14,566	22.3	84.6	1.3*	1.7*
	Female	6,626	23.7	83.5	0.5	0.6
Area I, Troop J	Caucasian	7,739	30.5	88.0*	0.7	1.3*
	Black	871	33.1	86.8	1.1	2.6
	Hispanic	734	33.0	92.9	0.7	3.1
	Other	228	25.0	90.8	0.4	0.0
	Male	6,624	29.9	89.5*	1.0*	1.9*
	Female	2,956	32.6	85.8	0.2	0.6
Area I, Troop L	Caucasian	8,610	30.1*	83.7*	0.6	0.4*
	Black	623	28.6	83.8	0.6	2.7
	Hispanic	667	25.3	88.3	1.0	1.8
	Other	318	17.9	92.5	0.0	1.6
	Male	7,287	29.1	84.2	0.8*	0.9*
	Female	2,945	29.9	84.4	0.1	0.2
Area I, Troop T	Caucasian	52,121	12.5*	92.4*	0.1*	0.2*
	Black	7,827	13.5	91.4	0.4	0.8
	Hispanic	1,992	11.2	92.9	0.5	1.3
	Other	3,910	7.6	95.6	0.0	0.2
	Male	47,133	12.3	92.6	0.2*	0.4*
	Female	19,124	12.1	92.4	0.0	0.1
Area II, Troop F	Caucasian	19,277	18.6*	89.5*	0.1	0.3*
	Black	965	11.5	93.6	0.2	1.3
	Hispanic	389	15.4	93.3	0.3	0.8
	Other	577	7.3	96.0	0.0	0.2
	Male	14,795	17.6	90.4*	0.1	0.4*
	Female	6,562	18.5	88.9	0.1	0.1
Area II, Troop P	Caucasian	8,410	25.7	84.5	0.4	0.4*
	Black	196	19.9	86.7	0.5	3.1
	Hispanic	88	27.3	90.9	0.0	6.8
	Other	66	15.2	89.4	0.0	0.0
	Male	6,179	25.6	85.0	0.4	0.7*
	Female	2,598	25.2	83.8	0.3	0.1

Table 5.3 Stop Outcomes by Race and Gender for Troops (p. 2 of 3)

	Drivers	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched
Area II, Troop R	Caucasian	7,887	18.6	92.2	0.3	0.6
	Black	447	15.4	96.4	0.0	1.1
	Hispanic	258	17.1	93.8	0.8	1.2
	Other	274	13.1	94.5	0.4	0.0
	Male	6,389	18.0	93.0	0.3	0.7
	Female	2,585	18.8	91.5	0.3	0.3
Area III, Troop A	Caucasian	17,509	29.2*	87.0	0.5	0.4*
	Black	631	40.3	84.2	0.3	1.6
	Hispanic	70	25.7	87.1	0.0	1.4
	Other	215	21.9	92.1	0.5	0.0
	Male	12,591	29.8	87.0	0.6*	0.5*
	Female	5,839	28.6	87.1	0.2	0.2
Area III, Troop B	Caucasian	20,005	23.9*	87.2*	0.9	0.6*
	Black	1,521	25.6	87.6	0.3	3.1
	Hispanic	144	18.8	92.4	0.0	2.8
	Other	446	12.1	96.9	0.0	0.9
	Male	15,486	23.6	88.0*	1.0*	1.0*
	Female	6,650	24.1	86.0	0.5	0.3
Area III, Troop G	Caucasian	19,923	35.6*	77.6*	0.7	0.5*
	Black	1,114	25.7	86.1	0.5	0.9
	Hispanic	304	22.7	89.1	0.7	3.3
	Other	694	18.4	90.1	0.1	0.6
	Male	15,221	33.9	78.9	0.8*	0.7*
	Female	6,870	35.3	78.0	0.3	0.3
Area IV, Troop C	Caucasian	20,808	36.5*	78.3*	0.4	0.3*
	Black	1,469	24.5	88.2	0.2	1.5
	Hispanic	709	17.8	92.4	0.0	1.8
	Other	1,125	16.4	92.8	0.0	0.4
	Male	17,694	33.3*	91.2*	0.4*	0.5*
	Female	6,651	36.3	76.9	0.0	0.2
Area IV, Troop D	Caucasian	15,275	41.1*	73.8*	0.5	0.6*
	Black	839	42.3	74.0	0.6	2.7
	Hispanic	151	27.8	80.8	0.7	4.6
	Other	321	26.5	85.7	0.0	0.6
	Male	11,406	41.1	74.8	0.7*	0.9*
	Female	5,220	39.9	72.6	0.2	0.3

Table 5.3 Stop Outcomes by Race and Gender for Troops (p. 3 of 3)

	Drivers	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched
Area IV, Troop E	Caucasian	15,079	36.8*	76.9*	0.5	0.5
	Black	733	29.5	84.9	0.3	1.0
	Hispanic	177	21.5	88.7	1.7	0.6
	Other	425	21.6	85.9	0.0	0.2
	Male	11,076	36.2	77.8	0.7*	0.7*
	Female	5,451	35.1	77.3	0.1	0.2
Area V, Troop K	Caucasian	9,697	33.8*	81.6	1.0	1.4*
	Black	2,081	37.7	81.7	1.3	5.0
	Hispanic	465	36.8	85.4	1.5	6.5
	Other	571	30.8	86.5	0.4	0.7
	Male	8,799	34.1	82.9	1.3*	2.9*
	Female	4,075	34.9	80.0	0.4	0.6
Area V, Troop M	Caucasian	13,894	37.8*	76.5*	0.4*	0.5*
	Black	1,429	30.6	81.4	1.0	2.6
	Hispanic	1,222	33.7	80.8	0.9	2.5
	Other	669	25.3	93.1	0.0	0.6
	Male	12,171	35.4*	78.7*	0.6*	1.1*
	Female	5,113	39.0	74.3	0.1	0.3
Area V, Troop N	Caucasian	12,201	20.4*	89.6*	0.2	0.2*
	Black	1,507	16.9	92.2	0.4	1.1
	Hispanic	951	16.6	92.6	0.4	0.6
	Other	722	10.5	95.6	0.0	0.0
	Male	11,029	18.7*	91.2*	0.3	0.4
	Female	4,450	21.0	88.3	0.2	0.1

Table 5.4 presents similar information at the station level. In contrast to information provided in Tables 5.2 and 5.3, however, the racial / ethnic categories presented in **Table 5.4** are a simple Caucasian / non-Caucasian dichotomy. The “non-Caucasian” category in this table includes Black, Black Hispanic, Caucasian Hispanic, Native American, Middle Eastern, and Asian drivers. A Caucasian / non-Caucasian comparison is used in **Table 5.4** because the number of stops in some racial / ethnic groups are too small for individual comparisons at the station level.

Similar to the differences in post-stop outcomes reported across racial / ethnic groups at the area and troop level, differences across stations are found. Of the 90 PSP stations, 31.1% (28 stations), 33.3% (30 stations), 13.3% (12 stations), and 46.7% (42 stations) reported statistically significant between Caucasians and non-Caucasians in the percentage of drivers warned, cited, arrested, and searched, respectively.

Table 5.4. Racial Comparisons of Stop Outcomes by Station (p.1 of 6)

	Drivers	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched
AREA I, Troop H						
Carlisle	Caucasian	4,242	16.1	90.4	0.2	0.6***
	Non-Caucasian	648	13.7	91.5	0.5	4.2
Chambersburg	Caucasian	3,262	29.9	77.3**	3.1	2.8***
	Non-Caucasian	399	28.7	83.0	3.8	5.8
Gettysburg	Caucasian	1,806	44.1	62.2*	0.3	0.4
	Non-Caucasian	261	44.8	69.0	0.4	0.8
Harrisburg	Caucasian	3,337	17.7	89.2	0.1*	0.4**
	Non-Caucasian	570	20.0	88.6	0.4	1.2
Lykens	Caucasian	896	36.3	83.6	0.2	0.6*
	Non-Caucasian	27	29.6	88.9	0.0	7.4
Newport	Caucasian	1,380	12.6	91.4	1.2	0.4
	Non-Caucasian	132	11.4	93.2	0.0	0.0
York	Caucasian	3,621	19.1	85.9	1.5	1.8
	Non-Caucasian	623	20.4	86.0	1.9	2.9
AREA I, Troop J						
Avondale	Caucasian	2,810	37.4	90.0	0.3	1.1**
	Non-Caucasian	834	37.4	91.0	0.2	2.5
Embreeville	Caucasian	2,088	32.3	84.3	0.4	1.1*
	Non-Caucasian	556	33.1	86.3	1.1	2.3
Ephrata	Caucasian	1,034	17.7	92.1	0.7**	0.7***
	Non-Caucasian	194	13.9	95.9	3.1	3.6
Lancaster	Caucasian	1,823	24.8	86.9	1.7	2.0
	Non-Caucasian	249	25.7	88.4	0.8	2.0
AREA I, Troop L						
Frackville	Caucasian	1,181	40.6***	77.6***	0.6	1.6
	Non-Caucasian	114	23.7	90.4	0.9	2.6
Hamburg	Caucasian	1,292	32.7***	90.1*	0.2	0.1
	Non-Caucasian	410	21.2	93.9	0.5	0.2
Jonestown	Caucasian	2,457	25.2	82.1	0.9	0.4***
	Non-Caucasian	561	23.2	84.3	0.9	4.3
Reading	Caucasian	2,426	24.7*	85.5	0.3	0.2**
	Non-Caucasian	458	30.1	84.3	0.4	0.9
Schuylkill Haven	Caucasian	1,264	37.5	82.6	0.8	0.2***
	Non-Caucasian	65	33.8	89.2	1.5	3.1

Table 5.4. Racial Comparisons of Stop Outcomes by Station (p.2 of 6)

	Drivers	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched
AREA I, Troop T						
Bowmansville	Caucasian	6,930	7.1	96.9	0.0	0.1
	Non-Caucasian	2,069	7.5	96.8	0.1	0.1
Everett	Caucasian	6,935	11.7**	93.5*	0.2***	0.1***
	Non-Caucasian	2,376	9.7	94.9	0.6	0.6
Gibsonia	Caucasian	6,784	21.8	87.5*	0.0**	0.1***
	Non-Caucasian	1,325	22.9	85.5	0.2	1.1
King of Prussia	Caucasian	5,864	15.5	90.6	0.1	0.1
	Non-Caucasian	1,401	15.6	90.1	0.1	0.0
New Stanton	Caucasian	6,577	15.1	90.5	0.0	0.1
	Non-Caucasian	1,054	15.0	90.6	0.1	0.2
Newville	Caucasian	8,403	11.0	92.6	0.0***	0.2***
	Non-Caucasian	2,549	10.4	93.0	0.4	1.5
Pocono	Caucasian	4,715	11.3	92.3	0.0**	0.0***
	Non-Caucasian	778	10.5	91.6	0.3	0.4
Somerset (T)	Caucasian	6,323	6.0	95.6**	0.2	0.8
	Non-Caucasian	2,166	7.2	94.2	0.2	1.0
AREA II, Troop F						
Coudersport	Caucasian	1,726	49.9	65.0	0.2	0.4
	Non-Caucasian	41	46.3	65.9	0.0	0.0
Emporium	Caucasian	1,294	30.1	84.5	0.1	0.1
	Non-Caucasian	17	35.3	76.5	0.0	0.0
Lamar	Caucasian	2,898	14.1***	90.6***	0.0	0.2
	Non-Caucasian	691	8.1	95.2	0.1	0.4
Mansfield	Caucasian	1,532	26.8	85.0	0.1**	0.1
	Non-Caucasian	85	23.5	90.6	1.2	0.0
Milton	Caucasian	1,877	9.2	97.8	0.0	0.3**
	Non-Caucasian	408	7.8	98.3	0.0	1.0
Montoursville	Caucasian	4,812	10.3	94.2*	0.1	0.3***
	Non-Caucasian	369	13.6	91.6	0.0	2.4
Selinsgrove	Caucasian	3,823	6.4	97.4	0.1	0.3
	Non-Caucasian	281	3.9	98.2	0.0	0.0
Stonington	Caucasian	1,463	42.6	78.4	0.7	0.3*
	Non-Caucasian	39	48.7	76.9	2.6	2.6

Table 5.4. Racial Comparisons of Stop Outcomes by Station (p.3 of 6)

	Drivers	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched
AREA II, Troop P						
Laporte	Caucasian	1,578	33.7	81.8	0.1	0.0
	Non-Caucasian	29	31.0	79.3	0.0	0.0
Shickshinny	Caucasian	1,075	24.7	83.9	0.7	0.0***
	Non-Caucasian	45	15.6	93.3	0.0	2.2
Towanda	Caucasian	1,840	29.8	81.0	0.2	0.8***
	Non-Caucasian	40	30.0	75.0	0.0	10.0
Tunkhannock	Caucasian	1,428	31.4	78.2	1.5	0.6
	Non-Caucasian	35	37.1	85.7	0.0	0.0
Wyoming	Caucasian	2,498	14.7	92.7	0.1	0.6***
	Non-Caucasian	201	15.9	91.5	0.5	3.5
AREA II, Troop R						
Blooming Grove	Caucasian	2,558	17.9	94.5*	0.2	0.5
	Non-Caucasian	304	14.1	97.4	0.3	0.7
Dunmore	Caucasian	1,806	20.5	90.0	0.1	0.4*
	Non-Caucasian	282	19.5	91.8	0.0	1.4
Gibson	Caucasian	1,045	27.7***	91.0**	0.6	0.4
	Non-Caucasian	246	15.4	96.3	0.4	0.0
Honesdale	Caucasian	2,584	14.4	92.0	0.3	0.8
	Non-Caucasian	147	8.8	95.2	0.7	1.4
AREA III, Troop A						
Ebensburg	Caucasian	3,089	21.0	86.1	1.0	0.4
	Non-Caucasian	138	16.7	89.1	0.7	0.7
Greensburg	Caucasian	5,455	27.8	93.5	0.0	0.2
	Non-Caucasian	239	33.1	92.5	0.0	0.4
Indiana	Caucasian	3,998	27.1	89.2	0.3	0.4**
	Non-Caucasian	221	29.9	90.5	0.5	1.8
Kiski Valley	Caucasian	2,747	36.7***	81.7	0.1	0.4
	Non-Caucasian	271	49.4	78.2	0.0	0.4
Somerset (A)	Caucasian	2,241	38.3	75.3	1.6	0.8***
	Non-Caucasian	47	36.2	72.3	2.1	8.5

Table 5.4. Racial Comparisons of Stop Outcomes by Station (p.4 of 6)

	Drivers	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched
AREA III, Troop B						
Belle Vernon	Caucasian	3,189	21.8	91.7	3.7***	0.2***
	Non-Caucasian	363	17.4	93.9	0.0	1.4
Pittsburgh	Caucasian	5,991	12.7***	96.0**	0.2	0.6***
	Non-Caucasian	815	20.0	93.6	0.2	2.2
Uniontown	Caucasian	3,630	40.7	70.0	0.6	1.1***
	Non-Caucasian	246	40.2	69.9	0.0	4.9
Washington	Caucasian	4,768	22.2	86.7	0.1	0.4
	Non-Caucasian	481	19.8	89.0	0.4	3.5
Waynesburg	Caucasian	2,452	32.2*	86.0**	1.1	0.6
	Non-Caucasian	206	24.3	93.7	0.0	1.5
AREA III, Troop G						
Bedford	Caucasian	3,099	37.0***	71.5***	1.2	0.3
	Non-Caucasian	232	19.4	89.2	0.0	0.9
Hollidaysburg	Caucasian	3,005	41.8	77.5*	0.7*	1.7*
	Non-Caucasian	220	35.5	83.2	2.3	4.1
Huntingdon	Caucasian	2,424	35.1	76.8	2.2	0.4
	Non-Caucasian	66	37.9	80.3	1.5	1.5
Lewistown	Caucasian	2,478	37.6*	72.6*	0.4	0.7
	Non-Caucasian	239	29.3	83.3	0.4	0.8
McConnellsburg	Caucasian	1,854	31.7***	78.6***	0.0**	0.3
	Non-Caucasian	528	17.8	91.5	0.4	0.8
Philipsburg	Caucasian	2,607	48.3***	76.8*	0.2	0.2
	Non-Caucasian	147	34.7	84.4	0.0	0.0
Rockview	Caucasian	4,522	23.8***	85.3	0.1	0.2**
	Non-Caucasian	680	17.6	89.1	0.0	0.9
AREA IV, Troop C						
Clarion	Caucasian	4,308	42.2***	73.4***	0.1	0.3***
	Non-Caucasian	1,212	25.4	86.4	0.2	2.3
Clearfield	Caucasian	4,628	24.5***	89.1***	0.0	0.2
	Non-Caucasian	957	16.7	95.2	0.0	0.6
Dubois	Caucasian	2,769	24.6***	84.0***	0.1	0.2
	Non-Caucasian	718	11.1	94.8	0.0	0.6
Kane	Caucasian	1,857	38.0	80.1	1.6	0.6
	Non-Caucasian	67	38.8	88.1	0.0	0.0

Table 5.4. Racial Comparisons of Stop Outcomes by Station (p.5 of 6)

	Drivers	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched
AREA IV, Troop C						
Punxsutawney	Caucasian	3,092	38.3***	75.1***	0.2	0.3
	Non-Caucasian	201	25.4	86.6	0.0	0.0
Ridgway	Caucasian	2,317	38.9**	79.9	0.6	0.5
	Non-Caucasian	107	25.2	86.9	0.0	0.0
Tionesta	Caucasian	2,068	58.8	58.1	0.8	0.2**
	Non-Caucasian	41	46.3	73.2	0.0	2.4
AREA IV, Troop D						
Beaver	Caucasian	2,453	49.2	65.1	0.4*	0.2***
	Non-Caucasian	205	47.3	62.9	1.5	2.9
Butler	Caucasian	5,325	37.4*	77.3**	0.8	0.5*
	Non-Caucasian	244	30.3	84.4	0.8	1.6
Kittanning	Caucasian	3,094	43.2	70.2**	0.8	0.9*
	Non-Caucasian	200	38.0	79.5	0.0	2.5
Mercer	Caucasian	2,277	36.6**	80.5	0.2	0.9***
	Non-Caucasian	505	29.7	81.8	0.2	3.4
New Castle	Caucasian	2,169	42.8**	73.2	0.0	0.3
	Non-Caucasian	157	54.1	70.7	0.0	0.0
AREA IV, Troop E						
Corry	Caucasian	1,077	42.7	72.9	0.7	0.3
	Non-Caucasian	32	56.3	75.0	0.0	0.0
Erie	Caucasian	4,047	25.0***	83.3***	0.1	0.2
	Non-Caucasian	482	18.0	89.0	0.0	0.2
Franklin	Caucasian	2,396	59.5	61.5	0.5	0.4
	Non-Caucasian	51	56.9	54.9	0.0	2.0
Girard	Caucasian	3,893	29.0	85.1	0.6	0.6
	Non-Caucasian	478	25.5	88.3	1.0	1.3
Meadville	Caucasian	2,409	47.8***	68.2***	1.2	0.9
	Non-Caucasian	278	31.7	82.0	0.0	0.4
Warren	Caucasian	1,350	29.4	80.7	0.7	0.5
	Non-Caucasian	14	14.3	92.9	0.0	0.0
AREA V, Troop K						
Media	Caucasian	3,595	30.4***	78.7	1.4	2.4***
	Non-Caucasian	1,181	35.4	79.6	1.9	6.2

Table 5.4. Racial Comparisons of Stop Outcomes by Station (p.6 of 6)

	Drivers	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched
AREA V, Troop K						
Philadelphia	Caucasian	2,376	29.7***	87.0	0.8	1.1***
	Non-Caucasian	1,265	35.2	84.9	0.9	3.2
Skippack	Caucasian	3,771	39.4	81.1**	0.8	0.6***
	Non-Caucasian	671	40.1	86.1	0.1	3.7
AREA V, Troop M						
Belfast	Caucasian	2,388	27.3	82.2	0.3	0.3**
	Non-Caucasian	587	24.0	84.7	0.3	1.2
Bethlehem	Caucasian	2,176	33.1	80.3	0.5	0.6
	Non-Caucasian	541	35.5	79.7	0.6	1.1
Dublin	Caucasian	3,784	59.6	64.5*	0.3*	0.4*
	Non-Caucasian	329	58.4	70.5	0.9	1.2
Fogelsville	Caucasian	3,627	33.1*	78.7**	0.4	0.5***
	Non-Caucasian	1,100	29.2	82.5	0.9	3.2
Trevose	Caucasian	1,975	22.5	84.2	0.8	0.9***
	Non-Caucasian	763	22.5	83.7	0.9	2.5
AREA V, Troop N						
Bloomsburg	Caucasian	2,595	13.0	97.2	0.2	0.0
	Non-Caucasian	747	12.6	98.0	0.0	0.1
Fern Ridge	Caucasian	1,948	13.3	95.4	0.6	0.1***
	Non-Caucasian	651	10.6	96.9	1.2	0.9
Hazleton	Caucasian	2,311	16.6**	89.1**	0.1	0.3
	Non-Caucasian	649	11.6	92.8	0.2	0.8
Lehighton	Caucasian	2,390	37.4	80.8	0.2	0.3
	Non-Caucasian	164	38.4	85.4	0.0	0.6
Swiftwater	Caucasian	3,046	20.7	86.9	0.1	0.5*
	Non-Caucasian	969	19.3	88.3	0.1	1.0

NOTE: Asterisks identify statistically significant chi-square associations. * $p < .05$ ** $p<.01$ *** $p<.001$

Tables 5.2, 5.3, and 5.4 illustrate the wide variation in outcomes across racial /ethnic and gender groups at the department, area, troop, and station levels. It is important to reiterate however, that the relationships reported in these tables are only bivariate. That is, the relationships reported in **Tables 5.2, 5.3, and 5.4** do not statistically control for other relevant legal and extralegal factors that might be expected to influence officer decision-making. Therefore, the information provided in these tables cannot determine whether or not differences in outcomes across racial / ethnic and gender groups are due to discrimination.

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 in the multivariate section of Section V. The information reported in **Tables 5.2 – 5.4** is included in this report solely to provide details to PSP administrators regarding differences in post-stop outcomes at the area, troop, and station levels. Although this information will allow PSP administrators to identify potential problems and target specific troops and stations for policy interventions, this information cannot directly examine questions of possible discrimination.

TROOPER DIFFERENCES IN TRAFFIC STOPS AND POST-STOP OUTCOMES

It is possible that differences in stop and post-stop outcome patterns exist based on Troopers' characteristics. That is, it is plausible that male and female Troopers, Caucasian and minority Troopers, etc. have different patterns of stopping, warning, citing, arresting, and searching drivers, and further that these differences may be related to the drivers' race / ethnicity. To begin exploring these possibilities, **Tables 5.5 – 5.9** present the bivariate relationships between Troopers' characteristics and their decisions to stop, warn, cite, arrest, and search different racial and ethnic groups. Statistically significant bivariate relationships at the .001 level are indicated with an asterisk. As with all the bivariate statistics presented in this report, these analyses are provided to explore trends and patterns in Troopers' behaviors and cannot directly assess individual bias or discrimination by PSP Troopers.

Table 5.5 documents the relationship between Troopers' characteristics and traffic stops for different racial / ethnic groups. Troopers' characteristics include: sex (measured as male, female), race (measured as Caucasian, non-Caucasian), years of experience with PSP (measured as less than five years, five years or more), education (measured as no college degree, two years of college, and four years or more of college), assignment (measured as patrol, crime, staff, Canine, or other) and rank (measured as Trooper, Corporal or higher).

The race/ethnicity of drivers is captured in four categories: Caucasian, non-Hispanic Black, Hispanic, and a combined category of any non-Caucasian (which includes Black, Hispanic, Asian, American Indian, and Middle Eastern). Note that the first three categories (Caucasian, Black, and Hispanic) are mutually exclusive however, the fourth category (any non-Caucasian) includes drivers previously classified as Black and Hispanic.

As shown in **Table 5.5**, significant differences in stops for racial / ethnic groups based on Troopers' gender, as female Troopers compared to male Troopers are significantly more likely to stop Caucasian drivers, and significantly less likely to stop non-Caucasian drivers. The effects of Troopers' race across the drivers' racial categories indicates that Caucasian Troopers are more likely to stop Caucasian drivers, while non-Caucasian Troopers are significantly more likely to stop Black drivers, Hispanic drivers, and non-Caucasian drivers. These differences are likely due to differences in patrol areas and assignments of Caucasian and minority Troopers.

Compared to more experienced Troopers, Trooper with less than five years experience were significantly more likely to stop Caucasian drivers, while significantly less likely to stop minority drivers. Trooper education level only matters slightly for the percentage of Caucasian drivers stopped, as those with less education stop more Caucasian drivers. **Table 5.5** also shows significant differences in the percentages of each racial group stopped based on Troopers' job assignments. Finally, Troopers' rank is associated with the race / ethnicity of drivers stopped. Specifically, officers with higher ranks (Corporal or above) were significantly less likely to stop Caucasian drivers and more likely to stop Black, Hispanic, and non-Caucasian drivers, compared to officers with lower rank (Troopers).

Table 5.5 Trooper Differences in Stops of Racial Groups

Trooper Characteristics	Total # of Stops	% Caucasian drivers stopped	% Black drivers stopped	% Hispanic drivers stopped	% Non-Caucasian drivers stopped
Female	10,924	86.7*	7.2	2.8	12.8*
Male	303,530	85.3	7.7	3.0	14.3
Caucasian	284,709	85.7*	7.5*	2.9*	13.9*
Non-Caucasian	30,041	81.6	9.4	3.7	17.5
Less than 5 years experience	95,903	86.4*	7.1*	2.9	13.2*
5 years experience or more	218,847	84.8	7.9	3.0	14.6
No college degree	121,277	85.0*	7.7	3.0	14.4
2 year college degree	69,839	85.2	7.7	2.9	14.4
≥ 4 year college degree	120,912	85.7	7.7	2.9	14.0
Patrol Assignment	305,137	85.4*	7.6*	2.9*	14.1*
Crime Assignment	2,854	86.2	7.0	3.6	13.5
Staff Assignment	3,191	84.0	8.6	3.7	15.7
Canine Assignment	145	63.4	29.0	4.8	36.6
Other Assignment	3,123	81.7	10.2	4.3	17.7
Rank of Trooper	164,621	86.0*	7.3*	2.9	13.6*
Rank of Corporal or higher	149,356	84.5	8.0	3.0	14.9

NOTE: Asterisks identify statistically significant chi-square bivariate associations. * $p<.001$

Table 5.6 documents the relationship between Troopers' characteristics and traffic stop outcomes for all drivers (regardless of drivers' race/ethnicity). Post-stop outcomes include the percentage of drivers stopped by Troopers who were warned, cited, arrested, and searched. **Table 5.6** also includes the number of drivers searched and the success rates of these searches. Due to the small number of searches in some categories, differences in Troopers' search success rates should be interpreted with caution.

As shown in **Table 5.6**, female Troopers warned significantly more drivers (28.8%) than male Troopers (25.9%). In contrast, male Troopers arrested and searched more drivers than female Troopers. Troopers' race also had a significant impact across warnings, citations, arrests, and searches. Caucasian troopers warned, arrested, and searched more drivers than Non-Caucasian Troopers. For example, Caucasian troopers warned 26.9% of stopped drivers compared to 17.0% of drivers stopped by Non-Caucasian troopers. In contrast, non-Caucasian Troopers issued citations to a higher percentage (89.4%) of stopped drivers, compared to Caucasian Troopers (84.4%). Troopers' experience also was related to the percentage of drivers that were issued warnings and citations. For example, Troopers with less than 5 years experience warned 28.4% of drivers compared with Troopers with more than 5 years experience, who warned 24.9% of the drivers. Troopers with less than 5 years experience were significantly less likely than Troopers with more than 5 years experience to issue citations and arrest drivers.

Table 5.6 also shows significant differences across all stop outcomes based on Troopers' education level. Troopers with no college education warned fewer drivers (24.0%) than Troopers with a two-year college degree (24.2%) or those with a four-year college degree (28.9%). Troopers with a four-year degree, however, were less likely to cite drivers, but more likely to search drivers, compared to Troopers with less education. Troopers with two-year degrees had significantly higher search success rates (32.2%) than those with no college (23.6%) or those with a four-year degree (24.0%). As expected, post-stop outcomes varied dramatically based on Troopers' assignments. Finally, officers with lower rank were significantly more likely to issue citations and arrest drivers, but less likely to issue formal warnings, compared to officers of higher rank.

Table 5.6 Trooper Differences in Stop Outcomes of ALL Drivers

Trooper Characteristics	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched	# drivers searched	% drivers searched resulting in seizure
Female	10,955	28.8*	84.2*	0.2	0.5*	51	15.7
Male	303,996	25.9	84.9	0.5	0.8	2,329	25.9
Caucasian	285,150	26.9*	84.4*	0.5*	0.8*	2,236	25.8
Non-Caucasian	30,097	17.0	89.4	0.2	0.5	148	25.0
Less than 5 years experience	96,056	28.4*	84.1*	0.4*	0.8	768	22.4
5 years experience or more	219,191	24.9	85.2	0.5	0.7	1,616	27.3
No college degree	121,485	24.0*	86.1*	0.5*	0.7*	825	23.6*
2 year college degree	69,941	24.2	85.6	0.4	0.7	512	32.2
≥ 4 year college degree	121,091	28.9	83.2	0.6	0.9	1,038	24.0
Patrol Assignment	305,611	25.2*	85.7*	0.5*	0.6*	1,971	24.2*
Crime Assignment	2,865	44.4	64.9	1.2	2.9	82	26.8
Staff Assignment	3,197	55.7	55.6	1.3	5.1	162	36.4
Canine Assignment	145	57.9	46.2	2.1	8.3	12	50.0
Other Assignment	3,129	50.4	55.6	1.0	4.9	153	32.0
Rank of Trooper	164,732	25.5*	85.4*	0.5*	0.8	1,252	26.3
Rank of Corporal or higher	149,740	26.4	84.3	0.4	0.8	1,124	25.0

NOTE: Asterisks identify statistically significant chi-square bivariate associations. * p<.001

Table 5.7 reports these relationships for only Black (non-Hispanic) drivers. That is, the post-stop outcomes for Black drivers are examined based on Troopers' characteristics. As **Table 5.7** demonstrates, no statistically significant differences in stop outcomes for Black drivers are evident by Troopers' gender. Troopers' race is associated with the percentage of warnings issued to Black motorists. Caucasian Troopers warned 24.6% of Black drivers stopped, whereas non-Caucasian Troopers warned only 20.4% of Black drivers stopped. Troopers with less than five years of experience also were significantly more likely to issue warnings to Black drivers compared to Troopers with more than 5 years experience.

Table 5.7 also shows significant differences in some stop outcomes based on Troopers' educational backgrounds and job assignments. Specifically, Troopers with less education were significantly less likely to issue formal warnings and more likely to issue citations to Black drivers compared to Troopers with more education. As expected, differences in post-stop outcomes for Black motorists are also evident based on Troopers' assignment category. Finally, no significant differences in stop outcomes for Black drivers were evident based on Troopers' rank.

Table 5.7 Trooper Differences in Stop Outcomes of BLACK Drivers

Trooper Characteristics	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched	# drivers searched	% drivers searched resulting in seizure
Female	782	25.4	87.2	0.5	0.9	7	28.6
Male	23,338	24.0	86.3	0.6	2.2	523	21.2
Caucasian	21,307	24.6*	86.2	0.7	2.2	477	20.8
Non-Caucasian	2,838	20.4	86.8	0.4	1.9	54	25.9
Less than 5 years experience	6,841	26.8*	86.4	0.6	2.5	168	13.1
5 years experience or more	17,304	23.0	86.3	0.6	2.1	363	25.1
No college degree	9,304	21.4*	88.1*	0.6	2.0	189	23.8
2 year college degree	5,370	22.7	86.3	0.7	2.3	125	24.0
≥ 4 year college degree	9,275	27.6	84.5	0.6	2.3	215	17.7
Patrol Assignment	23,286	22.8*	87.7*	0.5*	1.9*	445	18.9
Crime Assignment	199	44.7	62.3	3.5	9.0	18	22.2
Staff Assignment	274	61.3	50.4	3.6	10.2	28	39.3
Canine Assignment	42	78.6	26.2	2.4	7.1	3	66.7
Other Assignment	318	68.9	36.8	1.3	11.3	36	33.3
Rank of Trooper	12,077	23.8	86.7	0.6	2.1	257	19.5
Rank of Corporal or higher	12,014	24.4	85.9	0.7	2.3	273	23.1

NOTE: Asterisks identify statistically significant chi-square bivariate associations. * p<.001

Table 5.8 examines the same relationships between Trooper characteristics and stop outcomes, but focuses only on Hispanic drivers. No significant differences in stop outcomes for Hispanic drivers are evident based on Troopers' gender. Trooper race was important for the issuance of warnings to Hispanic drivers, as Caucasian Troopers issued warnings in 23.9% of stops involving Hispanic drivers, while non-Caucasian Troopers warned fewer (18.2%). Troopers with less than 5 years experience issued more formal warnings (26.2%) to Hispanic drivers compared to 22.0% of more experienced Troopers. Hispanic drivers were warned less and cited more frequently by Troopers with less than college education, compared to Troopers with 2 or 4 years of education. Once again, as expected, differences in stop outcomes for Hispanics are evident based on Trooper assignment. Finally, as with Black drivers, no significant differences in stop outcomes for Hispanic drivers were evident based on Troopers' rank.

Table 5.8 Trooper Differences in Stop Outcomes of HISPANIC Drivers

Trooper Characteristics	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched	# drivers searched	% drivers searched resulting in seizure
Female	307	26.7	90.2	0.3	1.6	5	0.0
Male	9,039	23.1	88.1	0.8	3.0	268	14.6
Caucasian	8,240	23.9*	88.1	0.8	3.1	257	14.4
Non-Caucasian	1,109	18.2	88.6	0.5	1.4	16	12.5
Less than 5 years experience	2,816	26.2*	89.8	0.7	3.6	100	12.0
5 years experience or more	6,533	22.0	87.5	0.8	2.6	173	15.6
No college degree	3,663	19.7*	90.0*	0.6	2.3	86	5.8*
2 year college degree	2,050	22.6	87.3	0.9	2.7	55	32.7
≥ 4 year college degree	3,559	27.1	87.0	0.8	3.7	132	12.1
Patrol Assignment	8,986	21.9*	89.7*	0.7	2.5*	221	12.7
Crime Assignment	103	44.7	66.0	1.0	10.7	11	0.0
Staff Assignment	117	51.3	53.8	1.7	12.0	14	21.4
Canine Assignment	7	85.7	14.3	0.0	28.6	2	0.0
Other Assignment	133	69.2	34.6	3.0	18.8	25	32.0
Rank of Trooper	4,839	23.3	88.2	0.9	3.2	153	12.4
Rank of Corporal or higher	4,495	23.2	88.3	0.6	2.7	120	16.7

NOTE: Asterisks identify statistically significant chi-square bivariate associations. * $p<.001$

Table 5.9 explores the same relationships between Trooper characteristics and stop outcomes, but examines all non-Caucasian drivers. No significant differences in stop outcomes for non-Caucasian drivers are evident based on Troopers' gender. Caucasian Troopers issued warnings in 22.2% of stops involving non-Caucasian drivers, while non-Caucasian Troopers warned fewer (17.9%). Troopers with less than 5 years experience issued more formal warnings (24.6%) to non-Caucasian drivers compared to 20.5% of non-Caucasian Troopers. Non-Caucasian drivers were warned less and cited more frequently by Troopers with less than college education, compared to Troopers with 2 or 4 years of education. Once again, as expected, differences in stop outcomes for non-Caucasians are evident based on Trooper assignment. Finally, as with Black and Hispanic drivers, no significant differences in stop outcomes for non-Caucasian drivers were evident based on Troopers' rank.

Table 5.9 Trooper Differences in Stop Outcomes of NON-CAUCASIAN Drivers

Trooper Characteristics	Total # of Stops	% drivers warned	% drivers cited	% drivers arrested	% drivers searched	# drivers searched	% drivers searched resulting in seizure
Female	1,396	23.4	89.5	0.4	1.0	14	14.3
Male	43,256	21.6	88.0	0.5	1.9	842	18.4
Caucasian	39,443	22.2*	88.0	0.5	2.0	785	18.0
Non-Caucasian	5,244	17.9	88.5	0.3	1.4	72	22.2
Less than 5 years experience	12,665	24.6*	88.3	0.5	2.2	279	12.5
5 years experience or more	32,022	20.5	88.0	0.5	1.8	578	21.1
No college degree	17,407	19.1*	89.7*	0.5	1.7	303	16.8
2 year college degree	10,058	20.2	88.3	0.5	1.9	187	26.2
≥ 4 year college degree	16,868	25.2	86.3	0.5	2.2	365	15.6
Patrol Assignment	43,160	20.4*	89.4*	0.5*	1.6*	712	16.3*
Crime Assignment	385	41.8	66.0	2.1	8.1	31	12.9
Staff Assignment	501	58.1	52.3	2.4	9.4	47	31.9
Canine Assignment	53	77.4	26.4	1.9	9.4	5	40.0
Other Assignment	552	66.7	38.8	1.4	11.1	61	32.8
Rank of Trooper	22,365	21.7	88.3	0.5	1.9	436	16.3
Rank of Corporal or higher	22,235	21.7	87.9	0.5	1.9	420	20.5

NOTE: Asterisks identify statistically significant chi-square bivariate associations. * $p<.001$

As noted for some of the previous analyses, caution must be used when interpreting these results. The analyses are based strictly on bivariate relationships – that is, there are no statistical controls for other factors that might influence traffic stop outcomes. These statistical controls are utilized in the multivariate analyses presented below.

MULTIVARIATE ANALYSES OF TRAFFIC STOP OUTCOMES

In **Tables 5.10 & 5.11**, the results of eight hierarchical multivariate models are presented. As noted in Section I, a multivariate statistical model is one that takes many different factors into account when attempting to explain a particular behavior. Unlike a bivariate model, it does not simply assess the relationship between two variables. Rather, a multivariate model examines many variables simultaneously, and therefore provides a more thorough and accurate interpretation of the data. The multivariate analyses to follow examine the associations between drivers' characteristics and post-stop outcomes (i.e., warnings, citations, searches, and arrests) 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, number of passengers), stop characteristics (e.g., time of day, day of the week, season, and roadway type), reasons for the stop (speeding, moving violations, equipment violations, etc.), other legal variables (e.g., number of reasons for the stop, evidence found during a search), Trooper characteristics (e.g., sex, race, experience, education, assignment, rank), and community characteristics where the stop occurred (e.g., residential population, poverty, factors related to traffic patterns, etc.) have all been hypothesized to influence post-stop outcomes. Multivariate analyses allow us to examine the effect 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.

The inclusion of community 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) is required.[9] The multivariate analyses examine the following specific variables for their influence over post-stop outcomes (i.e., warnings, citations, searches, arrests):

- Driver characteristics: race / ethnicity (four dichotomous variables – Caucasian, Black, Hispanic, other; Caucasian is the excluded comparison category in the analyses), gender (male=1), age, county residency where stop occurred (1=yes), Pennsylvania residency (1=yes).
- Vehicle characteristics: registration (1= no registration, 0=PA or out of state registration), number of passengers in the vehicle (range 1-5)
- Stop characteristics: time of day (daytime=1, rush hour =1), day of the week (weekday=1), season (summer=1), roadway type (interstate=1)
- Reason for the stop: seven dichotomous variables (i.e., moving violation, equipment/inspection violation, preexisting information, registration violation, license violation, special traffic enforcement program, other reason), with speeding as the excluded comparison category

[9] Using data at two or more levels of aggregation introduces a statistical dilemma where regression residuals for the level 1 cases (observations) within the same level 2 units (municipalities) may be correlated (i.e., more similar than level 1 cases taken from independent municipalities). This violates the assumption of independence that underlies most ordinary regression techniques. The implications of violating this assumption are substantial, as dependence can lead to inefficient estimates and biased test statistics, making the analyses appear to have more power than they do (Raudenbush & Bryk, 2002). Hierarchical linear modeling (HLM) is a modeling procedure that can overcome this statistical dilemma (Raudenbush & Bryk, 2002). HLM includes an extra error term, Ui, that reflects the extra variation common to all level 1 cases within the level 2 unit, so the level 1 error term (Rij) can be independent. That is, HLM explicitly models the dependence of the residuals through this error term. For binary outcome variables like the ones utilized here, hierarchical models cannot use the standard level 1 model which assumes a linear model and normally distributed errors at level 1, once the additional error term is included (Raudenbush & Bryk, 2002). To account for these characteristics of this type of dependent variable, we employ a nonlinear form of hierarchical modeling that uses a binomial sampling model with a Bernoulli distribution, as opposed to a normal sampling model, and a logit link instead of an identity link (Guo & Zhao, 2000; Raudenbush & Bryk, 2002).

- Other legal characteristics: number of reasons for the stop (range 1-6), evidence found during a search (evidence=1)
- Trooper characteristics: gender (1=male), race (1=Caucasian), experience (1= over 5 years), education (range 1-5), assignment (1=patrol), rank (1=Trooper)
- Community characteristics of the municipality where the stop occurred: total driving-age population (logged), % male in driving-age population, % Black in driving-age population, % Hispanic in driving-age population, average commute (in minutes), and three factor scores, measuring the latent variables poverty, residential mobility, and traffic/travel patterns

Table 5.10 presents the results of four separate HLM analyses of post-stop outcomes during all traffic stops. **Table 5.11** presents the findings for similar multivariate models that assess only traffic stops for speeding. Traffic stops for speeding were singled out for additional analyses based on two reasons: 1) the majority of PSP traffic stops were for speeding (72.0%), and 2) speeding is the only traffic offense where the severity of the offense can be directly measured (by the amount over the speed limit) and thus provides the best statistical control for legal factors that influence traffic stop dispositions.

Tables 5.10 & 5.11 display the results of four separate multivariate models that predict the following officer actions: 1) issuing a warning, 2) issuing a citation, 3) arresting a suspect, and 4) conducting a search. For each of these models, numerous independent variables were included that could potentially influence these officer actions. As shown in the left hand column, the predictor variables at Level 1 include: 1) driver characteristics, 2) vehicle characteristics, 3) stop characteristics, 4) reasons for the stop, 5) other legal variables, and 6) Trooper characteristics. Community characteristics of the stop location are included as predictor variables at Level 2. 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). Analyses reported in **Table 5.10** are based on 306,602 stops for which there were valid data on all the variables include in the models. Likewise, the analyses in Table 5.11 are based on 221,331 *speeding* stops for which there were valid data on all variables include in the models.

Each of the independent variables is assessed relative to their effect upon the dependent variable (i.e., warning, citation, arrest, and search). 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 Black, Hispanic, and other. The excluded category is Caucasian. Thus, the coefficients in the model should be interpreted as compared to Caucasians – that is, the likelihood of Black drivers being issued a citation compared to Caucasian drivers. The excluded category of the reason for the stop is speeding. The other variables are simply compared against their opposite (e.g., male drivers are compared to female drivers).

The first column for each model in **Tables 5.10** & **5.11** displays the 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 or non-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 (i.e., the large number of traffic stops), 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.

Since 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, everything else being equal. The odds ratio indicates the strength of the relationship. For example, an odds ratio of 3.0 indicates that the presence of the variable (e.g., being a Black driver) leads to three times the likelihood of receiving the outcome (e.g., conducting a search). 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. That is, the strength of the relationship may not be very large.

Multivariate Findings

Table 5.10 reports results for two-level hierarchical Bernoulli non-linear models predicting the issuance of warnings (Model 1), citations (Model 2), arrests (Model 3), and searches (Model 4) during 306,602 traffic stops in 2,267 municipalities for which there were valid data on all the variables in the models.

Model 1 – Warnings

Model 1 suggests that Hispanic drivers and drivers of other race / ethnicity are significantly *less* likely to receive a warning compared to Caucasian drivers. In contrast, female drivers, drivers 25 years or older, county residents, and Pennsylvania residents are significantly *more* likely to receive a warning compared to males, drivers 24 years or younger, non-county residents, and non-Pennsylvania residents.

Other characteristics of the vehicle and stop also have significant effects on the likelihood of warnings. Drivers of vehicles with more passengers, vehicles stopped during the nighttime, vehicles stopped on a weekday, and vehicles stopped on non-interstate roadways are significantly *more* likely to receive a warning compared to drivers of vehicles with fewer passengers, vehicles stopped during the daytime, vehicles stopped on a weekend, and vehicles stopped on interstate highways.

The results also show statistically significant and substantively strong relationships between the likelihood of receiving a warning and the reason for the stop, as well as for other legal variables.

Drivers stopped for moving violations, equipment or inspection violations, or vehicle registrations are significantly *more* likely to receive a warning compared to drivers stopped for speeding. Drivers stopped for multiple reasons are also *more* likely to receive a warning compared to those stopped for fewer reasons. This is likely because drivers stopped for multiple reasons were also issued citations for the other offenses. In contrast, drivers stopped for license violations, during special traffic enforcement programs, or for "other" reasons are significantly *less* likely to receive a warning compared to drivers stopped for speeding.

Troopers' characteristics also influence the likelihood of receiving warnings. Controlling for other factors, Caucasian troopers, troopers with more education, troopers with a non-patrol assignment, and troopers with a rank of corporal or higher are significantly more likely to issue formal warnings to motorists, compared to troopers who are non-Caucasian, have less education, are assigned to patrol, and have a non-supervisor rank.

Finally, none of the municipality characteristics of where the stop was made has a significant influence over the likelihood of drivers being issued warnings.

Model 2 – Citations

Model 2 in **Table 5.10** documents the significant predictors of issuing citations. The results show that after controlling for other relevant factors, Black and Hispanic drivers are not significantly more likely to be issued a citation compared to Caucasian drivers. However, male drivers, drivers 24 years old or younger, and drivers who do not reside in the county where the stop occurred are significantly *more* likely to be issued a traffic citation compared to female drivers, drivers 25 years old or older, and drivers who reside in the county where the stop occurred.

Only three vehicle and stop characteristics significantly predict if a citation is issued to a motorist. Specifically, drivers in vehicles with few passengers, stopped during the daytime, and stopped on an interstate are significantly *more* likely to receive a citation compared to drivers in vehicles with more passengers, stopped during the evening or nighttime, and stopped on state highways, county or local roads.

Nearly all of the reasons for a stop significantly predict being issued a citation. Drivers stopped for moving violation, equipment / inspection violations, preexisting information, registration violations, license violations, and special traffic enforcement are significantly *less* likely to receive citations compared to drivers stopped for speeding. That is, being stopped for speeding dramatically increases drivers' risks for being issued a citation compared to all other violations.

As expected, drivers stopped for more reasons (including violations observed after the stop is made) are significantly *more* likely to be issued citations. In contrast, drivers who are searched and found to be in possession of contraband are significantly *less* likely to be issued a citation compared to drivers not searched or those searched when no evidence was found. This negative relationship is likely because in most cases the seizure of contraband leads to an arrest, not a citation.

Finally, some Trooper characteristics – including race, education, assignment, and rank – significantly predict issuing citations. Non-Caucasian troopers, troopers with more education, troopers assigned to patrol, and troopers with no supervisory rank are significantly *more* likely to issue citations compared to Caucasian troopers, troopers with less education, troopers with a non-patrol assignment, and troopers with ranking Corporal or higher.

Model 3 – Arrest

Model 3 in **Table 5.10** reports the results of a two-level hierarchical model predicting arrests of motorists. The findings show that <u>none</u> of the racial/ethnic groups are significantly more or less likely to be arrested compared to Caucasian motorists stopped for similar traffic offenses. Likewise, drivers' age and state residency do not have a significant influence over arrest decisions. Drivers' gender and county residency, however, do appear to have a slight influence over arrest. Male drivers and drivers who reside in the county where they were stopped are significantly more likely to be arrested compared to female drivers and drivers who did not reside in the county where the stop occurred.

Most of the stop characteristics do significantly predict arrests. The risk of being arrested is statistically significantly *lower* for motorists stopped in the daytime, during rush hour, on a weekday, or traveling on an interstate, compared to motorists stopped in the evening or night, during a non-rush hour period, during a weekend, or traveling on a non-interstate roadway.

Three reasons for the stop also significantly predict arrest. Drivers stopped for a moving violation, preexisting information, and license violations are significantly more likely to be arrested compared to drivers stopped for speeding. An examination of the odds ratios shows that these variables are substantively stronger predictors of arrest compared to most of the other significant predictors in the model (with the obvious exception of evidence found during a search).

As expected, the strongest variable predicting arrest is the discovery of contraband during a search. The odds of being arrested are approximately 196 times larger for drivers where a search is conducted and evidence is discovered. Note that the importance of this variable, however, is not the direct influence it has over the likelihood of arrest, but rather the influence that other factors have over arrest once the discovery of evidence is statistically controlled. After holding the discovery of evidence constant in the statistical models, no racial disparities in arrest exist.

Finally, only one Trooper characteristic has a significant influence over arrest decisions; troopers with five or more years of experience are significantly more likely to arrest motorists compared to troopers with less than five years of experience. No municipality characteristics where the stop occurred had a significant influence over arrest decisions.

Model 4 – Searches

Finally, Model 4 in **Table 5.10** displays the significant predictors of conducting searches.

Unlike the previous citation and arrest models, drivers' race /ethnicity does have a significant and substantively strong influence over whether or not a search is conducted. After controlling for other relevant factors, Blacks, Hispanics, males, younger drivers, county residents, and non-Pennsylvania residents are statistically significantly *more* likely to be searched compared to Caucasians, females, older drivers, non-county residents, and in-state residents. It is important to note that the log odds for the Black, Hispanic, and gender coefficients are very large. This suggests that the influence of drivers' race/ethnicity and gender is substantively more important for predicting searches. After controlling for other legally relevant factors, Black and Hispanic drivers are 3.1 and 3.0 times more likely than Caucasian drivers to be searched during a traffic stop.

Drivers traveling with more passengers, during the evening or night and during non-rush hour periods are also significantly more likely to be searched compared to drivers traveling with fewer passengers, in the daytime, and during rush hour.

Most of the reasons for the stop are also substantively important predictors of searches. Drivers stopped for moving violations, equipment / inspection violations, preexisting information, registration violations, and license violations are significantly *more* likely to be searched compared to drivers stopped for speeding. As indicated by the size of the log odds, these predictors are substantively strong (e.g., drivers stopped for preexisting information are 7.1 times more likely to be searched compared to drivers stopped for speeding).

In contrast to the findings reported for Year 1, only one trooper characteristic (i.e., patrol assignment) significantly predicts searches. Troopers with non-patrol assignments are significantly more likely to conduct searches during traffic stops compared to troopers with patrol assignments. Finally, none of the community characteristics of the municipality where drivers were stopped significantly predict the likelihood of being searched.

Table 5.10 HLM Analyses Predicting Troopers' actions during all traffic stops

Variables: Level 1 variables (stop) (n=306,602)	Model 1: Warning Coeff.	Model 1: Warning Odds Ratio	Model 2: Citation Coeff.	Model 2: Citation Odds Ratio	Model 3: Arrest Coeff.	Model 3: Arrest Odds Ratio	Model 4: Search Coeff.	Model 4: Search Odds Ratio
Intercept	-0.31	0.73	0.71	2.03	-8.37*	0.00	-6.32*	0.00
Driver Characteristics								
Black	0.03	1.03	-0.09	0.91	0.28	1.32	1.13*	3.10
Hispanic	-0.17*	0.84	0.14	1.15	0.35	1.42	1.10*	3.00
Other Race	-0.28*	0.76	0.36*	1.43	-1.30	0.27	-0.26	0.77
Male	-0.15*	0.86	0.20*	1.22	0.81*	2.25	1.11*	3.03
Age	0.01*	1.01	-0.02*	0.98	0.00	1.00	-0.05*	0.95
County resident	0.15*	1.16	-0.13*	0.88	0.56*	1.75	0.29*	1.34
PA resident	0.11*	1.12	-0.05	0.95	0.23	1.26	-0.49*	0.61
Vehicle Characteristics								
No registration	-0.22	0.80	0.03	1.03	0.48	1.62	-0.21	0.81
Number of Passengers	0.04*	1.04	-0.06*	0.94	-0.10	0.90	0.17*	1.19
Stop Characteristics								
Daytime	-0.30*	0.74	0.50*	1.65	-1.52*	0.22	-0.48*	0.62
Rush hour	-0.03	0.97	0.03	1.03	-0.67*	0.51	-0.28*	0.76
Weekday	0.08*	1.08	-0.04	0.96	-0.57*	0.57	0.07	1.07
Summer	-0.05	0.95	0.02	1.02	0.07	1.07	-0.07	0.93
Interstate	-0.62*	0.54	0.63*	1.88	-0.55*	0.58	0.17	1.19
Reason for Stop								
Moving Violation	0.55*	1.73	-0.71*	0.49	1.73*	5.64	0.90*	2.46
Equipment/Inspection	1.16*	3.19	-1.26*	0.28	0.19	1.21	0.96*	2.61
Preexisting Info.	0.51	1.67	-0.90*	0.41	1.63*	5.10	1.96*	7.10
Registration	0.38*	1.46	-0.75*	0.47	0.11	1.12	1.05*	2.86
License	-0.25*	0.78	-0.32*	0.73	0.72*	2.05	1.62*	5.05
Special Traf. Enf. Program	-1.44*	0.24	-0.96*	0.38	0.18	1.20	0.10	1.11
Other	-0.90	0.41	-0.07	0.93	2.66	14.30	2.87	17.64
Other Legal Variables								
Number of reasons for stop	1.50*	4.48	1.16*	3.19	0.02	1.02	-0.51*	0.60
Evidence found during search	-0.33	0.72	-1.26*	0.28	5.28*	196.37	-	-
Trooper Characteristics								
Male	-0.06	0.94	-0.07	0.93	0.60	1.82	0.43	1.54
Caucasian	0.40*	1.49	-0.24*	0.79	0.70	2.01	0.47	1.60
> 5 years experience	-0.02	0.98	-0.10	0.90	0.48*	1.62	-0.19	0.83
Education scale	0.06*	1.06	-0.07*	0.93	0.09	1.09	0.05	1.05
Patrol assignment	-0.96*	0.38	1.15*	3.16	-0.23	0.79	-1.64*	0.19
Rank of Trooper	-0.14*	0.87	0.14*	1.15	0.18	1.20	-0.03	0.97
Level 2 variables (municipality) (n=2,267)								
Total Pop ≥15 (Ln)	-0.06	0.94	0.10	1.11	-0.01	0.99	0.08	1.08
% Pop Male ≥15	-0.00	1.00	0.00	1.00	0.03	1.03	-0.00	1.00
% Pop Black ≥15	0.00	1.00	0.00	1.00	-0.00	1.00	0.01	1.01
% Pop Hispanic ≥15	-0.00	1.00	0.03	1.03	-0.06	0.94	0.00	1.00
Poverty Factor	-0.02	0.98	-0.04	0.96	0.08	1.08	-0.05	0.95
Resid. Mobility Factor	-0.00	1.00	-0.03	0.97	0.14	1.15	-0.05	0.95
Traffic/Travel Factor	-0.07	0.93	0.07	1.07	-0.06	0.94	0.03	1.03
Average Commute	-0.01	0.99	0.01	1.01	0.02	1.02	-0.00	1.00

NOTE: * $p \leq .0001$

In an effort to better control for the legal severity during traffic stops, additional analyses were performed that examined only those drivers who were stopped for speeding (see **Table 5.11**). Unlike other traffic offenses, the severity of speeding can be accurately measured as the miles per hour over the speed limit. That is, in cases of speeding, the severity of the offense is precise and easily measured. Likewise, other infractions can be controlled in the model by including infractions discovered after the stop for speeding is made. It is expected that if post-stop decisions were not disparate across racial, gender, and age groups, the coefficients for race, gender, and age not be statistically significant after directly controlling for the speed motorists were traveling and the number of other violations observed during the traffic stop. **Table 5.11** reports the findings for 221,331 traffic stops for speeding in 1,811 municipalities for which there was valid data on all of the variables included in the models.

Although the previous models examining all traffic stops indicated that drivers' race/ethnicity did not significantly predict citations and arrest, the analyses examining only speeding stops suggest that Black drivers are significantly *less* likely to receive a citation, but significantly *more* likely to be arrested compared to Caucasians. Similar to the analysis predicting searches in all traffic stops, Black and Hispanic drivers are also significantly more likely than Caucasians to be searched as a result of traffic stops for speeding. Note that these relationships exist even after controlling for the exact severity of the offense (i.e., amount over the speed limit) and the number of other violations committed. When stopped for speeding, Black and Hispanic motorists are 3.8 and 3.9 times more likely, respectively, to be searched compared to Caucasian drivers.

The influence of gender also remains relatively constant even after more accurately controlling for legal characteristics of the stop. That is, male drivers are significantly more likely to be the recipients of coercive actions (citations, arrests, and searches) and less likely to receive warnings compared to female drivers. Once again, the sizes of the odds ratios for the gender coefficients suggest these relationships are substantively important. For male drivers stopped for speeding, the odds of being issued citations, arrests, and searches are 1.2, 2.7, and 3.4 times higher compared to female drivers, respectively.

Table 5.11 HLM Analyses Predicting Troopers' actions during speeding stops ONLY

	Model 1: Warning		**Model 2: Citation**		**Model 3: Arrest**		**Model 4: Search**	
Variables: Level 1 variables (stop)(n=221,331)	Coeff.	Odds Ratio	Coeff.	Odds Ratio	Coeff.	Odds Ratio	Coeff.	Odds Ratio
Intercept	-0.88	0.41	2.02	7.54	-8.91*	0.00	-6.28*	0.00
Driver Characteristics								
Black	0.15*	1.16	-0.31*	0.73	0.65*	1.92	1.33*	3.78
Hispanic	-0.13	0.88	0.08	1.08	0.42	1.52	1.36*	3.90
Other Race	-0.26*	0.77	0.31*	1.36	-1.93	0.82	-0.16	0.85
Male	-0.07*	0.93	0.16*	1.17	0.99*	2.69	1.22*	3.39
Age	0.01*	1.01	-0.02*	0.98	-0.00	1.00	-0.05*	0.95
County resident	0.21*	1.23	-0.22*	0.80	0.55*	1.73	0.23	1.26
PA resident	0.20*	1.22	-0.08	0.92	0.28	1.32	-0.40*	0.67
Vehicle Characteristics								
No registration	0.38	1.46	-0.32	0.73	1.62	5.05	0.70	2.01
Number of Passengers	0.01	1.01	-0.04*	0.96	0.00	1.00	0.16*	1.17
Stop Characteristics								
Daytime	-0.30*	0.74	0.33*	1.39	-1.19*	0.30	-0.39*	0.68
Rush hour	0.03	1.03	0.04	1.04	-0.47	0.63	-0.17	0.84
Weekday	0.10*	1.11	-0.06	0.94	-0.41*	0.66	0.16	1.17
Summer	-0.12*	0.89	0.03	1.03	0.18	1.20	-0.02	0.98
Interstate	-0.59*	0.55	0.75*	2.12	-0.22	0.80	0.21	1.23
Other Legal Variables								
Amount over the speed limit	-0.13*	0.88	0.25*	1.28	0.05*	1.05	0.01	1.01
Number of reasons for stop	1.81*	6.11	0.40*	1.49	0.96*	2.61	0.74*	2.10
Evidence found during search	0.09	1.09	-1.58*	0.21	5.70*	298.87	-	-
Trooper Characteristics								
Male	0.05	1.05	-0.27	0.76	0.77	2.16	0.54	1.72
Caucasian	0.30*	1.35	-0.11	0.90	0.90	2.46	0.42	1.52
> 5 years experience	0.05	1.05	-0.18	0.84	0.38	1.46	-0.30	0.74
Education scale	0.08*	1.08	-0.10*	0.90	0.03	1.03	-0.03	0.97
Patrol assignment	-1.04*	0.35	1.36*	3.90	-0.64	0.53	-1.70*	0.18
Rank of Trooper	-0.08	0.92	0.18*	1.20	0.27	1.31	0.13	1.14
Level 2 variables (municipality) (n=1,811)								
Total Pop ≥15 (Ln)	-0.03	0.97	0.02	1.02	0.01	1.01	0.05	1.05
% Pop Male ≥15	-0.00	1.00	0.01	1.01	0.02	1.02	0.01	1.01
% Pop Black ≥15	0.02	1.02	-0.02	0.98	-0.03	0.97	0.01	1.01
% Pop Hispanic ≥15	-0.00	1.00	0.03	1.03	-0.03	0.97	-0.02	0.98
Poverty Factor	-0.05	0.95	0.07	1.07	0.05	1.05	-0.05	0.95
Resid. Mobility Factor	-0.03	0.97	-0.05	0.95	0.17	1.19	0.05	1.05
Traffic/Travel Factor	-0.05	0.95	0.03	1.03	0.06	1.06	0.02	1.02
Average Commute	-0.01	0.99	0.00	1.00	0.02	1.02	-0.02	0.98

NOTE: * $p \leq .0001$

Multivariate Models Summary

The bivariate and multivariate findings regarding post-stop outcomes reported in this section, though instructive, should not be considered definitive. As noted in Section I, there are a number of factors that might influence officer behavior which have not been captured on the Contact Data Report, and therefore cannot be included in the statistical analyses. This problem, known as specification error, is a limitation of all multivariate models used in social science research. It simply is not possible to measure all of the factors that could possibly influence officers' decision making during traffic stops. Therefore, the findings must be interpreted with this limitation in mind. Second, given the large number of cases department wide, smaller differences among groups are more likely to reach statistical significance. Therefore, it is more instructive to examine the log odds to assess substantive significance, rather than rely strictly on indicators of statistical significance.

With these limitations in mind, the findings from the hierarchical non-linear models suggest that, after statistically controlling for driver characteristics, vehicle characteristics, stop characteristics, community factors, the reason for the stop, other legal variables, and officer characteristics, the following relationships remain:

- The reason for the stop and legal characteristics associated with the stops are the substantively strongest predictors of post-stop outcomes. That is, the reason for the stop, the number of violations, and whether or not evidence was found during searches have the strongest influence over police decision making.

- When all traffic stops are considered, drivers' race /ethnicity does <u>not</u> have a significant influence over whether or not drivers receive written warnings, citations, or are arrested. This finding represents substantial improvement from the findings based on Year 1 data that indicated Black and Hispanic motorists were significantly more likely to be arrested compared to Caucasian drivers.

- After controlling for other relevant legal and extra legal factors, however, drivers' race/ethnicity does show a significant influence over whether or not searches are conducted. The odds of being searched are 3.1 and 3.0 times higher for Black and Hispanic drivers compared to Caucasian drivers, respectively.

- When only speeding traffic stops are examined, Hispanic drivers are not significantly more likely to be issued warnings, citations, or be arrested compared to Caucasians. In contrast, Black motorists stopped for speeding are significantly *less* likely to receive citations, but are 1.9 times *more* likely to be arrested compared to Caucasians. These relationships exist even after the amount over the speed limit, the number of additional offenses, and any evidence found during searches is considered. In addition, Black and Hispanic motorists are 3.8 and 3.9 times more likely than Caucasians to be searched during traffic stops for speeding.

- Male drivers are significantly more likely to receive adverse consequences (e.g., citations, arrests, searches) compared to female drivers. Specifically, the odds of citation, arrest, and search during all traffic stops are 1.2, 2.3, and 3.0 times greater for male drivers compared to female drivers, respectively. Likewise, the odds of citation, arrest, and search are increased by 1.2, 2.7 and 3.4 times for males stopped for speeding compared to females stopped for speeding, respectively.

- Drivers' age and residency have a somewhat mixed and substantively weak influence over post-stop outcomes.

- Individual trooper characteristics also have a somewhat mixed and substantively weak influence over post-stop outcomes.

- The characteristics of the municipality where the stop occurred do not significantly predict the any post-stop outcomes.

Based on the findings presented in the section, it is the conclusion of this report that some racial /ethnic and gender disparities exist in post-stop outcomes. The greatest racial and gender disparities occur in the decisions to search motorists. Therefore, Section VI specifically addresses search decisions and provides more detailed analyses to examine these racial / ethnic disparities.

COMPARISONS TO YEAR 1 FINDINGS

- Consistent with the findings in the Year 1 Report, the data collected for the Year 2 Report show that the reason for traffic stops and legal characteristics associated with these stops continue to be the strongest predictors of post-stop outcomes.

- Contrary to the findings of the Year 1 Report, the data collected for the Year 2 Report show that driver's race / ethnicity has no statistically significant influence over issuing formal warnings, citations, and arrests. That is, when other relevant factors are considered, Black and Hispanic drivers are <u>not</u> more likely than Caucasians to be issued formal warnings, citations, or arrests.

- Consistent with the Year 1 Report, the data collected for the Year 2 Report show that driver's race / ethnicity continues to have a significant influence over search decisions. Even after controlling for relevant legal and extralegal characteristics associated with traffic stops, Black and Hispanic drivers are approximately three times more likely to be searched than Caucasian drivers.

- Consistent with the Year 1 Report, the data collected for the Year 2 Report show that male drivers continue to be significantly more likely than female drivers to be cited, searched, and arrested. Female drivers continue to be significantly more likely than males to receive a warning.

- Consistent with the Year 1 Report, the data collected for the Year 2 Report show that driver's age and residency continue to have weak and mixed influences on post-stop outcomes.

- Consistent with the Year 1 Report, the data collected for the Year 2 Report show that individual Trooper characteristics continue to have weak and mixed influence on post-stop outcomes.

- Consistent with the Year 1 Report, the data collected for the Year 2 Report show that the characteristics of the locality of traffic stops have no significant influence on post-stop outcomes.

VI. SEARCHES AND SEIZURES

OVERVIEW

The material presented in this section is focused specifically on motor vehicle and person searches conducted during traffic stops. As reported in Section V, searches are the only post-stop outcomes conducted by PSP troopers that have unexplained racial and ethnic disparities. After statistically controlling for some of the other relevant legal and extralegal factors, Black and Hispanic drivers are approximately three times more likely than Caucasians to be searched. The purpose of the analyses presented in this section is to further examine searches and seizures conducted by PSP troopers.

Section VI begins with a description of search and seizure rates for the department as a whole, along with by Area, Troop, and Station. This information is documented in **Table 6.1**. Thereafter, the search rates and search success rates department wide are reported for different driver and trooper characteristics in **Table 6.2**.

Table 6.3 documents the different types of searches conducted by Department, Area, and Troop. For additional analyses, the types of searches are collapsed into three categories: Type 1 (mandatory), Type II (suspicion), and Type III (discretionary). Using these three search types, **Table 6.4** documents the search rates for different types of drivers and troopers.

Table 6.5 reports the different types of contraband seized by Department, Area, Troop, and Station. Thereafter, the search success rates are explored in detailed. Specifically, **Table 6.6** reports the search success rates for different types of searches at the department and area level. Likewise, **Table 6.7** displays the search success rates by department and area for the three collapsed search type categories. **Table 6.8** reports the search success rates for each of the three collapsed search type categories by driver and trooper characteristics.

Section VI concludes with a series of analyses focused specifically on consent searches. These analyses document the percent of drivers where a consent search is requested, the percent of drivers who give consent, the percent of searches based solely on consent, the percent of drivers searched for additional reasons after declining a consent search, and the search success rates of consent searches. Finally, analyses are presented in **Table 6.9** that examine differences in the types of motorists and troopers who give and get consent to search.

Section VI concludes with a summary of the main findings and a comparison of those findings to data examined for the Year 1 Report.

SEARCH RATES

As reported in Section V, less than one percent of all member-initiated traffic stops during the one-year period under review resulted in a search of the vehicle or motorist. Given the infrequency with which PSP Troopers conduct searches, it may seem unusual that an entire section of this report is dedicated to exploring searches and seizures. The physical and psychological intrusion of a person or vehicle search, however, merits further exploration despite the small percentage of officer-initiated traffic stops that involve such police action.

Furthermore, nationwide a concern is growing that searches conducted during police-initiated traffic stops could be used in a manner to profile particular types of drivers. Although searching motorists is a statistically infrequent event, it is a highly visible form of coercive police action that merits further scrutiny.

Table 6.1 below reports the total numbers of traffic stops, total number of searches conducted during those stops, the percentage of stops that result in a seizure, and the percentage of searches that result in a seizure of contraband. This information is provided for the department as a whole, followed by area, troop, and station. As shown in **Table 6.1**, the percentage of traffic stops conducted by PSP Troopers that result in a search of the driver or vehicle is very small (0.08%), and ranges from no searches conducted by Troopers assigned to Laporte Station, to a high of 3.4% of all traffic stops conducted by Troopers assigned to Media Station. Also note that 13.8% of the member-initiated traffic stops conducted by Canine officers resulted in a search.[10]

[10] PSP canine officers are examined separately due to the unique nature of their assignment. Thus, all traffic stops conducted by canine officers are not included in individual station, troop, or area totals.

Table 6.1 Search Rates & Search Success Rates by Department, Area, Troop, and Station (p. 1 of 3)

	Total # of Stops	Total # of Searches	% of Stops Resulting in Person or Vehicle Search	% of Searches Resulting in Seizure
PSP Dept	315,705	2,388	0.8	25.7
AREA I	107,464	712	0.7	28.9
TROOP H	21,236	292	1.4	30.5
Carlisle	4,890	52	1.1	13.5
Chambersburg	3,669	115	3.1	41.7
Gettysburg	2,070	10	0.5	20.0
Harrisburg	3,913	19	0.5	0.0
Lykens	924	7	0.8	28.6
Newport	1,513	6	0.4	50.0
York	4,257	83	1.9	32.5
TROOP J	9,604	145	1.5	28.3
Avondale	3,648	53	1.5	24.5
Embreeville	2,647	36	1.4	30.6
Ephrata	1,230	14	1.1	35.7
Lancaster	2,079	42	2.0	28.6
TROOP L	10,236	71	0.7	25.4
Frackville	1,295	22	1.7	31.8
Hamburg	1,706	2	0.1	0.0
Jonestown	3,018	34	1.1	29.4
Reading	2,887	8	0.3	0.0
Schuylkill Haven	1,330	5	0.4	20.0
TROOP T	66,388	204	0.3	28.4
Bowmansville	9,035	11	0.1	9.1
Everett	9,316	22	0.2	31.8
Gibsonia	8,117	23	0.3	26.1
King of Prussia	7,271	5	0.1	80.0
New Stanton	7,642	10	0.1	10.0
Newville	10,962	56	0.5	23.2
Pocono	5,496	4	0.1	0.0
Somerset (T)	8,521	72	0.8	36.1
AREA II	39,171	171	0.4	21.6
TROOP F	21,386	70	0.3	20.0
Coudersport	1,767	7	0.4	14.3
Emporium	1,311	1	0.1	0.0
Lamar	3,594	9	0.3	33.3
Mansfield	1,621	1	0.1	100.0
Milton	2,290	9	0.4	0.0
Montoursville	5,188	25	0.5	20.0
Selinsgrove	4,112	13	0.3	23.1
Stonington	1,503	5	0.3	20.0

Table 6.1 Search Rates & Search Success Rates by Department, Area, Troop, and Station (p. 2 of 3)

	Total # of Stops	Total # of Searches	% of Stops Resulting in Person or Vehicle Search	% of Searches Resulting in Seizure
AREA II (cont.)				
TROOP P	8,786	49	0.6	18.4
Laporte	1,611	0	0.0	0.0
Shickshinny	1,124	1	0.1	0.0
Towanda	1,885	19	1.0	10.5
Tunkhannock	1,465	8	0.5	37.5
Wyoming	2,701	21	0.8	19.0
TROOP R	8,999	52	0.6	26.9
Blooming Grove	2,867	15	0.5	33.3
Dunmore	2,091	11	0.5	0.0
Gibson	1,296	4	0.3	25.0
Honesdale	2,745	22	0.8	36.4
AREA III	62,772	382	0.6	26.4
TROOP A	18,464	78	0.4	26.9
Ebensburg	3,228	12	0.4	50.0
Greensburg	5,699	10	0.2	10.0
Indiana	4,229	21	0.5	19.0
Kiski Valley	3,019	12	0.4	25.0
Somerset (A)	2,289	23	1.0	30.4
TROOP B	22,187	173	0.8	17.9
Belle Vernon	3,553	12	0.3	16.7
Pittsburgh	6,828	54	0.8	7.4
Uniontown	3,884	53	1.4	18.9
Washington	5,260	36	0.7	27.8
Waynesburg	2,662	18	0.7	27.8
TROOP G	22,121	131	0.6	37.4
Bedford	3,335	10	0.3	60.0
Hollidaysburg	3,225	61	1.9	45.9
Huntingdon	2,490	11	0.4	27.3
Lewistown	2,727	19	0.7	31.6
McConnellsburg	2,386	9	0.4	22.2
Philipsburg	2,756	6	0.2	50.0
Rockview	5,202	15	0.3	6.7

Table 6.1 Search Rates & Search Success Rates by Department, Area, Troop, and Station (p. 3 of 3)

	Total # of Stops	Total # of Searches	% of Stops Resulting in Person or Vehicle Search	% of Searches Resulting in Seizure
AREA IV	57,557	306	0.5	22.9
TROOP C	24,374	105	0.4	14.3
Clarion	5,523	43	0.8	9.3
Clearfield	5,590	16	0.3	12.5
Dubois	3,491	10	0.3	10.0
Kane	1,927	11	0.6	18.2
Punxsutawney	3,301	8	0.2	50.0
Ridgway	2,429	11	0.5	9.1
Tionesta	2,113	6	0.3	16.7
TROOP D	16,650	118	0.7	27.1
Beaver	2,661	11	0.4	18.2
Butler	5,574	29	0.5	34.5
Kittanning	3,295	34	1.0	44.1
Mercer	2,787	37	1.3	13.5
New Castle	2,333	7	0.3	0.0
TROOP E	16,533	83	0.5	27.7
Corry	1,114	3	0.3	0.0
Erie	4,535	11	0.2	9.1
Franklin	2,450	11	0.4	18.2
Girard	4,375	29	0.7	24.1
Meadville	2,692	22	0.8	50.0
Warren	1,367	7	0.5	28.6
AREA V	45,690	468	1.0	22.2
TROOP K	12,888	274	2.1	24.5
Media	4,793	161	3.4	26.1
Philadelphia	3,645	65	1.8	26.2
Skippack	4,450	48	1.1	16.7
TROOP M	17,298	141	0.8	19.9
Belfast	2,976	14	0.5	14.3
Bethlehem	2,726	19	0.7	31.6
Dublin	4,117	18	0.4	16.7
Fogelsville	4,737	53	1.1	18.9
Trevose	2,742	37	1.3	18.9
TROOP N	15,504	53	0.3	17.0
Bloomsburg	3,349	2	0.1	0.0
Fern Ridge	2,609	8	0.3	12.5
Hazleton	2,965	11	0.4	9.1
Lehighton	2,558	8	0.3	12.5
Swiftwater	4,023	24	0.6	25.0
Canine Unit	2,280	314	13.8	29.9

While variation in search rates across departmental jurisdictions is important to consider, it is also important to examine the search and seizure patterns of the department as a whole. Specifically, differences in search and seizure rates based on drivers' characteristics and Trooper characteristics for the whole department must be examined. Therefore, **Table 6.2** below reports the number of stops, number of searches, percentage of stops that resulted in a search, and the percentage of searches that resulted in a seizure for drivers with different races/ethnicities, genders, ages, and state of residencies. Likewise, **Table 6.2** reports differences in search rates and search success rates for Troopers that vary based on their race, gender, experience, and education.

Table 6.2. Search Rates & Search Success Rates by Driver and Trooper Characteristics

	Total # of Stops	Total # of Searches	% of Stops Resulting in Person or Vehicle Search	% of Searches Resulting in Seizure
All Drivers	315,705	2388	0.8	25.7
By Drivers' Characteristics				
Caucasian Driver	268,940	1518	0.6*	30.0*
Black Driver	24,179	532	2.2	21.2
Hispanic Driver	9,371	275	2.9	14.2
Other Driver	11,211	53	0.5	9.4
Male Driver	220,848	2116	1.0*	25.6
Female Driver	94,358	266	0.3	26.7
Driver 25 years old or under	109,879	1265	1.2*	28.8*
Driver over 25 years old	205,704	1118	0.5	22.3
Driver PA Resident	231,944	1652	0.7*	29.0*
Driver Non-PA Resident	83,761	736	0.9	18.3
By Troopers' Characteristics				
Caucasian Trooper	284,854	2232	0.8*	25.0
Non-Caucasian Trooper	30,939	152	0.5	25.8
Male Trooper	303,996	2329	0.8*	25.9
Female Trooper	10,955	51	0.5	15.7
Less than 5 years experience	9,635	772	0.8	22.4
5 years experience or more	218,895	1612	0.7	27.3
No College	121,485	825	0.7*	23.6
2 Year Degree	69,941	512	0.7	32.2
4 Year Degree	121,091	1038	0.9	24.0

Note: * $p > .001$. The number of stops indicated for each group may not add up to the total number of stops (315,705) due to missing data on the particular variables examined.

The results presented in **Table 6.2** above indicate that there are statistically significant differences in the search rates and search success rates across groups. Specifically, Black and Hispanic motorists, males, drivers under 25 years old, and non-Pennsylvania residents, are significantly more likely to be searched compared to Caucasian motorists, females, drivers 25 years or older, and Pennsylvania residents, respectively. In addition, drivers stopped by Caucasian Troopers, male Troopers, and Troopers with a 4-year college degree are significantly more likely to be searched compared to drivers stopped by non-Caucasian Troopers, female Troopers, and Troopers with less than a 4-year college degree. As noted in Section V, however, caution must be used when interpreting these findings. Tests of statistical significance are influenced by the 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. In addition, 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).

In addition, the search success rates are statistically significantly different for drivers of different races/ethnicities, ages, and residencies. There are no significant differences, however, in the search success rates across different groups of Troopers. Although the differences in male and female Troopers' search success rates appear large, the relationships are not statistically significant, due in part to the small number of searches conducted by female officers. The findings regarding search success rates are more fully explored later in this section.

TYPES OF SEARCHES

Table 6.3 documents the number of searches and the percentage of searches for each reason indicated on the Contact Data Report (e.g., consent, drug odor, plain view, incident to arrest, Canine alert, inventory, reasonable suspicion/ probable cause, warrant, and other) by department, area, and troop. Troopers may have indicated that a search was conducted for multiple reasons. As a result, the sum of percentages across search categories reported in **Table 6.3** may exceed 100%. In addition, the last column in **Table 6.3** indicates the percentage of searches that were conducted based only on drivers' consent. That is, 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. Specific information regarding the reason for the search is not provided at the station level due to the small number of searches conducted in many stations. Also note that the category of search warrant is excluded from this table because this information is not available for the entire data collection period.[11]

As shown in **Table 6.3**, 66.2% of the motorists at the department level gave their consent to be searched. A smaller percentage of searched drivers, however, were searched based *solely* on consent (45.6%). The second most prevalent reason for a search was the odor of drugs (15.4%) followed by reasonable suspicion or probable cause (13.5% of searches), inventory (8.0%),

[11] As indicated previously, the "warrant" category was added to the Contact Data Report on October 1, 2003 – five months after the data collection for Year 2 was initiated.

incident to arrest (7.6%), plain view (7.1%), and Canine alerts (2.1%). For 1.1% of searches, no specific reason was supplied (e.g., the "other" category, of missing data).

Table 6.3 also illustrates the different reasons for searches across areas and troops. Note that the Canine Unit is examined separately due to the large number of searches conducted by these Troopers. As shown in this table, the reasons for searches differ somewhat across areas, troops, and stations. For example, 72.5% of searches conducted in Area IV were based on consent, compared to only 54.9% of searches conducted in Area V.

Table 6.3 Reasons for Search by Department, Area, Troop, and Station

	# of Searches	% Consent	% Drug Odor	% Plain View	% Incident to Arrest	% K-9 Alert	% Inventory	% Reas. Susp./ Prob. Cause	% Other	% Consent Only
PSP Dept.*	2,388	66.2	15.4	7.1	7.6	2.1	8.0	13.5	5.4	45.6
AREA I	712	63.3	17.3	7.4	9.0	0.7	7.4	14.2	3.5	44.4
Troop H	292	64.4	19.5	9.6	9.9	1.0	5.1	11.6	3.8	46.2
Troop J	145	49.7	13.8	5.5	12.4	0.0	24.1	9.7	1.4	42.1
Troop L	71	63.4	18.3	5.6	8.5	1.4	0.0	12.7	2.8	46.5
Troop T	204	71.6	16.2	6.4	5.4	0.5	1.5	21.6	4.9	42.6
AREA II	171	67.8	15.2	5.3	2.9	2.3	1.8	5.8	2.9	59.6
Troop F	70	68.6	18.6	8.6	4.3	4.3	0.0	5.7	5.7	51.4
Troop P	49	65.3	8.2	2.0	4.1	0.0	6.1	6.1	0.0	65.3
Troop R	52	69.2	17.3	3.8	0.0	1.9	0.0	5.8	1.9	65.4
AREA III	382	64.4	15.2	10.5	10.2	1.3	1.3	17.3	3.1	46.3
Troop A	78	60.3	23.1	10.3	9.0	5.1	3.8	15.4	2.6	41.0
Troop B	173	78.6	12.1	2.9	9.2	0.6	0.0	11.6	1.2	61.8
Troop G	131	48.1	14.5	20.6	12.2	0.0	1.5	26.0	6.1	29.0
AREA IV	306	72.5	16.3	6.9	7.2	1.6	0.7	8.2	5.6	55.9
Troop C	105	74.3	5.7	5.7	8.6	2.9	0.0	9.5	6.7	60.0
Troop D	118	79.7	22.0	7.6	5.9	1.7	0.8	5.1	2.5	60.2
Troop E	83	60.2	21.7	7.2	7.2	0.0	1.2	10.8	8.4	44.6
AREA V	468	54.9	15.0	6.8	9.6	0.6	21.2	8.5	1.7	40.6
Troop K	274	56.6	19	7.7	7.3	0.4	27.7	6.9	1.5	38.3
Troop M	141	52.5	8.5	4.3	15.6	1.4	16.3	9.9	2.8	43.3
Troop N	53	52.8	11.3	9.4	5.7	0.0	0.0	13.2	0.0	45.3
Canine	314	88.0	13.0	4.0	2.0	9.0	1.0	26.0	20.0	40.0

* The total number of searches for the department includes 34 searches resulting from special enforcement projects and 2 searches with invalid station codes. These searches are not included in Area or Troop totals.

While examining the specific reasons for a search is instructive, this information is better analyzed 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 collective. For the analyses reported in **Table 6.4** below, searches were divided into three categories based on the presumed level of officer discretion for different situations. The first search category (Type I) includes searches that are required by PSP policy and therefore, mandatory for officers to perform. Type I searches include searches incident to arrest, based on a pre-existing warrant, and inventory searches. The second search category (Type II) includes searches that are not mandatory, but rather are based on suspicion and officer discretion. Specifically, Type II searches include plain view searches, canine alert searches, and drug odor searches. The third search category (Type III) includes searches that are likely the most discretionary for officers. Type III searches include those based only on consent, reasonable suspicion or probable cause, and searches for "other" or "unknown" reasons.[12] 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 reasonable suspicion [Type III], it was defined as a Type II search). Therefore, the analyses below examining the success rates for Type I, II, and II searches are mutually exclusive.

The influences of drivers' characteristics and Troopers' characteristics are examined within these three categories of searches and are reported in **Table 6.4**. The results suggest that larger percentages of Black and Hispanic searched motorists are searched for mandatory reasons (Type I searches), compared to Caucasian drivers. In addition, a larger percentage of Caucasian drivers are searched based on suspicion (Type II searches) compared to minority drivers. In the case of the most discretionary types of searches (Type III searches), relatively equivalent percentages of Caucasian, Black, and Hispanic motorists are searched, however, a significantly larger proportion of drivers in "other" racial groups are searched for more discretionary reasons.

Similar reasons for searches are shown for male and female drivers, although a slightly larger percentage of female drivers were searched for more discretionary reasons compared to male drivers (64.8% of female searches, compared to 60.5% of male searches). Searches of younger and older drivers also varied for mandatory and suspicion searches (Types 1 & II). A larger percentage of drivers under 25 years old were searched for reasons of suspicion, but a smaller percentage was searched for mandatory reasons, compared to drivers 25 years old or older. The use of discretionary searches, however, did not significantly vary by drivers' age. There were also significant differences in the types of searches conducted for Pennsylvania and non-Pennsylvania residents. Smaller percentages of Pennsylvania residents were searched for mandatory (Type 1) and suspicion (Type II) reasons, but a larger percentage was searched for discretionary reasons, compared to non-Pennsylvania residents. That is, contrary to common perceptions, out-of-state drivers are significantly less likely to be searched for discretionary reasons compared to drivers who reside in Pennsylvania.

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[12] Of the 2,388 searches conducted, 130 (5.4%) were for "other" unspecified reasons, while 133 (5.6%) did not indicate any reason for the search. The other category and the missing data have been combined into one category representing all unknown reasons for the search (n=263 searches, 11.0% of all searches). These searches are included in the Type III (discretionary) search category.

The differences in the reasons for search based on Troopers' characteristics, however, are minimal. That is, it appears that there are no substantively significant differences in the percentages of searches conducted for mandatory, suspicion, and discretionary reasons across Troopers' race, gender, experience, and education.

Table 6.4 Reasons for Search (by search type) by Driver and Trooper Characteristics

	Total # of Searches	% Mandatory (Type I) Searches	% Suspicion (Type II) Searches	% Discretionary (Type III) Searches
All Drivers	2,388	15.1	20.5	64.4
By Drivers' Characteristics				
Caucasian Driver	1,518	13.3	22.6	64.1
Black Driver	532	18.0	19.9	62.0
Hispanic Driver	275	20.7	13.1	66.2
Other Driver	53	9.4	3.8	86.8
Male Driver	2,116	16.9	22.6	60.5
Female Driver	266	14.9	20.3	64.8
Driver 25 years old or under	1,265	12.3	23.4	64.3
Driver over 25 years old	1,118	18.2	17.3	64.6
Driver PA Resident	1,652	8.0	14.4	77.6
Driver Non-PA Resident	736	18.2	23.2	58.6
By Troopers' Characteristics				
Caucasian Trooper	2,232	14.9	20.5	64.6
Non-Caucasian Trooper	152	17.1	20.4	62.5
Male Trooper	2,329	15.1	20.4	64.5
Female Trooper	51	15.7	23.5	60.8
Less than 5 years experience	772	15.8	16.8	67.4
5 years experience or more	1,612	14.7	22.3	63.0
No College	825	15.4	23.4	61.2
2 Year Degree	512	10.9	22.5	66.6
4 Year Degree	1,038	17.0	17.1	65.9

TYPES OF SEIZURES

Table 6.5 documents the types of evidence and/or contraband confiscated during searches conducted by PSP Troopers. For the second year of data collection, there were 871 seizures of contraband resulting from the 2,388 searches (25.7% of the searches resulted in seizing contraband). A majority of the contraband seized were drug (46.7%), alcohol (11.9%), or cash (18.0%) related. Approximately 22.7% of the evidence seized was categorized as "other."[13] Note that a single search could produce multiple types of contraband seized; therefore, the additive totals in the columns in Table 6.5 may exceed 100%. **Table 6.5** also documents the differences in the types of evidence seized across areas and troops. The trend displayed at the department level is fairly consistent across the area and troop level. More fluctuation is evident at the station level, particularly in locations where the number of seizures that occurred is very small.

[13] It is not possible to ascertain what types of evidence are included in this group because the scanner does not record the information and the actual forms (where Troopers may write in the information) have been destroyed as per the contractual agreement with the Pennsylvania State Police.

Table 6.5. Types of Evidence Seized by Department, Area, Troop, and Station (p.1 of 4)

	# of Seizures	% Cash	% Drugs	% Vehicle	% Weapons	% Stolen Prop.	% Alcohol	% Other
PSP Dept.*	871	18.0	46.7	6.0	8.5	1.5	11.9	22.7
AREA I	206	7.3	66.0	6.8	6.3	1.5	14.6	15.5
Troop H	89	4.5	71.9	3.4	6.7	2.2	20.2	7.9
Carlisle	7	14.0	71.0	14.0	14.0	0.0	29.0	0.0
Chambersburg	48	4.0	77.0	0.0	4.0	2.0	19.0	6.0
Gettysburg	2	0.0	0.0	0.0	50.0	0.0	0.0	50.0
Harrisburg	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lykens	2	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Newport	3	0.0	67.0	0.0	0.0	33.0	33.0	0.0
York	27	4.0	67.0	7.0	7.0	0.0	22.0	11.0
Troop J	41	2.4	73.2	7.3	4.9	0.0	7.3	17.1
Avondale	13	8.0	77.0	0.0	8.0	0.0	15.0	8.0
Embreeville	11	0.0	64.0	9.0	9.0	0.0	9.0	18.0
Ephrata	5	0.0	20.0	40.0	0.0	0.0	0.0	80.0
Lancaster	12	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Troop L	18	5.6	33.3	11.1	5.6	5.6	33.3	22.2
Frackville	7	0.0	29.0	14.0	0.0	0.0	29.0	29.0
Hamburg	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jonestown	10	10.0	40.0	10.0	10.0	0.0	40.0	20.0
Reading	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Schuylkill Haven	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Troop T	58	15.5	62.1	10.3	6.9	0.0	5.2	24.1
Bowmansville	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Everett	7	14.0	71.0	0.0	0.0	0.0	14.0	43.0
Gibsonia	6	0.0	33.0	0.0	0.0	0.0	0.0	67.0
King of Prussia	4	0.0	75.0	0.0	0.0	0.0	0.0	25.0
New Stanton	1	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Newville	13	23.0	46.0	15.0	8.0	0.0	8.0	15.0
Pocono	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Somerset (T)	26	15.0	73.0	8.0	12.0	0.0	4.0	15.0

Table 6.5. Types of Evidence Seized by Department, Area, Troop, and Station (p.2 of 4)

	# of Seizures	% Cash	% Drugs	% Vehicle	% Weapons	% Stolen Prop.	% Alcohol	% Other
AREA II	37	2.7	51.4	5.4	13.5	0.0	13.5	29.7
Troop F	14	7.1	57.1	14.3	7.1	0.0	14.3	21.4
Coudersport	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Emporium	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lamar	3	0.0	0.0	67.0	0.0	0.0	33.0	33.0
Mansfield	1	0.0	100.0	0.0	100.0	0.0	0.0	100.0
Milton	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montoursville	5	20.0	60.0	0.0	0.0	0.0	0.0	20.0
Selinsgrove	3	0.0	67.0	0.0	0.0	0.0	33.0	0.0
Stonington	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Troop P	9	0.0	66.7	0.0	22.2	0.0	11.1	11.1
Laporte	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shickshinny	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Towanda	2	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Tunkhannock	3	0.0	67.0	0.0	33.0	0.0	33.0	0.0
Wyoming	4	0.0	50.0	0.0	25.0	0.0	0.0	25.0
Troop R	14	0.0	35.7	0.0	14.3	0.0	14.3	50.0
Blooming Grove	5	0.0	60.0	0.0	20.0	0.0	20.0	20.0
Dunmore	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gibson	1	0.0	0.0	0.0	100.0	0.0	0.0	100.0
Honesdale	8	0.0	25.0	0.0	0.0	0.0	13.0	63.0
AREA III	101	8.9	63.4	3.0	8.9	1.0	23.8	9.9
Troop A	21	23.8	61.9	9.5	9.5	0.0	19.0	14.3
Ebensburg	6	33.0	67.0	17.0	0.0	0.0	33.0	0.0
Greensburg	1	100.0	100.0	0.0	100.0	0.0	0.0	0.0
Indiana	4	25.0	75.0	25.0	25.0	0.0	0.0	0.0
Kiski Valley	3	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Somerset (A)	7	14.0	29.0	0.0	0.0	0.0	29.0	43.0

Table 6.5. Types of Evidence Seized by Department, Area, Troop, and Station (p.3 of 4)

	# of Seizures	% Cash	% Drugs	% Vehicle	% Weapons	% Stolen Prop.	% Alcohol	% Other
Troop B	31	9.7	67.7	3.2	6.5	0.0	16.1	6.5
Belle Vernon	2	50.0	50.0	0.0	0.0	0.0	0.0	0.0
Pittsburgh	4	25.0	100.0	0.0	0.0	0.0	0.0	0.0
Uniontown	10	0.0	70.0	10.0	10.0	0.0	10.0	0.0
Washington	10	10.0	70.0	0.0	10.0	0.0	10.0	20.0
Waynesburg	5	0.0	40.0	0.0	0.0	0.0	60.0	0.0
Troop G	49	2.0	61.2	0.0	10.2	2.0	30.6	10.2
Bedford	6	0.0	50.0	0.0	17.0	17.0	33.0	17.0
Hollidaysburg	28	4.0	57.0	0.0	14.0	0.0	25.0	14.0
Huntingdon	3	0.0	100.0	0.0	0.0	0.0	67.0	0.0
Lewistown	6	0.0	50.0	0.0	0.0	0.0	50.0	0.0
McConnellsburg	2	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Philipsburg	3	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Rockview	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0
AREA IV	70	7.1	47.1	7.1	11.4	1.4	24.3	25.7
Troop C	15	13.3	40.0	13.3	6.7	6.7	46.7	13.3
Clarion	4	25.0	75.0	50.0	25.0	0.0	25.0	0.0
Clearfield	2	50.0	50.0	0.0	0.0	0.0	50.0	0.0
Dubois	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Kane	2	0.0	0.0	0.0	0.0	50.0	0.0	50.0
Punxsutawney	4	0.0	50.0	0.0	0.0	0.0	50.0	25.0
Ridgway	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Tionesta	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Troop D	32	6.3	65.6	6.3	12.5	0.0	12.5	12.5
Beaver	2	50.0	50.0	0.0	0.0	0.0	0.0	0.0
Butler	10	0.0	80.0	0.0	0.0	0.0	20.0	20.0
Kittanning	15	0.0	73.0	7.0	20.0	0.0	7.0	7.0
Mercer	5	20.0	20.0	20.0	20.0	0.0	20.0	20.0
New Castle	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 6.5. Types of Evidence Seized by Department, Area, Troop, and Station (p.4 of 4)

	# of Seizures	% Cash	% Drugs	% Vehicle	% Weapons	% Stolen Prop.	% Alcohol	% Other
Troop E	23	4.3	26.1	4.3	1.3	0.0	26.1	52.2
Corry	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Erie	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Franklin	2	0.0	50.0	0.0	0.0	0.0	50.0	50.0
Girard	7	14.0	43.0	14.0	14.0	0.0	43.0	0.0
Meadville	11	0.0	18.0	0.0	18.0	0.0	0.0	91.0
Warren	2	0.0	0.0	0.0	0.0	0.0	100.0	0.0
AREA V	104	3.8	59.6	8.7	5.8	4.8	13.5	19.2
Troop K	67	3.0	61.2	6.0	7.5	6.0	13.4	17.9
Media	42	5.0	60.0	5.0	7.0	10.0	14.0	19.0
Philadelphia	17	0.0	65.0	12.0	12.0	0.0	6.0	12.0
Skippack	8	0.0	63.0	0.0	0.0	0.0	25.0	25.0
Troop M	28	3.6	50.0	17.9	0.0	0.0	10.7	25.0
Belfast	2	50.0	50.0	0.0	0.0	0.0	0.0	0.0
Bethlehem	6	0.0	83.0	0.0	0.0	0.0	17.0	0.0
Dublin	3	0.0	33.0	0.0	0.0	0.0	0.0	100.0
Fogelsville	10	0.0	70.0	0.0	0.0	0.0	10.0	30.0
Trevose	7	0.0	0.0	71.0	0.0	0.0	14.0	14.0
Troop N	9	11.1	77.8	0.0	11.1	11.1	22.2	11.1
Bloomsburg	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fern Ridge	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Hazleton	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Lehighton	1	0.0	100.0	0.0	100.0	0.0	0.0	100.0
Swiftwater	6	17.0	100.0	0.0	0.0	0.0	17.0	0.0
Canine	94	13.8	78.7	7.4	12.8	2.1	4.3	1.6

* The total number of seizures for the department includes two seizures with invalid station codes. These searches are not included in Area or Troop totals.

SEARCH SUCCESS RATES

As described in the Year 1 Final Report, the discovery of contraband during person and vehicle searches is an important outcome to consider when examining potential bias by police officers. Often referred to as search "success rates," or "hit rates" (i.e., the percent of searches conducted that produce contraband and/or resulted in arrest), some scholars and police officials have argued that searches of minorities are more likely to produce contraband compared to searches of Caucasians (Herszenhorn, 2000; Knowles, Persico, & Todd, 2001). Others have argued that minority citizens are not more likely to be carrying illegal substances, and that a comparison of search success rates shows that racial profiling policies are ineffective (Cole, 1999; Harris, 2002).

Researchers have typically utilized the "outcome test" to identify racial and ethnic disparities by examining differential outcomes in search success rates. 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, 2002) 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 hit rates.

As documented in the Year 1 Final Report, based on PSP policies, Troopers have little discretion over some types of searches (e.g., inventory searches, searches incident to arrest, searches based on a preexisting warrant). Furthermore, it is likely that different reasons for searches might lead to varying search success rates. **Table 6.6** explores this possibility. Specifically, **Table 6.6** illustrates the overall search success rate, and the success rates for each specific type of search at both the department and area levels. Department-wide, the overall search success rate is 25.7%. This rate, however, varies dramatically across search types as exemplified by the range from 81.7% for plain view searches to 14.5% for consent only searches. Searches based on consent, "other" unspecified reason, and inventory are the least likely to be successful in terms of discovering contraband, with success rates at 22.0%, 20.8%, and 18.3%, respectively. Searches likely to be moderately successful include: incident to arrest (38.5%), reasonable suspicion / probable cause (41.8%), odor of drugs or alcohol (52.4%), and canine alerts (54.9%). These patterns remain relatively consistent across geographical areas within the department.

Table 6.6 Search Success Rates by Reasons for Search for Department and Areas

	Overall Search Success Rate	Consent Success Rate	Drug Odor Success Rate	Plain View Success Rate	Incid. to Arrest Success Rate	Canine Alert Success Rate	Inventory Success Rate	Reas. Susp./ PC Success Rate	Other Reason Success Rate	Consent Only Success Rate
PSP Dept.	25.7	22.0	52.4	81.7	38.5	54.9	18.3	41.8	20.8	14.5
Area I	28.9	26.2	59.3	92.5	40.6	40.0*	18.9	41.6	20.0*	18.4
Area II	21.6	14.7	50.0	66.7	60.0*	50.0*	0.0*	40.0	20.0*	11.8
Area III	26.4	19.9	39.7	82.5	41.0	80.0*	20.0*	42.4	33.3	13.0
Area IV	22.9	17.6	58.0	100.0	36.4	60.0*	50.0*	32.0	11.8	8.8
Area V	22.2	17.5	44.3	62.5	31.1	0.0*	21.2	35.0	25.0	14.2
Canine	29.9	28.3	60.0	64.3	50.0	58.6	50.0*	48.1	20.6	17.3

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. The category of “warrant” has been excluded from this table because information was not captured for an entire year period.
* Five or fewer searches conducted for this reason; interpret percentage with caution.

Information regarding the search success rates of different types of search is further summarized below. In Table 6.7, the search success rates for each type of search (collapsed by level of officer discretion) are displayed. As illustrated in this table, suspicion searches (i.e., searches based on canine alerts, plain view, and drug odor) are the most successful in terms of recovering contraband, while discretionary searches (i.e., searches based on reasonable suspicion, only consent, or some other unknown reason) are the least successful. Department-wide, 57.3% of suspicion searches resulted in the discovery of contraband, compared to only 14.8% of discretionary searches.

Table 6.7. Search Type Success Rates by Department and Areas

	Overall Search Success Rate	Type 1: Mandatory Searches Success Rate	Type 2: Suspicion Searches Success Rate	Type 3: Discretionary Searches Success Rate
PSP Dept.	25.7	29.4	57.3	14.8
Area I	28.9	30.8	64.5	16.6
Area II	21.6	37.5	57.1	10.9
Area III	26.4	37.2	53.4	15.1
Area IV	22.8	44.0	66.7	7.8
Area V	22.2	23.9	44.8	13.4
Canine	29.9	66.7	54.0	21.2

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.

It is also important to examine whether the search success rates for different types of searches varies based on drivers' and Troopers' characteristics. These findings are reported in **Table 6.8** below. As shown, there are significant differences in the search success rates across different types of searches for racial and ethnic groups. Specifically, mandatory searches of Hispanic drivers are the least likely to be successful in the discovery of contraband, compared to all other racial/ethnic groups. In contrast, searches that are based on suspicion and discretion are the most successful for Caucasian drivers, compared to all other racial/ethnic groups. For example, 64.7% of discretionary searches of Caucasian drivers are successful, compared to only 37.7% of searches of Black drivers, and 44.4% of searches of Hispanic drivers. Likewise, 17.2% of discretionary searches of Caucasian drivers result in the discovery of contraband, compared to 13.0% of searches of Black drivers and only 8.2% of searches of Hispanic drivers. Overall, the search success rate for Caucasian drivers is double that of Hispanic drivers (30.0% compared to 14.2%, respectively).

In comparison, only slight differences are found when examining search success rates for male and female drivers, and younger and older drivers. Residency of the driver does show significant differences in search success rates. Both suspicion and discretionary searches of motorists who reside in Pennsylvania were significantly more successful in the seizure of contraband compared to searches of non-Pennsylvania residents. That is, contrary to conventional police wisdom, searches of out-of-state residents do not produce more fruitful seizures.

Table 6.8. Search Type Success Rates by Citizen and Trooper Characteristics

	Total # Searches	Overall Search Success Rate	% Mandatory (Type I) Searches	% Suspicion (Type II) Searches	% Discretionary (Type III) Searches
All Drivers	2,388	25.7	29.4	57.3	14.8
By Drivers' Characteristics					
Caucasian Driver	1,518	30.0***	32.7*	64.7***	17.2**
Black Driver	532	21.2	31.3	37.7	13.0
Hispanic Driver	275	14.2	14.0	44.4	8.2
Other Driver	53	9.4	40.0	50.0	4.3
Male Driver	2,116	25.6	22.2	57.1	14.7
Female Driver	266	26.7	30.5	58.3	16.1
Driver 25 years old or under	1,265	28.8	32.9	59.5	16.8*
Driver over 25 years old	1,118	22.3	26.6	53.9	12.6
Driver PA Resident	1,652	29.0***	28.6	59.8*	16.9*
Driver Non-PA Resident	736	18.3	33.9	48.1	11.2
By Troopers' Characteristics					
Caucasian Trooper	2,232	25.8	29.1	58.1	14.7
Non-Caucasian Trooper	152	25.0	30.8	45.2	16.8
Male Trooper	2,329	25.9	29.6	57.2	15.1
Female Trooper	51	15.7	12.5	50.0	3.2
Less than 5 years experience	772	22.4*	23.0	59.2	13.1
5 years experience or more	1,612	27.3	32.5	56.5	15.7
No College	825	23.6**	24.4	52.3	12.5
2 Year Degree	512	32.2	46.4	64.3	19.1
4 Year Degree	1,038	24.0	27.3	57.9	14.3

NOTE: * $p > .05$, ** $p > .01$, *** $p > .001$

Based on the analyses presented above, it appears that the searches conducted for mandatory reasons (i.e., Type I searches) have success rates that are relatively equivalent across racial groups, with the exception of Hispanics. When drivers are searched for suspicion and discretionary reasons (Type II and III searches), however, Caucasian motorists are significantly more likely to be in possession of contraband compared to other racial/ethnic groups. Hispanic motorists are significantly less likely to be in possession of contraband compared to other racial groups across all search categories. Thus, although Black and Hispanic drivers are searched at higher rates compared to Caucasian drivers, PSP Troopers find less contraband during searches of minority drivers compared to searches of Caucasian drivers.

As noted in the Year 1 Report, the differential search rates and search success rates of minorities drivers appears to be a department-wide issue for concern, although the gap between the percentages of Caucasian drivers searched compared to minority drivers searched varies dramatically across areas, troops, and stations. As shown in **Table 6.2**, searches of Black drivers conducted by Troopers in Area II are more productive (in terms of seizing evidence) than searches of Caucasian motorists. In comparison, Areas IV and V (and in particular, Troops C, D, K and M – see **Table 6.3**) have the largest disparity in their search rates of minority drivers. Likewise, the percentages of searches resulting in the discovery of contraband of minorities are approximately half of the percentage for Caucasian drivers in these areas and troops. Station level differences are also reported in **Table 6.4,** however, the percentages of searches resulting in seizures are not included in this table. At the station level, the number of searches is too small for meaningful comparison.

Comparisons of Search Success Rates Across State Agencies

The literature review below reports empirical findings for 12 state police and highway patrol agencies with published reports that document search and seizure rates of minority and Caucasian drivers.[14] The findings for these agencies are reviewed in alphabetical order and summarized in **Table 6.9**.

As can be seen in **Table 6.9**, all of these state agencies report search rates that are disproportionately higher for Black and Hispanic drivers, as compared to Caucasian drivers. Compared to Caucasians, Blacks range from being 1.7 to 5.4 times more likely to be searched by state patrol agencies. This disproportionality is even higher for Hispanic drivers, as they are 1.8 to 9.6 times more likely to be searched than Caucasians by various state police agencies.

Furthermore, this higher propensity to search minority drivers documented by these studies, does not, for the most part, appear to result in the seizure of more contraband from these drivers. Only in New Jersey does the disproportionality in searches appear to be at least partially justified by the seizure rates, where Blacks and Hispanics, in particular, are more likely than their Caucasian counterparts to have evidence seized by police officers. Across the other state agencies, lower percentages of searches of Black and Hispanic motorists resulted in contraband seizures, compared to searches of Caucasians.[15] This is most dramatically evident in Texas, where the difference between Caucasian seizure rates and the rates of both Blacks and Hispanics is at least 10 percentage points. Elsewhere, in Arizona, Iowa, Missouri, Pennsylvania, and Washington, searches of Hispanic drivers are particularly less fruitful than searches of Caucasians.

The report on the traffic stop activity of the North Carolina State Highway Patrol is not included in the table because it presents its findings in a slightly different manner than the other reports. The report pays particular attention to the officers of the state's Criminal Interdiction Team (CIT), whose primary responsibility—drug interdiction—leads them to conduct significantly more searches than regular patrol officers. Nevertheless, the findings

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[14] North Carolina State Highway Patrol's report is not included in the table because its findings are presented in a different manner than the other states. It is reviewed in the text.

[15] Note that seizure rates for Massachusetts and Ohio are not available.

from North Carolina are consistent with the other state agencies. Although there is some fluctuation in the size of the disparity over time, Blacks that were stopped were more likely than Caucasians to be searched by both CIT and regular North Carolina troopers. The disproportionality was greatest in stops by CIT troopers. The findings on seizure rates are less consistent. Over a four-year study period, the search success rates for CIT searches of Caucasian and Black drivers have converged. Where Caucasians used to be considerably more likely to have contraband seized compared to Blacks, the trend has now reversed (possibly due to the lower number of consent searches). The productivity of searches by other NCSHP troopers, however, is consistent with other state agencies as blacks were less likely than Caucasians to be found carrying illegal contraband (Smith et al., 2003).

Collectively, findings from these studies suggest a pervasive pattern in state level law enforcement where minority motorists are searched more often than Caucasians, even though they are less likely than Caucasians be in possession of illegal contraband. That is, the trends in search success rates reported for the PSP are similar to or higher than those found in other state police agencies and studies using national data (e.g., see Engel & Calnon, 2004). Most of the studies currently available, however, do not report the specific search success rates for different types of searches. For example, we only have access to the consent search success rates for three state agencies other than Pennsylvania (i.e., Arizona Division of Public Safety, Maryland State Police, and Washington State Police). Compared to PSP's 14.5% consent search success rate, Arizona DPS, Maryland SP, and Washington SP had consent search success rates of 14.4%, 21.3%, and 22.6%, respectively (Engel, 2004; Gross & Barnes, 2002; Loverich et al., 2003). Thus, PSP's consent search success rates are consistent with their peer agencies across the country.

Table 6.9. Reported State Police and Highway Patrol Search and Seizure Rates, by Drivers' Race and Ethnicity1

State Police / Patrol Agency (citation)	% Caucasian Searched	% Black Searched	% Hispanic Searched	% Caucasian w/ Evidence Seized	% Black w/ Evidence Seized	% Hispanic w/ Evidence Seized
Arizona DPS (Engel, 2004)	3.2	7.4	7.1	24.0	22.6	17.3
Iowa SP (Iowa Division of Criminal and Juvenile Justice Planning, 2003)	2.7	7.1	10.3	42.6	40.0	27.4
Maryland SP[2] (Knowles et al., 2001)	NA	NA	NA	28.8	28.4	NA
Massachusetts SP (Farrell et al., 2004)	1.1	2.3	2.6	NA	NA	NA
Missouri SHP (MO Attorney General's Office, 2003)	3.4	5.6	8.9	32.9	27.6	18.1
New Jersey SP (Verniero & Zoubek, 1999)	0.5	2.7	4.8	10.5	13.5	38.1
Ohio SHP[3] (Cogswell, 2005)	0.3	0.9	2.3	66.1	63.7	26.1
Pennsylvania SP (Engel et al. 2005)	0.6	2.2	2.9	30.0	21.2	14.2
Rhode Island SP[4] (Farrell et al., 2004)	4.3	9.5	NA	14.8	13.9	NA
Texas Dept of Public Safety[5] (Texas Dept of Public Safety,	2.8	5.1	5.0	14.6	3.6	3.9
Washington SP[6] (Loverich et al., 2003)	0.4	1.0	1.0	24.8	18.9	16.7

[1] North Carolina State Highway Patrol's report is not included in the table because its findings are presented in a different manner than the other states (Smith et al., 2003). Findings from this report are reviewed in the text.
[2] The Maryland study did not examine stops without searches, so the percentages of drivers searched of those stopped is not reported.
[3] Search success rate for the Ohio State Highway Patrol is based only on a sample of "discretionary" searches.
[4] Search and seizure percentages for Rhode Island were not broken down by specific minority groups. The percentages listed under "Blacks" reflect the number of all nonwhite drivers.
[5] The seizure rates reported for Texas are based on drug evidence only.
[6] Only the discretionary searches conducted by the Washington State Patrol are reported. Washington's non-discretionary search success rates, however, follow the same pattern.

SPOTLIGHT ON CONSENT SEARCHES

The use of consent and other types of discretionary searches has been area of concern for police departments across the country. Although consent searches are legal, civil rights groups have argued that "the practice is coercive and invites discrimination, particularly for drivers with language barriers," (Egelko, 2003). Therefore, some state police agencies have agreed to ban searches based strictly on consent. For example, in February 2003, the California Highway Patrol extended their 3-year moratorium on consent searches to 2006 (Landis, 2004). California Highway Patrol suspended the use of consent searches based on data that suggested that minority drivers were more likely to be stopped and searched compared to Caucasian drivers, and these searches were less successful than searches of Caucasians (Egelko, 2003). Likewise, in July 2004, the state of Rhode Island passed legislation banning the use of consent searches by all police of motorists and vehicles not based on probable cause or reasonable suspicion (Landis, 2004). Some municipal police agencies, as well, have banned or are currently considering bans on consent searches. For example, in 2002, the Milwaukee City Council and the Chief of Police agreed to ban all consent searches by Milwaukee PD officers (Thomas-Lynn, 2003). Likewise, the City Council of Austin, Texas has been debating a proposal to ban all consent searches by Austin PD officers during traffic stops (Ann del Llano, 2004).

As noted previously, a substantial percentage of PSP searches are based *solely* on motorists' consent (45.6%). Furthermore, of the reasons identified on the Contact Data Report to conduct a search, "consent" is the least productive search reason in terms of discovering contraband. For searches based solely on consent, 14.5% resulted in the discovery of contraband. Findings from the Year 1 Report showed that Hispanics, drivers of "other" races, and drivers less than 25 years old were significantly more likely than Caucasian and Black drivers, and drivers over 25 years old, to be searched based solely on consent. For the second year data, however, fewer racial/ethic, gender, and age group differences were identified for consent only searches.

It was acknowledged in the Year 1 Report that the data available at that time could not determine how many drivers were initially asked for consent to search but refused officers' requests. Therefore, it was unknown if drivers of different race /ethnicity and age provide consent at equal rates. In an effort to further examine these issues, a new Contact Data Report was developed by PSP administrators. The new form was officially adopted department-wide October 1, 2003. This form included two changes related to searches: 1) a field was included that captures whether or not a consent search was requested, and 2) the category of search warrant was added to the list of reasons to conduct a search. The analyses focusing on consent searches that follow are based on the seven months of data collected after the Data Contact Report was changed.

Analyses of Consent Searches Conducted: October 1, 2003 – April 30, 2004

1. During this time period, Troopers conducted 165,759 traffic stops.
2. Troopers asked for consent to search during 1,245 stops (0.8% of all traffic stops initiated).
3. Of these 1,245 requests, 67.5% (840 requests) were granted by motorists, while 32.5% (405) were denied.
4. Of the 840 consent searches that were conducted, 23.6% resulted in the discovery of contraband (i.e., 23.6% search success rate).
5. Of the 840 consent searches that were conducted, 69.6% (585 searches) were based *solely* on consent; that is, there was no other reason indicated by the Trooper for the search.
6. Of the 585 searches based solely on consent, 16.1% resulted in the discovery of contraband (i.e., 16.1% search success rate).
7. Of the 405 consent search requests that were denied, 48.9% (198 denied search requests) resulted in a search based on some other reason.
8. Of the 198 denied search requests that were searched for another reason, 17.5% resulted in the discovery of contraband (i.e., 17.5% search success rate).
9. The search success rate for the remaining 206 search requests that were denied is unknown because these motorists were not searched for another reason.

In summary, these analyses suggest that contrary to common opinion, a substantial portion of motorists do not give their consent to be searched when asked by Troopers (32.5%). Of those who refused to give consent, however, nearly half (48.9%) were searched based on a different reason. The search success rates of those who give consent and those refuse consent but are subsequently searched anyway are statistically equivalent (16.1% compared to 17.5%, respectively).

Who Gives Consent?

There are racial/ethnic, gender, age, and residency differences among drivers who give their consent to be search. **Table 6.10** below documents these differences. As shown, Caucasians are significantly less likely to give their consent to be searched compared to other drivers of other races/ethnicities. That is, racial minorities are more likely to comply with officers' requests to search their persons and/or vehicles compared to Caucasians. In addition, male drivers, younger drivers, and out-of-state drivers are significantly more likely to comply with officers' requests to search them, compared to female drivers, older drivers, and drivers who reside in Pennsylvania, respectively.

Table 6.10 also documents the consent rates across different types of troopers. Contrary to the findings that different types of citizens are more/less likely to comply with officers' requests to search, with but one exception, different types of officers are not more or less likely to gain consent. Caucasian Troopers are significantly more likely to gain consent to search compared to non-Caucasian Troopers (i.e., 68.2% of requests to search issued by Caucasian Troopers were granted, compared to 54.7% of requests issued by non-Caucasian

Troopers). Although the difference between the consent rates for male and female troopers is also large (67.9% compared to 54.8% , respectively), this difference is not statistically significant, due in part to the small number of traffic stops in which a female Trooper asked for consent to search (n=31 traffic stops). Differences in Troopers' levels of experience and education had no influence over citizens' compliance with requests to search.

Table 6.10 Percentage of Request for Consent Searches Denied, by Driver and Troopers' Characteristics.

	Total # Requests for Consent to Search	% Requests for Consent to Search DENIED	% Requests for Consent to Search GRANTED
All Drivers	1,245	32.5	67.5
By Drivers' Characteristics			
Caucasian Driver	814	37.5***	62.5***
Black Driver	261	26.4	73.6
Hispanic Driver	135	16.3	83.7
Other Driver	30	23.3	76.7
Male Driver	1,111	31.1**	68.9**
Female Driver	132	43.9	56.1
Driver 25 years old or under	698	29.7*	70.3*
Driver over 25 years old	546	36.3	63.7
Driver PA Resident	833	35.9***	64.1***
Driver Non-PA Resident	412	25.7	74.3
By Troopers' Characteristics			
Caucasian Trooper	1,187	31.8*	68.2*
Non-Caucasian Trooper	53	45.3	54.7
Male Trooper	1,209	32.1	67.9
Female Trooper	31	45.2	54.8
Less than 5 years experience	404	30.0	70.0
5 years experience or more	836	33.6	66.4
No College	416	35.1	64.9
2 Year Degree	300	32.3	67.7
4 Year Degree	524	30.3	69.7

NOTE: * $p > .05$, ** $p > .01$, *** $p > .001$. The number of searches for each group may not add to the total 1,245 searches due to exclusion of missing cases (e.g., 5 cases excluded missing drivers' race, 2 cases missing drivers' gender, 1 case missing drivers' age, 5 cases missing Troopers' characteristics).

SUMMARY

- Most searches conducted by Troopers are based solely on the drivers' consent (45.6%). The second most common reason for a search is odor of drugs (15.4%), followed by reasonable suspicion and/or probable cause (13.5% of searches).

- Type III searches (i.e., searches based on the most officer discretion) are the least productive in recovering contraband. The search success rates of Type III (discretionary) searches is 14.8%, compared to 29.4% for Type I (mandatory) searches and 57.3% for Type II (suspicion) searches. Within the Type III search category, searches based solely on consent were the least successful. Department wide, 14.5% of searches based solely on consent resulted in the discovery of evidence.

- Black and Hispanic motorists are more likely to be searched based on mandatory (Type I) reasons than Caucasian and other non-Caucasian drivers. Caucasian and Black drivers are more likely to be searched based on suspicion (Type II) reasons than Hispanic and other non-Caucasian drivers. Hispanic and other non-Caucasian drivers are significantly more likely to be searched based on discretionary (Type III) reasons compared to Caucasian and Black drivers.

- PSP searches of minority drivers are less successful in recovering contraband compared to searches of Caucasian drivers. Specifically, department wide 30.0% of the searches of Caucasian drivers resulted in the seizure of contraband, compared to 21.2% of the searches of Black drivers, 14.2% of the searches of Hispanic drivers, and only 9.4% of the searches of drivers of other racial groups.

- Analyses based on the type of search (measured from the least discretionary to the most discretionary reasons) indicate that racial and ethnic disparities in search success rates are statistically significant across all three search type categories. The differences across racial / ethnic groups search success rates for Type I, Type II, and Type III searches are statistically significant, with contraband most likely to be discovered in searches of Caucasian drivers in Type II (suspicion) and Type II (discretionary) searches. Other non-Caucasians were most likely to be found with contraband in Type I (mandatory) searches.

- The information presented above cannot determine the legality of and/or the presence of discrimination in individual searches conducted by PSP Troopers.

COMPARISONS TO YEAR 1 REPORT

- In the Year 1 Report, the most frequent reasons for search were consent only, followed by reasonable suspicion / probable cause. In Year 2, consent only remained the most frequent reason, however odor of drugs became the second most frequent, followed by reasonable suspicion / probable cause.

- In Year 1, Type III (discretionary) searches were the least productive for Troopers, resulting in the lowest likelihood of finding contraband. In Year 2, this trend continued with Type III (discretionary) searches as the least likely to result in a seizure of contraband, and Type II (suspicion) searches being the most likely to discover contraband. This trend remained stable across both years of data collection, as the percentages of success of the three search categories did not fluctuate more than 2 percentage points.

- In Year 1, searches of minorities overall tended to be less successful in contraband discovery compared to searches of Caucasians. This trend was repeated in the data collected for Year 2. Across both years, searches of Caucasians were the most likely to result in the seizure of contraband, followed by searches of Black, Hispanics, and other non-Caucasians, respectively.

- The Year 1 Report found that racial / ethic disparities in search success rates were only statistically significant in Type III (discretionary) searches. For Year 2, it was found that racial / ethnic disparities in search success rates were statistically significant across all three types of searches.

- Data collected for Year 2 added information regarding consent searches. This information was not available for the Year 1 report.

VII. CONCLUSIONS AND POLICY IMPLICATIONS

OVERVIEW

Nationwide, allegations of racial profiling have suggested that police officers specifically target members of particular racial groups for traffic stops, citations, searches, and arrests. As with the findings from the first year of this study, findings from the second year cannot substantiate nor refute these claims. As noted in Section I, it is impossible with these data to determine the motivating factors behind traffic stops conducted by individual PSP Troopers. 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 we cannot determine if PSP Troopers are engaging in the behavior commonly referred to as "racial profiling", we can determine if patterns of racial disparities exist in stop and post-stop outcomes that warrant further scrutiny.

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, citations, arrests, and searches), and 3) specific examinations of searches and seizures. Regarding the initial stopping decision, it is the conclusion of this report that there continues to be no consistent evidence to suggest that Pennsylvania State Troopers make stopping decisions based on drivers' race and/or ethnicity. Regarding post-stop outcomes, it is the conclusion of this report that no racial/ethnic disparities exist for issuing warnings, citations, and arrests; however, racial/ethnic disparities exist for conducting searches. Further analyses of searches and seizures illustrate that although minority drivers are significantly more likely to be searched compared to Caucasians, they are less likely than Caucasians to be found in possession of contraband. These findings are described in detail below, followed by a description of PSP's current reform efforts and future policy and training recommendations.

THE INITIAL STOP

From May 2003 – April 2004, Troopers in the Pennsylvania State Police Department initiated 315,705 traffic stops, for which we have data. Only 0.2% of these traffic stops had missing information on the race/ethnicity of the driver, and only 1.8% had any type of missing data. Approximately 14.1% of the drivers stopped were non-Caucasian (85.3% Caucasian, 7.7% Black, 3.0% Hispanic, 2.5% other, and 0.6% unknown). The rate of stops for particular racial and ethnic groups varied dramatically across areas, troops, and stations. Some variation is to be expected given residential patterns related to race and travel patterns along interstates, highways, and major thoroughfares.

For each county, disproportionality indices and ratios were created, which measure the discrepancy between the "expected" rate of stops based on racial representation in the driving-age population and the actual rate of stops. Disproportionality indices and ratios are useful tools to identify outliers within the data. They must be interpreted with extreme caution, however, given their numeric instability. When the denominator for disproportionality indices (measured as the residential population of driving-age racial groups) is very low, the indices (and thus, ratios) can become artificially inflated. Despite the interpretation issues that accompany disproportionality indices and ratios, they can help identify potentially problematic areas.

To estimate the amount of racial/ethnic disparity in traffic stops conducted by the Pennsylvania State Police, five different benchmark/traffic stop comparisons were made at the county level:

1) All traffic stops in all 67 counties compared to residential Census driving-age populations,
2) Traffic stops in all 67 counties of motorists who reside in the county where the stop was made compared to residential Census driving-age populations,
3) All traffic stops in all 67 counties compared to traffic flow models created from residential Census data and traffic stop data,
4) Daytime traffic stops in 27 counties compared to daytime roadway usage observations in those 27 counties,
5) Daytime traffic stops for speeding in 27 counties compared to daytime speeding observations for those 27 counties.

The disproportionality ratios created for these five comparisons varied across benchmarks and across counties using the same benchmark. Despite the fluctuations in the disproportionality ratios, consistent patterns emerged. As the benchmarks that were used represented a closer approximation to actual traffic patterns, the disproportionality ratios decreased dramatically. This suggests that as we are better able to approximate the true driving population, comparisons of traffic stops made by PSP Troopers to these estimates show less and less disparity. One comparison (traffic model) even suggests that in most counties, PSP Troopers are actually *less* likely to stop minority motorists than Caucasians, compared to minority representation in the driving population.

Further exploration of the initial disproportionality ratios created from comparisons of all traffic stops to residential populations suggest that the racial/ethnic disparities are likely due to legitimate factors. First, most of the counties with high disproportionality ratios also have a very small minority population, which results in artificially inflated disproportionality ratios. Second, many of the counties with high levels of racial/ethnic disparities in traffic stops also contain a major interstate or thoroughfare that alters the racial composition of the driving population when compared to the residential population. Third, stops in these counties are above the departmental average for stops involving out-of-state, out-of-county, and out-of-municipality residents. This suggests that the residential populations used to determine the disproportionality ratios are not appropriate. Fourth, the percentage of stops of minorities in these counties during daylight hours is similar to the percentage of minorities stopped during evening hours when it is more difficult to assess the characteristics of the driver. Fifth, comparisons of traffic stops to estimates created from the traffic flow model suggest there are no racial/ethnic disparities, or the disparities are in the reverse direction as predicted (i.e., Caucasian motorists are more likely to be stopped compared to minority motorists). Finally, racial group comparisons of roadway usage and speeding observations to residential Census data indicate that residential Census data dramatically underestimates or overestimate the percentage of minority drivers.

Additional findings based on multiple analyses of traffic stops department wide also do not support the suggestion that PSP Troopers make stops based on drivers' race / ethnicity. First, the percentage of daylight stops of minority citizens department wide was roughly equivalent to the percentage of nighttime stops, when determining the characteristics of drivers is more difficult, if not impossible, prior to the stop. Second, although the rates for stops of non-Caucasian drivers are higher in some counties than their proportion in the population, findings from the roadway usage observations indicate that residential and driving populations often differ dramatically and therefore at least partially explain racial disparities in traffic stops. Third, observations of speeding behavior suggest that minority drivers (Blacks and non-Caucasians) are more likely to speed, and more likely to do so aggressively, compared to Caucasian drivers. Since the majority of PSP traffic stops are for speeding violations (72%), the speeding behavior of minority drivers likely puts them at an increased risk for traffic stops compared to Caucasian drivers. Finally, contrary to profiling allegations that suggest minorities are stopped for less serious reasons, minority drivers stopped for speeding were found to be traveling at higher speeds compared to Caucasian drivers stopped for speeding.

Based on all of the findings in the Year 1 and Year 2 Final Reports, it is the conclusion of this research team that there continues to be no consistent evidence that Pennsylvania State Troopers make stopping decisions based on drivers' race and/or ethnicity.

POST-STOP OUTCOMES

A second line of inquiry in this report was whether or not there were racial / ethnic differences in the outcomes motorists receive as the result of a traffic stop (e.g., warnings, citations, arrests, and searches). To properly examine this research question, hierarchical non-linear multivariate models were estimated in an effort to determine the relative influence of drivers' race/ethnicity on post-stop outcomes while statistically controlling for other relevant legal and extralegal factors. For example, these statistical models estimate the influence of drivers' race /ethnicity over warnings, citations, arrests, and searches while statistically controlling for the influence of the reason for the stop, evidence of contraband, severity of the traffic offenses, drivers' age, gender, residency, etc. Findings from the Year 1 Report indicated that while there were no statistically significant differences in warnings and citations, Black and Hispanic drivers were significantly more likely than Caucasian drivers to be arrested and searched. Specifically, after controlling for other relevant legal and extralegal factors, the findings in the Year 1 report indicated that Black and Hispanic motorists were 1.5 and 1.8 times more likely to be arrested, and 3.0 and 2.7 times more likely to be searched, compared to Caucasians, respectively.

The findings based on the second year of data (May 1, 2003 – April 30, 2004) shows improvement in the racial/ethnic disparities in post-stop outcomes. There continues to be no statistically significant racial/ethnic differences in the likelihood of being issued a warning or a citation as the result of a traffic stop. That is, after controlling for other legal and extralegal factors, Caucasian and non-Caucasian motorists are equally likely to receive a warning or citation.

Unlike the findings from the Year 1 Report, data collected in Year 2 also demonstrates no statistically significant differences in the likelihood of arrest across racial/ethnic groups. That is, data from Year 2 demonstrate that after statistically controlling for other legal and extralegal factors, Caucasian and non-Caucasian motorists are equally likely to be arrested by Pennsylvania State Troopers during member-initiated traffic stops. The most coercive police action (i.e., arrest) is now equally applied across racial/ethnic groups. This suggests a substantial improvement over the Year 1 findings.

SEARCHES & SEIZURES

The empirical findings regarding racial/ethnic differences in the likelihood of conducting searches remain a cause for concern. While it appears that the reasons for the stop and other legal characteristics are 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). The odds ratios indicate that the differences in outcomes based on drivers' characteristics merit further consideration. After controlling for other relevant legal and extralegal factors, findings from the Year 2 data indicate that the odds of being searched are 3.1 and 3.0 times higher for Black and Hispanic drivers compared to Caucasian drivers, respectively. Furthermore, when considering only stops for speeding (where the exact severity of the offense can be directly measured as the amount over the speed limit), Black and Hispanic drivers were 3.8 and 3.9 times more likely to be searched compared to Caucasians, respectively. As noted within this report; however, caution must be used when interpreting these findings because not all factors that might influence officer decision-making have been included in the statistical models. It is possible that some unmeasured legal and extralegal factors might account for some of the racial and gender disparities reported in traffic stop outcomes. Of particular concern is the inability to measure citizens' inconsistent stories when questioned by Troopers, along with any non-compliance and verbal resistance displayed during traffic stops.

Despite these limitations, the disproportionate searching of Black and Hispanic drivers merits further consideration. Section VI of this report was dedicated to examining issues surrounding searches and seizures during member-initiated traffic stops. The findings showed that PSP searches of minority drivers were less successful in recovering contraband compared to searches of Caucasian drivers. Specifically, department wide, 30.0% of the searches of Caucasian drivers resulted in the seizure of contraband, compared to 21.2% of the searches of Black drivers, 14.2% of the searches of Hispanic drivers, and only 9.4% of the searches of drivers of other racial groups. The findings also showed that Hispanic and other non-Caucasian drivers were significantly more likely to be searched based on discretionary reasons compared to Caucasian and Black drivers. These findings, however, do not address the legality of individual searches. That is, the data collected and reported within this document only examine trends and cannot address questions of whether or not individual searches conducted by PSP Troopers are legally justified or based on discrimination.

When examining the reasons for searches, the largest percentage of searches was conducted based solely on the drivers' consent (45.6% of all searches). Consent only searches; however, were the least productive in terms of discovering contraband compared to other reasons to search (e.g., mandatory and suspicion searches). Department wide, 14.5% of searches based solely on consent resulted in the discovery of contraband. A substantial proportion of motorists did not give their consent to be searched when asked by Troopers (32.5% of motorists asked for consent). Of those who refused to give consent; however, nearly half (48.9%) were searched based on a different reason. The search success rates of those who gave consent and those who refused consent but are subsequently searched anyway were statistically equivalent (16.1%

compared to 17.5%, respectively). Caucasians were significantly less likely to give their consent to be searched compared to drivers of other races/ethnicities. That is, racial minorities were more likely to comply with officers' requests to search their persons and/or vehicles compared to Caucasians.

The descriptive findings reported in Section VI also suggest that some racial/ethnic disparities in searches are localized in particular troops and stations. PSP administrators must closely examine the differences across troops and stations reported and attempt to determine if these differences are due to legitimate factors. With the specific information provided in Section VI, PSP administrators should be able to accurately identify potential problem areas.

Based on these findings, it is the conclusion of this report that some racial and ethnic disparities exist for searches conducted during member-initiated traffic stops. It cannot be determined with these data, however, if these disparities are due to discrimination.

POLICY RECOMMENDATIONS

As documented in Section I, based on the finding from the Year 1 Final Report, the Pennsylvania State Police made a series of policy and training recommendations. While the Pennsylvania State Police have continued an innovative and professional approach to understanding and altering racial/ethnic disparities in traffic stop outcomes, additional work is still needed to ensure that PSP Troopers display equitable treatment across racial/ethnic groups. The data suggest that the only continuing problem for PSP administrators is the racial/ethnic disparities in search and seizure rates. The Pennsylvania State Police must address these racial/ethnic disparities in searches and seizures directly and immediately in order to continue to sustain legitimacy among the citizens of the Pennsylvania Commonwealth. With this goal in mind, the following policy recommendations are made:

1) Supervisory staff must be made aware of, and held accountable for, racial/ethnic disparities in search and seizure rates within their jurisdictions. It is recommended the specific findings documented in this report be disseminated immediately to Area, Troop, and Station Commanders with a very clear mandate to identify and significantly reduce racial /ethnic disparities in searches and seizures within their jurisdictions.

2) The findings from Year 1 and Year 2 suggest that the racial/ethnic disparities reported for search success rates are due to racial differences in the most discretionary types of searches. Given the importance of officer discretion in deciding whether or not to conduct these types of searches, PSP research, training, and supervisory oversight must continue to focus on these types of searches to ensure officer compliance with existing departmental rules and regulations. For example, PSP administrators should examine Trooper compliance with the waiver of rights and consent to search form (Form SP 7-0027). Internal order OM 7-2, dated 6/24/87 requires that "the member requesting a consent to search shall ensure that the Waiver of Rights and Consent to Search form is prepared." Current practices, however, suggest that the consent to search form is not

routinely used by Troopers in the field. This form is designed to notify citizens of their rights to refuse consent. Specifically, the form states:

> "I HAVE BEEN TOLD THAT I DO NOT HAVE TO GIVE MY CONSENT. I UNDERSTAND THAT I HAVE THE RIGHT TO REFUSE THIS REQUEST, AND THAT THE POLICE MAY NOT BE ABLE TO CONDUCT THIS SEARCH WITHOUT A SEARCH WARRANT UNLESS I GIVE MY CONSENT. NONETHELESS, I VOLUNTARILY GIVE MY CONSENT TO THE POLICE TO CONDUCT THIS SEARCH."

3) Mandatory use of this form may reduce the racial/ethnic disparities in the rate of consent searches. As noted within this report, Caucasians are significantly more likely than minorities to refuse consent when asked. It is possible that minority drivers are less likely than Caucasians to be aware of their rights to refuse. Therefore, the use of Form SP 7-0027 should be considered mandatory for all consent searches and supervisory oversight regarding the proper use of this form should be reestablished.

4) As noted in the Year 1 Report, PSP administrators should give further consideration to how officers are trained to identify "suspicious" behavior. It is currently unknown what motorists' behaviors prompt PSP Troopers to ask for consent to search and/or to conduct searches based on more discretionary reasons. It is further unknown what factors lead to successful versus non-successful searches. Gaining this type of information is critical to produce effective change within the police organization. PSP administrators were encouraged in the Year 1 Report to implement research projects designed to elicit this type of information.

5) PSP administrators have initially responded to this recommendation. A research project specifically designed to examine the verbal and non-verbal behaviors of motorists that make Troopers "suspicious," and the accuracy of those "suspicion" cues is scheduled to begin July 1, 2005. One hypothesis advanced to explain racial/ethnic disparities in search and seizure rates is that some verbal, non-verbal, and behavioral cues used by law enforcement officers to determine suspicious behavior are not racially neutral. That is, although law enforcement officers do not consciously consider race and ethnicity when determining whom to search, the cues used to determine suspiciousness may occur more frequently with minorities. Through the use of focus groups, this research will explore the reasons why Pennsylvania State Troopers conduct searches and what verbal, non-verbal, and behavioral cues are perceived by Troopers as the most effective in predicting criminal behavior. In addition, these focus groups will explore how troopers were trained and their perceptions regarding the usefulness and accuracy of the training they received. From the information gathered in the focus groups, a quantitative survey will be developed. This survey will be administered department wide to troopers assigned to patrol duties, and will explore troopers attitudes toward search and seizure issues and determine which suspicious cues are the most widely used. Finally, aggregate comparisons of the Troopers' attitudes and use of suspicion cues will be compared to the racial and ethnic disparities in search rates and search success rates.

6) This research project is scheduled to conclude on September 30, 2006. Based on the research findings, specific policy recommendations will be issued to the Pennsylvania State Police at that time.

7) Finally, it is recommended that the Pennsylvania State Police continue to collect and analyze traffic stop data. By comparing the multiple years of traffic stop data, it will be possible to determine the relative effectiveness of any new policies and training on the rates of searches and seizures of minority motorists. As noted above, the Pennsylvania State Police plan to extend data collection to April 30, 2006.

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APPENDIX A

TRAFFIC MODEL METHODOLOGY

The traffic model is a weighted, spatial interaction model built from Census data and traffic stop data. The Census data is a measure of the residential population and its racial composition, and the traffic stop data is a measure of the racial composition and spatial distribution of the driving population. The Census data is used in two ways: a) it is a source of the racial composition of residents for the jurisdiction of interest, and b) it is a source of the racial makeup of residents from other jurisdictions surrounding the county of interest. These two sources are combined to produce the weighted spatial model. In essence, Census data is gathered for all jurisdictions and is used as a proxy for the racial composition of the residential population.

The stop data determines the weights for the driving population in both the jurisdiction of interest and surrounding jurisdictions. This is key information for the analysis because the driver's home jurisdiction information directs the amount of weight given to each jurisdiction. In other words, the number of drivers stopped in their home jurisdiction is used as the weight in combination with the Census data. By using the stop data, the race of the driver is known and is then used in combination with the Census data for all jurisdictions. An example is provided below to clarify the exact procedure necessary to develop the weight.

Combining the two data sources - Census and the stop data - produces a proxy for the driving population to allow a more accurate baseline. Each surrounding county that has drivers stopped in the jurisdiction of interest is considered one at a time in order to produce the weighted value that becomes the benchmark for the county of interest. The home residence of drivers may be outside of the immediate contiguous counties, but the same procedure applies to them.

There are two important facts to note prior to providing an example of the model. First, the raw values of both the stops and the population must be used. This is to allow the appropriate weight of each jurisdiction into the model. In essence, a county with a larger population should more heavily influence the weight than a county that is small (the actual distinction of large and small is not important). Second, the procedure detailed below must be completed for both the stops and the population. In other words, a new weighted value is attained for the expected stops and for the expected population. This is important because the expected stops are divided by the expected population to achieve a percent of stops by race, which operates as the new weighted benchmark. Recall that the Disproportionality Index (DI) is found by dividing the observed percent of stops by race into the expected percent of stops by race. In formula: Percent Observed Stops by Race / Percent Expected Stops by Race

To calculate the percents for the DI, the raw numbers must be used and the following formula provides the formula broken into intricate detail:

$$\frac{\text{Actual Number of Stops by Race / Actual Number of All Stops}}{\text{Expected Number of Stops by Race / Expected Number of All Stops}}$$

As discussed previously, the bottom half of the formula is the information provided by the traffic model (expected number of stops by race and expected number of all stops). There are four steps to calculating both the expected number stops by race and the expected number of all stops, and it is best explained by using the hypothetical example below. To further simplify the explanation, a hypothetical area has been created, complete with population and stop counts.

Figure A.1. Hypothetical Map of an Area

County B (pop = 75,000)	**County E** (pop = 1,000,000)	**County G** (pop = 750,000)
County C (pop = 50,000)	**County A** **(***county of interest***)** (pop = 500,000) (Stops = 10,000)	**County H** (pop = 10,000)
County D (pop = 100,000)	**County F** (pop = 250,000)	**County I** (pop = 5,000)

Pop. indicates the total population of all races by Census for the areas

Stop Data

Step 1 involves separating the drivers by race based on the stop data. For example, within County A, 10,000 drivers are stopped. Of the 10,000 drivers, 7,500 were Caucasian, 1,500 were Black, 550 were Hispanic, and 450 were from all other categories of race. This initial step of determining the racial composition of all stopped drivers is necessary to allow the drivers to then be separated by their home jurisdiction.

Once the race of all drivers is known, Step 2 requires all the drivers to be categorized according to their home jurisdiction. For example, of the 7,500 Caucasian drivers stopped, 5,500 were from County A, County D had 800 Caucasian drivers stopped in County A (county of interest), 1,000 from County E, and 200 from County H. For stopped Black drivers, 1,000 were from County A, 100 were from County D, 300 from County E, and 100 from County H. Stopped drivers who were Hispanics had 250, 75, 200, and 25 stops for Counties A, D, E, And H, respectively. The other category had 200 (County A), 75 (County D), 150 (County E), and 25 (County H) stopped drivers. Table 1 shows the racial composition of drivers stopped by their home jurisdiction. Notice that by reading **Table A.1** down the columns by race, the percent by home jurisdiction can be determined; whereas by reading across the rows, the percent by home jurisdiction is apparent.

Table A.1. Race of the Driver by Stop and Home Jurisdiction

Counties	Caucasian	Black	Hispanic	All Other	Total by Jurisdiction
County A	5,500 (73%)	1,000 (66.7%)	250 (45.5%)	200 (44.4%)	6,950 (69.5%)
County D	800 (10.7%)	100 (6.7%)	75 (3.8%)	75 (16.7%)	1,050 (10.5%)
County E	1,000 (13.3%)	300 (20%)	200 (36.4%)	150 (33.3%)	1,650 (16.5%)
County H	200 (2.7%)	100 (6.7%)	25 (4.5%)	25 (5.5%)	350 (3.5%)
Total	7,500	1,500	550	450	10,000

Table A. provides the raw Census data for each of the counties. The Census data is obtained as a measure of the residential population within each jurisdiction, and is read across the rows to total 100%.

Table A.2. Residential Population from Census for Race within Jurisdictions

Counties	Caucasian	Black	Hispanic	All Other	Total
County A	400,000 (80%)	50,000 (10%)	25,000 (5%)	25,000 (5%)	500,000
County D	95,000 (95%)	2,000 (2%)	2,000 (2%)	1,000 (1%)	100,000
County E	750,000 (75%)	200,000 (20%)	30,000 (3%)	20,000 (2%)	1,000,000
County H	4,000 (40%)	1,000 (10%)	4,000 (40%)	1,000 (10%)	10,000

Step 3 calculates the specific weight based on the stops by race and the Census data by race. For example, in County A, 5,500 (73%) of the stops were of Caucasian drivers (Table 1) and 400,000 of the residents in the county are Caucasian (Table 2). These values are multiplied together to get a value for County A of the number of Caucasian drivers from that county that are driving on the road[16] (293,333). This procedure must be performed for every jurisdiction that had drivers stopped in County A. For example, within County A, the county of interest, 800 (10.7%) of the Caucasian drivers stopped actual live in County D. Therefore, the percentage must be multiplied by the Census value of Caucasian drivers living within County D (95,000). This produces a value of 10.7% * 95,000 = 10,133. The resulting value, 13,000, is added to the original value of 293,333 calculated above. This procedure is followed for every jurisdiction that is represented in the county of interest. For County E, 13.3% is

[16] This is not the final step as this value must be added to the value for Caucasian from other counties for the final benchmark.

multiplied by 750,000 to get a value of 99,999 and in H, 2.7% is multiplied by 4,000 to get a value of 107.

In Step 4, the value of Caucasians for County A is added to the value of all other jurisdictions represented in the stop data. The expected number of stops for Caucasians is 293,333 + 10,133 + 99,999 + 107 = 403,572. This new value must be standardized by the expected population count derived by the same procedure to produce the expected percent stopped by race.

Population Data

Following the exact same procedure used for the calculation of the raw number of expected stops, the expected number of stops is calculated by multiplying the total stops in the county of interest by the Census data for that jurisdiction. Using the same figure as above, for County A, all the stops (69.5%) is multiplied by the total population from the Census for that jurisdiction (500,000), which produces 347,500 expected drivers. The same procedure is followed for the other jurisdictions – County D (10.5% * 100,000 = 10,500), County E (16.5% * 1,000,000 = 165,000); and County H (3.5% * 10,000 = 350). The values for each of the jurisdictions are summed to produced the expected number of drivers within County A (347,500 + 10,500 + 165,000 + 350 = 523,350).

To calculate the percent expected by race, the raw number of expected stops by race is divided by the total, raw number of expected stops (403,572 / 523,350 = 77.1%). This value is the denominator for all calculations to determine the expected percent stopped by race.

The procedure outlined in the "Stop Data" section is followed for all racial groups and the calculations are provided below.

Black
County A = (66.7%) (50,000) = 33,350
County D = (6.7%) (2,000) = 133
County E (20%) (200,000) = 40,000
County H (6.7%) (1,000) = 66.67
Total = 73,550 expected stops of Black drivers in County A

County A = (69.5 %) (500,000) = 347,500
County D = (10.5%) (100,000) = 10,500
County E (16.5%) (1,000,000) = 165,000
County H (3.5%) (10,000) = 350
Total = 523,350 expected stops of all drivers in County A

= 73,550 / 523,350
= Percent of Black Drivers expected to be stopped in County A = 14.1%

Hispanic
County A = (45.5%) (25,000) = 11,363
County D = (3.8%) (2,000) = 75
County E (36.4%) (30,000) = 10,909
County H (4.5%) (4,000) = 181
Total = 22,528 expected stops of Hispanic drivers in County A

County A = (69.5 %) (500,000) = 347,500
County D = (10.5%) (100,000) = 10,500
County E (16.5%) (1,000,000) = 165,000
County H (3.5%) (10,000) = 350
Total = 523,350 expected stops of all drivers in County A

= 22,528 / 523,350
= Percent of Hispanic Drivers expected to be stopped in County A = 4.3%

Other
County A = (44.4%) (25,000) = 11,111
County D = (16.7%) (1,000) = 167
County E (33.3%) (20,000) = 6,660
County H (5.5%) (1,000) = 55
Total = 17,993 expected stops of Other drivers in County A

County A = (69.5 %) (500,000) = 347,500
County D = (10.5%) (100,000) = 10,500
County E (16.5%) (1,000,000) = 165,000
County H (3.5%) (10,000) = 350
Total = 523,350 expected stops of all drivers in County A

= 17,993 / 523,350
= Percent of Other Drivers expected to be stopped in County A = 3.4%

The traffic model produces a new benchmark against which the stop data is compared. The traffic model does provide different results than if the residential Census values are used. For example, if Census data were used, Caucasians would make up 80% of the driving population in County A, whereas the traffic model suggests that the proper benchmark value for Caucasians should be 77.1%.

SUMMARY

The baseline of a county is a weighted average of the population of the county and the population at drivers' resident counties.

$$p_i = \sum_j p_j w_{ij} / \sum_j w_{ij}$$

where,
p_i is the baseline population (or population of an ethnic group) at county *i*;
p_j is the population (or population of an ethnic group) at driver resident county *j*;
w_{ij} is a measure of interaction between counties *i* and *j*.

Ideally, w_{ij} should be measured by the actual traffic flow from county *j* to county *i*. However, since such traffic flows are rarely available, w_{ij} is assumed to be a ratio of the number of stopped drivers at county *i* that are from county *j* over the total number of stops at county *i*.

$$w_{ij} = s_{ij} / \sum_j s_{ij}$$

s_{ij} is the number of stopped drivers at county *i* that are from county *j*.

Assumptions

There are four main assumptions underlying this model. First, the spatial distribution of stopped drivers, in combination with the Census data, represents the true distribution of all drivers. In other words, there is a pre-existing assumption of no bias in police stops. The calculation of the stop data and the Census data is used as a true proxy for the racial composition of drivers. This assumption is not substantiated.

Second, there is an assumption that the percent driving in the jurisdiction of interest represents the exact percent of drivers from the home county. For example, if 70% of drivers stopped live in County A, the assumption is that 70% of the total possible drivers in County A are driving. This is not known and consequently is an unsubstantiated assumption.

Third, this traffic model assumes that the weight of a county is determined by the percent of drivers by race from other counties stopped in the county of interest. Due to the fact that the only measure of the racial composition of the drivers within a jurisdiction is the stop data, that data must be utilized as a component of the model.

Fourth, this traffic model assumes that the driving population in one county is not entirely comprised of only that county's residents. In other words, for any one jurisdiction, it is assumed that drivers from other counties will also drive in that county. This assumption addresses the primary limitation of Census data in providing a more accurate baseline because Census data only reflects residents of one county, not those who drive from surrounding counties.

Initially, the model assumes the stops accurately reflect the driving population. In other words, because the model is partially calibrated by the actual traffic stops conducted by Pennsylvania State Troopers, it is reliant on the accuracy of the traffic stop data. This is a significant limitation, as the model is predicated upon the stopping behavior of the Troopers and if there is any existing bias, the model will not accurately reflect such a disparity. A second significant limitation of the model is it assumes that the percent of stops conducted by Troopers are an accurate reflection of the actual percent of drivers from other jurisdictions. The validity of this assumption is unknown. As noted earlier, if 70% of drivers stopped in one county are Caucasian and from County A, this model assumes that 70% of the Caucasian drivers in County A according to the residential Census populations are driving. It is possible that 100% of the Caucasian drivers from County A are driving, but still only make up 70% of the drivers stopped. Furthermore, it is possible that Troopers pay more or less attention to drivers from out-of-state, which would bias the estimate of the driving population based on the traffic model.

These two limitations are important to consider when evaluating the results generated from the traffic flow model. While the traffic flow model provides a more accurate depiction of the driving population, there is no mechanism available to check on the validity of the driving estimates provided by the model. In essence, there are two primary concerns: a) whether the drivers stopped in combination with the Census data provide an accurate proxy of the true driving population within the jurisdiction, and b) if the drivers stopped properly reflect their "home" jurisdictions, in other words, the percentage of drivers that travel from surrounding jurisdictions into the area of interest (i.e. other counties). Notwithstanding these limitations, the traffic flow model does provide an improved method of estimating the true baseline of driving population.

Limitations

As with all techniques developed to reflect the driving population of an area, this model has its limitations. Initially, the model assumes the stops accurately reflect the spatial distribution of driving population. In other words, one component of the model is calibrated by the actual traffic stops conducted by Pennsylvania State Troopers. This is a significant limitation, as the model is predicated upon the stopping behavior of the Troopers and if there is any existing bias, the model will not accurately reflect such a disparity.

This limitation also leads to the assumption that the percent of stops conducted by Troopers are an accurate reflection of the actual percent of drivers from other jurisdictions. This is not a supported assumption as there is no reason to believe or not believe that the percent of drivers stopped in one jurisdiction represents the exact percent of drivers who drive from that other jurisdiction. Furthermore, it is possible that Troopers pay more or less attention to drivers from out-of-state, which would bias the estimate of the driving population based on this model.

These limitations are important to consider when evaluating the traffic model. While the traffic model provides a more accurate depiction of the driving population, there is no mechanism available to check on the validity of the driving estimates provided by the model. In essence, there are two primary concerns: a) whether the drivers stopped, in combination with the Census data, provide an accurate proxy of the true driving population within the jurisdiction, and b) if the drivers stopped properly reflect their "home" jurisdictions, in other words, the percentage of drivers that travel from surrounding jurisdictions into the area of interest (i.e. other counties). Notwithstanding the limitation, the traffic model does provide an improved method of estimating the true baseline of driving population.

APPENDIX B

OBSERVATIONS OF ROADWAY USAGE AND DRIVER SPEEDING BEHAVIOR

This appendix documents the independent observational surveys of roadway usage and speeding patterns of drivers that were conducted in 27 Pennsylvania counties that were conducted in the first year of data collection (2002-2003) and originally appeared in Section IV of the Year 1 Report (Engel et al., 2004).

This appendix begins with a description of the rationale behind this type of benchmark data collection and is followed by a brief review of similar observational studies in other states. Thereafter, the observation methodology is documented. Specifically, the sampling design of particular counties, municipalities, and roadways for observation is described, as well as the training of observers and data collection procedures. Finally, the findings of the roadway and speeding surveys are described in two parts. First, a county-by-county analysis for each of the 20 originally sampled counties is presented. Second, analyses are presented for seven counties that were identified for additional observation.

THE BENCHMARK DILEMMA

The main issue facing researchers examining police traffic stops is that simply determining how often minorities are stopped, searched, cited, or arrested by police is not particularly meaningful until those percentages are compared to some "expected probability" of these actions toward minorities; this comparison is referred to as a benchmark or base rate (Rojek et al., 2002). The most frequent type of data used to determine expected probabilities is Census population figures. Though readily available, comparisons based on Census data are limited. First, several researchers have suggested that there is ample reason to suspect that residential populations do not necessarily represent the driving population in those areas. Second, the Census does not include measures of driving behavior that may account for racial disparity in stops. That is, merely demonstrating a difference between the percent of minorities stopped and the percent living in a particular area does not necessarily mean police officers have acted inappropriately. Indeed, an alternative explanation is that disparities may reflect differences in legally relevant behavior by members of particular demographic groups (Walker et al., 2000).

Some researchers have defended the use of population figures as an appropriate comparison group, suggesting that no research has indicated that there are racial differences in traffic violations or travel routines (ACLU; 2000; Lamberth, 1996, Verniero & Zoubek, 1999). Research in the travel, transportation, and accident analysis literatures, however, does show considerable racial differences in a variety of driving-related behaviors including:

- Frequency of driving personal vehicle/use of public transit (Krovi & Barnes 2000; Meehan & Ponder, 2002; Polzin, Chu, & Rey, 2000; Rosenbloom, 1998)
- Seat belt use (Baker et al., 1998; Braver, 2003; Everett et al., 2001; Glassbrenner 2003; Harper et al., 2000; Lerner et al., 2001; Nachiondo & Robinson, 1996; Wells, Williams, & Farmer, 2002)

- Vehicle ownership (FHA, 1995; Ross & Dunning, 1997)
- Possession of driver's license/driving without license (Chu et al., 2000; Polzin, Chu, & Rey, 2000)
- Fatal accident involvement (Baker et al., 1998; Braver, 2003; Campos-Outcalt et al., 1997; CDC, 2000; Missouri Dept of Health, 1998; Schiff & Becker, 1996; Voas et al., 2000)
- Alcohol-related accident involvement and driving under the influence (Abdel-Aty & Abdelwahab, 2000; Braver, 2003; Caetano & Clark, 2000; Everett et al., 2001; Harper et al., 2000; Jones & Lacey, 1998; Royal, 2000; Voas et al., 1998; Voas et al., 2000)

This research suggests that drivers' behavior, not police behavior, may at least partially account for racial disparity in police stops and stop outcomes.

Ultimately, relying solely on Census data as a benchmark comparison for traffic stops means that it is reasonable to assume that people drive where they live and that different demographic groups do not drive differently. The evidence for these assumptions, however, is lacking. Therefore, although collecting data on driving behavior is more costly—in terms of expenditures and time—than relying on demographic proxies, the acknowledged weaknesses of Census data have caused some researchers to initiate observational studies of roadway usage and driving behavior in order to determine both who is driving where and how they are driving. Indeed, many researchers involved in traffic stop data collection efforts have become more cautious in their conclusions based on population benchmarks. They note that further research needs to measure differences in driving behavior as an alternative explanation for racial disparity (Cordner et al., 2001; Cox et al., 2001; Lansdowne, 2000; Zingraff et al., 2000; Rojek et al., 2002).

This study supplements comparisons based on Census data with observational surveys of roadway usage and driver violating behavior. Although a number of different driving behaviors are illegal, this study focuses on one particular behavior—speeding. This selection can be justified for several reasons. First, a recent national survey revealed that people reported speeding as the most frequent reason (64%) for which they are stopped by police (Boyle et al., 1998). Second, in terms of methodological considerations, speeding is easier to measure than many other illegal driving behaviors. Furthermore, with RADAR technology, it can be measured reliably and objectively. Third, for many police agencies, particularly large state agencies and highway patrols, the majority of traffic stops are for speeding. Therefore, the most cost-effective type of benchmark data collection should focus on the most frequent violating behavior for which police officers make stops. Indeed, for this year's and last year's period of traffic stop data collection, the Pennsylvania State Police identified speeding as the reason for the stop in 72 and 75 percent of all traffic stops, respectively.

PRIOR OBSERVATIONAL RESEARCH

As noted above, little research associated with allegations of biased-based policing in traffic stops has actually explored the possibility that demographic groups differ in their driving behavior (Engel et al., 2002; Engel & Calnon, 2004b). In this section, we briefly review the few recent studies that have explored driving behavior as a benchmark for stop data.

John Lamberth (1994; 1996) administered the first observational studies, examining speeding behavior in the mid-1990s in New Jersey and Maryland. In order to determine who was speeding on the selected roadways, Lamberth had trained observers ride in a vehicle traveling at exact speed limit in Maryland and at five miles per hour over the speed limit in New Jersey. They recorded the characteristics of the drivers in the cars that passed them (the speeders) as well as the drivers in cars that the research vehicle passed (the non-speeders). Using this technique, which Lamberth called the "carousel method," he reported that the overwhelming majority of drivers (98% and 93% in New Jersey and Maryland respectively) were violating the posted speed limits. The major finding reported from this study, however, was that there were no significant differences in the violating behavior of Caucasian and Black drivers.

This technique, however, was flawed because it measured only a simple dichotomy of speeding or not speeding, which makes it impossible to determine if the severity of speeding behavior varied by demographic groups. This is particularly significant because most police agencies have formal policies or informal norms regarding the level of speeding that merits a warning or citation.[17] The limitations of this technique, therefore, prohibit giving much credence to the argument that Caucasian and Black drivers drive indistinguishably. The lack of a measure of the degree of the speeding violation simply does not capture (even at five miles per hour over the speed limit) drivers' real risk of being stopped for that behavior.

Since Lamberth's initial attempts to survey law-violating behavior, other researchers have altered these techniques and have advanced the methodological approach. A research team in North Carolina improved upon Lamberth's idea by more precisely measuring the amount over the limit at which vehicles were speeding (Smith et al., 2000). This study's technique for assessing speeding behavior relied on groups of observers using stopwatches to measure how long it took vehicles to pass the distance from their vehicle's rear bumper to the front bumper, while it was traveling at a set speed. In addition to the speed of passing vehicles, observers also recorded information about the vehicle and its occupants (e.g., drivers' race, gender, approximate age, vehicle color, state of license plate, type of vehicle), so that they could analyze demographic differences in speeding. The findings suggest that for particular roadway segments, Black drivers were significantly more likely to exceed the speed limit compared to Caucasian drivers.

The North Carolina study is slightly limited in that the assessments of speeding were conducted on only 14 highway segments that were 10-15 miles long across the entire state of North Carolina (48,711 square miles). Furthermore, the data collection period only lasted 6 weeks, was conducted 4 days a week and 6 hours a day. The external validity of this study, thus, is limited, particularly in terms of its small geographic representation and its inability to capture potential seasonal variation. Nevertheless, there is no reason to believe that the

[17] For example, the law of the Commonwealth of Pennsylvania requires that vehicles be traveling at more than six miles per hour above the posted speed limit in order for police to issue drivers a citation (75 Pa. C.S. § 3368).

finding that Black motorists are more likely to speed than Caucasian motorists is invalid for the roadway segments selected.

The methods of the research conducted in North Carolina measure strict differences in the severity of speeding by gender and race. For purposes of comparing observational data to official traffic stop data, this may be problematic. As the researchers in North Carolina suggest, drivers differ in their levels of "speeding savvy," which suggests that some drivers may speed in ways that minimize their risks of being detected and stopped by police. Therefore, citizens' risks of being stopped for speeding may not be fully captured through methods that strictly examine differences in the severity of speeding behavior. Methods to determine drivers' risks of being stopped for speeding would have to rely on the same techniques for detection of speeding as the police use.

The most recent examination of traffic violating behavior did just that. The Speed Violation Survey of the New Jersey Turnpike utilized RADAR and high-speed photography at 14 different locations along the 148-mile turnpike to identify the race, ethnicity, gender, and speeding behavior of drivers on the roadway (Lange et al., 2002; Lange, Johnson & Voas, 2005). Each location yielded approximately 48 hours of data collection during a three-month period in 2001, which varied by weekend and weekday. The researchers operationalized speeding as driving at least 15 miles per hour over the posted speed limit. A panel of three trained observers, who worked independently to identify the drivers' race, ethnicity, gender, and age, examined the photographs with no knowledge of the recorded speed of the vehicle. Cases with at least two identical ratings were treated as conclusive (about 68% of the photographs); the rest were treated as unclassifiable.[18]

Lange et al. (2002, 2005) found significant race, age, and gender differences in speeding behavior. Based on only the cases with conclusive driver data, their findings indicated that Black drivers were 64 percent more likely than Caucasian drivers to exceed the 65 m.p.h. limit by 15 or more miles per hour, controlling for age and sex. At the 55 m.p.h. speed limit, however, no statistically significant differences between Blacks and Caucasians were found. In the 65 mph zone, people coded as younger than 45 were 3 times more likely to speed than those over 45 and men were 20% more likely to speed than women, controlling for other driver characteristics. Significant age differences were also found in the 55 mph zone, but the gender difference disappeared. Overall, the vast majority of drivers were found to be driving less than 15 m.p.h. over the posted speed limit, which suggests that the operationalization of speeding in this study may have been too high. Perhaps another operationalization was possible, but it was not reported. Although this study served its specific purpose (initiated by police officers responsible for this area), its external validity to other locations or other types of roads is minimal.

[18] Lange et al. (2002, 2005) found no evidence to indicate that drivers' race was significantly related to the likelihood of unclassifiable data, indicating instead that unusable data was primarily due to technical problems associated with the positioning of cameras that produced glare and shadows on the windows of passing cars.

METHODOLOGY

The methodology of the current observational study in Pennsylvania is described in detail in this section. It borrows from and improves upon features of the prior data collection efforts detailed above.

Selecting observation counties and locations

The primary reason for collecting observational data on driving behavior was establish a more appropriate benchmark for the traffic stop data, particularly in counties where it was unlikely that Census data would accurately reflect the driving population. Due to the considerable size of the Commonwealth of Pennsylvania (44,820 square miles), it was not feasible, financially or practically, to conduct observations in each of Pennsylvania's 67 counties. It was determined that a sampling procedure would be utilized to select a more realistic number of counties to represent statewide traffic patterns. The details of this sampling strategy are included below.

As noted above, observational studies of roadway usage and driving behavior have been implemented in studies of traffic stops primarily because of the argument that Census data is unlikely to represent the driving population in many areas. Given this purpose, counties were not randomly selected, but rather were sampled based on three specific concerns:

1) The likelihood that county wide traffic patterns did not reflect the residential population
2) The county's general roadway usage
3) The likelihood of roadway usage by minorities in particular.[19]

The strategy was to identify county characteristics that were related to these three constructs. The research team identified seven such characteristics for all 67 Pennsylvania counties:

1. total county population,
2. the number of interstate miles within each county,
3. the total number of roadway miles within each county,
4. the population of Blacks within each county,
5. the population of Hispanics within each county,
6. the presence of tourist attractions, colleges and universities, or historical sites, and
7. the presence of seasonal attractions (e.g., amusement parks, water parks, ski resorts, etc.).

These seven characteristics were analyzed using a statistical technique known as principal components factor analysis, which can identify any underlying latent constructs among these

[19] The latter two factors associated with the sampling process were based on practical concerns; i.e., it would not be cost effective to conduct observations in several counties that had low population density, very small minority populations, and/or no major interstate travel.

characteristics.[20] The factor analysis revealed a factor with an eigenvalue greater than one (eigenvalue=3.31), which explained 43.7% of the variance.[21] Individual factor scores were generated for each county, and the counties were ranked from high to low, based on these scores. Essentially, the counties were ranked on their potential volume of traffic, possible minority roadway usage, and possible travel patterns that would not match residential populations.

The ranked 67 counties were then divided into four groups based on their factor scores. Twenty counties were selected for observation, with an over-sampling of the "high" group to better examine the counties where there is likely to be more traffic, more minority roadway usage, and traffic patterns that may not reflect residential populations. The factor score rankings and group classification of all 67 counties are displayed in **Table B.1.** As this table shows, of the 20 counties selected, 55% (11 counties) were from the high group, 20% (4 counties) were from the medium group, 15% (3 counties) were from the medium/low group, and 10% (2 counties) were from the low group.

Table B.1: County groupings based on factor analysis (n=67 counties)

GROUP 1—HIGH	GROUP 2—MEDIUM	GROUP 3—MED/LOW	GROUP 4—LOW
Allegheny (2)	Beaver (30)	Adams (39)	Armstrong (57)
Berks (8)	Bedford (32)	Bradford (40)	Cameron (67)
Bucks (10)	Blair (29)	Cambria (38)	Elk (65)
Chester (11)	Butler (24)	Carbon (49)	Forest (64)
Crawford (17)	**Centre (26)**	Clarion (45)	Fulton (56)
Dauphin (5)	Clearfield (27)	Clinton (48)	Jefferson (53)
Delaware (12)	Cumberland (18)	**Columbia (46)**	**Juniata (62)**
Erie (7)	**Franklin (23)**	Fayette (35)	**McKean (58)**
Lancaster (3)	**Lackawanna (21)**	Greene (36)	Mifflin (66)
Lehigh (4)	Lebanon (25)	Huntington (41)	Montour (63)
Luzerne (14)	Lycoming (28)	**Indiana (42)**	Perry (61)
Monroe (16)	**Mercer (20)**	Lawrence (43)	Potter (60)
Montgomery (6)	Northampton (19)	Snyder (50)	Sullivan (51)
Philadelphia (1)	Northumberland (33)	Somerset (44)	Venango (55)
Washington (15)	Pike (31)	Susquehanna (37)	Warren (59)
Westmoreland (13)	Schuylkill (22)	**Tioga (47)**	Wayne (52)
York (9)	Union (34)		Wyoming (54)

[20] Factor analysis is a statistical technique that, in effect, reduces multiple variables to determine an underlying dimension, or factor, that exists among them. In the case of the variables listed above, each of these variables is highly correlated with the others. Together, the variables represent an underlying dimension or construct. This underlying dimension could be thought of as something that measures larger volumes of travel by minorities, or travel patterns that may not match residential populations. For details regarding the use of factor analysis, see Kim & Mueller (1978).

[21] In addition, a second factor was extracted with an eigenvalue slightly greater than one (eigenvalue = 1.12). However, this factor only explained 16% of the variance and none of the factor loadings for individual variables was greater than .50. This factor was statistically weak and uninterpretable due to the small factor loadings. As a result, the factor analysis was interpreted as have only one significant underlying factor. The sampling procedures therefore were based on the factor scores generated from the main factor. The standardized factor scores for each county are available from the authors upon request.

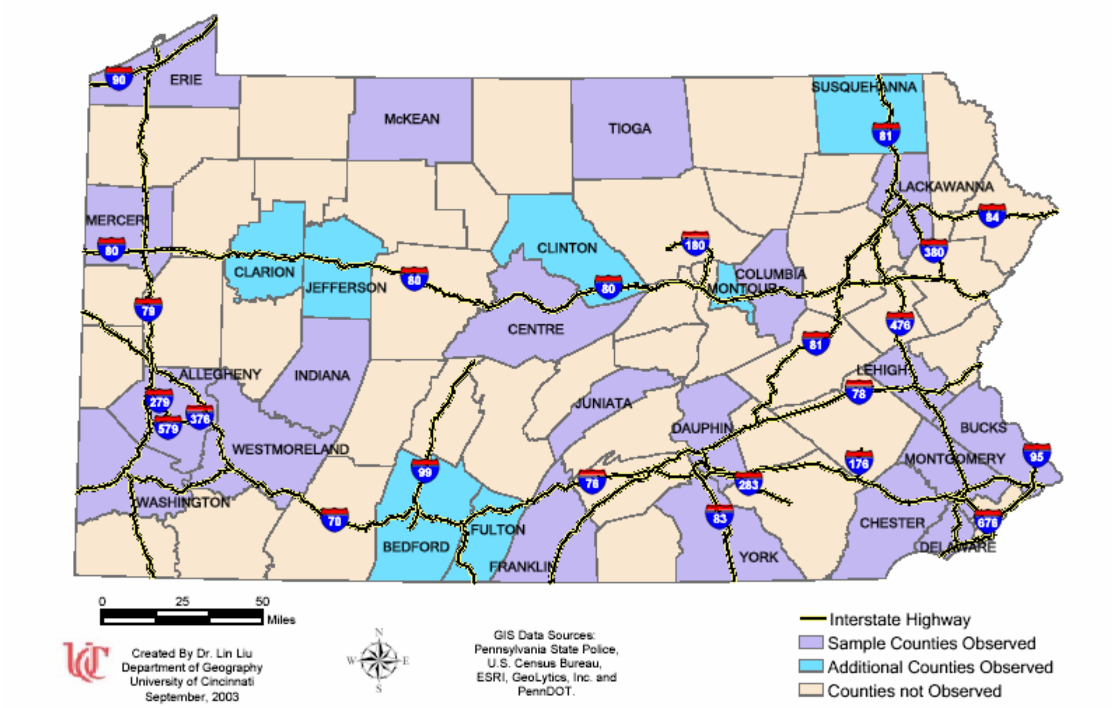
NOTE: Counties in bold were selected for observation. The numbers in parentheses indicate the counties' factor score rankings.

The final selection of counties from within the four groups was based on the amount of departmental activity within those counties and their geographic location.[22] The twenty counties selected are displayed on the map in **Figure B.1**, and include:

Allegheny	Dauphin	Juniata	Montgomery
Bucks	Delaware	Lackawanna	Tioga
Centre	Erie	Lehigh	Washington
Chester	Franklin	McKean	Westmoreland
Columbia	Indiana	Mercer	York

As **Figure B.1** also indicates, further observation was conducted for two days in seven additional counties: Bedford, Clarion, Clinton, Fulton, Jefferson, Montour, and Susquehanna. These counties were specifically identified based on preliminary analyses of the traffic stop data that indicated, in those counties, the percent of minorities that were stopped was substantially higher than the percent of minorities in the residential population (further discussion of these seven counties follows in the section on benchmark comparisons).

Figure B.1. Counties with Observed Traffic Counts in Pennsylvania



[22] The final selection of counties from the four categories determined by factor analysis was based on input from PSP administrators and the research team. Special consideration was given to the specific activities of the department. For example, some counties were not selected (e.g., Philadelphia county) because PSP has limited jurisdiction in those areas, while other counties were selected because of higher PSP activities. In addition, consideration was given to geographic location in an effort to more effectively cover the entire state and all major interstates (see **Figure B.1**).

Once the counties were selected, PSP stations with jurisdiction in those areas were identified. The initial selection of roadways to be observed was the responsibility of the commanders at these stations, based on the guidance of specific criteria (developed by the research team) that were deemed necessary for safety or data collection purposes. Specifically, station contacts were asked to select one location for each of the two initial days of observation that:

1) had a significant volume of traffic,
2) were generally representative of travel patterns in their jurisdiction,
3) generated a large number of citations,
4) were appropriate for use of RADAR while also allowing observers to see vehicle and driver characteristics, and
5) were safe for the observers to be stationed at all day.

After the first quarter (and each subsequent quarter) of traffic stop data collection was complete, the research team identified municipalities that had the highest percentages of stops and requested that they be targeted for subsequent observations. Although occasionally it was not feasible to position observers at sites that were appropriate for Troopers in these municipalities, the stations did their best to accommodate requests, barring construction, weather, or safety hazards. For the additional observed counties, observed municipalities were selected by the research team based on the percent of stops generally, and percent of minorities stops in particular.

Data collection training and procedures

Undergraduate research assistants were recruited to serve as observers, whose primary responsibilities were to collect and enter data assessing roadway usage and traffic violating behavior. In order to be eligible to participate as a research assistant, undergraduate students were required to hold a minimum 3.0 GPA, to fill out an initial screening application, and to complete informal interviews after passing the screening. Applicants that were selected to participate also had to pass the Institutional Review Board's human subjects training, which focuses on the importance of confidentiality and protection of human subjects during the research process. Furthermore, all participants signed and were required to abide by the confidentiality and data integrity standards established in the project's own confidentiality agreement. Groups of 6-15 observers were recruited and trained each semester of the project's duration, with a total of 50 students participating over the course of 2002 and 2003.

Once students completed the hiring process, two mandatory training sessions were organized. First, PSP RADAR training instructors at the State Police Training Academy spent four classroom hours explaining the philosophy, use, and limitations of RADAR technology to the team of observers. The PSP instructors then escorted several cars of observers to the nearby interstate where the observers would practice the techniques of RADAR learned earlier.[23]

[23] Copies of the RADAR training curriculum are available from the authors upon request.

The project manager conducted the second training session, in several small groups, focusing on the specific procedures and techniques of data collection and data entry. The first part of this training documented the expectations of the observers before, during, and after each observation trip. Second, the data collection instruments were described and reviewed item by item (see **Figure B.2**).[24] The majority of this part of the training session focused on the variables captured on the "RADAR Observation Form." Examples of each vehicle characteristic were offered, the different license plates available in Pennsylvania were reviewed, and the logic behind the order of the variables on the data collection instrument was explained (i.e., they are organized by the order in which they can be seen by observers).

Driver characteristics were reviewed extensively. Observers were trained that both members of the observation team had to agree on the characteristics of the observed driver, including drivers' race/ethnicity. Race and ethnicity were captured using the following categories: Caucasian, Black, Hispanic, Asian, Native American, Middle Eastern, and other minority. If both observers agreed that the driver was minority, but could not agree on a specific minority group, they were trained to record the race as simply "other non-Caucasian." If the observers could not agree on the more general Caucasian / non-Caucasian dichotomy, or if the driver's race was simply not discernible (e.g., tinted windows, sun visors, etc.), they were trained to record the driver's race as missing. Throughout the training, it was repeatedly emphasized to observers that missing data (on many items) was to be expected, and that they should always be confident in what was recorded; if they were not, they were trained to record the values for that variable(s) as missing.

Following the description of the data collection instrument, each group of observers practiced on the interstate, demonstrating their comprehension of the data collection process by showing that they could:

1. plug in & test the RADAR set before starting,
2. call out data while running RADAR,
3. call out data in order that it is on data sheet (less chance for error in recording data),
4. appropriately record data on the data collection instrument.

Each observer practiced calling out data and using RADAR with a minimum of 20 vehicles. Each observer also practiced recording data (with the appropriate abbreviations) and agreeing on race. All observers were evaluated in terms of their positioning and general use of RADAR, their ability to identify "good" RADAR situations (as defined by the PSP training personnel), their order of calling out data, their ability to also look at driver race while recording data, and their ability to accurately record the data. Following this roadway training, the training session also explained and demonstrated how the data collected would be entered into Microsoft Excel (for later transfer to SPSS), using one file for each type of data collected (i.e. one each for roadway usage and speeding observations).

The typical process of data collection consisted of reporting to the host police barracks, getting escorted to the pre-selected locations, and then setting up for data collection. During

[24] The project manager and data manager developed the data collection instruments during three 1-hour pilot test sessions on the nearby interstate, prior to the training of any undergraduate observers.

the data collection period, the two observers parked in a personal vehicle on the side or in the median of the roadway in order to collect information about the passing motorists and

Figure B.2. Radar Observation Form

NOTE: Any missing data should be indicated by a dash (--).

SPEED DETECTED	TYPE OF VEHICLE	COLOR OF VEHICLE	AGE OF VEHICLE	RACE OF DRIVER	GENDER OF DRIVER	AGE OF DRIVER	PASSENGERS	LICENSE PLATE
	S-Sedan **SC**-Sports Car/Coupe **SUV**-Sport Util. Veh. **MV**-Minivan, Wagon **T**-Pickup Truck **M**-Motorcycle	**R**-Red **BU**-Blue **G**-Green **S**-Silver/Gray **BK**-Black **W**-White **O**-Other	**N**-Less than 10 years old (newer) **O**-More than 10 years old (older)	**W**-White **B**-Black **H**-Hispanic **A**-Asian/Pac. Isl. **NA**-Native Amer. **ME**-Middle East. **O**-Other	**M**-Male **F**-Female	**Y**-25 & under **M**-26 to 65 **O**-Over 65	**Y**-Yes **N**-No	**P**-Pennsylvania **O**-Other

vehicles. Weather permitting, each day of observation was scheduled for between 7 and 8 hours of observation, which were divided approximately in half between observation of just roadway usage, and observation of speeding behavior (utilizing RADAR). Observers were scheduled for data collection only during daylight hours and during weather conditions that allowed proper visibility.

Within each of the selected twenty counties, research assistants completed a total of 10 days of observation (approximately 7-8 hours per day, for a planned total of about 1,500 hours of observation). Due to weather and daylight constraints, particularly during the winter months, some observers were not able to complete this amount of data collection. Observations were scheduled to vary by day of the week, time of day, and month of the year to allow for the possibility of variation in traffic patterns associated with day, time, and season. The observations conducted in the additional seven counties were scheduled for two consecutive 8-hour days.

The information from each of the 27 counties' observation sessions was compiled to generate the complete observation dataset covering 1,577.5 hours and 161,169 non-commercial vehicles (41.4% of which captured drivers' speeding behavior using RADAR, n=66,741).

Strengths and limitations

The data utilized in this study have a number of strengths in comparison to prior research. First, the approach of directly observing behavior in natural settings allows for the unobtrusive collection of data on drivers' offending behavior, minimizing the biases associated with official data collection and self-report methods. Second, the sampling procedures implemented to represent statewide travel patterns produce greater external reliability in terms of geography and road types than in the previous turnpike studies. Third, the year-long data collection and repeated observations in sampled counties also increases external validity in terms of seasonal variation. Fourth, using speeding behavior as a benchmark is a particularly strong comparison for traffic stops because it measures the presence or absence of legally relevant violating behavior, as well as the severity of that violating behavior (in terms of the miles per hour over the posted speed limit).

Nevertheless, some limitations should be noted. A general limitation of surveys that rely on the use of RADAR for speed detection may be that its use could slow down the speed of passing traffic. Proponents of this approach, however, suggest that that the effect of surveyors' or observers' use of RADAR on traffic should be similar to the effect of officers' use on driver behavior (Lange et al., 2002, 2005). Furthermore, recent research sponsored by the National Highway Traffic Safety Administration indicates that only a small minority of drivers (4%) use radar detectors regularly (Royal, 2003).

How often drivers' characteristics can be determined in stationary locations using RADAR is an empirical question that has not been addressed. As noted above, training sessions conducted prior to observers' participation in the study indicated that observers can determine the driver's race in good weather, during daylight hours, and when RADAR is conducted in locations with clear visibility to the roadway.[25] Therefore, if the goal of the research is to determine drivers' risk of being stopped for speeding, observers using RADAR in stationary vehicles may be a stronger method than observers in moving vehicles, or strategically placed video cameras.

Second, observers' and Troopers' subjective assessments of driver characteristics may inaccurately categorize drivers. The reliability and validity of observers' identification of drivers' demographic characteristics, particularly race and ethnicity, is a weakness of all data collection efforts of this type. In order to minimize this possibility in the current data collection effort, observers were trained that they both had to agree on drivers' characteristics or record the information as missing data. It is also important to note, however, that unlike observers traveling in moving traffic or the use of photographs, the location and visibility of observers allows researchers to collect data in conditions that are somewhat similar to what Troopers may actually experience.

Observers were trained that when a driver's race/ethnicity was identifiable as "minority" or "not Caucasian" but a more specific racial/ethnic category was not determinable, the race/ethnicity of the driver should be recorded as non-Caucasian. This procedure ensures that the overall minority group classification is as reliable as possible, but it increases the likelihood of underestimating Hispanic drivers by including them in the non-Caucasian group, but not identifying them specifically as Hispanic. It is also possible that some Hispanic drivers were incorrectly classified by observers as Caucasian.

The identification of Hispanic drivers during roadway observations is especially difficult. Other observational and traffic studies have reported the difficulties associated with the observation of Hispanics, particularly with distinguishing Hispanics from Caucasian drivers (Alpert, 2003; Lange et al., 2002, 2005; Smith & DeFrances, 2003). In New Jersey, the percent of Turnpike drivers identified as Hispanic was only 4.8 percent, while 14.2 percent of Turnpike drivers self identified as Hispanic (Lange et al., 2002, 2005). Similar differences between the Black and Caucasian populations of the two surveys were not found. Unfortunately, it is not possible to directly assess the incorrect classification of Hispanics in our roadway survey. It is one of the limitations of this type of benchmark data collection. To be cautious with our findings, we therefore do not present analyses based specifically on observations of Hispanic drivers. Hispanic drivers are included in the overall non-Caucasian category of drivers.

In addition to the limitations of racial/ethnic identification of drivers, the measure of drivers' age as a dichotomy of 25 years old or younger versus 26 years or older is rather crude. Although a dichotomous measure for age provides less precision, it is likely to have more

[25] The research team has also learned what troopers have known all along – that the initial decision to stop a car for a speeding infraction cannot be based on characteristics of the driver alone. Observers (and troopers) are trained to identify a car and determine the speed of that car. It is only after a vehicle's speed has been determined and it passes the stationary vehicle using RADAR that drivers' characteristics can be determined. Of course, troopers may make decisions to stop vehicles based on this information, but drivers must be violating the law first. That is, for speeding infractions, drivers' race / ethnicity can only be determined <u>after</u> the behavior is identified as a violation by troopers.

validity compared to a measure with more discrete categories. Nevertheless, observation of drivers' age for this dichotomy is somewhat subjective, particularly for drivers who are in their mid-20s. The possible inaccurate classification of age is one of the limitations of roadway observations. Unfortunately, the amount of inaccuracy in classifications cannot be determined.

Finally, it was practically and financially implausible to observe all roadways within each of the 27 sampled counties. Observation sessions were concentrated on segments of roadways that generated the most traffic stop activity. Therefore, our roadway observations should not be considered a direct measure of who is using the roadways in each county, but rather who is using the roadways in areas where they are most likely to come to police attention. Thus, the county averages of driver characteristics are only estimates of the county driving population at the highest risk of police detection and do not include all possible roadways on which traffic stops may have occurred.

FINDINGS

County-by-County Analysis

In this section, descriptive analyses of the data from each of the sampled counties are discussed. Each county's summary begins with a general description of the area, focusing in particular on factors that are likely to affect general travel patterns, and traffic patterns by minorities in particular, in the area. A series of county maps (**Figures B.3-22**) accompany the summaries of the sampled counties, illustrating each county's comparison of the percent of PSP stops (during Year 1 of the data collection effort) and PSU observations by municipality. Finally, several tables for each county describe the amount of observation conducted, speeding behavior by municipality, the racial composition of the residential and observed populations by municipality, and speeding behavior in the county by demographic groups. A summary of the major trends evident across all 27 counties is provided thereafter.

Allegheny County

Select Characteristics of Allegheny County:

- Located in southwestern corner of Pennsylvania
- Population = 1,281, 666 (2nd most populated county in PA)
- % Blacks = 13.0 (4th largest in PA)
- % Non-Caucasians = 15.0 (4th largest in PA)
- 93.8 interstate miles (largest interstate mileage in PA)
- 5,670.8 total roadway miles (largest roadway mileage in PA)
- Home to:
    - 3 professional sports teams--Steelers, Penguins, and Pirates
    - Mellon Arena, Heinz Field, and Three Rivers Stadium
    - 10 colleges and universities
    - Kennywood and Wildwood Amusement Parks
    - Pittsburgh International Airport
    - State Correctional Institution at Pittsburgh
- Jurisdiction of the Pittsburgh (formerly Findlay) and Gibsonia PSP stations

Table B.2 lists the municipalities that were observed in Allegheny County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Figure B.3 displays two maps of Allegheny County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

The first two columns of **Table B.2** and the maps in **Figure B.3** illustrate that the observed municipalities in Allegheny County reasonably mirror the municipalities with higher concentrations of PSP traffic stops. The major disjunction between the stop map and observation map in **Figure B.3** is that one observed municipality had less than 1% of all PSP stops (see West Deer Twp in **Table B.2**). In the same area of the county, one municipality that is shaded to indicate over 10% of PSP stops were made there, was not observed. This municipality is Indiana Twp; the PSP personnel in this jurisdiction indicated that, although 12.2% of the county's stops were in this area, there was not a suitably safe location for an observation team. Since West Deer Twp borders this municipality and presumably shares at least some of the same driving population, it was selected instead.

The remainder of **Table B.2** indicates that a large volume of vehicles was observed in Allegheny County, ranging from 76.5 vehicles to 144.1 vehicles observed per hour. The amount of RADAR conducted in the county (43.1%) was slightly higher than in the overall dataset (41.4%). Fortunately, there were no weather limitations in Allegheny County that prohibited observers from conducting RADAR.

Table B.2 Observations in Allegheny County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Ave. # Vehicles/Hour	% RADAR
Harmar Twp	7.7	3/17/2002	976	7.0	139.4	34.9
Monroeville Brgh	4.8	3/18/2002	1,009	7.0	144.1	31.6
Ohio Twp	2.9	6/14/2002	914	7.0	130.6	49.1
Robinson Twp	16.6	6/15/2002	1,010	7.5	134.7	30.0
Monroeville Brgh	4.8	9/29/2002	959	7.5	127.9	50.6
West Deer Twp	0.6	9/30/2002	712	5.0	142.4	17.3
Harmar Twp	7.7	9/30/2002	289	2.5	115.6	100.0
Marshall Twp	2.0	2/09/2003	667	8.0	83.4	55.0
Robinson Twp	16.6	4/11/2003	849	7.5	113.2	18.6
Robinson Twp	16.6	4/12/2003	967	7.5	128.9	79.5
Franklin Park	5.5	4/15/2003	574	7.5	76.5	42.9
County Total/Avg.	---	------------	8,926	74.0	120.6	43.1

* This column reflects the percent of PSP stops (n=10,811) in this county for each observed municipality.

Figure B.3. Allegheny County, PA.
Traffic Stops and Observations by Municipality

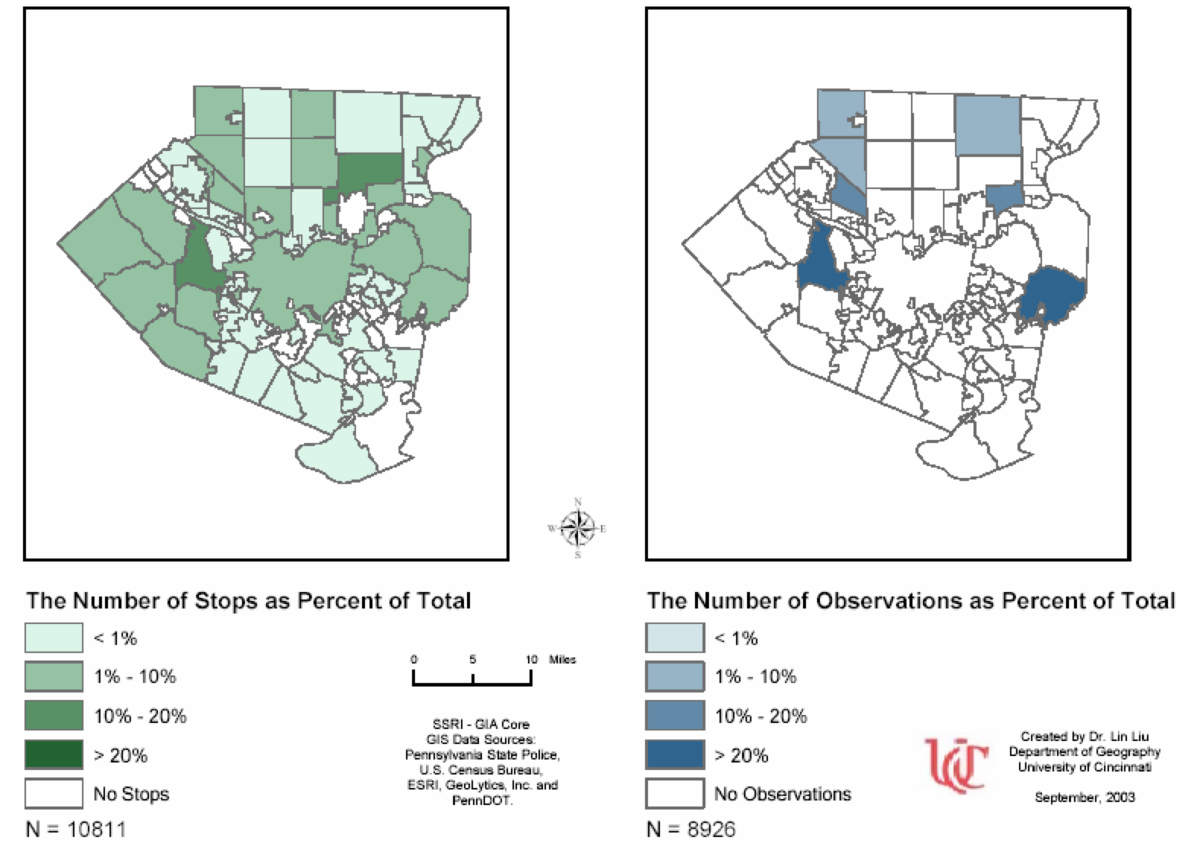


Table B.3 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Allegheny County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Allegheny County were conducted only on interstate highways.
- Municipalities with 65 mph speed limit have considerably smaller percentages of speeders than lower speed limits, even at the least severe level of speeding (> 5 mph over the limit).
- As would be expected, the percentages of drivers that are observed to be speeding decreases dramatically as more serious levels of speeding are examined.
- The table shows that the 45 mph zone in Robinson Twp and 50 mph zone in Marshall Twp maintain the largest percentages of speeders through each speeding category.

Table B.3 Speeding Behavior by Municipality in Allegheny County* (n=3,849)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Harmar Twp	Interstate	65	24.3	3.2	0.0	0.0
Monroeville Brgh	Interstate	55	89.3	57.1	22.6	5.6
Ohio Twp	Interstate	55	85.7	50.6	18.7	6.7
Robinson Twp	Interstate	45	98.3	82.8	61.4	23.8
Monroeville Brgh	Interstate	55	79.8	42.7	14.4	1.6
West Deer Twp	Interstate	65	10.6	0.0	0.0	0.0
Harmar Twp	Interstate	65	10.7	1.4	0.0	0.0
Marshall Twp	Interstate	50	92.4	74.1	42.2	14.2
Robinson Twp	Interstate	55	33.5	10.8	1.9	0.0
Robinson Twp	Interstate	55	86.6	56.0	26.7	7.2
Franklin Park	Interstate	55	85.4	46.3	17.1	3.7
County Average	-----------	--	71.4	44.6	21.2	6.3

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.4 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Allegheny County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- The observations conducted in Monroeville Borough, the municipality with the largest non-Caucasian residential population among the observed municipalities in Allegheny County, included a smaller observed non-Caucasian driving population.
- In contrast, the municipalities with small non-Caucasian residential populations (e.g., Harmar Twp, Ohio Twp, West Deer Twp) were observed to have a larger non-Caucasian driving population.
- The large difference between the county's non-Caucasian residential and observed driving populations (9.0 percentage points) may be partially due to not observing as many municipalities that have higher non-Caucasian residential populations.
- The county's percent missing driver race (2.9%) is slightly higher than percent missing in overall observation data (2.6%).

Table B.4 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Allegheny County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Harmar Twp	2,759	97.6	89.7	+7.9	0.7	3.6	-2.9	2.4	5.9	-3.5	4.4
Monroeville Brgh	24,133	86.5	92.5	-6.0	7.7	3.2	+4.5	13.5	6.0	+7.5	1.5
Ohio Twp	2,360	96.8	87.3	+9.5	1.0	4.0	-3.0	3.2	7.9	-4.7	4.8
Robinson Twp	9,795	95.3	90.7	+4.6	1.7	1.1	+0.6	4.7	2.6	+2.1	6.7
Monroeville Brgh	24,133	86.5	91.0	-4.5	7.7	2.4	+5.3	13.5	8.2	+5.3	0.7
West Deer Twp	8,969	98.9	94.7	+4.2	0.3	1.8	-1.5	1.1	4.5	-3.4	0.8
Harmar Twp	2,759	97.6	94.1	+3.5	0.7	1.7	-1.0	2.4	4.5	-2.1	1.4
Marshall Twp	4,192	95.9	95.1	+0.8	1.1	2.7	-1.6	4.1	3.1	+1.0	1.8
Robinson Twp	9,795	95.3	88.7	+6.6	1.7	2.0	-0.3	4.7	6.5	-1.8	4.8
Robinson Twp	9,795	95.3	93.9	+1.4	1.7	1.9	-0.2	4.7	4.8	-0.1	1.3
Franklin Park	8,274	95.2	95.8	-0.6	0.9	2.6	-1.7	4.8	3.3	+1.5	0.9
County Total/Avg	1,032,549	85.7	91.7	-6.0	11.0	2.5	+8.5	14.4	5.4	+9.0	2.9

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.5 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Allegheny County. The trends in this county are summarized below.

- Observation data from Allegheny County suggest no significant gender differences in observed speeding behavior.
- Age differences are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.1, 1.2, 1.5, and 2.1 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are no significant racial differences in observed speeding behavior in Allegheny County.

Table B.5 Speeding in Allegheny County by Driver Characteristics (n=3,849)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	1,170	1.2	70.9	45.6	21.0	6.1
Male	2,632		71.7	44.0	21.2	6.5
25 years old or under	339	1.4	78.8**	52.5**	30.1***	12.1***
Over 25 years old	3,455		70.8	43.8	20.3	5.8
Caucasian	3,559	2.3	71.0	44.5	21.4	6.4
Non-Caucasian	201		76.1	44.3	16.4	6.0

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Bucks County

Select Characteristics of Bucks County:

- Located in southeastern Pennsylvania, bordering state of New Jersey and Philadelphia County, which is home to 7 universities, Philadelphia International Airport, and 4 professional sports teams (Eagles, Phillies, 76ers, and Flyers)
- Population = 597,635 (4th most populated county)
- % Blacks = 3.6
- % Non-Caucasians = 7.5 (4th largest in PA)
- 37.1 interstate miles
- 3,318 total roadway miles
- Home to:
    - 2 colleges and universities
- Jurisdiction of the Dublin and Trevose PSP stations

Table B.6 lists the municipalities that were observed in Bucks County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Figure B.4 displays two maps of Bucks County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

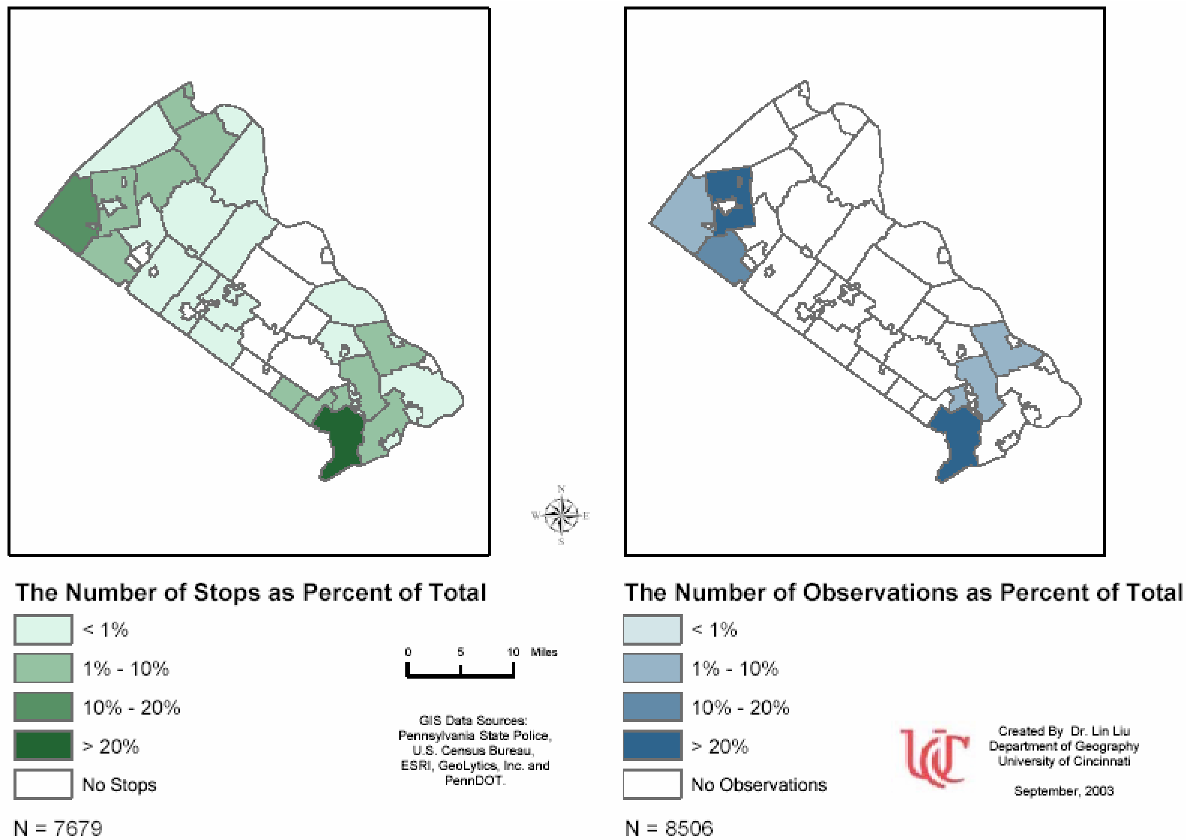
The first two columns of **Table B.6** and the maps in **Figure B.4** illustrate that the observed municipalities in Bucks County directly parallel the municipalities with higher concentrations of PSP traffic stops.

Table B.6 Observations in Bucks County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Bensalem Twp	26.6	04/19/2002	653	7.0	93.3	33.7
Lower Makefield Twp	5.6	04/20/2002	618	7.5	82.4	49.0
Richland Twp	3.5	07/28/2002	858	7.5	114.4	38.5
Milford Twp	16.5	07/29/2002	800	7.5	106.7	39.6
Middletown Twp	8.2	10/25/2002	698	7.5	93.1	98.9
Bensalem Twp	26.6	10/25/2002	967	7.5	128.9	52.7
West Rockhill Twp	8.2	03/10/2003	963	7.5	128.4	40.3
Richland Twp	3.5	03/11/2003	1,040	8.0	130.0	42.3
Bensalem Twp	26.6	04/25/2003	865	8.0	108.1	100.0
Bensalem Twp	26.6	04/26/2003	1,044	7.0	149.1	0.0
County Total/Avg	---	------------	8,506	75.0	113.4	47.8

* This column reflects the percent of PSP stops (n=7,679) in this county for each observed municipality.

Figure B.4. Bucks County, PA.
Traffic Stops and Observations by Municipality.



The remainder of **Table B.6** indicates that a large volume of vehicles was observed in Bucks County, ranging from 82.4 vehicles to 149.1 vehicles observed per hour. The amount of RADAR conducted in the county (47.8%) was somewhat higher than in the overall dataset (41.4%). Fortunately, the only day that there were weather limitations in Bucks County that prohibited observers from conducting RADAR was the last day of observation. Since the inclement weather was forecast, the observation team was able to compensate for the predicted lost RADAR time during the previous day.

Table B.7 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Bucks County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Bucks County were conducted on both interstate and state highways.
- All observed municipalities had a posted speed limit of 55 mph.
- There is tremendous variation in the percentages of speeders across municipality that is not attributable to speed limit (since all are 55 mph) and that does not appear to vary directly with road type.

- As would be expected, the percentages of drivers that are observed to be speeding decreases dramatically as more serious levels of speeding are examined.
- The table shows that the first two days of observation, in 55 mph zones on interstates in Bensalem and Lower Makefield Twps, maintain the largest percentages of speeders through each speeding category.

Table B.7 Speeding Behavior by Municipality in Bucks County* (n=4,063)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Bensalem Twp	Interstate	55	88.2	60.0	26.8	8.6
Lower Makefield Twp	Interstate	55	84.2	56.8	23.8	6.6
Richland Twp	State Hwy	55	43.9	13.3	5.2	1.8
Milford Twp	State Hwy	55	38.2	8.2	0.9	0.3
Middletown Twp	Interstate	55	66.4	31.7	11.3	2.9
Bensalem Twp	Interstate	55	78.6	50.8	21.6	5.9
West Rockhill Twp	State Hwy	55	74.2	47.4	20.9	8.0
Richland Twp	Int. & State Hwy	55	32.0	8.0	0.7	0.0
Bensalem Twp	Interstate	55	73.8	42.7	16.2	4.5
Bensalem Twp	Interstate	55	---	---	---	---
County Average	-----------	--	65.0	35.4	13.9	4.1

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.8 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Bucks County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- All municipalities (regardless of their % Black population) had higher percentages of Black drivers observed than is represented in their residential populations, though the most dramatic difference is 13.0 percentage points in Lower Makefield Twp.
- Two out of the four observations conducted in Bensalem Twp, the municipality with the largest non-Caucasian residential population among the observed municipalities in Bucks County, included a slightly smaller observed non-Caucasian driving population.
- Overall, the county's non-Caucasian residential population underestimates the non-Caucasian observed driving populations (4.4 percentage points).
- The county's percent missing driver race (2.2%) is slightly lower than percent missing in overall observation data (2.6%).

Table B.8 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Bucks County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Bensalem Twp	46,589	81.9	80.5	+1.4	6.4	14.3	-7.9	18.1	19.5	-1.4	0.5
Lwr Makefield Twp	24,594	92.7	80.0	+12.7	1.8	14.8	-13.0	7.4	20.0	-12.6	1.5
Richland Twp	7,605	95.8	92.8	+3.0	0.8	2.5	-1.7	4.2	7.2	-3.0	0.9
Milford Twp	6,766	97.4	95.7	+1.7	0.6	2.2	-1.6	2.7	4.3	-1.6	4.1
Middletown Twp	34,074	93.3	85.9	+7.4	2.0	8.2	-6.2	6.7	14.1	-7.4	1.6
Bensalem Twp	46,589	81.9	81.6	+0.3	6.4	11.7	-5.3	18.1	18.4	-0.3	2.3
West Rockhill Twp	3,464	97.9	89.3	+8.6	0.6	1.8	-1.2	2.1	10.7	-8.6	3.1
Richland Twp	7,605	95.8	93.0	+2.8	0.8	1.4	-0.6	4.2	7.0	-2.8	2.8
Bensalem Twp	46,589	81.9	85.8	-3.9	6.4	8.9	-2.5	18.1	14.2	+3.9	3.9
Bensalem Twp	46,589	81.9	86.8	-4.9	6.4	8.9	-2.5	18.1	13.2	+4.9	0.7
County Total/Avg	461,606	91.9	87.5	+4.4	3.0	7.0	-4.0	8.1	12.5	-4.4	2.2

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.9 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Bucks County. The trends in this county are summarized below.

- Observation data from Bucks County suggest no significant gender differences in observed speeding behavior.
- Age differences are statistically significant across three of the four levels of speeding. Although there is a difference of nearly six percentage points between younger and older drivers at 20 mph over the limit, the difference does not reach statistical significance.
- The effects of age on speeding behavior are somewhat stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.2, 1.4, and 1.9 times more likely to exceed the speed limit by 5, 10, and 15 miles per hour, respectively, compared to drivers identified as over 25 years old.
- The effects of race on speeding behavior are stronger at more serious degrees of speeding in Bucks County. Racial differences in speeding at 5 mph over the limit are not as strong and do not reach statistical significance. In contrast, drivers identified as non-Caucasian are approximately 1.2, 1.5, and 2.1 times more likely than Caucasian drivers are to exceed the speed limit by 10, 15, and 20 miles per hour, respectively.

Table B.9 Speeding in Bucks County by Driver Characteristics (n=4,063)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	1,328	2.0	63.3	35.1	13.9	3.8
Male	2,653		65.6	35.5	13.9	4.2
25 years old or under	471	1.9	73.2***	47.3***	23.8***	9.1
Over 25 years old	3,513		63.8	33.8	12.6	3.4
Caucasian	3,446	3.0	64.3	34.4**	13.1***	3.5***
Non-Caucasian	496		68.8	40.3	19.4	7.3

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Centre County

Select Characteristics of Centre County:

- Located in central Pennsylvania
- Population = 135,758
- % Blacks = 2.9
- % Non-Caucasians = 6.1
- 32.8 interstate miles

- 1,653.8 total roadway miles
- Home to:
    - Penn State University (Main Campus)
    - Beaver Stadium and Bryce Jordan Center
    - University Park Airport
    - State Correctional Institution at Rockview
- Jurisdiction of the Rockview and Philipsburg PSP stations

Table B.10 lists the municipalities that were observed in Centre County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

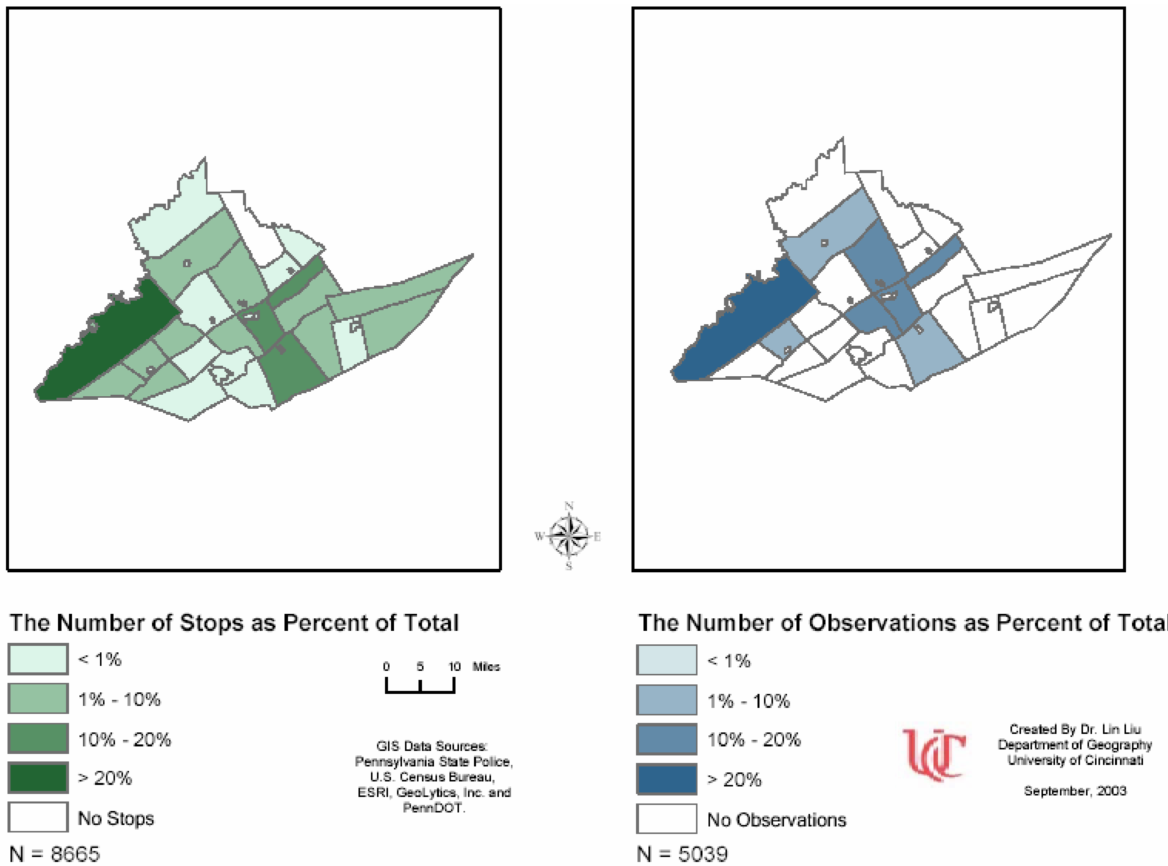
Figure B.5 displays two maps of Centre County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table B.10 Observations in Centre County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Rush Twp	26.5	04/26/2002	361	7.5	48.1	100.0
Rush Twp	26.5	07/19/2003	435	7.5	58.0	55.9
Potter Twp	10.2	08/20/2002	406	7.5	54.1	53.2
Rush Twp	26.5	08/21/2002	443	7.5	59.1	42.4
Worth Twp	5.6	12/13/2002	332	5.0	66.4	67.2
Snow Shoe Twp	2.6	01/31/2003	326	6.0	54.3	0.0
Boggs Twp	7.7	03/07/2003	730	7.5	97.3	37.7
Marion Twp	10.6	03/08/2003	707	7.5	94.3	49.9
Spring Twp	10.2	04/28/2003	585	7.5	78.0	44.3
Benner Twp	5.9	04/30/2003	714	7.5	95.2	43.6
County Total/Avg	---	------------	5,039	71.0	79.7	48.2

* This column reflects the percent of PSP stops (n=8,665) in this county for each observed municipality.

Figure B.5. Centre County, PA.
Traffic Stops and Observations by Municipality.



The first two columns of **Table B.10** and the maps in **Figure B.5** illustrate that the observed municipalities in Centre County are directly comparable to the municipalities with higher concentrations of PSP traffic stops.

The remainder of **Table B.10** indicates that a moderate volume of vehicles was observed in Centre County, ranging from 48.1 to 97.3 vehicles observed per hour. The amount of RADAR conducted in the county (48.2%) was somewhat higher than in the overall dataset (41.4%). Fortunately, although a fast-moving weather system prevented the completion of a day of observation in December, the only day of observation that was severely limited (prohibited RADAR and completion of the day) by inclement weather in Centre County occurred in January.

Table B.11 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Centre County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Centre County were conducted on a combination of interstate and state highways.

- Observed speed limits included 50, 55, and 65 mph zones. In general, municipalities with 65 mph speed limit have smaller percentages of speeders than lower speed limits, although the speeding behavior observed in Marion Twp does not conform to this general trend.
- As would be expected, the percentages of drivers that are observed to be speeding decreases dramatically as more serious levels of speeding are examined.
- The table shows that the 55 mph zone in Potter Twp maintains the largest (or second largest) percentage of speeders through each speeding category.

Table B.11 Speeding Behavior by Municipality in Centre County* (n=2,429)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Rush Twp	State Hwy	55	51.2	18.3	6.1	1.9
Rush Twp	State Hwy	55	51.4	15.6	7.0	3.3
Potter Twp	State Hwy	55	67.6	37.0	13.4	3.2
Rush Twp	Interstate	65	35.6	8.0	0.5	0.0
Worth Twp	State Hwy	50	46.6	15.7	4.5	0.4
Snow Shoe Twp	Interstate	65	------	-------	------	-----
Boggs Twp	Interstate	65	37.8	5.5	1.1	0.0
Marion Twp	Interstate	65	49.9	13.9	4.0	1.7
Spring Twp	State Hwy	55	39.0	12.7	2.3	0.4
Benner Twp	State Hwy	55	53.4	21.2	5.8	1.6
County Average	-----------	--	48.3	16.3	4.9	1.4

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.12 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Centre County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- The observations conducted in Benner Twp, the municipality with the largest non-Caucasian residential population (27.1%) among the observed municipalities in Centre County, included a far smaller observed non-Caucasian driving population (1.7%).
- In contrast, many of the municipalities with small non-Caucasian residential populations (e.g., Rush, Snow Shoe, Boggs, Marion, and Spring Twps) were observed to have at least slightly larger non-Caucasian driving populations.
- The large difference between the county's non-Caucasian residential and observed driving populations (6.1 percentage points) may be partially due to not observing as many municipalities that have higher non-Caucasian residential populations.
- The county's percent missing driver race (0.8%) is considerably smaller than the percent missing in the overall observation data (2.6%).

Table B.12 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Centre County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Rush Twp	2,845	99.2	98.1	+1.1	0.0	0.3	-0.3	0.8	1.1	-0.3	0.8
Rush Twp	2,845	99.2	99.8	-0.6	0.0	0.0	0.0	0.8	0.2	+0.6	1.8
Potter Twp	2,574	99.1	99.3	-0.2	0.2	0.2	0.0	1.0	0.7	+0.3	0.7
Rush Twp	2,845	99.2	95.0	+4.2	0.0	2.5	-2.5	0.8	5.0	-4.2	0.0
Worth Twp	663	97.7	99.7	-2.0	0.0	0.3	-0.3	2.3	0.3	+2.0	0.0
Snow Shoe Twp	1,412	98.8	97.9	+0.9	0.0	1.5	-1.5	1.2	2.1	-0.9	0.0
Boggs Twp	2,229	98.8	94.8	+4.0	0.1	3.3	-3.2	1.2	5.2	-4.0	0.4
Marion Twp	698	99.4	88.9	+9.5	0.1	3.8	-3.7	0.6	11.1	-10.5	3.0
Spring Twp	4,799	98.7	98.2	+0.5	0.2	1.2	-1.0	1.4	1.8	-0.4	0.0
Benner Twp	4,604	72.9	98.3	-25.4	22.4	1.3	+21.1	27.1	1.7	+25.4	0.1
County Total/Avg	114,083	90.5	96.6	-6.1	2.8	1.6	-1.2	9.5	3.4	+6.1	0.8

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.13 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Centre County. Some of the trends in this county vary from other counties and are summarized below.

- Observation data from Centre County suggests only slight statistically significant gender differences in observed speeding behavior. Men are 1.3 times more likely to speed at 10 miles per hour over the speed limit than women are.
- Age differences in Centre County are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.2, 1.6, 2.8, and 4.2 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are no significant racial differences in observed speeding behavior in Centre County.

Table B.13 Speeding in Centre County by Driver Characteristics (n=2,429)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	772	1.2	45.6	13.3**	4.0	0.9
Male	1,628		49.3	17.6	5.2	1.7
25 years old or under	310	0.7	55.8**	23.9***	11.0***	4.2***
Over 25 years old	2,101		47.0	15.1	4.0	1.0
Caucasian	2,326	1.0	48.2	16.3	4.8	1.4
Non-Caucasian	78		47.4	17.9	7.7	1.3

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Chester County

Select Characteristics of Chester County:

- Located in southeast Pennsylvania, bordering Delaware and Maryland
- Population = 433,501
- % Blacks = 6.7
- % Non-Caucasians = 12.6
- 26 interstate miles
- 3,348 total roadway miles (6th highest roadway mileage in PA)
- Home to:
    - 7 colleges and universities
- Jurisdiction of the Avondale and Embreeville PSP stations

Table B.14 lists the municipalities that were observed in Chester County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Figure B.6 displays two maps of Chester County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

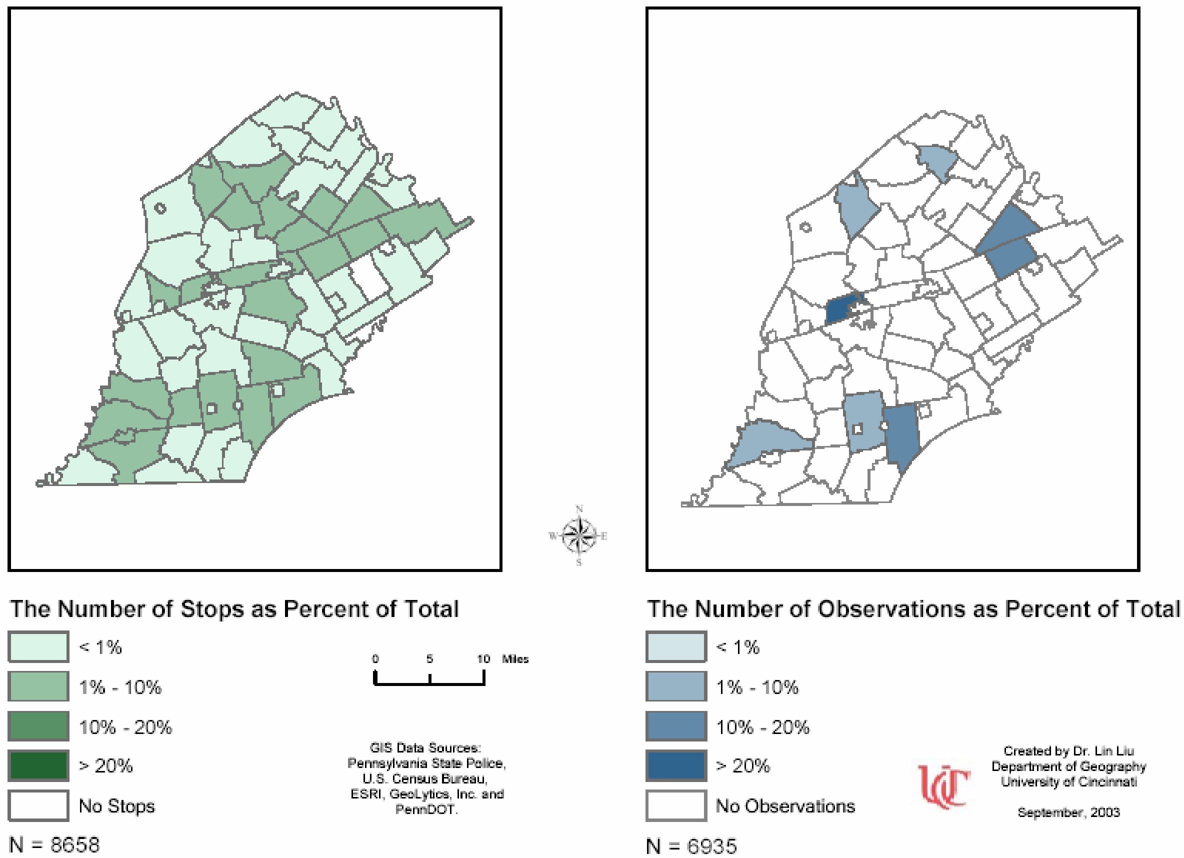
The first two columns of **Table B.14** and the maps in **Figure B.6** illustrate that the observed municipalities in Chester County reasonably represent the municipalities with higher concentrations of PSP traffic stops. As shown in **Figure B.6**, however, PSP traffic stops in Chester County were evenly spread out and it was not possible to observe each of the municipalities with relatively high concentrations of PSP stops.

Table B.14 Observations in Chester County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Valley Twp	7.9	04/05/02	826	7.0	118.0	36.6
East Whiteland Twp	6.1	04/06/02	1,212	7.0	173.1	25.2
London Grove Twp	8.3	07/17/02	716	7.5	95.5	42.7
Lower Oxford Twp	2.2	07/18/02	546	7.5	72.8	42.3
South Coventry Twp	0.4	10/06/02	654	7.5	87.2	43.1
Charlestown Twp	5.1	10/07/02	729	7.5	97.2	40.9
New Garden Twp	6.5	02/14/03	647	7.5	86.3	50.2
New Garden Twp	6.5	02/16/03	288	4.0	72.0	0.0
West Nantmeal Twp	7.2	04/11/03	503	7.5	67.1	0.0
Valley Twp	7.9	04/12/03	814	7.5	108.5	72.1
County Total/Avg	---	------------	6,935	70.5	86.2	38.0

* This column reflects the percent of PSP stops (n=8,658) in this county for each observed municipality.

Figure B.6. Chester County, PA.
Traffic Stops and Observations by Municipality.



The remainder of **Table B.14** indicates that a large volume of vehicles was observed in Chester County, with a wide range from 67.1 vehicles to 173.1 vehicles observed per hour. The amount of RADAR conducted in the county (38.0%) was lower than in the overall dataset (41.4%). Unfortunately, two days of observation were marked by inclement weather, which prohibited the use of RADAR. In the case of New Garden Twp (2/16/03), the weather was severe enough that the normal 7-8 hour observation day had to be concluded after only four hours.

Table B.15 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Chester County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Chester County were conducted on state highways.
- Speed limits observed include 35, 40, and 55 mph zones.
- As would be expected, the percentages of drivers that are observed to be speeding decreases dramatically as more serious levels of speeding are examined.

- The table shows that the 55 mph zones in East Whiteland and New Garden Twps maintain the largest percentage of speeders through each speeding category.

Table B.15 Speeding Behavior by Municipality in Chester County* (n=2,636)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Valley Twp	State Hwy	55	49.7	20.9	5.6	2.0
E. Whiteland Twp	State Hwy	55	85.6	54.4	29.8	11.8
London Grove Twp	State Hwy	55	61.8	28.4	10.1	2.6
Lower Oxford Twp	State Hwy	55	58.9	20.3	3.9	0.9
S. Coventry Twp	State Hwy	35	41.5	17.4	2.5	0.0
Charlestown Twp	State Hwy	40	25.5	3.4	0.3	0.0
New Garden Twp	State Hwy	55	85.8	51.4	24.0	8.0
New Garden Twp	State Hwy	55	--	--	--	--
W. Nantmeal Twp	State Hwy	55	--	--	--	--
Valley Twp	State Hwy	55	80.9	51.3	21.5	6.5
County Average	-----------	--	63.8	33.8	13.7	4.4

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.16 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Chester County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- The observations conducted in Valley, Lower Oxford, and New Garden Twps, the municipalities with the largest non-Caucasian residential populations among the observed municipalities in Chester County, assessed smaller observed non-Caucasian driving populations.
- In contrast, other municipalities with small non-Caucasian residential populations (e.g., Charlestown and West Nantmeal Twps) were observed to have larger non-Caucasian driving populations.
- The county's percent missing driver race (2.0%) is slightly lower than percent missing in overall observation data (2.6%).

Table B.16 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Chester County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Valley Twp	3,890	70.5	95.9	-25.4	24.8	2.5	+22.3	29.5	4.1	+25.4	4.6
East Whiteland Twp	7,323	88.4	88.6	-0.2	3.5	7.1	-3.6	11.6	11.4	+0.2	3.5
London Grove Twp	3,828	83.3	89.4	-6.1	3.0	3.9	-0.9	16.8	10.6	+6.2	0.8
Lower Oxford Twp	3,467	52.4	92.7	-40.3	41.7	3.0	+38.7	47.7	7.3	+40.5	2.0
South Coventry Twp	1,458	97.8	97.5	+0.3	0.6	1.4	-0.8	2.2	2.5	+0.3	0.3
Charlestown Twp	3,118	94.2	93.1	+1.1	1.7	3.7	-2.0	5.8	6.9	-1.1	2.6
New Garden Twp	6,592	71.1	90.9	-19.8	3.7	5.6	-1.9	28.9	9.1	+19.8	1.2
New Garden Twp	6,592	71.1	83.4	-12.3	3.7	8.8	-5.1	28.9	16.6	+12.3	1.7
West Nantmeal Twp	1,535	97.3	86.2	+11.1	0.7	6.6	-5.9	2.7	13.8	-11.1	0.6
Valley Twp	3,890	70.5	88.8	-18.3	24.8	6.8	+18.0	29.5	11.2	+18.3	4.8
County Total/Avg	332,260	87.9	91.0	-3.1	6.1	4.9	+1.2	12.1	9.0	+3.1	2.0

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.17 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Chester County. The trends in this county are summarized below.

- Observation data from Chester County suggest no significant gender differences in observed speeding behavior.
- Age differences are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.2, 1.6, 2.4, and 3.6 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There is only one significant racial difference in observed speeding behavior in Chester County, though the differences at each of the categories of speeding are consistent with overall trends. Non-Caucasians are about 1.2 times more likely to exceed the speed limit by 10 miles per hour than Caucasians.

Table B.17 Speeding in Chester County by Driver Characteristics (n=2,636)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	1,012	1.1	64.6	33.9	13.6	4.1
Male	1,594		63.2	33.4	13.4	4.3
25 years old or under	281	1.3	72.6***	50.9***	27.8***	11.4***
Over 25 years old	2,320		62.6	31.3	11.7	3.2
Caucasian	2,371	2.3	63.6	32.8*	13.0	4.0
Non-Caucasian	205		66.8	40.0	17.6	4.9

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Columbia County

Select Characteristics of Columbia County:

- Located in east central Pennsylvania
- Population = 64,151
- % Blacks = 1.0
- % Non-Caucasians = 2.9
- 19.1 interstate miles
- 1,389.8 total roadway miles
- Home to:
    - Bloomsburg University
    - Knoebel's Amusement Park
- Jurisdiction of the Bloomsburg PSP station

Table B.18 lists the municipalities that were observed in Columbia County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Figure B.7 displays two maps of Columbia County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

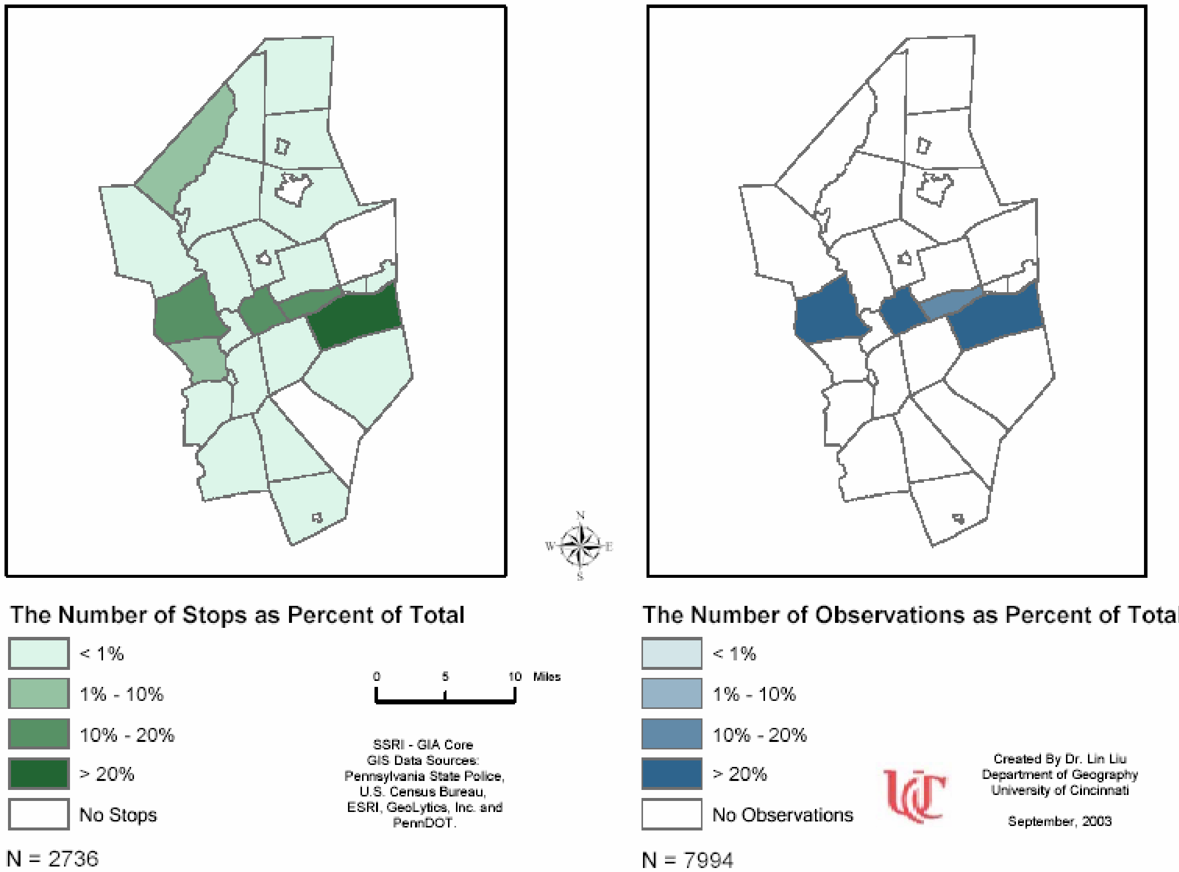
The first two columns of **Table B.18** and the maps in **Figure B.7** illustrate that the observations are concentrated in the same four municipalities in Columbia County that PSP traffic stops are most prevalent.

Table B.18 Observations in Columbia County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Mifflin Twp	52.9	03/15/02	770	7.0	110.0	22.1
Hemlock Twp	15.9	03/16/02	1,040	7.0	148.6	36.9
Hemlock Twp	15.9	06/26/02	692	8.0	86.5	35.4
Scott Twp	11.1	06/27/02	694	7.0	99.1	46.1
South Centre	10.8	11/10/02	775	7.5	103.3	38.7
Mifflin Twp	52.9	11/11/02	769	7.5	102.5	0.0
Mifflin Twp	52.9	03/01/03	717	6.0	119.5	67.6
Scott Twp	11.1	03/03/03	927	7.0	132.4	62.8
Hemlock Twp	15.9	04/11/03	890	7.5	118.7	0.0
South Centre Twp	10.8	04/12/03	720	7.0	102.9	65.6
County Total/Avg	---	------------	7,994	71.5	111.8	37.0

* This column reflects the percent of PSP stops (n=2,736) in this county for each observed municipality.

Figure B.7. Columbia County, PA.
Traffic Stops and Observations by Municipality.



The remainder of **Table B.18** indicates that a large volume of vehicles was observed in Columbia County, ranging from 86.5 vehicles to 148.6 vehicles observed per hour. The amount of RADAR conducted in the county (37.0%) was somewhat lower than in the overall dataset (41.4%). This lower percentage reflects two days of observation that were limited by inclement weather, which prohibited observers from conducting RADAR.

Table B.19 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Columbia County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Columbia County were conducted only on the major interstate highway (I 80) that runs through the county.
- All observed municipalities were marked with 65 mph speed limits.
- Perhaps as a result of the 65 mph zones, only two municipalities (Hemlock and Scott Twps) had greater than 50% of drivers exceeding the speed limit by 5 or more miles per hour (percentages that are considerably smaller than in many other counties).

- As would be expected, the percentages of drivers that are observed to be speeding decreases dramatically as more serious levels of speeding are examined. Indeed, an average of only 1% of all observed drivers were exceeding the speed limit by 20 or more miles per hour.

Table B.19 Speeding Behavior by Municipality in Columbia County* (n=2,958)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Mifflin Twp	Interstate	65	49.4	14.1	4.7	1.2
Hemlock Twp	Interstate	65	54.2	23.4	8.6	3.1
Hemlock Twp	Interstate	65	52.7	8.2	1.6	0.0
Scott Twp	Interstate	65	64.7	25.6	7.2	1.6
South Centre Twp	Interstate	65	34.7	9.0	2.3	0.7
Mifflin Twp	Interstate	65	--	--	--	--
Mifflin Twp	Interstate	65	49.5	16.7	4.3	1.4
Scott Twp	Interstate	65	36.9	7.0	1.0	0.0
Hemlock Twp	Interstate	65	--	--	--	--
South Centre Twp	Interstate	65	33.9	9.7	2.1	0.6
County Average	-----------	--	45.5	13.9	3.8	1.0

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.20 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Columbia County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- All the observed municipalities, and Columbia County overall, have less than 3% non-Caucasian residential populations.
- All observed municipalities have larger percentages of non-Caucasians in the observed driving populations that in the residential populations. The differences vary in size from 0.6 to 6.0 percentage points.
- The county's percent missing driver race (1.5%) is just over a full percentage point lower than the percent missing in the overall observation data (2.6%).

Table B.20 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Columbia County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Mifflin Twp	1,789	98.8	92.9	+5.9	0.0	1.4	-1.4	1.1	7.1	-6.0	0.8
Hemlock Twp	1,448	98.1	92.5	+5.6	0.2	2.9	-0.9	1.9	7.5	-5.6	1.1
Hemlock Twp	1,448	98.1	94.7	+3.4	0.2	2.8	-0.8	1.9	5.3	-3.4	1.6
Scott Twp	3,940	97.4	94.9	+2.5	0.3	1.8	-1.5	2.6	5.1	-2.5	3.5
South Centre Twp	1,597	98.3	95.7	+2.6	0.1	2.8	-2.7	1.7	4.3	-2.6	0.4
Mifflin Twp	1,789	98.9	95.2	+3.7	0.0	3.4	-3.4	1.1	4.8	-3.7	0.0
Mifflin Twp	1,789	98.9	93.8	+5.1	0.0	3.6	-3.6	1.1	6.2	-5.1	2.5
Scott Twp	3,940	97.4	96.8	+0.6	0.3	2.0	-1.7	2.6	3.2	-0.6	0.8
Hemlock Twp	1,448	98.1	94.0	+4.1	0.2	2.4	-2.2	1.9	6.0	-4.1	2.6
South Centre Twp	1,597	98.3	92.9	+5.4	0.1	2.7	-2.6	1.7	7.1	-5.4	2.5
County Total/Avg	52,456	97.4	94.3	+3.1	0.8	2.6	-1.8	2.6	5.7	3.1	1.5

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.21 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Columbia County. The gender and race trends in this county vary somewhat from the patterns in other counties and all the demographic relationships are summarized below.

- Observation data from Columbia County suggest no significant gender differences in observed speeding behavior.
- Age differences are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.3, 2.4, 3.8, and 5.0 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are racial differences in observed speeding behavior in Columbia County at all levels of speeding, but the differences only reach statistical significance for 10 and 15 miles per hour. Non-Caucasians are 1.8 and 2.1 times more likely than Caucasian drivers are to exceed the speed limit by 10 and 15 miles per hour, respectively.

Table B.21 Speeding in Columbia County by Driver Characteristics (n=2,958)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	947	1.4	44.9	14.1	3.5	1.1
Male	1,971		45.4	13.5	3.8	1.1
25 years old or under	313	2.0	57.8***	28.4***	10.9***	3.5***
Over 25 years old	2,585		43.6	11.9	2.9	0.7
Caucasian	2,762	2.0	44.8	13.1***	3.5*	1.0
Non-Caucasian	138		52.9	23.9	7.2	1.4

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Dauphin County

Select Characteristics of Dauphin County:

- Located in central Pennsylvania
- Population = 251,798
- % Blacks = 18.1 (2nd largest in PA)
- % Non-Caucasians = 25.3 (2nd largest in PA)
- 40.9 interstate miles
- 1,858.7 total roadway miles
- Home to:
    - PA state capitol government offices

- 2 colleges and universities
- Hersheypark Amusement Park and Hersheypark Stadium
- Harrisburg International Airport

- Jurisdiction of the Harrisburg and Lykens PSP stations

Table B.22 lists the municipalities that were observed in Dauphin County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

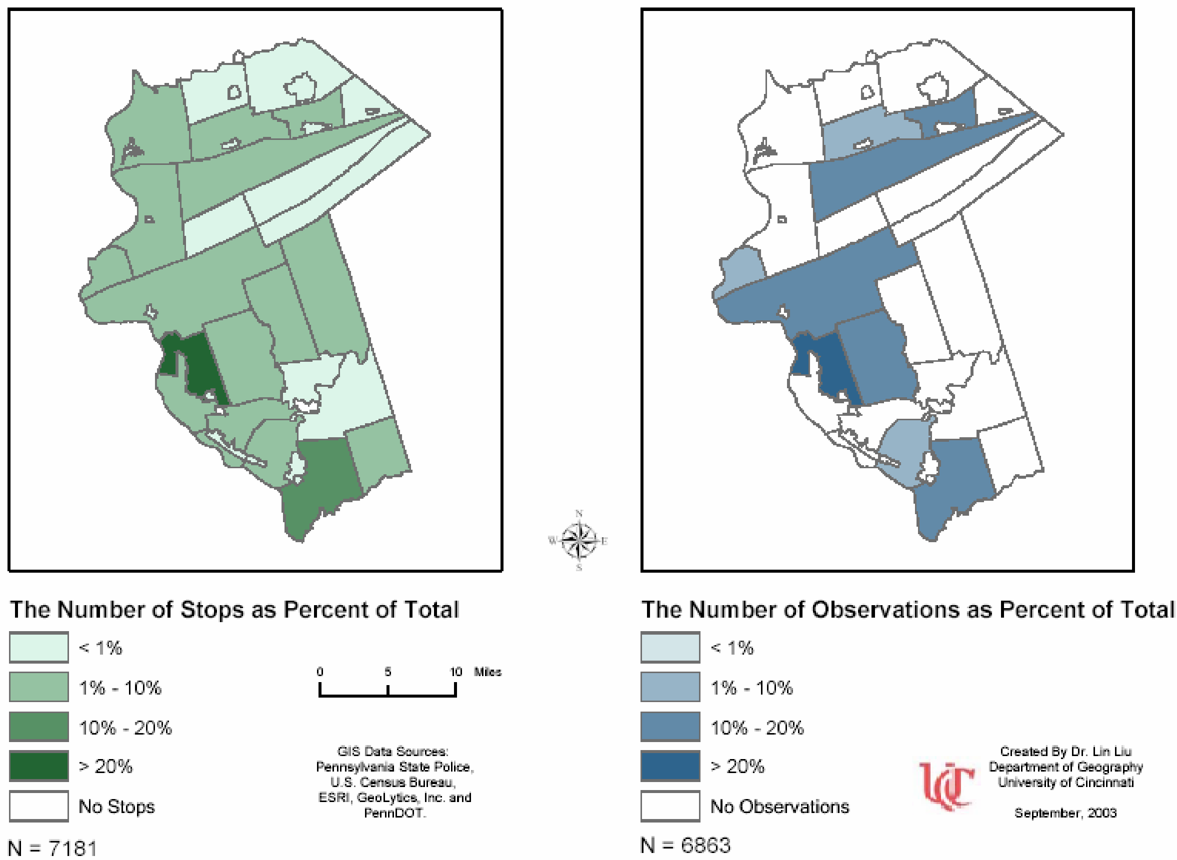
Figure B.8 displays two maps of Dauphin County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table B.22 Observations in Dauphin County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Middle Paxton Twp	2.7	04/07/02	923	6.5	142.0	43.2
Londonderry Twp	13.3	04/08/02	948	7.0	135.4	37.8
Jackson Twp	1.1	06/06/02	717	7.5	95.6	36.0
Wiconisco Twp	1.4	06/07/02	761	7.5	101.5	34.8
Susquehanna Twp	23.7	10/04/03	800	7.5	106.7	0.0
Lower Paxton Twp	5.6	10/05/03	857	8.0	107.1	66.2
Washington Twp	2.1	03/02/03	380	7.5	50.7	55.0
Reed Twp	9.0	03/03/03	277	7.0	39.6	39.4
Susquehanna Twp	23.7	04/11/03	657	7.0	93.9	0.0
Lower Swatara Twp	6.7	04/12/03	543	6.5	83.5	42.4
County Total/Avg	---	------------	6,863	72.0	95.3	34.9

* This column reflects the percent of PSP stops (n=7,181) in this county for each observed municipality.

Figure B.8. Dauphin County, PA.
Traffic Stops and Observations by Municipality.



The first two columns of **Table B.22** and the maps in **Figure B.8** illustrate that the observed municipalities in Dauphin County match well the municipalities with higher concentrations of PSP traffic stops.

The remainder of **Table B.22** indicates that a highly variable volume of vehicles was observed in Dauphin County, ranging from 39.6 vehicles to 142.0 vehicles observed per hour. The amount of RADAR conducted in the county (34.9%) was considerably lower than in the overall dataset (41.4%). Unfortunately, there were weather limitations in Dauphin County that prohibited observers from conducting RADAR for several partial or entire days.

Table B.23 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Dauphin County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Dauphin County were conducted on both state and interstate highways.
- Observations were conducted in 45, 55, and 65 mph speed limits.

- There is no clear pattern of association between speed limit or road type and percent speeding.
- As would be expected, the percentages of drivers that are observed to be speeding decreases dramatically as more serious levels of speeding are examined.
- The table shows that the 55 mph zones in Middle Paxton and Lower Paxton Twps maintain the largest percentages of speeders through each speeding category.

Table B.23 Speeding Behavior by Municipality in Dauphin County* (n=2,395)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Mid. Paxton Twp	State Hwy	55	78.9	43.4	19.0	6.3
Londonderry Twp	Interstate	65	68.4	31.3	12.8	3.6
Jackson Twp	State Hwy	55	15.9	1.9	0.8	0.4
Wiconisco Twp	State Hwy	55	24.9	7.9	2.6	0.4
Susquehanna Twp	State Hwy	55	--	--	--	--
Lwr. Paxton Twp	Interstate	55	70.4	41.6	14.1	1.9
Washington Twp	State Hwy	45	55.0	15.8	3.8	2.4
Reed Twp	State Hwy	45	31.2	2.8	0.0	0.0
Susquehanna Twp	Interstate	55	--	--	--	--
Lwr. Swatara Twp	Interstate	65	10.0	1.7	0.0	0.0
County Average	-----------	--	51.7	24.5	9.1	2.3

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.24 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Dauphin County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- The observations conducted in Susquehanna and Lower Paxton Twps, the municipalities with the largest non-Caucasian residential populations among the observed municipalities in Dauphin County, included considerably smaller non-Caucasian driving populations.
- In contrast, some of the municipalities with small non-Caucasian residential populations (e.g., Middle Paxton and Londonderry Twps) were observed to have a larger non-Caucasian driving population, while others (e.g., Jackson, Wiconisco, Washington, and Reed Twps) were observed as having even smaller non-Caucasian driving populations.
- The county's percent missing driver race (1.1%) is considerably lower than the percent missing in the overall observation data (2.6%).

Table B.24 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Dauphin County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Middle Paxton Twp	3,910	98.2	94.8	+3.4	0.3	2.1	-1.8	1.8	5.2	-3.4	2.4
Londonderry Twp	4,068	98.0	92.9	+5.1	0.5	3.9	-3.4	2.0	7.7	-5.7	2.4
Jackson Twp	1,414	98.4	98.9	-0.5	0.2	0.3	-0.1	1.6	0.6	+1.0	0.0
Wiconisco Twp	936	99.1	100.0	-0.9	0.0	0.0	0.0	1.0	0.0	+1.0	0.0
Susquehanna Twp	17,634	77.1	95.6	-18.5	17.9	2.3	+15.6	22.9	4.4	+18.5	1.6
Lower Paxton Twp	35,528	87.0	94.4	-7.4	7.7	3.2	+4.5	13.0	5.6	+7.4	0.6
Washington Twp	1,574	98.3	99.5	-1.2	0.5	0.5	0.0	1.7	0.5	+1.2	0.5
Reed Twp	150	96.7	98.9	-2.2	0.7	1.1	-0.4	3.3	1.1	+2.2	0.4
Susquehanna Twp	17,634	77.1	97.4	-20.3	17.9	1.4	+16.5	22.9	2.6	+20.3	1.1
Lower Swatara Twp	6,443	93.5	92.9	+0.6	2.7	4.5	-1.8	6.5	7.1	-0.6	0.9
County Total/Avg	197,393	78.7	96.0	-17.3	15.1	2.1	+13.0	21.3	4.0	+17.3	1.1

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.25 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Dauphin County. The trends in this county are summarized below.

- Observation data from Dauphin County suggest no significant gender differences in observed speeding behavior.
- Age differences are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.3, 1.7, 2.3, and 3.2 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are racial differences in observed speeding behavior in Dauphin County at all levels of speeding, but the differences only reach statistical significance for 15 miles per hour. Non-Caucasians are 1.9 times more likely than Caucasian drivers are to exceed the speed limit by 15 miles per hour.

Table B.25 Speeding in Dauphin County by Driver Characteristics (n=2,374)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	724	0.9	49.7	22.4	10.2	2.6
Male	1,650		52.5	25.2	8.4	2.2
25 years old or under	277	0.9	63.2***	38.3***	18.4***	5.8***
Over 25 years old	2,096		50.1	22.5	7.9	1.8
Caucasian	2,263	1.4	51.2	23.8	8.7*	2.1
Non-Caucasian	99		57.6	32.3	16.2	5.1

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Delaware County

Select Characteristics of Delaware County:

- Located in southeast Pennsylvania, bordering Philadelphia County, which is home to 17 universities, Philadelphia International Airport, and 4 professional sports teams (Eagles, Phillies, 76ers, and Flyers)
- Population = 550,864 (5th most populated county)
- % Blacks = 15.1 (3rd largest in PA)
- % Non-Caucasians = 18.0 (5th largest in PA)
- 25.5 interstate miles
- 1,770.9 total roadway miles
- Home to:
    - 8 colleges and universities

    - State Correctional Institution at Chester
- Jurisdiction of the Media PSP station

Table B.26 lists the municipalities that were observed in Delaware County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

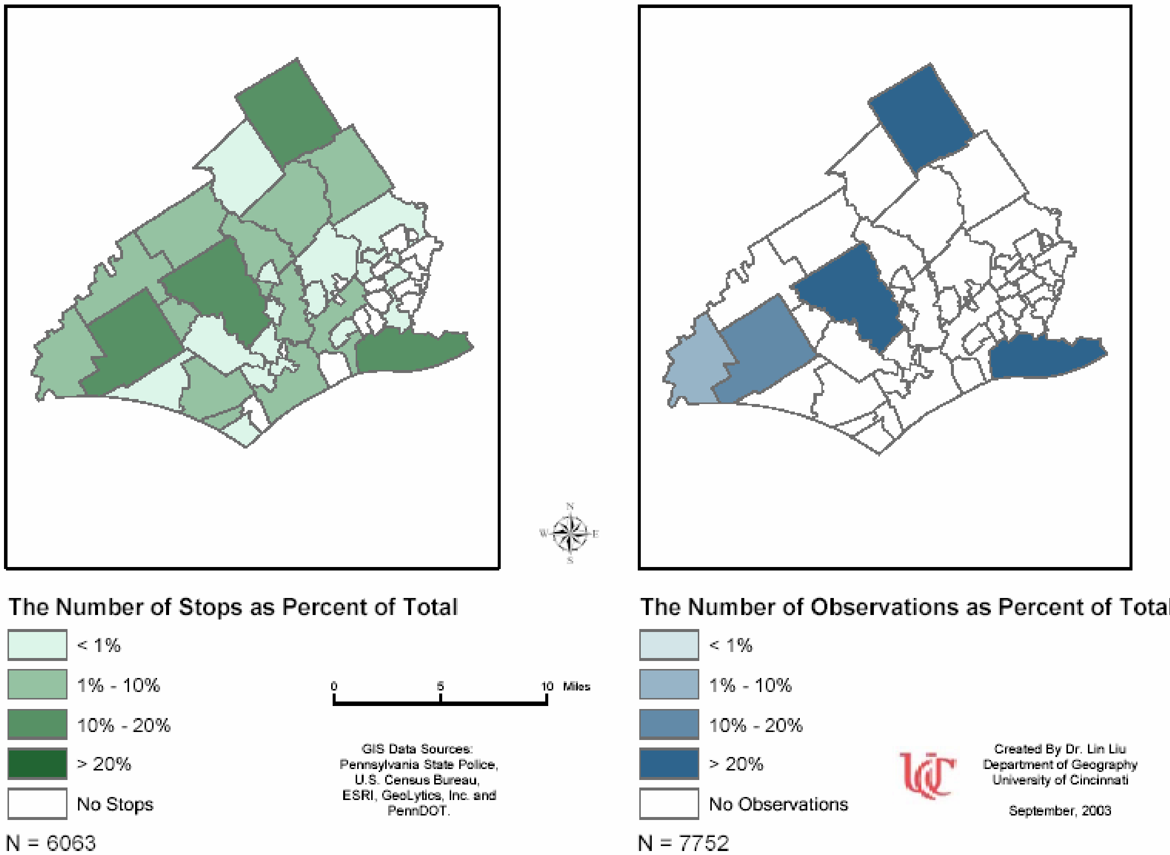
Figure B.9 displays two maps of Delaware County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table B.26 Observations in Delaware County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Radnor Twp	15.6	04/05/02	552	6.0	92.0	24.8
Tinicum Twp	18.2	04/06/02	485	7.0	69.3	46.0
Middletown Twp	16.8	07/31/02	659	7.5	87.9	40.7
Tinicum Twp	18.2	08/01/02	742	8.0	92.8	33.7
Middletown Twp	16.8	10/27/02	898	8.5	105.7	42.0
Radnor Twp	15.6	10/28/02	1,115	7.5	148.7	33.8
Concord Twp	11.0	03/07/03	858	7.5	114.4	33.2
Middletown Twp	16.8	03/08/03	865	7.5	115.3	49.7
Chadds Ford Twp	8.5	05/25/03	660	8.5	77.7	48.5
Tinicum Twp	18.2	06/11/03	918	8.0	114.8	56.0
County Total/Avg	---	------------	7,752	76.0	102.0	41.0

* This column reflects the percent of PSP stops (n=6,063) in this county for each observed municipality.

Figure B.9. Delaware County, PA.
Traffic Stops and Observations by Municipality.



The first two columns of **Table B.26** and the maps in **Figure B.9** illustrate that the observations in Delaware County are concentrated in the same municipalities that have the highest concentrations of PSP traffic stops.

The remainder of **Table B.26** indicates that a large volume of vehicles was observed in Delaware County, ranging from 69.3 vehicles to 148.7 vehicles observed per hour. The amount of RADAR conducted in the county (41.0%) was approximately the same as in the overall dataset (41.4%). Fortunately, there were no weather limitations in that prohibited observers from conducting RADAR.

Table B.27 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Delaware County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Delaware County took place on state and interstate highways.
- Observations were conducted in 35, 45, and 55 mph speed limits.

- It appears that 55 mph zones consistently have the highest percentages of speeders at all levels of speeding, though there are exceptions (see Chadds Ford Twp).
- Compared to other counties, Delaware County has relatively high percentages of speeders in most municipalities (even at the more severe levels of speeding).
- The table shows that the first day of observation in Radnor Twp and each of the three observation sessions in Tinicum Twp maintain the largest percentages of speeders through each speeding category.

Table B.27 Speeding Behavior by Municipality in Delaware County* (n=3,181)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Radnor Twp	Interstate	55	97.1	71.5	29.2	6.6
Tinicum Twp	Interstate	55	92.4	70.9	33.2	9.4
Middletown Twp	State Hwy	45	61.6	28.4	6.7	0.4
Tinicum Twp	Interstate	55	86.4	45.2	14.8	0.4
Middletown Twp	State Hwy	45	57.3	26.8	6.6	1.1
Radnor Twp	Interstate	55	75.6	33.4	9.8	1.9
Concord Twp	State Hwy	45	30.5	7.4	1.4	0.7
Middletown Twp	State Hwy	35 & 45	76.2	31.6	9.1	2.3
Chadds Ford Twp	State Hwy	55	44.1	18.1	5.0	0.9
Tinicum Twp	Interstate	55	92.8	66.9	31.5	10.3
County Average	-----------	--	69.6	38.7	14.2	3.5

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.28 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Delaware County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- With two slight exceptions (the second observation at Radnor Twp and Chadds Ford Twp), the observed municipalities had larger non-Caucasian driving populations than would be suggested by residential population statistics.
- Despite the larger non-Caucasian representation in the municipalities' observed driving populations, the county's non-Caucasian residential population is still higher than the overall observed driving populations for the county. This difference (3.4 percentage points) is likely because the county has other municipalities with higher non-Caucasian residential populations that were not included in the observation locations.
- The county's percent missing driver race (5.9%) is much higher than the percent missing in the overall observation data (2.6%). This is likely the result of observers' difficulty in agreeing on the Caucasian/non-Caucasian dichotomy in a more racially diverse area.

Table B.28 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Delaware County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Radnor Twp	25,578	88.7	71.6	+17.1	3.2	24.0	-20.8	11.3	28.4	-17.1	17.6
Tinicum Twp	3,469	97.1	84.7	+12.4	0.8	10.4	-9.6	2.9	15.3	-12.4	12.4
Middletown Twp	13,208	94.4	82.4	+12.0	2.8	15.3	-12.5	5.6	17.6	-12.0	0.9
Tinicum Twp	3,469	97.1	71.8	+25.3	0.8	23.9	-23.1	2.9	28.2	-25.3	6.9
Middletown Twp	13,208	94.4	91.1	+3.3	2.8	6.6	-3.8	5.6	8.9	-3.3	2.3
Radnor Twp	25,578	88.7	88.9	-0.2	3.2	6.6	-3.4	11.3	11.1	+0.2	5.0
Concord Twp	7,417	95.8	86.2	+9.6	1.1	10.8	-9.7	4.2	13.8	-9.6	1.2
Middletown Twp	13,208	94.4	90.7	+3.7	2.8	4.4	-1.6	5.6	9.3	-3.7	0.1
Chadds Ford Twp	2,569	94.6	94.7	-0.1	1.1	1.5	-0.4	5.4	5.3	+0.1	12.0
Tinicum Twp	3,469	97.1	77.3	+19.8	0.8	18.7	-17.9	2.9	22.7	-19.8	8.0
County Total/Avg	429,852	81.3	84.7	-3.4	13.3	11.6	-1.7	18.7	15.3	+3.4	5.9

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.29 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Delaware County. The trends in this county are summarized below.

- Observation data from Delaware County do show small, but statistically significant, gender differences in observed speeding behavior. Men are 1.1, 1.1, and 1.3 times more likely than women are to exceed the speed limit by 5, 10, and 15 miles per hour, respectively.
- Age differences are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.1, 1.4, 1.8, and 2.5 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are significant racial differences across all levels of speeding.
- Non-Caucasians are about 1.2, 1.5, 1.9, and 1.8 times more likely than Caucasian drivers to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table B.29 Speeding in Delaware County by Driver Characteristics (n=3,181)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	1,172	2.5	65.6***	35.5**	11.9*	2.9
Male	1,929		71.6	40.3	15.0	3.7
25 years old or under	328	2.0	76.5**	53.0***	22.9***	7.3***
Over 25 years old	2,789		68.4	36.7	12.8	2.9
Caucasian	2,571	5.7	66.7***	35.4***	12.1***	3.0*
Non-Caucasian	429		80.2	52.9	22.6	5.4

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Erie County

Select Characteristics of Erie County:

- Located in northwestern corner of Pennsylvania, bordering New York and Ohio
- Population = 280,843
- % Blacks = 6.7
- % Non-Caucasians = 10.7
- 73 interstate miles (4th highest interstate mileage in PA)
- 2,541.2 total roadway miles
- Home to:
  - 5 colleges and universities
  - Erie International Airport

    - State Correctional Institution at Albion
- Jurisdiction of the Erie, Girard, and Corry PSP stations

Table B.30 lists the municipalities that were observed in Erie County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

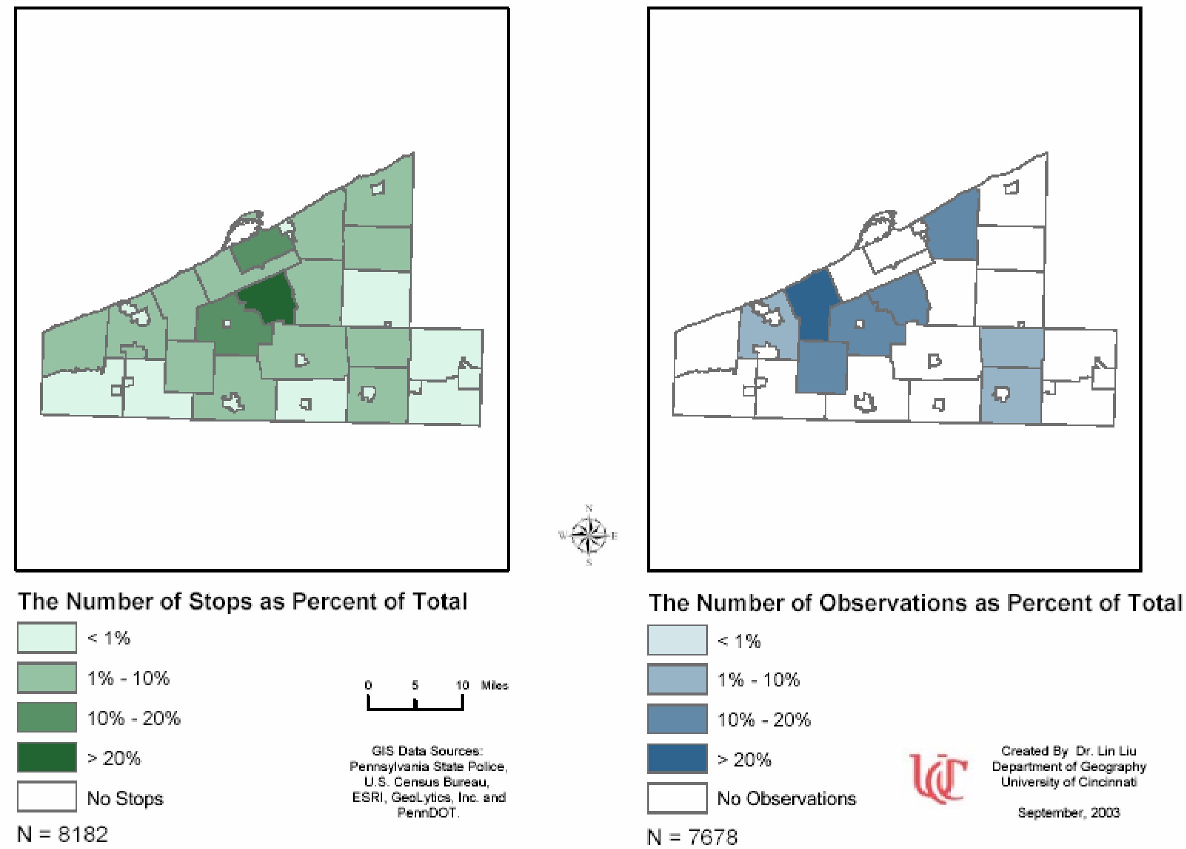
Figure B.10 displays two maps of Erie County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table B.30 Observations in Erie County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Fairview Twp	8.6	04/05/02	1,539	8.0	193.4	22.5
Franklin Twp	2.9	04/06/02	1,450	7.5	193.3	42.7
Summit Twp	20.5	07/09/02	693	6.5	106.6	7.8
Summit Twp	20.5	07/10/02	530	8.0	66.3	100.0
Amity Twp	1.3	01/31/03	446	8.0	55.8	44.4
Union Twp	1.5	02/01/03	315	3.5	90.0	0.0
Girard Twp	6.3	03/30/03	666	7.5	88.8	52.0
McKean Twp	12.2	03/31/03	555	7.5	74.0	41.6
McKean Twp	12.2	05/14/03	600	7.5	80.0	41.8
Harborcreek Twp	7.5	05/15/03	884	7.5	117.9	45.1
County Total/Avg	---	------------	7,678	71.5	107.4	38.7

* This column reflects the percent of PSP stops (n=8,182) in this county for each observed municipality.

Figure B.10. Erie County, PA.
Traffic Stops and Observations by Municipality.



The first two columns of **Table B.30** and the maps in **Figure B.10** illustrate that the observed municipalities in Erie County reasonably correspond to the municipalities with higher concentrations of PSP traffic stops. The major disjunction between the stop map and observation map in **Figure B.10** is that one municipality, shaded to indicate over 10% of PSP stops were made there, was not observed. This municipality is the City of Erie, where approximately 10.7% of the county's stops were made. This municipality was not selected for observation because the PSP personnel in this jurisdiction indicated that they did not have primary jurisdiction in the area.

The remainder of **Table B.30** indicates that a highly variable volume of vehicles was observed in Erie County, ranging from 55.8 vehicles to 193.4 vehicles observed per hour. The amount of RADAR conducted in the county (38.7%) was somewhat lower than in the overall dataset (41.4%). Unfortunately, this area of the state was frequently prone to severe weather (note the lack of observation dates between August and January). Many observation sessions in Erie County had to be rescheduled due to inclement weather, and one day of observation (2/1/03) had to be concluded early because of an impending winter storm. The ability to conduct RADAR was also prohibited during that observation session.

Table B.31 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Erie County.

Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Erie County were conducted on state and interstate highways.
- Observations were conducted in several speed limits: 40, 45, 55, and 65 mph.
- All observed municipalities (regardless of speed limit) had fairly small percentages of speeders, even at the least severe level of speeding (> 5 mph over the limit). Perhaps due to the frequent inclement weather mentioned above, speeding is less prevalent in Erie County compared to some of the other observed counties.
- The table shows that two of the 55 mph zones (in Summit and Amity Twps) and the 40 mph zone in McKean Twp maintain the largest percentages of speeders through each speeding category.

Table B.31 Speeding Behavior by Municipality in Erie County* (n=2,974)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Fairview Twp	State Hwy	45	32.1	9.8	1.2	0.0
Franklin Twp	Interstate	65	23.4	3.6	1.5	0.3
Summit Twp	Interstate	55	48.1	11.1	5.6	1.9
Summit Twp	State Hwy	55	32.6	7.5	2.1	0.8
Amity Twp	State Hwy	55	39.4	11.6	4.0	0.5
Union Twp	State Hwy	55	--	--	--	--
Girard Twp	State Hwy	55	17.6	6.1	1.4	0.3
McKean Twp	State Hwy	55	25.5	8.7	1.3	0.9
McKean Twp	Interstate	40	39.8	11.2	2.8	0.4
Harborcreek Twp	State Hwy	55	12.8	2.3	0.3	0.0
County Average	-----------	--	27.0	6.8	1.7	0.4

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.32 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Erie County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- Seven of the 10 observed municipalities had slightly larger non-Caucasian driving populations than would be suggested by residential population statistics.
- All observed municipalities have less than 3% non-Caucasian residential populations, but the percent non-Caucasian in the overall county population statistics is 8.6%.

This is likely to partially account for the small percent non-Caucasian (1.9%) that was observed in the driving population. That is, Erie County has other municipalities with higher non-Caucasian residential populations that were not included in the observation locations.

- Erie County's percent missing driver race (1.5%) is lower than the percent missing in the overall observation data (2.6%).

Table B.32 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Erie County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Fairview Twp	7,914	98.2	99.3	-1.1	0.5	0.6	-0.1	1.8	0.7	+1.1	1.7
Franklin Twp	1,215	99.0	98.4	+0.6	0.2	0.8	-0.6	1.0	1.6	-0.6	2.1
Summit Twp	4,393	98.5	94.7	+4.2	0.6	3.4	-2.8	1.6	5.3	-3.7	1.3
Summit Twp	4,393	98.5	98.5	0.0	0.6	0.9	-0.3	1.6	1.5	+0.1	0.2
Amity Twp	857	99.3	97.7	+1.6	0.0	0.2	-0.2	0.7	1.0	-0.3	1.1
Union Twp	1,338	99.6	99.0	+0.6	0.1	0.3	-0.3	0.4	1.0	-0.6	1.6
Girard Twp	3,908	98.7	98.3	+0.4	0.2	0.6	-0.4	1.3	1.7	-0.4	0.8
McKean Twp	3,514	98.4	96.8	+1.6	0.4	1.9	-1.5	1.6	3.2	-1.6	3.8
McKean Twp	3,514	98.4	98.2	+0.2	0.4	1.3	-0.9	1.6	1.8	-0.2	0.2
Harborcreek Twp	12,136	97.4	98.6	-1.2	1.1	0.7	+0.4	2.6	1.4	+1.2	1.0
County Total/Avg	218,976	91.6	98.1	-6.5	5.3	1.0	+4.3	8.4	1.9	+6.5	1.5

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.33 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Erie County. The trends in this county are summarized below.

- Observation data from Erie County suggests slight gender differences in observed speeding behavior. Men are significantly more likely than women are to exceed the speed limit by 10 or more miles per hour.
- Age differences are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.4, 2.1, 3.2, and 22.0 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are no significant racial differences in observed speeding behavior in Erie County. This may partially be a result of the small number of non-Caucasians that were observed.

Table B.33 Speeding in Erie County by Driver Characteristics (n=2,974)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	1,096	1.6	26.1	5.6*	1.2	0.4
Male	1,830		27.8	7.7	2.1	0.4
25 years old or under	404	1.1	35.1***	12.4***	4.2***	2.2***
Over 25 years old	2,537		25.7	6.0	1.3	0.1
Caucasian	2,882	1.2	27.1	6.8	1.7	0.4
Non-Caucasian	55		23.6	5.5	1.8	0.0

Note: Asterisks identify statistically significant chi-square bivariate associations. * $p<.05$ ** $p<.01$ *** $p<.001$

[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Franklin County

Select Characteristics of Franklin County:

- Located in south central Pennsylvania, bordering Maryland
- Population = 129,313
- % Blacks = 2.7
- % Non-Caucasians = 5.9
- 40.7 interstate miles
- 1,688.5 total roadway miles
- Home to:
  - 2 colleges and universities
- Jurisdiction of the Chambersburg PSP station

Table B.34 lists the municipalities that were observed in Franklin County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the

dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Figure B.11 displays two maps of Franklin County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

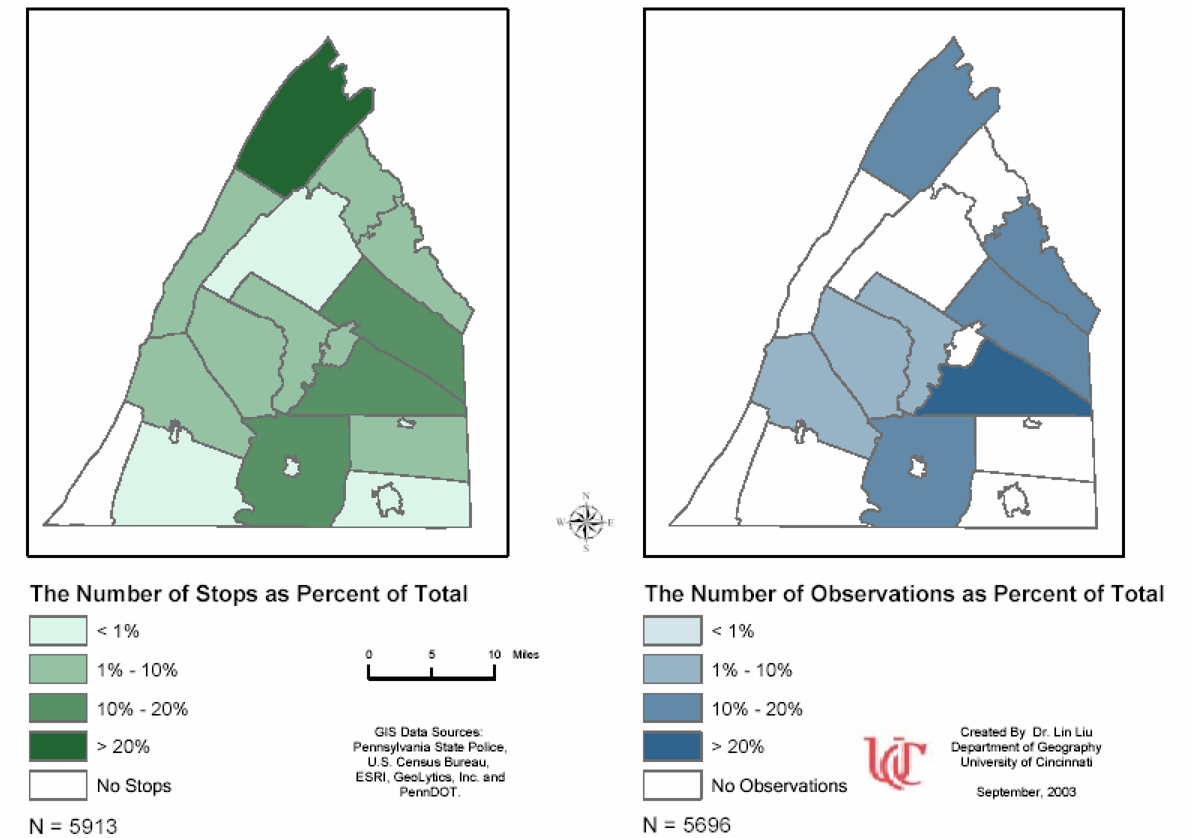
The first two columns of **Table B.34** and the maps in **Figure B.11** illustrate that the observed municipalities and municipalities with higher concentrations of PSP traffic stops in Franklin County match well.

Table B.34 Observations in Franklin County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Guilford Twp	10.6	02/24/2002	897	9.0	99.7	30.9
Antrim Twp	17.2	02/24/2002	216	2.0	108.0	0.0
Greene Twp	17.6	02/25/2002	353	6.0	58.8	100.0
Hamilton Twp	2.8	02/25/2002	477	3.0	159.0	0.0
St. Thomas Twp	2.3	05/28/2002	343	7.5	45.7	100.0
Peters Twp	1.4	05/29/2002	432	7.5	57.6	100.0
Greene Twp	17.6	09/20/2002	542	7.5	72.3	47.8
Antrim Twp	17.2	09/21/2002	843	7.5	112.4	51.5
Fannett Twp	28.8	03/30/2003	220	6.0	36.7	0.0
Guilford Twp	10.6	03/31/2003	333	6.5	51.2	100.0
Fannett Twp	28.8	06/05/2003	403	7.5	53.7	42.2
Southampton Twp	5.7	06/06/2003	637	7.5	84.9	42.4
County Total/Avg	---	------------	5,696	77.5	73.5	50.4

* This column reflects the percent of PSP stops (n=5,913) in this county for each observed municipality.

Figure B.11. Franklin County, PA.
Traffic Stops and Observations by Municipality.



The remainder of **Table B.34** indicates that a highly variable volume of vehicles was observed in Franklin County, ranging from 36.7 vehicles to 159.0 vehicles observed per hour. The amount of RADAR conducted in the county (50.4%) was considerably higher than in the overall dataset (41.4%). This high percentage is the result of two different factors. First, the observation sessions conducted in February, 2002 involved two observation teams, one conducting all RADAR, the other doing only observation. Second, there were three locations where traffic volume was low enough that the use of RADAR was possible for entire days.

Table B.35 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Franklin County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Franklin County were conducted on state and interstate highways.
- Speed limits observed include 45, 55, and 65 mph zones.
- All observed municipalities (regardless of speed limit or road type) had fairly small percentages of speeders, even at the least severe level of speeding (> 5 mph over the

limit). Speeding is less prevalent at all levels of speeding in Franklin County compared to some of the other observed counties.
- The table shows that the 45 mph zone in Guilford Twp maintains the largest percentages of speeders through each speeding category.

Table B.35 Speeding Behavior by Municipality in Franklin County* (n=2,871)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Guilford Twp	Int/St Hwy	55 & 65	39.4	9.4	1.1	0.4
Antrim Twp	Interstate	65	-----	-----	-----	-----
Greene Twp	State Hwy	55	28.0	9.3	1.4	0.6
Hamilton Twp	State Hwy	55	-----	-----	-----	-----
St. Thomas Twp	State Hwy	55	26.2	9.9	3.2	0.3
Peters Twp	State Hwy	55	37.3	13.4	4.9	1.2
Greene Twp	State Hwy	55 & 65	0.4	0.4	0.0	0.0
Antrim Twp	Interstate	65	22.4	2.8	0.2	0.0
Fannett Twp	State Hwy	45	-----	-----	-----	-----
Guilford Twp	State Hwy	45	64.9	27.3	7.8	1.2
Fannett Twp	State Hwy	45	43.5	16.5	3.5	1.2
Southampton Twp	State Hwy	55	9.3	1.1	0.0	0.0
County Average	-----------	--	30.4	10.0	2.5	0.5

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.36 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Franklin County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- All observed municipalities, and Franklin County overall, have residential percentages of non-Caucasians of less than 5 percent.
- The observations conducted in Guilford, Greene, and Hamilton Twps, the municipalities with the relatively larger non-Caucasian residential populations (3-5%) among the observed municipalities in Franklin County, included smaller non-Caucasian driving populations.
- In contrast, half of the municipalities with relatively smaller non-Caucasian residential populations (1.2-2.6%) were observed to have a slightly larger non-Caucasian driving population, while the other half were observed as having even smaller non-Caucasian driving populations.
- The county's percent missing driver race (2.0%) is slightly lower than the percent missing in the overall observation data (2.6%).

Table B.36 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Franklin County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Guilford Twp	10,535	95.8	94.9	+0.9	1.7	1.9	-0.2	4.2	3.2	+1.0	1.9
Antrim Twp	9,425	97.7	94.9	+2.8	0.8	1.4	-0.6	2.3	5.1	-2.8	0.0
Greene Twp	9,784	96.5	95.8	+0.7	1.5	1.1	+0.4	3.5	2.8	+0.7	1.4
Hamilton Twp	6,936	95.6	96.6	-1.0	2.2	1.7	+0.5	4.4	2.1	+2.3	1.3
St. Thomas Twp	4,504	97.9	99.1	-1.2	0.5	0.9	-0.4	2.1	0.9	+1.2	0.0
Peters Twp	3,307	97.4	98.4	-1.0	0.8	1.2	-0.4	2.6	1.6	+1.0	0.0
Greene Twp	9,784	96.5	96.7	-0.2	1.5	1.1	+0.4	3.5	2.2	+1.3	1.1
Antrim Twp	9,425	97.7	95.7	+2.0	0.8	1.8	-1.0	2.3	2.6	-0.3	1.7
Fannett Twp	1,738	98.8	97.7	+1.1	0.5	0.9	-0.4	1.2	1.4	-0.2	0.9
Guilford Twp	10,535	95.8	98.2	-2.4	1.7	1.5	+0.2	4.2	1.8	+2.4	0.0
Fannett Twp	1,738	98.8	92.8	+6.0	0.5	0.0	+0.5	1.2	0.0	+1.2	7.2
Southampton Twp	4,549	97.4	93.9	+3.5	1.0	0.6	+0.4	2.6	0.8	+1.8	5.3
County Total/Avg	101,875	95.3	95.9	-0.6	2.1	1.3	+0.8	4.7	2.1	+2.6	2.0

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.37 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Franklin County. The trends in this county are summarized below.

- Observation data from Franklin County suggest no significant gender differences in observed speeding behavior.
- Age differences are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.4, 1.8, 3.2, and 4.0 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are no significant racial differences in observed speeding behavior in Franklin County. This may partially be a result of the small number of non-Caucasians that were observed.

Table B.37 Speeding in Franklin County by Driver Characteristics (n=2,871)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	1,083	0.9	30.4	10.3	2.2	0.3
Male	1,761		30.6	9.8	2.8	0.7
25 years old or under	313	1.2	40.6***	16.6***	6.4***	1.6**
Over 25 years old	2,525		29.1	9.1	2.0	0.4
Caucasian	2,764	1.6	30.2	10.0	2.6	0.5
Non-Caucasian	60		23.3	6.7	0.0	0.0

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Indiana County

Select Characteristics of Indiana County:

- Located in of Pennsylvania
- Population = 89,605
- % Blacks = 1.8
- % Non-Caucasians = 2.9
- No interstate miles
- 2,067.3 total roadway miles
- Home to:
    - Indiana University of Pennsylvania
    - State Correctional Institution at Pine Grove for young adult offenders
- Jurisdiction of the Indiana PSP station

Table B.38 lists the municipalities that were observed in Indiana County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the

dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Figure B.12 displays two maps of Indiana County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

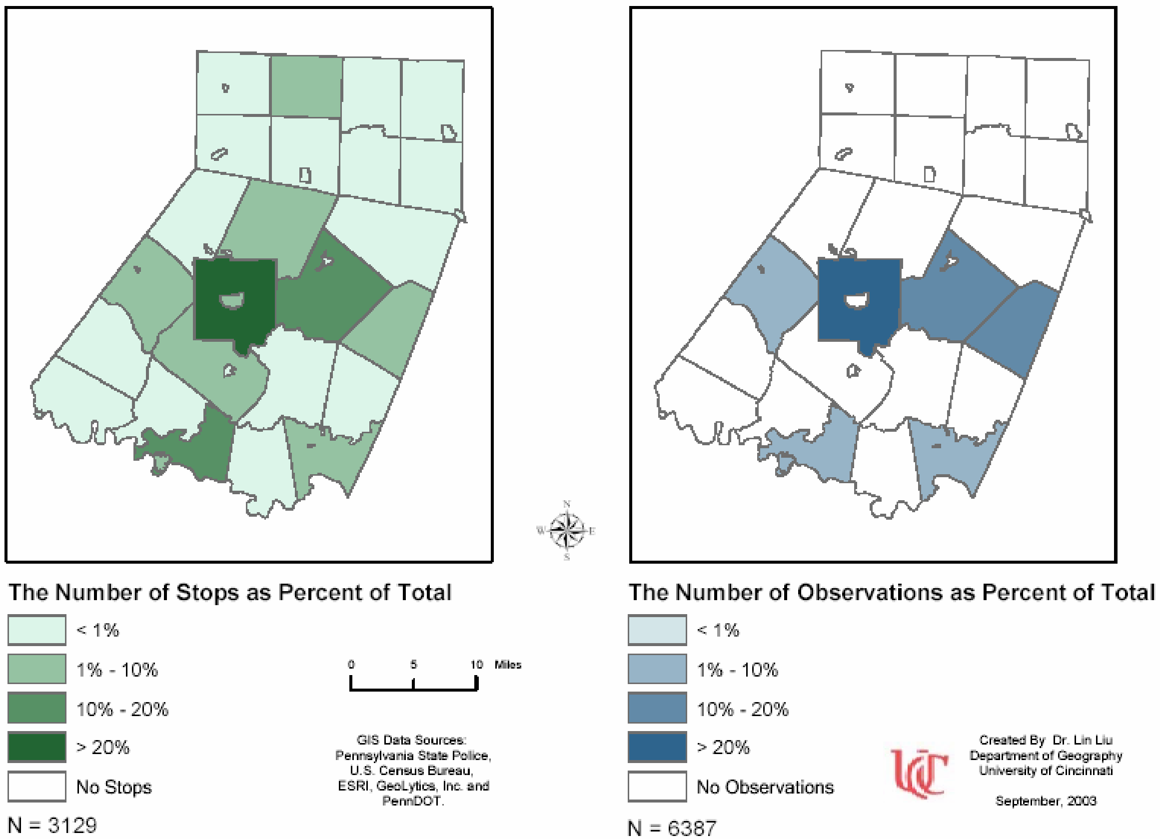
The first two columns of **Table B.38** and the maps in **Figure B.12** illustrate that the observed municipalities in Indiana County are consistent with the municipalities with higher concentrations of PSP traffic stops.

Table B.38 Observations in Indiana County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Cherryhill Twp	10.3	05/30/2002	815	8.0	101.9	35.0
White Twp	26.1	05/31/2002	757	8.0	94.6	48.7
White Twp	26.1	08/04/2002	684	7.5	91.2	45.8
White Twp	26.1	08/05/2002	842	7.5	112.3	48.8
Blairsville Brgh	1.1	01/17/2003	482	7.0	68.9	56.6
East Wheatfield Twp	8.5	01/18/2003	393	5.5	71.5	53.2
Armstrong Twp	6.1	03/21/2003	636	7.0	90.9	36.3
Pine Twp	9.7	03/22/2003	701	9.0	77.9	29.7
Burrell Twp	17.6	04/27/2003	633	7.5	84.4	41.4
Pine Twp	9.7	04/28/2003	444	7.5	59.2	40.8
County Total/Avg	---	------------	6,387	74.5	85.7	42.9

* This column reflects the percent of PSP stops (n=3,129) in this county for each observed municipality.

Figure B.12. Indiana County, PA.
Traffic Stops and Observations by Municipality.



The remainder of **Table B.38** indicates that a moderate volume of vehicles was observed in Indiana County, ranging from 59.2 vehicles to 112.3 vehicles observed per hour. The amount of RADAR conducted in the county (42.9%) was slightly higher than in the overall dataset (41.4%). Fortunately, there were no weather limitations in Indiana County that prohibited observers from conducting RADAR.

Table B.39 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Indiana County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Indiana County were conducted only on state highways, as there are no interstates that pass through this county.
- Observed municipalities included 35, 45, 50, 55, and 65 mph speed limits. There is no clear pattern of association between speed limit and percent of drivers speeding.
- There is a high degree of variability among municipalities' percentages of speeders, even at the least severe level of speeding (> 5 mph over the limit). Armstrong Twp

had only 5.6% of drivers observed to be exceeding the speed limit by at least 5 miles per hour, while the second observation at White Twp had 83.1%.

Table B.39 Speeding Behavior by Municipality in Indiana County* (n=2,742)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Cherryhill Twp	State Hwy	65	11.6	1.1	0.0	0.0
White Twp	State Hwy	65	19.0	4.9	1.4	0.3
White Twp	State Hwy	35	83.1	46.6	15.0	3.8
White Twp	State Hwy	45	38.7	12.7	1.9	0.7
Blairsville Brgh	State Hwy	50	64.5	28.9	9.5	4.4
E. Wheatfield Twp	State Hwy	55	73.7	34.9	9.6	3.8
Armstrong Twp	State Hwy	55	5.6	0.9	0.0	0.0
Pine Twp	State Hwy	45	24.0	9.1	1.4	0.0
Burrell Twp	State Hwy	50	64.5	31.7	11.8	2.7
Pine Twp	State Hwy	55	53.6	25.4	6.1	1.7
County Average	-----------	--	43.1	19.0	5.5	1.7

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.40 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Indiana County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- The observations conducted in White Twp and Blairsville Borough, the municipalities with the largest non-Caucasian residential populations (5.6 and 3.5 percent, respectively) among the observed municipalities in Indiana County, included smaller observed non-Caucasian driving populations.
- In contrast, the municipalities with non-Caucasian residential populations less than 2.0 percent were observed to have larger non-Caucasian driving populations (by as little as 0.5 percent and as much as almost 7 percentage points).
- The county's percent missing driver race (1.8%) is slightly lower than the percent missing in the overall observation data (2.6%).

Table B.40 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Indiana County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Cherryhill Twp	2,244	99.0	98.5	+0.5	0.5	0.1	+0.4	1.0	1.5	-0.5	1.3
White Twp	11,603	94.4	99.2	-4.8	2.3	0.3	+2.0	5.6	0.8	+4.8	6.2
White Twp	11,603	94.4	98.1	-3.7	2.3	1.2	+1.1	5.6	1.9	+3.7	0.2
White Twp	11,603	94.4	99.0	-4.6	2.3	0.2	+2.1	5.6	1.0	+4.6	0.1
Blairsville Brgh	2,899	96.5	97.1	-0.6	2.5	1.5	+1.0	3.5	2.9	+0.6	0.4
East Wheatfield Twp	2,094	98.8	91.9	+7.0	0.1	3.9	-3.8	1.2	8.1	-6.9	2.5
Armstrong Twp	2,395	98.9	98.4	+0.5	0.2	1.1	-0.9	1.1	1.6	-0.5	3.5
Pine Twp	1,691	99.5	98.7	+0.8	0.1	0.6	-0.5	0.5	1.3	-0.8	0.7
Burrell Twp	3,041	98.0	98.2	-0.2	1.3	1.4	-0.1	2.0	1.8	+0.2	1.0
Pine Twp	1,691	99.5	99.3	+0.2	0.1	0.7	-0.6	0.5	0.7	-0.2	1.8
County Total/Avg	73,249	96.6	98.1	-1.5	1.6	0.9	+0.7	3.4	1.9	+1.5	1.8

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.41 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Indiana County. The trends in this county vary considerably from patterns in other counties, particularly with regard to the gender and racial differences. All trends in Indiana County are summarized below.

- Observation data from Indiana County show gender differences in observed speeding behavior at all levels of speeding severity, reaching statistical significance for 10 and 15 miles per hour over the limit. Specifically, men are 1.3 and 1.8 times more likely than women are to exceed the posted speed limit by 10 and 15 miles per hour, respectively.
- Age differences are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.5, 2.1, 2.8, and 3.7 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- The only significant racial difference in observed speeding behavior indicates that at the lowest level of speeding severity (5 or more miles per hour), non-Caucasians are 1.4 times more likely to exceed the speed limit than Caucasians are.

Table B.41 Speeding in Indiana County by Driver Characteristics (n=2,742)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	905	1.1	42.0	16.2**	3.6**	1.1
Male	1,807		44.1	20.6	6.5	1.9
25 years old or under	311	0.8	62.7***	36.0***	12.9***	4.8***
Over 25 years old	2,409		40.8	17.0	4.6	1.3
Caucasian	2,639	1.9	42.9*	19.1	5.5	1.7
Non-Caucasian	51		58.8	21.6	5.9	2.0

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Juniata County

Select Characteristics of Juniata County:

- Located in central Pennsylvania
- Population = 22,821 (least populated county among sampled counties, 7th smallest population in PA)
- % Blacks = 0.5
- % Non-Caucasians = 3.6
- No interstate miles
- 735.1 total roadway miles (5th smallest roadway mileage in PA)

- Jurisdiction of the Lewistown PSP station

Table B.42 lists the municipalities that were observed in Juniata County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Figure B.13 displays two maps of Juniata County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

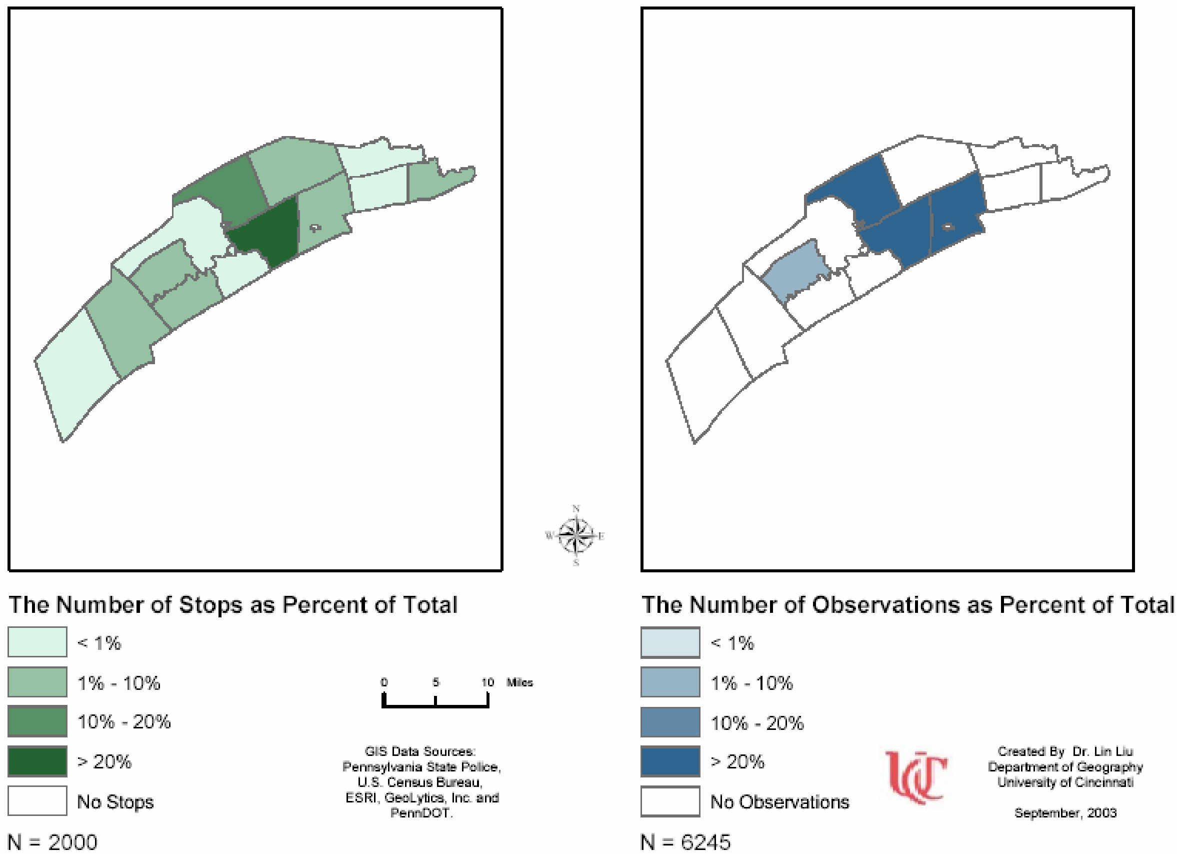
The first two columns of **Table B.42** and the maps in **Figure B.13** illustrate that PSP traffic stops are highly concentrated in just a few municipalities; therefore, observation sessions were similarly concentrated.

Table B.42 Observations in Juniata County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Walker Twp	57.1	04/26/2002	914	7.0	130.6	18.9
Walker Twp	57.1	04/27/2002	861	7.5	114.8	50.3
Fermanagh Twp	19.2	08/11/2002	693	7.5	92.4	54.4
Walker Twp	57.1	08/12/2002	463	7.0	66.1	55.7
Delaware Twp	9.5	11/05/2002	469	7.5	62.5	47.3
Delaware Twp	9.5	11/06/2002	601	7.5	80.1	43.4
Beale Twp	1.9	02/08/2003	550	6.5	84.6	42.5
Walker Twp	57.1	02/24/2003	341	7.5	45.5	5.8
Fermanagh Twp	19.2	04/06/2003	700	7.5	93.3	49.0
Delaware Twp	9.5	04/09/2003	653	7.5	87.1	45.9
County Total/Avg	---	------------	6,245	73.0	85.6	40.7

* This column reflects the percent of PSP stops (n=2,000) in this county for each observed municipality.

Figure B.13. Juniata County, PA.
Traffic Stops and Observations by Municipality.



The remainder of **Table B.42** indicates that a rather variable volume of vehicles was observed in Juniata County, ranging from 45.5 vehicles to 130.6 vehicles observed per hour. The amount of RADAR conducted in the county (40.7%) was slightly lower than in the overall dataset (41.4%). Fortunately, there were no weather limitations in Juniata County that prohibited observers from conducting RADAR.

Table B.43 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Juniata County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Juniata County were conducted only on state highways.
- Observed municipalities included 40, 55, 60, and 65 mph speed limits.
- The only municipality that had more than 50 percent of drivers speeding, even at the least severe level of speeding (> 5 mph over the limit) was the 40 mph zone in Walker Twp.

Table B.43 Speeding Behavior by Municipality in Juniata County* (n=2,544)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Walker Twp	State Hwy	65	46.8	16.8	7.5	2.3
Walker Twp	State Hwy	65	46.4	16.6	5.5	1.8
Fermanagh Twp	State Hwy	60	40.1	17.0	5.3	1.9
Walker Twp	State Hwy	40	78.3	41.9	12.8	2.7
Delaware Twp	State Hwy	65	34.7	5.4	0.9	0.5
Delaware Twp	State Hwy	65	39.1	9.6	1.1	0.4
Beale Twp	State Hwy	55	32.4	11.0	2.8	0.0
Walker Twp	State Hwy	65	12.5	0.0	0.0	0.0
Fermanagh Twp	State Hwy	65	39.1	11.4	2.6	0.6
Delaware Twp	State Hwy	65	15.7	2.3	0.3	0.0
County Average	-----------	--	41.1	14.6	4.3	1.2

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.44 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Juniata County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- All observed municipalities had very high percentages of Caucasians in the residential populations.
- Only two municipalities were observed to have even smaller non-Caucasian driving populations (the third observation session in Walker Twp and Beale Twp).
- Most of the municipalities with very small non-Caucasian residential populations were observed to have larger non-Caucasian driving populations, though the percent difference between the two only ranges from 0.2 and 4.1 percentage points.
- The county's percent missing driver race (0.9%) is considerably lower than the percent missing in the overall observation data (2.6%).

Table B.44 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Juniata County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Walker Twp	1,965	99.0	97.0	+2.0	0.4	1.2	-0.8	1.0	3.0	-2.0	0.6
Walker Twp	1,965	99.0	96.6	+2.4	0.4	1.6	-1.2	1.0	3.4	-2.4	0.5
Fermanagh Twp	2,049	98.8	97.1	+1.6	0.1	2.2	-2.1	1.2	2.9	-1.7	0.1
Walker Twp	1,965	99.0	99.1	-0.1	0.4	0.2	+0.2	1.0	0.9	+0.1	0.0
Delaware Twp	1,176	99.3	99.1	+0.2	0.0	0.4	-0.4	0.7	0.9	-0.2	0.0
Delaware Twp	1,176	99.3	98.8	+0.5	0.0	0.8	-0.8	0.7	1.2	-0.5	0.0
Beale Twp	548	98.2	99.7	-1.5	0.4	0.0	+4.0	1.8	0.3	+1.5	0.0
Walker Twp	1,965	99.0	94.9	+4.1	0.4	2.0	-1.6	1.0	5.1	-4.1	0.4
Fermanagh Twp	2,049	98.8	96.8	+2.0	0.1	1.8	-1.7	1.2	3.2	-2.0	3.3
Delaware Twp	1,176	99.3	96.5	+2.8	0.0	1.7	-1.7	0.7	3.5	-2.8	3.5
County Total/Avg	17,759	97.8	97.3	+0.5	0.2	1.3	-1.1	2.2	2.7	-0.5	0.9

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.45 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Juniata County. The trends in this county are highly significant across all demographic characteristics and are summarized below.

- Observation data from Juniata County show significant gender differences in three of the four levels of observed speeding behavior.
- The direction of these gender differences, however, is not the same as is evident in other counties and the overall observation data. That is, women, not men, are 1.1, 1.3, and 1.7 times more likely to exceed the speed limit by 5, 10, and 15 miles per hour, respectively.
- Age differences are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.4, 2.0, 3.3, and 5.5 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are also significant racial differences in observed speeding behavior in Juniata County that increase in strength at more serious levels of speeding. Specifically, non-Caucasians are 1.3, 2.0, 3.1, and 7.8 times more likely than Caucasians are to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table B.45 Speeding in Juniata County by Driver Characteristics (n=2,544)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	818	0.9	44.0*	17.4**	5.7**	1.1
Male	1,702		39.4	13.1	3.4	1.2
25 years old or under	251	0.8	54.2***	25.9***	11.2***	4.4***
Over 25 years old	2,272		39.5	13.2	3.4	0.8
Caucasian	2,454	1.0	40.7*	14.2**	4.0**	1.0***
Non-Caucasian	64		54.7	28.1	12.5	7.8

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001

[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Lackawanna County

Select Characteristics of Lackawanna County:

- Located in northeastern Pennsylvania
- Population = 213,295
- % Blacks = 1.6
- % Non-Caucasians = 4.0
- 68.2 interstate miles (5th highest interstate mileage in PA)
- 1,504.7 total roadway miles

- Home to:
    - 5 colleges and universities
    - Montage Mountain Ski Resort
- Jurisdiction of the Dunmore PSP station

Table B.46 lists the municipalities that were observed in Lackawanna County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

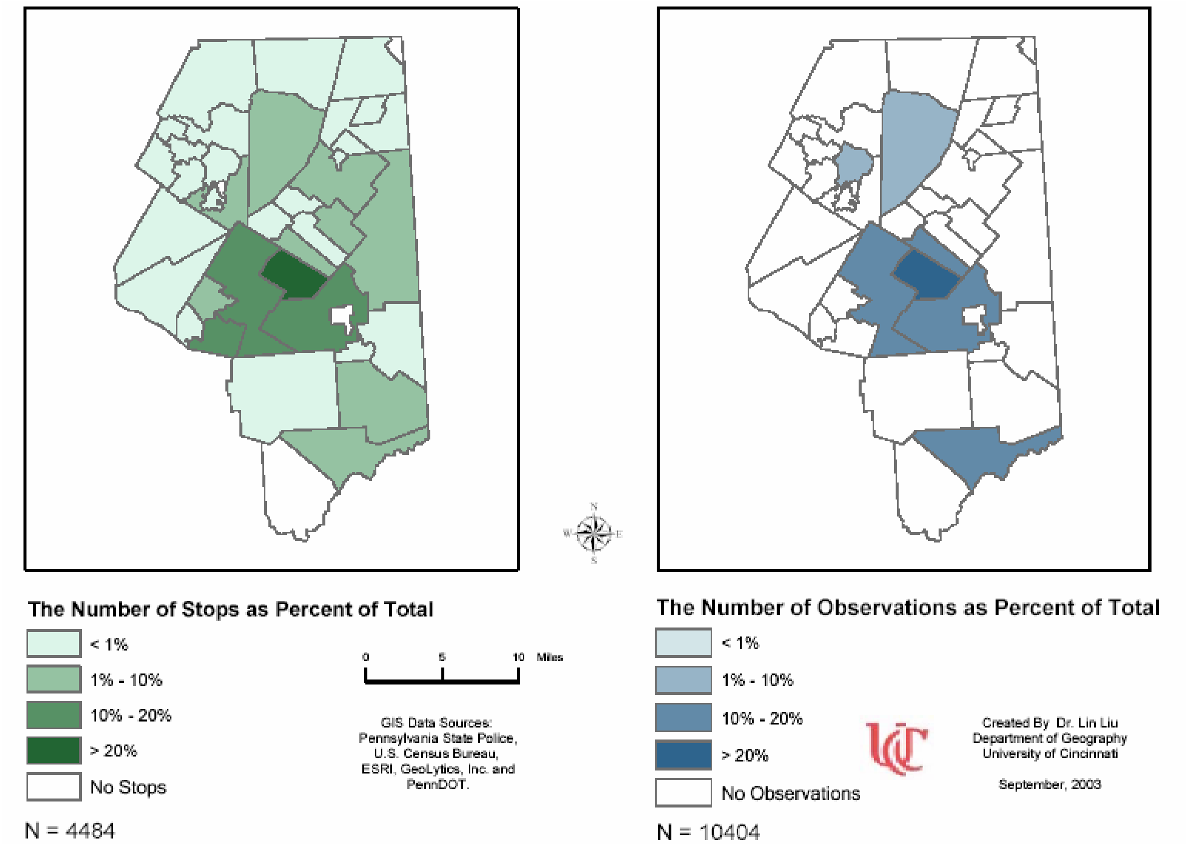
Figure B.14 displays two maps of Lackawanna County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table B.46 Observations in Lackawanna County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Dunmore Brgh	31.7	05/05/2002	1,706	8.0	213.3	42.8
Throop Brgh	1.7	05/06/2002	1,579	8.0	197.4	43.0
Clifton Twp	4.9	07/26/2002	1,042	6.5	160.3	50.2
Roaring Brook Twp	14.0	07/27/2002	989	7.5	131.9	49.5
City of Scranton	10.3	10/15/2002	807	7.5	107.6	45.1
Roaring Brook Twp	14.0	03/07/2003	790	7.5	105.3	42.0
Abington Twp	0.1	03/08/2003	919	7.5	122.5	44.2
City of Scranton	10.3	04/17/2003	887	7.5	118.3	39.0
Dunmore Brgh	31.7	04/18/2003	831	7.5	110.8	40.2
Scott Twp	3.7	04/19/2003	854	7.5	113.9	45.7
County Total/Avg	---	------------	10,404	75.0	138.7	44.2

* This column reflects the percent of PSP stops (n=4,484) in this county for each observed municipality.

Figure B.14. Lackawanna County, PA.
Traffic Stops and Observations by Municipality.



The first two columns of **Table B.46** and the maps in **Figure B.14** illustrate that the observed municipalities in Lackawanna County reasonably match the municipalities with higher concentrations of PSP traffic stops. The major disjunction between the stop map and observation map in **Figure B.14** is that one municipality, shaded to indicate over 10% of PSP stops were made there, was not observed. This municipality is the Borough of Moosic; the PSP personnel in this jurisdiction indicated that although 12.4% of the county's stops were in this area, there was not a suitably safe location for an observation team. In addition, one observed municipality (Abington Twp) accounted for less than 1% of the county's stops, but was selected for observation because Interstate 81 runs directly through it.

The remainder of **Table B.46** indicates that a very large volume of vehicles was observed in Lackawanna County, ranging from 105.3 vehicles to 213.3 vehicles observed per hour. The amount of RADAR conducted in the county (44.2%) was somewhat higher than in the overall dataset (41.4%), which is at least partially due to the fact that there were no weather limitations during any observation sessions in Lackawanna County.

Table B.47 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Lackawanna County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- The majority of observations in Lackawanna County were conducted on interstate highways, with only one day of observation taking place on a state highway.
- Municipalities observed were in either 55 or 65 mph speed limits.
- A high percentage of drivers were observed to be exceeding the speed limit in Lackawanna County. In six of the 10 municipalities, observers noted that at least half of the drivers were exceeding the speed limit by at least 5 miles per hour.
- The table shows that the 55 mph zones in Dunmore Borough and Abington Twp, and the 65 mph zone in Scott Twp maintain the largest percentages of speeders through each speeding category.

Table B.47 Speeding Behavior by Municipality in Lackawanna County* (n=4,594)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Dunmore Brgh	Interstate	65	38.1	10.5	2.1	0.5
Throop Brgh	State Hwy	65	9.3	1.6	0.4	0.0
Clifton Twp	Interstate	65	29.8	10.1	1.7	0.6
Roaring Brook Twp	Interstate	65	28.8	8.6	2.0	0.8
City of Scranton	Interstate	55	51.6	14.6	2.5	0.0
Roaring Brook Twp	Interstate	65	59.9	24.1	6.9	2.7
Abington Twp	Interstate	55	88.4	69.7	35.0	11.8
City of Scranton	Interstate	55	74.9	38.7	8.4	1.2
Dunmore Brgh	Interstate	55	92.2	63.8	26.3	6.3
Scott Twp	Interstate	65	90.5	41.3	8.5	2.3
County Average	-----------	--	50.2	24.1	7.9	2.2

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.48 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Lackawanna County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- Observations conducted in nine out of the 10 observed municipalities showed larger non-Caucasian driving populations than would be expected based on their residential populations. The higher percentages of observed minorities are most likely a function of the large number of interstate miles in Lackawanna County.
- The only municipality that had a smaller non-Caucasian driving population than residential population was the City of Scranton, which has the lowest % Caucasian residential population (93.8%).
- The county's percent missing driver race (1.6%) is lower than the percent missing in the overall observation data (2.6%).

Table B.48 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Lackawanna Cnty.

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Dunmore Brgh	11,445	98.4	93.6	+4.8	0.4	2.9	-2.5	1.7	6.4	-4.7	1.8
Throop Brgh	3,275	98.9	97.7	+1.4	0.4	0.6	-0.2	1.1	2.3	-1.2	0.8
Clifton Twp	918	97.2	93.2	+4.0	0.4	3.3	-2.7	2.8	6.8	-4.0	2.8
Roaring Brook Twp	1,346	98.4	95.7	+2.7	0.3	2.1	-1.8	1.6	4.3	-2.7	0.5
City of Scranton	62,414	93.8	98.1	-4.3	2.5	0.7	+1.8	6.2	1.9	+4.3	0.4
Roaring Brook Twp	1,346	98.4	95.0	+3.4	0.3	3.8	-3.3	1.6	5.0	-3.4	1.1
Abington Twp	1,261	96.4	93.5	+2.9	0.0	2.2	-2.2	3.6	6.5	-2.9	0.7
City of Scranton	62,414	93.8	92.6	+1.2	2.5	4.9	-2.4	6.2	7.4	-1.2	3.8
Dunmore Brgh	11,445	98.4	89.3	+9.1	0.4	4.7	-4.3	1.7	10.7	-9.0	2.5
Scott Twp	3,942	98.3	83.7	+13.0	0.5	11.3	-10.8	1.7	16.3	-14.6	1.9
County Total/Avg	172,463	96.7	93.6	+3.1	1.1	3.3	-2.2	3.3	6.4	-3.1	1.6

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.49 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Lackawanna County. The trends in this county are summarized below.

- Observation data from Lackawanna County suggest no significant gender differences in observed speeding behavior.
- Age differences are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.1, 1.4, 1.9, and 2.0 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are also significant racial differences in observed speeding behavior in Lackawanna County, which are stronger at more serious levels of speeding.
- Specifically, non-Caucasians are 1.4, 1.9, 2.3, and 3.2 times more likely than Caucasians to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table B.49 Speeding in Lackawanna County by Driver Characteristics (n=4,594)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	1,380	1.1	49.9	23.8	8.0	2.4
Male	3,166		50.0	24.0	7.6	2.1
25 years old or under	853	1.2	54.7**	30.2***	12.4***	3.6**
Over 25 years old	3,687		48.9	22.4	6.6	1.8
Caucasian	4,211	1.6	48.7***	22.6***	7.1***	1.9***
Non-Caucasian	312		67.6	42.3	16.3	6.1

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Lehigh County

Select Characteristics of Lehigh County:

- Located in east central Pennsylvania
- Population = 312,090
- % Blacks = 4.2
- % Non-Caucasians = 21.2 (3rd largest in PA, due in part to highest % Hispanic in PA—10.2)
- 44.9 interstate miles
- 1,952.8 total roadway miles
- Home to:
    - 4 colleges and universities
    - Dorney Amusement Park

    - Lehigh Valley International Airport
- Jurisdiction of the Fogelsville and Bethlehem PSP stations

Table B.50 lists the municipalities that were observed in Lehigh County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the number of hours observed produces the information presented in the next column —average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

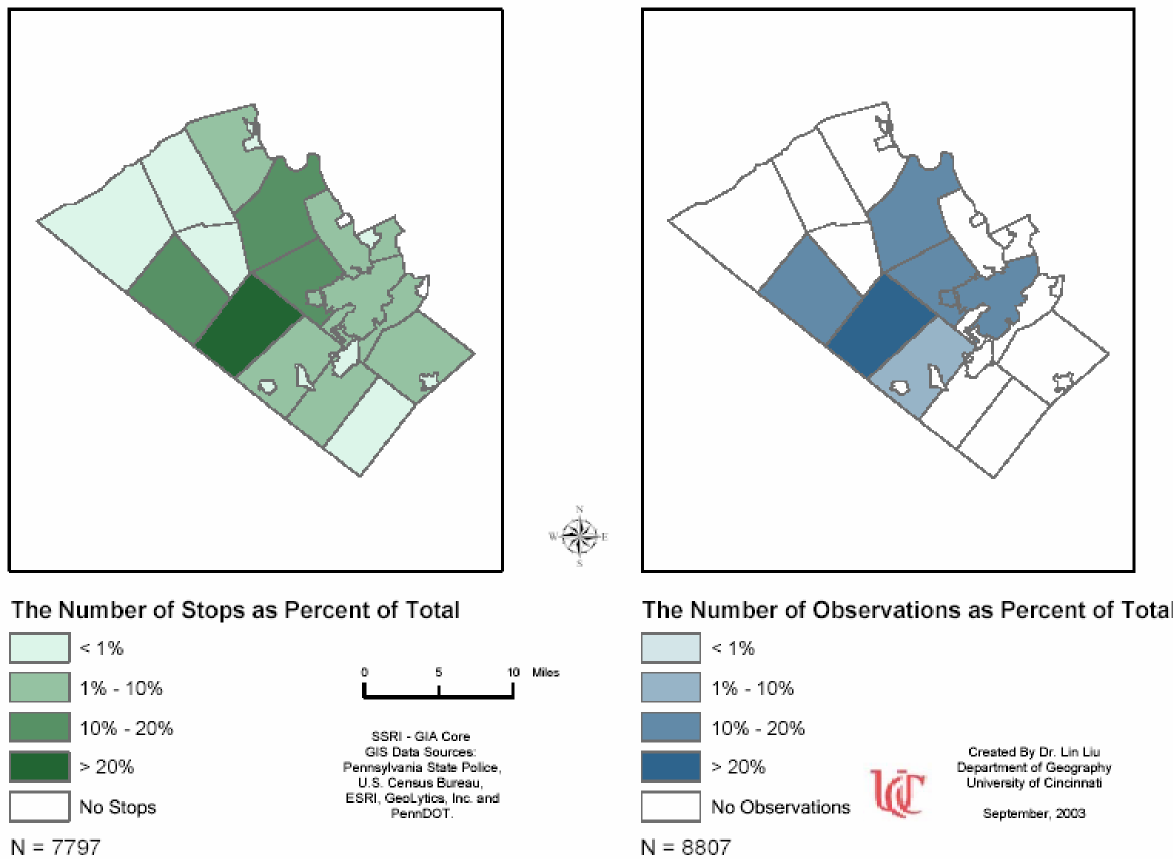
Figure B.15 displays two maps of Lehigh County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table B.50 Observations in Lehigh County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
City of Bethlehem	2.1	04/07/2002	1,293	7.5	172.4	48.1
South Whitehall Twp	13.3	04/08/2002	887	7.5	118.3	25.5
Upper Macungie Twp	22.2	06/20/2002	1,017	7.5	135.6	38.8
City of Allentown	2.7	06/21/2002	1,452	7.5	193.6	0.0
North Whitehall Twp	14.4	11/08/2002	729	6.5	112.2	53.6
North Whitehall Twp	14.4	11/09/2002	803	7.0	114.7	34.4
Weisenberg Twp	13.7	04/04/2003	649	7.5	86.5	48.5
Upper Macungie Twp	22.2	04/05/2003	810	7.5	108.0	47.9
Weisenberg Twp	13.7	06/12/2003	493	7.5	65.7	47.5
Lower Macungie Twp	6.4	06/13/2003	674	7.5	89.9	44.5
County Total/Avg	---	------------	8,807	73.5	119.8	35.7

* This column reflects the percent of PSP stops (n=7,797) in this county for each observed municipality.

Figure B.15. Lehigh County, PA.
Traffic Stops and Observations by Municipality.



The first two columns of **Table B.50** and the maps in **Figure B.15** illustrate that the observations were concentrated in the same municipalities in Lehigh County that PSP traffic stop activity is highest.

The remainder of **Table B.50** indicates that at a majority of the observed locations, a large volume of vehicles was observed in Lehigh County, ranging from 65.7 vehicles to 172.4 vehicles observed per hour. The amount of RADAR conducted in the county (35.7%) was lower than in the overall dataset (41.4%), largely due to rainy weather in several of the early observation sessions that limited observers' ability to conduct RADAR.

Table B.51 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Lehigh County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Lehigh County were conducted on local, state, and interstate highways.
- Despite the variation in road type, all observed locations were within 55 mph zones.

- A very high percentage of drivers were observed to be exceeding the speed limit in Lehigh County. In the nine municipalities in which RADAR was conducted, at least half of the observed drivers were exceeding the speed limit by at least 5 miles per hour.
- The high percentage of speeders is consistent even in the more serious speeding categories, as an average of 20% and 5% of all drivers were observed to be speeding by 15 and 20 mph, respectively.
- The table shows that the 35 mph zone in North Whitehall Twp and one of the 55 mph zones in Upper Macungie Twp maintain the largest percentages of speeders through each speeding category.

Table B.51 Speeding Behavior by Municipality in Lehigh County * (n=3,147)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
City of Bethlehem	State Hwy	55	69.8	37.9	15.3	2.9
South Whitehall Twp	State Hwy	55	61.1	25.7	6.2	1.8
Upper Macungie Twp	Interstate	55	65.6	30.6	8.1	1.0
City of Allentown	Interstate	55	--	--	--	--
North Whitehall Twp	State Hwy	55	57.0	29.4	11.5	3.8
North Whitehall Twp	County/local	35	98.6	83.7	46.0	8.7
Weisenberg Twp	Interstate	55	87.9	54.9	22.9	6.0
Upper Macungie Twp	Interstate	55	93.6	73.2	41.0	14.2
Weisenberg Twp	Interstate	55	80.8	55.6	24.8	4.7
Lower Macungie Twp	Interstate	55	66.0	32.7	9.3	3.0
County Average	----------	--	74.8	45.9	20.0	5.1

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.52 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Lehigh County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- The observations conducted in the City of Allentown, the municipality with the largest non-Caucasian residential population among the observed municipalities in Lehigh County, included a considerably smaller observed non-Caucasian driving population. A similar pattern is evident in the City of Bethlehem, although the difference between the residential and observed populations is much smaller.

- In contrast, the most of the municipalities with smaller non-Caucasian residential populations (e.g., South Whitehall, Weisenberg, & Lower Macungie Twps) were observed to have a larger non-Caucasian driving population.
- The county's percent missing driver race (4.4%) is higher than the percent missing in the overall observation data (2.6%). This is likely the result of observers' difficulty in agreeing on the Caucasian/non-Caucasian dichotomy in a more racially diverse area.

Table B.52 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Lehigh County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
City of Bethlehem	15,765	88.8	90.4	-1.6	2.2	4.4	-2.2	11.2	9.6	+1.6	3.0
South Whitehall Twp	14,726	95.6	94.2	+1.4	0.8	2.3	-1.5	4.4	5.8	-1.4	2.8
Upper Macungie Twp	10,584	93.2	95.8	-2.6	0.9	2.1	-1.2	6.9	4.2	+2.7	8.4
City of Allentown	82,735	70.6	91.8	-21.2	6.7	4.3	+2.4	29.4	8.2	+21.2	6.4
North Whitehall Twp	10,948	97.1	97.9	-0.8	0.6	1.4	-0.8	2.9	2.1	+0.8	1.4
North Whitehall Twp	10,948	97.1	98.4	-1.3	0.6	1.0	-0.4	2.9	1.6	+1.3	0.6
Weisenberg Twp	3,192	97.9	88.7	+9.2	0.5	7.6	-7.1	2.1	11.3	-9.2	4.9
Upper Macungie Twp	10,584	93.2	85.8	+8.5	0.9	9.7	-8.8	6.9	14.2	-7.3	8.2
Weisenberg Twp	3,192	97.9	92.4	+5.5	0.5	2.5	-2.0	2.1	7.6	-5.5	1.8
Lower Macungie Twp	14,972	93.5	93.4	+0.1	0.5	3.4	-2.9	6.6	6.6	0.0	3.3
County Total/Avg	245,601	86.2	92.8	-6.6	3.0	3.9	-0.9	13.8	7.2	+6.6	4.4

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.53 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Lehigh County. The trends in this county are summarized below.

- Observation data from Lehigh County suggest no significant gender differences in observed speeding behavior.
- Age differences are statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.1, 1.4, 1.6, and 2.4 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are also significant racial differences in observed speeding behavior in Lehigh County, as non-Caucasians are 1.3, 1.4, and 2.3 times more likely than Caucasian drivers to exceed the speed limit by 10, 15, and 20 miles per hour, respectively.

Table B.53 Speeding in Lehigh County by Driver Characteristics (n=3,147)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	1,024	2.7	72.9	46.2	19.6	4.7
Male	2,038		75.3	45.1	19.5	4.8
25 years old or under	464	3.2	82.5***	58.6***	28.2***	9.5***
Over 25 years old	2,584		73.0	43.0	17.8	3.9
Caucasian	2,817	3.9	74.0	44.6**	19.1*	4.4***
Non-Caucasian	206		79.1	55.8	26.2	10.2

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

McKean County

Select Characteristics of McKean County:
- Located in northwestern Pennsylvania, bordering New York
- Population = 45,936
- % Blacks = 2.1
- % Non-Caucasians = 4.4
- No interstate miles
- 1,106.8 total roadway miles
- Home to:
  - University of Pittsburgh at Bradford
  - McKean Federal Correctional Institution
- Jurisdiction of the Kane PSP station

Table B.54 lists the municipalities that were observed in McKean County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the number of hours observed produces the information presented in the next column —average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Figure B.16 displays two maps of McKean County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

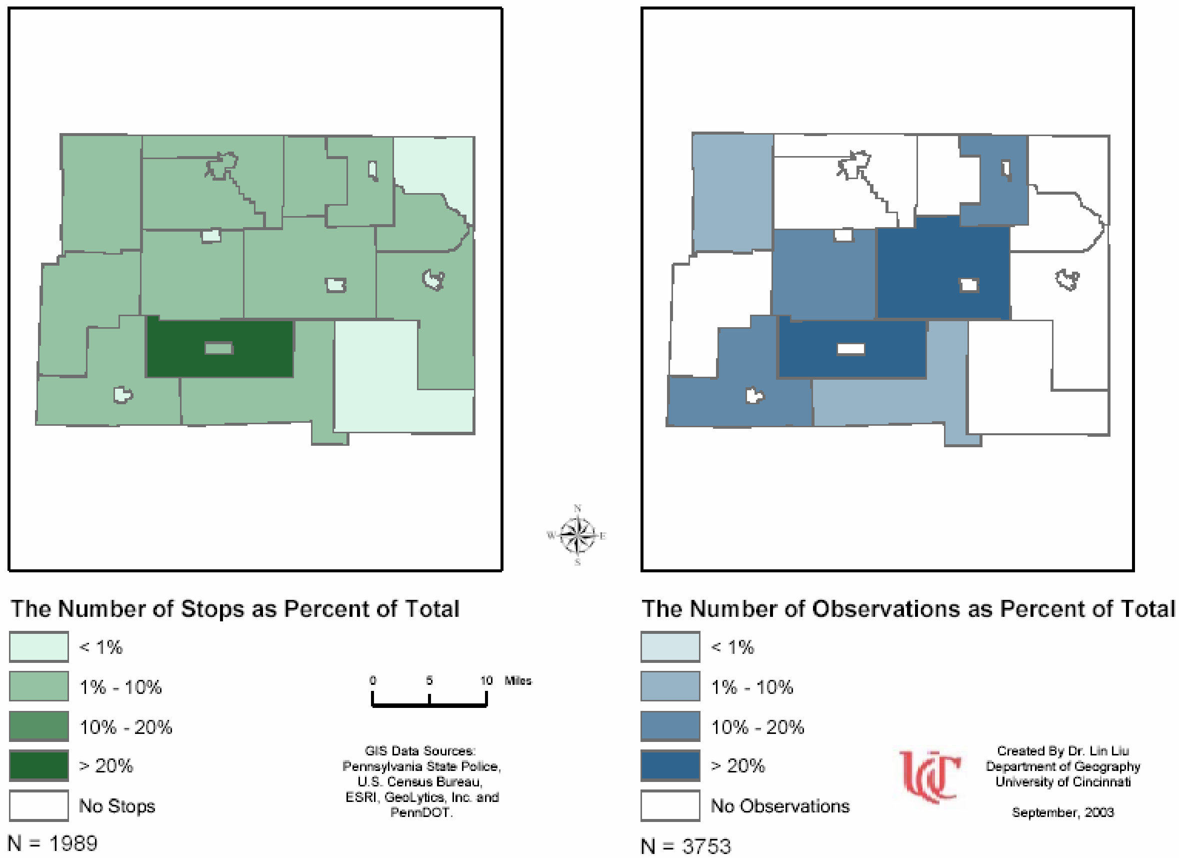
The first two columns of **Table B.54** and the maps in **Figure B.16** illustrate that the observed municipalities in McKean County are a good representation of the municipalities with higher concentrations of PSP traffic stops.

Table B.54 Observations in McKean County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Sergeant Twp	7.7	05/21/2002	281	7.5	37.5	52.7
Wetmore Twp	5.2	05/22/2002	431	7.5	57.5	49.2
Corydon Twp	7.1	08/11/2002	357	7.5	47.6	100.0
Lafayette Twp	3.8	08/12/2002	377	7.5	50.3	100.0
Hamlin Twp	36.0	12/18/2002	229	7.0	32.7	95.6
Hamlin Twp	36.0	12/19/2002	275	7.5	36.7	100.0
Keating Twp	9.2	03/21/2003	509	7.5	67.9	27.1
Eldred Twp	6.1	03/22/2003	584	7.5	77.9	34.4
Hamlin Twp	36.0	04/25/2003	289	7.5	38.5	53.3
Keating Twp	9.2	04/26/2003	422	7.5	56.3	7.8
County Total/Avg	---	------------	3,753	74.5	50.4	56.3

* This column reflects the percent of PSP stops (n=1,989) in this county for each observed municipality.

Figure B.16. McKean County, PA.
Traffic Stops and Observations by Municipality.



The remainder of **Table B.54** indicates that a fairly low volume of vehicles was observed in McKean County, ranging from 32.7 vehicles to 77.9 vehicles observed per hour. The amount of RADAR conducted in the county (56.3%) was considerably higher than in the overall dataset (41.4%) because traffic volume was so low that the use of RADAR was possible for entire days. There were also no significant weather limitations in McKean County that prohibited observers from conducting RADAR.

Table B.55 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in McKean County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in McKean County were conducted only on state highways, as no interstate highways run through the county.
- Municipalities with 55 mph speed limits have considerably smaller percentages of speeders than 45 mph speed limits, even at the least severe level of speeding (> 5 mph over the limit). Indeed, the two 45 mph zones in Hamlin Twp maintain the largest percentages of speeders through each speeding category.

- Overall, compared to other observed counties, speeding is less serious in McKean County.

Table B.55 Speeding Behavior by Municipality in McKean County * (n=2,113)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Sergeant Twp	State Hwy	55	33.1	12.8	5.4	1.4
Wetmore Twp	State Hwy	55	23.1	3.8	1.4	0.5
Corydon Twp	State Hwy	55	23.6	4.2	1.4	0.3
Lafayette Twp	State Hwy	55	20.7	4.5	1.3	0.0
Hamlin Twp	State Hwy	45	93.6	72.6	35.6	8.2
Hamlin Twp	State Hwy	45	94.9	75.3	28.7	5.1
Keating Twp	State Hwy	45	68.1	32.6	12.3	2.2
Eldred Twp	State Hwy	55	36.3	9.0	2.5	0.0
Hamlin Twp	State Hwy	55	35.1	9.1	3.9	1.9
Keating Twp	State Hwy	55	45.5	0.0	0.0	0.0
County Average	-----------	--	45.5	23.8	9.7	2.0

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.56 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and McKean County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- The observations conducted in Lafayette Twp, the municipality with by far the largest non-Caucasian residential population among the observed municipalities in McKean County, included a dramatically smaller observed non-Caucasian driving population.
- In contrast, the remainder of the municipalities all have very small non-Caucasian residential populations and similarly small or even smaller non-Caucasian driving populations were observed.
- The county's percent missing driver race (1.4%) is lower than the percent missing in the overall observation data (2.6%).

Table B.56 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in McKean County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Sergeant Twp	149	96.0	100.0	-4.0	0.7	0.0	+0.7	4.0	0.0	+4.0	1.1
Wetmore Twp	1,384	99.6	100.0	-0.4	0.0	0.0	0.0	0.4	0.0	+0.4	0.0
Corydon Twp	235	99.6	98.9	+0.7	0.0	0.6	-0.6	0.4	1.1	-0.7	0.3
Lafayette Twp	2,173	52.3	97.9	-45.6	34.3	1.1	+33.2	47.7	2.1	+45.6	0.8
Hamlin Twp	671	99.3	97.8	-1.5	0.0	0.9	-0.9	0.8	2.2	-1.4	0.9
Hamlin Twp	671	99.3	99.3	0.0	0.0	0.7	-0.7	0.8	0.7	+0.1	0.0
Keating Twp	2,448	98.4	99.4	-1.0	0.1	0.2	-0.1	1.6	0.6	+1.0	3.0
Eldred Twp	1,323	99.3	98.0	+1.3	0.1	1.1	-1.0	0.7	2.0	-1.3	5.0
Hamlin Twp	671	99.3	98.6	+0.7	0.0	0.0	0.0	0.8	1.4	-0.6	0.0
Keating Twp	2,448	98.4	99.5	-1.1	0.1	0.5	-0.4	0.8	0.5	+0.3	0.2
County Total/Avg	36,368	95.6	98.9	-3.3	2.3	0.5	+1.8	4.4	1.1	+3.3	1.4

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.57 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in McKean County. The trends in this county are summarized below.

- Observation data from McKean County suggest no significant gender differences in observed speeding behavior.
- The effects of age on speeding behavior are only statistically significant at 5 and 15 mph over the speed limit, as drivers identified as 25 years or younger are about 1.4 and 1.6 times more likely than drivers over 25 to exceed the speed limit by 5 and 15 miles per hour, respectively.
- There are no significant racial differences in observed speeding behavior in McKean County. This may partially be a result of the very small number of non-Caucasians that were observed.

Table B.57 Speeding in McKean County by Driver Characteristics (n=2,113)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	636	1.3	48.4	25.6	9.9	1.4
Male	1,450		44.3	23.0	9.7	2.2
25 years old or under	193	0.9	60.1***	26.9	14.5*	3.1
Over 25 years old	1,902		44.0	23.2	9.1	1.8
Caucasian	2,074	0.2	45.5	23.8	9.6	2.0
Non-Caucasian	25		44.0	16.0	16.0	0.0

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Mercer County

Select Characteristics of Mercer County:
- Located in western Pennsylvania, bordering Ohio
- Population = 120,293
- % Blacks = 5.7
- % Non-Caucasians = 7.2
- 53.8 interstate miles
- 2,006.3 total roadway miles
- Home to:
    - 2 colleges and universities
    - State Regional Correctional Facility at Mercer
- Jurisdiction of the Mercer PSP station

Table B.58 lists the municipalities that were observed in Mercer County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the

dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

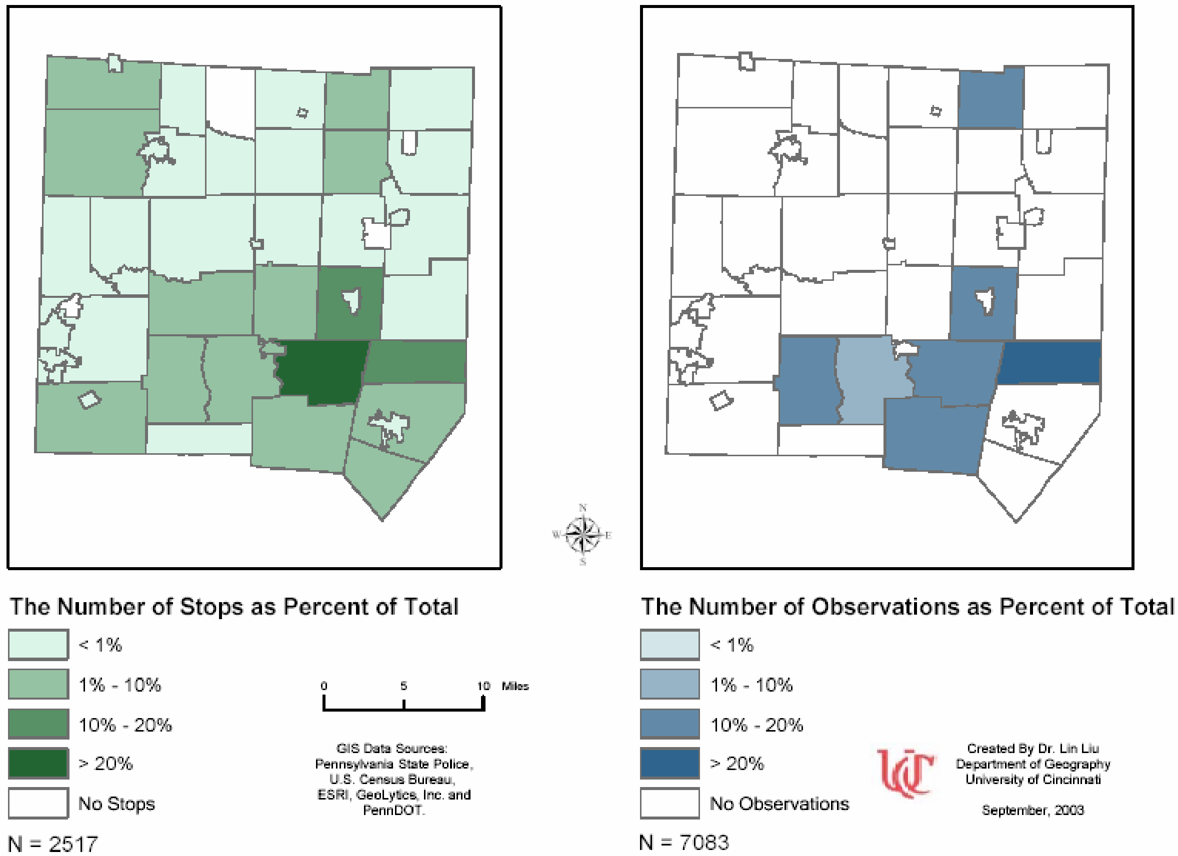
Figure B.17 displays two maps of Mercer County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table B.58 Observations in Mercer County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Lackawannock Twp	8.3	04/19/2002	734	7.5	97.9	35.6
Springfield Twp	5.7	04/20/2002	983	7.5	131.1	35.9
Wolf Creek Twp	13.6	07/28/2002	995	7.5	132.7	47.8
Deer Creek Twp	3.2	07/29/2002	946	7.5	126.1	92.6
Jackson Twp	11.0	01/09/2003	517	7.0	73.9	48.0
Findley Twp	30.5	01/10/2003	562	7.5	74.9	35.4
East Lackawannock Twp	4.8	03/23/2003	600	7.0	85.7	40.8
Findley Twp	30.5	03/24/2003	507	7.5	67.6	34.1
Wolf Creek Twp	13.6	05/23/2003	586	7.5	78.1	52.2
Jackson Twp	11.0	05/24/2003	653	7.0	93.3	54.7
County Total/Avg	---	------------	7,083	73.5	96.4	49.3

* This column reflects the percent of PSP stops (n=2,517) in this county for each observed municipality.

Figure B.17. Mercer County, PA.
Traffic Stops and Observations by Municipality.



The first two columns of **Table B.58** and the maps in **Figure B.17** illustrate that the observed municipalities in Mercer County are reasonably similar to the municipalities with higher concentrations of PSP traffic stops.

The remainder of **Table B.58** indicates that a moderately large volume of vehicles was observed in Mercer County, ranging from 67.6 vehicles to 132.7 vehicles observed per hour. The amount of RADAR conducted in the county (49.3%) was higher than in the overall dataset (41.4%). Fortunately, there were no weather limitations in Mercer County that prohibited observers from conducting RADAR.

Table B.59 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Mercer County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Mercer County were conducted only on interstate highways and only in 65 mph zones.

- A relatively smaller percentage of drivers were observed to be exceeding the speed limit in Mercer County, compared to many of the other observed counties. Observers noted that in only two of the ten observed municipalities were at least half of the observed drivers exceeding the speed limit, even at the least severe level of speeding (at least 5 miles per hour).
- Less than 1% of drivers in several municipalities exceeded the speed limit by 15 and 20 miles per hour.
- The table shows that the 65 mph zones in Wolf Creek and East Lackawannock Twps maintain the largest percentages of speeders through each speeding category.

Table B.59 Speeding Behavior by Municipality in Mercer County * (n=3,494)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Lackawannock Twp	Interstate	65	26.8	3.1	0.0	0.0
Springfield Twp	Interstate	65	39.4	7.6	1.1	0.0
Wolf Creek Twp	Interstate	65	60.1	19.7	6.1	1.7
Deer Creek Twp	Interstate	65	33.9	8.3	1.4	0.2
Jackson Twp	Interstate	65	46.8	8.5	2.8	0.0
Findley Twp	Interstate	65	28.1	3.5	0.5	0.0
E. Lackawannock Twp	Interstate	65	58.8	15.9	2.9	0.4
Findley Twp	Interstate	65	41.6	10.4	0.6	0.0
Wolf Creek Twp	Interstate	65	45.8	9.2	1.6	0.3
Jackson Twp	Interstate	65	42.3	8.4	2.8	0.3
County Average	-----------	--	42.1	9.9	2.2	0.4

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.60 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Mercer County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- The observations conducted in Findley Twp, the municipality with the largest non-Caucasian residential population among the observed municipalities in Mercer County, included much smaller observed non-Caucasian driving populations.
- In contrast, the remainder of the observed municipalities, with considerably smaller non-Caucasian residential populations, was observed to have larger non-Caucasian driving populations.
- At the county level, however, the overall difference between the county's non-Caucasian residential and observed driving populations was relatively small (only 1.0 percentage point).
- The county's percent missing driver race (2.1%) is slightly lower than the percent missing in the overall observation data (2.6%).

Table B.60 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Mercer County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Lackawannock Twp	1,884	97.4	93.6	+3.8	0.7	3.9	-3.2	2.6	6.4	-3.8	1.4
Springfield Twp	1,525	98.4	95.8	+2.6	0.3	2.1	-1.8	1.6	4.2	-2.6	1.4
Wolf Creek Twp	569	96.8	94.1	+2.7	0.0	2.1	-2.1	3.2	5.9	-2.7	0.7
Deer Creek Twp	369	99.2	94.2	+5.0	0.3	2.1	-1.8	0.8	5.8	-5.0	0.9
Jackson Twp	965	98.6	96.9	+1.7	0.0	2.3	-2.3	1.5	3.1	-1.6	0.4
Findley Twp	2,029	78.2	96.4	-18.2	16.8	2.3	+14.5	21.8	3.6	+18.2	1.4
East Lackawannock Twp	1,303	96.6	91.4	+5.2	1.5	4.6	-3.1	3.5	8.6	-5.1	3.2
Findley Twp	2,029	78.2	94.7	-16.5	16.8	2.8	+14.0	21.8	5.3	+16.5	3.0
Wolf Creek Twp	569	96.8	95.8	+1.0	0.0	2.5	-2.5	3.2	4.2	-1.0	5.8
Jackson Twp	965	98.6	95.8	+2.8	0.0	2.3	-2.3	1.5	4.2	-2.7	5.1
County Total/Avg	95,732	93.8	94.8	-1.0	4.6	2.6	+2.0	6.2	5.2	+1.0	2.1

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.61 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Mercer County. The trends in this county are summarized below.

- Observation data from Mercer County suggest no significant gender differences in observed speeding behavior.
- The effects of age on speeding behavior are statistically significant, only at the two lesser degrees of speeding. Specifically, drivers identified as 25 years or younger are about 1.4 and 2.1 times more likely than drivers over 25 are to exceed the speed limit by 5 and 10 miles per hour, respectively.
- Significant racial differences in observed speeding behavior are evident at all levels of speeding in Mercer County. The strength of the effect increases with severity of speeding, as non-Caucasians are 1.2, 1.7, 3.0, and 6.0 times more likely than Caucasians to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table B.61 Speeding in Mercer County by Driver Characteristics (n=3,494)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	1,018	1.3	42.5	10.5	2.8	0.3
Male	2,432		41.8	9.6	1.9	0.4
25 years old or under	398	1.4	55.3***	18.1***	3.3	0.5
Over 25 years old	3,047		40.2	8.8	2.0	0.4
Caucasian	3,253	2.1	41.4*	9.7**	2.0**	0.3**
Non-Caucasian	168		51.2	16.7	6.0	1.8

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Montgomery County

Select Characteristics of Montgomery County:

- Located in southeastern Pennsylvania, bordering Philadelphia County, which is home to 17 universities, Philadelphia International Airport, and 4 professional sports teams (Eagles, Phillies, 76ers, and Flyers)
- Population = 750,097 (3rd most populated county)
- % Blacks = 8.0 (5th largest in PA)
- % Non-Caucasians = 11.6
- 57.2 interstate miles
- 3,477.1 total roadway miles (5th highest roadway mileage in PA)
- Home to:
  - 5 colleges and universities
  - Valley Forge Historical Park

    - State Correctional Institution at Graterford
- Jurisdiction of the King of Prussia, Skippack, and Philadelphia PSP stations

Table B.62 lists the municipalities that were observed in Montgomery County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

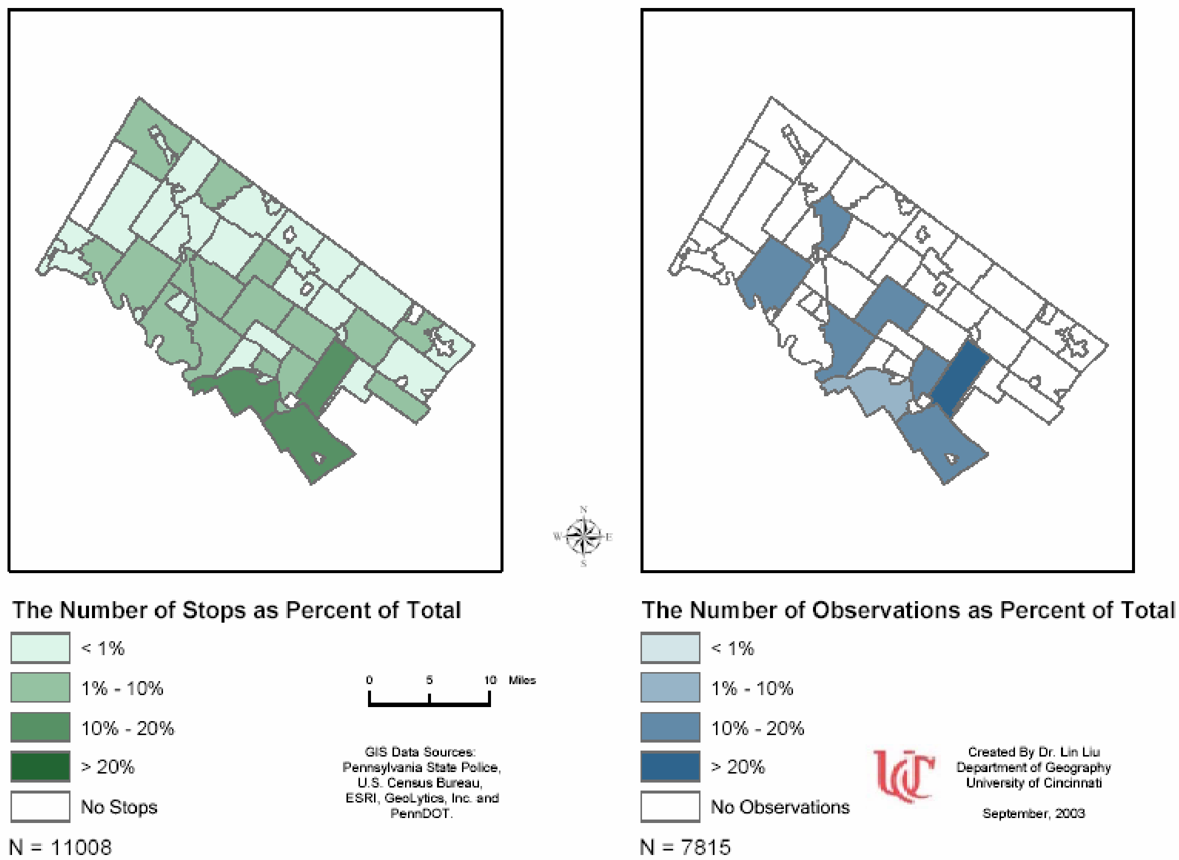
Figure B.18 displays two maps of Montgomery County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table B.62 Observations in Montgomery County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Whitemarsh Twp	12.9	03/15/2002	702	6.0	117.0	24.5
Whitemarsh Twp	12.9	03/16/2002	1,000	6.5	153.9	28.0
Upper Salford Twp	0.9	07/01/2002	840	7.5	112.0	39.9
Worcester Twp	5.0	07/02/2002	791	7.5	105.5	32.5
Upper Merion Twp	16.2	12/08/2002	345	4.5	76.7	47.2
Upper Merion Twp	16.2	12/09/2002	414	4.0	103.5	40.6
Limerick Twp	2.9	03/14/2003	954	7.5	127.2	45.4
Lower Providence Twp	3.6	03/15/2003	974	7.5	129.9	50.3
Lower Merion Twp	10.2	04/27/2003	807	7.5	107.6	34.6
Plymouth Twp	6.2	04/28/2003	988	7.5	131.7	27.3
County Total/Avg	---	------------	7,815	66.0	118.4	36.4

* This column reflects the percent of PSP stops (n=11,008) in this county for each observed municipality.

Figure B.18. Montgomery County, PA.
Traffic Stops and Observations by Municipality.



The first two columns of **Table B.62** and the maps in **Figure B.18** illustrate that the observed municipalities in Montgomery County correspond well to the municipalities with higher concentrations of PSP traffic stops.

The remainder of **Table B.62** indicates that a large volume of vehicles was observed in Montgomery County, ranging from 76.7 vehicles to 153.9 vehicles observed per hour. The amount of RADAR conducted in the county (36.4%) was lower than in the overall dataset (41.4%), due largely to inclement weather and very heavy traffic volume. Observations in those municipalities that were observed for less than 7.5 hours per day were cut short due to darkness or weather hazards.

Table B.63 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Montgomery County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Montgomery County were conducted on local, state, and interstate highways.

- Observed municipalities were in 35, 45, and 55 mph zones.
- A very high percentage of drivers were observed to be exceeding the speed limit in Montgomery County. In nine of the ten observed municipalities, at least half of the observed drivers were exceeding the speed limit by at least 5 miles per hour, and in seven of the ten over 50% of drivers were exceeding the speed limit by at least 10 miles per hour.
- The high percentage of speeders is consistent even in the more serious speeding categories. An average of 23% and 6% of all drivers were observed to be speeding by 15 and 20 mph, respectively.

Table B.63 Speeding Behavior by Municipality in Montgomery County* (n=2,847)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Whitemarsh Twp	Interstate	55	91.3	66.3	32.0	7.6
Whitemarsh Twp	Interstate	55	90.0	75.0	47.1	13.2
Upper Salford Twp	County/local	45	37.0	8.1	0.3	0.0
Worcester Twp	County/local	35	84.8	50.6	13.2	3.1
Upper Merion Twp	Interstate	55	95.1	70.6	40.5	11.0
Upper Merion Twp	Interstate	55	97.0	72.6	37.5	10.1
Limerick Twp	State Hwy	55	88.2	54.5	15.2	2.8
Lwr Providence Twp	State Hwy	55	80.8	48.2	18.4	1.8
Lwr Merion Twp	Interstate	55	95.7	81.4	51.6	22.9
Plymouth Twp	Interstate	55	72.6	26.7	3.3	0.0
County Average	-----------	--	81.1	52.3	23.2	6.3

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.64 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Montgomery County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- The observations conducted in Upper Merion and Lower Providence Twps, the municipalities with the largest non-Caucasian residential populations among those observed in Montgomery County, included somewhat smaller observed non-Caucasian driving populations.
- In contrast, the remainder of the municipalities, with smaller non-Caucasian residential populations, was observed to have larger non-Caucasian driving populations.
- A large percentage of non-Caucasian drivers was observed in Montgomery County, which is not surprising given the large non-Caucasian residential population in the county.
- The county's percent missing driver race (1.8%) is slightly lower than the percent missing in the overall observation data (2.6%).

Table B.64 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Montgomery County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Whitemarsh Twp	13,603	92.8	89.6	+3.2	2.1	4.2	-2.1	7.2	10.4	-3.2	1.9
Whitemarsh Twp	13,603	92.8	87.1	+5.7	2.1	6.2	-4.1	7.2	12.9	-5.7	4.7
Upper Salford Twp	2,300	97.0	96.5	+0.5	0.5	2.0	-1.5	3.0	3.5	-0.5	0.6
Worcester Twp	5,863	92.1	86.0	+6.1	2.3	6.2	-3.9	7.9	14.0	-6.1	0.6
Upper Merion Twp	22,370	84.6	89.5	-4.9	4.5	6.4	-1.9	15.4	10.5	+4.9	0.9
Upper Merion Twp	22,370	84.6	94.2	-9.6	4.5	3.9	+0.6	15.4	5.8	+9.6	0.0
Limerick Twp	10,198	94.8	91.3	+3.5	2.0	4.7	-4.7	5.2	8.7	+3.5	2.3
Lower Providence Twp	17,267	84.6	87.4	-2.8	8.4	5.7	+2.7	15.4	12.6	+2.8	1.3
Lower Merion Twp	48,340	89.5	85.2	+4.3	4.6	7.2	-2.6	10.5	14.8	-4.3	2.2
Plymouth Twp	13,181	89.1	88.2	+0.9	4.0	5.8	-1.8	10.9	11.8	-0.9	1.6
County Total/Avg	588,605	86.3	89.2	-2.9	7.1	5.3	+1.8	13.7	10.8	+2.9	1.8

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.65 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Montgomery County. The trends in this county are summarized below.

- Observation data from Montgomery County suggest no significant gender differences in observed speeding behavior.
- Age differences are statistically significant across all levels of speeding and the effect of age on speeding behavior is stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.1, 1.2, 1.7, 2.1 times more likely than drivers over 25 are to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are no statistically significant racial differences in observed speeding behavior in Montgomery County.

Table B.65 Speeding in Montgomery County by Driver Characteristics (n=2,847)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	817	0.9	79.4	50.6	21.8	6.3
Male	1,474		82.2	53.2	24.0	6.2
25 years old or under	335	0.9	88.7***	62.4***	36.7***	11.6***
Over 25 years old	2,486		80.1	50.8	21.2	5.5
Caucasian	2,523	1.5	80.7	51.8	22.8	6.0
Non-Caucasian	280		84.6	55.7	26.8	8.9

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Tioga County

Select Characteristics of Tioga County:

- Located in north central Pennsylvania, bordering New York
- Population = 41,373
- % Blacks = 0.8
- % Non-Caucasians = 2.2
- No interstate miles
- 1,936.3 total roadway miles
- Home to:
    - Mansfield University
- Jurisdiction of the Mansfield PSP station

Table B.66 lists the municipalities that were observed in Tioga County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the number of hours observed produces the information presented in the next column —average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Figure B.19 displays two maps of Tioga County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

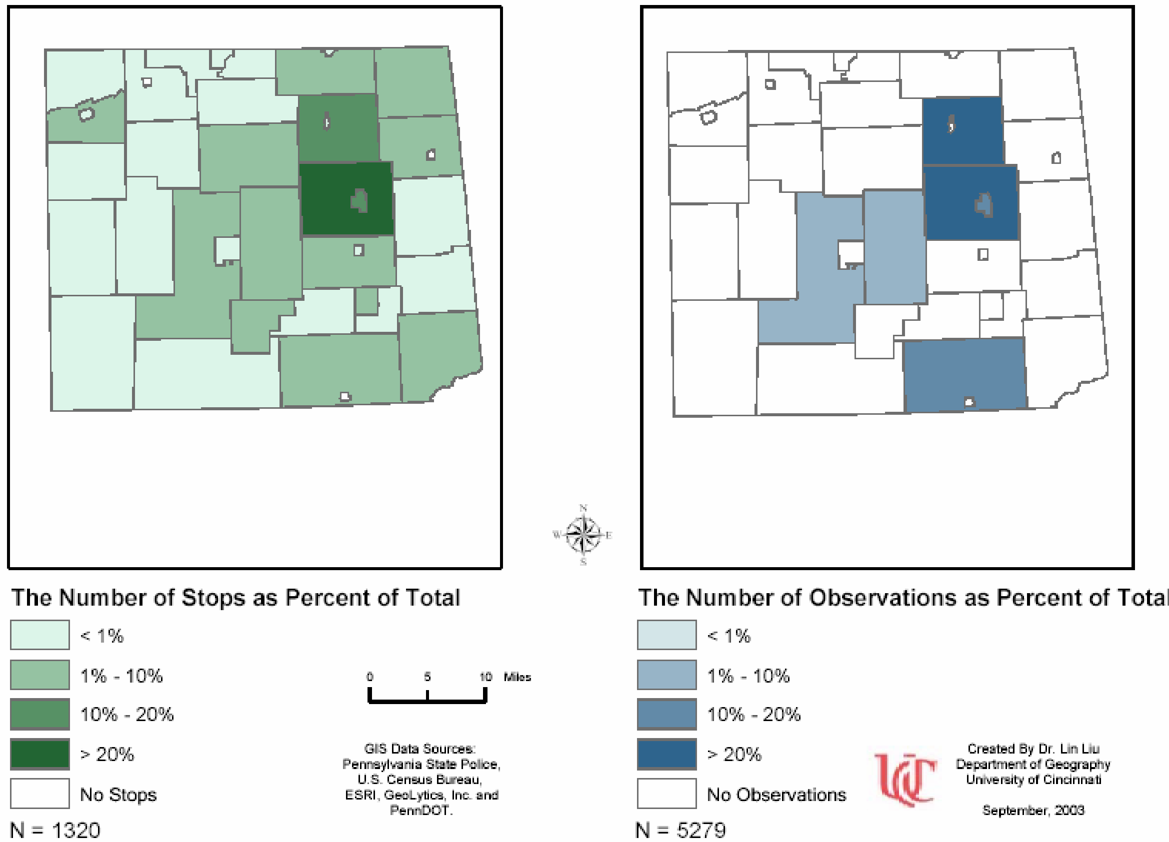
The first two columns of **Table B.66** and the maps in **Figure B.19** illustrate that the majority of PSP traffic stops in Tioga County are concentrated in three municipalities. These municipalities, as well as those with moderate percentages of PSP traffic stops, were the focus of observation sessions in Tioga County.

Table B.66 Observations in Tioga County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Liberty Twp	8.5	04/12/2002	770	7.0	110.0	46.4
Mansfield Brgh	17.7	04/13/2002	768	7.0	109.7	6.5
Delmar Twp	4.9	07/14/2002	382	7.5	50.9	49.2
Tioga Twp	18.7	07/15/2002	490	7.5	65.3	35.3
Richmond Twp	20.4	01/31/2003	699	7.5	93.2	0.0
Richmond Twp	20.4	02/01/2003	704	7.5	93.9	0.0
Tioga Twp	18.7	03/04/2003	291	7.0	41.6	100.0
Charleston Twp	6.7	03/05/2003	476	7.5	63.5	24.6
Richmond Twp	20.4	05/19/2003	324	6.5	49.9	42.0
Tioga Twp	18.7	05/20/2003	375	7.5	50.0	36.3
County Total/Avg	---	------------	5,279	72.5	72.8	27.4

* This column reflects the percent of PSP stops (n=1,320) in this county for each observed municipality.

Figure B.19. Tioga County, PA.
Traffic Stops and Observations by Municipality.



The remainder of **Table B.66** indicates that a moderate volume of vehicles was observed in Tioga County, ranging from 41.6 vehicles to 110.0 vehicles observed per hour. The amount of RADAR conducted in the county (27.4%) was considerably lower than in the overall dataset (41.4%), due to several partial or entire days when the weather prohibited observers from conducting RADAR.

Table B.67 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Tioga County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Tioga County were conducted only on state highways, as no interstate highways run through this county's borders.
- Observed locations included 45, 55, and 65 mph zones.
- As would be expected, the percentages of drivers that are observed to be speeding decreases dramatically as more serious levels of speeding are examined. The majority of drivers in the county, however, were not observed to be speeding even at the least serious level of speeding.

- The table shows that the 45 mph zone in Tioga Twp maintains the largest percentages of speeders through each speeding category.

Table B.67 Speeding Behavior by Municipality in Tioga County* (n=1,448)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Liberty Twp	State Hwy	65	32.2	7.0	1.4	0.3
Mansfield Brgh	State Hwy	55	30.0	8.0	0.0	0.0
Delmar Twp	State Hwy	55	18.1	4.8	1.6	0.0
Tioga Twp	State Hwy	55	50.9	16.2	4.0	0.6
Richmond Twp	State Hwy	55	--	--	--	--
Richmond Twp	State Hwy	45	--	--	--	--
Tioga Twp	State Hwy	45	94.5	53.3	14.4	3.1
Charleston Twp	State Hwy	55	6.8	1.7	0.9	0.0
Richmond Twp	State Hwy	55	23.5	4.4	1.5	0.7
Tioga Twp	State Hwy	55	65.4	30.1	11.8	2.2
County Average	-----------	--	45.3	18.6	5.2	1.0

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.68 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Tioga County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- The observations conducted in the Borough of Mansfield, the municipality with the largest non-Caucasian residential population among the observed municipalities in Tioga County, included a much smaller observed non-Caucasian driving population.
- In contrast, seven of the nine remaining municipalities with considerably smaller non-Caucasian residential populations were observed to have larger non-Caucasian driving populations.
- At the county level, however, the overall difference between the county's non-Caucasian residential and observed driving populations was very small (only 0.2 percentage points).
- The county's percent missing driver race (1.2%) is lower than the percent missing in the overall observation data (2.6%).

Table B.68 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Tioga County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Liberty Twp	698	99.6	97.1	+2.5	0.0	2.1	-2.1	0.4	2.9	-2.5	1.7
Mansfield Brgh	3,029	92.9	99.5	-6.6	4.1	0.4	+3.7	7.1	0.5	+6.6	0.4
Delmar Twp	2,251	98.9	100.0	-1.1	0.1	0.0	+0.1	1.1	0.0	+1.1	1.8
Tioga Twp	787	98.9	96.9	+2.0	0.0	1.0	-0.1	1.1	3.1	-2.0	1.8
Richmond Twp	1,926	97.5	97.1	+0.4	0.4	0.7	-0.3	2.5	2.9	-0.4	0.3
Richmond Twp	1,926	97.5	98.7	-1.2	0.4	0.4	0.0	2.5	1.3	+1.2	0.3
Tioga Twp	787	98.9	98.6	+0.3	0.0	1.4	-1.4	1.1	1.4	-0.3	0.3
Charleston Twp	2,551	98.4	98.3	+0.1	0.1	0.8	-0.7	1.7	1.7	0.0	0.2
Richmond Twp	1,926	97.5	95.9	+1.6	0.4	1.6	-1.2	2.5	4.1	-1.6	1.5
Tioga Twp	787	98.9	94.9	+4.0	0.0	1.4	-1.4	1.1	5.1	-4.0	5.1
County Total/Avg	32,849	98.0	97.8	+0.2	0.6	1.0	-0.4	2.0	2.2	-0.2	1.2

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.69 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Tioga County. The trends in this county are summarized below.

- Observation data from Tioga County suggest no significant gender differences in observed speeding behavior.
- Age differences are statistically significant across all three of the four levels of speeding, as drivers identified as 25 years or younger are about 1.2, 1.6, and 2.0 times more likely than drivers over 25 to exceed the speed limit by 5, 10, and 15 miles per hour, respectively.
- There are also significant racial differences in three of the four levels of observed speeding behavior in Tioga County. Non-Caucasians are 1.4, 3.1, and 7.0 times more likely than Caucasians are to exceed the speed limit at 5, 15, and 20 miles per hour, respectively.

Table B.69 Speeding in Tioga County by Driver Characteristics (n=1,448)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	464	1.2	43.3	20.5	4.7	1.3
Male	967		46.0	17.6	5.4	0.9
25 years old or under	115	1.2	54.8*	27.8**	9.6*	1.7
Over 25 years old	1,316		44.1	17.6	4.8	1.0
Caucasian	1,392	1.7	44.4*	18.0	5.0**	0.9**
Non-Caucasian	32		62.5	31.3	15.6	6.3

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Washington County

Select Characteristics of Washington County:

- Located in southwestern Pennsylvania, bordering Ohio
- Population = 202,897
- % Blacks = 3.7
- % Non-Caucasians = 5.0
- 64.5 interstate miles
- 2,823.5 total roadway miles
- Home to:
  - 2 colleges and universities
  - Post Gazette Pavilion and Star Lake Amphitheatre
- Jurisdiction of the Washington PSP station

Table B.70 lists the municipalities that were observed in Washington County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Figure B.19 displays two maps of Washington County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

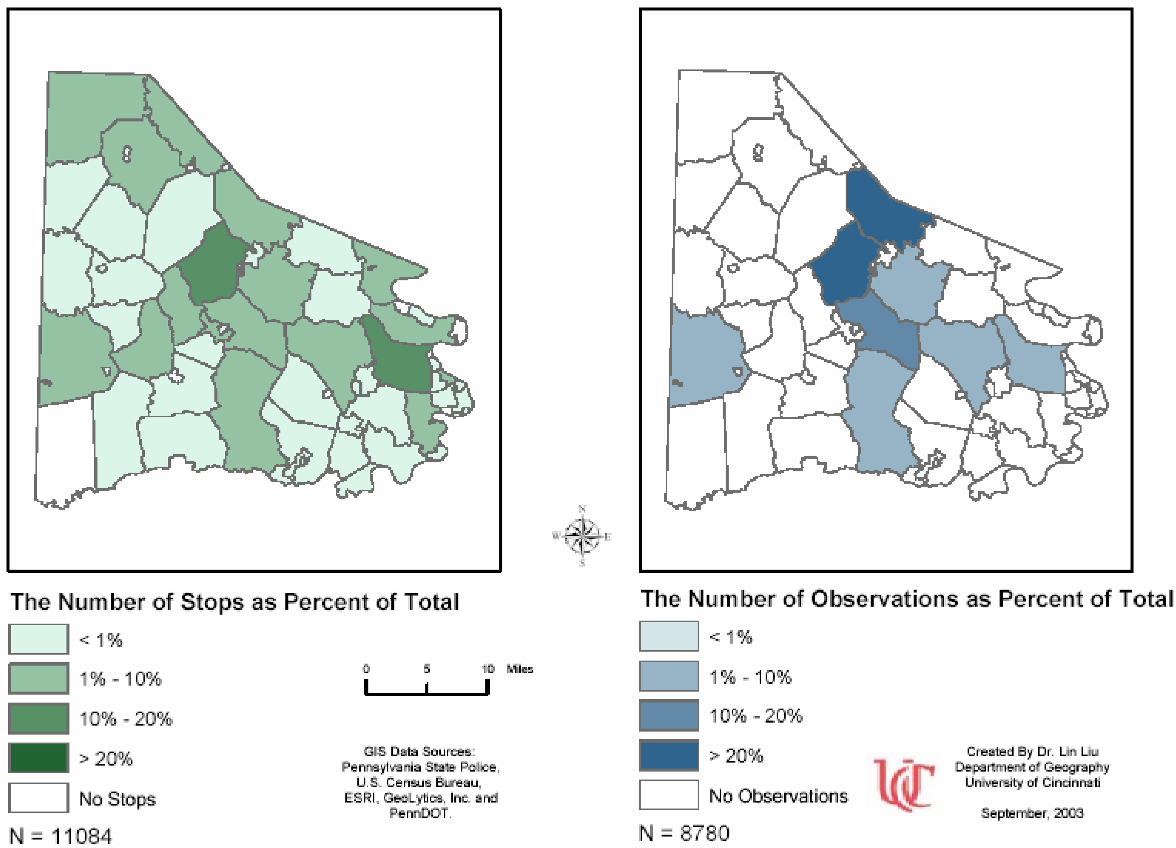
The first two columns of **Table B.70** and the maps in **Figure B.19** illustrate that the observed municipalities in Washington County match up well with the municipalities with higher concentrations of PSP traffic stops.

Table B.70 Observations in Washington County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Cecil Twp	7.4	06/02/2002	890	7.5	118.7	35.4
South Strabane Twp	6.8	06/03/2002	1,191	7.5	158.8	37.1
Chartiers Twp	16.1	08/21/2002	1,050	7.5	140.0	22.9
Somerset Twp	8.4	08/22/2002	870	7.5	116.0	36.8
Cecil Twp	7.4	01/31/2003	1,012	7.5	134.9	38.0
Donegal Twp	1.3	02/01/2003	796	6.5	122.5	0.0
Chartiers Twp	16.1	03/21/2003	865	7.5	115.3	26.8
North Strabane Twp	6.2	03/22/2003	848	7.5	113.1	49.8
Fallowfield Twp	10.9	05/04/2003	605	9.5	63.7	33.2
Amwell Twp	4.9	06/02/2003	653	7.5	87.1	44.1
County Total/Avg	---	------------	8,780	76.0	115.5	32.4

* This column reflects the percent of PSP stops (n=11,083) in this county for each observed municipality.

Figure B.20. Washington County, PA.
Traffic Stops and Observations by Municipality.



The remainder of **Table B.70** indicates that a relatively large volume of vehicles was observed in Washington County, ranging from 63.7 vehicles to 158.8 vehicles observed per hour. The amount of RADAR conducted in the county (32.4%) was much lower than in the overall dataset (41.4%), due to both inclement weather and very heavy traffic that limited observers' ability to conduct RADAR.

Table B.71 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Washington County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Washington County were conducted only on interstate highways.
- Observed municipalities were in 55 and 65 mph zones.
- In seven of the nine municipalities in which RADAR was conducted, over half of all observed drivers were exceeding the speed limit by at least 5 miles per hour. As would be expected, however, the percentages of drivers that were observed to be speeding decreased dramatically as more serious levels of speeding were examined.

Table B.71 Speeding Behavior by Municipality in Washington County* (n=2,845)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Cecil Twp	Interstate	55	53.7	18.7	6.3	2.2
South Strabane Twp	Interstate	55	51.4	17.0	3.8	0.2
Chartiers Twp	Interstate	55	72.5	31.7	13.8	2.9
Somerset Twp	Interstate	55	80.3	41.9	12.5	2.5
Cecil Twp	Interstate	55	68.6	30.9	10.6	1.3
Donegal Twp	Interstate	65	--	--	--	--
Chartiers Twp	Interstate	55	67.7	34.1	10.8	1.3
North Strabane Twp	Interstate	55	75.8	36.0	11.1	1.7
Fallowfield Twp	Interstate	55	38.8	13.9	3.5	0.5
Amwell Twp	Interstate	65	36.8	8.7	1.7	0.3
County Average	-----------	--	61.6	26.3	8.3	1.4

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.72 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Washington County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- The observations conducted in Chartiers Twp, the municipality with the comparatively largest non-Caucasian residential population among the observed municipalities in Washington County, included slightly smaller observed non-Caucasian driving populations.
- In contrast, the municipalities with smaller non-Caucasian residential populations were observed to have larger non-Caucasian driving population, by as little as 1.2 and as much as 9.0 percentage points.
- In the county overall, a slightly larger percentage of non-Caucasian drivers was observed than would be expected based on the racial group's representation in the driving-age population.
- The county's percent missing driver race (5.4%) is considerably higher than the percent missing in the overall observation data (2.6%).

Table B.72 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Washington County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Cecil Twp	7,741	97.4	88.4	+9.0	1.5	7.1	-5.6	0.4	0.7	-0.3	2.6
South Strabane Twp	6,581	97.3	92.4	+4.9	1.6	4.7	-3.1	0.3	0.6	-0.3	2.7
Chartiers Twp	5,854	95.4	97.1	-1.7	3.5	1.5	+2.0	0.3	0.3	0.0	4.6
Somerset Twp	2,203	98.9	93.6	+5.3	0.2	2.6	-2.4	0.4	0.6	-0.2	1.1
Cecil Twp	7,741	97.4	95.0	+2.4	1.5	3.4	-1.9	0.4	0.4	0.0	2.6
Donegal Twp	1,916	99.3	94.4	+4.9	0.1	3.9	-3.8	0.1	0.4	-0.3	0.7
Chartiers Twp	5,854	95.4	96.2	-0.8	3.5	2.9	+0.6	0.3	0.3	0.0	4.6
North Strabane Twp	8,057	96.5	93.4	+3.1	2.0	3.6	-1.6	0.5	0.0	+0.5	3.5
Fallowfield Twp	3,762	97.4	94.4	+3.0	1.5	3.1	-1.6	0.6	0.7	-0.1	2.6
Amwell Twp	3,130	98.6	97.4	+1.2	0.6	1.8	-1.2	0.2	0.0	+0.2	1.4
County Total/Avg	163,294	95.6	94.1	+1.5	3.0	3.5	-0.5	0.5	0.4	+0.1	4.5

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.73 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Washington County. The trends in this county are summarized below.

- Observation data from Washington County suggest no significant gender differences in observed speeding behavior.
- Age differences are statistically significant across all levels of speeding, and the effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.1, 1.5, 2.1, and 5.2 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There are also significant racial differences in observed speeding behavior in Washington County at the three higher levels of speeding. Specifically, non-Caucasians are 1.5, 1.8, and 2.5 times more likely than Caucasians to exceed the speed limit by 10, 15, and 20 miles per hour, respectively.

Table B.73 Speeding in Washington County by Driver Characteristics (n=2,845)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	845	3.0	61.5	27.3	8.9	1.8
Male	1,914		61.3	25.9	8.0	1.3
25 years old or under	276	2.9	67.4*	37.3***	15.2***	4.7***
Over 25 years old	2,488		60.6	24.9	7.4	0.9
Caucasian	2,518	6.1	60.4	25.3**	7.8**	1.3*
Non-Caucasian	155		67.7	36.8	14.2	3.2

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Westmoreland County

Select Characteristics of Westmoreland County:

- Located in southwestern Pennsylvania
- Population = 369,993
- % Blacks = 2.3
- % Non-Caucasians = 3.4
- 57.7 interstate miles
- 3,627.5 total roadway miles (4th roadway mileage in PA)
- Home to:
    - 4 colleges and universities
    - Idlewild Amusement Park
    - Seven Springs Mountain Resort
    - State Correctional Institution at Greensburg

- Jurisdiction of the Greensburg, Kiski Valley, Belle Vernon, and New Stanton PSP stations

Table B.74 lists the municipalities that were observed in Westmoreland County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

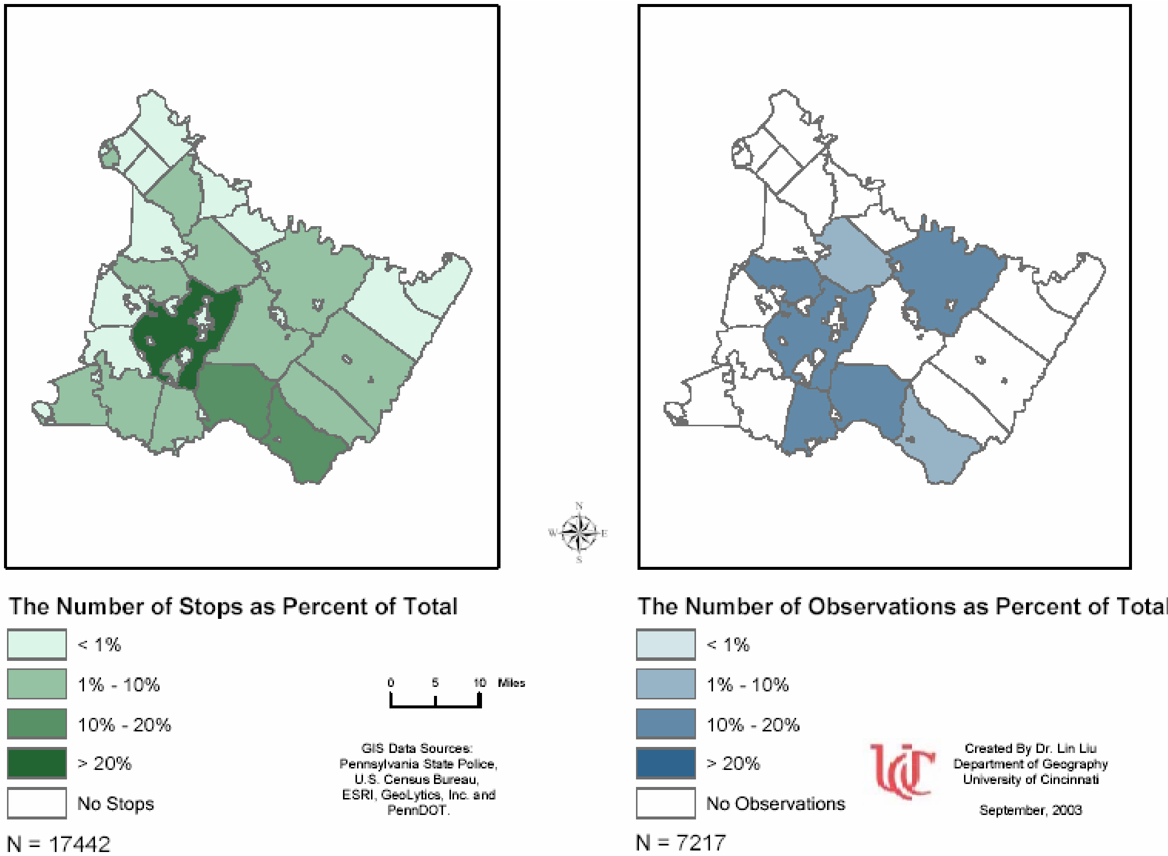
Figure B.21 displays two maps of Westmoreland County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table B.74 Observations in Westmoreland County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Derry Twp	4.4	04/12/2002	499	7.0	71.3	38.7
Salem Twp	4.9	04/13/2002	458	5.0	91.6	0.0
Penn Twp	7.1	06/26/2002	1,295	7.5	172.7	42.8
Hempfield Twp	22.3	06/27/2002	796	6.5	122.5	32.8
Derry Twp	4.4	09/22/2002	757	7.5	100.9	35.1
East Huntingdon Twp	1.6	09/23/2002	871	7.5	116.1	43.3
Mount Pleasant Twp	13.9	04/13/2003	903	7.5	120.4	53.7
Donegal Twp	15.7	04/14/2003	578	7.5	77.1	35.5
Mount Pleasant Twp	13.9	05/14/2003	513	7.5	68.4	43.5
Hempfield Twp	22.3	05/15/2003	617	7.5	82.3	43.9
County Total/Avg	---	------------	7,217	71.0	101.7	38.9

* This column reflects the percent of PSP stops (n=17,440) in this county for each observed municipality.

Figure B.21. Westmoreland County, PA.
Traffic Stops and Observations by Municipality.



The first two columns of **Table B.74** and the maps in **Figure B.21** illustrate that the observed municipalities in Westmoreland County reasonably mirror the municipalities with higher concentrations of PSP traffic stops.

The remainder of **Table B.74** indicates that a rather variable volume of vehicles was observed in Westmoreland County, ranging from 68.4 vehicles to 172.7 vehicles observed per hour. The amount of RADAR conducted in the county (38.9%) was lower than in the overall dataset (41.4%), mainly due to inclement weather that prohibited observers from conducting RADAR for an entire day.

Table B.75 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Westmoreland County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in Westmoreland County were conducted on state and interstate highways.
- Observed speed limits included 35, 45, 50, 55, and 65 mph zones.

- Municipalities with 65 mph speed limit have considerably smaller percentages of speeders than lower speed limits, even at the least severe level of speeding (> 5 mph over the limit).
- The table shows that the 45 mph zones in Mount Pleasant and Derry Twps and 50 mph zone in Marshall Twp maintain the largest percentages of speeders through each speeding category.

Table B.75 Speeding Behavior by Municipality in Westmoreland County* (n=2,805)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Derry Twp	State Hwy	50	71.0	35.2	10.9	2.6
Salem Twp	State Hwy	55	--	--	--	--
Penn Twp	Interstate	65	20.2	3.4	0.8	0.0
Hempfield Twp	Interstate	65	8.0	1.1	0.8	0.4
Derry Twp	State Hwy	45	78.6	43.2	19.2	6.0
E. Huntingdon Twp	State Hwy	55	52.3	18.8	5.3	1.6
Mt. Pleasant Twp	State Hwy	50	22.7	7.2	2.3	0.6
Donegal Twp	State Hwy	35	77.1	50.7	22.0	7.3
Mt. Pleasant Twp	State Hwy	45	90.6	61.4	31.4	11.7
Hempfield Twp	State Hwy	45	74.9	39.1	12.9	4.4
County Average	-----------	--	47.9	23.4	9.2	3.0

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.76 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and Westmoreland County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- All observed municipalities in Westmoreland County had very high percentages of Caucasians in the residential populations.
- In eight of the ten observed municipalities, larger non-Caucasian populations were observed than are represented in the residential populations. The same pattern is evident in the county overall.
- The greatest difference between residential and observed non-Caucasian driving populations was in Penn Twp (9.6 percentage points).
- The county's percent missing driver race (6.2%) is much higher than percent missing in overall observation data (2.6%).

Table B.76 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Westmoreland Cnty.

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Derry Twp	11,885	98.0	94.8	+3.2	1.2	3.0	-1.8	0.4	0.4	0.0	2.0
Salem Twp	5,579	98.0	96.5	+1.5	1.3	2.9	-1.6	0.2	0.0	+0.2	2.0
Penn Twp	14,883	98.6	89.0	+9.6	0.3	5.3	-5.0	0.4	0.5	-0.1	1.4
Hempfield Twp	33,509	97.4	94.4	+3.0	1.2	2.0	-0.8	0.3	0.1	+0.2	2.6
Derry Twp	11,885	98.0	96.6	+1.4	1.2	1.6	-0.4	0.4	0.1	+0.3	2.0
East Huntingdon Twp	6,237	98.8	97.6	+1.2	0.4	1.5	-1.1	0.2	0.0	+0.2	1.2
Mount Pleasant Twp	9,042	99.1	94.0	+5.1	0.2	1.3	-1.1	0.3	0.2	+0.1	0.9
Donegal Twp	1,948	99.0	97.2	+1.8	0.1	0.7	-0.6	0.6	0.2	+0.4	1.0
Mount Pleasant Twp	9,042	99.1	99.6	-0.5	0.2	0.4	-0.2	0.3	0.0	+0.3	0.9
Hempfield Twp	33,509	97.4	97.6	-0.2	1.2	1.8	-0.6	0.3	0.0	+0.3	2.6
County Total/Avg	298,521	96.8	95.2	+1.6	1.8	2.2	-0.4	0.4	0.2	+0.2	3.2

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.77 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Westmoreland County. The trends in this county are summarized below.

- Observation data from Westmoreland County suggest only slight gender differences in observed speeding behavior, as women are 1.1 times more likely to exceed the speed limit by 5 or more miles per hour than men.
- Age differences are strong and statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.3, 1.5, 2.1, and 2.8 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- There is only a small statistically significant difference in observed speeding behavior by race in Westmoreland County, although it is in the opposite direction of most of the observed racial differences. Caucasians are 1.3 times more likely to exceed the speed limit by at least 5 miles per hour than non-Caucasians are.

Table B.77 Speeding in Westmoreland County by Driver Characteristics (n=2,805)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	934	2.2	51.7**	24.9	9.0	3.2
Male	1,810		45.7	22.5	9.3	2.8
25 years old or under	274	2.1	60.6***	33.9***	17.2***	6.9***
Over 25 years old	2,471		46.1	22.0	8.3	2.5
Caucasian	2,461	7.8	48.8**	23.8	9.2	2.8
Non-Caucasian	134		36.6	19.4	6.7	3.0

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

York County

Select Characteristics of York County:

- Located in southeast Pennsylvania, bordering Maryland
- Population = 381,751
- % Blacks = 4.2
- % Non-Caucasians = 9.4
- 46.3 interstate miles
- 3,675.9 total roadway miles (3rd highest roadway mileage in PA)
- Home to:
    - 2 colleges and universities
- Jurisdiction of the York PSP station

Table B.78 lists the municipalities that were observed in York County, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Figure B.22 displays two maps of York County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

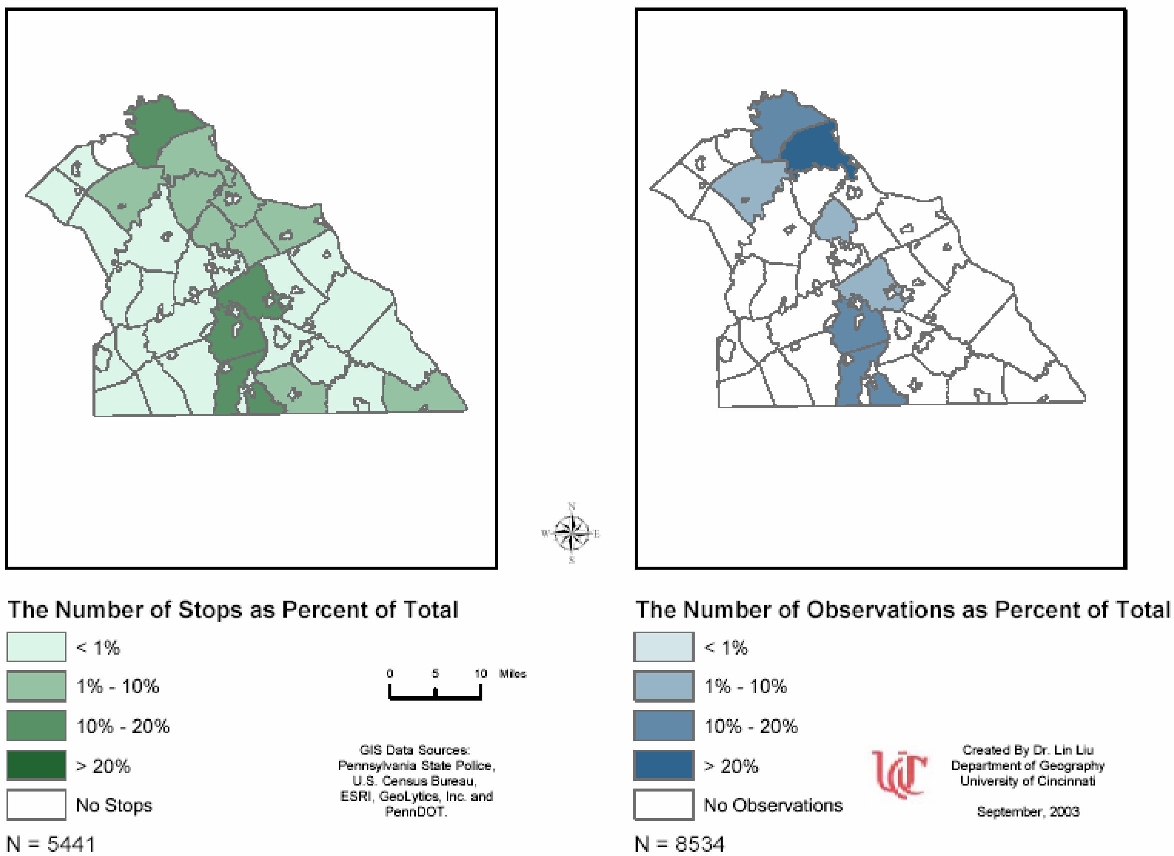
The first two columns of **Table B.78** and the maps in **Figure B.22** illustrate that the observed municipalities in York County correspond well to the municipalities with higher concentrations of PSP traffic stops.

Table B.78 Observations in York County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Newberry Twp	8.0	03/24/2002	993	7.5	132.4	38.1
Springfield Twp	14.5	03/25/2002	1,093	7.5	145.7	35.4
Shrewsbury Twp	10.1	06/06/2002	710	7.0	101.4	46.5
Warrington Twp	1.7	06/07/2002	535	8.5	62.9	43.9
Fairview Twp	15.8	10/25/2002	782	7.0	111.7	11.8
Manchester Brgh	4.7	10/26/2002	756	7.5	100.8	64.8
Shrewsbury Twp	10.1	03/02/2003	900	7.0	128.6	53.2
Newberry Twp	8.0	03/03/2003	1,260	8.0	157.5	48.6
Fairview Twp	15.8	04/13/2003	757	7.5	100.9	43.5
York Twp	11.8	04/14/2003	649	7.5	86.5	41.9
County Total/Avg	---	------------	8,435	75.0	112.5	42.8

* This column reflects the percent of PSP stops (n=5,441) in this county for each observed municipality.

Figure B.22. York County, PA.
Traffic Stops and Observations by Municipality.



The remainder of **Table B.78** indicates that a generally large volume of vehicles was observed in York County, ranging from 62.9 vehicles to 157.5 vehicles observed per hour. The amount of RADAR conducted in the county (42.8%) was very similar to the percentage in the overall dataset (41.4%). Fortunately, there were no weather limitations in York County that prohibited observers from conducting RADAR.

Table B.79 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in York County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations in York County were conducted on state and interstate highways.
- Municipalities with 65 mph speed limits tend to have smaller percentages of speeders than the 55 mph speed limits, though there are a few exceptions (e.g., York Twp).
- In the county overall, less than half of the drivers were observed to be speeding, even at the least severe level of speeding.
- The table shows that the 55 mph zones in Springfield and Fairview Twps maintain the largest percentages of speeders through each speeding category.

Table B.79 Speeding Behavior by Municipality in York County* (n=3,652)

Municipality Name	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Newberry Twp	Interstate	65	35.4	8.7	2.4	0.5
Springfield Twp	Interstate	55	85.0	47.5	17.8	6.5
Shrewsbury Twp	Interstate	65	38.8	15.5	3.0	1.5
Warrington Twp	State Hwy	55	36.6	14.0	5.1	3.0
Fairview Twp	Interstate	55	75.0	43.5	17.4	6.5
Manchester Twp	Interstate	65	17.8	3.7	1.0	0.2
Shrewsbury Twp	Interstate	65	46.6	11.3	2.3	0.2
Newberry Twp	Interstate	55	43.0	14.1	2.6	0.3
Fairview Twp	Interstate	55	90.0	61.4	33.1	7.0
York Twp	Interstate	65	50.0	16.5	5.9	2.2
County Average	-----------	--	48.5	20.6	7.5	2.1

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.80 is a comparison of residential and observed populations of racial groups in each of the observed municipalities and York County as a whole. The total driving-age municipality (or county) population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- Although all of the observed municipalities, and York County overall, have Caucasian residential populations 93 percent or larger, observations in 6 municipalities included less than 90 percent Caucasian drivers.
- Furthermore, all observed municipalities had larger non-Caucasian driving populations than their residential populations would have suggested.
- The largest differences were during the first observations in Newberry and Springfield Twps (10.2 and 11.3 percentage points, respectively).
- The county’s percent missing driver race (1.8%) is slightly lower than the percent missing in the overall observation data (2.6%).

Table B.80 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in York County

Municipality Observed	Driving-Age Population	% CAUCASIAN			% BLACK			% NON-CAUCASIAN*			% MISSING
		Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Newberry Twp	10,860	97.0	86.8	+10.2	0.7	8.1	-7.4	3.0	13.2	-10.2	0.2
Springfield Twp	3,060	98.8	87.3	+11.5	0.3	6.3	-6.0	1.2	12.5	-11.3	0.2
Shrewsbury Twp	4,665	98.4	91.0	+7.4	0.2	4.5	-4.3	1.6	7.9	-6.3	1.1
Warrington Twp	3,516	98.0	97.6	+0.4	0.1	0.7	-0.6	2.0	2.2	-0.2	0.2
Fairview Twp	11,254	96.5	88.2	+8.3	0.7	4.1	-3.4	3.5	11.1	-7.6	0.6
Manchester Twp	9,854	94.6	89.2	+5.4	1.9	6.3	-4.4	5.4	10.3	-4.9	0.5
Shrewsbury Twp	4,665	98.4	83.7	+14.7	0.2	5.0	-4.8	1.6	9.0	-7.4	7.3
Newberry Twp	10,860	97.0	89.6	+7.4	0.7	3.6	-2.9	3.0	7.8	-4.8	2.6
Fairview Twp	11,254	96.5	92.5	+4.0	0.7	4.0	-3.3	3.5	4.9	-1.4	2.6
York Twp	19,161	95.7	92.4	+3.3	1.4	4.8	-3.4	4.3	6.0	-1.7	1.5
County Total/Avg	298,227	93.0	89.2	+3.8	3.2	4.9	-1.7	7.0	9.0	-2.0	1.8

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.81 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in York County. The trends in this county are summarized below.

- Observation data from York County suggest no significant gender differences in observed speeding behavior.
- Age differences are statistically significant across all levels of speeding.
- The effects of age on speeding behavior are stronger at more serious degrees of speeding. Drivers identified as 25 years or younger are about 1.3, 1.8, 2.7, and 3.6 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- Small racial differences in observed speeding behavior are evident at three of the four levels of speeding. In York County, non-Caucasians are 1.2, 1.5, and 1.6 times more likely to exceed the speed limit by 5, 10, and 15 miles per hour, respectively.

Table B.81 Speeding in York County by Driver Characteristics (n=3,652)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	1,181	1.0	49.9	21.0	6.9	1.7
Male	2,435		47.5	20.2	7.7	2.3
25 years old or under	466	1.4	60.7***	33.5***	16.5***	5.8***
Over 25 years old	3,134		46.5	18.7	6.1	1.6
Caucasian		3,269	2.1	47.4***	19.6***	7.0**
	2.0					
Non-Caucasian	308		57.1	28.6	11.4	3.6

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Additional Observed Counties

Additional counties were selected for observation (conducted in June 2003) after the 9-month report suggested that these counties had inappropriately high disproportionality indices (based on residential Census data comparisons). Specifically, we have identified counties with Black, Hispanic, and non-Caucasian disproportionality indices greater than 5.0 for further consideration and additional roadway observations. The selected counties include: Bedford, Clarion, Clinton, Fulton, Jefferson, Montour, and Susquehanna. Columbia and Juniata counties also had population-based disproportionality indices above 5.0 for all three racial groups, but were already included in the original sample of observed counties. As noted in the methodology section earlier, the municipalities selected for observation within these counties were based on their high percentages of PSP stops and stops of minorities in particular. It is important to note that additional observations were only conducted for two 8-hour days. Therefore, these counties have smaller numbers of cases than the original sample of 20 counties.

Table B.82 lists the municipalities that were observed in the seven additional counties, as well as each municipality's percent of PSP stops in that county. The third column of the table notes the dates of each of the county's observation sessions. The next two columns document the total number of vehicles and hours observed during each day of observation. Dividing the total number of vehicles by the total number of hours observed produces the information presented in the next column—average number of vehicles observed per hour. The final column indicates the percentage of the total number of vehicles for which speeding behavior was measured with RADAR.

Table B.82 Observations in Additional Counties

County Observed	Municipality Observed	% of PSP Stops*	Date	# Vehicles Observed	# Hours Observed	Avg # vehicles/hour	% RADAR
Susquehanna	New Milford Twp	33.0	6/08/2003	648	8.0	81.0	47.1
Susquehanna	Lenox Twp	23.9	6/09/2003	689	8.0	86.1	43.8
Montour	Liberty Twp	45.0	6/22/2003	752	8.0	94.0	45.3
Montour	Valley Twp	36.4	6/23/2003	829	8.0	103.6	47.8
Clarion	Clarion Twp	33.7	6/19/2003	996	8.0	124.5	38.4
Clarion	Clarion Twp	33.7	6/20/2003	1,228	8.0	153.5	47.5
Jefferson	Washington Twp	46.2	6/22/2003	1,126	8.0	140.8	52.6
Jefferson	Washington Twp	46.2	6/23/2003	1,325	8.0	165.6	41.4
Clinton	Lamar Twp	72.4	6/24/2003	1,264	8.0	158.0	41.1
Clinton	Lamar Twp	72.4	6/25/2003	1,149	8.0	143.6	45.3
Fulton	Brush Creek Twp	28.2	6/27/2003	1,256	8.0	157.0	51.6
Fulton	Wells Twp	40.9	6/28/2003	1,340	8.0	167.5	50.4
Bedford	East Providence Twp	39.8	6/29/2003	1,579	8.0	197.4	45.1
Bedford	East Providence Twp	39.8	6/30/2003	1,293	8.0	161.6	48.5

* This column reflects the percent of each county's PSP stops that occurred in the observed municipality.

Table B.82 shows that in all of the observed municipalities in these additional counties, at least 20 percent of the county's stops occurred in those municipalities. This reflects the selection criteria (outlined above) for these extra observation sessions. The Table Blso indicates that large volumes of vehicles were observed in each of these municipalities, ranging from 81.0 vehicles to 197.4 vehicles observed per hour. The amount of RADAR conducted in these municipalities was slightly higher than in the overall dataset (41.4%), with the exception of two days. Fortunately, these observation sessions were not marked by prolonged weather limitations that prohibited observers from conducting RADAR.

Table B.83 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in each of the additionally observed counties. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were exceeding the posted speed limit by 5 mile per hour increments. The table illustrates specific municipality-level variation and the major trends can be summarized as follows:

- Observations were conducted only on interstate highways (e.g., I-81, I-80, and I-76).
- Larger percentages of speeders were observed in 55 mph speed limits compared to 65 mph.

- As would be expected, the percentages of drivers that are observed to be speeding decreases dramatically as more serious levels of speeding are examined, though the percentages vary by municipality.
- The table shows that the 55 mph zones in Brush Creek and East Providence Twps maintain the largest percentages of speeders through each speeding category.

Table B.83 Speeding Behavior by Municipality in Additional Counties*

County Observed	Municipality Observed	Road Type	Speed Limit	% Speeding >5 mph over	% Speeding >10 mph over	% Speeding >15 mph over	% Speeding >20 mph over
Susquehanna	New Milford Twp	Interstate	65	39.5	9.2	2.0	0.3
Susquehanna	Lenox Twp	Interstate	65	50.3	11.3	2.6	0.7
Montour	Liberty Twp	Interstate	65	51.0	15.0	4.1	0.6
Montour	Valley Twp	Interstate	65	52.5	11.4	1.5	0.3
Clarion	Clarion Twp	Interstate	65	52.9	18.8	3.7	0.8
Clarion	Clarion Twp	Interstate	65	57.8	21.4	5.3	1.9
Jefferson	Washington Twp	Interstate	65	53.4	15.5	3.7	1.0
Jefferson	Washington Twp	Interstate	65	44.3	13.5	3.1	0.5
Clinton	Lamar Twp	Interstate	65	57.1	24.4	9.8	1.7
Clinton	Lamar Twp	Interstate	65	37.6	10.0	2.1	0.2
Fulton	Brush Creek Twp	Interstate	55	90.9	67.6	39.4	19.9
Fulton	Wells Twp	Interstate	65	28.0	6.8	1.9	0.0
Bedford	East Providence Twp	Interstate	55	83.7	55.5	27.8	10.3
Bedford	East Providence Twp	Interstate	55	82.0	53.6	27.9	10.5

*These percentages are the percent that were speeding among only the cases with valid RADAR data.

Table B.84 is a comparison of residential and observed populations of racial groups in each of the observed municipalities. The total driving-age municipality population is provided for reference in the first column to the right of the listed municipalities. The next three columns under % Caucasian indicate the % of Caucasians in the residential driving-age population and the observed driving population, and then the difference between those two measures. The next two sets of columns do the same for Blacks and non-Caucasians. The final column shows the percent of observation data in the municipality for which observers were unable to capture driver race information. The major points in this table include:

- All seven counties that were targeted for additional observation had very small non-Caucasian residential populations, which are reflected in the small % non-Caucasian residential population at the municipality level (0.9 to 2.5).
- The % difference column for non-Caucasians illustrates that the racial makeup of residential and observed driving populations in these municipalities is considerably different—ranging from a change of 5.4 percentage points in Valley Twp (Montour County) to 17.1 percentage points in Wells Twp (Fulton County).
- The percent of data missing driver race varies widely by municipality from 1.9% in East Providence Twp (Bedford County) to 11.9% in Washington Twp (Jefferson County). Only five of the 14 observation sessions had percentages of missing race data that were smaller than the overall percent missing (2.6%) in the observation data.

Table B.84 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics for Additional Counties

County Observed	Municipality Observed	Munic. Driv-- Age Pop.	% CAUCASIAN Pop.	% CAUCASIAN Obs.	% CAUCASIAN % Diff	% BLACK Pop.	% BLACK Obs.	% BLACK % Diff	% NON-CAUCASIAN Pop.	% NON-CAUCASIAN Obs.	% NON-CAUCASIAN % Diff	% MISSING Obs. Only
Susquehanna	New Milford Twp	1,420	98.0	85.8	+12.2	0.2	5.1	-4.9	2.0	11.2	-9.2	2.9
Susquehanna	Lenox Twp	1,419	98.9	85.1	+13.8	0.2	2.6	-2.4	1.1	10.9	-9.8	4.1
Montour	Liberty Twp	1,150	99.1	89.0	+10.1	0.1	4.3	-4.2	0.9	8.9	-8.0	2.1
Montour	Valley Twp	1,632	98.4	90.6	+7.8	0.2	3.9	-3.7	1.6	7.0	-5.4	2.4
Clarion	Clarion Twp	2,635	97.5	85.1	+12.4	1.4	4.6	-3.2	2.5	9.9	-7.4	4.9
Clarion	Clarion Twp	2,635	97.5	81.3	+16.2	1.4	5.5	-4.1	2.5	13.0	-10.5	5.7
Jefferson	Washington Twp	1,571	98.7	76.2	+22.5	0.4	6.0	-5.6	1.3	11.9	-10.6	11.9
Jefferson	Washington Twp	1,571	98.7	88.8	+9.9	0.4	3.7	-3.3	1.3	9.1	-7.8	2.0
Clinton	Lamar Twp	1,942	99.0	82.9	+16.1	0.2	5.4	-5.2	1.0	13.0	-12.0	4.1
Clinton	Lamar Twp	1,942	99.0	78.7	+20.3	0.2	7.7	-7.5	1.0	16.5	-15.5	4.8
Fulton	Brush Creek Twp	568	97.9	78.3	+19.6	0.0	10.7	-10.7	2.1	18.6	-16.5	3.0
Fulton	Wells Twp	409	99.0	79.3	+19.7	0.0	10.2	-10.2	1.0	18.1	-17.1	2.6
Bedford	East Providence Twp	1,458	98.5	82.1	+16.4	0.1	8.7	-8.6	1.5	16.0	-14.5	1.9
Bedford	East Providence Twp	1,458	98.5	80.0	+18.5	0.1	11.4	-11.3	1.5	18.1	-16.6	1.9

* The non-Caucasian racial category includes Blacks, any Hispanics, Asians/Pacific Islanders, Native Americans, Middle Eastern, and those of mixed races.
NOTE: The % difference is a racial group's percentage in the driving-age population minus the racial group's percentage in the observed driving population.

Table B.85 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Bedford County. The trends in this county are summarized below.

- Observation data from Bedford County suggest no significant gender differences in observed speeding behavior.
- Age differences are statistically significant across three of the four levels of speeding. The effects of age on speeding behavior are stronger at more serious degrees of speeding in Bedford County. Drivers identified as 25 years or younger are about 1.3, 1.7, and 2.5 times more likely than drivers over 25 are to exceed the speed limit by 10, 15, and 20 miles per hour, respectively.
- Race differences are statistically significant across all levels of speeding.
- The effects of race on speeding behavior are stronger at more serious degrees of speeding in Bedford County. Drivers identified as non-Caucasian are about 1.1, 1.5, 1.8,and 2.3 times more likely than Caucasian drivers to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table B.85 Speeding in Bedford County by Driver Characteristics

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	417	1.2	83.5	54.2	26.6	9.6
Male	906		82.5	54.4	28.3	10.5
25 years old or under	1,100	1.6	84.9	65.1***	42.7***	20.6***
Over 25 years old	218		82.3	52.1	24.8	8.1
Caucasian	1,115	1.6	81.3***	50.8***	24.8***	8.5***
Non-Caucasian	203		90.6	73.4	44.3	19.2

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Table B.86 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Clarion County. The trends in this county are fairly similar to other counties and are summarized below.

- Observation data from Clarion County suggest only significant gender differences in observed speeding behavior at the most serious level of speeding. Men are approximately 20 times more likely to speed 20 mph over the limit than women are.
- Age differences are strong and statistically significant across three of the four levels of speeding. The effects of age on speeding behavior are stronger at more serious degrees of speeding in Clarion County. Drivers identified as 25 years or younger are about 2.0, 2.3, and 4.2 times more likely than drivers over 25 are to exceed the speed limit by 10, 15, and 20 miles per hour, respectively.
- Race differences are statistically significant across three out of four levels of speeding.
- Drivers identified as non-Caucasian in Clarion County are about 1.3, 2.0, and 2.5 times more likely than Caucasian drivers are to exceed the speed limit by 5, 10, and 15 miles per hour, respectively.

Table B.86 Speeding in Clarion County by Driver Characteristics

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	295	3.5	57.3	20.3	3.1	0.0*
Male	636		53.9	19.7	5.2	2.0
25 years old or under	108	3.5	61.1	36.1***	9.3*	4.6**
Over 25 years old	823		54.4	17.9	4.0	1.1
Caucasian	791	5.5	53.2**	17.7***	3.9**	1.3
Non-Caucasian	121		66.9	34.7	9.9	3.3

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Table B.87 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Clinton County. The trends in this county are summarized below.

- Observation data from Clinton County suggest no significant gender differences in observed speeding behavior.
- Age differences are strong and statistically significant across three of the four levels of speeding in Clinton County. Drivers identified as 25 years or younger are about 1.4, 2.1, and 2.6 times more likely than drivers over 25 are to exceed the speed limit by 5, 10, and 15 miles per hour, respectively.
- Race differences are statistically significant across three out of four levels of speeding.
- Drivers identified as non-Caucasian in Clinton County are about 1.3, 2.0, and 2.2 times more likely than Caucasian drivers are to exceed the speed limit by 5, 10, and 15 miles per hour, respectively.

Table B.87 Speeding in Clinton County by Driver Characteristics

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	323	3.6	44.9	16.7	5.3	1.2
Male	681		48.6	17.5	6.0	0.9
25 years old or under	128	4.7	61.7***	32.0***	12.5***	2.3
Over 25 years old	864		45.4	15.2	4.9	0.8
Caucasian	806	6.2	44.8***	14.8***	4.7**	0.9
Non-Caucasian	171		60.2	29.2	10.5	1.8

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Table B.88 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Fulton County. The trends in this county are summarized below.

- Observation data from Fulton County suggest no significant gender differences in observed speeding behavior.
- Age differences are statistically significant across all four levels of speeding. The effects of age on speeding behavior are stronger at more serious degrees of speeding in Fulton County. Drivers identified as 25 years or younger are about 1.3, 1.6, 1.9, and 2.1 times more likely than drivers over 25 to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.
- Race differences are statistically significant across all levels of speeding.
- The effects of race on speeding behavior are also stronger at more serious degrees of speeding in Fulton County. Drivers identified as non-Caucasian are about 1.2, 1.5, 1.7,and 2.1 times more likely than Caucasian drivers to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table B.88 Speeding in Fulton County by Driver Characteristics

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	361	1.5	60.9	38.0	17.5	9.7
Male	943		57.9	35.8	21.3	9.8
25 years old or under	200	1.9	70.5***	52.0***	33.0***	17.5***
Over 25 years old	1,099		56.4	33.5	17.8	8.3
Caucasian	1,086	2.4	56.6***	33.7***	18.2***	8.3***
Non-Caucasian	206		68.9	50.0	30.6	17.5

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Table B.89 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Jefferson County. The trends in this county are summarized below.

- Observation data from Jefferson County suggest no significant gender differences in observed speeding behavior.
- Age differences are strong and statistically significant across three of the four levels of speeding.
- Drivers identified as 25 years or younger in Jefferson County are about 1.3, 1.8, and 2.2 times more likely than drivers over 25 to exceed the speed limit by 5, 10, and 15 miles per hour, respectively.
- Race differences are strong and statistically significant across all levels of speeding.
- The effects of race on speeding behavior are stronger at more serious degrees of speeding in Jefferson County. Drivers identified as non-Caucasian are about 1.2, 1.5, 2.8,and 4.0 times more likely than Caucasian drivers to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table B.89 Speeding in Jefferson County by Driver Characteristics

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	352	3.1	47.4	13.4	3.4	0.3
Male	753		49.4	15.3	3.6	1.1
25 years old or under	149	3.7	60.4**	24.2***	6.7*	2.0
Over 25 years old	949		47.1	13.2	3.1	0.6
Caucasian	958	4.9	47.3*	13.6*	2.8**	0.6*
Non-Caucasian	126		58.7	20.6	7.9	2.4

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Table B.90 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Montour County. The trends in this county vary considerably (at least in terms of statistically significant findings) from other counties and are summarized below.

- Observation data from Montour County suggest no significant gender differences in observed speeding behavior.
- Although age differences in speeding behavior are apparent, there are likely too few cases to detect statistically significant differences. The main trend of the age-speeding relationship in other counties—younger drivers are more likely to speed than older drivers—is evident in Montour County as well even though it does not reach statistical significance.
- The effects of race on speeding behavior are not consistently significant across all levels of speeding in Montour County. Drivers identified as non-Caucasian are about 1.3 and 3.4 times more likely than Caucasian drivers are to exceed the speed limit by 5 and 15 miles per hour, respectively. The racial differences in speeding at 10 and 20 mph over the limit are also consistent with other counties—non-Caucasians are more likely than Caucasians to speed—despite the lack of statistical significance.

Table B.90 Speeding in Montour County by Driver Characteristics

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	218	0.5	46.3	11.0	2.3	0.5
Male	515		54.0	13.6	2.9	0.4
25 years old or under	88	0.5	60.2	19.3	3.4	1.1
Over 25 years old	645		50.5	11.9	2.6	0.3
Caucasian	656	2.2	50.3*	12.2	2.3*	0.3
Non-Caucasian	65		64.6	20.0	7.7	1.5

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Table B.91 presents crosstabulations of drivers' gender, age, and race with varying levels of speeding behavior (5, 10, 15, and 20 miles per hour over the posted speed limit) from the observations in Susquehanna County. The trends in this county also vary from most of the other counties and are summarized below.

- Observation data from Susquehanna County suggest significant gender differences in observed speeding behavior at both 5 and 10 mph over the limit.
- Men are 1.4 and 2.5 times more likely to speed at 5 and 10 mph over the limit than women are in Susquehanna County.
- Strong age differences are not evident in Susquehanna County, as the only statistically significant difference between drivers identified as 25 years or younger and drivers over 25 is at 10 mph over the limit, where younger drivers are 2.1 times more likely than older drivers to exceed the speed limit by 10 miles per hour.
- Statistically significant race differences are also not evident in Susquehanna County, although non-Caucasians are more than 2 times as likely to exceed the speed limit by 15 and 20 mph are greater, which is consistent with racial differences in speeding in other counties.

Table B.91 Speeding in Susquehanna County by Driver Characteristics

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph
Female	147	1.0	35.4**	4.8*	2.0	0.7
Male	455		47.7	12.1	2.4	0.4
25 years old or under	95	1.0	50.5	17.9**	2.1	0.0
Over 25 years old	507		43.6	8.7	2.2	0.6
Caucasian	514	3.6	44.2	9.3	1.9	0.4
Non-Caucasian	72		45.8	12.5	4.2	1.4

Note: Asterisks identify statistically significant chi-square bivariate associations. * p<.05 ** p<.01 ***p<.001
[1] The % missing data reflects the percent of all RADAR data collection for which observers were not able to capture one or more characteristics of the driver.

Summary of Roadway Usage and Speeding Observations in All Counties

As summarized above in the county-by-county analysis, research teams from the Pennsylvania State University and University of Cincinnati conducted over 1,500 hours of roadway usage and speeding observations in 27 of Pennsylvania's 67 counties. A brief summary of these observations and their findings is provided below:

- With few exceptions (e.g., weather, construction, or other safety hazards), municipalities selected for observation corresponded well to municipalities with the greatest amounts of PSP traffic enforcement activity in the select counties.

- Eight counties (e.g., Centre, Chester, Columbia, Dauphin, Erie, Montgomery, Tioga, and Westmoreland) were more adversely affected by weather and daylight constraints than others were, slightly limiting both total hours of observation and hours of RADAR conducted.

- The volume of vehicles observed per hour varied within and across counties. The overall average was 102.2, but ranged from a low of 32.7 vehicles per hour in McKean County to a high of 213.3 in Lackawanna County.

- In counties with more than one speed limit observed, speeding tended to be more prevalent in lower speed limits.

- The majority of municipalities with small non-Caucasian residential populations were observed to have larger non-Caucasian driving populations. This was especially true in the additional observed counties that had very small non-Caucasian residential populations, in which several of the differences between residential and observed non-Caucasian populations was ten percentage points or more.

- Often, municipalities with larger non-Caucasian residential populations had smaller observed non-Caucasian populations, a finding that is probably related to the clustering of minority groups in urban areas where use of public transit is more prevalent.

- Speeding behavior varied widely by location and drivers' demographic characteristics. The strength of the association between driver demographic characteristics and speeding varied by county and by severity of speeding as well.

- The lowest percentages of speeders, across all levels of speeding, were in Erie County. The highest were in Bedford County, followed by Montgomery County.

- Significant gender differences in speeding behavior were not evident in most observed counties. In the few counties that did show differences, all but one (Juniata County) suggested males are slightly more likely to exceed the speed limit than females.

- Differences in speeding behavior by driver age were consistently present in almost all observed counties, and suggested that drivers 25 and younger are significantly more likely to speed than older drivers are.

- The evidence for racial differences in speeding behavior was somewhat mixed.

- Six counties showed no significant differences in speeding by race, at any degree of speeding (e.g., Allegheny, Centre, Erie, Franklin, McKean, and Montgomery counties).

- Fourteen other counties showed statistically significant differences in speeding behavior between Caucasians and non-Caucasians at most or all four levels of speeding severity (e.g., Bedford, Bucks, Clarion, Clinton, Delaware, Fulton, Jefferson, Juniata, Lackawanna, Lehigh, Mercer, Tioga, Washington, and York counties).

APPENDIX C

WAIVER OF RIGHTS AND CONSENT TO SEARCH

A. PURPOSES

The Waiver of Rights and Consent to Search, Form SP 7-0027, shall be used to strengthen the fact that an individual , prior to a search, has been thoroughly warned regarding their rights. It will also help to show that an individual has knowingly, understandably and voluntarily consented to a search of the place(s), item(s) or vehicle(s)under their control.

B. PREPARATION

The member requesting a consent to search shall ensure that the Waiver of Rights and Consent to Search form is prepared. The reverse side of the form includes a Spanish version for use in appropriate circumstances. The Spanish version has been reproduced in the same format as the English version for the convenience of members using the form. The form shall be printed with ball point pen or typewritten in an original only.

C. GENERAL INSTRUCTIONS:

1. The Waiver of Rights and Consent to Search form is primarily self - explanatory.

2. An endeavor shall be made to secure the signature of at least one witness who can attest to the contents of the form being properly transmitted to the individual involved.

3. The form shall be signed at the scene immediately prior to the search.

D. DISTRIBUTION

The Waiver of Rights and Consent to Search form shall be attached. to the station copy of the appropriate investigative report. Upon conclusion of the investigation, the form shall be removed from the station copy of the investigative report and attached to the Department Headquarters copy of the final supplement report.

SP 7-0027 (6-87)
OM 7-2

6/24/87

PENNSYLVANIA STATE POLICE
WAIVER OF RIGHTS AND CONSENT TO SEARCH

____

____
TROOP-STATION
INCIDENT NUMBER

(1) PLACE(S), ITEM(S) OR VEHICLE(S) TO BE SEARCHED:
____

____
____

ADDRESS OR LOCATION:
____

____
____

(2) ITEM(S) TO BE SEARCHED FOR AND SEIZED, IF FOUND:
____

____
____

(3) I, ________________________, HAVE BEEN REQUESTED BY
____
(CONSENTOR SHALL PRINT FULL NAME) (PRINT NAME)

OF THE PENNSYLVANIA STATE POLICE TO GIVE MY CONSENT FOR POLICE OFFICERS TO SEARCH PLACE(S), ITEM(S) OR VEHICLE(S) DESCRIBED ABOVE FOR THE ITEMS DESCRIBED ABOVE. I HAVE BEEN TOLD THAT I DO NOT HAVE TO GIVE MY CONSENT. I UNDERSTAND THAT I HAVE THE RIGHT TO REFUSE THIS REQUEST, AND THAT THE POLICE MAY NOT BE ABLE TO CONDUCT THIS SEARCH WITHOUT A SEARCH WARRANT UNLESS I GIVE MY CONSENT. NONETHELESS, I VOLUNTARILY GIVE MY CONSENT TO THE POLICE TO CONDUCT THIS SEARCH.

(4) □ I am the owner of the place(s), item(s) or vehicle(s) to be searched.

□ I rent or lease the place(s), item(s) or vehicle(s) to be searched from another person.

□ With the permission of the owner, I have equal access and control over the place(s), item(s) or vehicle(s) to be searched.

(5) I also understand that in addition to the items described above, if the following is found it may also be seized:

(1) any contraband, the fruits of a crime or things otherwise criminally possessed.

(2) property which is or has been used as the means of committing a criminal offense.

(3) property which constitutes evidence of the commission of a criminal offense.

(6) No one, including anyone from the Pennsylvania State Police or any other police officer, has threatened me in any way, nor has anything been promised to me in return for giving my consent to conduct this search.

WITNESS(ES)
CONSENTOR

(PRINT NAME) (PRINT NAME)

(SIGNATURE) (SIGNATURE)

(PRINT NAME) (ADDRESS)

(SIGNATURE) (CITY, STATE)

DATE: TIME: DATE: TIME:

34.2

POLICIA ESTATAL DE PENSILVANIA

RENUNCIA DE DERECHOS Y CONSENTIMIENTO PARA REGISTRAR

OM 7-2
6/24/87

TROPA - ESTACIÓN ______________________

NÚMERO DEL INCIDENTE ______________________

(1) LUGAR(ES), ARTÍCULO(S) O VEHÍCULO(S) QUE VAN A REGISTRAR: ______________________

____

DIRECCIÓN O LOCALIDAD: ______________________

____

(2) ARTÍCULO(S) POR CUALES REGISTRARÁN Y QUE CONFISCARÁN SI SE ENCUENTRAN: ______________________

____

(3) A MI, ______________________ (PERSONA DANDO PERMISO ESCRIBE SU NOMBRE EN LETRA DE MOLDE), SE ME HA SIDO PEDIDO POR ______________________ (NOMBRE EN LETRA DE MOLDE), DE LA POLICIA ESTATAL DE PENSILVANIA QUE DE MI PERMISO PARA QUE LA POLICIA REGISTRE EL (LOS) LUGAR(ES), ARTÍCULO(S) O VEHÍCULO(S) ANTES MENCIONADO(S) PARA LOS ARTÍCULOS ANTEDICHOS Y DESCRITOS. SE ME HA DICHO QUE *NO TENGO QUE DAR MI CONSENTIMIENTO. YO ENTIENDO QUE TENGO EL* DERECHO DE REHUSAR O NEGAR ESTA PETICIÓN, Y QUE POSIBLEMENTE LA POLICIA NO PUEDA LLEVAR A CABO ESTE REGISTRO SIN UNA AUTORIZACIÓN DE REGISTRO A MENOS DE QUE YO DE MI CONSENTIMIENTO. SIN EMBARGO, YO DOY MI CONSENTIMIENTO VOLUNTARIAMENTE A LA POLICIA PARA CONDUCIR EL REGISTRO.

(4) ☐ Yo soy el dueño del lugar(es), artículo(s) o vehículo(s) que va(n) a ser registrado(s).

☐ Yo alquilo de otra persona el (los) lugar(es), artículo(s) o vehículo(s) que va(n) a ser registrado(s).

☐ Con el permiso del dueño, yo tengo igualdad de acceso y control sobre el (los) lugar(es), artículo(s) o vehículo(s) que va(n) a ser registrado(s).

(5) Yo también entiendo que además de los artículos antedichos, si lo siguiente se encuentra también puede ser confiscado:

(1) cualquier contrabando, resultado de un crimen o cosas de otro modo ilegalmente poseídas.

(2) propiedad que es o que ha sido utilizada como el medio de perpetración de un crimen.

(3) propiedad que constituye prueba de la perpetración de un crimen.

(6) Nadie, incluyendo a nadie de la Policia Estatal de Pensilvania o otro policia, me ha amenazado en ninguna forma, ni me ha prometido nada por haber dado mi consentimiento para conducir este registro.

TESTIGO(S)	CONSENTIDOR(ES)
(NOMBRE EN LETRA DE MOLDE)	(NOMBRE EN LETRA DE MOLDE)
(FIRMA)	(FIRMA)
(NOMBRE EN LETRA DE MOLDE)	(DIRECCIÓN)
(FIRMA)	(CIUDAD) (ESTADO)

FECHA: HORA: FECHA: HORA:

34.3

APPENDIX D

ROBIN SHEPARD ENGEL

Division of Criminal Justice
University of Cincinnati
PO Box 210389
Cincinnati, OH 45221-0389

Office: (513) 556-5850
Fax: (513) 556-3303
E-mail: robin.engel@uc.edu

Education

Ph.D. — Criminal Justice — 1999
Rockefeller College of Public Affairs and Policy
University at Albany, State University of New York
Dissertation Title: *Street Level Supervision: Styles of Patrol Supervisors & their Effects on Subordinate Behavior*
Specialization areas: Administration of criminal justice, criminal law
Research tool: Advanced statistics, systematic observation of police

M.A. — Criminal Justice — 1994
Rockefeller College of Public Affairs and Policy
University at Albany, State University of New York

B.A. — Criminal Justice, Psychology, *Magna Cum Laude* — 1992
Concentration: Political Science / American Government
University at Albany, State University of New York

Professional Employment

06/02 – present
Associate Professor, Division of Criminal Justice
Research Associate, Center for Criminal Justice Research
University of Cincinnati
Courses: CJ 101 (Introduction to Criminal Justice)
CJ 201 (Introduction to Policing)
CJ 481 (Police and the Community)
CJ 505 (Explaining Police Behavior)
CJ 702 (CJ Administration & Management – graduate)
CJ 730 (Theory and Philosophy of Law Enforcement – graduate)
CJ 810 (Seminar on Criminal Justice Theory – graduate)
CJ 881 (Police and the Community – graduate)

06/02 – 08/03
Visiting Scientist, Population Research Institute
The Pennsylvania State University

07/99 – 07/02
Assistant Professor, Crime, Law and Justice
Department of Sociology, The Pennsylvania State University
Courses: AdmJ 111 (Introduction to the Administration of Justice)
AdmJ 485 (Policing in America)
AdmJ 482 (Criminal Justice Agency Administration)
CLJ 501 (Criminal Justice System and Organizations – graduate)
CLJ 585 (Issues in Law Enforcement – graduate)

08/98 – 06/99
Instructor, Crime, Law and Justice
Department of Sociology, Pennsylvania State University

Courses: AdmJ 485 (Policing in America)

09/93 – 05/94 **Instructor**, School of Criminal Justice
University at Albany
Courses: CRJ 200 (Introduction to the Nature of Crime)
CRJ 201 (Introduction to the Administration of Justice)

Grant and Contract Activity

08/05 – 08/06 *Contract pending* -- **Principal Investigator**, "Project on Police-Citizen Contacts, Year 4" funded by the Pennsylvania State Police ($129,557).

05/05 – 07/06 *Contract pending* – **Principal Investigator**, "Examining Racial and Ethnic Disparities in Search and Seizure Rates," with Richard Johnson (co-PI), funded by the Pennsylvania State Police ($56,592).

07/04 – 12/05 **Principal Investigator**, "Traffic Stop Data Collection Project for the City of Cleveland, Department of Public Safety, Division of Police," with James Frank (co-PI), funded by the Cleveland Division of Police ($95,679).

06/04 – 08/05 **Principal Investigator**, "Project on Police-Citizen Contacts, Year 3" funded by the Pennsylvania State Police ($124,040).

07/03 – 08/04 **Principal Investigator**, "Project on Police-Citizen Contacts, Year 2" funded by the Pennsylvania State Police ($144,174).

01/02 – 07/03 **Principal Investigator**, "Project on Police-Citizen Contacts," funded by the Pennsylvania State Police ($251,804).

02/02 **Recipient**, U. S. Speaker and Specialist Grant, U. S. Department of State, Office of International Programs, and Trinidad and Tobago's Ministry of National Security. Travel grant to Trinidad and Tobago ($4,500).

05/99 – 09/99 **Principal Investigator**, "Police research methodologies: Comparisons of structured survey items and semi-structured debriefing data for police supervisors," funded by the Research & Graduate Studies Office and the Center for Research on Crime and Justice, The Pennsylvania State University ($7,700).

Research

Journal Articles:

Engel, R. S. Forthcoming. Citizens' perceptions of procedural and distributive injustice during traffic stops with police. Journal of Research in Crime and Delinquency.

Bernard, T. B., Calnon, J. M., **Engel, R. S.,** & Hays, Z. R. Forthcoming. Efficiency and the New Differential Processing. Journal of Crime and Justice.

Novak, K. S. & Engel, R. S. Forthcoming. Disentangling the influence of suspects' demeanor and mental disorder on arrest. Policing: An International Journal of Police Strategies & Management.

Engel, R. S. & Calnon, J. M. 2004. Examining the influence of drivers' characteristics during traffic stops with police: Results from a national survey. Justice Quarterly 21(1):49-90.

Engel, R. S. & Calnon, J. M. 2004. Comparing benchmark methodologies for police-citizen contacts: Traffic stop data collection for the Pennsylvania State Police. Police Quarterly 7(1): 97-125.

Engel, R. S. & Worden, R. E. 2003. Police officers' attitudes, behavior, and supervisory influences: An analysis of problem solving. Criminology 41(1):131-166.

Engel, R. S. 2003. Explaining suspects' resistance and disrespect toward police. Journal of Criminal Justice 31:475-492.

Engel, R. S. 2003. How police supervisory styles influence patrol officer behavior. Research for Practice, National Institute of Justice. Washington DC: U.S. Department of Justice.

Reprinted in Dunham, R. G. and Alpert, G. P. Critical Issues in Policing: Contemporary Readings. Waveland Press: Long Grove, IL, pps. 131-140.

Engel, R. S., Calnon, J. M., & Bernard, T. J. 2002. Theory and racial profiling: Shortcomings and future directions in research. Justice Quarterly 19(2):249-273.

Engel, R. S. 2002. Patrol officer supervision in the community policing era. Journal of Criminal Justice 30(1):51-64.

Novak, K. J., Frank, J., Smith, B. W., & **Engel, R. S.** 2002. Revisiting the decision to arrest: Comparing beat and community officers. Crime & Delinquency 48(1):70-98.

Engel, R. S. & Silver, E. 2001. Policing mentally disordered suspects: A reexamination of the criminalization hypothesis. Criminology 39(2):225-252.

Bernard, T. J. & **Engel, R. S.** 2001. Conceptualizing criminal justice theory. Justice Quarterly 18(1):1-30.

Reprinted in S. Cote (ed.), 2002. Criminological Theories: Bridging the Past to the Future. Newbury Park: Sage Publications, chapter 3.

Engel, R. S. 2001. Supervisory styles of patrol sergeants and lieutenants. Journal of Criminal Justice 29:341-355.

Reprinted in Stojkovic, S., Klofas, J., & Kalinich, D. (eds.), 2004. The Administration and Management of Criminal Justice Organizations, A Book of Readings, Fourth Edition. Prospect Heights, IL: Waveland Press, Inc.

Engel, R. S. 2000. The effects of supervisory styles on patrol officer behavior. Police Quarterly 3(3):262-293.

Engel, R. S., Sobol, J., & Worden, R. E. 2000. Further exploration of the demeanor hypothesis: The interaction effects of suspects' characteristics and demeanor on police behavior. Justice Quarterly 17(2):235-258.

Worden, R. E. & **Shepard, R. L.** 1996. Demeanor, crime, and police behavior: A reexamination of the Police Services Study data. Criminology 34(1):83-105.

Worden, R. E., **Shepard, R. L.,** & Mastrofski, S. D. 1996. On the meaning and measurement of suspects' demeanor toward the police. Journal of Research in Crime and Delinquency 33(3):324-336.

Widom, C. S. & **Shepard, R. L.** 1996. Accuracy of adult recollections of childhood victimization: Part 1. Childhood physical abuse. Psychological Assessment 8(4):412-421.

Book Chapters:

Engel, R. S. 2001. Police officer behavior. In J. Dressler (ed.) Encyclopedia of Crime and Justice, Revised Edition. New York: Macmillan Reference.

Engel, R. S. 2001. Police history. In J. Dressler (ed.) Encyclopedia of Crime and Justice, Revised Edition. New York: Macmillan Reference.

Engel, R. S. 2001. Urban police. In J. Dressler (ed.) Encyclopedia of Crime and Justice, Revised Edition. New York: Macmillan Reference.

Technical Reports:

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

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., Tillyer R. & Wooldredge, J. 2004. Critique of Solop's I-40 and I-17 Stop Data Reports. Report submitted to the U. S. District Attorney's Office (District of Arizona) in the matter of *U.S. v. Gayle*.

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., 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., Calnon, J. M., & Dutill, J. R. 2003. Project on police citizen contacts: Third quarter report. Report submitted to the Pennsylvania State Police, Harrisburg, PA.

Engel, R. S., Calnon, J. M., & Dutill, J. R. 2003. Project on police citizen contacts: Six month report. Report submitted to the Pennsylvania State Police, Harrisburg, PA.

Engel, R. S., Calnon, J. M., & Dutill, J. R. 2002. Project on police citizen contacts: First quarter report. Report submitted to the Pennsylvania State Police, Harrisburg, PA.

Engel, R. S. & Worden R. E. 2000. Police officers' attitudes, behavior, and supervisory influences: An analysis of problem-solving. Report submitted to the National Institute of Justice, Washington DC: U.S. Department of Justice.

Engel, R. S. 2000. Patrol officer supervision in the community policing era. Report submitted to the National Institute of Justice, Washington DC: U.S. Department of Justice.

Engel, R. S. & Silver, E. 2000. Policing mentally disordered suspects: A reexamination of the criminalization hypothesis. Report submitted to the National Institute of Justice, Washington DC: U.S. Department of Justice.

Shepard, R. L. 1999. Patrol supervisory styles. Report submitted to the National Institute of Justice, Washington DC: U.S. Department of Justice.

Parks, R. B., Mastrofski, S. D., Reiss, Jr., A. J., Worden, R. E., Terrill, W. C., DeJong, C., Stroshine, M., & **Shepard, R. L.** 1998. St. Petersburg Project on Policing Neighborhoods: A study of the police and the community. Report submitted to the St. Petersburg, FL Police Department.

Expert Testimony:

Engel, R. S. Expert testimony scheduled before U.S. District Court (District of Arizona) in *U.S. v. Gayle*, on the issue of racial profiling, September 2005, Phoenix, AZ

Engel, R. S. Remarks delivered at the Ministry of National Security's War on Crime Program, National Address, Port of Spain, Trinidad, February 25, 2002. Live nationwide radio and television broadcasts.

Engel, R. S. Expert testimony given before the Pennsylvania House of Representatives, Judiciary Committee on House Resolution 269 and the issue of racial profiling, October 22, 2001, Harrisburg, PA

Consulting:

New Jersey State Attorney General, racial profiling and statistical consultant, 2005-present

U.S. Department of Justice, United States Attorney, District of Arizona, racial profiling and statistical consultant, 2004 – present

County of Coconino, Office of the District Attorney, racial profiling and statistical consultant, 2004 – present

Ohio Highway Patrol and the SIEC committee, data analysis consultant, 2003-2004
Minister of National Security, Trinidad & Tobago, police & crime policy consultant, 2002

Office of the Commissioner, Pennsylvania State Police, racial profiling and statistical consultant, 2001 – present

Training Seminars:

Engel, R. S. & Johnson, R. Effective Supervision in the Community Policing Era. Training Workshop presented to the Fairfield, OH Police Department, October 1, 2004.

Engel, R. S. & Johnson, R. Effective Supervision in the Community Policing Era. Training workshop presented to the Roanoke, VA Police Department, December 10, 2003.

Advisory Board Member:

Biased-Based Policing, Denominator Conferences. Funded by the Police Executive Research Forum and COPS, Department of Justice. Advisory Board Member, March 2004 – August 2004.

Eliminating Unintentional Racial Biases in Police Officer Decision-Making. New Jersey Department of Law & Public Safety and the New Jersey Office of the Attorney General. Advisory board member, February 2004 – February 2005.

Invited Presentations:

Engel, R. S. & Tillyer, R. The State of Racial Profiling Research: Analytical Issues Involved in Benchmarking and Examining Post-Stop Outcomes. Presentation delivered to the Ohio Highway Patrol, Columbus, OH, March 1, 2005.

Engel, R. S. Yes or No – Does "Consent" Matter? Examining Consent Searches for Two State Police Agencies. Presentation delivered to the Police Policy Research Group at the University of Albany, Albany, NY, February 23, 2005.

Engel, R. S. The All Important Numerator (Stop Data). Presentation at *By the Numbers: How to Analyze Race Data from Vehicle Stops*, sponsored by the Police Executive Research Forum and the COPS Office, Kansas City, MO, August 24-25, 2004.

Engel, R. S. and Alpert, G. Ensuring Data Quality. Presentation at *By the Numbers: How to Analyze Race Data from Vehicle Stops*, sponsored by the Police Executive Research Forum and the COPS Office, Kansas City, MO, August 24-25, 2004.

Engel, R. S. Analyzing Post-Stop Data. Presentation at *By the Numbers: How to Analyze Race Data from Vehicle Stops*, sponsored by the Police Executive Research Forum and the COPS Office, Kansas City, MO, August 24-25, 2004.

Zingraff, M. and **Engel, R. S.** Observation Benchmarking. Presentation at *By the Numbers: How to Analyze Race Data from Vehicle Stops*, sponsored by the Police Executive Research Forum and the COPS Office, Kansas City, MO, August 24-25, 2004.

Engel, R. S. Project on Police-Citizen Contacts Year 1 Final Report. Presentation to the Commonwealth of Pennsylvania Legislative Black Caucus, Harrisburg, PA, May 25, 2004.

Engel, R. S. & Edelman, W. Results from the MARCS intra-operability study. Presentation to the Ohio Highway Patrol and the SIEC committee, Columbus, OH, March 31, 2004.

Engel, R. S. Racial Profiling: Research Issues and Findings. Presentation to the Roanoke, VA Police Department, December 11, 2003.

Engel, R. S. Issues surrounding benchmarking in racial profiling research. Presentation at the Third National Symposium on Racial Profiling, sponsored by Northwestern University Center for Public Safety and the Police Executive Research Forum, Chicago, November 5, 2003.

Engel, R. S. Understanding community policing policies in the Unites States: Assessing similarities, differences, and effectiveness. Presentation to the Minister of National Security, Commissioner of Police, and senior officers from Trinidad and Tobago, Port of Spain, Trinidad, February 21, 2002.

Engel, R. S. Why do cops do what they do? Colloquium series sponsored by the Pennsylvania Prison Society, Centre County Branch, State College, PA, February 5, 2002.

Engel, R. S. & Silver, E. Policing mentally disordered suspects. Colloquium series sponsored by the Psychiatry Department and Center for Mental Health Policy and Service Research, University of Pennsylvania, January 14, 2002.

Shepard, R. L. The effects of supervisory styles on patrol officer behavior. Paper presented at the National Institute of Justice annual conference, Washington, D.C., July 18-21, 1998.

Invited Conference Participant:

Status Check: Police Studies, International Conference. Eastern Kentucky University, Richmond, Kentucky, June 12-14, 2003.

Confronting Racial Profiling in the 21st Century: Implications for Racial Justice. Northeastern University, Boston, MA, March 8 & 9, 2003.

Conference Presentations:

Tillyer R., **Engel R. S.**, & Wooldredge J. Examining Traffic Stop Dispositions: Results from the Arizona Department of Public Safety. Paper presented at the Academy of Criminal Justice Sciences annual meetings, Chicago, IL, March 16-19, 2005.

Engel, R. S. & Calnon, J. M. Examining differences in speeding behavior: Results from a statewide roadway observation study. Paper presented at the American Society of Criminology annual meetings, Nashville, TN, November 17-20, 2004.

Tillyer R. & **Engel, R. S.** Modeling racial and ethnic differences in traffic stops: A macro-level approach. Paper presented at the American Society of Criminology annual meetings, Nashville, TN, November 17-20, 2004.

Novak, K. J. & **Engel, R. S.** Revisiting the Criminalization Hypothesis of Police-Mentally Disordered Suspects. Paper presented at the Academy of Criminal Justice Sciences annual meetings, Las Vegas, Nevada, March 2004.

Engel, R. S. & Novak, K. J. Race, demeanor, resistance and police coercion: Disentangling the relationships. Paper presented at the American Society of Criminology annual meetings, Chicago, Illinois, November 18-22, 2003.

Engel, R. S. Citizens' perceptions of procedural and distributive injustice during traffic stops with police. Paper presented at the American Society of Criminology annual meetings, Chicago, Illinois, November 12-16, 2002.

Calnon, J. M. & **Engel, R. S.** Further exploration of base rate methodologies for police traffic stops. Paper presented at the American Society of Criminology annual meetings, Chicago, Illinois, November 12-16, 2002.

Engel, R. S. Explaining suspect disrespect toward police. Paper presented at the American Society of Criminology annual meetings, Atlanta, Georgia, November 7-10, 2001.

Engel, R. S. Does police supervision matter? A conceptual framework for understanding supervisory influence over officer behavior. Paper presented at the Academy of Criminal Justice Sciences annual meetings, Washington, DC, April 4-7, 2001.

Calnon, J. M. & **Engel, R. S.** Issues surrounding the collection of racial profiling data. Paper presented at the Academy of Criminal Justice Sciences annual meetings, Washington, DC, April 4-7, 2001.

Engel, R. S. & Silver, E. Policing mentally disordered suspects: Revisiting the criminalization hypothesis. Paper presented at the American Society of Criminology annual meetings, San Francisco, CA, November 16-20, 2000.

Engel, R. S. & Silver, E. Policing the mentally ill. Paper presented at the Academy of Criminal Justice Sciences, New Orleans, LA, March 2000.

Shepard, R. L. & Hayslett-McCall, K. Patrol supervisors' attitudes toward community policing: Comparing structured survey items and semi-structured debriefing data. Paper presented at the American Society of Criminology, Toronto Canada November 17-20, 1999.

Bernard, T. J. & **Shepard, R. L.** Criminal justice theory. Paper presented at the American Society of Criminology, Toronto Canada November 17-20, 1999.

Shepard, R. L., Hayslett-McCall, K., & Binder, M. Survey research methodologies: Comparing structured survey items and semi-structured debriefing data for police supervisors. Paper presented at the Academy of Criminal Justice Sciences, Orlando, FL March 10-13, 1999.

Shepard, R. L. The effects of supervisory styles on officer behavior. Paper presented at the Academy of Criminal Justice Sciences, Orlando, FL March 10-13, 1999.

Shepard, R. L. Leadership styles of patrol field officers. Paper presented at the annual meeting of the American Society of Criminology, Washington, D.C. November 11-14, 1998.

Shepard, R. L., Stroshine, M. S., Worden, R. E. & Bynum, T. S. Patterns of street-level supervision. Paper presented at the annual meeting of the American Society of Criminology, San Diego, CA, November 19-22, 1997.

Shepard, R. L., Sobol, J. J., & Worden, R. E. Further exploration of the demeanor hypothesis: The interaction effects of suspects' characteristics and demeanor on police behavior. Paper presented at the annual meeting of the Academy of Criminal Justice Sciences, Louisville, KY, March 12-15, 1997.

Bayley, D. H., Worden, R. E., McCluskey, J., & **Shepard, R. L.** The utilization and management of police overtime. Paper presented at the annual meeting of the Academy of Criminal Justice Sciences, Las Vegas, NV, March 12-16, 1996.

Shepard, R. L. & Worden, R. E. Police supervision: Differences within and between police departments. Paper presented at the annual meeting of the American Society of Criminology, Boston, MA, November 15-18, 1995.

Widom, C. S. & **Shepard, R. L.** Accuracy of retrospective memories of early childhood victimization. Workshop at the annual meeting of the American Society of Criminology, Miami, FL, November 9-12, 1994.

Worden, R. E. & **Shepard, R. L.** On the meaning, measurement, and estimated effects of suspects' demeanor toward the police. Paper presented at the annual meeting of the American Society of Criminology, Miami, FL. November 9-12, 1994.

Manuscripts in progress / under peer review:

Engel, R. S., Tillyer, R., Wooldredge J. Examining traffic stop dispositions: Results from the Arizona Department of Public Safety. Target journal: *Criminology*

Engel, R. S., Tillyer R., & Calnon, J. M. Social Science and the Law: Legal implications for racial profiling research. Target journal: *Law & Society Review*

Engel, R. S. & Johnson, R. Understanding Racial and Ethnic Disparities in Search and Seizure Rates for State Police Agencies. Target journal: *Justice Quarterly*

Engel, R. S. & Calnon, J. M. Examining differences in speeding behavior: Results from a statewide roadway observation study. Target journal: *Criminology & Public Policy*

Engel, R. S. & Novak, K. J. Race, demeanor, resistance and police coercion: Disentangling the relationships. Target journal: *Justice Quarterly*

Honors and Awards

Promotion of Diversity Award, Center for the Advancement of Teaching & Learning University of Cincinnati	2004
Faculty Incentive Award for Research and Scholarship College of Education, CJ, & Human Services, University of Cincinnati	2004
Faculty Incentive Award for Research and Scholarship College of Education, University of Cincinnati	2003
Recipient, U.S. Speaker and Specialist Grant to undertake community policing project in Trinidad and Tobago. Grant awarded by the U.S. State Department, Office of International Information Programs	2002
Selected workshop participant, "Quantitative Analysis of Crime and Criminal Justice," Inter-university Consortium for Political and Social Research, University of Michigan ($2,500 stipend)	2001
Eliot H. Lumbard award for academic excellence, School of Criminal Justice, University at Albany	1998
Travel grant award (competitive funding), Graduate Student Organization, University at Albany	1997
Initiatives for women award for academic achievement, University at Albany	1995
Teaching assistant (competitive funding), University at Albany	1993-94
Graduate student fellowship (competitive funding), University at Albany	1992-93
Phi Beta Kappa National Honor Society	1992
Alpha Phi Sigma Criminal Justice National Honor Society	1992
Golden Key National Honor Society	1992

Service

Internal – University of Cincinnati, Division of Criminal Justice

Policing committee, *chair*	2003 – 2005
Speakers committee, *chair*	2003 – 2004
Social committee, *chair*	2003 – 2004
Graduate committee, *member*	2002 – 2003, 2004 – 2005
Masters committee, *member*	2002 – 2003
Criminal justice committee, *member*	2002 – 2005
Policing committee, *member*	2002 – 2003
Undergraduate curriculum committee, *member*	2003 – 2004

Internal – Pennsylvania State University, Crime Law & Justice Program

Faculty liaison for the Justice Association (undergraduate group)	2000 – 2002
Departmental advisory board committee, *member*	1998 – 1999
Undergraduate committee, *member*	2000 – 2002
Social committee, *chair*	1998 - 2001
Recruitment committee, *member*	1999 – 2002
Graduate committee, *member*	1998 – 2002

External

Police Supervisory Training Seminars provided for municipal police agencies	2003 – 2004
American Society of Criminology, Ethical Issues Committee, *Member*	2004 – 2006
Academy of Criminal Justice Sciences, Ethics Committee, *Member*	2004 – 2007
American Society of Criminology 2004 Annual Meetings, *Area Chair*	2003 – 2004

Academy of Criminal Justice Sciences 2004 Annual Meetings, *Area Chair*	2003 – 2004
Associate Editor – *Justice Quarterly*	2001 – present
Manuscript reviewer for *Criminology, Justice Quarterly, Criminology & Public Policy, Law & Society Review, Social Science Quarterly, Journal of Research in Crime and Delinquency, Police Quarterly, Criminal Justice Review, Police Practice and Research: An International Journal, Policing: An International Journal of Police Strategies & Management*	1999 – present
Panel chair and discussant at the ACJS annual meetings	1995 – 2004
Panel chair and discussant at the ASC annual meetings	1999 – 2004
Academic course consultation for Elizabethtown College, Elizabethtown, PA	2000
Fundraiser event coordinator benefiting the Women's Resource Center, State College, PA	2000
American Society of Criminology, employment exchange committee	1998 – 2000
Television interview, WNBC Channel 5, Cincinnati, OH, May 1,	2003
Television interviews, central / western Pennsylvania stations	1999 – 2000
Printed media interviews, east coast and mid-Atlantic newspapers	1999 – present

Interview, "Walking the walk: What kind of supervisors do patrol officers respond to? A new study takes a look." *Law Enforcement News*, Vol. XXIX, No. 604 August 31, 2003.

Professional Memberships

American Society of Criminology (ASC)
Academy of Criminal Justice Sciences (ACJS)

CURRICULUM VITA
Jennifer M. Calnon

Crime, Law and Justice Program ■ Department of Sociology ■ 211 Oswald Tower ■ University Park, PA 16802
■ FAX: (814) 863-7216 ■ Email: jmc439@psu.edu

Education

Ph.D. Crime, Law, and Justice, The Pennsylvania State University — Expected 2005
Dissertation: *The Influence of Race, Age, and Gender on Law-Violating Driving Behavior*
Co-Chairs: Robin S. Engel and Eric Silver

M.A. Crime, Law, and Justice, The Pennsylvania State University — May 2002
Thesis: *The Help-seeking Behavior of Victims of Intimate Partner Violence*
Chair: Robin S. Engel

B.A. Sociology and Political Science, *Magna Cum Laude* — May 1999
State University of New York at Geneseo

Research Experience

<u>Research Consultant,</u> Project on Police-Citizen Contacts, Dr. Robin Engel—Principal Investigator
May 2003-January 2005

- Trained incoming project staff on tracking and scanning of confidential data forms
- Conducted data analysis, prepared statistical tables, and wrote portions of technical reports for the police department

<u>Project Manager</u>, Project on Police Citizen Contacts, Dr. Robin Engel—Principal Investigator
January 2002-August 2003

- This project's contract involved the collection and analyses of traffic stop data and base rates for the Pennsylvania State Police in partnership with Penn State University
- Participated in meetings with State Police officials to discuss ongoing data collection
- Prepared memorandums and quarterly data analysis reports for the police department
- Designed and pilot tested data collection forms for field observation
- Hired, coordinated, and supervised 50 Penn State undergraduate research assistants
- Trained undergraduate research assistants on field observation techniques, data collection and data entry procedures
- Administrative duties included: ensuring compliance with human subject confidentiality training, coordination of payroll paperwork, input of confidential data forms, scheduling of field observation sessions, and serving as point of contact for 90 police stations

Research Assistant, Dr. Robin Engel
September 1999-December 2001

- Prepared for and participated in official meetings with Pennsylvania State Police administrators in preparation for data collection contract with that agency
- Preparation of research literature reviews on police-citizen traffic and pedestrian contacts, police officer attitudes and officer reactivity to observers
- Qualitative data analysis of written narratives for shifts with patrol supervisors

Skills & Training:

- Quantitative Methods & Statistics: SPSS & HLM (a multi-level data analysis program)
- The Pennsylvania State University's Institutional Review Board Human Participants Research Basic Training Seminar
- Qualitative Data Analysis
- Archival and Web-Based Research
- Spreadsheet and database creation and maintenance (Microsoft Excel)
- Legal Research

Areas of Specialization and Interest:

- Police officer behavior and decision-making
- Race and gender stratification
- Administration of Criminal Justice
- Domestic violence victims' help-seeking and decision-making

Publications and Presentations:

Peer Reviewed Publications:

Bernard, Thomas J., **Calnon, Jennifer M.**, Engel, Robin S., and Hays, Zachary R. (2005). Efficiency and the New Differential Processing. *Journal of Crime and Justice.*

Engel, Robin S. and **Calnon, Jennifer M.** (2004). Examining the influence of race during traffic stops with police: Results from a national survey. *Justice Quarterly, 21*, 49-90.

Engel, Robin S. and **Calnon, Jennifer M.** (2004). Comparing baseline methodologies for police-citizen contacts: Traffic stop data collection for the Pennsylvania State Police. *Police Quarterly, 7*, 97-125.

Engel, Robin S., **Calnon**, **Jennifer M.** and Bernard, Thomas J. (2002). Theory and racial profiling: Shortcomings and directions for future research. *Justice Quarterly, 19*, 249-273.

Technical Reports:

Engel, Robin S., **Calnon, Jennifer M.**, Tillyer, Robert, Johnson, Richard, Liu, Lin, and Wang, Xuguang. (March 2005). *Project on Police-Citizen Contacts: Year 2 Final Report.* Report submitted to the Pennsylvania State Police Department.

Engel, Robin S., **Calnon, Jennifer M**, Liu, Lin, and Johnson, Richard. (December 2003). *Project on Police-Citizen Contacts: Year 1 Final Report.* Report submitted to the Pennsylvania State Police Department. Publicly available at: http://www.psp.state.pa.us/psp/lib/psp/pdf/psp_police_citizens_contact_final_report_2002-2003.pdf

Engel, Robin S., **Calnon, Jennifer M.**, Liu, Lin, and Dutill, Joshua R. (April 2003). *Project on Police-Citizen Contacts: Nine-Month Report.* Report submitted to the Pennsylvania State Police Department.

Engel, Robin S., **Calnon, Jennifer M.**, and Dutill, Joshua R. (January 2003). *Project on Police-Citizen Contacts: Six-Month Report.* Report submitted to the Pennsylvania State Police Department.

Engel, Robin S., **Calnon, Jennifer M.**, and Dutill, Joshua R. (October 2002). *Project on Police-Citizen Contacts: First Quarterly Report.* Report submitted to the Pennsylvania State Police Department.

National Conference Presentations:

Engel, Robin S. and **Calnon, Jennifer M.** "Examining Racial Differences in Speeding Behavior: Results from a Statewide Roadway Observation Study." Paper presented at the annual meeting of the American Society of Criminology, Nashville, TN, November 16-20, 2004.

Calnon, Jennifer M. and Engel, Robin S. "Further Exploration of Base Rate Methodologies For Police Traffic Stops." Paper presented at the annual meeting of the American Society of Criminology, Chicago, IL, November 12-16, 2002.

Calnon, Jennifer M. "The Help-Seeking Behavior of Domestic Violence Victims." Paper presented at the annual meeting of the American Society of Criminology, Atlanta, GA, November 7-10, 2001.

Calnon, Jennifer M. and Engel, Robin S. "Issues Surrounding the Collection of Racial Profiling Data." Paper presented at the annual meeting of the Academy of Criminal Justice Sciences, Washington, D.C., April 3-7, 2001.

Calnon, Jennifer M. and Thomas J. Bernard. "Discrimination without Prejudice: The Systemic Production of Discriminatory Outcomes." Paper presented at the annual meeting of the American Society of Criminology, San Francisco, CA, November 15-18, 2000.

<u>Teaching Experience</u>

<u>Guest Lecturer</u>
Spring 2000, Spring 2003

- Invited to prepare and deliver lectures in the following courses:
    - Introduction to the American Criminal Justice System (Functions of the Police)
    - Minorities and the Criminal Justice System (Racial Profiling)
    - Introduction to Criminology (Domestic Violence, Racial Profiling)

<u>Teaching Assistant,</u> Introduction to the American Criminal Justice System, Dr. Robin Engel
January 2001-May 2001

- Assisted in writing and evaluating multiple choice and short answer examinations
- Supervised and mentored six undergraduate teaching assistants

<u>Teaching Assistant</u>, Juvenile Delinquency, Instructor: Megan Kurlychek, M.A.
May 2000-June 2000

- Assisted in writing exam questions and evaluating examinations
- Preparation and delivery of lectures on criminological theory and the death penalty

<u>Teaching Assistant</u>, Policing in America, Dr. Robin Engel
January 2000-May 2000, January 2001-May 2001

- Assisted in development and evaluation of multiple choice and essay examinations
- Preparation and delivery of lectures
- Developed group project assignments on special topics in policing

<u>Teaching Assistant</u>, Research Methods, Dr. Edward Day
September 1999-May 2000

- Preparation and delivery of weekly lectures on research methods
- Evaluation of examinations
- Assisted students with writing formal research proposals during class and office hours

Training:

<u>Seminar on College Teaching in Sociology and Criminal Justice</u>, Dr. Darrell Steffensmeier
January 2000-May 2000

- This weekly seminar focused on undergraduate teaching, choosing textbooks, preparing new courses, and developing strategies for instructing in different class environments
- Developed a teaching philosophy, introductory level syllabi, sample study guide and exam questions, and delivered an introductory level criminal justice lecture

Interests:

- Administration of Justice
- Policing in America
- Juvenile Delinquency and the Juvenile Justice System
- Introduction to Social Statistics & Research Methodology
- Criminology

Service

Graduate student representative, Crime, Law, and Justice Graduate Committee
August 2002-May 2003

- Assisted faculty committee members in review and selection of incoming graduate student applications
- Coordinated weekend visit and meetings for prospective graduate students

Graduate student representative, Sociology/Crime, Law and Justice Colloquia Committee
August 2002-May 2003

- Worked with four student members to coordinate 6-8 colloquia for SOC/CLJ guest speaker series

Graduate student representative, Crime, Law and Justice Travel Funding Committee
August 1999-August 2003

- Determined guidelines for allocation of departmental travel funding to graduate students

Volunteer Counselor/Advocate, Centre County Women's Resource Center
September 1999-September 2001

- Completed 85 hour training course in domestic violence and sexual assault peer counseling and advocacy
- Volunteered 10-15 hours per week answering crisis hotline calls, providing direct services to victims, and performing administrative duties to support domestic violence shelter, education and advocacy team, and volunteer training team

CURRICULUM VITAE

Rob Tillyer, M.A.

Contact Information:

University of Cincinnati
Division of Criminal Justice
PO Box 210389
600 Dyer Hall
Cincinnati, Ohio
45221-0389

E-Mail:
rob.tillyer@uc.edu
robtillyer@hotmail.com

Phone:
513-556-0615
513-477-6912

Education:

University of Cincinnati, Cincinnati, OH.
2003-Present
Ph.D. Student, Criminal Justice

Simon Fraser University, Vancouver, B.C.
2003
Master of Arts, Criminology
2001
Bachelor of Arts with Honors, Criminology

Douglas College, Vancouver, B.C.
1998
Criminology Diploma

Awards:

2003-Present
University Graduate Assistantship & Scholarship, University of Cincinnati

Project Manager:

2004-Present

Project on Police-Citizen Contacts
Report writing, statistical analysis, GIS mapping, and managing the collection of the data for a project studying the stopping and arresting procedures of the Pennsylvania State Police.

P.I. Dr. Robin Engel

Research Associate:

2004-Present

Research Associate in the Criminal Justice Research Center at the University of Cincinnati.

Research Assistant:

2004-Present

Traffic Stop Data Collection Project
GIS analysis, report writing, and data analysis for an 18-month project with the Cleveland Police Department investigating racial profiling.

P.I. Dr. Robin Engel

2004

Project Safe Neighborhoods (PSN)
Data analysis, GIS mapping, and presentation of trends in crime for the Columbus Police Department.

2004

Ohio Service for Crime Opportunity Reduction (OSCOR)
Web construction, project development, and problem solving for the OSCOR project. This year-long project aims to provide local communities with crime-specific problem assistance.

P.I. Dr. Eck & Fisher

2003-2002

Assisted development of crime scenarios and data input for a crime mapping software package (CrimePoint) focusing on sexual assault and burglary.

Private Consulting

2002

Primary Analyzer of forensic files for youth offenders using a quantitative coding instrument.

P.I.: Dr. Raymond Corrado

2002-2001

Primary Interviewer on the National Victimization Project. Specifically, interviewed Aboriginal individuals on a wide range of topics including victimization, education, family history, and neighborhood/community opinions.

P.I.: Dr. Raymond Corrado

Research:

Current Projects:

HLM Analysis: A tri-level examination of the factors affecting post-stop outcomes using data from the Arizona State Police. Specifically, citations, arrests, and searches are predicted using individual level variables, organizational characteristics, and neighborhood factors.
To Be Presented at: The American Society of Criminology (ASC) Conference:

November, 2005

Spatial Analysis: An analysis of the spatial patterning of gun crimes in Columbus, Ohio. Specifically, this paper extends previous research by Roncek and Maier (1991) by disaggregating liquor establishments and focusing on gun crimes.
To Be Presented at: The 8th Annual Crime Mapping Conference Research Conference:

September, 2005

HLM Analysis: An analysis of the contextual and individual factors potentially effecting post-stop outcomes in Arizona. This paper uses stop data collected at the mile marker on Interstate and State highways to identify predictor variables.
Presented at: The Academy of Criminal Justice Sciences (ACJS) Conference:

March, 2005

Racial Profiling: A comment on the current state of racial profiling in light of recent court decisions. Specifically, concerns with developing an accurate benchmark are discussed, the strengths and weaknesses of various methods of reporting, and the statistical weakness of relying on the standard deviation as a means to identify jurisdictions that are racially biased.
Presented at the American Society of Criminology (ASC) Conference:

November, 2004

Master's Degree:

A theoretical argument for the validity, utility and importance of the Criminal Event Perspective, which relies on the principles of Environmental Criminology. Specifically, the research focused on a spatial analysis of transit systems and their relationship to crime through the use of ArcView and S Plus.

Honors' Degree:

An analysis of the Internet and its interplay with law and in particular, individual rights. Primarily focusing on freedom of expression, privacy and Mill's harm principle in hopes of classifying Internet activity under the current Canadian criminal law system.

Teaching Experience:

Teaching Assistant/Tutor Marker

University of Cincinnati
Summer 2004
Crime Prevention
Criminal Justice Research Methods

Simon Fraser University
2003-2001
Quantitative Research Methods
Criminological Theory
Sociological Explanation of Criminal Behavior
Human Rights and Civil Liberties
Social Problems

Lectures

Simon Fraser University
2002-2001
Environmental Criminology
Crime Mapping/Archival Research Methods
Social Learning Theory, Social Control Theory, Labeling Theory
Masculinities Theory

Kwantlen University College
2002
Evolution of Criminological Theory

Conference Participation:

American Society of Criminology:

2005: Toronto, ON.
2004: Nashville, TN.

Empiricism Gone Wrong: The Legal and Political Interpretation of Racial Profiling Research

Academy of Criminal Justice Sciences:

2005: Chicago, IL.
Examining Traffic Stop Dispositions: Results from the Arizona Department of Public Safety

Police Executive Research Forum:

2004: Kansas City, Mo.
By the Numbers: How to Analyze Race Data from Vehicle Stops

Canadian Law and Society:

2002: Vancouver, B.C.
The interplay between privacy, the Canadian *Charter of Rights and Freedoms*, and the Internet.

Western Society of Criminology:

2002: San Diego, CA.
The lack of agreement among scholars, academics and governments regarding the basis of human rights impacts the protection of human rights within First World countries. Specifically, this disagreement affects Canadian policy regarding homelessness.

Invited Presentation:

2005

Engel, R. S. & Tillyer, R. The State of Racial Profiling Research: Analytical Issues Involved in Benchmarking and Examining Post-Stop Outcomes. Presentation delivered to the Ohio Highway Patrol, Columbus, OH, March 1, 2005.

2005

Tillyer, R. and Klahm, C. F. A 'Shot' of Crime: A spatial exploration into the relationship between liquor establishments and violent crimes. Poster Forum presented at the University of Cincinnati Graduate Recruitment Weekend, Cincinnati, OH, March 4, 2005.

2004

Cleveland Police Department
An overview of past racial profiling research and an outline of the most effective methods to initializing and carrying out a racial profiling project.

2004

Columbus Police Department
A presentation detailing crime trends over the past three years within the City of Columbus. Specifically, crime types were

2004

Community Police Patterning Center (CPOP)
A final report detailing the results of a survey of elementary students in Cincinnati, Ohio regarding their victimization experiences.

Administrative Experience:

2004 – Present University of Cincinnati
Member of the Graduate Student Committee
Primary Responsibilities: organize meetings with students, presentations at meetings, and a resource for new students.

2002-2001 Simon Fraser University
Graduate representative on the Appointments Committee within the School of Criminology. Focus on file evaluation, interviews and presentations for the hiring of Adjunct instructors and Professors for tenure-track positions within the School.

Professional Associations:

American Society of Criminology
2002 - Present
Academy of Criminal Justice Sciences
2004 - Present

Professional Training:

2004
Geographic Information Systems (GIS) training on ArcGIS through GIS Cubed. The training focused on basic tools within the GIS environment and specifically on the use of census data within a GIS project.

CURRICULUM VITA

RICHARD R. JOHNSON

Personal Data

Home Address	20 Ridge Drive, # 208 Fairfield, OH 45014 (513) 942-4757
Work Address	Division of Criminal Justice University of Cincinnati P. O. Box 210389 Cincinnati, OH 45221-0389
E-mail Address	richardjohnson5385@hotmail.com

Education

Doctoral Student	**Criminal Justice** **Division of Criminal Justice** **University of Cincinnati, Cincinnati, Ohio** Advisor: Dr. Robin Engel, PhD Primary Concentrations: Criminal Justice and Policing Secondary Concentrations: Crime Prevention and Criminology	2002-Present
M.S.	**Criminology** **Department of Criminology** **Indiana State University, Terre Haute, Indiana** Concentration: Policing Culminating Project: *"Program Evaluation of a Domestic Violence Probation Program"*	2000
B.S.	**Criminal Justice** **School of Public and Environmental Affairs** **Indiana University, South Bend, Indiana** Concentration: Policing Minor: Public Administration	1996
A.S.	**Criminal Justice** **School of Public and Environmental Affairs** **Indiana University, South Bend, Indiana** Concentration: Policing	1995

Experience

2002-present **Adjunct Instructor**, Division of Criminal Justice
University of Cincinnati, Cincinnati, Ohio

1999-2001 **Adjunct Professor**, Department of Criminal Justice
Waubonsee Community College, Sugar Grove, Illinois

1997-1999 **Adjunct Instructor**, Department of Public Services
Vincennes University, Ft. Benjamin Harrison, Indiana

Teaching Interest Areas

Introduction to Policing
Police Operations
Criminal Investigation
Research Methods
Criminal Justice Management
Domestic Violence

Teaching Skills

Distance Learning Experience – Received 16 hours of training in teaching via video teleconferencing classroom. Experienced teaching to two campuses simultaneously via a video teleconferencing system. Spring Semester, 2000 – Waubonsee Community College.

Accelerated Teaching Format Experience – Taught through an accelerated format teaching 5 hours each on Saturday and Sunday for 4 weekends. Spring and Fall Semesters, 1998 – Vincennes University.

Problem-Based Learning Model Training – Received 16 hours of training in the use of the student-based, problem-based learning model for instruction. Summer, 2000 – Waubonsee Community College.

Electronic Classroom Skills – Have extensive experience in the use of multi-media teaching delivery systems including the use of PowerPoint and video-assisted lectures. Well versed in the use of the Blackboard electronic course management system to assist with grading, readings, and assignments.

Courses Taught

Introduction to Criminal Justice
Autumn Quarter, 2003 – University of Cincinnati*
Spring Quarter, 2003 – University of Cincinnati
Fall Semester, 2000 – Waubonsee Community College
Spring Semester, 2000 – Waubonsee Community College
Fall Semester, 1999 – Waubonsee Community College
Spring Semester, 1999 – Waubonsee Community College

Juvenile Delinquency
Fall Semester, 2000 – Waubonsee Community College

Juvenile Justice System
Spring Semester, 2001 – Waubonsee Community College

Substantive Criminal Law
Spring Semester, 1998 – Vincennes University Ft. Harrison

Criminal Justice Management
Winter Quarter, 2004 – University of Cincinnati*

Introduction to Policing
Winter Quarter, 2004 – University of Cincinnati*
Winter Quarter, 2003 – University of Cincinnati

Police Patrol Operations
Fall Semester, 1998 – Vincennes University Ft. Harrison

Criminal Investigation
Spring Quarter, 2003 – University of Cincinnati
Winter Quarter, 2003 – University of Cincinnati

Police and the Community
Spring Quarter, 2004 – University of Cincinnati*
Winter Quarter, 2004 – University of Cincinnati*

Police Organization and Management
Autumn Quarter, 2004 – University of Cincinnati
Summer Quarter, 2004 – University of Cincinnati
Summer Quarter, 2003 – University of Cincinnati

* Co-taught with a full faculty member.

Publications

Richard R. Johnson (2004). Citizen expectations of police traffic stop behaviors. *Policing: An International Journal of Police Strategies and Management,* 27(4), 487-497.

Richard R. Johnson (2004). Police officer frustrations about handling domestic violence calls. *Police Journal,* 77(3), 207-219.

Richard R. Johnson (2002). Changing attitudes about domestic violence. *Law and Order,* 50(4), 60-65.

Richard R. Johnson (2001). Intensive probation for domestic violence offenders. *Federal Probation,* 65(3), 36-39.

Richard R. Johnson (2001). The importance of dispatchers in the response to domestic violence. *Sheriff,* 53(6), 40-42.

Richard R. Johnson (2001). The psychological influence of the police uniform. *FBI Law Enforcement Bulletin,* 70(3), 27-32.

Richard R. Johnson (2000). Making death notifications. *Law and Order,* 48(10), 177-180.

Richard R. Johnson (1999). The advantages of two-officer patrol teams. *Law and Order,* 47(1), 68-70.

Richard R. Johnson (1998). Citizen complaints: What the police should know. *FBI Law Enforcement Bulletin,* 67(12), 1-5.

Richard R. Johnson (1998). Responding to aircraft accidents. *Law and Order,* 46(8), 107-111.

Richard R. Johnson (1998). A patrol officer's guide to identifying child abuse. *Law and Order,* 46(4), 77-79.

Richard R. Johnson (1997). Ten principles for managing anger. *Law and Order,* 45(5), 53-55.

Richard R. Johnson (1996). Military resources for police. *Law and Order,* 44(11), 79-81.

Richard R. Johnson (1996). Aggression influences on police officers. *Law and Order,* 44(7), 56-58.

Works Under Review

Richard R. Johnson, Police uniform color and citizen impression formation. Under review by the *Journal of Police and Criminal Psychology* since July, 2004. Revise & resubmit, March, 2005.

Richard R. Johnson, The influence of management on officer traffic enforcement activity. Under review by *Policing: An International Journal of Police Strategies and Management* since August, 2004. Revise & resubmit, March, 2005.

Richard R. Johnson, Police management influences on patrol officer drug enforcement activity. Under review by *Police Practice and Research: An International Journal* since September, 2004.

Richard R. Johnson, Racial profiling or simply misreading the cues? Under review by *Police Journal* since October, 2004.

Richard R. Johnson, Confounding influences on police detection of deception. Under review by the Journal of Criminal Justice since March, 2005.

Works in Progress

Richard R, Johnson, Police management influences on officer domestic violence arrest activity.

Richard R. Johnson, Firearms assaults against the police at family disturbance calls.

Technical Reports

Robin S. Engel, Jennifer M. Calnon, **Richard R. Johnson**, Robert Tillyer, Lin Liu (2005). *Project on Police-Citizen Contacts, Year 2 Annual Report.* Harrisburg, PA: Pennsylvania State Police.

Robin S. Engel, Jennifer M. Calnon, Lin Liu, **Richard R. Johnson** (2004). *Project on Police-Citizen Contacts, Year 1 Annual Report.* Harrisburg, PA: Pennsylvania State Police.

Lawrence Travis, Robin S. Engel, William Elderman, **Richard R. Johnson** (2004). *Ohio Public Safety Communications Interoperability Survey*. Columbus, OH: Ohio Department of Administration.

Conference Presentations

Matthew Zingraff and **Richard R. Johnson**, *Observational Benchmarking Techniques*, Police Executive Research Forum (PERF) Conference "By the Numbers: How to Analyze Race Data from Vehicle Stops," Kansas City, August 24-25, 2004.

Richard R. Johnson, *Utilizing Theory to Explain the Behavior of Criminal Justice Officials*, Annual Conference of the American Society of Criminology, Denver, November 19-22, 2003.

Richard R. Johnson, *Race Differences in Driving Behavior: Implications for Racial Profiling Research*, Annual Conference of the Midwestern Criminal Justice Association, Chicago, October 2-4, 2003.

Richard R. Johnson, *Police Officer Frustrations about Handling Domestic Violence Calls*, Annual Conference of the Midwestern Criminal Justice Association, Chicago, October 2-4, 2003.

Research Experience

2003 – 2005	**Project Manager**, Project on Police-Citizen Contacts. A racial profiling evaluation of all traffic stops conducted by trooper of the Pennsylvania State Police. Principle Investigator: Dr. Robin S. Engel.
2003 – 2004	**Principle Investigator**, Patrol Officer Productivity Influences Study. Conducted a study of management and organizational influences on patrol officer arrest productivity of a sample of 407 municipal police officers from 23 suburban police agencies in Southwestern Ohio.
2003 – 2004	**Research Assistant**, Ohio State Interoperability Public Safety Radio Communication Survey, a survey of police, fire, and EMS communications capability for the Ohio Department of Administrative Services. Principle Investigators: Dr. Lawrence Travis and Dr. Robin S. Engel

Research Interests

Effective criminal justice system responses to domestic violence
Effective police first-line supervision techniques
Police-citizen interactions
Criminal justice curricula development

Training Conducted

Robin S. Engel and **Richard R. Johnson**, *Effective Supervision for Community Policing*, Fairfield Police Department, Fairfield, OH. Facilitated a one-day training seminar for 14 police sergeants and lieutenants. October, 2004.

Robin S. Engel and **Richard R. Johnson**, *Effective Supervision for Community Policing*, Roanoke Police Department Regional Academy, Roanoke, VA. Facilitated a two-day training seminar for 37 police sergeants and lieutenants. December, 2003.

Richard R. Johnson and Sean Fergus, *Domestic Violence Investigations*, Kane County State's Attorney Office, St. Charles, IL. In-service training seminar attended by 207 municipal police officers, April, 2001.

Richard R. Johnson, *Causes and Types of Juvenile Domestic Violence*, Kane County Court Services, St. Charles, IL. In-service training seminar attended by 55 juvenile detention officers, December, 1999.

Richard R. Johnson, *Supervising Domestic Violence Offenders,* Kane County Court Services, St. Charles, IL. In-service training seminar attended by 111 probation officers, September, 1999.

Awards and Honors

2004 - University Graduate Scholarship, Division of Criminal Justice, University of Cincinnati.

2003 - University Graduate Scholarship, Division of Criminal Justice, University of Cincinnati.

2002 - University Graduate Scholarship, Division of Criminal Justice, University of Cincinnati.

2000 - Partner in Peace Award for the Prevention of Domestic Violence, Community Crisis Center, Elgin, Illinois.

1996 - Outstanding Criminal Justice Student Award, School of Public and Environmental Affairs, Indiana University at South Bend.

1996 - Scholastic Achievement Award, Indiana University at South Bend.

Practitioner Experience

Criminal Investigator – Kane County State's Attorney Office (IL) [1 year]
Trooper – Indiana State Police [14 years]
Probation Officer – Kane County Court Services (IL) [2 years]
Military Police Officer – U.S. Air Force and Air Force Reserves [6 years]

Professional Affiliations

Academy of Criminal Justice Sciences
American Society of Criminology
Midwestern Criminal Justice Association
Pi Alpha Alpha Honor Society

References

Dr. Robin S. Engel, Ph.D.
Associate Professor
Division of Criminal Justice
University of Cincinnati
P.O. Box 210389
Cincinnati, OH 45221-0389
(513) 556-5850
Robin.Engel@UC.Edu

Dr. John P. Wright, Ph.D.
Associate Professor
Division of Criminal Justice
University of Cincinnati
P.O. Box 210389
Cincinnati, OH 45221-0389
(513) 556-5829
John.Wright@UC.Edu

Dr. James Frank, J.D., Ph.D.
Associate Professor
Division of Criminal Justice
University of Cincinnati
P.O. Box 210389
Cincinnati, OH 45221-0389
(513) 556-5832
James.Frank@UC.Edu

Lin Liu, Ph.D., Associate Professor
Department of Geography
University of Cincinnati
Cincinnati, OH 45221-0131
Tel: (513) 556-3429
Fax: (513) 556-3370
Email: lin.liu@uc.edu

A. Education

1984 B.S., Geography, Peking University
1987 M.S., Remote Sensing, Peking University
1994 Ph.D., Geography, The Ohio State University

B. Positions and Honors

Positions and Employment

1987-1989 Assistant Professor, GIS Lab Manager, Peking University, China
1989-1990 Software Engineer, State Land Administration, China
1991 Graduate Student Intern, Environmental Systems Research Institute (ESRI), Redlands, CA
1994-1996 Assistant Professor, University of New Orleans, LA
1997-2001 Assistant Professor, University of Cincinnati, OH
2001-Present Associate Professor, University of Cincinnati, OH

Honors

1996 China-Cornell Fellowship
1996-1997 President, Association of Overseas Chinese Professionals in GIS (CPGIS)
1997 Summer Research Fellowship, University of Cincinnati

C. Selected Publication (2000 – Present)

Liu, L. 2005. *GIS and Risk Assessment/Management*, editor, a special Issue of *International Journal on Risk Assessment and Management.* Inderscience, UK.

Hasan, K., L. Liu 2005. Estimating the Spatial-temporal Distribution of Radon Releases from the K-65 Silos, *International Journal on Risk Assessment and Management.* Inderscience, UK.

Li, B., Q. Zhou, Y. Ding, L. Liu, H. Tu and Q. Tang. 2003. Expert Evaluation as Means of Promoting GIS Software Development, *Journal of Geographic Information Sciences*. Vol 9, No. 1-2. December 2003. pp: 22-28.

Liu, L. X. Wang, J. Eck and J. Liang. 2004. Simulating Crime Events And Crime Patterns In a RA/CA Model, *Geographic Information Systems and Crime Analysis*, edited by F. Wang. 2004. Reading, PA: Idea Publishing.

X. Xu, L. Liu. 2004. GIS based Analysis of Store Closure: A Case Study of An Office Depot Store in Cincinnati, *Proceedings of 12th Int. Conf. on Geoinformatics* – Geospatial Information Research: Bridging the Pacific and Atlantic University of Gävle, Sweden, 7-9 June 2004. pp. 533-540.

Liu, L. and X. Wang. 2002. "Building a geographic information system for the sustainable development of Chiang Mai," In Romanos, M. and C. Auffrey, eds. *Managing the development of intermediate size cities: the sustainability of urban existence in Thailand.* Dordrecht, The Netherlands: Kluwer Academic Publishers.

Liu, L. 2000. "A cell-based distance decay model for studying water quality in relation to non-point source pollution", *Proceedings of 4th International Conference on Integrating GIS and Environmental Modeling (GIS/EM4): Problems, Prospects and Research Needs.*

Lee, B., L. Liu and H. Stafford. 2000. "Industrial Districts: Measuring Local Links", *Industrial Networks and Proximity* (edited by M.B. Green and Rod McNaugton), Ashgate Publishing. pp. 87-104.

D. Research Support

Uber, J. and L. Liu. "Drinking Water Quality and Emergency Visits for Gastroenteritis in Atlanta", funded by USEPA through Emory University. Duration: 9/1/2004-8/31/2007. Total funding: $235,000.

Eck, J. and L. Liu. "Analyze Data on Cincinnati Police Vehicle Stops", funded by The City of Cincinnati. Duration: 10/16/2001 to 10/15/2003. Total funding: $146,075.

Frohn, R., R. Beck, L. Liu and X. Wang. "Statewide Land Use Classification and Validation in Ohio", funded by Ohio Environmental Protection Agency. Duration: 7/1/2001 to 12/31/2004. Total funding: $333,930.

Liu, L., R. Bhatnagar. "Advanced Algorithms for Spatial Temporal Interactions in Distributed GIS Environments", funded by National Science Foundation (NSF), duration 9/1/2000 to 8/31/2004. Total funding: $489,621.

Pant, P. D., Y. Cheng and L. Liu. "Rational Schedule of Base Accident Rates for Rural Highways in Ohio", funded by Ohio Department of Transportation (ODOT), duration 7/1/2000 to 6/30/2002. Total funding: $195,070.

E. Student Advising

10 advisees (3 Ph.D., 7 M.A.) have graduated under my supervision. Currently having 4 Ph.D. and 1 M.A. advisees.

VITA

Xuguang Wang, Ph.D.
GIS Software Product Specialist, ESRI
380 New York St., Redlands, CA 92373

Education

Mar. 2005 **Ph.D.**, Geography, with specialization in GIS, University of Cincinnati, Cincinnati, Ohio, U.S.A.

June 2000 **M.E.**, Photogrammetry and Remote Sensing, Chinese Academy of Surveying and Mapping, Beijing, P. R. China

July 1997 **B.S.**, Environmental Studies, Peking University, Beijing, P.R. China

Employment History

Jan. 2005 – present **GIS Software Product Specialist**
Environmental Systems Research Institute (ESRI), Inc.
Redlands, California, U.S.A.

Sept. 2004 – Dec. 2004 **GIS Lab Assistant**
Department of Geography, University of Cincinnati, Ohio, U.S.A.

Jan. 2004 – Aug. 2004 **Research Assistant**
Department of Geography & Division of Criminal Justice, University of Cincinnati, Ohio, U.S.A.

Sept. 2003 – Dec. 2003 **Teaching Assistant**
Department of Geography, University of Cincinnati, Ohio, U.S.A.

Jan. 2001 – June 2003 **Research Assistant**
Department of Geography, University of Cincinnati, Ohio, U.S.A.

July 2000 – Dec. 2000 **Surveying and Mapping Engineer**
Chinese Academy of Surveying and Mapping, Beijing, P. R. China

July 1998 – June 2000 **Research Assistant**
Chinese Academy of Surveying and Mapping, Beijing, P. R. China

Publications

Lin Liu, **Xuguang Wang**, John Eck, and Jun Liang (2005). "Simulating crime events and crime patterns in a RA/CA model". *Geographic Information Systems and Crime Analysis,* Edited by F. Wang. Hershey, PA: Idea Group Publishing

Conference Presentations

Nov. 2004. "Agent learning and adaptation in a RA/CA crime simulation model". The 2004 American Society of Criminology Conference, Nashville, Tennessee, U.S.A.

Mar. 2004. "Spatial crime pattern simulation using agent-based modeling and GIS". In paper session: *Place of Insecurity and Public Response*, The 2004 Association of American Geographers Annual Meeting, Philadelphia, Pennsylvania, U.S.A.

Professional Affiliations

Association of American Geographers (in GIS, Quantitative and Mathematical Geography Specialty Groups) Association of Chinese Professionals in Geographic Information Systems (Abroad)

Honors and Awards

Graduate student summer research fellowship, University of Cincinnati, July 2003
University Graduate Scholarship, University of Cincinnati, 2001 - 2003
Third Prize Winner, National Mechanic Competition, P. R. China, 1992 – 1993

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