Project on Police-Citizen Contacts

Year 1 Final Report

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Colonel Jeffrey Miller, Commissioner of the Pennsylvania State Police

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EXECUTIVE SUMMARY

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 was being followed by Troopers. To determine if racial disparities exist, data was collected during 327,120 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.

Four different disproportionality indices were created for racial/ethnic groups: 1) all traffic stops were compared to county level residential Census data, 2) traffic stops of drivers residing in the counties where they were stopped were compared to county level residential Census data, 3) daytime traffic stops were compared to daytime roadway observations, and 4) daytime traffic stops for speeding were compared to daytime speeding observations. Of these comparisons, it is argued that the most reliable disproportionality indices compare traffic stop data against roadway usage and speeding behavior observations.

Roadway usage and speeding observations were initially conducted in a sample of 20 Pennsylvania counties across various times of the day, days of the week, and months of the year. After examining the traffic stop data comparisons to residential Census data, several counties were identified as having disproportionality indices that were significantly higher than the other counties. As a result, roadway and speeding observations were conducted in seven additional counties. In total, 1,578 hours of roadway and speeding observations were conducted in 27 counties, and observers recorded information about 161,169 passing vehicles and drivers.

After examining multiple traffic stop disproportionality indices for each county, it is the conclusion of this report that no consistent evidence exists to suggest that Pennsylvania State Troopers make stopping decisions based on drivers' race or ethnicity. That is, although racial and ethnic disparities in traffic stops exist, these disparities decrease dramatically when more appropriate observation benchmarks are utilized. Several additional findings support this conclusion as well. First, the percentage of minority drivers stopped during the day are virtually identical to the percentage of stops at night when it would be much more difficult for Troopers to assess drivers' race and/or ethnicity. Second, the data collected from roadway speeding observations show that black drivers and non-Caucasian drivers are more likely to speed, and do so more aggressively, compared to Caucasian drivers. Speeding behavior will likely increase drivers' risk of being stopped by PSP Troopers because approximately 75% of PSP traffic stops are for speeding violations. Third, few racial differences exist in the initial reasons for the traffic stop. Finally, when stopped for speeding, the average speed is significantly higher for minority drivers compared to white drivers. That is, there is no evidence to suggest that minorities are being stopped for more minor offenses compared to white drivers.

For post-stop outcomes, though, it appears there are racial, ethnic, and gender disparities, particularly for arrest and search decisions. Examination of traffic stop data with hierarchical multivariate statistical models reveals that the strongest predictors of post-stop outcomes are the reasons for the stop and other legal factors. Even after controlling for these legal factors, however, some drivers' characteristics remain statistically and substantively significant predictors of post-stop outcomes. For example, the odds of black drivers being arrested and searched are 1.5 and 3.0 times higher compared to the odds of white drivers, respectively. Likewise, the odds of Hispanic drivers being arrested and searched are 1.8 and 2.7 times higher compared to the odds of white drivers, respectively. Furthermore, a comparison of search success rates shows that minority drivers who are searched are significantly less likely to be in possession of contraband compared to white drivers who are searched. The reasons for searches also differ significantly across racial and ethnic groups.

Therefore, it is the conclusion of this report that some racial, ethnic, and gender disparities exist for post-stop outcomes (particularly arrests and searches). It cannot be determined with these data, however, if these disparities are due to discrimination because of the inability to measure all factors that might account for these disparities. Rather, the findings show that racial, ethnic, and gender disparities in traffic stop dispositions remain after statistically controlling for the legal factors that can be measured with these data.

Based on earlier recommendations, PSP administrators have taken initial steps to address these disparities, 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 traffic stop data collection, 4) the addition of data collection on information related to search decisions, and 5) the installation and use of digital recorders in every patrol car. This report recommends the continuation of these new initiatives, with a redirected focus on officer training and supervisor accountability. In addition, it is recommended that PSP administrators further examine the factors that lead officers to initiate searches. Based on this additional information, PSP administrators may find it necessary to reconsider and perhaps refine their policies regarding consent and other types of discretionary searches.

I. INTRODUCTION

PROJECT ON POLICE-CITIZEN CONTACTS

I. INTRODUCTION

One of the most salient research and public policy issues currently facing police administrators involves the possible use of race and/or ethnicity as a criterion in police decision-making during discretionary traffic and field interrogation stops. This behavior, often described as "racial profiling" has led to widespread criticism of the police at the local, state, and national levels. The perceived phenomenon of racial profiling is well known in American society. Researchers and the media have repeatedly documented individual cases of prominent minority citizens being stopped, detained, and often harassed by police based solely or partially, they believe, on their race and/or ethnicity (e.g., Harris, 1999b; Reilly, 2002; West, 1993). It has been so widespread that the term "DWB" (driving while black/brown) has become part of the American lexicon (Harris, 1999a, 1999b). Likewise, a Gallup poll conducted in 1999 reported that the vast majority of Americans (77% of blacks and 56% of whites) believed that racial profiling is widespread, and that 81% reported disapproval for this practice (Newport, 1999). This widespread attention to the issue of profiling reflects public concern that race-based decision-making reflects racial prejudice, either overt or covert, by individual police officers and administrators.

The practice of targeting racial minorities for routine traffic and pedestrian stops can be traced back to the war on drugs that promoted profiling as an effective policing tactic to detect drug offenders (Harris, 2002; Tonry, 1995). The legitimacy of this tactic, however, has recently come under increased scrutiny and a debate regarding the effectiveness of profiling strategies has ensued. Some scholars and activist groups argue that targeting individuals based solely on their race and/or ethnicity is an ineffective and discriminatory police practice (Harris, 2002; Kennedy, 1997). Other scholars argue that since minorities are more likely to commit crime, profiling strategies represent a rational policing response (Hersezenhorn, 2000; Taylor & Whitney, 1999). This debate has brought to light the realization that most police departments did not collect information necessary to examine the issues surrounding racially biased policing (Harris, 2002). Furthermore, many data collection efforts that did exist were poorly implemented, monitored, and designed, lacked important legal and extralegal variables, and suffered from inappropriate and limited statistical rigor applied in the analyses (Engel, Calnon, & Bernard, 2002).

The problem of racial profiling came to a prominent place in public attention in the mid 1990s, with the most visible events occurring in two of Pennsylvania's neighboring states: New Jersey and Maryland. Several related events in New Jersey brought that state to the forefront of the racial profiling controversy. In 1996, a New Jersey Superior Court judge dismissed a case against 19 defendants (*State v. Pedro Soto*) based on the suppression of evidence obtained in a series of searches, which the defendants argued were not valid because they were part of a pattern of racial profiling by New Jersey State Troopers. The dismissal of this case prompted an appeal in 1998, during which two Troopers fired 11 shots into a van carrying four young Black males after a traffic stop, injuring three of them. Shortly after the shooting, newspaper reports of disproportionate minority arrest statistics on the turnpike prompted New Jersey State Police Superintendent Williams to argue that the drug problem primarily involves minority groups, a comment after which the Superintendent was promptly fired by Governor Whitman (Ramirez, McDevitt, & Farrell, 2000).

In Maryland, the racial profiling controversy arose out of a 1992 traffic stop of Robert Wilkins and his family. It was followed by a well-publicized, ACLU-sponsored, lawsuit (*Wilkins v. Maryland State Police*). The reason for the traffic stop was a relatively minor speeding violation (5 mph over a 55 mph speed limit), but the stop was prolonged by an unfruitful search of the family's rental car conducted by officers and canines. It is due to the *Soto* and *Wilkins* lawsuits in these two states that researchers began to get involved in traffic stop and benchmark data collection. Dr. John Lamberth first conducted his observational surveys of driver speeding on segments of the I-95 turnpike in New Jersey and Maryland (Lamberth, 1994, 1996). In addition to the relevant events outside of Pennsylvania's borders, there were further relevant events within the state, as both the Pittsburgh and Philadelphia police departments have already begun mandatory data collection on traffic and/or pedestrian stops pursuant to the settlement of a federal consent decree and ACLU lawsuits (Ramirez et al., 2000).

DATA COLLECTION FOR THE PENNSYLVANIA STATE POLICE

It is within this context and political climate that the Pennsylvania State Police teamed with researchers from The Pennsylvania State University to *voluntarily* implement a data collection effort designed to examine traffic stop patterns and post-stop outcomes for citizens stopped by PSP Troopers. The Pennsylvania State Police have a strict policy prohibiting the use of biased-based profiling by their members. The Pennsylvania State Police define "biased-based profiling" in the following manner:

> 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).

In January 2002, the Pennsylvania State Police contracted with Dr. Robin Engel, the Principal Investigator, and her research team from The Pennsylvania State University 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. Data included in this final report for Year 1 were collected from May 1, 2002 – April 30, 2003.

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. This final report, based on a full year of data collection, includes the similar statistical analyses as provided in previous reports, but also includes final results from the roadway observation and speeding study, comparisons of various benchmarks for stop data, and final multivariate analyses of post-stop outcomes. The results documented in this final report should take precedence over findings reported earlier based on partial data.

Issues Involved in Police Stop Data Collection

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) collection of traffic stop data to benchmarks (i.e., the denominator), 3) the creation and interpretation of disproportionality indices (i.e., the numerator divided by the denominator), and 4) examinations of post-stop outcomes (i.e., disposition data). Each of these four areas have special considerations and research issues that must be addressed to provide data and analyses that are accurate and valid. These issues are identified and described below, and the response of the Pennsylvania State Police and academic research team regarding these issues is documented throughout 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.

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 is further described in Section II.

Note that the gender and racial/ethnic characteristics of drivers 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. 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 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 be conducted for the full 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 that determining how often minorities are stopped by police 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, Blackman, & Johnson, 2001; Smith et al., 2000)

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., 2000; 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 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 are making stops. Of the traffic stops analyzed for this report, over 75% 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 were compared to three related benchmarks: 1) census data of residential driving age populations (i.e., individuals 16 years or older) where the traffic stops occurred, 2) systematic observations of roadway usage, and 3) systematic observations of traffic violating behavior (i.e., speeding). In addition, analyses of only those stopped motorists who reside within the county where they were stopped were compared to Census information (i.e., the numerator was changed to match the Census based denominator). In Section IV, each of these benchmark measures is more fully described, and in Section V the comparison of benchmark results are reported.

The Creation and Interpretation of Disproportionality Indices

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. For example, an index of 5.0 would suggest that the rate of stops of a particular group in a particular area was five times higher than the expected level of stops for that group in that area.

There are several issues involved with the use of disproportionality indices. First, there is an obvious connection between the validity of disproportionality indices and the type of benchmark used to make the comparison. 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, 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 because the denominator is so small.

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. For this study, we examined the size of the disproportionality indices 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 that were one or two standard deviations above the mean when transformed to Z-scores. In addition, we compared disproportionality indices for the same county created through different benchmarks. Our specific findings and more information related to disproportionality indices are provided in Section V.

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 whites (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 (1999b, 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 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 artifactual 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.

Further description of the multivariate analyses and associated caveats are described in Sections IV and VI.

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.

Report Outline

The following final report is divided into seven sections: 1) introduction, 2) traffic stop data collection methodology, 3) description of traffic stop data, 4) collection and description of roadway usage and speeding observations, 5) traffic stop benchmark comparisons, 6) description and analyses of post-stop outcomes, 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 over 327,000 traffic stops.

Section III

Section III provides descriptive statistics for the traffic stop data collected for the entire 12-month period. 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.

Section IV

Section IV 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 latter part of Section IV describes the observation data at the state, county, and municipality level. It also discusses bivariate and hierarchical multivariate analyses of driver, vehicle, and location correlates of speeding behavior.

Section V

Section V compares the rate of stops of racial groups to available benchmark information, including driving-age population Census data, residency of drivers based on zip codes, observations of roadway usage, and observations of drivers' speeding behaviors. Based on these data, comparisons are made at the county level. To aid in the interpretation of the benchmark comparisons, several maps and tables are included in this section. Disproportionality indices are created to examine the differences in the percentage of minority drivers stopped by Troopers compared to their representation in several of these comparison populations. Based on the population-based disproportionality indices, nine counties were selected for more detailed examination.

Section VI

The post-stop outcomes (e.g., warning, citation, arrest, search, and seizure of contraband) are documented in Section VI. More specific information is also presented for searches and seizures. 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 VI, several hierarchical multivariate analyses are presented that predict officer decision making after the traffic stop has been made.

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.

II. TRAFFIC STOP
DATA COLLECTION METHODOLOGY

II. TRAFFIC STOP DATA COLLECTION METHODOLOGY

This section documents the methodology utilized for the data collection effort. Specifically, the collection of the police-citizen contact data and census residential driving age population data are described below. The limitations of this data collection effort are also discussed. **Figure 2.1** (the Citizen Contact Report) and **Table 2.1** (a summary of the year's submitted contact reports) are described and included in the text.

CONTACT DATA

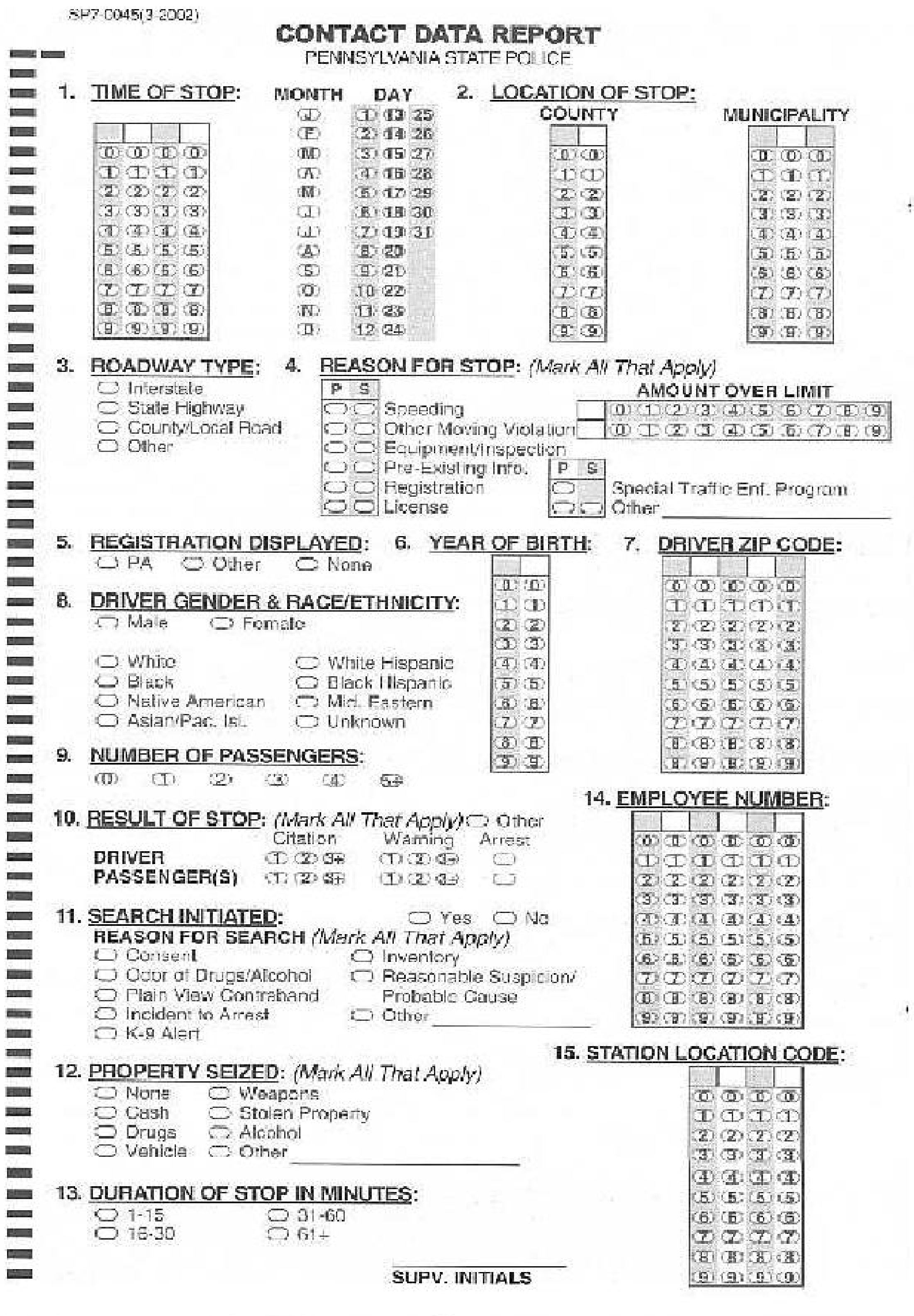
The police contact form utilized by Troopers during all member-initiated traffic stops gathers information regarding: 1) the stop (e.g., date/time, location, type of roadway, reasons for the stop, and the duration of the stop), 2) the driver (e.g., gender, age, race/ethnicity, zip code of residency), 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). **Figure 2.1** is a copy of the data collection form.

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. In addition, bi-weekly 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.**

As noted in Section I, 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 327,289 forms received by project personnel, only 169 forms were not ultimately included in the final data set. These forms were likely excluded because the errors detected were uncorrectable by project staff. All other forms that were initially rejected by the scanner were subsequently corrected and included in the data set. Of the 327,120 forms included in the final data set, only 4.3% had one or more items missing. Adding the rejection and missing data rates, only 4.9% 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. Beaver, Emporium, and Huntingdon stations led the department with the lowest missing data rate (1.3%) while Swiftwater station had the highest (12.1%).

Figure 2.1. Pennsylvania State Police Contact Data Report.



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

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

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)* Other

	Citation	Warning	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

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**, 1.7 % 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 0.3% for Avondale, Coudersport, Ebensburg, and Somerset (A) stations and a high of 8.9% for Swiftwater station.

In addition, only 0.3% of forms had missing or invalid employee identification numbers. This percentage varied across stations from 0.0% for Kiski Valley and Lehighton stations to 2.0% for Lancaster 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 Section I:

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 made by Colonel Evanko's administration and continued under the leadership of Colonel Miller.

Table 2.1. Scan Form Report for May, 2002 - April, 2003 (p.1 of 5).

	Total # Received	% Rejected Initially	% Missing Any Data	% Missing Race	% Missing Emp ID #	% Missing Supv Sign	Total # in Dataset
PSP Department	**327,289**	**0.6%**	**4.3%**	**1.7%**	**0.3%**	**0.0%**	**327,120***
AREA I	121,231	0.8%	4.5%	1.5%	0.4%	0.0%	120,494
Troop H	21,657	1.0%	5.1%	2.2%	0.3%	0.0%	21,481
Troop J	11,998	0.5%	3.8%	1.2%	0.7%	0.0%	11,656
Troop L	11,187	0.7%	5.0%	1.3%	0.2%	0.0%	11,129
Troop T	76,389	1.1%	4.1%	1.3%	0.3%	0.0%	76,228

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	3,101	25	0.8%	5.6%	1.6%	0.4%	0.0%	3,081
Chambersburg	2130	3,870	48	1.2%	3.1%	1.3%	0.3%	0.0%	3,798
Gettysburg	2160	1,965	36	1.8%	2.8%	1.5%	0.1%	0.0%	1,962
Harrisburg	2110	5,277	59	1.1%	5.1%	1.9%	0.3%	0.0%	5,269
Lykens	2140	1,079	7	0.6%	5.2%	0.9%	0.5%	0.0%	1,064
Newport	2150	1,588	12	0.8%	6.0%	3.7%	0.3%	0.0%	1,579
York	2170	4,777	28	0.6%	7.0%	4.0%	0.4%	0.0%	4,728

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	3,502	14	0.4%	1.6%	0.3%	0.2%	0.0%	3,490
Embreeville	4230	2,910	2	0.1%	4.8%	2.3%	0.3%	0.0%	2,599
Ephrata	4250	1,665	6	0.4%	1.8%	0.7%	0.1%	0.0%	1,654
Lancaster	4210	3,921	43	1.1%	6.0%	1.5%	2.0%	0.0%	3,913

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	2,420	13	0.5%	4.9%	1.5%	0.1%	0.0%	2,414
Hamburg	4340	1,866	4	0.2%	11.4%	2.3%	0.2%	0.0%	1,836
Jonestown	4320	2,818	26	0.9%	2.3%	0.5%	0.2%	0.0%	2,817
Reading	4310	2,511	25	1.0%	5.1%	2.0%	0.2%	0.0%	2,500
Schuylkill Haven	4370	1,572	11	0.7%	2.4%	0.6%	0.1%	0.0%	1,562

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	10,027	111	1.1%	3.7%	1.3%	0.2%	0.0%	10,007
Everett	2240	12,726	145	1.1%	3.6%	0.9%	0.2%	0.0%	12,698
Gibsonia	2220	7,367	57	0.8%	2.8%	1.2%	0.3%	0.0%	7,353
King of Prussia	2270	7,757	111	1.4%	3.4%	0.9%	0.3%	0.0%	7,733
New Stanton	2290	7,210	101	1.4%	4.1%	1.5%	0.5%	0.0%	7,195
Newville	2250	12,001	68	0.6%	3.1%	1.0%	0.3%	0.0%	11,986
Pocono	2280	7,905	50	0.6%	4.6%	1.3%	0.3%	0.0%	7,886
Somerset (T)	2230	11,396	164	1.4%	7.1%	2.3%	0.5%	0.0%	11,370

* 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, 2002 - April, 2003 (p.2 of 5).

	Total # Received	% Rejected Initially	% Missing Any Data	% Missing Race	% Missing Emp ID #	% Missing Supv Sign	Total # in Dataset
PSP Department	**327,289**	**0.6%**	**4.3%**	**1.7%**	**0.3%**	**0.0%**	**327,120***
AREA II	40,933	0.6%	4.3%	2.2%	0.3%	0.0%	40,822
Troop F	23,104	0.5%	3.9%	1.9%	0.1%	0.0%	23,058
Troop P	7,769	0.3%	2.3%	1.6%	0.4%	0.0%	7,735
Troop R	10,060	1.0%	6.7%	3.2%	0.4%	0.0%	10,029

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	1,921	3	0.2%	1.8%	0.3%	0.2%	0.0%	1,917
Emporium	2430	1,497	0	0.0%	1.3%	0.8%	0.1%	0.0%	1,490
Lamar	2440	3,843	23	0.6%	7.2%	4.8%	0.1%	0.0%	3,851
Mansfield	2450	1,353	13	1.0%	4.9%	2.5%	0.2%	0.0%	1,345
Milton	2460	3,555	13	0.4%	3.7%	1.5%	0.2%	0.0%	3,549
Montoursville	2410	4,343	21	0.5%	3.8%	1.8%	0.1%	0.0%	4,331
Selinsgrove	2470	4,614	30	0.7%	3.4%	1.0%	0.2%	0.0%	4,601
Stonington	2480	1,978	2	0.1%	1.9%	1.1%	0.1%	0.0%	1,974

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	1,304	5	0.4%	1.9%	1.2%	0.2%	0.0%	1,298
Shickshinny	3240	946	5	0.5%	3.9%	0.9%	0.4%	0.0%	934
Towanda	3250	1,617	7	0.4%	4.2%	1.5%	0.2%	0.0%	1,613
Tunkhannock	3260	1,156	0	0.0%	4.0%	3.0%	0.1%	0.0%	1,152
Wyoming	3210	2,746	6	0.2%	3.8%	1.4%	0.7%	0.0%	2,738

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	2,120	27	1.3%	6.6%	4.1%	0.1%	0.0%	2,113
Dunmore	3310	4,070	43	1.1%	4.4%	1.6%	0.6%	0.0%	4,065
Gibson	3350	1,862	13	0.7%	6.9%	3.2%	0.5%	0.0%	1,849
Honesdale	3330	2,008	14	0.7%	11.1%	5.4%	0.2%	0.0%	2,002

* 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, 2002 - April, 2003 (p.3 of 5).

	Total # Received	% Rejected Initially	% Missing Any Data	% Missing Race	% Missing Emp ID #	% Missing Supv Sign	Total # in Dataset
PSP Department	**327,289**	**0.6%**	**4.3%**	**1.7%**	**0.3%**	**0.0%**	**327,120***
AREA III	61,908	0.3%	4.0%	1.0%	0.3%	0.0%	61,797
Troop A	14,800	0.3%	3.5%	0.8%	0.4%	0.0%	14,766
Troop B	25,062	0.3%	4.6%	1.4%	0.4%	0.0%	25,031
Troop G	22,046	0.2%	4.1%	0.9%	0.2%	0.0%	22,000

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	3,064	6	0.2%	1.6%	0.3%	0.2%	0.0%	3,055
Greensburg	1110	4,802	19	0.4%	5.5%	1.3%	1.0%	0.0%	4,798
Indiana	1130	2,994	10	0.3%	3.4%	0.7%	0.3%	0.0%	2,984
Kiski Valley	1140	2,246	1	0.0%	2.6%	1.1%	0.0%	0.0%	2,241
Somerset (A)	1160	1,694	5	0.3%	2.4%	0.3%	0.1%	0.0%	1,688

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	3,927	8	0.2%	3.7%	1.5%	0.2%	0.0%	3,917
Findlay	1230	7,193	27	0.4%	3.6%	0.9%	0.2%	0.0%	7,187
Uniontown	1240	4,337	9	0.2%	4.0%	1.5%	0.3%	0.0%	4,331
Washington	1210	6,715	28	0.4%	7.2%	1.6%	0.7%	0.0%	6,710
Waynesburg	1250	2,890	8	0.3%	3.0%	1.4%	0.2%	0.0%	2,886

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	2,612	8	0.3%	1.9%	0.5%	0.2%	0.0%	2,607
Hollidaysburg	2310	3,021	1	0.0%	2.9%	0.7%	0.3%	0.0%	3,018
Huntingdon	2330	1,831	0	0.0%	1.3%	0.4%	0.1%	0.0%	1,819
Lewistown	2340	3,550	6	0.2%	9.3%	2.1%	0.2%	0.0%	3,544
McConnellsburg	2350	2,403	7	0.3%	4.8%	1.2%	0.1%	0.0%	2,395
Philipsburg	2380	2,505	7	0.3%	3.3%	0.6%	0.2%	0.0%	2,499
Rockview	2370	6,124	9	0.1%	3.4%	0.8%	0.3%	0.0%	6,118

* 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, 2002 - April, 2003 (p.4 of 5).

	Total # Received	% Rejected Initially	% Missing Any Data	% Missing Race	% Missing Emp ID #	% Missing Supv Sign	Total # in Dataset
PSP Department	**327,289**	**0.6%**	**4.3%**	**1.7%**	**0.3%**	**0.0%**	**327,120***
AREA IV	57,383	0.2%	3.3%	1.6%	0.3%	0.0%	57,260
Troop C	28,197	0.2%	3.3%	1.6%	0.2%	0.0%	28,165
Troop D	14,432	0.2%	2.1%	1.0%	0.2%	0.0%	14,388
Troop E	14,754	0.3%	4.6%	2.1%	0.4%	0.0%	14,707

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	6,312	16	0.3%	3.1%	1.1%	0.2%	0.0%	6,302
Clearfield	1330	5,875	12	0.2%	2.5%	0.7%	0.3%	0.0%	5,867
Dubois	1340	5,333	5	0.1%	3.2%	1.3%	0.1%	0.0%	5,321
Kane	1350	1,986	7	0.4%	7.2%	5.6%	0.6%	0.0%	1,978
Punxsutawney	1310	3,372	5	0.1%	1.7%	0.7%	0.1%	0.0%	3,366
Ridgway	1360	2,661	9	0.3%	5.8%	4.3%	0.1%	0.0%	2,681
Tionesta	1370	2,658	10	0.4%	2.3%	1.1%	0.2%	0.0%	2,650

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	3,495	3	0.1%	1.3%	0.5%	0.2%	0.0%	3,486
Butler	1410	4,057	4	0.1%	2.1%	0.9%	0.3%	0.0%	4,047
Kittanning	1420	2,670	10	0.4%	1.8%	1.1%	0.2%	0.0%	2,661
Mercer	1430	2,738	2	0.1%	3.2%	1.8%	0.2%	0.0%	2,732
New Castle	1460	1,472	5	0.3%	2.3%	1.0%	0.1%	0.0%	1,462

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	919	3	0.3%	4.0%	2.3%	0.3%	0.0%	907
Erie	1510	3,202	5	0.2%	5.0%	1.4%	0.4%	0.0%	3,192
Franklin	1530	1,796	1	0.1%	4.5%	2.1%	0.4%	0.0%	1,786
Girard	1540	4,141	24	0.6%	4.9%	2.4%	0.5%	0.0%	4,135
Meadville	1550	3,819	14	0.4%	4.4%	2.3%	0.2%	0.0%	3,815
Warren	1560	877	4	0.5%	2.6%	1.0%	1.0%	0.0%	872

* 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, 2002 - April, 2003 (p.5 of 5).

	Total # Received	% Rejected Initially	% Missing Any Data	% Missing Race	% Missing Emp ID #	% Missing Supv Sign	Total # in Dataset
PSP Department	**327,289**	**0.6%**	**4.3%**	**1.7%**	**0.3%**	**0.0%**	**327,120***
AREA V	44,814	0.7%	4.9%	2.5%	0.2%	0.0%	44,720
Troop K	11,989	0.5%	3.7%	1.3%	0.2%	0.0%	11,966
Troop M	16,358	0.8%	3.4%	1.3%	0.3%	0.0%	16,325
Troop N	16,467	0.9%	7.6%	4.9%	0.2%	0.0%	16,429

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	5,933	22	0.4%	3.0%	0.9%	0.2%	0.0%	5,922
Philadelphia	4110	2,863	12	0.4%	5.4%	2.0%	0.3%	0.0%	2,859
Skippack	4130	3,193	24	0.8%	3.3%	1.4%	0.3%	0.0%	3,185

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	3,423	22	0.6%	2.6%	1.1%	0.5%	0.0%	3,417
Bethlehem	4410	2,804	18	0.6%	3.3%	0.9%	0.3%	0.0%	2,800
Dublin	4420	3,223	10	0.3%	3.7%	2.1%	0.2%	0.0%	3,212
Fogelsville	4450	3,937	24	0.6%	3.3%	1.0%	0.2%	0.0%	3,930
Trevose	4430	2,971	50	1.7%	4.1%	1.6%	0.4%	0.0%	2,966

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	2,974	16	0.5%	3.5%	2.0%	0.2%	0.0%	2,963
Fern Ridge	3130	1,836	10	0.5%	6.2%	3.3%	0.4%	0.0%	1,827
Hazleton	3110	3,730	68	1.8%	5.4%	2.6%	0.2%	0.0%	3,721
Lehighton	3140	1,522	18	1.2%	3.6%	1.4%	0.0%	0.0%	1,517
Swiftwater	3160	6,405	30	0.5%	12.1%	8.9%	0.1%	0.0%	6,401

Canine Section	8470	1,020	13	1.3%	6.0%	2.0%	0.2%	0.0%	1,015
Special Project	0008	81	1	1.2%	2.0%	1.3%	0.3%	0.0%	300

* 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.

CENSUS DATA FOR TRAFFIC STOP LOCATION & MOTORISTS' RESIDENCE

U.S. Census data was utilized for analyses involving both the numerator (i.e., traffic stop data) and the denominator (as an initial benchmark). For each member-initiated traffic stop by PSP Troopers, the municipality and county of the stop is recorded, along with the residential zip code of the driver. These codes are merged with demographic information provided by the U.S. Census. In Pennsylvania, there are 67 counties, 2,567 municipalities, and 2,111 residential zip codes. Municipalities are political subdivisions of counties and incorporate cities, boroughs, towns, and townships (U.S. Census Bureau, 2002). 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).

The percent of drivers stopped in the county and municipality in which they reside is estimated based on drivers' residential zip codes. Note, however, that 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.

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 for this report are based on estimates of <u>driving-age</u> residential populations (i.e., individuals 16 years or older). The use of census data as a benchmark is further described in section IV.

<u>Limitations of the methodology</u>

For the traffic stop data collected directly by Troopers, the reliability and validity of citizens' race involves two related concerns. First, Troopers 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 a potential effort by Troopers to protect themselves from criticism, departmental discipline, and potential lawsuits.

Unfortunately, the validity of the data collected by Troopers cannot be directly assessed. However, the PPCC has taken several steps to increase the validity and reliability of the data collected. First, Troopers have been guaranteed confidentiality by the research team, due in part to the repeated misunderstanding and misuse of police-citizen contact data. The promise of confidentiality is likely to encourage Troopers to accurately report information and to maintain their prior levels of activity. In addition, bi-weekly reports have been 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. PSP administrators can measure estimates of officer disengagement internally by comparing activity levels on other departmental forms (not including the traffic stop form) before and after the implementation of traffic stop data collection.

SUMMARY

This section documents the methodology utilized for the collection of police-citizen contact data as well as the use of census residential driving age population data. The major features of the data collection effort are summarized below.

- Information collected on PSP's citizen contact forms includes:
    - the stop (e.g., date/time, location, type of roadway, reasons for the stop, and the duration of the stop)
    - the driver (e.g., gender, age, race/ethnicity, zip code of residency)
    - the vehicle (e.g., state of registration, number of passengers)
    - the outcome of the stop (e.g., citation, written warning, arrest, search, property seized during the search)
    - identification information (e.g., location of the stop – county and municipality, and the Troopers' station and employee identification).

- The total number of forms included in the data set is 327,120, only 4.3% of which were missing any data.

- The remarkably low missing data rates documented in this section were likely due to the combination of several factors: the guarantee of confidentiality for troopers, pilot testing and training periods, consistent feedback on the completion of data forms, supervisors' accountability for subordinates' completion of data forms, and a firm commitment from the department's leadership.

- Each stop was able to be linked to U.S. Census data for the municipality and county in which the stop occurred.

- Population statistics for racial groups can be used for benchmark comparisons to traffic stops that occurred in the same municipality and county.

III. DESCRIPTION OF TRAFFIC STOP DATA

III. DESCRIPTION OF TRAFFIC STOP DATA

This section describes the findings based on a compilation of one full year of data (May 1, 2002 – April 30, 2003) received from the Contact Data Reports. 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 suggest any causal influences, as those are discussed in the subsequent sections. **Tables 3.1 – 3.7** report the specific data segments presented by category across the department, area, troop, and station level. Data for these aggregate levels are presented for comparison purposes only.

TRAFFIC STOP CHARACTERISTICS

Based on the valid data available, 327,120 traffic stops were initiated by Pennsylvania State Troopers (PSP) during the period beginning May 1, 2002 and ending April 30, 2003. Area I accounted for roughly one-third of the total stops (120,866). **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. These categories are reported at the department, area, and troop level in **Table 3.1**, while **Table 3.2** provides the information at the station level. Across the department, the majority of the stops were initiated on a weekday (71.8%) and occurred during the daytime (72.4%), with the 7 a.m. – 3 p.m. shift conducting 48.2% of the stops followed closely by the 3 p.m. – 11 p.m. shift accounting for 42.3% of the stops and the remaining 9.5% of the stops recorded during the 11 p.m. – 7 a.m. shift. Over 95% of the stops occurred on an interstate (54.5%) or state highway (41.6%). Local and county roadways only accounted for 3.7% of stops. The majority of vehicles stopped (71.1%) were registered in Pennsylvania and had on average 0.7 passengers. Over 90% of the stops lasted between 1-15 minutes in duration, while over 98% 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 (p.1 of 1)

	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+
PSP Dept.	327,120	71.8	72.4	48.2	42.3	9.5	54.5	41.6	3.7	0.2	71.1	0.7	90.4	7.9	1.2	0.4
Area I	120,866	71.9	74.4	48.3	42.8	9.0	75.0	22.5	2.3	0.2	67.7	0.7	91.2	7.5	1.0	0.4
Troop H	21,531	75.6	70.2	47.0	39.5	13.5	49.7	44.2	5.8	0.4	78.0	0.5	87.5	10.7	1.3	0.6
Troop J	11,958	78.6	68.6	45.4	41.5	13.2	1.4	91.5	7.0	0.1	88.5	0.6	85.6	11.1	2.7	0.6
Troop L	11,131	74.4	71.4	45.9	43.7	10.4	48.5	45.5	5.8	0.2	76.2	0.6	83.5	14.5	1.5	0.5
Troop T	76,246	69.5	76.8	49.4	43.8	6.8	97.6	2.2	0.1	0.1	60.3	0.8	94.2	5.0	0.5	0.3
Area II	40,831	69.3	74.5	51.3	40.8	7.9	37.1	59.7	3.1	0.1	69.9	0.7	88.9	9.7	1.2	0.2
Troop F	23,063	67.9	73.9	50.6	41.4	8.1	27.9	69.0	3.0	0.1	71.0	0.7	94.2	4.8	0.8	0.2
Troop P	7,735	70.2	73.9	49.7	41.9	8.4	25.4	70.8	3.6	0.2	82.5	0.6	88.5	9.6	1.7	0.2
Troop R	10,033	71.6	76.6	54.1	38.7	7.1	67.3	29.8	2.8	0.1	57.7	0.7	77.0	21.3	1.6	0.2
Area III	61,799	72.7	70.2	48.3	42.2	9.5	35.5	59.5	4.7	0.3	80.5	0.6	93.1	5.4	1.1	0.4
Troop A	14,766	72.0	73.5	52.2	39.1	8.8	0.8	91.0	7.9	0.3	94.9	0.5	93.3	4.8	1.4	0.5
Troop B	25,031	73.7	71.6	49.0	40.5	10.5	57.3	38.5	4.0	0.2	76.9	0.6	92.1	6.2	1.4	0.4
Troop G	22,002	71.9	66.3	44.9	46.3	8.8	34.0	62.3	3.2	0.5	74.8	0.7	94.1	4.9	0.6	0.4
Area IV	57,275	70.6	69.6	44.8	44.5	10.8	45.1	51.1	3.6	0.1	68.3	0.7	92.7	6.1	0.8	0.4
Troop C	28,174	71.2	74.2	48.5	43.0	8.5	52.8	45.8	1.4	0.0	57.1	0.8	94.0	5.0	0.7	0.3
Troop D	14,393	66.7	64.9	42.6	43.9	13.5	24.9	69.2	5.8	0.1	83.4	0.6	92.3	6.4	0.9	0.4
Troop E	14,708	73.4	65.3	39.7	48.0	12.3	50.1	43.8	5.8	0.4	74.8	0.7	90.7	7.6	1.0	0.7
Area V	44,724	75.5	71.6	49.1	39.9	11.0	52.9	40.7	6.2	0.2	73.2	0.6	84.1	13.4	2.1	0.5
Troop K	11,968	75.9	67.7	46.6	36.5	16.9	33.8	56.0	9.8	0.5	87.5	0.5	84.5	13.7	1.5	0.3
Troop M	16,325	74.9	66.8	45.5	44.0	10.4	47.5	46.3	6.1	0.1	78.8	0.6	85.5	13.0	1.1	0.4
Troop N	16,431	75.9	79.3	54.5	38.3	7.3	72.2	24.0	3.6	0.2	57.1	0.7	82.3	13.5	3.5	0.7

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

	Total #	%	Time of Stop	Shift			Roadway Type				Regist.	Passengers	Duration of Stop (minutes)			
	of Stops	Weekday	% Daytime	% 7-3	% 3-11	% 11-7	% Inter.	% State	% Local	% Other	% PA	Avg/vehicle	% 1-15	% 16-30	% 31-60	% 61+
AREA I																
TROOP H																
Carlisle	3,081	65.9	65.8	46.5	38.7	14.7	62.3	30.0	7.4	0.3	72.4	0.6	74.7	22.2	1.4	1.7
Chambersburg	3,798	74.6	58.2	39.3	36.7	24.0	49.3	37.7	12.5	0.5	72.7	0.6	91.3	7.2	1.3	0.2
Gettysburg	1,962	74.7	77.0	51.7	40.6	7.7	6.8	90.0	3.1	0.1	73.8	0.5	88.4	5.3	3.6	2.7
Harrisburg	5,269	87.2	83.5	55.7	35.5	8.7	60.1	36.3	3.6	0.0	83.1	0.4	92.2	7.1	0.7	0.1
Lykens	1,064	76.3	77.2	51.5	43.4	5.1	0.9	97.0	1.7	0.5	96.7	0.5	91.7	7.4	0.8	0.1
Newport	1,579	76.1	82.5	59.2	32.1	8.7	1.0	97.2	1.9	0.0	86.6	0.6	89.7	9.3	1.0	0.1
York	4,778	69.9	59.6	36.8	47.6	15.5	74.9	19.0	5.2	0.9	74.8	0.6	85.3	13.3	1.1	0.3
TROOP J																
Avondale	3,490	79.4	77.1	51.1	40.8	8.1	0.8	92.6	6.4	0.2	82.4	0.6	86.0	8.5	4.4	1.1
Embreeville	2,899	74.1	68.1	45.1	44.0	10.9	0.6	90.0	9.3	0.1	93.4	0.5	85.4	12.6	1.8	0.3
Ephrata	1,654	77.3	63.6	42.0	38.3	19.7	4.6	90.4	5.0	0.0	91.8	0.7	93.7	4.6	1.3	0.4
Lancaster	3,915	81.7	63.4	41.9	41.5	16.5	1.1	92.2	6.8	0.0	89.1	0.6	82.1	15.0	2.5	0.5
TROOP L																
Frackville	2,414	71.6	65.8	45.2	37.5	17.4	56.2	41.0	2.6	0.2	71.7	0.6	92.0	6.5	1.3	0.3
Hamburg	1,836	69.5	76.7	49.5	42.0	8.5	80.5	12.9	6.5	0.1	56.5	0.8	90.1	7.5	1.4	0.9
Jonestown	2,817	72.8	71.5	45.4	45.1	9.6	65.8	24.3	9.8	0.0	64.9	0.7	64.0	32.7	2.4	0.9
Reading	2,502	84.1	73.8	45.4	46.4	8.2	26.2	68.0	5.2	0.6	96.2	0.4	88.4	10.0	1.2	0.4
Schuylkill Haven	1,562	72.1	69.9	44.8	48.3	6.9	3.0	93.0	3.9	0.1	94.8	0.5	89.6	9.8	0.6	0.0
TROOP T																
Bowmansville	10,007	68.0	78.6	51.5	43.7	4.8	99.9	0.1	0.0	0.0	72.5	0.8	96.5	3.0	0.3	0.1
Everett	12,698	70.5	75.9	48.1	44.3	7.7	99.9	0.1	0.0	0.0	48.8	0.9	94.7	4.3	0.7	0.4
Gibsonia	7,353	73.3	86.1	58.5	38.7	2.8	89.7	10.0	0.2	0.0	56.0	0.7	79.3	19.8	0.7	0.3
King of Prussia	7,733	69.8	78.5	55.7	29.8	14.5	99.1	0.4	0.5	0.0	78.9	0.5	93.6	5.6	0.5	0.2
New Stanton	7,195	65.7	72.5	47.1	47.2	5.8	87.6	11.2	0.2	1.0	72.8	0.7	93.6	6.0	0.4	0.1
Newville	11,986	65.3	73.8	42.9	51.0	6.2	99.9	0.1	0.0	0.0	59.9	0.9	96.3	3.0	0.5	0.2
Pocono	7,886	73.0	79.2	50.7	48.2	1.1	99.8	0.0	0.0	0.1	74.2	0.8	98.9	0.8	0.3	0.1
Somerset (T)	11,370	71.4	73.5	46.5	43.2	10.3	99.8	0.2	0.0	0.0	35.2	0.8	96.9	1.8	0.7	0.6

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

	Total #	%	Time of Stop	Shift			Roadway Type				Regist.	Passengers	Duration of Stop (minutes)			
	of Stops	Weekday	% Daytime	% 7-3	% 3-11	% 11-7	% Inter.	% State	% Local	% Other	% PA	Avg/vehicle	% 1-15	% 16-30	% 31-60	% 61+
AREA II																
TROOP F																
Coudersport	1,917	67.5	67.9	41.6	46.2	12.3	0.2	96.3	3.5	0.0	84.4	0.7	83.7	15.7	0.6	0.1
Emporium	1,490	66.0	80.5	53.5	41.0	5.5	0.1	89.9	9.4	0.5	93.2	0.7	98.3	1.5	0.2	0.0
Lamar	3,851	59.5	71.4	51.0	41.1	7.9	88.3	10.6	1.1	0.0	40.6	0.9	96.5	3.0	0.4	0.1
Mansfield	1,345	76.2	72.6	54.1	40.4	5.6	2.3	96.0	1.6	0.1	57.9	0.8	92.9	6.1	0.9	0.2
Milton	3,549	68.1	76.2	54.0	40.8	5.2	60.4	38.3	1.2	0.0	57.9	0.8	96.4	3.2	0.3	0.1
Montoursville	4,336	68.1	73.6	53.0	37.4	9.6	19.0	75.2	5.8	0.0	79.3	0.7	91.3	5.4	2.9	0.5
Selinsgrove	4,601	69.2	76.4	47.4	45.4	7.2	0.4	98.0	1.6	0.0	77.9	0.6	97.1	2.5	0.2	0.1
Stonington	1,974	77.2	70.9	49.9	38.4	11.8	0.1	96.5	3.1	0.4	98.1	0.5	94.0	5.8	0.2	0.1
TROOP P																
Laporte	1,298	70.2	76.2	51.3	45.2	3.5	0.2	99.2	0.5	0.1	86.8	0.7	95.0	4.6	0.3	0.2
Shickshinny	934	69.5	75.4	55.9	35.1	9.0	2.3	91.1	6.7	0.0	95.7	0.5	91.2	8.1	0.6	0.0
Towanda	1,613	72.9	68.8	44.2	46.3	9.5	0.1	98.1	1.6	0.3	82.6	0.6	84.1	9.2	6.3	0.5
Tunkhannock	1,152	67.5	70.6	43.3	45.8	10.9	0.3	91.2	8.3	0.2	93.9	0.6	93.3	6.5	0.2	0.0
Wyoming	2,738	70.0	76.6	52.8	38.4	8.7	70.8	25.8	3.2	0.2	71.2	0.6	85.1	14.1	0.7	0.1
TROOP R																
Blooming Grove	2,113	68.3	79.9	57.1	36.6	6.3	74.6	23.2	2.1	0.1	50.4	0.7	44.3	50.6	4.8	0.4
Dunmore	4,069	77.6	76.9	55.9	37.5	6.6	85.7	11.8	2.4	0.2	58.3	0.6	82.8	16.1	1.0	0.2
Gibson	1,849	62.0	69.2	41.6	45.4	13.0	78.6	18.2	3.1	0.2	35.3	0.8	89.5	10.2	0.2	0.1
Honesdale	2,002	71.7	79.3	59.1	37.2	3.7	12.1	84.0	3.9	0.1	85.0	0.6	88.2	11.0	0.6	0.3
AREA III																
TROOP A																
Ebensburg	3,055	68.3	81.7	59.8	36.2	4.0	0.2	97.5	2.3	0.0	93.1	0.6	97.3	2.0	0.4	0.3
Greensburg	4,798	75.7	70.6	56.9	31.3	11.9	0.8	90.6	8.4	0.2	97.7	0.4	96.0	3.4	0.4	0.3
Indiana	2,984	72.4	75.2	46.9	46.3	6.9	0.6	95.2	4.1	0.2	94.2	0.5	89.8	4.5	4.8	1.0
Kiski Valley	2,241	68.9	70.6	47.1	43.2	9.6	0.1	81.1	18.1	0.7	96.3	0.6	87.9	11.3	0.8	0.0
Somerset (A)	1,688	71.8	67.8	41.1	48.1	10.7	3.0	86.4	10.1	0.5	89.9	0.6	92.1	6.2	0.6	1.1

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

	Total #	%	Time of Stop	Shift			Roadway Type				Regist.	Passengers	Duration of Stop (minutes)			
	of Stops	Weekday	% Daytime	% 7-3	% 3-11	% 11-7	% Inter.	% State	% Local	% Other	% PA	Avg/vehicle	% 1-15	% 16-30	% 31-60	% 61+
TROOP B																
Belle Vernon	3,917	71.0	79.2	54.2	39.6	6.3	66.4	32.2	1.4	0.1	74.5	0.6	95.7	2.4	0.6	1.3
Findlay	7,187	75.1	73.7	49.9	43.6	6.6	64.9	33.6	1.5	0.0	78.4	0.5	95.0	4.0	0.8	0.2
Uniontown	4,331	76.0	63.0	43.2	37.7	19.1	1.2	89.4	9.0	0.5	93.6	0.6	93.1	6.3	0.4	0.2
Washington	6,710	73.7	74.8	52.2	35.9	11.9	82.9	11.7	5.3	0.1	70.8	0.6	92.2	7.3	0.4	0.1
Waynesburg	2,886	70.2	61.8	40.9	49.1	10.1	51.1	44.9	3.5	0.5	65.9	0.7	78.3	13.8	7.5	0.5
TROOP G																
Bedford	2,607	69.8	64.5	44.2	49.4	6.4	46.2	51.3	2.5	0.0	74.9	0.7	94.1	5.3	0.5	0.1
Hollidaysburg	3,020	74.9	63.3	40.9	46.8	12.3	61.9	31.2	4.5	2.4	84.8	0.6	94.4	4.5	0.4	0.7
Huntingdon	1,819	73.6	56.8	36.0	49.9	14.2	1.5	94.0	4.1	0.5	93.9	0.6	88.1	7.0	2.9	2.0
Lewistown	3,544	74.7	61.9	41.9	51.6	6.5	2.2	92.4	5.4	0.1	91.4	0.6	88.3	11.2	0.4	0.1
McConnellsburg	2,395	74.6	75.9	54.7	39.6	5.7	69.8	27.4	2.6	0.2	41.8	0.7	95.0	4.1	0.6	0.3
Philipsburg	2,499	70.8	72.7	50.9	39.9	9.2	5.0	92.6	2.2	0.2	85.9	0.6	98.0	1.7	0.2	0.1
Rockview	6,118	68.7	67.5	45.4	45.8	8.8	41.1	56.8	2.1	0.1	63.0	0.8	97.2	2.4	0.2	0.2
AREA IV																
TROOP C																
Clarion	6,302	75.8	69.0	48.2	41.8	10.0	80.0	18.3	1.8	0.0	42.0	0.9	94.5	4.4	0.8	0.3
Clearfield	5,867	66.2	71.0	43.8	49.0	7.3	76.8	22.7	0.5	0.0	44.9	0.9	98.1	1.5	0.2	0.2
Dubois	5,321	73.9	77.5	51.2	39.9	9.0	81.1	17.8	1.1	0.0	41.9	0.8	98.0	1.4	0.3	0.3
Kane	1,978	73.0	78.4	51.0	43.9	5.2	1.3	92.6	6.0	0.1	73.2	0.7	93.8	5.5	0.5	0.3
Punxsutawney	3,375	65.9	77.3	51.1	39.0	9.9	21.6	76.6	1.7	0.1	79.3	0.7	93.7	5.1	0.7	0.4
Ridgway	2,681	70.2	81.6	54.2	40.4	5.5	8.2	91.5	0.2	0.1	76.7	0.7	80.5	17.1	1.9	0.6
Tionesta	2,650	72.8	72.8	43.6	46.0	10.5	1.6	97.9	0.5	0.1	90.9	0.6	89.8	9.2	0.9	0.1
TROOP D																
Beaver	3,486	65.3	61.5	38.6	41.1	20.3	0.6	95.6	3.8	0.0	83.9	0.5	90.6	8.5	0.5	0.4
Butler	4,052	66.5	64.7	44.9	44.1	11.0	34.1	58.5	7.4	0.1	90.3	0.6	93.0	5.1	1.5	0.4
Kittanning	2,661	68.4	60.4	41.7	46.3	12.0	0.2	94.4	5.2	0.2	95.8	0.6	95.5	3.6	0.6	0.4
Mercer	2,732	62.7	68.6	43.5	46.0	10.6	76.9	19.7	3.4	0.1	57.8	0.9	89.5	8.9	1.0	0.6
New Castle	1,462	75.1	75.4	45.6	41.6	12.8	5.1	82.7	12.0	0.1	88.1	0.5	94.0	5.8	0.2	0.1

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

	Total #	%	Time of Stop	Shift			Roadway Type				Regist.	Passengers	Duration of Stop (minutes)			
	of Stops	Weekday	% Daytime	% 7-3	% 3-11	% 11-7	% Inter.	% State	% Local	% Other	% PA	Avg/vehicle	% 1-15	% 16-30	% 31-60	% 61+
TROOP E																
Corry	907	75.5	68.5	43.8	46.8	9.5	1.0	88.8	10.3	0.0	92.4	0.6	92.2	6.8	0.8	0.2
Erie	3,193	73.2	70.9	46.0	45.1	8.8	59.9	31.1	7.9	1.1	60.4	0.8	85.9	12.0	1.7	0.5
Franklin	1,786	67.1	53.9	33.2	53.4	13.4	6.8	86.2	6.8	0.2	91.8	0.6	90.0	9.2	0.5	0.4
Girard	4,135	76.4	67.4	39.0	50.5	10.5	66.4	27.9	5.6	0.2	72.7	0.8	91.5	7.1	0.9	0.5
Meadville	3,815	72.3	64.9	39.0	43.2	17.8	67.1	29.5	3.0	0.4	73.1	0.8	93.1	4.7	0.8	1.4
Warren	872	75.1	56.7	32.0	57.2	10.8	1.5	94.2	4.4	0.0	91.7	0.6	94.2	4.5	0.6	0.8
AREA V																
TROOP K																
Media	5,922	75.0	61.9	40.9	41.3	17.8	42.7	51.0	6.0	0.4	82.7	0.5	82.4	15.7	1.5	0.5
Philadelphia	2,861	74.9	72.4	50.8	34.1	15.1	49.9	44.8	4.6	0.8	88.8	0.5	81.1	16.1	2.5	0.3
Skippack	3,185	78.4	74.2	53.6	29.7	16.7	2.8	75.4	21.5	0.4	95.4	0.4	91.4	7.9	0.7	0.1
TROOP M																
Belfast	3,417	77.5	73.3	47.6	46.8	5.7	42.1	54.4	3.4	0.0	73.7	0.7	88.4	10.9	0.6	0.1
Bethlehem	2,800	73.3	58.9	41.0	45.9	13.1	15.3	78.5	6.1	0.1	88.1	0.5	94.0	4.6	1.1	0.3
Dublin	3,212	76.1	67.7	41.8	52.2	6.0	0.3	83.6	15.7	0.3	95.6	0.4	90.2	9.2	0.7	0.0
Fogelsville	3,930	73.6	66.5	47.8	38.1	14.1	79.9	16.2	3.8	0.1	64.9	0.7	77.4	20.5	1.5	0.7
Trevose	2,966	73.8	66.1	48.4	38.1	13.5	92.0	6.0	1.8	0.2	76.4	0.5	80.0	17.8	1.4	0.8
TROOP N																
Bloomsburg	2,963	70.7	81.4	54.9	39.3	5.8	90.3	7.7	1.7	0.2	51.4	0.8	76.1	19.2	4.5	0.3
Fern Ridge	1,827	74.4	76.4	46.8	47.2	6.0	61.5	33.2	5.2	0.1	60.0	0.8	88.2	7.9	3.6	0.2
Hazleton	3,723	74.3	77.6	50.0	44.4	5.6	75.1	20.7	4.0	0.3	60.8	0.7	79.6	17.7	2.5	0.3
Lehighton	1,517	73.5	79.3	55.8	38.8	5.4	5.5	90.6	3.8	0.1	92.1	0.5	90.1	4.5	4.9	0.5
Swiftwater	6,401	80.2	80.2	58.7	31.6	9.7	81.1	15.1	3.8	0.1	48.4	0.7	83.3	12.1	3.4	1.2
Canine Unit	1,015	75.2	74.6	51.9	43.1	5.0	85.6	10.9	2.7	0.8	47.5	0.8	77.5	13.4	6.8	2.3

Table 3.3 provides the temporal breakdown of traffic stop occurrences by month. At both the department and area level, May, 2002 accounted for the highest percentage of stops: 11.7% across the department, and between 11.1% and 13.3% in the areas. August (9.9%), July (9.6%), March (9.4%), and September (9.0%) were the next highest months across the department. Not surprisingly, the winter months showed a noticeable decline in the percentage of stops: 5.8% in December and January and 5.7% in February. Of the 16 troops, 12 reported May as their busiest month.

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.	327,120	11.7	8.5	9.6	9.9	9.0	7.6	8.1	5.8	5.8	5.7	9.4	8.9
AREA I	120,866	11.5	8.5	9.9	9.5	8.8	7.8	7.9	5.9	6.4	6.0	9.1	8.8
Troop H	21,531	12.1	10.0	11.3	8.0	8.0	8.0	8.6	5.9	5.3	5.2	9.7	7.8
Carlisle	3,081	10.7	6.8	10.5	10.1	10.2	9.8	6.5	6.9	4.7	4.4	12.1	7.5
Chambersburg	3,798	8.1	6.3	9.7	5.4	4.3	6.0	10.4	11.2	8.2	7.0	12.4	11.0
Gettysburg	1,962	15.4	12.5	6.9	6.2	10.0	5.6	10.1	7.2	5.5	4.3	7.3	9.0
Harrisburg	5,269	11.2	11.8	13.8	7.6	8.7	8.2	7.5	4.4	5.4	5.9	7.9	7.7
Lykens	1,064	10.3	4.4	5.0	10.5	11.4	12.6	11.5	4.5	7.5	5.4	10.2	6.8
Newport	1,579	11.2	12.4	19.9	8.9	6.7	8.9	8.4	2.5	1.3	4.6	10.9	4.4
York	4,778	16.6	12.6	10.8	9.3	7.6	7.7	8.5	3.6	4.0	4.2	8.6	6.6
Troop J	11,958	16.2	9.2	10.6	13.4	10.8	7.5	7.5	4.6	4.7	4.1	4.6	6.9
Avondale	3,490	13.1	8.2	11.7	15.3	12.3	6.2	7.0	5.5	5.9	4.0	4.3	6.6
Embreeville	2,899	18.2	8.6	9.2	9.3	8.1	7.0	9.8	5.0	5.1	6.0	5.4	8.3
Ephrata	1,654	15.5	8.1	8.6	12.6	11.5	9.4	7.5	2.7	4.7	2.7	6.5	10.3
Lancaster	3,915	17.8	10.9	11.4	15.1	11.2	8.3	6.3	4.2	3.5	3.3	3.4	4.6
Troop L	11,131	12.2	9.1	12.1	11.7	9.6	6.8	7.7	4.7	4.7	5.2	9.4	6.8
Frackville	2,414	12.7	6.8	8.1	11.1	10.7	7.3	7.9	6.5	5.4	6.1	7.3	10.0
Hamburg	1,836	11.2	12.1	14.9	11.9	8.2	5.6	6.4	5.5	3.1	4.7	9.3	7.2
Jonestown	2,817	12.3	10.1	12.7	6.7	9.3	7.9	8.6	3.9	5.8	5.5	10.7	6.6
Reading	2,502	13.6	9.8	15.3	12.6	10.0	5.7	8.3	4.4	4.5	4.8	7.8	3.4
Schuylkill Haven	1,562	10.4	6.2	8.4	19.9	9.8	7.4	6.2	3.3	3.9	4.2	13.0	7.2
Troop T	76,246	10.4	7.9	9.0	9.1	8.6	7.9	7.9	6.3	7.2	6.6	9.6	9.7
Bowmansville	10,007	8.4	8.0	9.3	10.8	9.8	10.0	8.1	6.1	7.5	5.1	8.4	8.7
Everett	12,698	7.7	7.8	7.5	8.7	8.9	9.1	10.7	7.0	7.7	7.5	9.0	8.3
Gibsonia	7,353	11.0	7.9	10.4	7.4	7.2	4.9	5.1	6.7	7.0	9.1	12.0	11.4
King of Prussia	7,733	11.7	8.3	8.1	7.5	7.9	6.2	8.6	7.8	9.7	5.6	8.8	9.9
New Stanton	7,195	8.6	4.9	6.6	9.4	6.0	7.4	6.8	4.7	4.8	7.1	17.7	16.1
Newville	11,986	10.4	8.0	9.8	9.9	10.9	8.6	8.0	5.7	6.9	5.5	7.9	8.5
Pocono	7,886	12.7	9.0	9.8	8.1	6.0	7.3	8.1	7.3	8.2	7.2	7.6	8.7
Somerset (T)	11,370	13.9	8.5	10.4	9.5	9.4	7.8	6.1	5.4	5.9	6.3	8.3	8.7

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	40,831	11.1	9.6	9.3	10.1	8.4	7.0	8.5	5.9	4.5	6.0	10.0	9.6
Troop F	23,063	10.2	11.5	10.5	10.0	8.0	7.1	7.7	6.6	5.4	5.7	8.3	9.1
Coudersport	1,917	11.9	12.7	11.4	16.0	9.0	6.5	7.9	4.6	3.7	3.7	6.2	6.4
Emporium	1,490	11.1	15.8	9.4	9.5	8.7	6.6	7.7	1.7	3.8	4.7	8.2	12.8
Lamar	3,851	9.1	6.3	9.7	6.1	6.5	11.1	10.6	7.8	6.2	6.8	13.1	6.8
Mansfield	1,345	13.4	14.6	15.5	8.6	7.7	4.9	3.2	4.3	6.6	5.4	7.2	8.6
Milton	3,549	10.3	14.4	10.4	10.8	9.2	7.6	9.3	3.5	5.6	5.5	6.6	6.9
Montoursville	4,336	8.4	12.3	9.7	11.3	9.6	5.4	7.3	7.5	5.2	4.7	8.1	10.5
Selinsgrove	4,601	10.1	10.9	10.6	10.1	7.2	6.4	5.9	10.8	4.8	6.9	6.9	9.5
Stonington	1,974	11.7	9.9	10.5	9.2	5.9	6.2	6.7	4.8	6.8	6.6	8.3	13.4
Troop P	7,735	14.5	8.7	8.2	12.2	9.0	5.6	10.6	3.4	3.7	5.7	10.0	8.6
Laporte	1,298	11.1	8.0	6.1	15.9	8.5	7.6	10.3	2.1	3.0	6.4	13.3	7.8
Shickshinny	934	11.5	6.6	8.5	11.5	12.2	5.5	17.6	3.2	4.6	3.4	8.9	6.6
Towanda	1,613	16.0	12.5	10.5	8.6	7.1	6.8	9.2	3.0	3.1	4.7	10.9	7.5
Tunkhannock	1,152	12.4	7.8	11.2	10.5	7.6	4.0	10.1	5.1	3.6	6.7	9.3	11.8
Wyoming	2,738	17.2	7.8	6.4	13.6	9.8	4.7	9.2	3.5	4.1	6.2	8.5	9.0
Troop R	10,033	10.7	5.7	7.2	8.5	8.9	7.7	8.9	6.3	3.1	6.9	14.1	11.8
Blooming Grove	2,113	9.2	3.8	6.0	8.5	7.2	7.1	9.9	6.7	4.0	7.5	14.6	15.5
Dunmore	4,069	10.4	6.8	8.0	11.7	10.1	7.1	7.2	4.8	2.6	6.0	15.2	10.0
Gibson	1,849	13.2	9.0	7.7	6.3	9.5	5.4	9.8	6.5	2.5	4.6	15.4	10.1
Honesdale	2,002	10.7	2.6	6.2	4.1	7.8	11.7	10.4	8.9	4.0	10.3	10.2	13.1
AREA III	61,799	11.3	7.8	9.6	9.7	9.5	8.1	8.0	5.3	5.6	5.7	10.5	9.0
Troop A	14,766	12.5	7.6	9.4	11.1	9.3	7.7	6.8	6.1	4.3	5.2	10.5	9.6
Ebensburg	3,055	11.0	5.5	8.5	11.5	8.7	6.9	4.5	4.4	5.2	8.2	13.9	11.9
Greensburg	4,798	16.6	7.5	6.4	10.2	10.7	7.5	8.9	7.3	5.9	4.9	7.9	6.2
Indiana	2,984	8.8	7.9	12.6	14.8	9.2	8.9	5.3	5.0	2.9	4.5	9.7	10.6
Kiski Valley	2,241	13.6	8.2	8.5	8.9	8.0	7.8	6.9	7.2	3.4	3.9	13.3	10.4
Somerset (A)	1,688	9.3	10.1	14.6	9.3	8.5	6.8	7.6	6.2	2.1	3.7	9.5	12.3
Troop B	25,031	10.8	8.8	8.6	9.5	9.7	8.7	9.2	5.1	5.8	5.0	10.3	8.6
Belle Vernon	3,917	9.7	6.5	8.6	9.7	8.0	8.0	8.6	4.3	6.8	4.7	16.2	9.0
Findlay	7,187	10.4	9.2	9.0	7.6	10.5	10.5	7.6	4.5	5.3	4.0	11.0	10.2
Uniontown	4,331	11.1	8.7	9.0	13.6	9.8	7.5	11.4	6.6	5.0	5.2	7.2	5.0
Washington	6,710	12.4	10.6	8.3	9.8	11.2	8.1	9.9	4.8	6.0	4.4	6.4	8.2
Waynesburg	2,886	9.1	7.0	7.5	7.4	7.0	8.3	8.7	5.8	6.5	8.6	14.1	10.1
Troop G	22,002	11.0	6.9	11.0	8.9	9.2	7.7	7.6	5.1	6.2	6.9	10.6	9.0
Bedford	2,607	7.8	5.3	10.2	9.7	13.0	8.3	6.7	6.1	5.8	6.1	10.1	10.9
Hollidaysburg	3,020	15.6	8.1	9.1	8.2	10.6	7.8	6.3	4.7	4.4	6.8	12.0	6.4
Huntingdon	1,819	10.1	5.7	11.0	11.5	8.4	7.2	8.9	4.2	7.1	6.5	12.1	7.4
Lewistown	3,544	11.9	8.5	10.7	8.5	6.2	9.5	8.1	5.0	6.2	7.7	9.5	8.3
McConnellsburg	2,395	8.3	4.3	7.8	7.6	8.1	8.2	7.6	6.9	6.2	7.2	12.4	15.5
Philipsburg	2,499	10.4	10.0	12.3	7.4	7.8	6.9	7.0	3.2	8.2	7.1	10.5	9.1
Rockview	6,118	11.0	6.1	13.1	9.6	10.0	6.5	8.1	5.3	6.3	6.7	9.7	7.7

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	57,275	13.3	8.4	10.1	10.3	8.6	7.1	8.1	5.7	5.2	5.2	8.8	9.0
Troop C	28,174	11.6	8.2	9.9	10.2	8.1	7.6	8.6	5.3	6.2	5.8	8.8	9.8
Clarion	6,302	10.7	7.4	11.3	10.0	7.3	6.5	7.6	6.5	8.4	5.7	8.7	10.0
Clearfield	5,867	10.9	5.6	9.6	8.3	7.4	9.9	9.1	5.4	7.5	7.7	8.8	10.0
Dubois	5,321	10.0	6.6	9.7	10.7	9.8	6.7	10.3	6.3	4.4	4.7	10.5	10.2
Kane	1,978	12.5	11.1	9.2	10.7	9.5	6.5	6.7	2.4	3.3	6.3	10.4	11.6
Punxsutawney	3,375	13.1	10.3	10.6	15.3	7.8	9.0	6.1	2.5	3.4	4.6	8.4	8.9
Ridgway	2,681	12.7	11.6	10.5	9.0	6.9	5.3	9.3	5.7	7.6	6.7	7.0	7.9
Tionesta	2,650	15.1	10.5	6.5	8.5	8.5	7.8	10.6	6.2	6.1	3.9	6.7	9.7
Troop D	14,393	15.2	8.1	10.4	10.8	8.0	7.4	6.7	6.2	4.8	5.2	8.5	8.8
Beaver	3,486	10.6	8.7	10.4	9.6	7.5	8.7	7.0	7.8	5.7	6.5	9.4	8.0
Butler	4,052	17.3	7.8	7.6	9.2	8.1	7.8	9.1	3.9	5.6	4.6	9.7	9.3
Kittanning	2,661	15.7	7.7	11.1	12.9	8.9	7.4	6.2	6.2	3.3	4.0	9.2	7.4
Mercer	2,732	17.8	7.6	11.5	11.1	7.4	5.7	3.9	6.6	4.3	5.7	6.2	12.3
New Castle	1,462	14.8	8.6	14.6	13.6	8.3	6.2	5.8	8.4	3.8	4.4	6.3	5.1
Troop E	14,708	14.8	9.1	10.4	10.1	10.0	6.0	8.6	6.1	3.8	4.3	9.2	7.6
Corry	907	21.0	9.9	7.8	7.8	6.4	2.1	14.8	4.0	0.4	5.7	5.7	14.3
Erie	3,193	17.5	8.8	9.5	8.0	9.4	4.5	7.5	7.8	3.1	3.7	14.3	6.0
Franklin	1,786	19.8	7.2	5.1	8.2	7.2	3.9	8.6	7.5	5.1	3.9	10.4	13.2
Girard	4,135	11.6	9.3	11.8	12.5	11.7	6.7	7.0	5.5	4.5	4.6	8.3	6.5
Meadville	3,815	12.6	10.3	13.7	11.3	12.1	8.6	8.9	5.4	3.4	3.5	5.5	5.0
Warren	872	12.4	7.8	5.3	7.7	4.9	6.1	12.6	4.6	5.4	8.3	12.8	12.2
AREA V	44,724	11.7	8.5	8.4	10.7	9.9	7.4	8.1	5.9	6.3	5.6	8.9	8.6
Troop K	11,968	13.3	10.1	8.8	9.8	10.6	6.5	7.4	6.6	6.5	5.2	6.2	8.9
Media	5,922	12.5	8.3	9.0	11.4	10.4	7.2	6.7	7.9	6.3	5.5	6.8	8.1
Philadelphia	2,861	12.7	14.2	9.3	10.1	8.7	6.3	8.9	5.4	6.8	2.9	4.5	10.2
Skippack	3,185	15.3	9.9	8.0	6.4	12.9	5.5	7.4	5.4	6.8	6.7	6.4	9.2
Troop M	16,325	11.3	6.3	8.1	10.6	9.0	7.6	7.5	6.8	7.5	6.6	9.8	8.8
Belfast	3,417	11.7	9.3	8.5	14.7	12.4	6.1	4.7	3.1	5.9	4.9	8.4	10.3
Bethlehem	2,800	11.5	7.3	8.6	12.1	7.8	8.5	9.3	6.6	5.8	6.6	9.4	6.7
Dublin	3,212	8.0	6.2	5.0	9.6	4.9	6.6	9.4	9.9	12.4	9.1	8.7	10.2
Fogelsville	3,930	16.6	4.5	11.2	8.2	10.6	7.6	6.0	6.0	6.0	6.2	11.6	5.7
Trevose	2,966	7.4	4.7	6.6	8.9	8.5	9.6	9.0	8.9	7.6	6.6	10.6	11.7
Troop N	16,431	10.9	9.5	8.4	11.5	10.3	7.9	9.1	4.5	5.1	5.0	9.9	8.2
Bloomsburg	2,963	9.4	10.1	6.3	11.9	14.4	8.4	8.2	2.5	3.9	4.4	13.0	7.6
Fern Ridge	1,827	9.5	14.1	12.8	20.1	11.6	3.9	5.9	4.3	4.7	1.9	8.4	3.0
Hazleton	3,723	12.6	10.5	8.5	9.4	9.0	13.0	9.0	3.6	4.1	5.0	8.7	6.6
Lehighton	1,517	5.0	5.7	2.7	7.7	9.6	8.6	8.9	8.7	6.7	7.2	16.2	13.1
Swiftwater	6,401	12.4	8.2	9.4	10.9	8.8	5.8	10.6	5.0	5.9	5.5	8.0	9.6
Canine Unit	1,015	4.2	8.6	7.4	8.1	11.1	13.9	7.1	8.2	5.9	5.7	10.8	9.0

Tables 3.4 and 3.5 report the reasons for the stop, both preceding the stop and subsequent to the stop initiated by the Troopers, and include speeding, moving violations, vehicle inspections and traffic enforcement. These tables also include the average speed over the limit observed for speeding traffic stops. All categories are summarized at the department, area, and troop level (**Table 3.4**) and at the station level (**Table 3.5**).

Across the department, *speeding* was the most frequent violation observed prior to the stop (74.6%). There is slight variation across areas in the frequency of speeding stops, with Area I reporting *speeding* as the reason preceding the stop for 79.4% of their drivers stopped, compared to Area V's 66.6% of drivers stopped. The troops varied in speeding stops from a high of 85.0% (Troop T) to a low of 53.8% (Troop K). The majority of troops reported speeding as the reason preceding the stop for over 70% of drivers' stopped (9 of 16 troops). These differences at the troop level were mirrored at the station level. For example, Everett reported *speeding* as the reason preceding the stop for 93.3% of their drivers, compared to only 50.6% of drivers stopped by Troopers in the Philadelphia station. Similar to the troop level, the majority of stations reported *speeding* as the reason preceding the stop for over 70% of the traffic stops (52 out of 89 stations). Interestingly, three stations within Troop K all reported speeding as the reason less than 56% of the time, which accounts for the troop having the lowest average compared with other troops (i.e., Philadelphia – 50.6%, Media – 54.6%, Skippack – 55.1%).

Moving violations were the next most common reason preceding the stop traffic stop across the department at 13.6%. The areas varied on moving violations from a high of 17.8% (Area V) to a low of 10.0% (Area IV). Similarly, there was variation across the troops from 24.6% (Troop K) to 7.6% (Troop C).

At the department level, the third ranking reason for stops was *equipment inspections* (9.0%), followed closely by *traffic enforcement* (8.9%). The closeness of these two categories at the departmental level was mirrored at the area level in which *traffic enforcement* ranked third in three of the areas and *equipment inspections* third in the other two areas.

The a*verage speed over the limit* was recorded at 18.8 across the department. At the area level, the average speed over the limit ranged from a high of 20.6 in Area V to a low of 17.2 in Area IV. At the troop level, the range between average speeds over the limit was somewhat larger, with an average speed of 23.2 over the limit in Troop K, compared to an average speed of 16.6 in Troop C. More dramatic differences are displayed at the station level. For example, the average speed over the limit ranged from highs of 26.1 (Trevose), 23.9 (Media), and 23.1 (Philadelphia) to lows of 14.1 (Tionesta), 14.4 (Emporium), and 14.9 (Philipsburg).

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 (53.8%); however, Troop K reported the highest *average speed over the limit*. 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 Philipsburg), while much less likely in others (e.g., Trevose, Media, and Philadelphia). 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, 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. This possibility will be more fully explored in Sections IV, V, and VI of this report.

Table 3.4. Reason for Stop By Department, Area, & Troop (p. 1 of 1)

	Total # of Stops	% Speeding P	% Speeding S	Amt. over Limit Avg.	% Mov.Viol. P	% Mov. Viol. S	% Equip./ Inspect. P	% Equip./ Inspect. S	% Preexist. Info. P	% Preexist. Info. S	% Regist. P	% Regist. S	% License P	% License S	% Spec. Traf. Enf. P	% Other P	% Other S
PSP Dept	327,120	74.6	0.5	18.8	13.6	1.9	9.0	2.8	0.2	0.2	1.5	2.1	0.2	2.9	8.9	1.1	1.0
AREA I	120,866	79.4	0.4	19.1	12.0	1.3	6.6	1.9	0.2	0.1	1.2	1.6	0.1	2.3	6.7	1.1	0.7
Troop H	21,531	70.2	0.9	19.1	15.0	1.2	10.5	1.8	0.3	0.0	2.4	1.6	0.2	2.8	12.4	2.3	0.8
Troop J	11,958	66.8	0.3	21.4	13.8	1.0	15.7	2.2	0.3	0.1	2.5	2.1	0.3	4.4	13.4	3.6	0.5
Troop L	11,131	72.0	0.6	18.8	14.7	1.3	10.3	2.1	0.2	0.4	1.6	1.7	0.2	3.1	18.7	1.5	1.0
Troop T	76,246	85.0	0.2	18.9	10.5	1.3	3.5	1.9	0.2	0.1	0.6	1.5	0.1	1.6	2.2	0.4	0.7
AREA II	40,831	72.9	0.4	18.3	14.4	2.1	9.5	3.5	0.2	0.17	1.0	1.8	0.2	2.4	10.0	1.4	1.0
Troop F	23,063	76.7	0.3	17.6	11.9	2.4	7.7	4.3	0.1	0.2	0.9	1.9	0.1	2.5	8.6	1.4	1.4
Troop P	7,735	66.8	0.6	19.6	16.8	2.8	12.6	3.3	0.3	0.3	1.3	2.1	0.3	3.3	11.6	0.6	0.7
Troop R	10,033	68.8	0.6	19.3	18.1	0.9	11.1	1.7	0.2	0.0	1.1	1.5	0.3	1.6	11.8	2.3	0.2
AREA III	61,799	70.1	0.6	18.8	16.1	1.9	10.5	2.8	0.2	0.3	2.0	2.7	0.2	3.6	9.5	1.1	0.8
Troop A	14,766	61.6	0.8	19.2	17.4	1.5	16.6	2.8	0.2	0.7	3.0	2.8	0.3	3.6	10.7	1.6	1.0
Troop B	25,031	68.7	0.7	20.4	18.1	1.4	9.6	2.3	0.2	0.2	2.3	1.8	0.3	3.0	11.5	1.1	0.5
Troop G	22,002	77.2	0.5	17.0	12.9	2.8	7.5	3.3	0.2	0.1	1.0	3.6	0.2	4.3	6.5	0.8	1.0
AREA IV	57,275	77.6	0.6	17.2	10.0	2.7	9.2	3.3	0.4	0.3	1.3	2.9	0.1	3.5	8.9	0.9	2.0
Troop C	28,174	82.7	0.5	16.6	7.6	2.7	6.7	2.9	0.4	0.3	0.6	2.2	0.1	2.5	8.5	1.1	2.2
Troop D	14,393	70.9	0.4	18.3	12.7	3.6	13.5	5.1	0.3	0.2	2.1	4.2	0.1	5.7	9.3	0.5	2.4
Troop E	14,708	74.4	0.8	17.4	12.1	1.9	10.1	2.4	0.3	0.4	1.8	2.8	0.2	3.4	9.3	0.7	1.4
AREA V	44,724	66.6	0.6	20.6	17.8	2.4	12.1	3.6	0.2	0.3	2.2	2.0	0.2	3.0	13.1	1.3	0.7
Troop K	11,968	53.8	0.9	23.2	24.8	1.4	17.4	1.8	0.2	0.0	2.7	2.0	0.2	2.8	12.2	0.8	0.7
Troop M	16,325	67.6	0.4	22.1	16.1	2.3	12.6	3.2	0.2	0.2	2.5	2.3	0.1	3.9	14.1	1.3	0.9
Troop N	16,431	74.9	0.5	17.9	14.4	3.3	7.7	5.3	0.2	0.6	1.4	1.7	0.1	2.3	12.7	1.6	0.7

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

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

	Total # of Stops	% Speeding P	% Speeding S	Amt. over limit Avg.	% Mov. Viol. P	% Mov. Viol. S	% Equip./ Inspect. P	% Equip./ Inspect. S	% Preexist. Info. P	% Preexist. Info. S	% Regist. P	% Regist. S	% License P	% License S	% Spec. Traf. Enf. P	Other P	Other S
AREA I																	
TROOP H																	
Carlisle	3,081	76.2	2.3	18.2	9.2	0.9	8.4	1.9	0.3	0.0	2.1	1.1	0.3	2.9	6.6	0.5	0.6
Chambersburg	3,798	70.2	0.9	18.1	12.9	1.3	13.1	1.6	0.3	0.1	2.5	1.9	0.1	2.8	11.6	0.9	0.9
Gettysburg	1,962	70.1	0.8	18.2	15.1	1.7	10.9	3.1	0.4	0.0	1.8	1.7	0.4	4.1	20.5	2.5	0.6
Harrisburg	5,269	63.5	0.7	19.4	20.0	1.1	11.1	1.6	0.3	0.0	3.9	1.2	0.1	1.6	9.1	2.5	0.9
Lykens	1,064	53.9	0.7	17.9	18.6	2.5	23.4	2.3	0.3	0.2	2.7	6.6	0.3	5.6	2.2	0.7	2.3
Newport	1,579	84.9	0.3	18.8	11.1	0.6	3.4	1.5	0.1	0.0	0.5	0.9	0.0	2.5	39.8	2.0	0.5
York	4,778	72.3	0.3	21.0	15.5	1.0	8.6	1.6	0.3	0.1	1.4	1.1	0.1	3.0	10.4	4.8	0.5
TROOP J																	
Avondale	3,490	56.5	0.3	22.4	14.6	1.0	24.1	1.9	0.6	0.0	2.4	2.4	0.4	4.8	12.8	0.8	0.3
Embreeville	2,899	60.6	0.3	21.0	19.9	1.1	15.4	3.0	0.1	0.1	3.4	2.8	0.1	5.4	8.6	1.2	0.5
Ephrata	1,654	84.0	0.1	21.4	9.3	0.7	5.6	1.9	0.1	0.1	1.2	1.5	0.2	4.7	11.9	0.9	0.8
Lancaster	3,915	73.3	0.3	21.0	10.5	1.1	12.8	2.0	0.2	0.1	2.6	1.5	0.2	3.1	18.1	9.0	0.6
TROOP L																	
Frackville	2,414	69.6	0.6	17.6	16.2	1.5	11.1	2.0	0.3	0.1	1.4	2.0	0.5	3.7	13.9	1.2	0.3
Hamburg	1,836	79.0	0.4	21.6	13.7	1.7	5.0	2.7	0.3	0.4	0.8	1.6	0.2	2.1	24.5	3.2	1.5
Jonestown	2,817	76.5	0.1	18.5	11.7	0.8	9.7	1.9	0.1	0.4	1.6	1.0	0.1	2.5	4.0	0.6	1.9
Reading	2,502	70.3	0.7	18.5	14.8	0.5	12.0	1.3	0.2	0.0	1.6	1.2	0.2	2.4	34.6	0.5	0.5
Schuylkill Haven	1,562	62.1	1.3	17.8	18.8	2.6	13.6	3.1	0.3	1.1	3.1	3.5	0.2	5.8	20.0	3.2	0.8
TROOP T																	
Bowmansville	10,007	73.2	0.3	16.9	23.0	0.5	2.4	1.0	0.0	0.0	0.4	0.7	0.2	1.0	1.8	0.3	0.1
Everett	12,698	93.3	0.1	18.8	3.2	0.9	2.7	2.3	0.3	0.2	0.6	2.8	0.0	2.9	1.0	0.8	2.0
Gibsonia	7,353	89.7	0.2	15.6	5.8	1.5	3.0	2.6	0.2	0.1	0.5	3.1	0.1	1.8	1.4	0.4	0.9
King of Prussia	7,733	79.0	0.6	22.2	14.5	4.6	4.3	1.5	0.4	0.1	1.2	1.3	0.1	1.5	3.1	0.3	0.4
New Stanton	7,195	79.4	0.3	18.8	15.7	0.6	4.0	1.5	0.1	0.0	0.4	1.7	0.0	1.9	0.5	0.1	0.3
Newville	11,986	84.2	0.2	18.2	7.8	0.9	6.7	1.8	0.1	0.0	1.0	1.3	0.1	1.6	2.8	0.1	0.4
Pocono	7,886	88.0	0.2	17.5	8.1	1.2	3.0	1.2	0.1	0.2	0.2	0.8	0.1	1.2	8.2	0.3	0.0
Somerset (T)	11,370	89.6	0.1	22.4	9.0	1.0	2.0	3.2	0.1	0.0	0.1	0.5	0.0	0.9	0.2	0.6	1.0

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

	Total # of Stops	% Speeding P	% Speeding S	Amt. over limit Avg.	% Mov. Viol. P	% Mov. Viol. S	% Equip./ Inspect. P	% Equip./ Inspect. S	% Preexist. Info. P	% Preexist. Info. S	% Regist. P	% Regist. S	% License P	% License S	% Spec. Traf. Enf. P	Other P	Other S
AREA II																	
TROOP F																	
Coudersport	1,917	59.8	0.5	15.1	17.1	4.8	19.4	4.5	0.1	0.1	1.2	6.1	0.3	5.7	2.2	0.9	6.3
Emporium	1,490	55.2	0.2	14.4	27.9	9.3	15.0	3.2	0.3	0.7	0.9	4.1	0.2	6.2	4.4	0.7	0.2
Lamar	3,851	86.4	0.3	17.2	4.1	1.5	2.8	2.0	0.2	0.6	0.5	0.9	0.1	1.3	6.9	5.1	1.9
Mansfield	1,345	75.8	0.4	16.2	15.5	1.5	6.0	6.0	0.2	0.0	0.4	1.1	0.0	1.3	2.2	0.4	1.2
Milton	3,549	78.0	0.2	18.4	16.5	0.6	3.0	3.9	0.1	0.0	0.3	0.7	0.1	1.4	9.7	0.7	0.2
Montoursville	4,336	78.3	0.2	17.8	11.3	1.3	6.9	4.3	0.0	0.1	1.1	1.1	0.2	2.0	15.4	1.0	1.8
Selinsgrove	4,601	85.2	0.3	19.0	9.3	1.8	2.7	6.0	0.1	0.0	0.9	0.6	0.1	0.6	11.1	0.1	0.5
Stonington	1,974	65.3	0.3	17.3	7.2	4.5	23.6	5.7	0.2	0.4	2.1	5.7	0.2	7.0	3.4	0.8	0.5
TROOP P																	
Laporte	1,298	69.0	0.1	17.5	18.0	2.3	11.0	2.3	0.5	0.3	1.0	2.6	0.6	2.9	8.1	0.2	0.2
Shickshinny	934	79.7	0.9	18.5	11.7	0.5	5.7	4.1	0.1	0.0	1.5	1.4	0.3	2.3	20.8	0.3	0.2
Towanda	1,613	58.3	1.0	17.5	11.1	6.9	22.2	5.9	0.4	0.9	2.0	3.7	0.5	5.5	10.2	1.4	2.2
Tunkhannock	1,152	62.5	0.3	18.6	26.3	1.9	8.7	3.4	0.4	0.0	1.5	1.7	0.4	3.0	7.6	0.7	0.4
Wyoming	2,738	68.0	0.8	22.4	17.4	1.7	11.6	2.0	0.1	0.1	0.8	1.4	0.1	2.6	12.6	0.3	0.4
TROOP R																	
Blooming Grove	2,113	64.7	0.6	18.5	17.4	0.6	15.7	1.9	0.1	0.1	0.9	2.0	0.1	0.9	7.2	4.2	0.2
Dunmore	4,069	76.3	0.8	19.9	17.9	1.4	4.2	1.4	0.1	0.0	1.0	1.2	0.2	2.4	7.0	1.7	0.1
Gibson	1,849	71.8	0.5	17.9	17.1	0.8	9.0	2.1	0.4	0.0	1.0	1.2	0.4	1.4	20.7	2.4	0.2
Honesdale	2,002	55.1	0.3	20.3	20.1	0.3	21.9	1.6	0.1	0.0	1.8	1.5	0.5	1.2	18.4	1.3	0.4
AREA III																	
TROOP A																	
Ebensburg	3,055	64.6	0.6	18.3	15.0	0.9	17.1	2.8	0.1	0.1	1.9	1.7	0.1	2.0	3.1	0.3	1.6
Greensburg	4,798	61.9	1.0	20.7	13.7	1.7	18.2	2.1	0.1	1.4	4.4	2.7	0.4	3.6	10.7	1.2	0.8
Indiana	2,984	62.7	1.0	18.3	17.4	0.8	15.9	3.7	0.3	0.0	2.0	2.8	0.2	3.4	16.3	2.7	0.3
Kiski Valley	2,241	54.6	0.1	19.6	28.3	1.2	15.3	2.3	0.4	0.6	2.2	2.9	0.3	3.8	15.8	3.0	1.1
Somerset (A)	1,688	63.0	0.9	17.6	17.4	3.6	14.4	3.9	0.4	0.7	3.2	4.9	0.5	6.2	8.0	1.1	1.7

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

	Total # of Stops	% Speeding P	% Speeding S	Amt. over limit Avg.	% Mov. Viol. P	% Mov. Viol. S	% Equip./ Inspect. P	% Equip./ Inspect. S	% Preexist. Info. P	% Preexist. Info. S	% Regist. P	% Regist. S	% License P	% License S	% Spec. Traf. Enf. P	Other P	Other S
AREA III (cont.)																	
TROOP B																	
Belle Vernon	3,917	78.7	0.7	20.2	11.4	1.7	8.6	2.6	0.2	0.1	1.2	1.2	0.0	2.3	7.3	0.5	0.2
Findlay	7,187	81.3	0.3	21.4	8.3	1.4	7.0	3.2	0.1	0.5	2.5	2.0	0.5	3.8	22.1	0.7	0.3
Uniontown	4,331	55.4	0.4	19.1	26.3	1.0	14.3	1.9	0.3	0.0	3.1	2.3	0.2	3.2	10.1	1.5	2.0
Washington	6,710	62.4	1.1	20.7	27.3	1.7	6.2	1.7	0.1	0.0	1.7	1.5	0.1	2.7	7.7	1.7	0.2
Waynesburg	2,886	58.6	0.9	18.0	18.2	1.3	18.2	1.9	0.5	0.0	3.2	2.2	0.3	2.7	1.3	0.9	0.2
TROOP G																	
Bedford	2,607	75.5	0.3	16.9	11.6	1.8	10.1	3.6	0.3	0.2	1.5	4.2	0.1	5.1	7.5	0.0	1.2
Hollidaysburg	3,020	66.3	0.5	17.8	19.5	3.3	12.1	3.3	0.2	0.0	1.8	7.7	0.1	7.6	5.9	0.8	1.0
Huntingdon	1,819	58.3	0.1	16.6	23.4	6.4	12.4	4.6	0.4	0.2	1.8	4.0	0.3	6.4	8.4	0.3	0.5
Lewistown	3,544	79.1	0.2	17.1	10.0	1.9	9.0	3.8	0.1	0.1	1.1	2.6	0.2	3.2	3.4	1.3	0.4
McConnellsburg	2,395	81.6	0.2	16.1	8.2	2.6	9.2	3.9	0.1	0.0	0.4	2.3	0.1	2.2	8.8	0.3	2.2
Philipsburg	2,499	89.2	0.6	14.9	7.8	4.7	1.3	3.5	0.1	0.3	0.3	3.7	0.0	4.5	6.5	1.6	1.1
Rockview	6,118	81.3	1.1	17.9	12.7	1.7	3.8	2.3	0.1	0.1	0.7	2.1	0.3	3.2	6.8	0.8	1.0
AREA IV																	
TROOP C																	
Clarion	6,302	85.7	0.5	17.9	7.8	3.5	4.6	3.0	0.5	0.4	0.5	3.3	0.1	3.3	18.5	0.5	3.8
Clearfield	5,867	89.3	0.9	16.6	6.6	3.9	2.9	2.8	0.1	0.3	0.4	1.9	0.0	1.6	0.6	0.2	1.1
Dubois	5,321	80.1	0.6	16.1	7.2	1.2	5.2	1.6	1.2	0.2	0.5	1.1	0.1	1.6	3.4	4.2	3.4
Kane	1,978	77.1	0.2	17.0	14.1	1.3	7.3	0.9	0.4	0.0	0.9	1.2	0.4	1.5	4.8	0.4	0.3
Punxsutawney	3,375	76.7	0.0	17.1	7.6	3.0	12.4	3.8	0.2	0.2	1.2	3.5	0.2	5.2	9.0	0.6	1.0
Ridgway	2,681	80.8	0.3	15.8	7.4	2.2	9.8	5.2	0.2	0.6	0.6	1.9	0.3	2.2	10.4	0.5	2.2
Tionesta	2,650	80.1	0.4	14.1	5.8	1.9	12.0	3.9	0.2	0.0	0.8	2.3	0.2	2.0	13.2	0.1	1.4
TROOP D																	
Beaver	3,486	67.6	0.1	19.1	10.8	2.3	19.8	4.9	0.1	0.0	3.4	3.9	0.0	4.7	6.6	0.4	1.1
Butler	4,052	69.1	0.5	18.6	13.4	1.8	14.5	3.7	0.4	0.1	1.5	3.2	0.1	4.4	10.0	0.7	1.9
Kittanning	2,661	70.4	0.3	19.2	13.5	4.9	13.1	5.5	0.3	0.5	2.0	4.7	0.1	7.4	9.1	0.3	3.4
Mercer	2,732	81.6	0.6	17.6	10.4	5.5	5.3	6.2	0.2	0.3	0.9	5.9	0.2	7.4	8.6	0.3	2.3
New Castle	1,462	64.8	0.9	15.0	17.8	5.3	11.7	6.4	0.8	0.0	3.0	3.8	0.2	4.9	15.3	0.8	5.4

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

	Total # of Stops	% Speeding P	% Speeding S	Amt. over limit Avg.	% Mov. Viol. P	% Mov. Viol. S	% Equip./ Inspect. P	% Equip./ Inspect. S	% Preexist. Info. P	% Preexist. Info. S	% Regist. P	% Regist. S	% License P	% License S	% Spec. Traf. Enf. P	Other P	Other S
AREA IV (cont.)																	
TROOP E																	
Corry	907	74.4	0.7	16.2	13.0	1.7	10.5	1.7	0.3	0.0	1.1	3.6	0.1	5.2	10.7	0.6	4.1
Erie	3,193	72.4	1.9	18.5	16.3	1.1	7.5	1.3	0.2	0.2	1.2	1.3	0.2	1.4	23.5	0.3	0.0
Franklin	1,786	62.9	0.5	16.2	10.5	4.0	21.6	4.0	0.5	0.2	2.4	4.3	0.2	5.7	4.7	0.5	1.2
Girard	4,135	81.7	0.4	17.7	9.4	1.4	6.3	2.1	0.2	1.1	2.0	3.1	0.1	3.8	7.6	1.1	1.5
Meadville	3,815	75.8	0.5	16.9	10.7	2.1	10.3	3.2	0.3	0.2	1.8	3.1	0.1	3.1	1.5	0.8	2.1
Warren	872	65.3	0.3	17.7	18.5	2.0	12.4	1.5	0.5	0.0	2.4	2.2	0.5	4.0	7.5	0.7	0.2
AREA V																	
TROOP K																	
Media	5,922	54.6	0.7	23.9	27.7	1.3	14.3	1.8	0.2	0.0	2.5	1.8	0.2	1.9	8.1	0.5	0.4
Philadelphia	2,861	50.6	1.0	23.1	24.9	2.8	19.9	2.2	0.3	0.0	2.5	2.5	0.4	4.9	15.7	1.4	0.6
Skippack	3,185	55.1	1.1	21.9	19.4	0.5	20.8	1.4	0.1	0.1	3.3	1.9	0.1	2.5	16.5	0.7	1.1
TROOP M																	
Belfast	3,417	80.4	0.3	21.2	9.7	3.8	7.8	5.9	0.0	0.5	1.2	2.8	0.0	4.3	13.3	0.2	0.2
Bethlehem	2,800	61.3	0.4	21.4	15.6	1.8	18.1	3.4	0.2	0.1	5.0	2.5	0.1	5.1	17.4	2.5	2.3
Dublin	3,212	57.4	0.3	20.3	19.4	1.7	17.9	2.2	0.4	0.3	2.3	2.5	0.0	3.7	19.9	0.3	0.8
Fogelsville	3,930	75.4	0.7	22.0	17.2	2.7	5.1	2.7	0.2	0.0	1.4	1.5	0.1	2.2	10.6	2.3	0.7
Trevose	2,966	59.2	0.4	26.1	18.9	1.2	16.9	1.8	0.1	0.0	3.1	2.2	0.4	5.0	10.1	1.2	0.8
TROOP N																	
Bloomsburg	2,963	88.4	0.5	16.8	8.0	7.5	2.5	5.7	0.2	0.1	0.5	1.5	0.1	2.7	19.6	2.5	0.0
Fern Ridge	1,827	73.0	0.6	17.9	13.0	1.2	8.9	4.4	0.3	0.0	1.4	0.9	0.1	1.5	25.3	3.0	1.2
Hazleton	3,723	69.9	0.2	18.0	17.0	0.7	11.6	1.8	0.2	0.1	1.5	2.2	0.2	3.6	12.2	1.5	0.7
Lehighton	1,517	71.3	1.4	18.6	17.2	0.8	8.7	3.6	0.1	0.0	1.2	1.3	0.1	2.5	15.0	1.9	0.7
Swiftwater	6,401	73.0	0.5	18.3	15.5	4.0	7.4	7.8	0.3	1.5	1.9	1.8	0.1	1.6	5.7	0.7	0.8
Canine	1,015	57.8	1.3	16.2	19.8	6.4	17.8	4.3	0.5	0.1	2.5	1.7	0.1	3.9	0.1	0.7	0.1

DRIVERS' CHARACTERISTICS

Drivers' Age & Gender

Tables 3.6 and 3.7 provide the synopsis of drivers' characteristics across the department, area, and troop levels in **Table 3.6**, and the station level in **Table 3.7**. Department wide, the average age of drivers was 34.2, and 70.9% 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 39.4 in Tionesta (**Table 3.7**), compared to 31.0 in Hollidaysburg (**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 station (77.2%), while the lowest percentage of male drivers stopped by Troopers occurred in Shickshinny (61.8%).

Drivers' Race & Ethnicity

The racial / ethnic background of drivers was also recorded by Troopers. The racial and ethnic composition of drivers was visually determined by the Troopers. 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 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 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. Each Trooper was advised of this confidentiality agreement by the principal investigator in a training video.

The racial and ethnic descriptions of drivers stopped by Troopers are recorded at the department, area, and troop level 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 (83.7%)
- Black (7.9%)

- White Hispanic (2.7%)
- Black Hispanic (0.4%)
- Native American (0.1%)
- Middle Eastern (1.9%)
- Asian/Pacific Islander (1.8%)
- Unknown race / ethnicity or missing data (1.7%)

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 3 stations (i.e., Honesdale, Kane, and Swiftwater) reporting greater than 5% 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 placed on the data collection effort. As previously mentioned in the Methodology section, each individual traffic stop form was reviewed by multiple supervisors to ensure accuracy and minimize errors. 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. These issues and their implications for determining discrimination in stopping patterns will be more fully explored in Sections IV & V of this report.

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 (90.9%), while Area V stopped the lowest percent of White drivers (76.5%). Differences in racial composition of drivers stopped across areas are also pronounced for Black drivers. For example, black drivers accounted for 11.3% of drivers stopped in Area V, compared to 4.6% 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 (**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 94.9% of drivers in Troop P, to a low of 73.9% in Troop K. Black drivers represented 17.3% of stops in Troop K, while only 2.2% of stops Troop P. Similarly, White Hispanics varied from 7.0% of the stops by Troopers in Troop J, compared to only 0.5% of stops by Troopers in Troop A.

As expected, at the station level (**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 99.1% of stops in Emporium to only 63.5% of stops in Philadelphia and 64.2% of stops by the Canine Unit. In addition, Troopers in Philadelphia stopped the highest percentage of Black drivers compared to all other stations (24.6%), while there were multiple stations with fewer than 1% of their stops being of black drivers (e.g., Tionesta, Emporium, and Coudersport). Please refer to **Table 3.7** for the breakdown across the other racial categories.

<u>Drivers' Residency</u>

Tables 3.6 and **3.7** also report drivers' residency based on zip code. For every traffic stop, Troopers were to record the drivers' zip code to determine what percentage of stops occur in locations where the drivers actually reside. 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, state wide, 95.9% of the drivers stopped by Troopers did not reside in the municipality where they were stopped, 67.9% did not reside in the county where they were stopped, and 29.5% did not reside in Pennsylvania.

When broken down at the area, troop, and station levels, it becomes obvious that the percentages of out-of-state, out-of-county, and out-of-municipality 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 (33.2%), out-of-county drivers (76.7%), and out-of-municipality drivers (97.9%). Conversely, Troopers working in Area III stopped the lowest percent of out-of-state drivers (20.1%), out-of-county drivers (56.2%), and out-of-municipality drivers (94.3%).

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 92.1% of drivers stopped in Troop A. At the station level, less than 1% of drivers stopped by Troopers in the turnpike stations (i.e., Somerset (T) and Everett stations) resided in the municipality where stopped, compared to 84.5% of drivers stopped by Troopers assigned to the Fern Ridge station.

Likewise, drivers stopped in a different county than the one in which they reside ranged from 91.3% of drivers stopped in Troop T, compared to only 40.5% 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 (99.3%), while Troopers assigned to the Greensburg station stopped the lowest percent of out-of-county drivers (23.4%).

Finally, the highest percentage of out-of-state drivers stopped at the Troop level was in Troop C (43.5%), whereas Troop A (5.2%) 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) (64.8%), Gibson (64.6%), Dubois (58.2%), and Clarion (58.2%) stations. In contrast, only 2.1%, 2.3%, and 3.0% of drivers stopped in Stonington, Greensburg, and Lykens stations, respectively, were non-PA residents.

Given that only slightly more than 4% 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 explored in greater detail in Sections IV & V of this report.

Table 3.6. Characteristics of Drivers Stopped By Department, Area & Troop (p. 1 of 1)

	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.	327,120	34.3	70.9	83.7	7.9	2.7	0.4	0.1	1.9	1.8	1.7	29.5	67.9	95.9
Area I	120,866	34.2	71.2	81.4	10.0	3.2	0.5	0.1	2.2	2.2	1.5	33.2	76.7	97.9
Troop H	21,531	33.3	69.1	86.8	6.7	2.9	0.3	0.0	1.0	1.2	2.2	23.2	56.1	94.8
Troop J	11,958	33.4	69.6	80.5	8.9	7.0	0.5	0.1	1.0	1.5	1.2	12.7	40.5	94.8
Troop L	11,131	34.4	71.3	85.0	6.2	4.2	0.9	0.2	1.6	1.3	1.4	24.5	56.1	95.8
Troop T	76,246	34.6	72.1	79.4	11.6	2.5	0.4	0.1	2.9	2.7	1.3	40.5	91.3	99.6
Area II	40,831	34.9	71.5	89.2	4.6	1.9	0.2	0.0	1.4	1.4	2.2	30.9	67.5	95.3
Troop F	23,063	35.2	70.9	89.2	4.9	2.0	0.2	0.0	1.4	1.3	1.9	29.7	71.5	96.1
Troop P	7,735	34.5	71.6	94.9	2.2	1.1	0.1	0.1	0.5	0.4	1.6	19.1	55.4	95.2
Troop R	10,033	34.7	72.9	84.8	5.7	2.3	0.3	0.1	2.0	2.4	3.2	42.8	67.7	93.6
Area III	61,799	34.2	69.7	90.9	5.4	1.0	0.1	0.1	1.1	1.2	1.1	20.1	56.2	94.3
Troop A	14,766	34.5	68.9	94.6	3.4	0.5	0.1	0.0	0.6	0.8	0.8	5.2	43.0	92.1
Troop B	25,031	34.2	70.0	90.6	6.5	0.6	0.1	0.1	1.0	1.0	1.4	24.1	53.7	94.6
Troop G	22,002	33.8	69.9	88.8	5.6	1.8	0.2	0.1	1.6	1.7	0.9	25.6	67.8	95.4
Area IV	57,275	34.6	71.8	87.1	5.9	1.8	0.3	0.1	2.2	1.6	1.6	32.1	65.8	94.9
Troop C	28,174	35.8	74.0	84.1	6.5	2.7	0.6	0.1	2.9	2.0	1.6	43.5	78.7	96.1
Troop D	14,393	32.9	69.9	90.0	6.0	1.2	0.1	0.1	1.3	0.9	1.0	17.3	56.0	95.0
Troop E	14,708	33.9	69.3	89.9	4.7	0.9	0.1	0.1	1.8	1.5	2.1	24.9	50.5	92.5
Area V	44,724	34.0	71.6	76.5	11.3	5.4	0.6	0.0	2.2	2.3	2.6	27.7	63.7	95.1
Troop K	11,968	34.2	70.3	73.9	17.3	3.3	0.4	0.0	1.6	3.0	1.3	13.9	53.7	95.5
Troop M	16,325	33.4	70.7	79.7	8.4	6.3	0.8	0.0	2.2	2.1	1.3	22.1	61.2	95.5
Troop N	16,431	34.5	73.4	75.3	9.8	6.0	0.6	0.1	2.5	2.1	4.9	43.4	73.3	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	3,081	32.9	69.7	87.8	6.5	2.2	0.6	0.0	0.7	1.4	1.6	28.7	66.2	96.9
Chambersburg	3,798	32.9	67.2	87.6	6.9	3.0	0.2	0.0	1.2	0.9	1.3	27.0	41.7	91.7
Gettysburg	1,962	34.0	67.7	87.2	4.5	5.1	0.2	0.0	0.9	1.1	1.5	25.3	56.1	95.6
Harrisburg	5,269	34.6	70.9	87.0	6.6	3.1	0.2	0.0	1.3	1.4	1.9	20.1	66.3	96.3
Lykens	1,064	33.3	65.7	97.2	1.6	0.7	0.1	0.0	0.1	0.3	0.9	3.0	29.0	89.2
Newport	1,579	33.5	64.5	90.6	3.1	1.6	0.2	0.1	1.2	1.2	3.7	15.3	79.9	97.9
York	4,778	32.3	71.1	81.4	10.0	3.2	0.4	0.1	0.8	1.3	4.0	26.4	48.1	94.3
Area I, Troop J														
Avondale	3,490	33.9	68.2	76.7	10.2	11.4	0.3	0.0	0.6	0.8	0.3	19.0	42.1	95.7
Embreeville	2,899	34.2	67.8	77.5	12.4	4.1	0.6	0.1	1.7	2.2	2.1	7.0	37.3	95.6
Ephrata	1,654	31.3	70.5	82.2	6.6	7.2	1.2	0.0	1.0	1.8	0.7	9.9	43.8	96.6
Lancaster	3,915	33.3	71.8	85.5	6.0	5.3	0.4	0.1	0.9	1.7	1.5	12.4	40.1	92.8
Area I, Troop L														
Frackville	2,414	34.3	72.6	89.3	5.0	2.7	0.3	0.1	0.8	1.1	1.5	29.7	59.1	95.7
Hamburg	1,836	35.6	72.8	74.5	9.9	5.2	1.9	1.1	4.1	2.8	2.3	44.0	84.8	98.2
Jonestown	2,817	33.3	72.5	82.1	8.3	5.4	0.5	0.2	2.0	1.3	0.5	35.7	74.6	96.8
Reading	2,502	35.0	68.7	85.7	4.3	5.5	1.9	0.0	0.9	0.9	2.0	4.5	29.6	92.9
Schuylkill Haven	1,562	34.3	69.5	94.6	2.7	1.3	0.1	0.0	0.5	0.6	0.6	5.3	27.2	96.1
Area I, Troop T														
Bowmansville	10,007	32.6	68.3	76.7	12.6	3.8	0.6	0.1	2.8	3.1	1.3	29.2	92.3	99.7
Everett	12,698	35.2	71.1	76.4	13.7	2.5	0.3	0.1	3.7	3.4	0.9	50.9	99.3	99.9
Gibsonia	7,353	35.5	71.1	82.6	10.7	1.6	0.2	0.0	2.5	1.7	1.2	44.4	82.4	99.0
King of Prussia	7,733	35.5	74.3	80.5	9.9	2.7	1.1	0.0	2.4	3.1	0.9	21.8	77.9	98.9
New Stanton	7,195	33.6	72.3	86.7	8.7	1.0	0.1	0.0	1.8	1.5	1.5	28.3	73.8	98.5
Newville	11,986	34.1	72.4	77.6	12.7	2.8	0.5	0.0	3.2	2.9	1.0	41.1	96.7	99.9
Pocono	7,886	33.4	69.1	87.4	6.0	2.4	0.4	0.0	2.0	1.8	1.3	27.6	95.8	99.9
Somerset (T)	11,370	36.2	77.2	74.3	14.9	2.7	0.2	0.1	3.7	3.1	2.3	64.8	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	1,917	37.0	71.8	98.5	0.6	0.2	0.0	0.1	0.2	0.4	0.3	16.4	55.5	88.5
Emporium	1,490	37.8	75.9	99.1	0.5	0.1	0.0	0.0	0.1	0.1	0.8	8.3	73.8	93.7
Lamar	3,851	34.2	73.4	75.8	8.6	4.6	0.6	0.0	3.0	2.7	4.8	59.1	92.4	99.6
Mansfield	1,345	37.6	73.7	90.6	3.5	1.2	0.4	0.0	0.9	1.7	2.5	43.0	66.0	96.4
Milton	3,549	34.1	69.5	81.9	9.2	3.8	0.3	0.0	2.6	2.1	1.6	42.7	88.3	98.4
Montoursville	4,336	35.0	71.1	92.3	4.2	1.1	0.1	0.0	0.9	1.2	1.8	21.0	53.7	95.3
Selinsgrove	4,601	34.4	68.5	92.2	4.6	1.2	0.0	0.0	1.1	0.7	1.0	23.5	80.7	97.9
Stonington	1,974	35.6	66.7	97.5	0.8	0.6	0.1	0.0	0.1	0.4	1.1	2.1	36.0	91.6
Area II, Troop P														
Laporte	1,298	38.6	75.0	97.8	1.1	0.4	0.1	0.1	0.2	0.2	1.2	15.2	79.4	94.9
Shickshinny	934	33.4	61.8	96.8	1.1	1.2	0.1	0.0	0.2	0.3	0.9	4.8	34.7	94.1
Towanda	1,613	34.0	72.7	98.0	0.8	0.7	0.1	0.0	0.3	0.2	1.6	18.1	36.8	92.3
Tunkhannock	1,152	33.6	73.0	94.2	1.1	1.6	0.1	0.0	0.3	0.3	3.0	7.5	67.5	95.4
Wyoming	2,738	33.5	72.2	91.2	4.6	1.5	0.2	0.2	1.1	0.6	1.4	31.3	57.1	97.4
Area II, Troop R														
Blooming Grove	2,113	36.1	74.3	86.3	5.0	2.6	0.5	0.1	1.1	1.1	4.1	49.2	78.3	93.1
Dunmore	4,069	33.8	73.5	84.2	6.4	2.4	0.3	0.1	2.6	2.9	1.7	43.1	71.3	95.7
Gibson	1,849	33.6	76.2	77.9	9.1	2.8	0.4	0.0	3.2	4.9	3.2	64.6	80.4	96.9
Honesdale	2,002	36.4	67.0	90.9	2.1	1.5	0.1	0.0	0.3	0.5	5.4	15.3	37.5	86.8
Area III, Troop A														
Ebensburg	3,055	34.4	69.4	94.4	3.2	0.5	0.0	0.0	1.0	0.9	0.3	6.7	52.2	91.8
Greensburg	4,798	34.9	64.8	95.3	3.0	0.3	0.0	0.0	0.2	1.0	1.3	2.3	23.4	92.2
Indiana	2,984	33.8	72.6	94.2	3.2	1.0	0.1	0.0	0.6	0.7	0.7	6.4	55.3	92.9
Kiski Valley	2,241	34.3	70.1	91.9	6.4	0.3	0.1	0.0	0.6	0.5	1.1	4.1	60.4	92.5
Somerset (A)	1,688	35.2	71.5	97.7	0.8	0.4	0.1	0.0	0.6	0.5	0.3	10.2	37.3	90.8
Area III, Troop B														
Belle Vernon	3,917	35.0	74.2	89.2	6.7	1.0	0.1	0.3	1.1	1.0	1.5	26.2	62.2	95.3
Findlay	7,187	33.4	69.7	89.0	7.6	0.7	0.1	0.0	1.3	1.2	0.9	22.9	55.6	96.4
Uniontown	4,331	34.1	67.8	93.7	5.7	0.2	0.1	0.0	0.1	0.2	1.5	6.1	23.7	90.2
Washington	6,710	35.2	70.1	90.5	6.4	0.7	0.1	0.0	0.9	1.3	1.6	31.0	63.0	95.8
Waynesburg	2,886	33.3	68.1	92.4	4.6	0.4	0.0	0.0	1.4	1.1	1.4	35.6	60.9	93.1

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	2,607	32.3	67.4	92.1	4.7	0.9	0.0	0.0	1.3	0.9	0.5	25.0	60.3	95.2
Hollidaysburg	3,020	31.0	66.9	91.9	4.3	1.0	0.0	0.1	1.0	1.5	0.7	16.3	54.4	90.6
Huntingdon	1,819	34.5	70.8	96.3	2.4	1.0	0.0	0.0	0.1	0.2	0.4	5.8	56.3	96.2
Lewistown	3,544	32.8	69.5	92.0	3.2	1.3	0.2	0.1	1.0	1.6	2.1	10.4	68.9	95.2
McConnellsburg	2,395	36.3	74.1	77.8	14.0	2.3	0.3	0.1	2.4	2.7	1.2	57.2	85.9	95.8
Philipsburg	2,499	35.5	67.5	94.9	2.7	0.6	0.1	0.0	1.1	0.4	0.6	13.8	67.8	97.8
Rockview	6,118	34.6	71.7	83.5	6.8	3.4	0.6	0.0	2.8	2.6	0.8	37.5	73.3	96.8
Area IV, Troop C														
Clarion	6,302	35.0	74.5	76.0	10.3	4.2	0.9	0.2	4.4	3.3	1.1	58.2	86.6	98.0
Clearfield	5,867	34.9	72.5	80.2	8.7	2.8	0.6	0.1	4.4	2.7	0.7	55.2	81.1	97.7
Dubois	5,321	35.3	75.0	78.9	9.0	4.6	0.8	0.1	3.4	2.3	1.3	58.2	88.0	98.8
Kane	1,978	36.6	75.8	90.5	1.3	0.4	0.2	0.2	1.3	0.9	5.6	30.2	60.5	92.2
Punxsutawney	3,375	35.5	73.0	93.1	3.1	1.1	0.2	0.0	1.3	1.0	0.7	21.1	68.0	95.6
Ridgway	2,681	36.7	72.0	91.8	2.0	0.7	0.2	0.0	0.9	1.0	4.3	24.4	63.7	89.9
Tionesta	2,650	39.4	75.9	98.6	0.4	0.5	0.0	0.0	0.2	0.3	1.1	10.6	78.7	92.8
Area IV, Troop D														
Beaver	3,486	32.7	69.2	90.5	7.1	0.5	0.1	0.1	0.9	0.8	0.5	17.7	51.0	95.7
Butler	4,052	32.2	71.6	93.8	3.6	0.9	0.1	0.1	0.7	0.6	0.9	10.0	54.4	93.0
Kittanning	2,661	32.5	67.2	93.3	4.5	0.5	0.0	0.0	0.5	0.3	1.1	4.4	47.0	95.6
Mercer	2,732	33.0	71.0	79.0	9.6	3.4	0.4	0.1	4.0	2.5	1.8	43.0	79.8	98.4
New Castle	1,462	35.8	69.9	92.6	6.3	0.3	0.0	0.1	0.3	0.3	1.0	11.8	43.8	90.9
Area IV, Troop E														
Corry	907	33.3	70.7	98.5	1.2	0.2	0.0	0.0	0.0	0.0	2.3	5.8	36.7	93.7
Erie	3,193	34.7	68.4	87.9	5.3	1.2	0.3	0.2	2.5	2.2	1.4	39.7	50.9	92.4
Franklin	1,786	34.1	69.7	96.0	1.4	0.5	0.1	0.3	0.6	0.6	2.1	8.3	39.5	89.5
Girard	4,135	33.8	67.1	87.5	6.2	1.2	0.1	0.1	1.9	1.6	2.4	26.0	44.2	89.4
Meadville	3,815	33.3	71.0	87.3	5.9	0.7	0.1	0.1	2.4	1.9	2.3	27.2	70.6	96.7
Warren	872	34.0	73.1	98.4	0.7	0.4	0.2	0.0	0.1	0.2	1.0	8.5	27.3	93.7

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	5,922	33.8	70.2	74.6	17.8	2.7	0.2	0.0	1.6	2.5	0.9	19.2	55.8	96.6
Philadelphia	2,861	34.6	72.7	63.5	24.6	3.9	1.0	0.0	1.7	4.5	2.0	13.0	69.5	94.9
Skippack	3,185	34.5	68.4	81.7	10.0	3.7	0.2	0.0	1.5	2.4	1.4	5.0	35.6	94.2
Area V, Troop M														
Belfast	3,417	32.3	70.8	78.2	8.4	8.0	0.6	0.0	1.9	2.0	1.1	27.9	68.7	98.2
Bethlehem	2,800	33.2	69.7	80.5	6.5	7.4	1.2	0.0	2.6	1.6	0.9	13.1	52.9	94.0
Dublin	3,212	34.4	68.7	92.6	2.1	2.6	0.6	0.1	0.7	1.0	2.1	4.6	50.9	93.7
Fogelsville	3,930	34.1	73.5	75.7	9.3	8.5	0.8	0.0	3.3	2.3	1.0	35.5	73.8	97.8
Trevose	2,966	33.0	70.0	72.4	15.8	4.1	0.9	0.0	2.5	3.8	1.6	25.2	54.9	92.6
Area V, Troop N														
Bloomsburg	2,963	33.0	73.1	77.9	9.7	5.2	0.7	0.0	3.3	2.1	2.0	49.6	89.2	98.4
Fern Ridge	1,827	32.8	71.7	78.3	9.8	5.2	0.8	0.0	2.5	1.9	3.3	39.9	68.0	84.5
Hazleton	3,723	33.8	73.9	79.1	8.4	6.1	0.4	0.1	2.8	2.1	2.6	40.9	73.8	97.4
Lehighton	1,517	35.0	69.5	92.2	2.9	2.9	0.3	0.0	0.7	0.9	1.4	7.7	46.8	87.4
Swiftwater	6,401	36.1	74.7	67.1	12.3	7.2	0.6	0.1	2.4	2.5	8.9	51.4	73.7	95.2
Canine Unit	1,015	33.0	78.0	64.2	18.7	10.8	0.2	0.0	2.9	2.1	2.0	52.1	81.5	96.1

SUMMARY

This section describes the characteristics of traffic stops and stopped drivers at the department, area, troop, and station level, based on a full year of data. 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 (71.8%)
  - Occurred during the daytime (72.4%)
  - Occurred on an interstate (54.5%) or state highway (41.6%)
  - Involved a vehicle registered in Pennsylvania (71.1%)
  - Involved vehicles with an average of 0.7 passengers
  - Lasted between 1-15 minutes (90.4%)

- Spring and summer months accounted for the largest percentages of traffic stops.

- At the department level, the most frequent violation observed prior to traffic stops was speeding (nearly 75%), followed by moving violations (13.6%), equipment inspections (9.0%), and special traffic enforcement programs (8.9%).

- The departmental average speed over the limit was recorded at 18.8, but the range varies considerably across area, troop, and station.

- Department wide, Troopers recorded the following drivers' characteristics:
  - Average age of 34.2
  - 70.9% were male
  - White (83.7%), Black (7.9%), Hispanic (3.1%), Middle Eastern (1.9%), Asian/Pacific Islander (1.8%), Native American (0.1%), and Unknown race / ethnicity or missing data (1.7%)
  - Non-resident of PA (29.5%), non-resident of county stopped in (67.9%), and non-resident of municipality stopped in (95.9%)

- Driver 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.

IV. OBSERVATIONS OF ROADWAY USAGE AND DRIVER SPEEDING BEHAVIOR

IV. OBSERVATIONS OF ROADWAY USAGE & DRIVER SPEEDING BEHAVIOR

This section is devoted to the observational surveys of roadway usage and speeding patterns of drivers that were conducted in 27 Pennsylvania counties. The section 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 observers and data collection procedures. The findings of the roadway and speeding surveys are described in three 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. Finally, the overall analysis focuses on the road usage and speeding behavior observed across the state.

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., 2000; 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. For the year-long period of traffic stop data collection, the Pennsylvania State Police identified speeding as the reason for the stop in 75 percent of all traffic stops.

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 white 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.[1] The limitations of this technique, therefore, prohibit giving much credence to the argument that white 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 white 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 finding that black motorists are more likely to speed than white motorists is invalid for the roadway segments selected.

[1] 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).

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., 2001). 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.[2]

Lange et al. (2001) 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 white 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 whites 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.

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.

[2] Lange et al. (2001) 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.

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.[3]

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 characteristics.[4] The factor analysis revealed a factor with an eigenvalue greater than one

[3] 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.

[4] 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).

(eigenvalue=3.31), which explained 43.7% of the variance.[5] 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 4.1.** 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 4.1: 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)

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

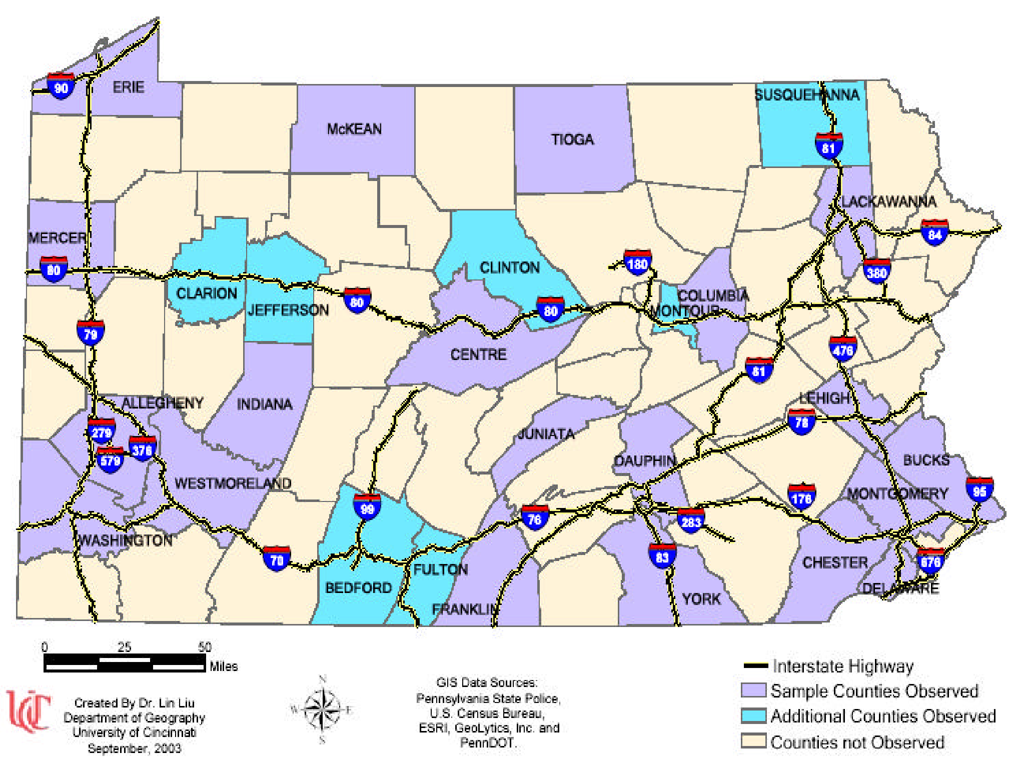
[5] In addition, a second factor was extracted with an eigenvalue slightly greater than one (eigenvalue = 1.12). However, this factor only explained 16% of the variance and none of the factor loadings for individual variables was greater than .50. This factor was statistically weak and uninterpretable 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.

departmental activity within those counties and their geographic location.[6] The twenty counties selected are displayed on the map in **Figure 4.1**, and include:

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

As **Figure 4.1** 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 4.1. Counties with Observed Traffic Counts in Pennsylvania



6 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 4.1**).

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.[7]

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

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

observation trip. Second, the data collection instruments were described and reviewed item by item (see Appendix A for the data collection instrument).[8] 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: white, 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), and
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 the data collection period, the two observers parked in a personal vehicle on the side or in the

[8] 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.

median of the roadway in order to collect information about the passing motorists and 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., 2001). 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.[9] 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; 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., 2001). Similar differences between the black and white 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 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

[9] 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.

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 4.2-21**) accompany the summaries of the sampled counties, illustrating each county's comparison of the percent of PSP stops 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 on pages 174-176.

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 4.2 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 4.2 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 4.2** and the maps in **Figure 4.2** 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 4.2** is that one observed municipality had less than 1% of all PSP stops (see West Deer Twp in **Table 4.2**). 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 4.2** 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 4.2 Observations in Allegheny County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # 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 4.2. Allegheny County, PA.
Traffic Stops and Observations by Municipality.

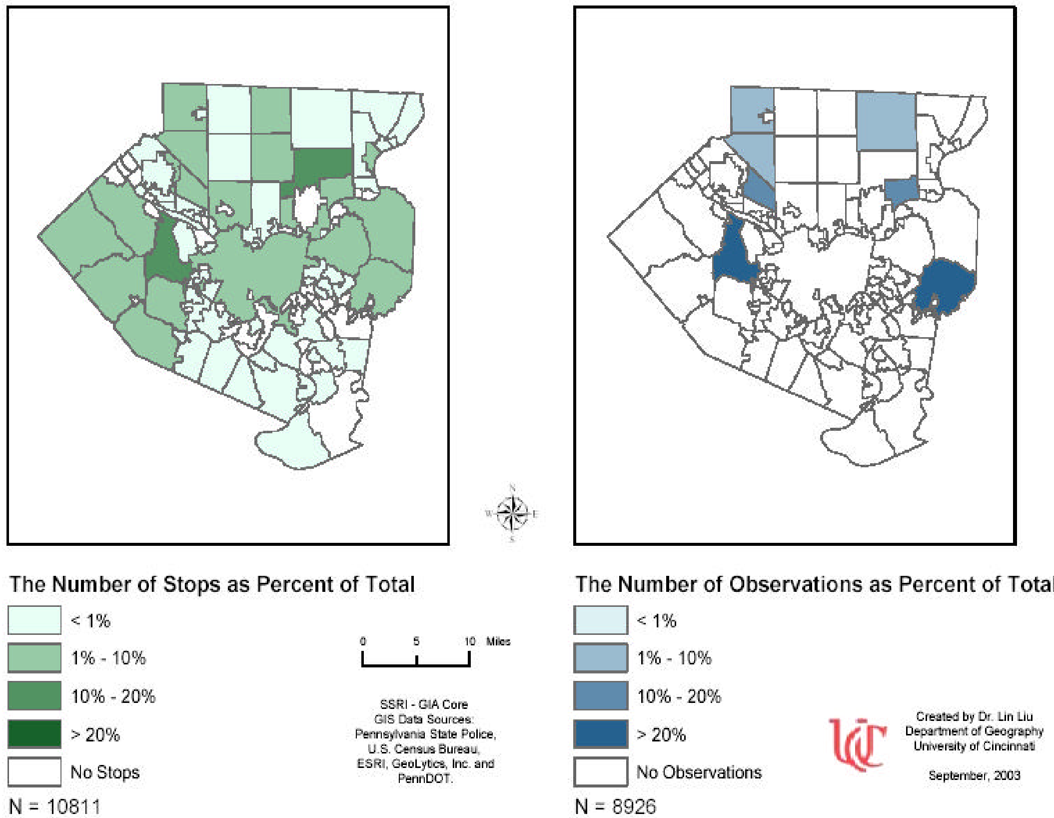


Table 4.3 describes some features of the observation sites (e.g., road type and speed limit) and documents the observed speeding behavior of drivers by municipality in Allegheny County. Each of the % speeding columns indicates the percent of drivers (only those that were observed with RADAR) who were 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 4.3 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 4.4 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.4 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Allegheny County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.5 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 4.5 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
White	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 4.6 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 4.3 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.

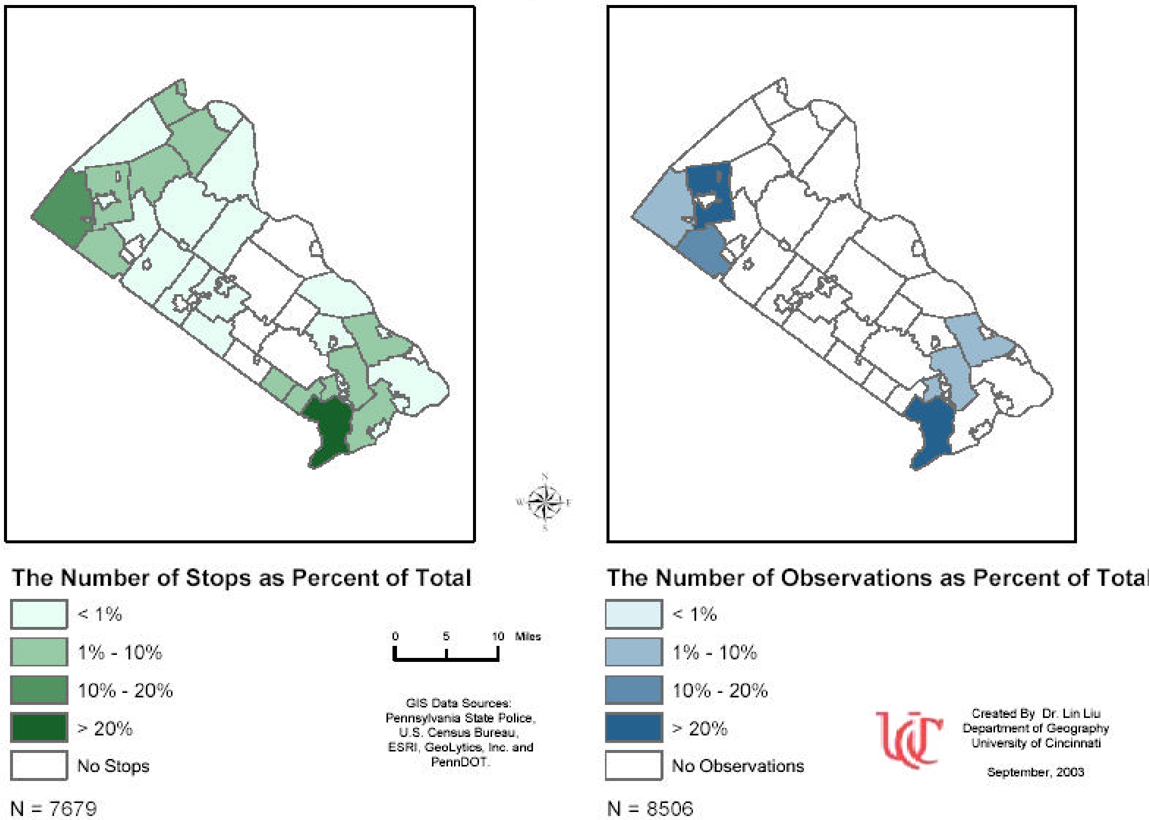
The first two columns of **Table 4.6** and the maps in **Figure 4.3** illustrate that the observed municipalities in Bucks County directly parallel the municipalities with higher concentrations of PSP traffic stops.

Table 4.6 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 4.3. Bucks County, PA.
Traffic Stops and Observations by Municipality.



The remainder of **Table 4.6** 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 4.7 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 4.7 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 4.8 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.8 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Bucks County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.9 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 white drivers are to exceed the speed limit by 10, 15, and 20 miles per hour, respectively.

Table 4.9 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
White	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 4.10 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.

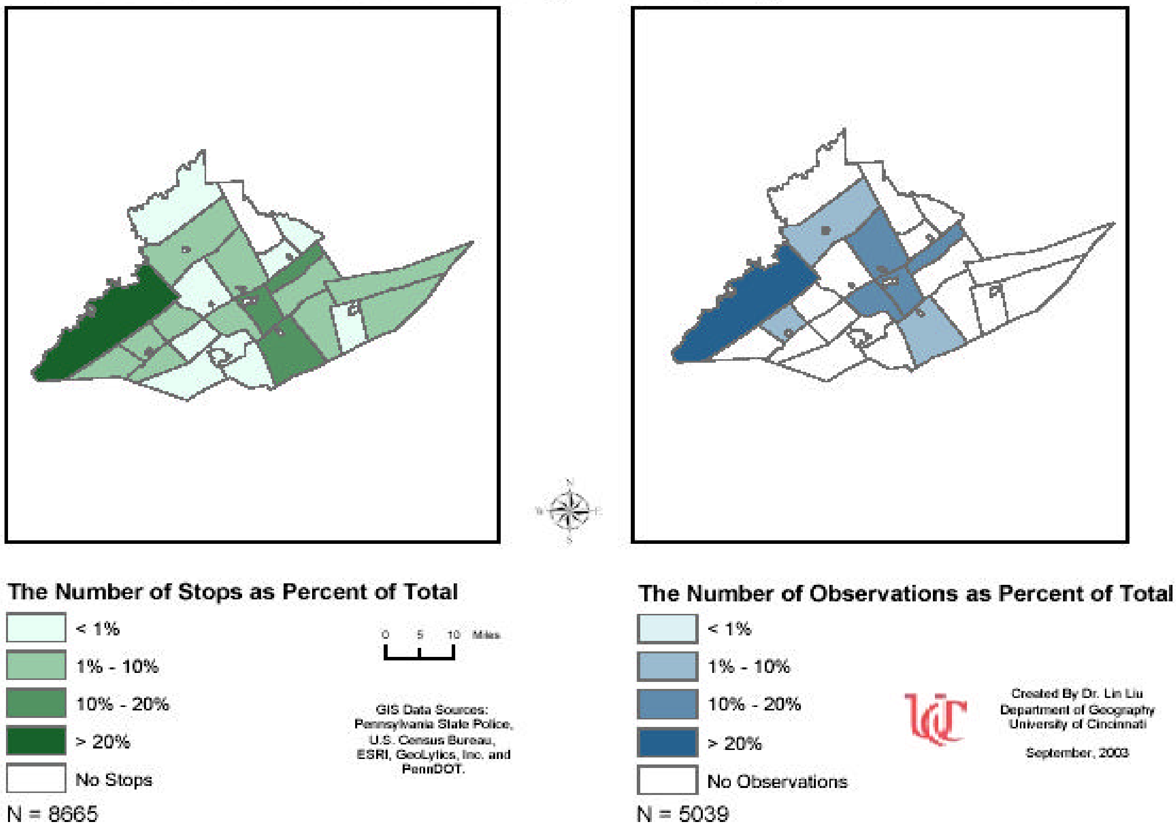
Figure 4.4 displays two maps of Centre County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table 4.10 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 4.4. Centre County, PA.
Traffic Stops and Observations by Municipality



The first two columns of **Table 4.10** and the maps in **Figure 4.4** 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 4.10** 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 4.11 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 4.11 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 4.12 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.12 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Centre County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.13 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 4.13 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
White	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 4.14 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 4.5 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.

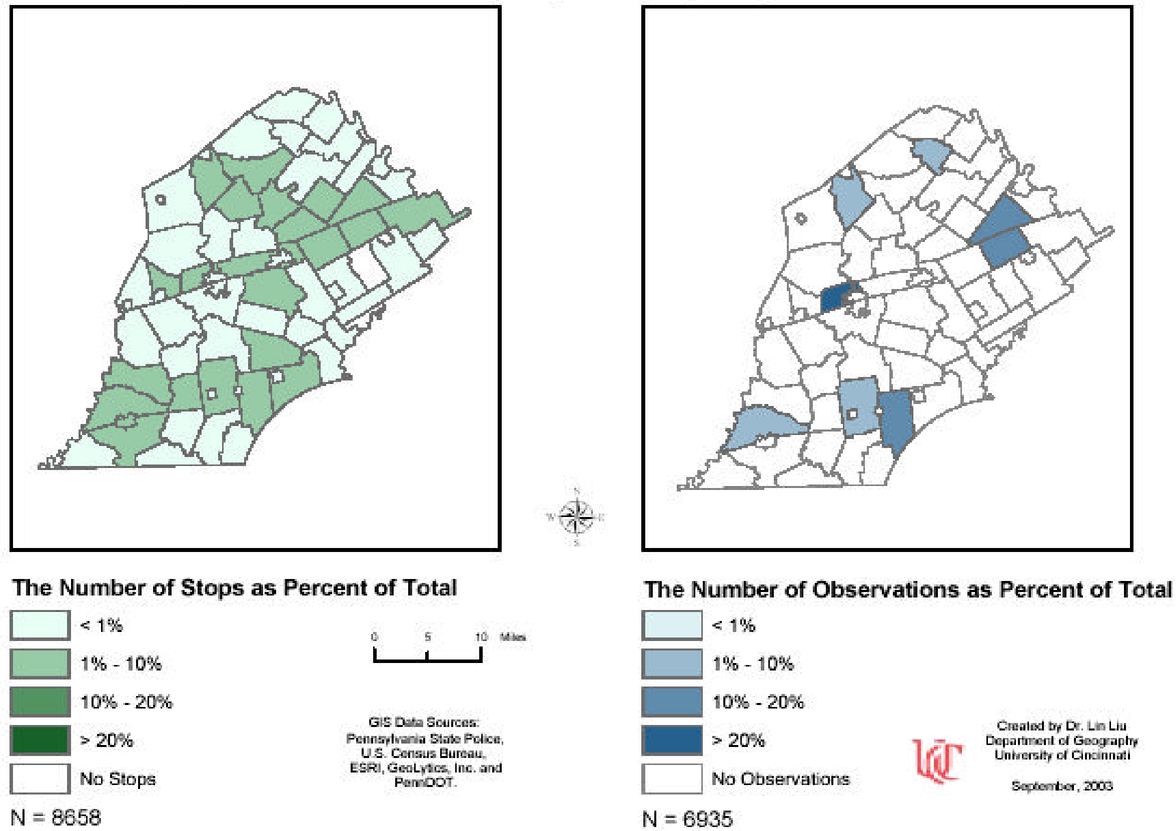
The first two columns of **Table 4.14** and the maps in **Figure 4.5** illustrate that the observed municipalities in Chester County reasonably represent the municipalities with higher concentrations of PSP traffic stops. As shown in **Figure 4.5**, however, PSP traffic stops in Chester County were evenly spread out and it was not possible to observe each of the municipalities with relatively high concentrations of PSP stops.

Table 4.14 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 4.5. Chester County, PA.
Traffic Stops and Observations by Municipality



The remainder of **Table 4.14** 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 4.15 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 both interstate and 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 4.15 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	Interstate	55	61.8	28.4	10.1	2.6
Lower Oxford Twp	Interstate	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 4.16 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.16 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Chester County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.17 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 whites.

Table 4.17 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
White	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 4.18 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 4.6 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.

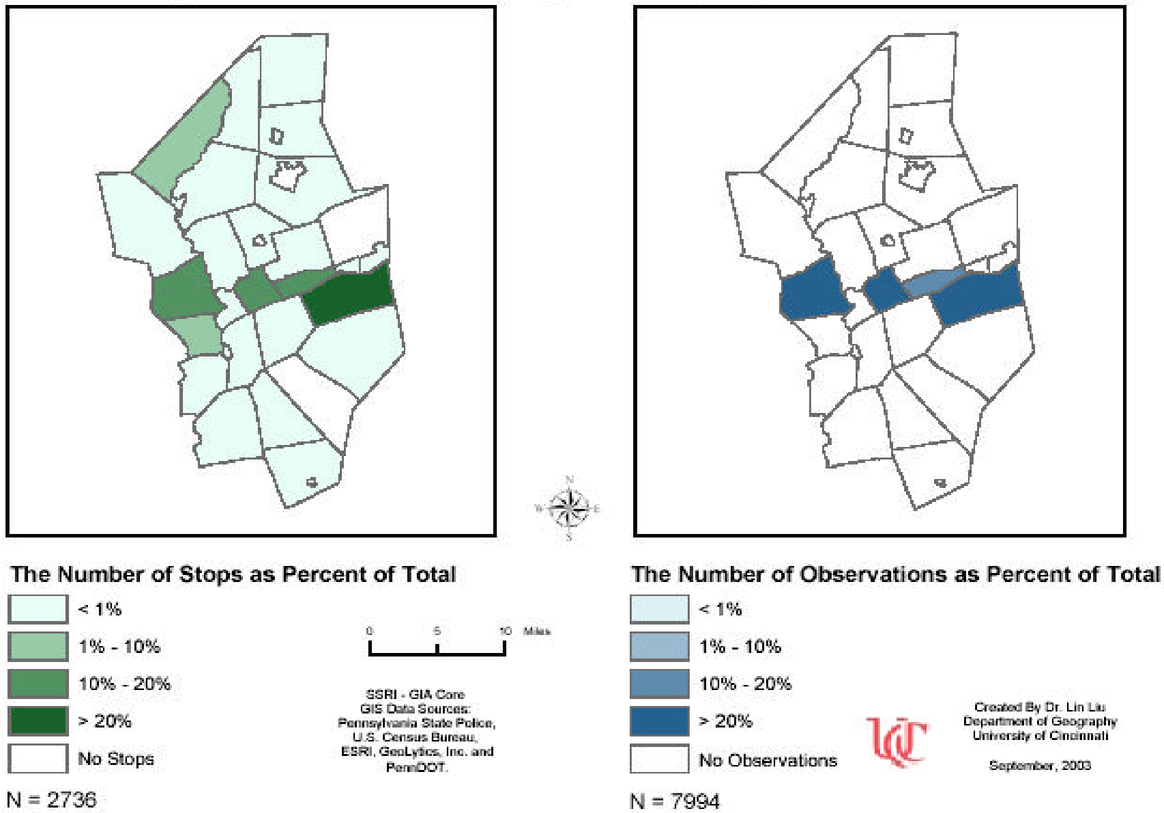
The first two columns of **Table 4.18** and the maps in **Figure 4.6** illustrate that the observations are concentrated in the same four municipalities in Columbia County that PSP traffic stops are most prevalent.

Table 4.18 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 4.6. Columbia County, PA.
Traffic Stops and Observations by Municipality



The remainder of **Table 4.18** 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 4.19 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 4.19 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 4.20 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.20 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Columbia County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.21 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 white drivers are to exceed the speed limit by 10 and 15 miles per hour, respectively.

Table 4.21 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
White	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 4.22 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.

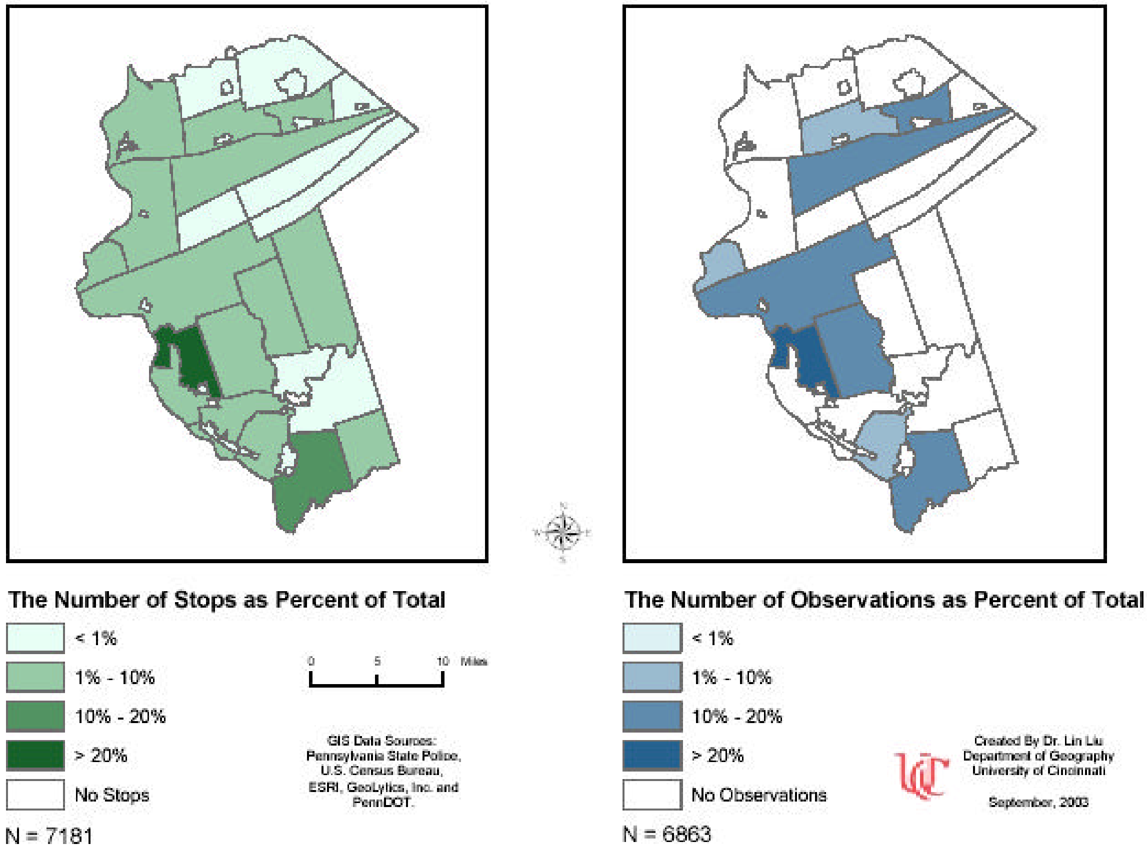
Figure 4.7 displays two maps of Dauphin County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table 4.22 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 4.7. Dauphin County, PA.
Traffic Stops and Observations by Municipality



The first two columns of **Table 4.22** and the maps in **Figure 4.7** illustrate that the observed municipalities in Dauphin County match well the municipalities with higher concentrations of PSP traffic stops.

The remainder of **Table 4.22** 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 4.23 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 4.23 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	Interstate	45	55.0	15.8	3.8	2.4
Reed Twp	Interstate	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 4.24 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.24 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Dauphin County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.25 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 white drivers are to exceed the speed limit by 15 miles per hour.

Table 4.25 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
White	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 4.26 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.

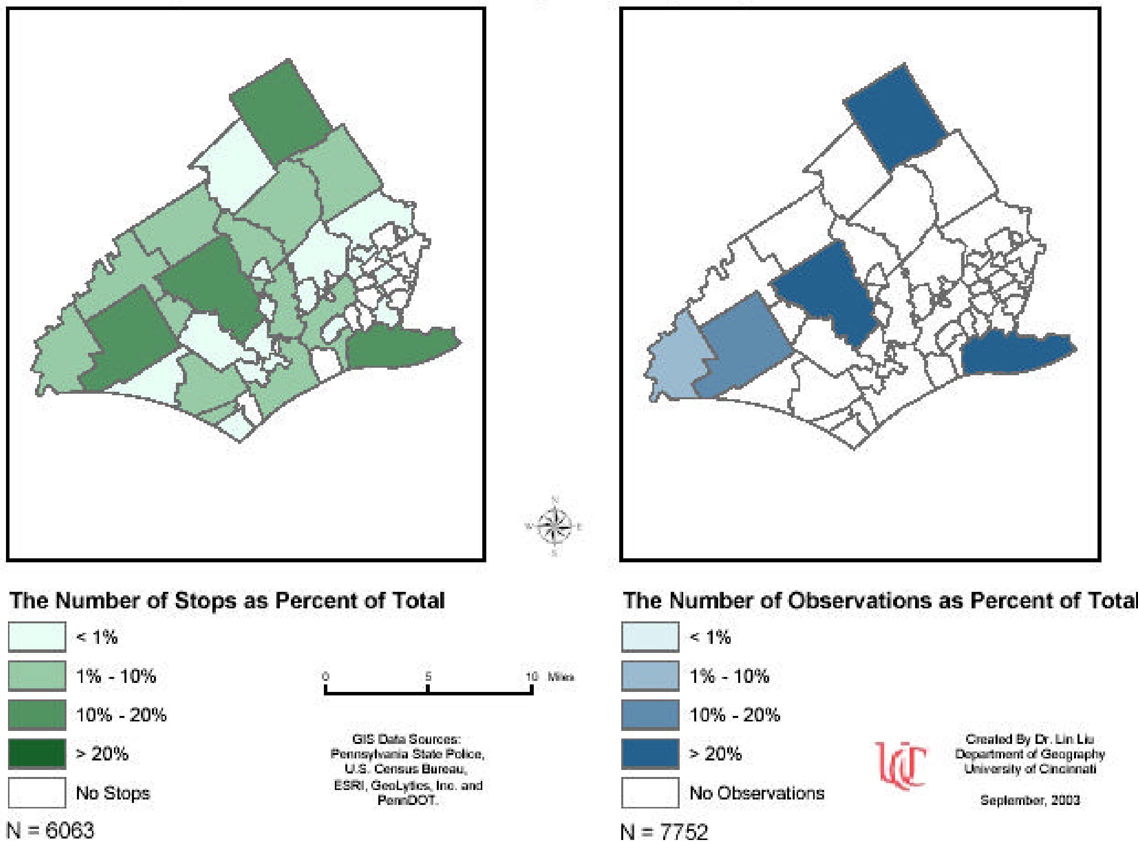
Figure 4.8 displays two maps of Delaware County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table 4.26 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 4.8. Delaware County, PA.
Traffic Stops and Observations by Municipality



The first two columns of **Table 4.26** and the maps in **Figure 4.8** 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 4.26** 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 4.27 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 local, 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 4.27 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	Inter/Local	35 & 45	76.2	31.6	9.1	2.3
Chadds Ford Twp	Local	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 4.28 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 % White indicate the % of whites 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 of interest in this table are:

- 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 white/non-Caucasian dichotomy in a more racially diverse area.

Table 4.28 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Delaware County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.29 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 white drivers to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table 4.29 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
White	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 4.30 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.

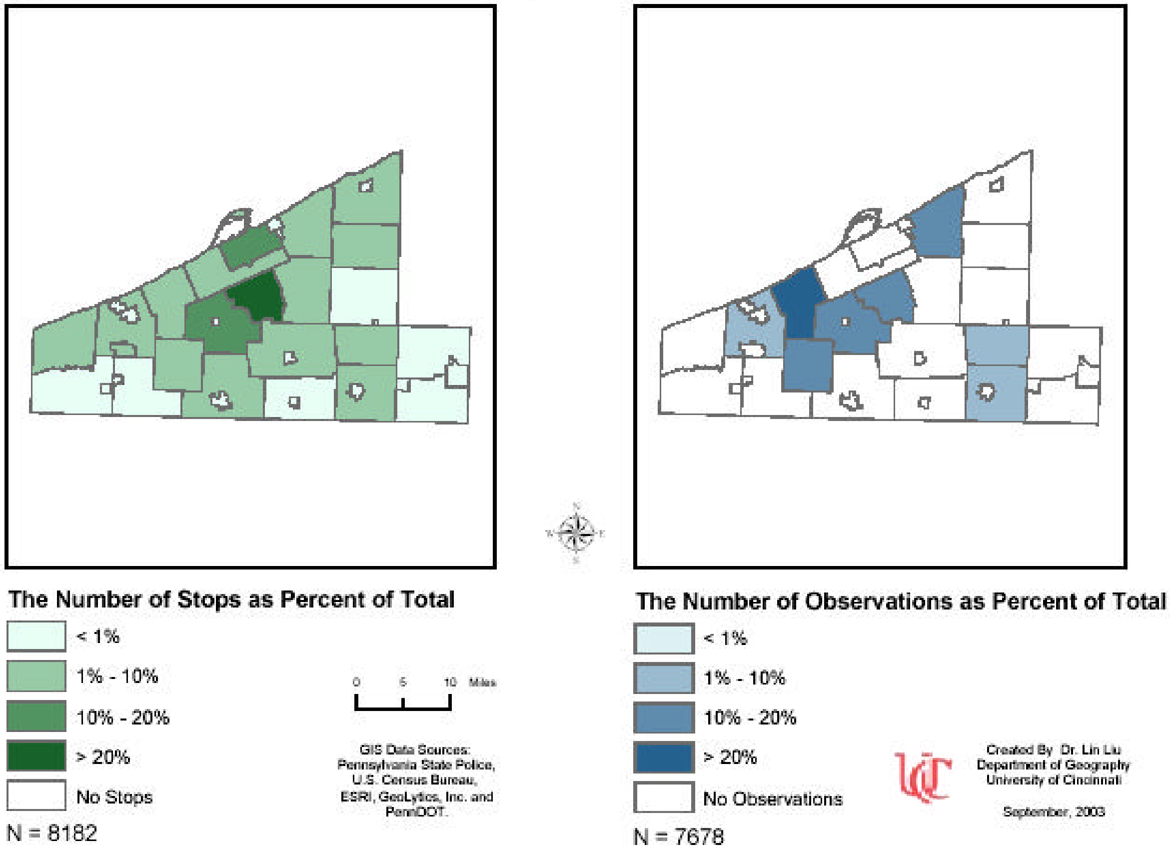
Figure 4.9 displays two maps of Erie County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table 4.30 Observations in Erie County

Municipality Observed	% of PSP Stops*	Date	# of Vehicles Observed	# of Hours Observed	Avg. # vehicles/hour	% RADAR
Franklin Twp	2.9	04/05/02	1,539	8.0	193.4	22.5
Fairview Twp	8.6	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 4.9. Erie County, PA.
Traffic Stops and Observations by Municipality



The first two columns of **Table 4.30** and the maps in **Figure 4.9** 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 4.9** 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 4.30** 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 4.31 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 local, 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 4.31 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
Franklin Twp	County/local	45	32.1	9.8	1.2	0.0
Fairview 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	State Hwy	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 4.32 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.32 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Erie County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Pop.	Obs.	% Diff.	Obs. Only
Franklin Twp	7,914	98.2	99.3	-1.1	0.5	0.6	-0.1	1.8	0.7	+1.1	1.7
Fairview 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 4.33 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 4.33 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
White	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 4.34 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 4.10 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.

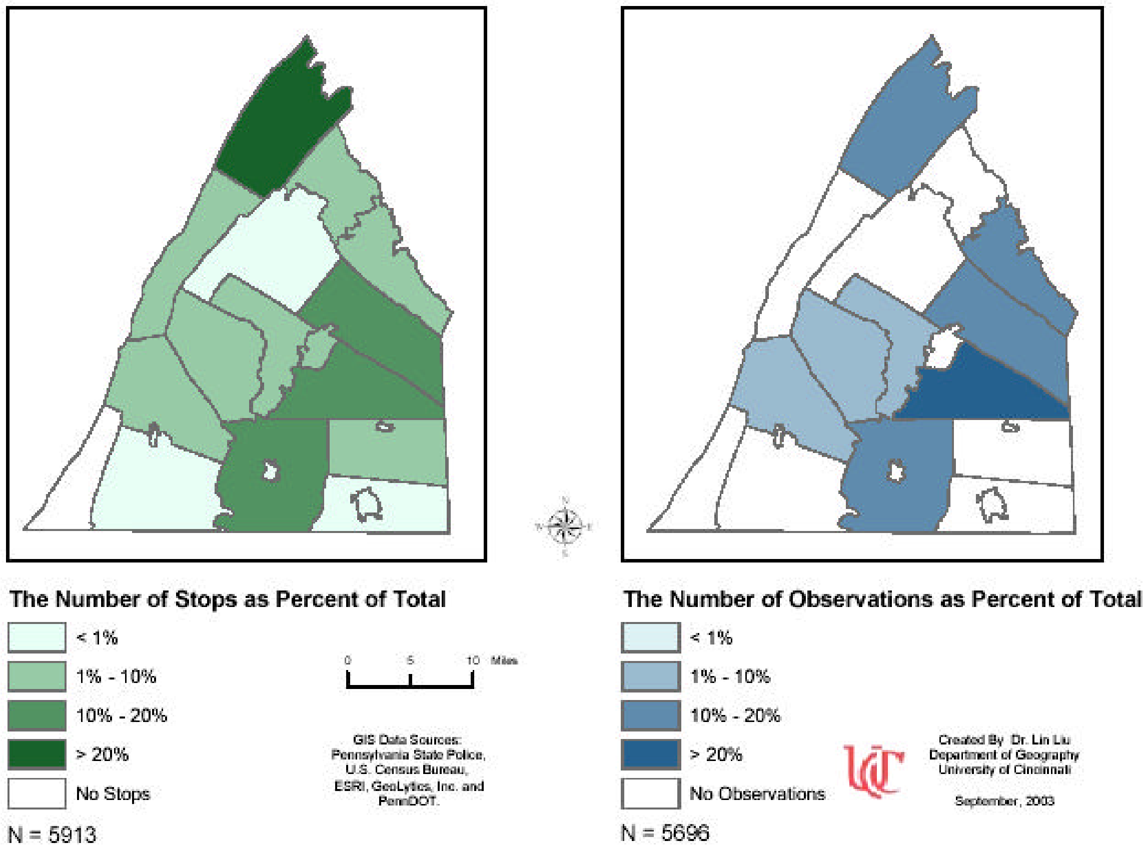
The first two columns of **Table 4.34** and the maps in **Figure 4.10** illustrate that the observed municipalities and municipalities with higher concentrations of PSP traffic stops in Franklin County match well.

Table 4.34 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 4.10. Franklin County, PA.
Traffic Stops and Observations by Municipality



The remainder of **Table 4.34** 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 4.35 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 4.35 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 4.36 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.36 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Franklin County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.37 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 4.37 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
White	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 4.38 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 4.11 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.

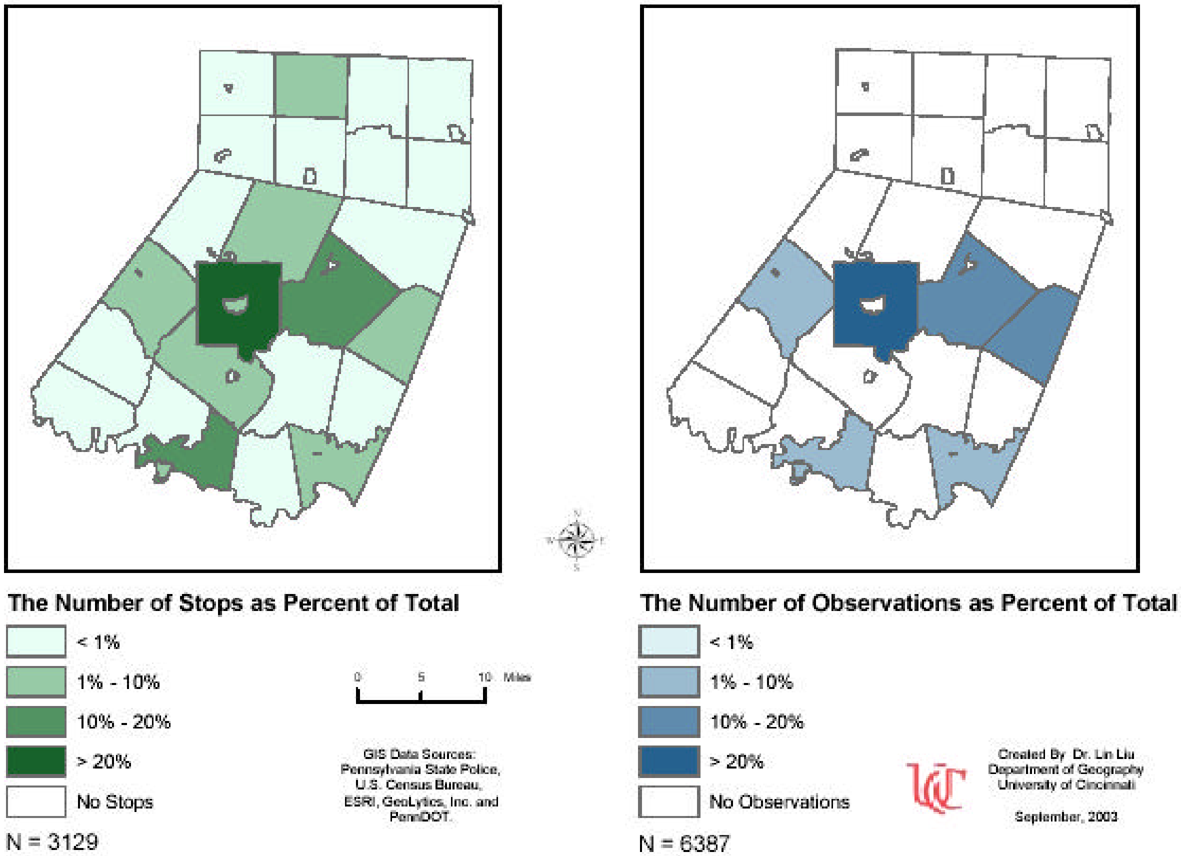
The first two columns of **Table 4.38** and the maps in **Figure 4.11** illustrate that the observed municipalities in Indiana County are consistent with the municipalities with higher concentrations of PSP traffic stops.

Table 4.38 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 4.11. Indiana County, PA.
Traffic Stops and Observations by Municipality



The remainder of **Table 4.38** 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 4.39 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 4.39 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 4.40 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.40 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Indiana County

Municipality Observed	Driving-Age Population	% WHITE Pop.	% WHITE Obs.	% WHITE % Diff.	% BLACK Pop.	% BLACK Obs.	% BLACK % Diff.	% NON-CAUCASIAN* Pop.	% NON-CAUCASIAN* Obs.	% NON-CAUCASIAN* % Diff.	% MISSING 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 4.41 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 whites are.

Table 4.41 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
White	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 4.42 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 4.12 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.

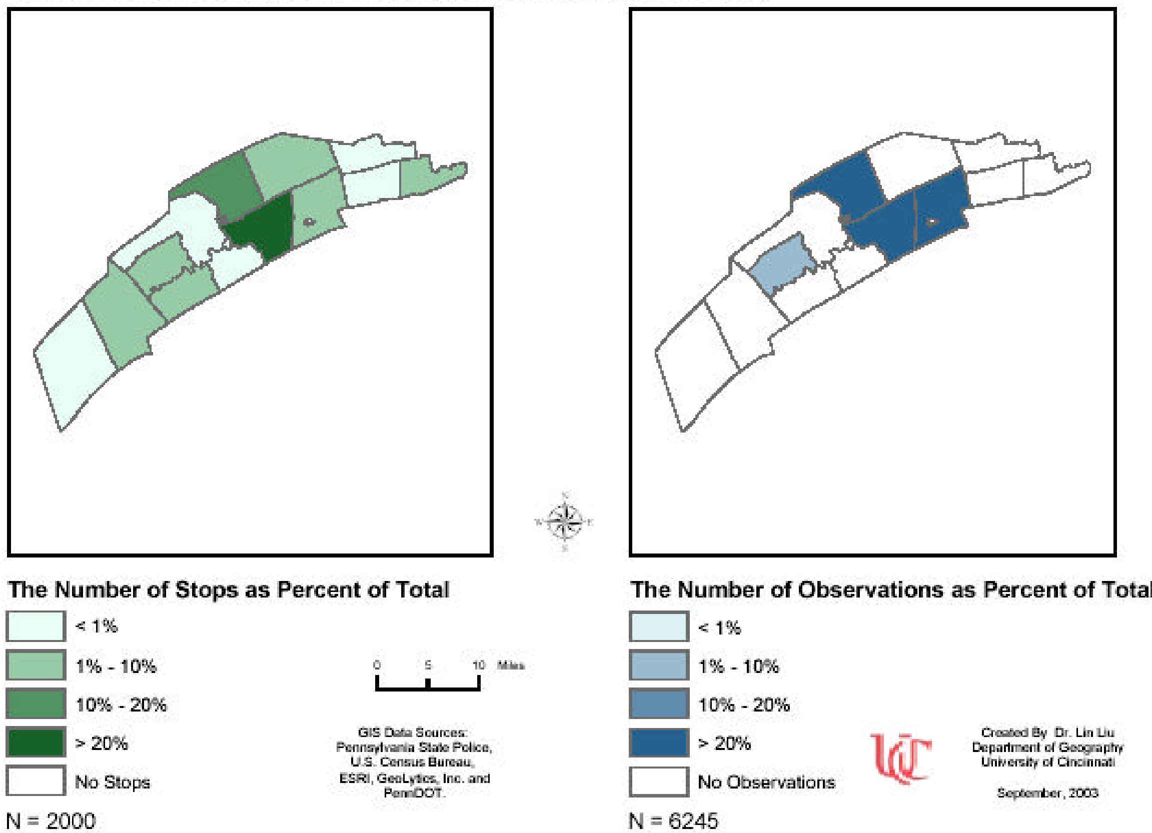
The first two columns of **Table 4.42** and the maps in **Figure 4.12** illustrate that PSP traffic stops are highly concentrated in just a few municipalities; therefore, observation sessions were similarly concentrated.

Table 4.42 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 4.12. Juniata County, PA.
Traffic Stops and Observations by Municipality



The remainder of **Table 4.42** 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 4.43 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 4.43 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 4.44 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 % White indicate the % of whites 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 of interest in this table are:

- All observed municipalities had very high percentages of whites 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 4.44 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Juniata County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.45 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 whites are to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table 4.45 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
White	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 4.46 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.

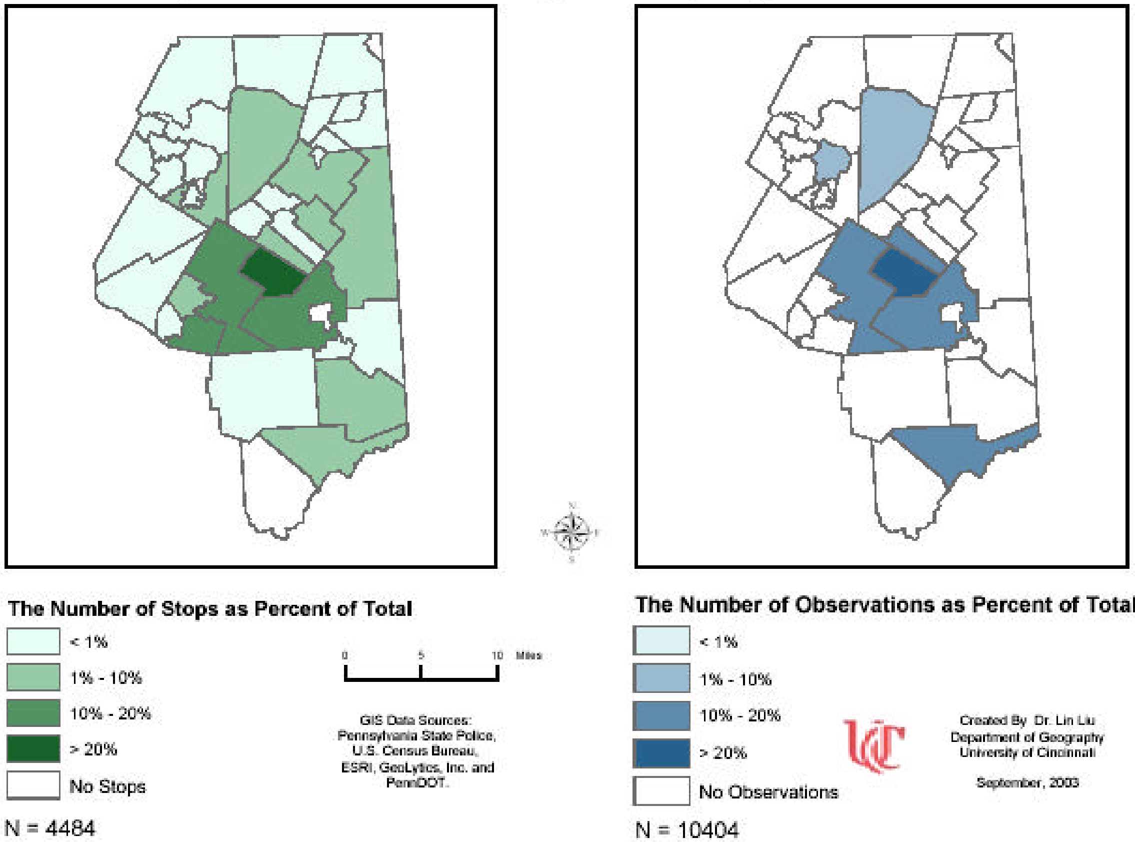
Figure 4.13 displays two maps of Lackawanna County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table 4.46 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 4.13. Lackawanna County, PA.
Traffic Stops and Observations by Municipality



The first two columns of **Table 4.46** and the maps in **Figure 4.13** 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 4.13** 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 4.46** 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 4.47 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 4.47 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 4.48 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 % White indicate the % of whites 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 of interest in this table are:

- 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 % white 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 4.48 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Lackawanna Cnty.

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.49 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 whites to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table 4.49 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
White	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 4.50 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.

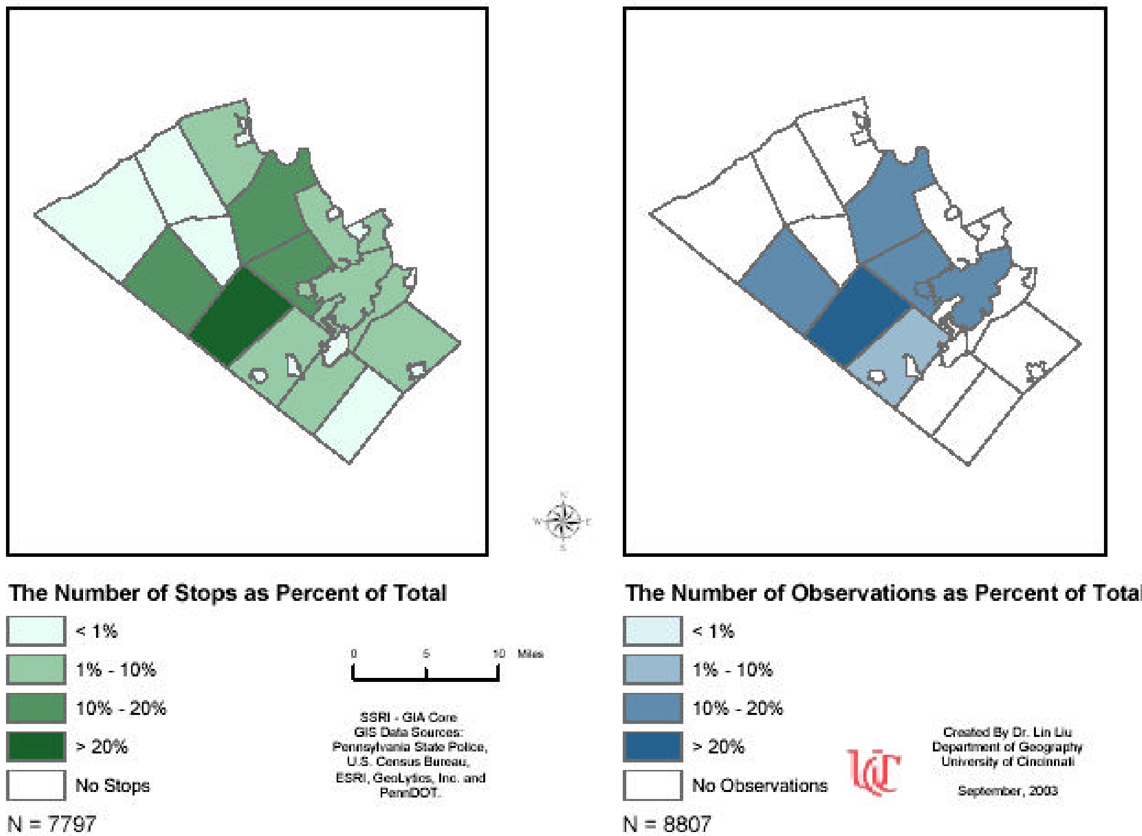
Figure 4.14 displays two maps of Lehigh County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table 4.50 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 4.14. Lehigh County, PA.
Traffic Stops and Observations by Municipality



The first two columns of **Table 4.50** and the maps in **Figure 4.14** illustrate that the observations were concentrated in the same municipalities in Lehigh County that PSP traffic stop activity is highest.

The remainder of **Table 4.50** 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 4.51 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 4.51 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 4.52 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 % White indicate the % of whites 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 of interest in this table are:

- 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 white/non-Caucasian dichotomy in a more racially diverse area.

Table 4.52 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Lehigh County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.53 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 white drivers to exceed the speed limit by 10, 15, and 20 miles per hour, respectively.

Table 4.53 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
White	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 4.54 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 4.15 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.

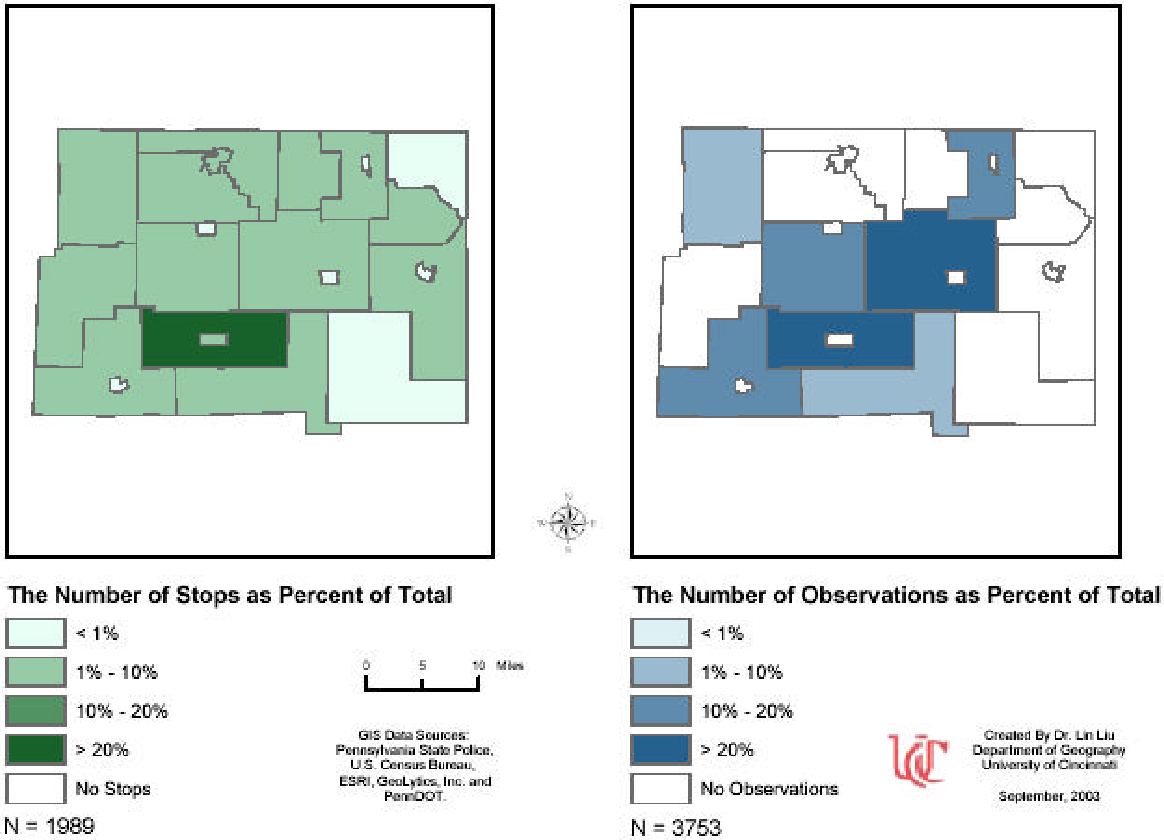
The first two columns of **Table 4.54** and the maps in **Figure 4.15** illustrate that the observed municipalities in McKean County are a good representation of the municipalities with higher concentrations of PSP traffic stops.

Table 4.54 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 4.15. McKean County, PA.
Traffic Stops and Observations by Municipality



The remainder of **Table 4.54** 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 4.55 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 local and 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 4.55 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	County/local	45	68.1	32.6	12.3	2.2
Eldred Twp	State Hwy	55	36.3	9.0	2.5	0.0
Hamlin Twp	County/local	55	35.1	9.1	3.9	1.9
Keating Twp	County/local	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 4.56 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.56 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in McKean County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.57 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 4.57 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
White	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 4.58 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.

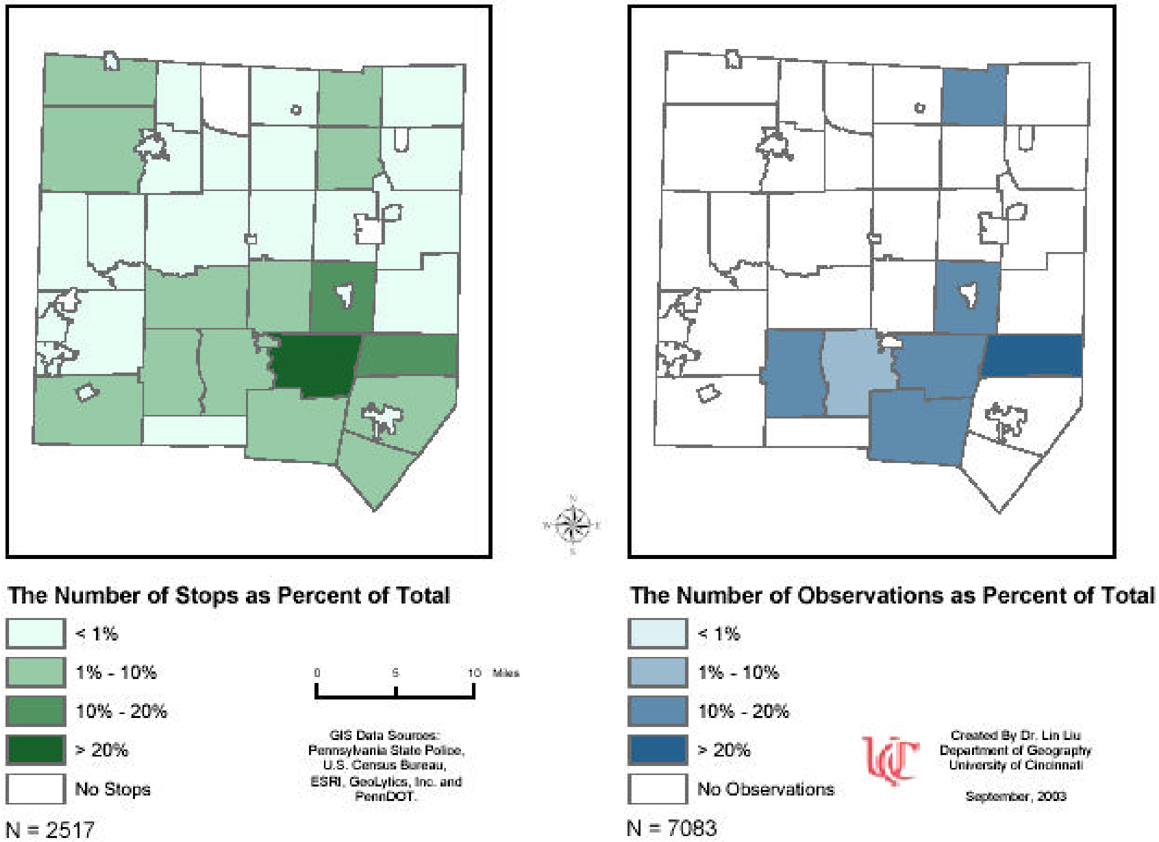
Figure 4.16 displays two maps of Mercer County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table 4.58 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 4.16. Mercer County, PA.
Traffic Stops and Observations by Municipality



The first two columns of **Table 4.58** and the maps in **Figure 4.16** 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 4.58** 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 4.59 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 4.59 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 4.60 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.60 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Mercer County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.61 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 whites to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table 4.61 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
White	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 4.62 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.

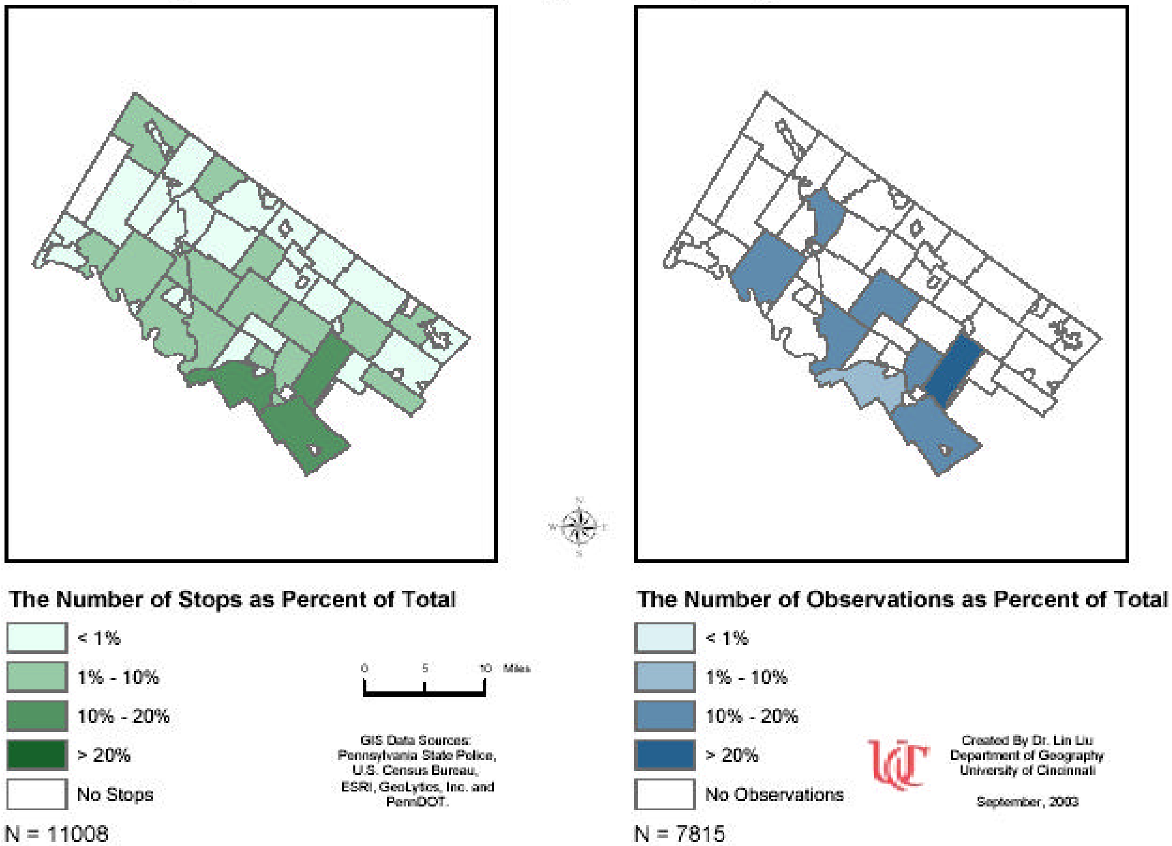
Figure 4.17 displays two maps of Montgomery County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table 4.62 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 4.17. Montgomery County, PA.
Traffic Stops and Observations by Municipality



The first two columns of **Table 4.62** and the maps in **Figure 4.17** illustrate that the observed municipalities in Montgomery County correspond well to the municipalities with higher concentrations of PSP traffic stops.

The remainder of **Table 4.62** 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 4.63 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 4.63 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	Interstate	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 4.64 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.64 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Montgomery County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.65 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 4.65 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
White	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 4.66 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 4.18 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.

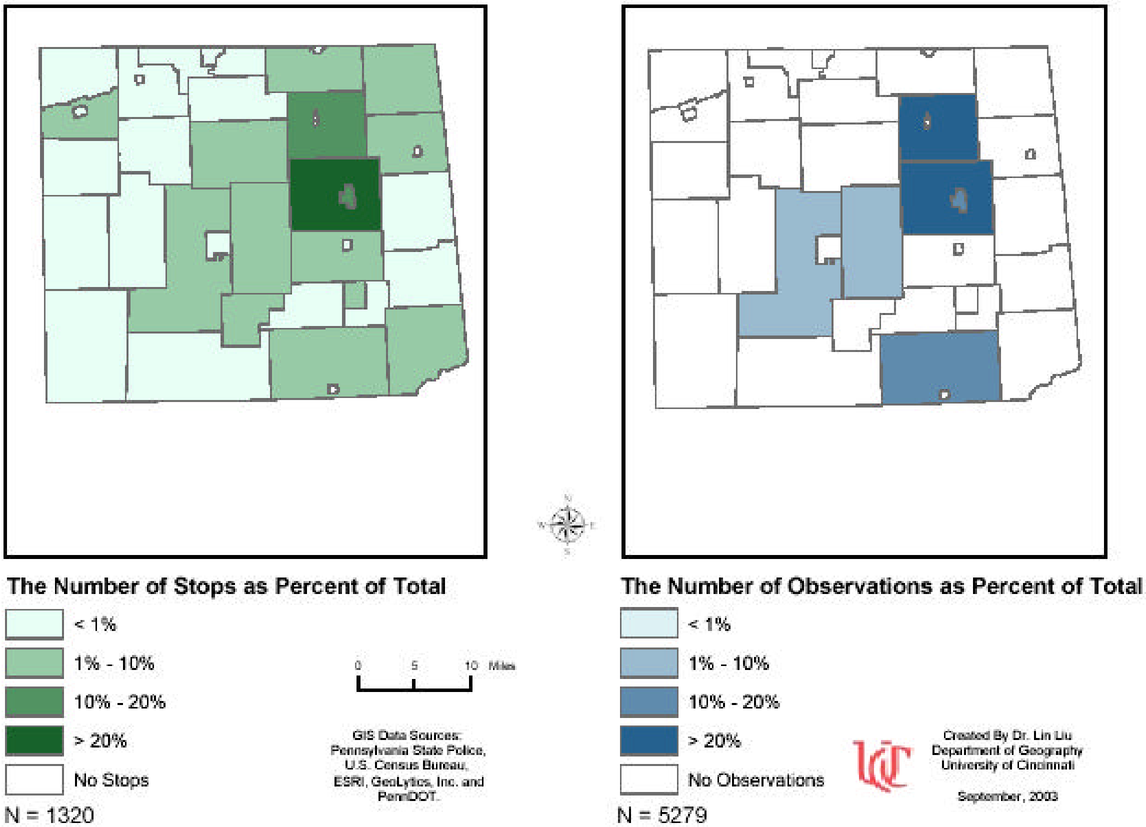
The first two columns of **Table 4.66** and the maps in **Figure 4.18** illustrate that the majority of PSP traffic stops in Tioga County are concentrated in three municipalities. These municipalities, as well as those with moderate percentages of PSP traffic stops, were the focus of observation sessions in Tioga County.

Table 4.66 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 4.18. Tioga County, PA.
Traffic Stops and Observations by Municipality



The remainder of **Table 4.66** 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 4.67 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 primarily 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 4.67 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	County/local	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 4.68 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.68 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Tioga County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.69 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 whites are to exceed the speed limit at 5, 15, and 20 miles per hour, respectively.

Table 4.69 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
White	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 4.70 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 4.19 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.

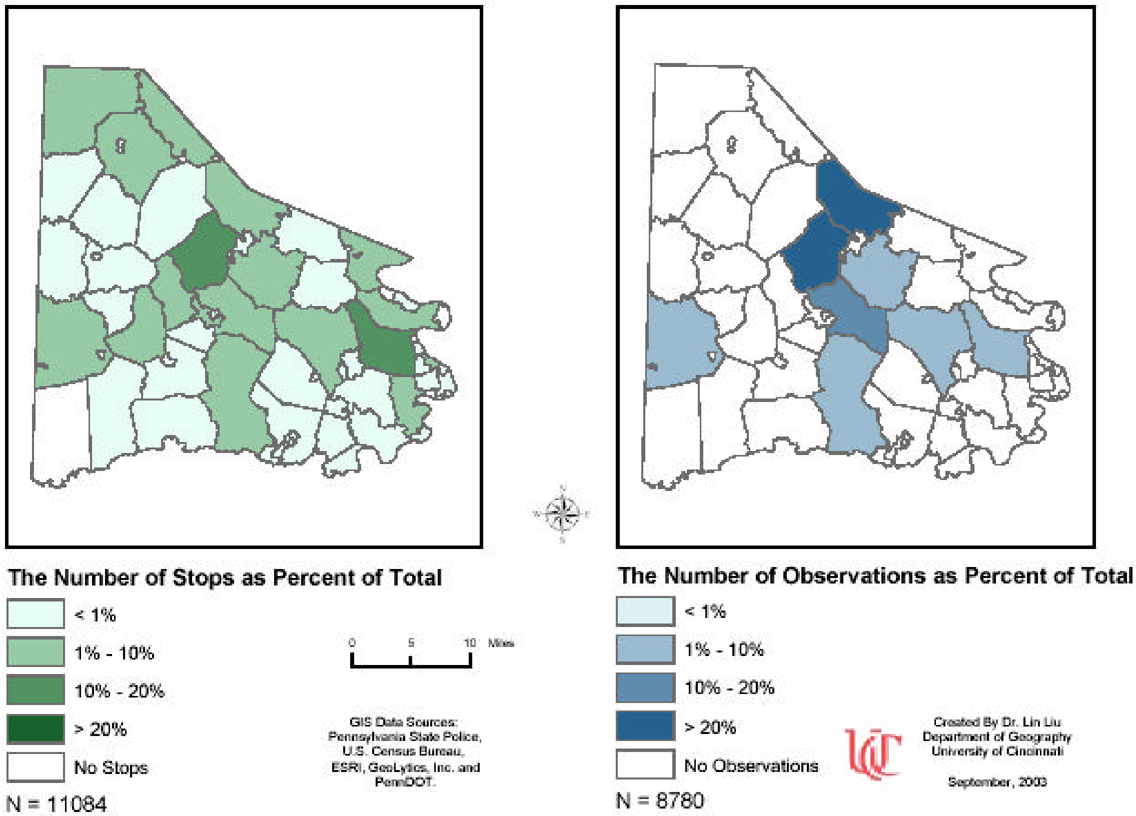
The first two columns of **Table 4.70** and the maps in **Figure 4.19** illustrate that the observed municipalities in Washington County match up well with the municipalities with higher concentrations of PSP traffic stops.

Table 4.70 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 4.19. Washington County, PA.
Traffic Stops and Observations by Municipality



The remainder of **Table 4.70** 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 4.71 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 4.71 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 4.72 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.72 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Washington County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.73 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 whites to exceed the speed limit by 10, 15, and 20 miles per hour, respectively.

Table 4.73 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
White	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 4.74 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.

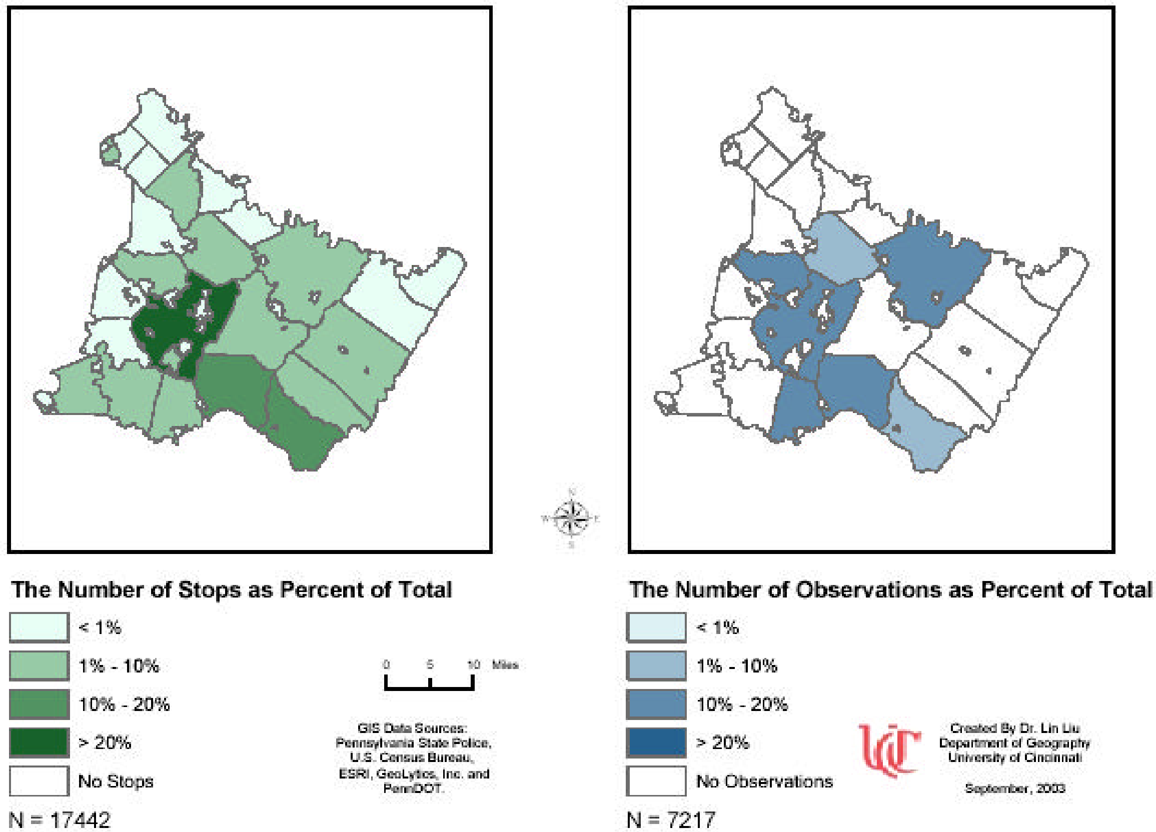
Figure 4.20 displays two maps of Westmoreland County. The first illustrates the percent of traffic stops by PSP Troopers in that county's municipalities, and the second documents the percent of observations by the PSU research team in the same municipalities. These maps demonstrate how well the PSU observation sites correspond to the municipalities that produce higher percentages of PSP traffic stops.

Table 4.74 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 4.20. Westmoreland County, PA.
Traffic Stops and Observations by Municipality



The first two columns of **Table 4.74** and the maps in **Figure 4.20** illustrate that the observed municipalities in Westmoreland County reasonably mirror the municipalities with higher concentrations of PSP traffic stops.

The remainder of **Table 4.74** 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 4.75 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 local, 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 4.75 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	County/local	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 4.76 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 % White indicate the % of whites 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 of interest in this table are:

- All observed municipalities in Westmoreland County had very high percentages of whites 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 4.76 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in Westmoreland Cnty.

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.77 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. Whites are 1.3 times more likely to exceed the speed limit by at least 5 miles per hour than non-Caucasians are.

Table 4.77 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
White	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 4.78 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 4.21 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.

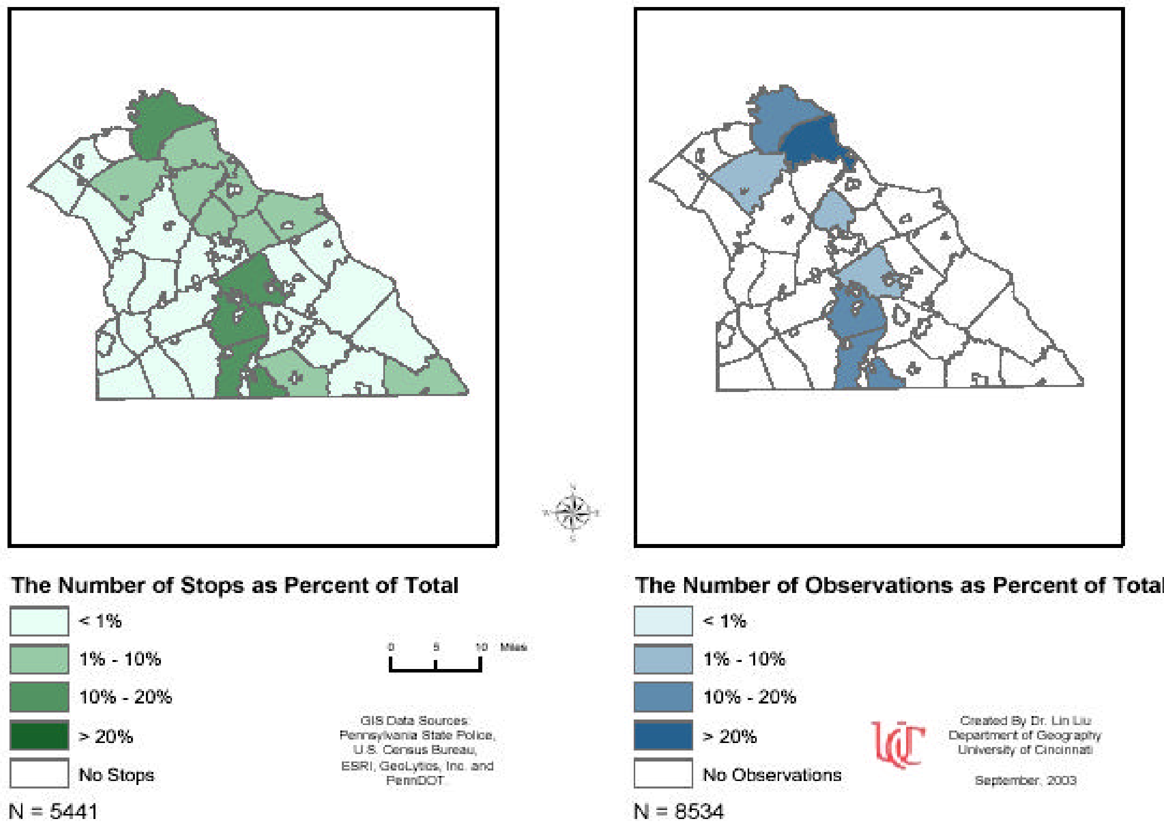
The first two columns of **Table 4.78** and the maps in **Figure 4.21** illustrate that the observed municipalities in York County correspond well to the municipalities with higher concentrations of PSP traffic stops.

Table 4.78 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 4.21. York County, PA.
Traffic Stops and Observations by Municipality



The remainder of **Table 4.78** 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 4.79 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 4.79 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	State Hwy	55	75.0	43.5	17.4	6.5
Manchester Twp	State Hwy	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 4.80 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 % White indicate the % of whites 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 of interest in this table are:

- Although all of the observed municipalities, and York County overall, have white residential populations 93 percent or larger, observations in 6 municipalities included less than 90 percent white 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 4.80 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics in York County

		% WHITE			% BLACK			% NON-CAUCASIAN*			% MISSING
Municipality Observed	Driving-Age Population	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 4.81 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 4.81 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
White	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 4.82 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 4.82 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 4.82 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 also 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 4.83 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 4.83 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 4.84 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 % White indicate the % of whites 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 of interest in this table are:

- 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 4.84 Comparison of Racial Percentages of Observed Drivers & Driving-Age Population Statistics for Additional Counties

County Observed	Municipality Observed	Munic. Driv-- Age Pop.	% WHITE Pop.	% WHITE Obs.	% WHITE % 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 4.85 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 white drivers to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table 4.85 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
White	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 4.86 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 white drivers are to exceed the speed limit by 5, 10, and 15 miles per hour, respectively.

Table 4.86 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
White	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 4.87 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 white drivers are to exceed the speed limit by 5, 10, and 15 miles per hour, respectively.

Table 4.87 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
White	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 4.88 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 white drivers to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table 4.88 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
White	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 4.89 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 white drivers to exceed the speed limit by 5, 10, 15, and 20 miles per hour, respectively.

Table 4.89 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
White	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 4.90 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 white 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 whites to speed—despite the lack of statistical significance.

Table 4.90 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
White	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 4.91 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 4.91 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
White	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.

- Across the state, 54.0%, 25.9%, 9.9%, and 2.8% of drivers were observed to be exceeding the speed limit by at least 5, 10, 15, and 20 miles per hour, respectively.

- 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).

Statewide analysis

Demographic characteristics

The characteristics of observed drivers reported in **Table 4.92** are based on the roadway surveys in both the original twenty sampled counties: Allegheny, Bucks, Centre, Chester, Columbia, Dauphin, Delaware, Erie, Franklin, Indiana, Juniata, Lackawanna, Lehigh, McKean, Mercer, Montgomery, Tioga, Washington, Westmoreland, and York, and the additionally observed counties: Bedford, Clarion, Clinton, Fulton, Jefferson, Montour, and Susquehanna. The information in **Table 4.92** describes the characteristics of all observed drivers by county, including their age, gender, race, vehicle license plate, and speeding behavior, as recorded by the observation teams. The majority of drivers identified by observers were perceived to be between 26 and 65 years old (73.4%). Considerably smaller percentages of observed drivers were estimated as being 25 or younger (12.5%) or over 65 (12.6%). Only 1.5% of drivers' ages were not identifiable by observers. Similarly, a larger percentage of drivers within each county were male rather than female (65.3% compared to 33.2%). Observers were unable to identify the gender of only 1.5% of drivers.

As **Table 4.92** indicates, 6.8% of all observed drivers were perceived to be non-Caucasian. Although observers did capture more specific racial categories during their observations, (e.g., black, Hispanic, Asian, Middle Eastern, and Native American), the most reliable measures of observation are based on white / black and Caucasian / non-Caucasian dichotomies. As previously noted in the methodology portion of Section IV, observers were also trained to identify drivers as "non-Caucasian" if they were certain the driver was of some racial or ethnic minority group (i.e., not Caucasian), but were unclear or could not agree on the precise racial/ethnic group classification. Using this protocol, observers were unable to identify or agree upon the drivers' race in only 2.7% of all observations.

As with the traffic stop data, we would expect, and did record, a rather wide variation across the sampled counties on the percentage of drivers classified as non-Caucasian. For example, as documented in **Table 4.92**, nine counties (Centre, Dauphin, Erie, Franklin, Indiana, Juniata, McKean, Tioga, and Westmoreland) had observations of less than 5% non-Caucasian drivers, whereas eight counties had observations of 10% or more drivers that were non-Caucasian. Two of these counties, Bucks and Delaware, are located in the Philadelphia area. The other six counties—Bedford, Clarion, Clinton, Fulton, Jefferson, and Susquehanna—all have major interstates running through those areas. Bedford, Fulton, and Susquehanna also border other states.

Approximately 73.5% of all observed vehicles had Pennsylvania license plates, a percentage that is quite similar to the 70.5% of Pennsylvania drivers (as measured by driver zip code) stopped by PSP Troopers statewide (see **Table 3.6**). Observations, however, do show considerable variation in the percentage of drivers with PA license plates. As shown in **Table 4.92,** Bedford, Clarion, Clinton, Fulton, Jefferson, Lackawanna, Mercer, Montour, and

Susquehanna County had percentages of observed in-state drivers under 60%, with a low of 28.3% in Fulton County. Not surprisingly, these counties share one or both of the following characteristics: 1) border or proximity to state border, and/or 2) major interstate(s). In contrast, Indiana and Juniata counties (centrally located within the state) had observed percentages of in-state drivers that exceeded 90% (see **Figure 4.1**).

Table 4.92 Descriptive Characteristics of Observed Drivers and Vehicles (n=161,169)

County Name	# of drivers/ vehicles	Driver Age				Driver Gender		Driver Race			License Plate	
		% =25	% 26-65	% > 65	% Missing	% Male	% Missing	% White	% Non-Caucasian	% Missing	% PA	% Missing
Total Sample	161,169	12.5	73.4	12.6	1.5	65.3	1.5	90.5	6.8	2.7	73.5	2.4
Allegheny	8,926	9.4	77.5	11.8	1.3	67.3	1.2	91.7	5.4	2.9	75.4	3.0
Bedford*	2,872	15.4	70.3	12.6	1.7	67.9	1.3	81.2	16.9	1.9	44.6	2.2
Bucks	8,506	12.6	72.4	13.6	1.4	63.7	1.5	85.6	12.2	2.2	76.0	2.1
Centre	5,039	13.8	72.5	13.2	0.6	66.4	0.8	95.7	3.5	0.8	81.6	1.1
Chester	6,935	10.2	81.6	7.4	0.8	61.0	0.9	89.2	8.8	2.0	87.1	2.4
Clarion*	2,224	9.3	71.8	15.2	3.7	65.2	3.4	83.0	11.6	5.4	57.3	5.9
Clinton*	2,413	15.1	60.0	21.7	3.2	68.3	2.6	80.9	14.7	4.4	45.8	6.0
Columbia	7,994	14.5	71.6	12.6	1.3	66.6	1.0	92.9	5.6	1.5	67.2	2.0
Dauphin	6,863	13.6	71.6	13.8	1.0	66.9	0.8	94.9	3.9	1.1	82.7	1.8
Delaware	7,752	10.2	80.6	6.9	2.4	60.4	2.8	79.7	14.4	5.9	76.4	3.7
Erie	7,678	13.3	72.1	13.3	1.4	60.7	1.8	96.7	1.8	1.5	85.1	1.7
Franklin	5,696	11.6	65.0	22.1	1.3	63.5	1.1	95.9	2.1	2.0	82.8	1.0
Fulton*	2,596	13.9	67.8	16.1	2.1	70.7	1.7	78.8	18.4	2.8	28.3	2.3
Indiana	6,342	12.4	76.1	10.7	0.7	65.2	1.3	96.4	1.8	1.8	92.4	2.0
Jefferson*	2,451	12.8	62.5	19.7	4.9	66.1	4.7	83.0	10.4	6.6	46.3	6.8
Juniata	6,245	11.4	76.7	11.4	0.6	67.8	0.7	96.4	2.6	0.9	94.4	0.3
Lackawanna	10,404	17.2	69.4	12.3	1.1	66.6	1.0	92.1	6.3	1.6	59.8	3.0
Lehigh	8,807	13.4	72.1	12.2	2.3	63.5	2.0	88.7	6.9	4.4	78.9	1.5
McKean	3,753	9.5	76.6	12.2	1.6	66.6	1.9	97.5	1.0	1.4	82.6	1.7
Mercer	7,083	11.5	76.5	10.8	1.2	69.9	1.1	92.8	5.1	2.1	59.2	2.0
Montgomery	6,020	12.2	77.2	9.7	0.9	62.0	0.9	88.3	9.9	1.8	87.7	1.8
Montour*	1,581	11.3	76.2	12.0	0.5	68.5	0.6	89.8	7.9	2.3	52.6	1.1
Susquehanna*	1,339	14.8	71.4	12.6	1.2	73.8	1.1	85.4	11.1	3.5	26.2	1.6
Tioga	5,279	10.3	75.8	13.4	0.5	65.9	0.9	96.7	2.1	1.2	69.8	1.7
Washington	8,780	11.2	73.9	12.1	2.7	66.6	2.7	89.0	5.6	5.4	64.2	3.9
Westmoreland	7,217	11.1	71.1	15.8	2.0	64.9	1.9	89.3	4.5	6.2	85.6	3.2
York	8,534	15.0	70.7	13.2	1.1	64.6	0.8	89.2	9.0	1.8	68.0	3.1

*Additionally observed counties with only two days of observation.

Speeding Behavior

As noted above, observation teams also utilized RADAR to capture drivers' speeding behavior. It is important to note that the use of RADAR allowed observers to establish the exact speeds of passing vehicles, and thus, the capability of determining the exact severity of drivers' offending behavior. The dependent variable speeding is measured in a series of dichotomous variables representing whether the driver was observed exceeding the posted speed limit by: 1) at least 5 miles per hour, 2) at least 10 mph, 3) at least 15 mph, 4) at least 20 mph, and 5) at least 25 mph. The analyses in this section examine characteristics associated with each of the progressively more serious levels of speeding.

Table 4.93 presents crosstabulations of drivers' gender, age, and race with speeding behavior in all 27 observed counties. The findings suggest that some drivers' characteristics are associated with speeding behavior, at least at the bivariate level. As shown in **Table 4.93**, higher percentages of non-Caucasian and younger drivers were observed to exceed the speed limit by 5, 10, 15, 20, and 25 miles per hour. These findings represent statistically significant chi-square bivariate associations. These results suggest that non-Caucasian drivers are about 1.6 times more likely to exceed the speed limit by 10 miles per hour or more compared to white drivers. The association is stronger at more severe levels of speeding, as non-Caucasians are 1.9, 2.4, and 2.8 times more likely to exceed the speed limit by 15, 20, and 25 miles per hour, respectively, compared to whites. Likewise, drivers identified as 25 years or younger are about 1.5 times more likely to exceed the speed limit by 10 miles per hour, and 2.0, 2.7, and 4.0 times more likely to exceed the speed limit by 15, 20, and 25 miles per hour, respectively. The only statistically significant difference found in speeding behavior between male and female drivers is at the most serious level of speeding—25 mph or more over the speed limit. In this category, men are 1.4 times more likely to speed than women are.

These results may partially explain the racial differences in traffic stops for speeding. That is, they suggest that non-Caucasian drivers are more likely to exceed the speed limit than white drivers are, particularly at the most serious levels. Thus, differences in the rate of stops of non-Caucasian drivers compared to white drivers may be based, in part, on legal considerations. Multivariate analyses to follow examine the associations between drivers' characteristics and speeding behavior when other characteristics likely associated with speeding behavior are statistically controlled.

Table 4.93 Differences in Behavior Observed by Driver Characteristics (n=66,741)

Driver Characteristics	# of drivers	% Missing[1]	% over 5 mph	% over 10 mph	% over 15 mph	% over 20 mph	% over 25 mph
All Drivers	66,741	--	54.0	25.9	9.9	2.8	0.7
Female	21,651	1.6	53.5	25.7	9.6	2.6	0.5**
Male	44,051		54.0	25.8	10.0	2.9	0.7
25 years old or under	7,958	1.6	63.3***	36.6***	17.2***	6.2***	2.0***
Over 25 years old	57,704		52.4	24.3	8.8	2.3	0.5
White	60,481	2.7	52.7***	24.7***	9.3***	2.5***	0.6***
Non-Caucasian	4,460		66.2	38.6	17.3	6.1	1.7

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.

In addition to driver characteristics, other situational characteristics (e.g., vehicle characteristics, roadway type, etc.) as well as community characteristics may also influence speeding behavior. Multivariate analyses allow us to examine the effect of each of the 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. The inclusion of community characteristics in the analyses introduces additional statistical complexity with the use of data at two levels of aggregation, which requires the application of a specialized statistical program called hierarchical linear and nonlinear modeling (HLM).[10] The multivariate analyses examine the following specific variables for their influence on observed speeding behavior:

- Driver demographic characteristics: gender (male=1), race (non-Caucasian=1 or black=1), and age (25 and under=1)
- Vehicle characteristics: passengers in the vehicle (1=yes), state of license plate (PA=1), color of vehicle (red=1), and type of vehicle (sports car=1)
- Situational characteristics: morning rush hour=1, afternoon rush hour=1, weekday=1, road type (interstate=1), and speed limit
- Community characteristics: 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[11]

Tables 4.94 and **4.95** present the results of two-level hierarchical nonlinear analyses of observed drivers' miles per hour over the posted speed limit, including at least 10, 15, 20, and 25 miles per hour over the limit. **Tables 4.94** and **Table 4.95** are similar, with the

[10] 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. 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).

[11] As described in footnote 4, factor analysis is a statistical technique that can analyze several variables in order to identify any underlying latent constructs (factors) among the characteristics. Three separate underlying factors are identified, representing municipality-level poverty, municipality residential mobility, and municipality traffic or travel patterns. These factor analyses were conducted using the following municipality variables: 1) for the poverty factor: percent male-headed households, percent with at least a high school diploma, percent employed, and median income, 2) for the residential mobility factor: percent who have moved in last 5 years and percent foreign born, and 3) for the traffic/travel factor: percent not commuting to work by car and percent housing units with no vehicle. Essentially, the municipalities were assigned factor scores based on their poverty level, residential mobility, and potential traffic/travel patterns.

exception of the driver race variable, which is non-Caucasian for **Table 4.94** (including the racial categories black, Hispanic, Middle Eastern, Asian/Pacific Islander, Native American, and other minority) and black for **Table 4.95**. The first column for each model is 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 large sample size (i.e., the large number of roadway observations), the statistical significance of the relationships is assessed at the 0.001 level. As noted in Section I, it is prudent to use a more stringent threshold for statistical significance when examining larger numbers of observations because as the sample size increases, there is a stronger possibility that the relationships reported are due to chance alone (Allison, 1999). The asterisks indicate that the relationships between variables are due to chance less than 0.1% of the time. The sign (positive or negative) of the coefficient 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 exceed the speed limit by a particular number of miles per hour, while a negative sign would indicate that males are less likely than females to exceed the speed limit.

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 speeding based on that predictor variable, everything else being equal. The odds ratio indicates the strength of the relationship. For example, an odds ratio of 2.0 indicates that the presence of the variable (e.g., being a black driver) leads to twice the likelihood of the outcome (e.g., exceeding the speed limit). 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.

Model 1 in **Table 4.94** examines whether observed drivers were exceeding the speed limit by 10 or more miles per hour. Driver gender does not have a statistically significant influence on speeding behavior. Race and age, on the other hand, do exert significant effects on the odds of drivers' exceeding the speed limit by 10 or more miles per hour. The odds of exceeding the speed limit by at least 10 miles per hour are 1.35 times higher for non-Caucasians than Caucasians, and 1.8 times higher for drivers 25 and under compared to older drivers. Other significant effects suggest that exceeding the speed limit by at least 10 miles per hour is less likely for vehicles with in-state license plates, more likely for sports cars, and less likely for vehicles traveling in higher speed limits. None of the community characteristics significantly affects speeding behavior.

Model 2 in **Table 4.94** examines whether observed drivers were exceeding the speed limit by 15 or more miles per hour. The effect of driver gender is now statistically significant, but it is an especially weak effect as the odds of men exceeding the speed limit by 15 or more miles per hour is only 1.1 times the odds for women. The influences of race and age are stronger, in comparison to gender, but the coefficient for driver nonwhite does not increase as much as the age coefficient does in comparison to the effects in Model 1. The odds of non-Caucasians exceeding the speed limit by at least 15 miles per hour are 1.43 times higher than the odds for whites. Age effects are stronger, as the odds of exceeding the speed limit by at least 15 miles per hour are 2.1 times higher for drivers 25 and under compared to older drivers. Other significant, though not as substantive, effects suggest that exceeding the speed limit by at least 15 miles per hour is less likely for vehicles with in-state license plates, more likely for sports cars, and slightly less likely for vehicles traveling in higher speed limits. Municipality level factors, again, do not significantly affect speeding behavior.

Model 3 in **Table 4.94** presents the results of analyses examining whether observed drivers were exceeding the speed limit by 20 or more miles per hour. Again, all three driver demographic characteristics exert statistically significant effects on the odds of drivers' exceeding the speed limit. All three effects are stronger than in the previous two models, but the predictive power of gender is still weak. Men have odds only 1.2 times greater than women do of speeding by 20 or more miles per hour. The odds of non-Caucasians exceeding the speed limit by at least 20 miles per hour are 1.7 times higher than the odds for whites. Age effects remain the strongest in comparison to both the other demographic variables as well as the situational and community variables. The odds of exceeding the speed limit by at least 20 miles per hour for drivers 25 and under are 2.6 times the odds for older drivers. Some situational variables—presence of passengers, in-state license plate, and speed limit—also exert significant negative effects on the odds of exceeding the speed limit by at least 20 miles per hour. Vehicle type, on the other hand, has a significant positive effect on the odds of speeding, as drivers of sports cars have odds 1.4 times the odds of drivers of all other vehicle types. Finally, municipality level variables fail to exert statistically significant effects on drivers' speeding behavior.

Finally, Model 4 in **Table 4.94** presents the results of analyses examining whether observed drivers were exceeding the speed limit by 25 or more miles per hour. Again, all three driver demographic characteristics exert statistically significant effects on the odds of drivers' exceeding the speed limit. All three effects are stronger than in the previous three models. Men have odds 1.5 times greater than women do of speeding by 25 or more miles per hour. The odds of non-Caucasians exceeding the speed limit by at least 25 miles per hour are 2.0 times higher than the odds for whites. Age effects remain the strongest in comparison to both the other demographic variables as well as the situational and community variables. The odds of exceeding the speed limit by at least 25 miles per hour for drivers 25 and under are 3.7 times the odds for older drivers. The only situational variable that remains statistically significant in Model 4 is speed limit, as drivers in higher speed limits are slightly less likely to exceed the speed limit by at least 25 miles per hour compared to drivers in lower speed limits. Finally, municipality level variables still lack statistically significant effects on drivers' speeding behavior.

Table 4.94 HLM analyses predicting non-Caucasian drivers' speeding behavior (n=61,834)[1]

	Model 1:		**Model 2:**		**Model 3:**		**Model 4:**	
	= 10 mph over the limit		= 15 mph over the limit		= 20 mph over the limit		= 25 mph over the limit	
Variables	Coeff.	Odds Ratio	Coeff.	Odds Ratio	Coeff.	Odds Ratio	Coeff.	Odds Ratio
Intercept	-1.43	0.24	-2.79	0.06	-3.43	0.03	-5.61*	0.00
Level 1 variables (observation)								
Driver Male	0.05	1.05	0.12*	1.13	0.17*	1.19	0.40*	1.49
Driver Non-Caucasian	0.30*	1.35	0.36*	1.43	0.53*	1.69	0.69*	2.00
Driver 25 years old or under	0.59*	1.80	0.76*	2.14	0.95*	2.58	1.32*	3.74
Passengers	-0.03	0.97	-0.07	0.93	-0.19*	0.83	-0.17	0.84
PA License Plate	-0.31*	0.74	-0.33*	0.72	-0.29*	0.75	-0.09	0.92
Vehicle Red	-0.06	0.95	-0.08	0.92	-0.04	0.96	-0.12	0.88
Sports Car	0.21*	1.23	0.30*	1.35	0.34*	1.41	0.36	1.43
Morning Rush Hour	-0.04	0.96	-0.08	0.92	-0.06	0.94	-0.10	0.90
Afternoon Rush Hour	-0.26	0.77	-0.16	0.85	-0.12	0.89	0.38	1.47
Weekday	-0.09	0.91	-0.20	0.82	-0.24	0.79	-0.06	0.94
Interstate	0.21	1.23	0.50	1.65	0.39	1.47	0.37	1.45
Speed Limit	-0.10*	0.91	-0.10*	0.90	-0.09*	0.92	-0.06*	0.94
Level 2 variables (municipality)								
Total Pop =16 (Ln)	0.12	1.13	0.10	1.10	0.08	1.09	0.08	1.08
% Pop Male =16	-0.02	0.98	-0.03	0.97	-0.04	0.96	-0.04	0.96
% Pop Black =16	0.01	1.01	0.00	1.00	0.00	1.00	-0.01	0.99
% Pop Hispanic =16	0.01	1.01	0.02	1.02	0.06	1.06	0.04	1.04
Poverty Factor	-0.16	0.85	-0.18	0.83	-0.18	0.84	-0.14	0.87
Resid. Mobility Factor	0.12	1.12	0.13	1.14	0.04	1.04	0.11	1.12
Traffic/Travel Factor	-0.04	0.96	-0.07	0.94	-0.01	0.99	-0.13	0.88
Average Commute	0.00	1.00	-0.02	0.98	0.03	1.03	0.05	1.06

NOTE: * $p < .001$
[1] Excludes 4,907 cases due to missing data (primarily on two items: driver race and license plate).

Turning to **Table 4.95** and the focus on black drivers, Model 5 examines whether observed drivers were exceeding the speed limit by 10 or more miles per hour. The findings are similar to those for **Table 4.94**. Driver gender, again, does not have a statistically significant influence on speeding behavior. Race and age, on the other hand, do exert significant effects on the odds of drivers' exceeding the speed limit by 10 or more miles per hour, though the race effect is not as strong as that for age. The odds of exceeding the speed limit by at least 10 miles per hour are 1.4 times higher for blacks than whites, and 1.8 times higher for drivers 25 and under compared to older drivers. Other significant effects suggest that exceeding the speed limit by at least 10 miles per hour is less likely for vehicles with in-state license plates, more likely for sports cars, and less likely for vehicles traveling in higher speed limits. None of the community characteristics significantly affects speeding behavior.

Model 6 in **Table 4.95** examines whether observed drivers were exceeding the speed limit by 15 or more miles per hour. The effect of driver gender, though weak (odds=1.1), is now statistically significant. The influences of race and age are stronger, both in comparison to gender and to the effects in Model 5. The odds of blacks exceeding the speed limit by at least 15 miles per hour are 1.6 times the odds for whites. Age effects are stronger, as the odds of exceeding the speed limit by at least 15 miles per hour are 2.2 times higher for drivers 25 and under compared to older drivers. Other significant, though less substantive, effects suggest that exceeding the speed limit by at least 15 miles per hour is less likely for vehicles with in-state license plates, more likely for sports cars, and slightly less likely for vehicles traveling in higher speed limits. Municipality level factors, again, do not significantly affect speeding behavior.

Model 7 in **Table 4.95** presents the results of analyses examining whether observed drivers were exceeding the speed limit by 20 or more miles per hour. Again, all three driver demographic characteristics exert statistically significant effects on the odds of drivers' exceeding the speed limit. All three effects are stronger than in the previous two models, but the predictive power of gender is still fairly weak. Men have odds only 1.2 times greater than women do of speeding by 20 or more miles per hour. The odds of blacks exceeding the speed limit by at least 20 miles per hour are 1.9 times higher than the odds for whites. Age effects remain the strongest in comparison to both the other demographic variables as well as the situational and community variables. The odds of exceeding the speed limit by at least 20 miles per hour for drivers 25 and under are 2.6 times the odds for older drivers. Some situational variables—in-state license plate and speed limit—also exert significant effects on the odds of exceeding the speed limit by at least 20 miles per hour. None of the municipality level variables exert statistically significant effects on drivers' speeding behavior.

Finally, Model 8 in **Table 4.95** presents the results of analyses examining whether observed drivers were exceeding the speed limit by 25 or more miles per hour. Again, all three driver demographic characteristics exert statistically significant effects on the odds of drivers' exceeding the speed limit. All three effects are stronger than in the previous three models. Men have odds 1.5 times greater than women do of speeding by 25 or more miles per hour. The odds of blacks exceeding the speed limit by at least 25 miles per hour are 2.2 times higher than the odds for whites. Age effects remain the strongest in comparison to both the other demographic variables as well as the situational and community variables. The odds for drivers 25 and under of exceeding the speed limit by at least 25 miles per hour are 3.8 times the odds for older drivers. The only situational variable that remains statistically significant in Model 8 is speed limit, as drivers in higher speed limits are slightly less likely to exceed the speed limit by at least 25 miles per hour compared to drivers in lower speed limits. Finally, municipality level variables lack statistically significant effects on drivers' speeding behavior.

As noted in the review of prior observational research, other studies have explored racial differences in driving behavior as a possible explanation for racial disparity in police traffic stops. The findings of the current study do not support Lamberth's (1994, 1996) findings in New Jersey and Maryland that blacks and whites drive indistinguishably. As discussed above, the methodology used in Lamberth's road surveys did not allow for an assessment of the severity of speeding behavior. Observational studies that go beyond a simple dichotomy of speeding or not speeding have produced findings that directly contradict Lamberth's early work. Specifically, our results bolster the findings of the Speed Violation Survey of the New Jersey Turnpike, which found that blacks, men, and younger people were more likely than whites, women, and older people to exceed the 65 m.p.h. speed limit by 15 or more miles per hour (Lange et al., 2001). In addition, these findings mirror those reported in North Carolina.[12] Observational surveys of roadways in 27 counties of Pennsylvania suggest that non-Caucasians (and specifically blacks) and drivers 25 years old or younger are significantly more likely to exceed the posted speed limit by 10, 15, 20, and 25 miles per hour than are their white and older driving counterparts. As was true in the New Jersey study, the effect of gender on speeding is inconsistent and much weaker than the effects of race and age.

It is possible, relative to race, that the propensity to speed is influenced by a higher proportion of younger drivers among black drivers. Studies have shown that blacks and other minorities who are older are more likely to use public transportation compared to older whites (Burkhardt, McGavock, Nelson, & Mitchell, 2002). This could create a population of black drivers that is more heavily weighted towards younger, more aggressive drivers. The hierarchical models presented above do control for age, however, it must be noted that the measurement of drivers' age is somewhat crude due to the limitations associated with observational research. It is possible that with a more accurate measure of drivers' age, the predictive value of drivers' race over speeding behavior could be reduced. Unfortunately, we are unable to test this hypothesis with observational speeding data.

[12] The specific findings for the North Carolina speeding survey are scheduled to be publicly released by the National Institute of Justice in 2004.

Table 4.95 HLM analyses predicting black drivers' speeding behavior (n=61,834)[1]

	Model 5:		Model 6:		Model 7:		Model 8:	
	< 10 mph over the limit		< 15 mph over the limit		< 20 mph over the limit		< 25 mph over the limit	
Variables	Coeff.	Odds Ratio	Coeff.	Odds Ratio	Coeff.	Odds Ratio	Coeff.	Odds Ratio
Intercept	-1.43	0.24	-2.78	0.06	-3.41	0.03	-5.57*	0.00
Level 1 variables (observation)								
Driver Male	0.06	1.06	0.13*	1.14	0.18*	1.20	0.42*	1.51
Driver Black	0.34*	1.41	0.46*	1.58	0.64*	1.89	0.77*	2.17
Driver 25 years old or under	0.59*	1.81	0.77*	2.15	0.96*	2.61	1.33*	3.79
Passengers	-0.03	0.97	-0.07	0.93	-0.18	0.84	-0.16	0.85
PA License Plate	-0.31*	0.73	-0.34*	0.71	-0.29*	0.75	-0.10	0.91
Vehicle Red	-0.06	0.95	-0.08	0.92	-0.04	0.96	-0.12	0.88
Sports Car	0.21*	1.23	0.30*	1.35	0.34	1.41	0.37	1.44
Morning Rush Hour	-0.04	0.96	-0.08	0.92	-0.06	0.94	-0.10	0.91
Afternoon Rush Hour	-0.26	0.77	-0.16	0.85	-0.12	0.89	0.38	1.47
Weekday	-0.09	0.91	-0.21	0.81	-0.24	0.79	-0.06	0.94
Interstate	0.21	1.23	0.50	1.65	0.39	1.48	0.38	1.46
Speed Limit	-0.10*	0.91	-0.10*	0.90	-0.09*	0.92	-0.06*	0.94
Level 2 variables (municipality)								
Total Pop =16 (Ln)	0.12	1.13	0.10	1.10	0.08	1.09	0.08	1.08
% Pop Male =16	-0.02	0.98	-0.03	0.97	-0.04	0.96	-0.04	0.96
% Pop Black =16	0.01	1.01	0.00	1.00	0.00	1.00	-0.01	0.99
% Pop Hispanic =16	0.01	1.01	0.02	1.02	0.06	1.06	0.04	1.04
Poverty Factor	-0.16	0.85	-0.18	0.83	-0.18	0.84	-0.14	0.87
Resid. Mobility Factor	0.12	1.12	0.13	1.14	0.04	1.04	0.11	1.12
Traffic/Travel Factor	-0.04	0.96	-0.07	0.94	-0.01	0.99	-0.13	0.88
Average Commute	0.00	1.00	-0.02	0.98	0.03	1.03	0.06	1.06

NOTE: * $p < .001$
[1] Excludes 4,907 cases due to missing data (primarily on two items: driver race and license plate).

SUMMARY

The HLM analyses based on the full speeding survey data are displayed in **Tables 4.94** and **4.95** and predict whether drivers exceeded the speed limit by at least 10, 15, 20, and 25 miles per hour. The results show that:

- Driver gender is not a consistent or strong predictor of speeding behavior.
- At all levels of speeding severity, drivers observed to be non-Caucasian, black, and 25 years old or younger were more likely to exceed the speed limit compared to drivers observed to be white and older than 25.
- The strength of the effects of drivers' race and age increases with severity of speeding.
- The strongest predictor of speeding behavior across all the HLM models is driver age, followed by driver race.
- Drivers in sports cars, in vehicles with out-of-state plates, and in lower speed limits are more likely to speed compared to drivers in other vehicle types, PA-plated vehicles, and higher speed limits.
- Municipality characteristics have no significant influence on drivers' speeding behavior.

As outlined earlier in this section, however, it is important to note that the roadway and speeding observation data have the following limitations:

- Observations could only be conducted during daylight hours.
- Observation locations were limited to sites where observers could see driver characteristics, but not all RADAR locations used by PSP fit this requirement.
- Only 27 of Pennsylvania's 67 counties were sampled for observations due to the cost of roadway observations.
- The use of RADAR for speed detection may slow down the normal speed of passing traffic due to the limited use of RADAR detectors. Therefore, the observations of speeding behavior might be better described as observations of speeding behavior that are more likely to come to the attention of police. That is, this study more accurately measures "non-savvy" speeding behavior.
- Observers' assessments of driver characteristics may inaccurately categorize drivers. Furthermore, the actual reliability and validity of observers' identification of drivers' demographic characteristics cannot be assessed with these data. This is a weakness of all roadway observation data collection efforts. In an effort to address this weakness, this data collection effort required that two trained observers must agree on the

drivers' characteristics or the information was recorded as missing. In addition, observers' assessments of drivers' characteristics are made in similar conditions as those faced by officers.

- The identification of Hispanic drivers during roadway observations was especially difficult. Therefore, the coding scheme allowed observers to classify drivers as Caucasian and non-Caucasian in situations where the specific racial/ethnic group of the driver could not be determined.

- Drivers' age, which was found to be an important predictor of speeding behavior, is measured as a dichotomy. This dichotomous measure obviously lacks precision, however is likely to be more reliable than an age measure with multiple categories. It is likely that a more precise age measure would account for more of the variance in speeding behavior.

V. TRAFFIC STOP BENCHMARK COMPARISONS

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In this section, PSP traffic stop data is directly compared to multiple benchmarks and disproportionality indices are calculated at the county level. There are four different comparisons made: 1) all traffic stops are compared to county level Census data (driving age population), 2) traffic stops of county residents are compared to county level Census data (driving age population), 3) daytime traffic stops are compared to roadway observation data, and 4) daytime speeding traffic stops are compared to speeding observation data. The first two comparisons are made for black, Hispanic, and all non-Caucasian drivers. The last two comparisons, based on observation data, are made only for two racial/ethnic groups: black drivers and all minority drivers (including drivers who are black, Hispanic, Middle Eastern, Asian, American Indian, and/or Pacific Islanders). Disproportionality indices are not created for Hispanic drivers using observation data, because as noted in Section IV, observation techniques for identifying Hispanic drivers are less reliable.[13]

The first Census-based benchmark comparison is displayed at the county level in **Table 5.1**. The disproportionality indices calculated in these tables are also graphically displayed for each of the 67 counties in **Figure 5.1** (black disproportionalities), **Figure 5.2** (Hispanic disproportionalities), and **Figure 5.3** (all non-Caucasian disproportionalities). Based on these Census-based disproportionality indices, nine counties are given further attention: Bedford, Clarion, Clinton, Columbia, Fulton, Jefferson, Juniata, Montour, and Susquehanna. **Figures 5.4 – 5.12** graphically display the residency of motorists stopped by Troopers in each of these counties. In addition, the data reported in **Tables 5.2 and 5.3** more closely examines the residency and race of drivers stopped in the state overall, and in these nine select counties in particular. These analyses suggest that Census-based benchmark comparisons to all traffic stops conducted by PSP are not appropriate.

Based on the limited nature of the analyses presented in **Table 5.1**, a second Census-based comparison is created. **Table 5.4** displays the disproportionality indices 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.

Additional comparisons are made to subsets of the traffic stop data for 27 of the 67 counties. First, the percentage of minority stops during daylight hours is compared to the percentage of minority drivers observed on the roadways. Disproportionality indices based on the roadway observation denominator are presented in **Table 5.5**. The disproportionality indices for black and non-Caucasian drivers for each county are graphically displayed in **Figures 5.13** and **5.14**. In addition, disproportionality indices based on comparisons of drivers stopped for speeding and drivers observed speeding are presented in **Table 5.6**.

Table 5.7 provides a comprehensive comparison of the disproportionality indices created with multiple benchmarks for each county. **Tables 5.8, 5.9**, and **5.10** examine differences in

[13] It is likely that if our observers have misestimated the driving population of Hispanics, they have underestimated (by classifying Hispanics as whites) rather than overestimated their representation in the driving population. Therefore, the disproportionality indices for Hispanics based on observational data would likely be artificially inflated.

the reasons drivers are stopped and differences in drivers' speeding behavior as possible explanations for the disparities in the percentage of minority drivers stopped. Section V concludes with a brief summary of the findings for benchmark comparisons with traffic stop data.

THE USE OF BENCHMARKS & CREATION OF DISPROPORTIONALITY INDICES

As described in Section I, 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 the results across different benchmarks differ. For example, Census data are widely regarded as the weakest benchmark measure, while observations are considered more valid indicators of actual roadway usage. Therefore, benchmarks based on roadway observations should be given more weight than Census benchmarks when interpreting the findings.

Traffic stop studies have frequently utilized a "disproportionality index" to quantify these comparisons between a group's actual and expected representation in police actions. The calculation of disproportionality indices involves dividing the proportion of a group's actual rates of police actions by the proportion of the group's expected rates of the same actions, based on the group's representation in one of the types of comparison populations listed above (e.g., Cox et al., 2001, Rojek et al., 2002). 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 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.

As noted in Section I, studies expressing disproportionality in terms 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).

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

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, however, the residents of an area 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, blacks, in comparison to whites, 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).

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 when using population statistics is the instability of disproportionality indices when the denominator is very small. 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 index. For example, if 5% of the stops in County "A" were of black motorists, but the driving population of County "A" is 0.5% black, the disproportionality index = .05 / 0.005 = 10. However, if the population changed slightly (e.g., from 0.5% to 0.6%), the disproportionality index would be reduced by a factor of two (0.05 / 0.006 = 8). Thus, disproportionality indices created with very small denominators are more likely to be unstable and should be interpreted with extreme caution.

We present the disproportionality indices based on driving-age population with the above noted limitations in mind, and as a reference point for other, more appropriate benchmark comparisons. The first four columns of **Table 5.1** are based on driving-age population statistics: the total county population 16 and over, and each of the racial groups' representation in this population. The next four columns provide information about PSP's traffic stops in each county, including the total number of stops, and the percentages of each of the three racial groups among those stops. The final three columns display the driving-age population-based disproportionality indices for blacks, Hispanics, and non-Caucasians, respectively. Focusing on the driving-age population benchmark, **Table 5.1** illustrates the tremendous variability in the counties' disproportionality indices for black, Hispanic, and non-Caucasian drivers.

Table 5.1 Driving-Age Population Disproportionality Indices by County (p.1 of 2)

County	Total Pop.	% of Pop. > 16			Total #	% of PSP Stops			Driving-Age Pop DI		
Name	> 16	Blk	Hisp	NonCauc	PSP Stops	Blk	Hisp	NonCauc	Blk	Hisp	NonCauc
Adams	71,142	1.06	2.85	5.12	1,810	4.28	5.44	11.89	4.03	1.91	2.32
Allegheny	1,032,549	10.96	0.79	14.35	10,811	8.96	1.15	13.28	0.82	1.46	0.93
Armstrong	57,908	0.75	0.36	1.66	1,523	1.97	0.26	2.90	2.62	0.72	1.74
Beaver	145,231	5.30	0.61	6.77	6,106	9.59	1.02	13.60	1.81	1.66	2.01
Bedford	39,579	0.30	0.45	1.53	10,868	12.26	2.32	20.74	40.42	5.18	13.52
Berks	291,984	3.29	7.71	12.55	5,104	7.37	8.05	19.74	2.24	1.04	1.57
Blair	103,439	1.05	0.45	2.30	2,938	4.24	0.92	7.67	4.02	2.06	3.33
Bradford	48,699	0.28	0.53	2.04	1,645	0.80	0.80	2.04	2.83	1.51	1.00
Bucks	461,606	3.00	2.12	8.08	7,679	9.11	4.47	18.10	3.03	2.11	2.24
Butler	136,021	0.74	0.49	2.29	4,327	3.95	1.09	6.58	5.35	2.22	2.88
Cambria	124,636	2.72	0.84	4.35	3,142	3.29	0.54	5.65	1.21	0.65	1.30
Cameron	4,713	0.25	0.38	1.19	1,480	0.54	0.14	0.88	2.14	0.36	0.74
Carbon	47,425	0.53	1.20	2.68	7,380	6.03	3.24	13.00	11.49	2.70	4.84
Centre	114,083	2.81	1.68	9.52	8,665	5.73	3.12	13.14	2.04	1.86	1.38
Chester	332,260	6.09	3.39	12.09	8,658	11.08	7.38	21.79	1.82	2.18	1.80
Clarion	33,803	0.80	0.35	2.04	8,087	8.72	4.39	19.68	10.84	12.67	9.65
Clearfield	66,781	1.80	0.57	3.07	8,300	8.41	3.86	18.93	4.67	6.72	6.17
Clinton	30,775	0.51	0.55	2.01	4,078	8.81	5.36	19.98	17.15	9.71	9.95
Columbia	52,456	0.79	0.82	2.59	2,736	9.71	5.13	20.35	12.31	6.26	7.87
Crawford	70,860	1.53	0.53	3.06	3,998	5.60	0.83	10.49	3.65	1.56	3.43
Cumberland	172,051	2.37	1.18	5.89	13,347	11.48	3.33	19.95	4.83	2.82	3.39
Dauphin	197,393	15.09	3.37	21.32	7,181	6.97	2.96	12.37	0.46	0.88	0.58
Delaware	429,852	13.25	1.36	18.67	6,063	18.06	2.98	25.19	1.36	2.20	1.35
Elk	27,754	0.10	0.28	1.07	2,511	1.53	1.05	4.43	14.64	3.72	4.12
Erie	218,976	5.25	1.70	8.41	8,182	5.46	1.29	10.63	1.04	0.76	1.26
Fayette	118,938	3.13	0.33	4.21	4,995	5.56	0.24	6.27	1.78	0.74	1.49
Forest	4,120	2.38	1.17	4.54	1,335	0.68	0.15	1.28	0.29	0.13	0.28
Franklin	101,875	2.09	1.44	4.69	5,913	8.27	3.02	14.72	3.95	2.09	3.14
Fulton	11,145	0.59	0.30	1.64	6,891	12.77	2.77	21.57	21.56	9.35	13.14
Greene	32,799	4.70	0.94	6.43	2,857	4.57	0.46	7.48	0.97	0.49	1.16
Huntingdon	36,899	5.95	1.20	7.85	1,883	2.77	0.85	4.00	0.47	0.71	0.51
Indiana	73,249	1.62	0.47	3.37	3,129	3.12	1.00	5.46	1.93	2.10	1.62
Jefferson	36,524	0.10	0.39	1.18	5,879	6.17	3.45	13.68	64.40	8.94	11.56
Juniata	17,759	0.21	1.39	2.19	2,000	3.82	1.99	9.01	18.33	1.43	4.11

Table 5.1 Driving-Age Population Disproportionality Indices by County (p.2 of 2)

County Name	Total Pop. > 16	% of Pop. > 16 Blk	Hisp	NonCauc	Total # PSP Stops	% of PSP Stops Blk	Hisp	NonCauc	Driving-Age Pop DI Blk	Hisp	NonCauc
Lackawanna	172,463	1.06	1.10	3.31	4,484	6.20	2.78	14.55	5.82	2.53	4.39
Lancaster	358,785	2.46	4.65	9.07	12,388	9.71	5.24	19.61	3.95	1.13	2.16
Lawrence	75,486	2.99	0.45	4.25	2,358	6.48	0.51	7.94	2.17	1.14	1.87
Lebanon	95,106	1.06	3.94	6.31	2,813	9.98	7.20	21.06	9.39	1.83	3.34
Lehigh	245,601	3.00	8.14	13.78	7,797	8.06	7.73	20.42	2.69	0.95	1.48
Luzerne	260,466	1.63	0.99	3.55	8,215	5.53	3.64	12.53	3.39	3.70	3.53
Lycoming	95,509	3.71	0.55	5.34	4,135	3.79	0.91	6.59	1.02	1.65	1.23
McKean	36,368	2.27	1.08	4.40	1,989	1.26	0.61	4.19	0.56	0.56	0.95
Mercer	95,732	4.59	0.58	6.24	2,517	9.93	3.76	20.50	2.16	6.51	3.29
Mifflin	36,299	0.36	0.45	1.38	1,603	2.26	0.82	5.03	6.27	1.81	3.65
Monroe	105,797	5.37	5.56	13.17	7,904	12.03	7.90	24.49	2.24	1.42	1.86
Montgomery	588,605	7.14	1.84	13.74	11,008	13.41	3.93	22.37	1.88	2.13	1.63
Montour	14,363	0.76	0.77	3.11	607	9.44	6.29	22.85	12.44	8.14	7.34
Northampton	212,048	2.44	5.53	10.03	4,372	8.21	8.70	21.00	3.36	1.57	2.09
Northumberland	76,571	1.60	0.91	3.11	2,268	1.74	0.85	3.21	1.08	0.93	1.03
Perry	33,847	0.32	0.58	1.55	904	2.70	2.03	7.32	8.55	3.48	4.71
Philadelphia	1,174,446	40.35	7.23	53.47	99	37.11	7.22	50.52	0.92	1.00	0.94
Pike	35,256	3.19	4.31	9.29	1,985	4.98	3.15	10.36	1.56	0.73	1.12
Potter	13,924	0.24	0.41	1.98	1,914	0.68	0.26	1.68	2.79	0.64	0.85
Schuylkill	122,900	2.38	1.09	4.15	4,330	4.05	2.33	8.03	1.70	2.14	1.93
Snyder	29,585	0.77	0.81	2.33	4,631	4.62	1.24	7.74	5.99	1.54	3.32
Somerset	64,461	1.92	0.68	3.10	10,161	12.74	2.61	21.24	6.65	3.82	6.86
Sullivan	5,480	2.52	1.13	5.07	1,294	1.09	0.47	1.95	0.43	0.41	0.38
Susquehanna	32,849	0.23	0.56	1.67	1,841	9.10	3.20	20.46	39.34	5.68	12.27
Tioga	32,871	0.58	0.41	2.01	1,320	2.97	1.14	6.79	5.12	2.77	3.38
Union	34,272	8.06	4.31	13.82	2,637	9.19	3.85	17.46	1.14	0.89	1.26
Venango	45,456	0.91	0.45	2.18	1,882	1.94	0.91	4.68	2.12	2.04	2.15
Warren	34,586	0.18	0.33	1.40	880	0.58	0.46	1.50	3.21	1.39	1.07
Washington	163,294	3.00	0.50	4.45	11,084	6.43	0.74	9.12	2.14	1.48	2.05
Wayne	37,711	1.67	1.51	4.14	2,108	2.34	1.58	4.73	1.41	1.04	1.14
Westmoreland	298,521	1.83	0.43	3.23	17,442	7.84	1.16	12.17	4.29	2.68	3.77
Wyoming	21,818	0.41	0.57	1.87	1,128	1.16	1.61	3.30	2.81	2.80	1.77
York	298,227	3.17	2.39	7.02	5,441	9.65	3.58	15.67	3.04	1.50	2.23

For the county comparisons of traffic stops of black motorists to the residential black driving age population documented in **Table 5.1**, disproportionality indices range from a low of 0.29 in Forest County to a high of 64.4 in Jefferson County. Eight counties have disproportionality indices less than or equal to one. Overall, 19 counties (28.4%) have black disproportionality indices greater than 5.0. Of these 19 counties, 16 have residential populations that are less than 1% black. That is, the high disproportionality indices for some of these 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, counties with very small percentages of black populations have unstable indices.

Figure 5.1. Population_Based Disproportionality Indices for Black Drivers By County

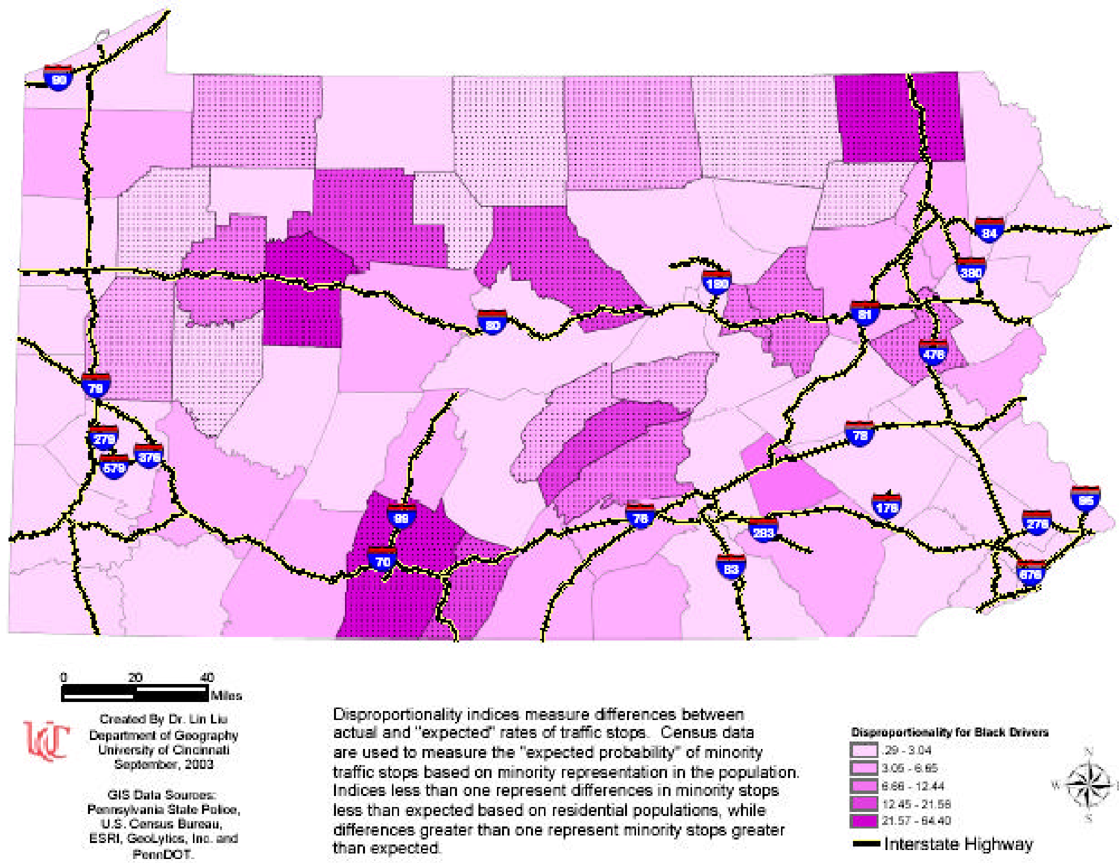
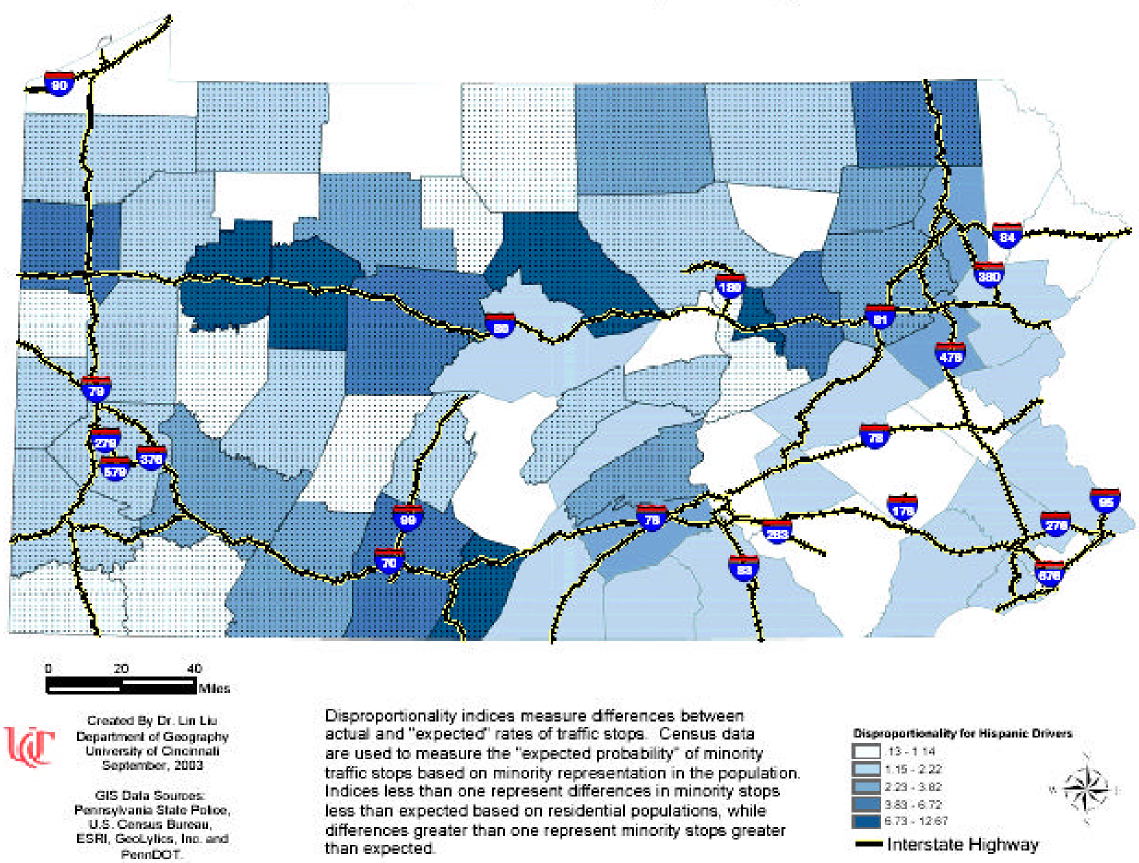


Figure 5.1 graphically displays the differences in black residential driving-age populations and PSP traffic stops of black drivers by county. As **Figure 5.1** illustrates, counties with higher disproportionality indices – i.e., counties with higher than expected rates of black motorists stopped based 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 indices 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 indices.

Comparisons of driving-age Hispanic residential populations and traffic stops are also reported in **Table 5.1**. As with blacks, there is wide variation among the disproportionality indices for Hispanics, although the range is considerably smaller. For the Hispanic population, disproportionality indices range from 0.13 in Forest County to 12.67 in Clarion County. Seventeen counties had indices less than or equal to one. That is, 25.4% of counties had fewer than the number of expected stops of Hispanic drivers based on their county populations. Ten counties had indices greater than or equal to 5.0 (i.e., Bedford, Clarion, Clearfield, Clinton, Columbia, Fulton, Jefferson, Mercer, Montour, and Susquehanna); of these, five ranged from 8.0 to 12.7 (i.e., Clarion, Clinton, Fulton, Jefferson, and Montour). Each of these ten counties has a Hispanic residential driving-age population of less than 1%. The differences in residential driving-age populations and PSP traffic stops for Hispanics are graphically displayed in **Figure 5.2**. 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 indices for blacks and Hispanics.

Figure 5.2. Population_Based Disproportionality Indices for Hispanic Drivers By County



Finally, the non-Caucasian comparisons in **Table 5.1** show disproportionality indices that range from 0.29 in Forest County to 13.52 in Bedford County. Note that 10 counties have disproportionality indices of 1.0 or lower. That is, 14.9% of counties had fewer stops of non-Caucasian drivers than would be expected based on their residential driving-age county populations. On the other hand, ten counties (i.e., Bedford, Clarion, Clearfield, Clinton, Columbia, Fulton, Jefferson, Montour, Somerset, and Susquehanna) had indices above 5.0. With the exceptions of Clearfield, Montour, and Somerset, these counties also had black and Hispanic disproportionality indices that were at least 5.0. These ten counties all have very low populations of non-Caucasian residents, but also have at least one major interstate or highway that may significantly influence the proportion of minority traffic stops. The differences in the non-Caucasian residential populations and traffic stops of non-Caucasian drivers are graphically displayed in **Figure 5.3**. As is shown, traffic stops of non-Caucasian drivers that exceed their residential population tend to be clustered around major interstates (e.g., I-80 and I-76). The possibility that residential driving-age populations do not match traffic patterns is further examined in the analyses reported below.

Figure 5.3. Population_Based Disproportionality Indices for Non-Caucasian Drivers By County

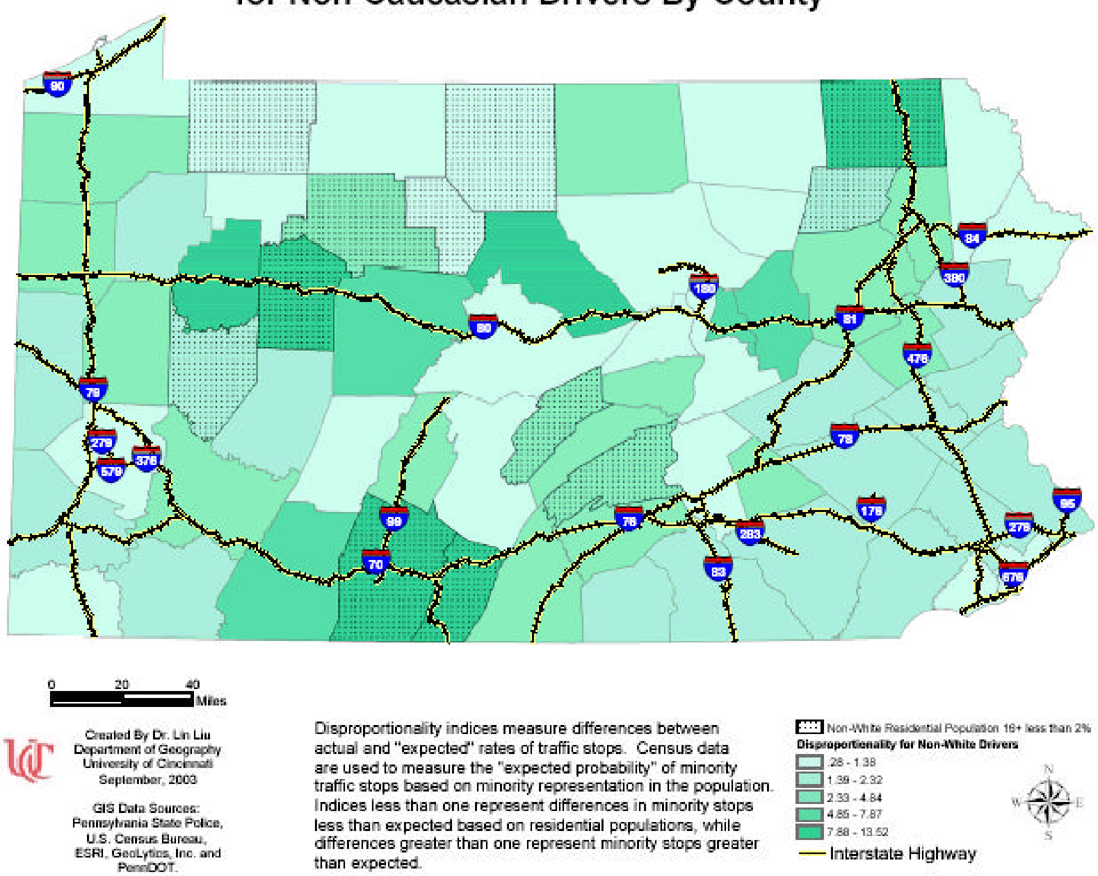


Table 5.1 and **Figures 5.1 – 5.3** indicate that nine of Pennsylvania's 67 counties had population-based disproportionality indices for each racial group that were 5.0 or greater (Bedford, Clarion, Clinton, Columbia, Fulton, Jefferson, Juniata, Montour, and Susquehanna). Of these nine counties, five had two population-based disproportionality indices over 10.0 (Bedford, Clarion, Fulton, Jefferson, and Susquehanna). As documented in Section IV, two of these counties—Columbia and Juniata—were included in the sample of twenty original observed counties. Due to the extremely high disproportionality indices evident in the additional seven counties, observations and additional analyses (see next subsection) were conducted in these counties as well.

On the other hand, 18 counties (Allegheny, Armstrong, Cambria, Cameron, Dauphin, Erie, Fayette, Forest, Greene, Huntingdon, Lehigh, McKean, Northumberland, Philadelphia, Pike, Potter, Sullivan, Union) had at least one population-based disproportionality index under 1.0, indicating that particular racial groups were stopped less often than would be expected based on their percentage in the driving-age population.

Further Examination of Nine Counties

As noted previously, there is not a scientifically accepted standard for the appropriate value of disproportionality indices. Based on z-score comparisons across the counties, we have identified some counties with black, Hispanic, and non-Caucasian disproportionality indices that are one or two standard deviations higher than the average scores for further consideration and additional roadway observations. The disproportionality indices for these selected counties are greater than 5.0. As documented in **Table 5.1**, several counties with high disproportionality indices were identified. Of these counties, eight counties have disproportionality indices greater than 5.0 for black, Hispanic, and non-Caucasian drivers (Bedford, Clarion, Clinton, Columbia, Fulton, Jefferson, Montour, and Susquehanna). In addition, Juniata County has the fifth highest disproportionality index for blacks (18.3) and also merits further attention. A more thorough examination of these counties is provided in **Figures 5.4 - 5.12**.

Figures 5.4 – 5.12 show the residential location of the drivers stopped in these nine counties. On these nine maps, each dot represents three stopped drivers. The density of the dots is proportional to the number of stopped drivers. It is important to note that non-Pennsylvania residency drivers are not represented on these maps. Therefore, 47.1% of drivers stopped in Bedford County, 50.8% in Clarion, 59.8% in Clinton, 46.7% in Columbia, 49.1% in Fulton, 42.4% in Jefferson, 13.1% in Juniata, 48.4% in Montour, and 64.9% stopped in Susquehanna County are not graphically displayed in **Figures 5.4-5.12**.

Figure 5.4. Bedford County, PA.
Pennsylvania Resident Traffic Stops

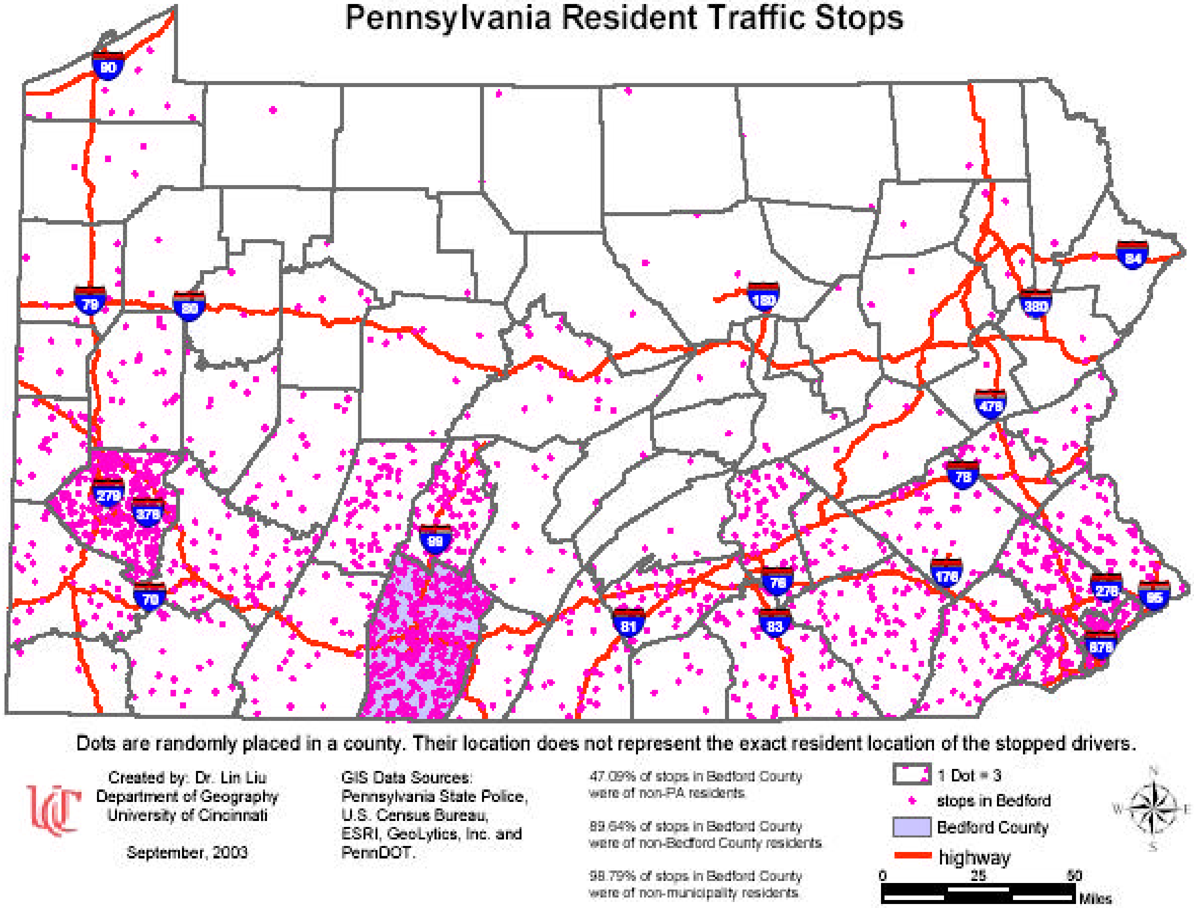


Figure 5.4 displays the distribution of residency patterns for Bedford County. The distribution of Pennsylvania drivers stopped in Bedford County appears to follow Interstates 76 and 99. A large number of the in-state drivers stopped in Bedford County reside in the Philadelphia and Pittsburgh areas and nearly half of the drivers stopped in Bedford County (47.1%) were out-of-state residents.

Figure 5.5. Clarion County, PA.
Pennsylvania Resident Traffic Stops

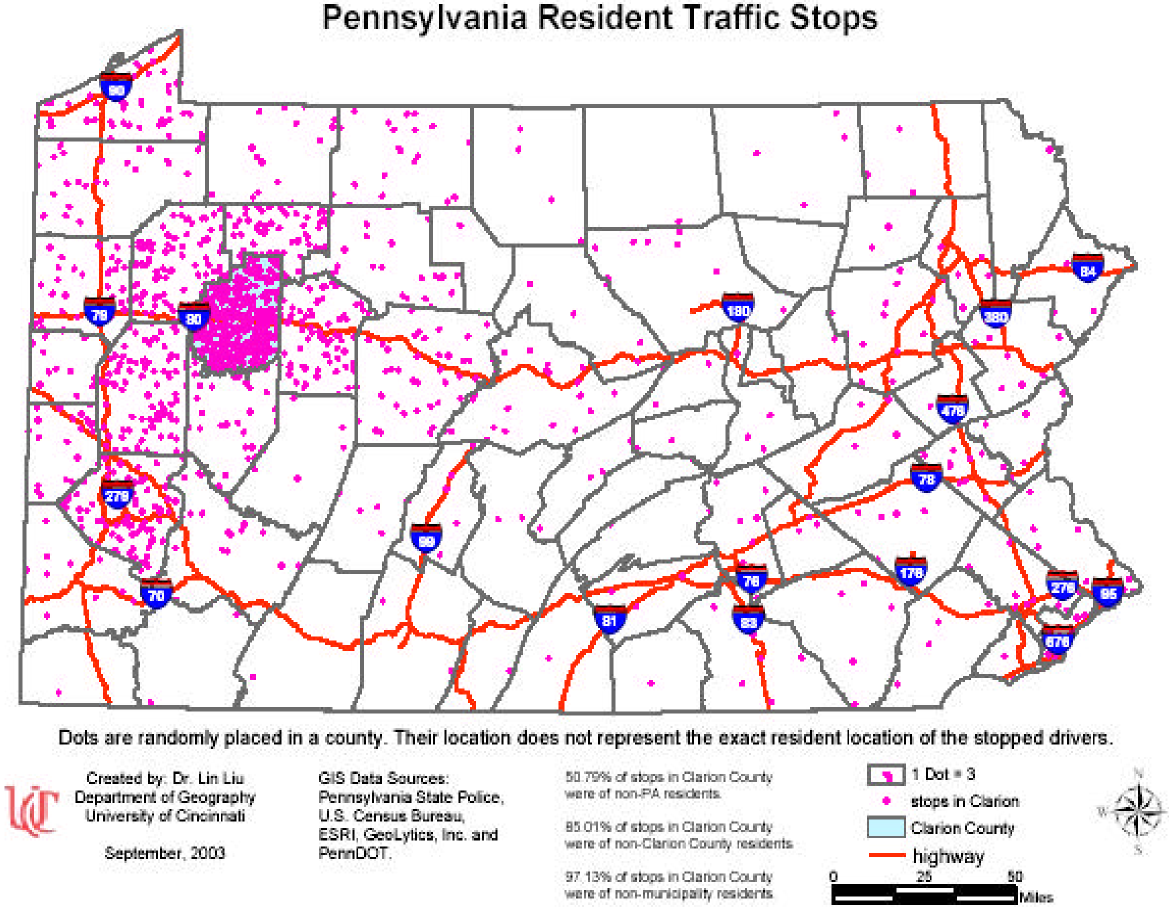


Figure 5.5 reports the distribution of residency patterns for drivers stopped in Clarion County. It appears the distribution of in-state drivers stopped in Clarion County is concentrated in the western portion of Pennsylvania, and the distribution appears to follow Interstate 80. In addition, over half of the drivers stopped in Clarion County (50.8%) were non-Pennsylvania residents.

Figure 5.6. Clinton County, PA.
Pennsylvania Resident Traffic Stops

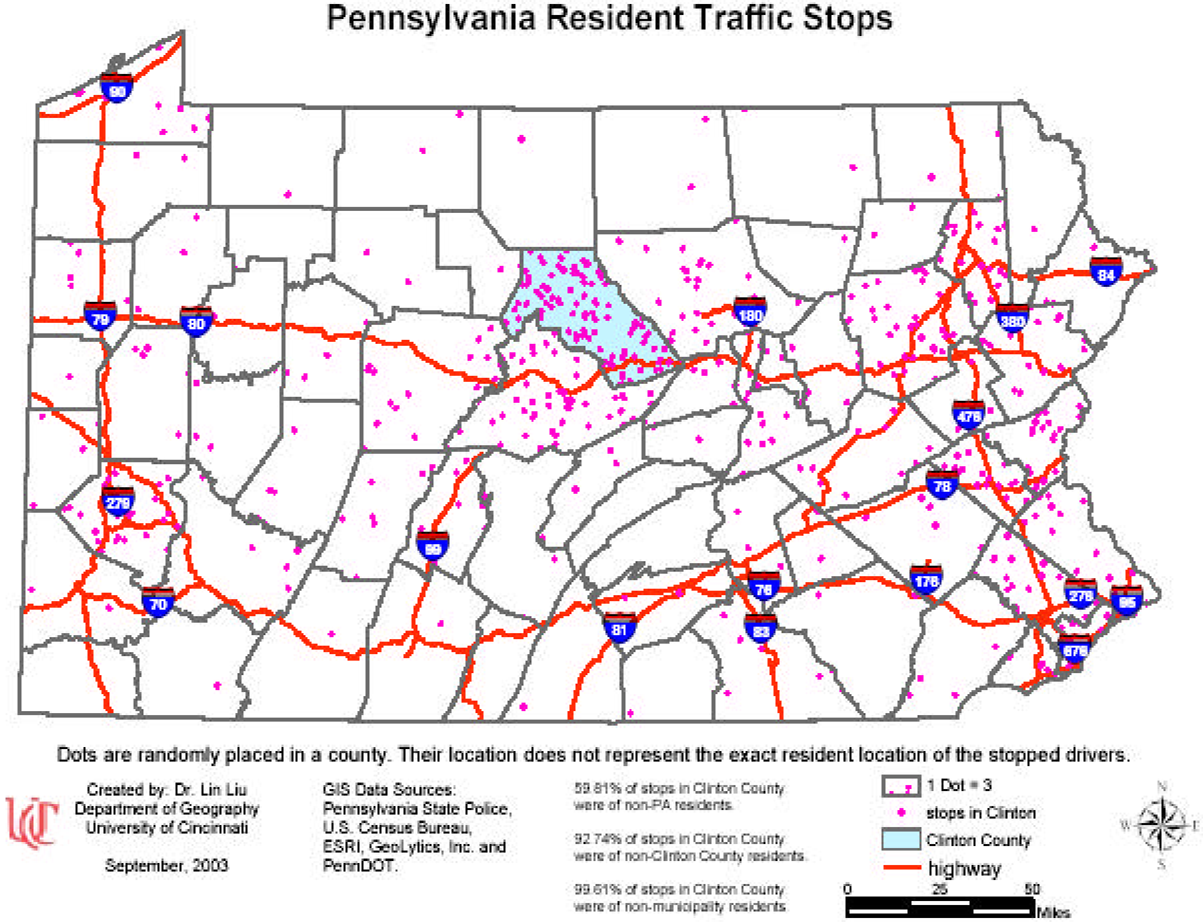


Figure 5.6 illustrates the residency distribution for traffic stops in Clinton County. The distribution of in-state drivers stopped in Clinton County is scattered along Interstate 80. A relatively small number of the stopped drivers reside in Clinton County (7.3%), while a noticeable number of the stopped drivers reside in Central and Eastern Pennsylvania and almost 60% reside out-of-state.

Figure 5.7. Columbia County, PA.
Pennsylvania Resident Traffic Stops

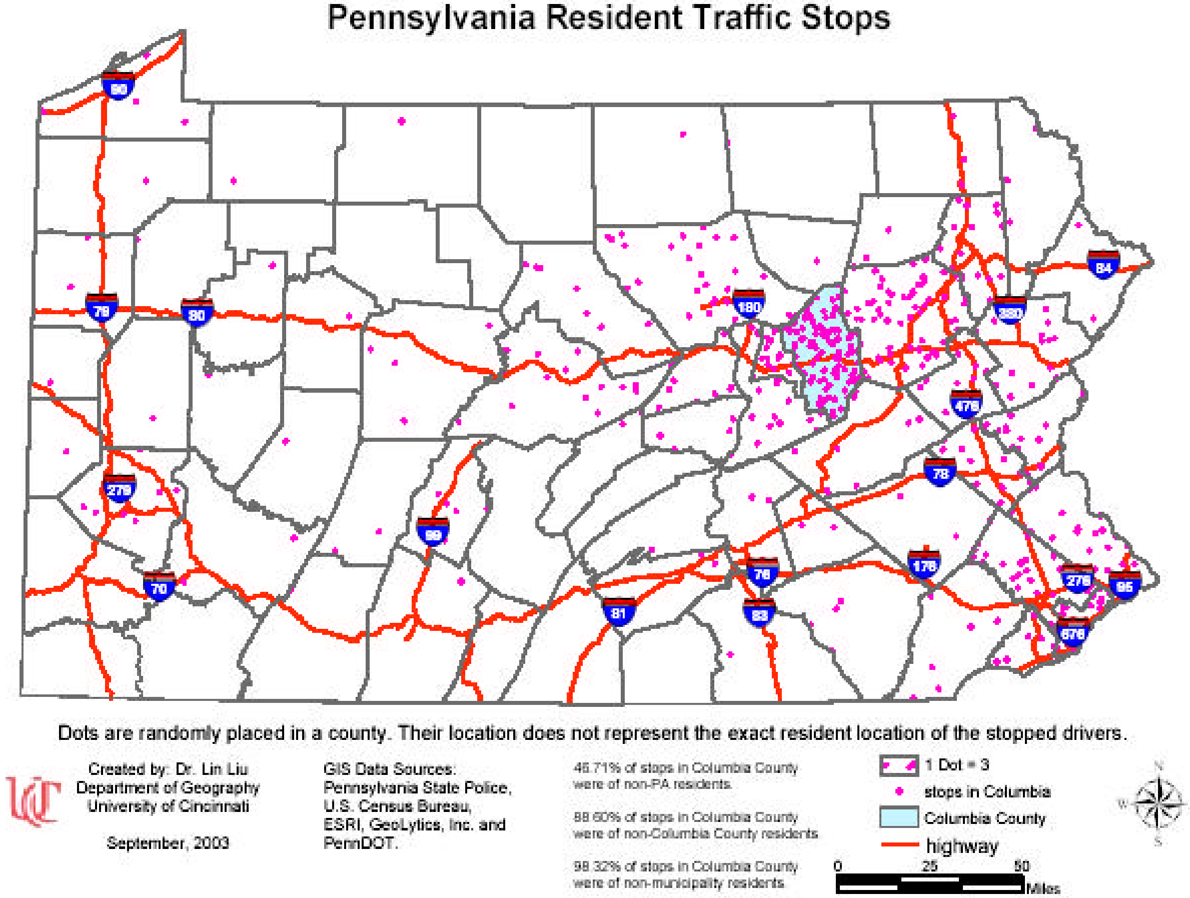


Figure 5.7 reports the distribution of residency patterns for drivers stopped in Columbia County. This map illustrates that a relatively large number of the in-state drivers stopped in Columbia County live in nearby counties along Interstate 80. In addition, 46.7% of drivers stopped in Columbia County are non-Pennsylvania residents.

Figure 5.8. Fulton County, PA.
Pennsylvania Resident Traffic Stops

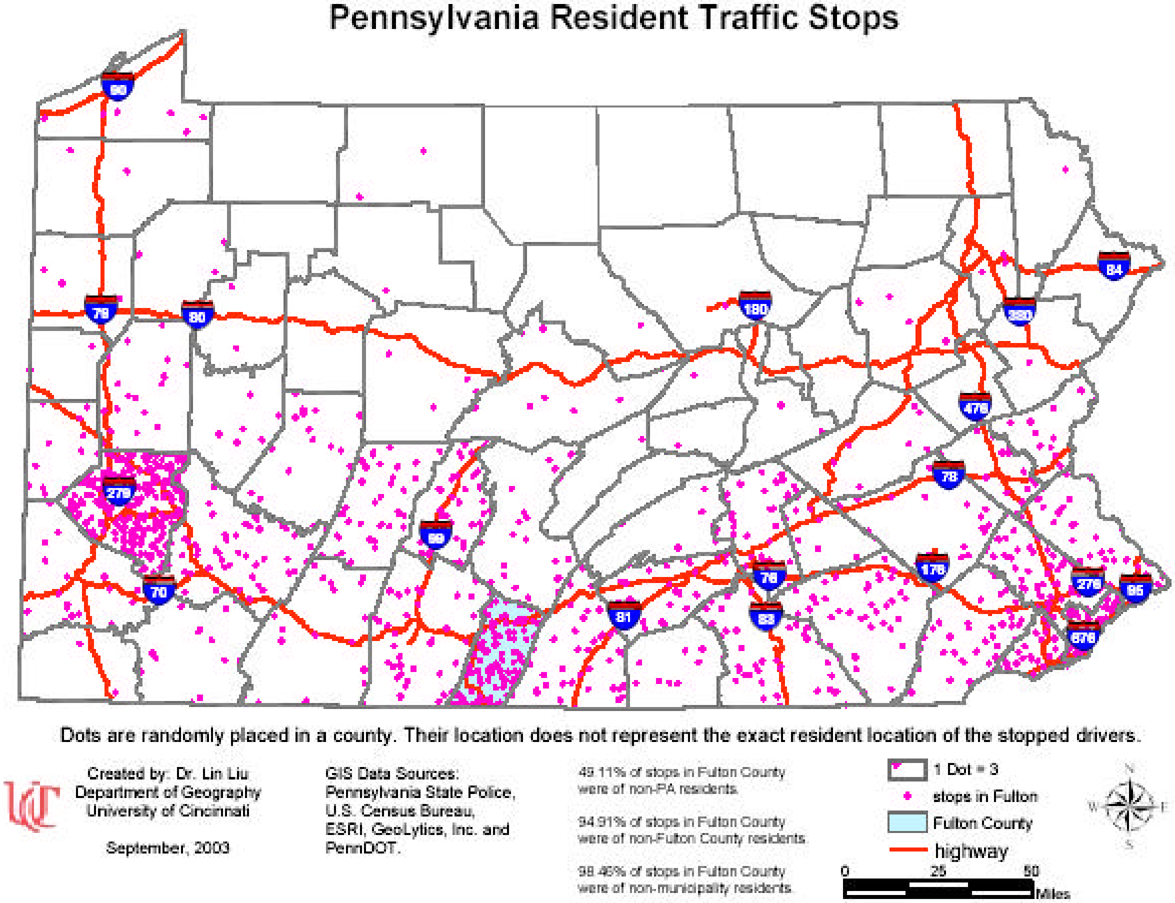


Figure 5.8 displays the findings for Fulton County. Similar to residency distribution of in-state drivers stopped in Bedford County, the distribution of in-state drivers stopped in Fulton County follows Interstates 76 and 99. A large number of the in-state drivers stopped reside in the areas in and around Philadelphia and Pittsburgh. Importantly, only 5.1% of the traffic stops in Fulton County are residents of that county, making Census data inappropriate for purposes of benchmark comparisons. In addition, almost half (49.1%) of drivers stopped in Fulton County are non-Pennsylvania residents.

Figure 5.9. Jefferson County, PA.
Pennsylvania Resident Traffic Stops

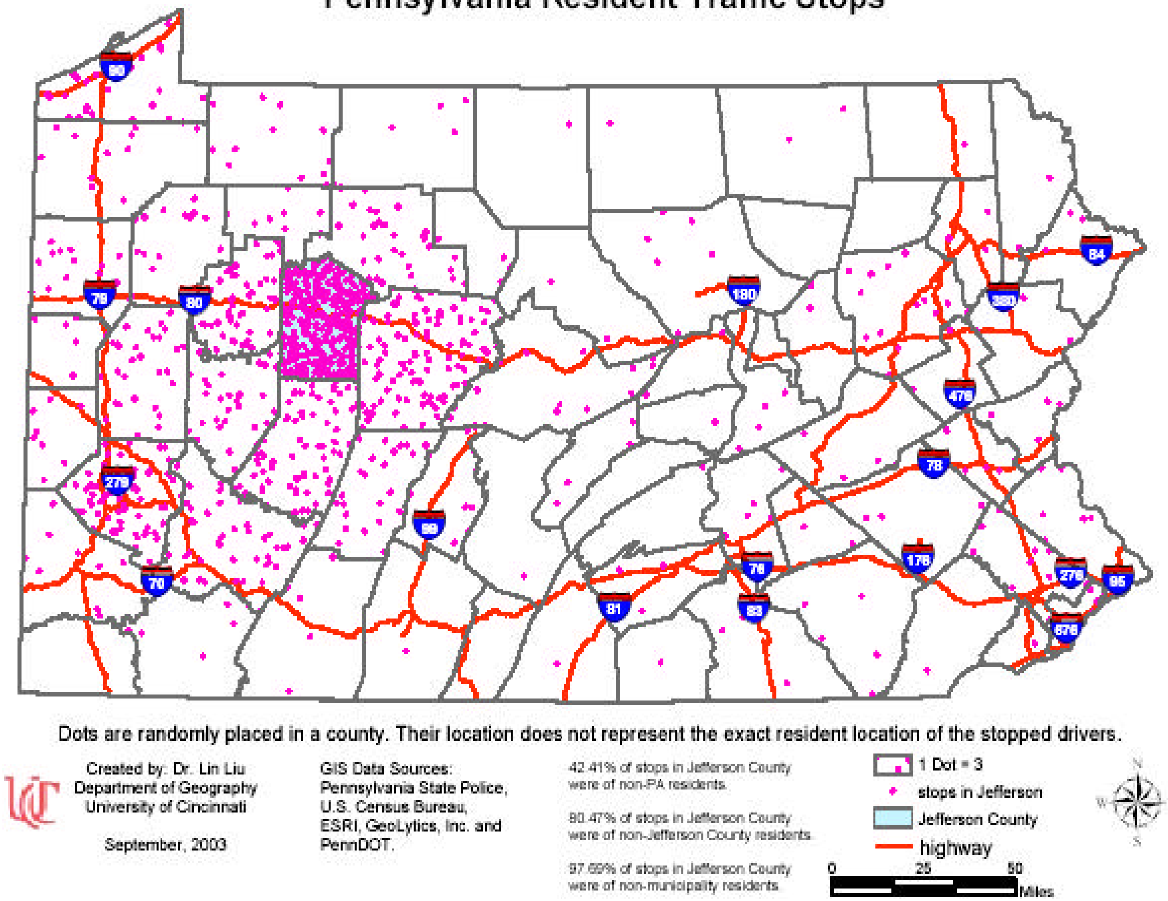


Figure 5.9 reports the residential distribution for Jefferson County. This map illustrates that the distribution of in-state drivers stopped in Jefferson County is concentrated in Western Pennsylvania, with a considerable proportion of drivers residing in Jefferson County (approximately 20%). This suggests that, compared to some of the other counties with high disproportionality indices, the residential populations of Jefferson and surrounding counties should be considered a more accurate measure to use as a comparison to traffic stop data. That is, the racial disproportionalities of traffic stops observed in Jefferson County cannot be adequately explained by differences in stopped motorists' residencies. It must also be considered, however, that 42.4% of the drivers stopped in Jefferson County were non-Pennsylvania residents.

Figure 5.10. Juniata County, PA.
Pennsylvania Resident Traffic Stops

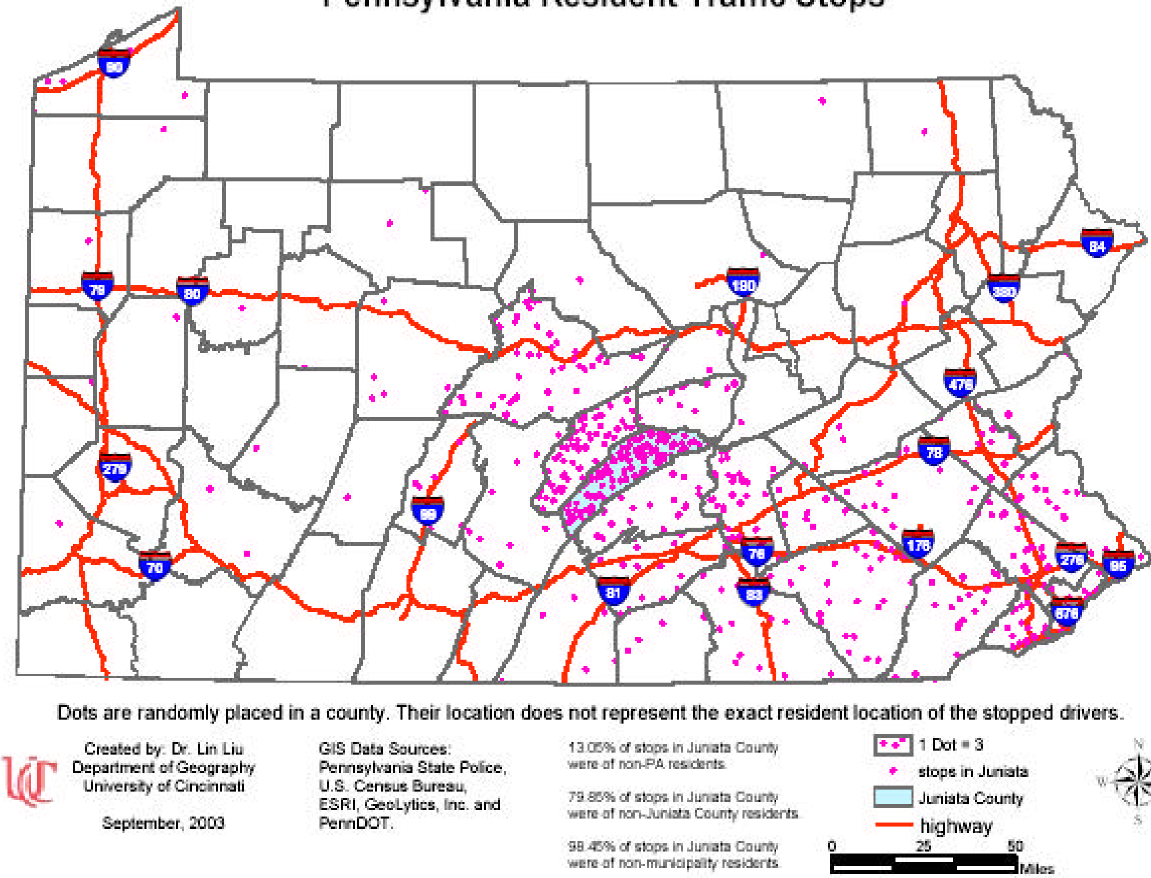


Figure 5.10 illustrates the residency distribution for drivers stopped in Juniata County. Note that Juniata is the only county in this group that does not contain an interstate highway. A large number of the drivers stopped in Juniata County reside in that county (20%) and within Pennsylvania (87%). The in-state drivers that are not residents of Juniata County appear to reside in other nearby counties and Eastern Pennsylvania. Once again, this suggests that the residential populations of Juniata and surrounding counties should be considered a more accurate measure for comparisons to traffic stop data. Thus, the racial disproportionalities of traffic stops observed in Juniata County also cannot be adequately explained by differences in stopped motorists' residencies.

Figure 5.11. Montour County, PA.
Pennsylvania Resident Traffic Stops

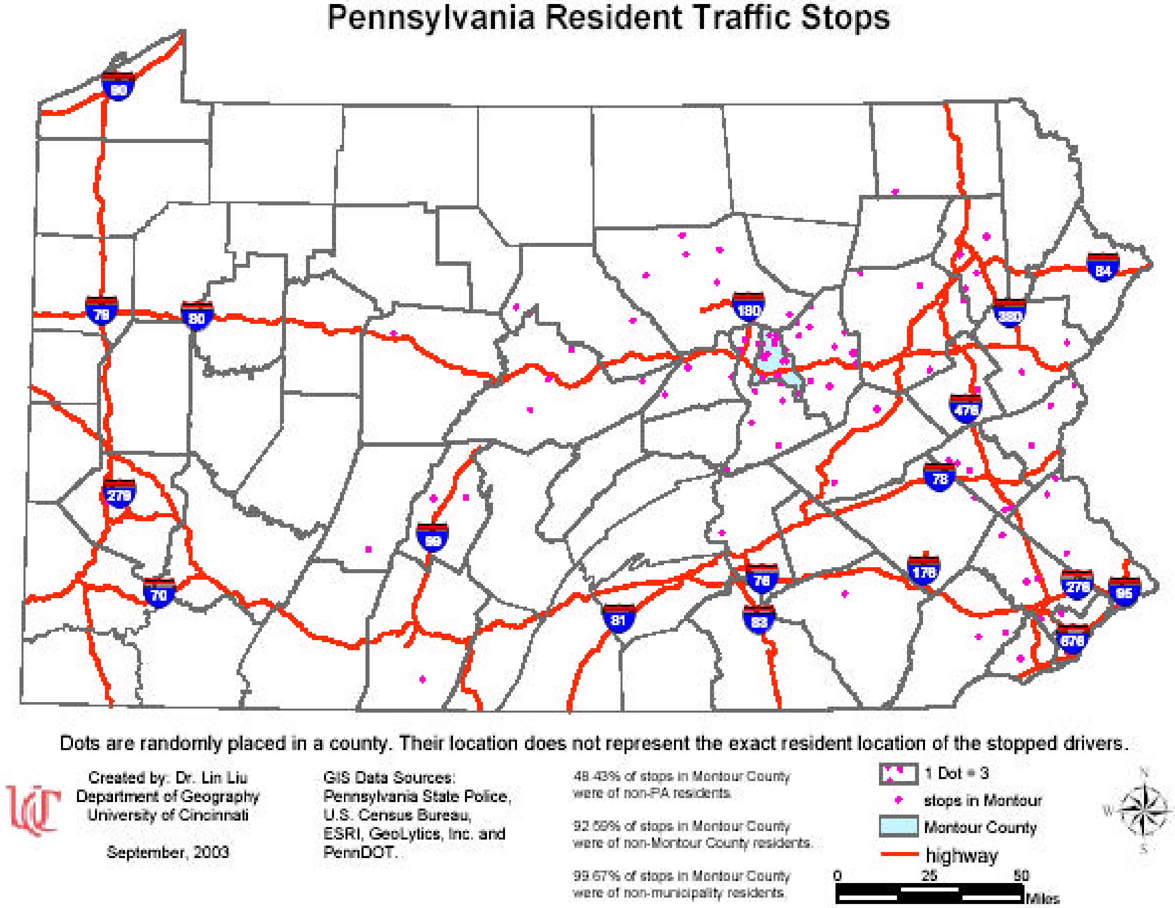


Figure 5.11 displays residential patterns of drivers stopped in Montour County. This map illustrates that very few traffic stops of in-state residents are made in Montour County. Almost half of the traffic stops made in Montour county are of non-Pennsylvania residents. Of the relatively few in-state drivers that are stopped in Montour County, most reside in Eastern Pennsylvania. Only approximately 7% of stops in Montour County were of county residents.

Figure 5.12. Susquehanna County, PA.
Pennsylvania Resident Traffic Stops

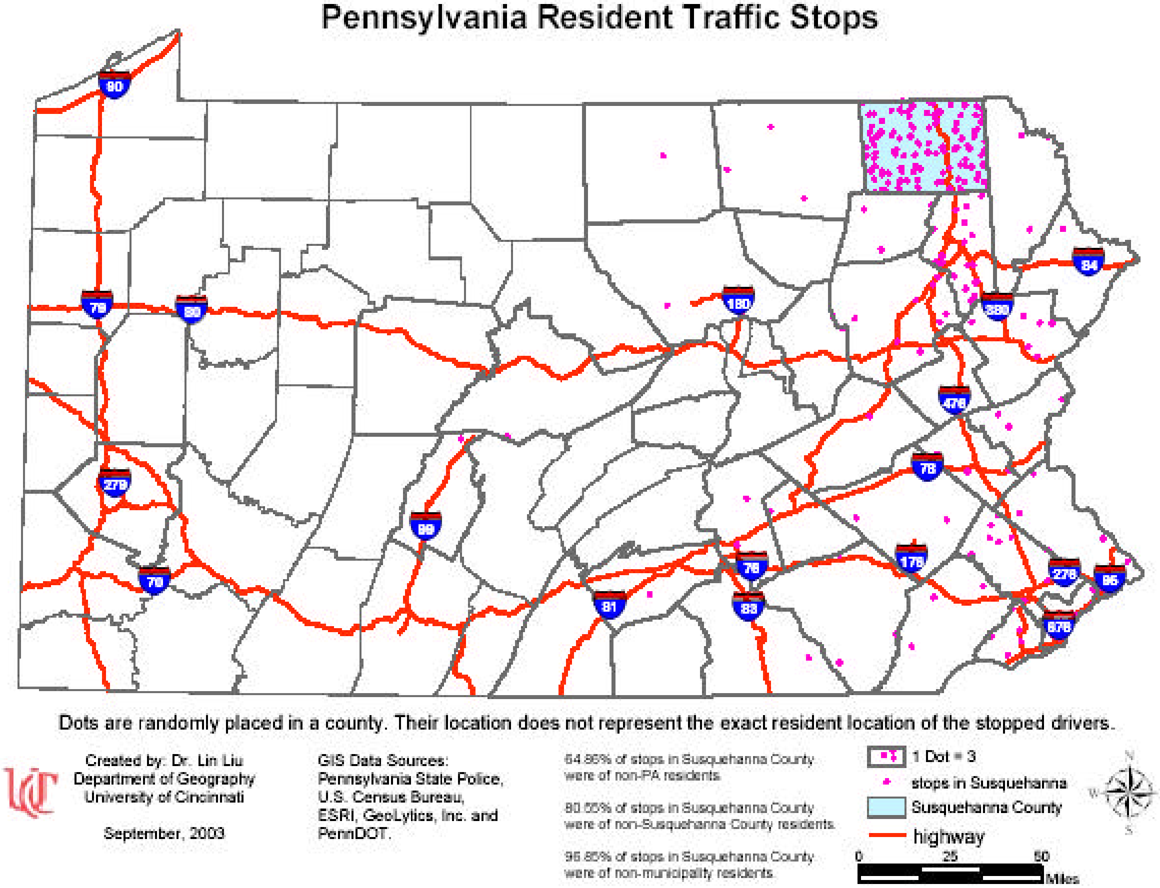


Figure 5.12 graphically displays the residential patterns of drivers stopped in Susquehanna County. A majority of drivers stopped in Susquehanna (approximately 65%) do not live in the state of Pennsylvania. Of the 35% of drivers stopped that do reside in-state, the majority reside in Susquehanna County along with other areas in Eastern Pennsylvania (especially Northeastern Pennsylvania).

A comparison of the maps for these nine counties reveals the following general patterns:

- A large majority of drivers stopped do not reside in the location where they are stopped. Thus, differences in traffic patterns are likely to explain many of the disparities produced by comparisons between stops and residential populations.

- Stopped drivers generally reside in counties close to where they are stopped. For example, a large number of drivers stopped in western counties such as Clarion and Jefferson reside in Western Pennsylvania, while a large number of drivers stopped in eastern counties such as Columbia and Susquehanna live in Eastern Pennsylvania.

- The spatial pattern of interstate highways strongly correlates with the spatial distribution of the drivers stopped in counties containing highways. For example, a large number of drivers stopped in northern counties such as Clinton and Columbia live in counties along Interstate 80, and a large number of drivers stopped in southern counties such as Bedford and Fulton reside in counties along Interstate 76, the Philadelphia and Pittsburgh Areas, or out-of-state.

- Differences in patterns of stopped motorists residencies alone cannot adequately explain the racial disproportionalities in traffic stops observed in Jefferson and Juniata Counties. Note however, that there may be legitimate reasons for these disparities other than discrimination that should be further explored. Additional data collected for these two counties will be examined in greater detail below.
- Of the nine highlighted counties, two (Columbia and Juniata) were included in the original sample for observation. Based on disproportionality indices generated for earlier reports, the traffic patterns in the remaining seven counties were subsequently observed. Comparisons between residential Census populations and observations of drivers on the roadways in these two counties will be more fully explored later in this section.

Further consideration of traffic stops of non-residents

The average percent of all drivers (regardless of race) stopped from out-of-state is 29.5% department-wide (see **Table 3.6)**. Note, however, that the percent of drivers who do not reside in the location where they are stopped differs significantly by drivers' race, and across counties. **Table 5.2** shows this residency variation by race for white, black, Hispanic, and non-Caucasian drivers, and **Table 5.3** illustrates this variation for the nine specific counties with higher disproportionality indices.

As reported in **Table 5.2**, 25.1% of white drivers compared to 49.9% of black drivers, 53.1% of Hispanic drivers, and 53.5% of non-Caucasian drivers stopped by Troopers were non-Pennsylvania residents. In addition, 65.3% of white drivers, compared to 82.2% of black drivers, 77.7% of Hispanic drivers, and 82.8% of non-Caucasian drivers were not residents of the counties in which they were stopped. Similar patterns emerge for the drivers' residency in municipalities where they are stopped. These results suggest that traffic patterns do not accurately reflect racial patterns in residency.

Table 5.2 Racial Differences in the Residency of Motorists Stopped by Troopers

Driver Characteristics	% stops of non-PA residents	% stops of non-county residents	% stops of non-municipality residents
White	25.1	65.3	95.7
Black	49.9	82.2	97.3
Hispanic	53.1	77.7	96.5
Non-Caucasian	53.5	82.8	97.5

In order to examine more closely the residency and race of those individuals who are stopped in these nine high disproportionality-index counties, comparisons between the percent of minority stops that were of non-Pennsylvania, non-county, and non-municipality residents are made with the percent of white stops of non-residents (see **Table 5.3**). As this table demonstrates, all nine counties 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 whites in the same areas. Of particular importance are the differences in residency of drivers stopped in Jefferson and Juniata Counties. In Jefferson County, only 34.6% of the white drivers were non-PA residents, compared to 88.3% of all minority drivers. Likewise, in Juniata County, only 11.7% of the white drivers stopped by Troopers were non-PA residents compared to 26.6% of minority drivers. This suggests that traffic patterns may differ by racial groups in and around these two counties.

Table 5.3 Residency Comparisons of Drivers Stopped by Race for Select Counties

County	% Stops of non-PA residents				% Stops of non-county residents				% Stops of non-municipality residents			
Name	WHT	BLK	HISP	NON-CA	WHT	BLK	HISP	NON-CA	WHT	BLK	HISP	NON-CA
Bedford	41.3	66.3	79.2	69.5	87.1	99.2	99.2	99.3	98.5	100.0	100.0	100.0
Clarion	40.7	88.3	93.2	90.3	81.3	98.9	100.0	99.2	96.5	99.7	100.0	99.7
Clinton	51.9	86.4	89.4	85.2	90.7	99.4	100.0	99.6	99.5	100.0	100.0	100.0
Columbia	38.3	69.2	86.3	77.5	86.0	97.3	98.6	98.2	97.9	100.0	99.3	99.8
Fulton	43.8	65.4	75.1	68.1	93.7	99.2	100.0	99.4	98.1	99.8	100.0	99.9
Jefferson	34.6	84.2	95.0	88.3	77.4	99.4	98.0	98.5	97.4	100.0	99.5	99.8
Juniata	11.7	25.3	33.3	26.6	78.4	97.3	82.1	93.8	98.2	100.0	100.0	100.0
Montour	39.1	68.4	92.1	78.3	91.1	96.5	100.0	97.8	99.6	100.0	100.0	100.0
Susquehanna	58.2	90.9	86.2	89.8	75.7	97.0	94.8	97.6	96.0	99.4	98.3	99.5

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

As graphically displayed in **Figures 5.1, 5.2,** and **5.3**, traffic patterns on the Interstates may be a partial explanation for the large disparities in some counties between the number of minority drivers stopped by Troopers and their representation in the population. To further explore this possibility, analyses examining the drivers' residency (based on their zip codes) were conducted. Traffic stops for the comparisons to Census data are restricted to only those drivers who were stopped in the counties where they also reside. If the numerator of a disproportionality index is restricted to only county residents, then the percentage of a racial group in resident-only stops should presumably more closely mirror county population statistics than stops of all drivers would. Note, however, that counties may still have disproportionality indices that are not equivalent to 1.0 if driving *behavior* differs by demographic characteristics. This possibility will be further explored later in this section.

Table 5.4 displays county-level disproportionality indices for stops of county residents only compared to county driving-age population statistics. The first two columns display the percent and number of PSP stops in each county that were of only county residents. The next three columns show the racial percentages of stops that were of only county residents. The final three columns note the disproportionality indices for blacks, Hispanics, and non-Caucasians, based on a numerator of only county residents that were stopped and a denominator based on county-level driving-age populations.

Table 5.4 illustrates that the disproportionality indices based on only stops of county residents are dramatically smaller than those based on all stopped drivers. Virtually all of the driving-age population disproportionality indices that were higher than 10.0 based on stops of all drivers dropped to less than 5.0. Many disproportionality indices become smaller than 2.0 when based on county residents only. The largest decline in a county's disproportionality index occurs in Jefferson County, where the driving-age population-based disproportionality index is 64.40 and the county-only index is over 60 points smaller at 1.83. Twenty other moderately high population-based disproportionality indices (ranging from 5.0 - 9.99) are also substantively decreased when only stops of county residents are considered, and some actually become smaller than 1.0.

Table 5.4 also shows that one or more of the racial disproportionality indices for some counties are larger when considering stops of only county residents as compared to all stopped drivers. Only 12 of 67 counties, however, see an increase in one or more racial disproportionality indices when based on county residents only. The disproportionality indices for seven of these 12 counties increase by less than half of a point (an eighth county, Cameron County, increased by only 1.5). Three other counties only increase minimally in their proximity to 1.0 (Allegheny, Forest, Pike).

In summary, the comparisons displayed in **Table 5.4** (based on comparisons of only traffic stops of drivers who reside in the county there they were stopped to residential populations) are more appropriate than Census-based comparisons to all traffic stops (regardless of the residency of the driver). The results suggest that initial disproportionality indices reported in **Table 5.1** were artificially inflated. Analyses of traffic stops made of only county residents show much less racial disparity. Nevertheless, these analyses are limited because the denominator only captured the residential population and not the actual driving population. Thus, additional analyses based on observation benchmarks are warranted.

Table 5.4 County Resident-Only Disproportionality Indices by County (p.1 of 2)

County	% of PSP Stops	# PSP Stops	% Stops of Cnty Res.			Pop-based DI-Cnty Res.		
Name	of Cnty Res.	of Cnty Res.	Blk	Hisp	NonCauc	Blk	Hisp	NonCauc
Adams	52.49	832	1.96	7.48	9.82	1.85	2.63	1.92
Allegheny	53.07	4,609	9.96	0.48	13.30	0.91	0.61	0.93
Armstrong	58.44	790	1.02	0.00	1.14	1.35	0.00	0.69
Beaver	38.44	1,926	7.60	0.42	9.05	1.43	0.68	1.34
Bedford	11.52	1,126	0.89	0.18	1.43	2.95	0.40	0.93
Berks	47.73	2,240	4.39	9.78	15.58	1.33	1.27	1.24
Blair	52.38	1,369	2.57	0.29	4.04	2.44	0.66	1.76
Bradford	64.50	1,041	0.29	0.29	0.98	1.03	0.55	0.48
Bucks	52.01	3,196	4.64	1.97	9.11	1.54	0.93	1.13
Butler	45.97	1,872	1.02	0.54	2.05	1.38	1.09	0.89
Cambria	54.23	1,521	2.57	0.26	3.69	0.94	0.31	0.85
Cameron	36.42	387	1.04	0.00	1.04	4.10	0.00	0.88
Carbon	16.68	923	2.43	1.66	4.53	4.62	1.38	1.69
Centre	31.54	2,428	1.24	0.41	3.68	0.44	0.25	0.39
Chester	50.03	4,123	9.08	9.59	20.59	1.49	2.83	1.70
Clarion	20.02	1,212	0.66	0.00	1.08	0.83	0.00	0.53
Clearfield	21.70	1,577	0.45	0.13	0.89	0.25	0.22	0.29
Clinton	8.09	296	0.68	0.00	1.01	1.32	0.00	0.50
Columbia	14.11	312	2.27	0.65	3.25	2.88	0.79	1.26
Crawford	33.77	1,179	1.80	0.09	2.23	1.18	0.16	0.73
Cumberland	15.94	1,657	2.92	0.97	5.60	1.23	0.82	0.95
Dauphin	42.72	2,411	7.67	2.70	12.22	0.51	0.80	0.57
Delaware	51.41	2,665	15.64	1.70	20.96	1.18	1.25	1.12
Elk	46.95	970	0.31	0.00	0.83	2.98	0.00	0.77
Erie	55.68	4,472	3.58	1.11	6.03	0.68	0.65	0.72
Fayette	77.28	3,738	6.23	0.24	6.77	1.99	0.74	1.61
Forest	20.75	209	0.00	0.48	0.48	0.00	0.41	0.11
Franklin	38.54	2,285	4.92	2.75	8.37	2.35	1.90	1.79
Fulton	6.23	351	2.02	0.00	2.59	3.41	0.00	1.58
Greene	39.31	1,108	0.37	0.09	0.92	0.08	0.10	0.14
Huntingdon	55.66	782	0.90	0.00	1.16	0.15	0.00	0.15
Indiana	45.61	1,377	1.75	0.51	3.14	1.08	1.08	0.93
Jefferson	24.51	1,148	0.18	0.35	1.05	1.83	0.91	0.89
Juniata	30.15	403	0.51	1.77	2.78	2.43	1.28	1.27

Table 5.4 County Resident-Only Disproportionality Indices by County (p.2 of 2)

County Name	% of PSP Stops of Cnty Res.	# PSP Stops of Cnty Res.	% Stops of Cnty Res. Blk	Hisp	NonCauc	Pop-based DI-Cnty Res. Blk	Hisp	NonCauc
Lackawanna	34.50	1,270	2.69	1.90	6.02	2.53	1.72	1.82
Lancaster	33.73	3,756	4.64	6.64	13.82	1.89	1.43	1.52
Lawrence	48.56	1,051	6.24	0.10	6.83	2.09	0.22	1.61
Lebanon	29.08	680	1.47	6.18	8.63	1.38	1.57	1.37
Lehigh	34.22	2,088	5.12	7.77	16.89	1.71	0.95	1.23
Luzerne	37.70	2,838	1.99	3.45	6.33	1.22	3.50	1.78
Lycoming	53.35	2,006	4.01	0.30	5.33	1.08	0.55	1.00
McKean	42.79	802	0.00	0.25	0.38	0.00	0.23	0.09
Mercer	26.66	541	3.56	0.00	4.49	0.77	0.00	0.72
Mifflin	48.66	713	1.56	0.42	2.27	4.32	0.94	1.65
Monroe	32.36	2,290	11.47	6.96	20.65	2.19	1.25	1.57
Montgomery	48.56	4,151	9.75	2.48	17.51	1.37	1.35	1.28
Montour	13.18	45	4.55	0.00	6.82	5.99	0.00	2.19
Northampton	45.86	1,506	5.27	5.73	13.13	2.15	1.04	1.31
Northumberland	75.31	1,355	0.97	0.74	2.16	0.60	0.81	0.69
Perry	34.62	263	0.38	1.15	1.91	1.21	1.97	1.23
Philadelphia	65.66	53	51.92	7.69	65.38	1.29	1.06	1.22
Pike	31.64	441	3.46	4.62	8.78	1.09	1.07	0.94
Potter	50.26	844	0.59	0.24	1.54	2.43	0.58	0.78
Schuylkill	52.45	2,222	0.86	1.09	2.54	0.36	1.00	0.61
Snyder	23.02	889	1.37	1.48	3.41	1.77	1.83	1.47
Somerset	11.72	1,156	0.26	0.17	0.69	0.14	0.25	0.22
Sullivan	24.27	266	0.00	0.38	0.77	0.00	0.34	0.15
Susquehanna	19.77	358	1.42	0.85	2.56	6.16	1.52	1.54
Tioga	36.89	459	0.22	0.88	1.09	0.38	2.12	0.54
Union	18.35	276	1.82	0.36	2.55	0.23	0.08	0.18
Venango	67.75	1,046	0.68	0.48	1.93	0.74	1.08	0.89
Warren	76.36	615	0.33	0.16	0.82	1.83	0.49	0.59
Washington	39.13	3,640	4.86	0.08	5.53	1.62	0.17	1.24
Wayne	66.89	1,257	1.36	0.96	2.72	0.82	0.64	0.66
Westmoreland	45.92	6,614	3.01	0.28	4.01	1.65	0.63	1.24
Wyoming	51.42	348	1.45	0.87	2.32	3.51	1.52	1.24
York	49.51	2,536	5.62	3.39	10.04	1.77	1.42	1.43

COMPARISON # 3: Daytime traffic stops compared to daytime roadway observations

The tables and figures previously presented clearly suggest that, in many areas, population comparisons to traffic stop data are inappropriate. As noted in Section IV, the limited utility of Census-based benchmarks has prompted the collection of other types of benchmark data, including observational surveys of roadway usage.

Table 5.5 displays the black and non-Caucasian disproportionality indices for each observed municipality within each of 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 disproprotionality index is created.[14] In addition, a county level summary measure is produced based on the percentages of stops and observations countywide.

Comparisons of black observed driving populations and traffic stops for the 27 observed counties are graphically displayed in **Figure 5.13**. As both the table and figure show, the black disproportionality indices range from 1.18 in Fulton County to 5.86 in Franklin County. The range for black observation-based disproportionality indices is significantly more truncated than previously displayed population-based disproportionality indices. On the low end of this range, eighteen counties (66.6% of observed counties), have disproportionality indices less than 3.0. Particularly important to note is that eight of nine counties (Bedford, Clarion, Clinton, Fulton, Jefferson, Juniata, Montour, and Susquehanna) that have population-based disproportionality indices greater than 10.0 have observation-based disproportionality indices *less than* 3.0 (Columbia County = 3.64). Clearly, the extremely high disproportionality indices for these counties can be partially explained by the greater representation of black drivers in the actual observed driving population than in their very small black residential driving-age populations (noted by the shading in **Figure 5.13**).

[14] Ten of the 148 observed municipalities were eliminated from the disproportionality indices because there were too few traffic stops conducted in those municipalities during the daytime on the roadway types observed. The eliminated municipalities and corresponding counties include: 1) Bucks County, Richland Twp, interstate; 2) Chester County, South Coventry Twp, state highway; 3) Erie County, Union Twp, state highway; 4) Indiana County, Blairsville Brgh, state highway; 5) Lackawanna County, Abington Twp, interstate; 6) McKean County, Hamlin Twp, county/local road; 7) Montgomery County, Lower Providence Twp, interstate; 8) Montgomery County, Upper Salford Twp, county/local road; 9) Westmoreland County, Donegal Twp, county / local road; and 10) York County, Manchester Twp, state highway.

Table 5.5 Municipality & County Disproportionality Indices for 27 Observed Counties (p. 1 of 4)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Allegheny County		**8.69**	**13.19**	**2.58**	**5.56**	**3.36**	**2.37**
Franklin Park	I	9.35	12.46	2.64	3.34	3.54	3.73
Harmar Twp	I	14.15	21.95	3.28	5.83	4.31	3.77
Marshall Twp	I	9.15	17.65	2.75	3.21	3.33	5.50
Monroeville Brgh	I	8.22	14.25	2.83	7.19	2.90	1.98
Ohio Twp	I	7.49	11.45	4.25	8.28	1.76	1.38
Robinson Twp	I	4.38	7.16	1.70	4.70	2.58	1.52
West Deer Twp	I	10.42	12.50	1.84	4.53	5.66	2.76
Bedford County		**11.96**	**20.13**	**10.15**	**17.25**	**1.18**	**1.17**
E. Providence Twp	I	11.98	21.13	10.15	17.25	1.18	1.22
Bucks County		**8.93**	**17.49**	**7.03**	**12.50**	**1.27**	**1.40**
Bensalem Twp	I	13.27	24.85	10.68	16.06	1.24	1.55
Lwr Makefield Twp	I	11.85	21.95	14.78	20.03	0.80	1.10
Middletown Twp	I	18.77	31.10	8.15	14.12	2.30	2.20
Milford Twp	SH	2.57	6.92	2.22	4.30	1.16	1.61
Richland Twp	SH	1.24	8.07	1.88	7.09	0.66	1.14
West Rockhill Twp	SH	3.25	13.92	1.82	10.72	1.79	1.30
Centre County		**5.94**	**13.90**	**1.72**	**3.52**	**3.45**	**3.95**
Benner Twp	SH	2.96	5.26	1.26	1.68	2.35	3.13
Boggs Twp	I	10.04	27.62	3.30	5.23	3.04	5.28
Marion Twp	I	9.58	26.39	3.79	11.08	2.53	2.38
Potter Twp	SH	5.40	9.93	0.25	0.74	21.60	13.42
Rush Twp	I & SH	9.33	20.38	0.97	2.20	9.62	9.26
Snow Shoe Twp	I	16.03	35.88	1.53	2.15	10.48	16.69
Spring Twp	SH	2.46	8.93	1.37	2.06	1.80	4.33
Worth Twp	SH	1.34	2.15	0.30	0.30	4.47	7.17
Chester County		**10.29**	**20.59**	**4.87**	**8.96**	**2.11**	**2.30**
Charlestown Twp	SH	3.45	6.90	3.66	6.90	0.94	1.00
East Whiteland Twp	SH	10.61	19.61	7.09	11.37	1.50	1.72
London Grove Twp		10.09	22.43	3.94	10.56	2.56	2.12
Lower Oxford Twp		7.19	13.73	2.99	7.29	2.40	1.88
New Garden Twp	SH	8.51	25.98	6.62	11.39	1.29	2.28
Valley Twp	SH	11.66	21.80	4.69	7.70	2.49	2.83
West Nantmeal Twp		11.53	22.66	6.60	13.80	1.75	1.64
Clarion County		**8.85**	**19.65**	**5.37**	**12.30**	**1.65**	**1.60**
Clarion Twp	I	11.83	26.41	5.37	12.30	2.20	2.15
Clinton County		**8.74**	**19.48**	**6.81**	**15.35**	**1.28**	**1.27**
Lamar Twp	I	9.18	20.76	6.81	15.35	1.35	1.35
Columbia County		**9.39**	**20.04**	**2.58**	**5.65**	**3.64**	**3.55**
Hemlock Twp	I	8.81	22.16	2.72	6.40	3.24	3.46
Mifflin Twp	I	11.95	24.08	2.78	6.00	4.30	4.01
Scott Twp	I	5.79	13.64	1.89	3.97	3.06	3.44
South Centre Twp	I	7.83	18.43	2.78	5.63	2.82	3.27

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

Table 5.5 Municipality & County Disproportionality Indices for 27 Observed Counties (p. 2 of 4)

County & Municipality	Road Type*	% of PSP Stops (dayime)		% of Observations		Disproportionality Indices	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Dauphin County		**6.58**	**11.63**	**2.06**	**3.96**	**3.19**	**2.94**
Jackson Twp	SH	1.52	3.03	0.28	1.12	5.43	2.71
Londonderry Twp	I	16.22	24.09	3.89	7.68	4.17	3.14
Lower Paxton Twp		8.67	16.00	3.17	5.63	2.74	2.84
Middle Paxton Twp	SH	6.03	9.48	2.11	5.22	2.86	1.82
Reed Twp		3.28	6.23	1.09	1.09	3.01	5.72
Susquehanna Twp	I	5.41	10.62	1.39	2.62	3.89	4.05
Susquehanna Twp	SH	4.03	6.58	2.29	4.45	1.76	1.48
Washington Twp		1.74	3.48	0.53	0.53	3.28	6.57
Delaware County		**17.08**	**23.45**	**11.55**	**15.35**	**1.52**	**1.53**
Chadds Ford Twp	C/L	3.85	7.69	1.55	5.34	2.48	1.44
Concord Twp	SH	8.94	12.80	10.85	13.80	0.82	0.93
Middletown Twp	I & SH	19.66	24.48	8.19	11.40	2.40	2.15
Radnor Twp	I	17.07	22.12	11.82	16.31	1.44	1.36
Tinicum Twp	I	31.86	43.09	18.71	23.05	1.70	1.87
Erie County		**5.11**	**10.13**	**1.04**	**1.88**	**4.91**	**5.40**
Amity Twp	SH	0.00	1.22	0.23	2.27	0.00	0.54
Fairview Twp		2.01	4.91	0.60	0.73	3.35	6.73
Franklin Twp		9.03	16.77	0.85	1.62	10.62	10.35
Girard Twp	SH	0.00	1.68	0.61	1.66	0.00	1.01
Harborcreek Twp	SH	2.76	5.07	0.69	1.37	4.00	3.70
McKean Twp	SH	3.33	6.67	1.59	2.47	2.09	2.70
Summit Twp	I	6.19	13.13	3.36	5.26	1.84	2.50
Summit Twp	SH	4.05	6.36	0.95	1.51	4.26	4.21
Franklin County		**7.56**	**13.65**	**1.29**	**2.11**	**5.86**	**6.47**
Antrim Twp	I	8.88	17.43	1.72	3.16	5.16	5.52
Fannett Twp	SH	0.00	0.00	0.34	0.51	0.00	0.00
Greene Twp	SH	0.00	2.08	1.13	2.49	0.00	0.84
Guilford Twp	I	8.89	15.00	2.15	3.31	4.13	4.53
Guilford Twp	SH	5.45	10.00	1.48	2.47	3.68	4.05
Hamilton Twp		9.38	11.46	1.70	2.12	5.52	5.41
Peters Twp	SH	0.00	0.00	1.16	1.62	0.00	0.00
St. Thomas Twp	SH	1.72	1.72	0.88	0.88	1.95	1.95
Southampton Twp	SH	9.30	9.30	0.66	0.83	14.09	11.20
Fulton County		**12.68**	**21.46**	**10.74**	**18.91**	**1.18**	**1.13**
Brush Creek Twp	I	17.69	27.30	11.00	19.21	1.61	1.42
Wells Twp	I	11.45	21.06	10.50	18.62	1.09	1.13
Indiana County		**3.22**	**5.84**	**0.92**	**1.86**	**3.50**	**3.14**
Armstrong Twp	SH	0.73	5.11	1.14	1.63	0.64	1.63
Burrell Twp	SH	4.55	10.77	1.44	1.75	3.16	1.75
Cherryhill Twp	SH	2.55	3.83	0.12	1.49	21.25	1.49
E. Wheatfield Twp	SH	4.93	8.07	3.92	8.09	1.26	8.09
Pine Twp	SH	4.09	5.45	0.62	1.06	6.60	1.06
White Twp	SH	2.89	3.90	0.66	1.38	4.38	1.38

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

Table 5.5 Municipality & County Disproportionality Indices for 27 Observed Counties (p. 3 of 4)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Jefferson County		**5.93**	**13.27**	**5.11**	**11.14**	**1.16**	**1.19**
Washington Twp	I	10.29	22.03	5.11	11.14	2.01	1.98
Juniata County		**3.74**	**8.33**	**1.33**	**2.65**	**2.81**	**3.14**
Beale Twp	SH	0.00	0.00	0.00	0.29	--	0.00
Delaware Twp	SH	4.32	8.64	1.06	1.94	4.08	4.45
Fermanagh Twp	SH	2.41	6.83	1.97	3.07	1.22	2.22
Walker Twp	SH	5.53	11.06	1.33	3.17	4.16	3.49
Lackawanna County		**5.46**	**13.68**	**3.35**	**6.40**	**1.63**	**2.14**
Clifton Twp	I	10.38	26.23	3.26	6.81	3.18	3.85
City of Scranton	I	5.16	9.13	2.90	4.71	1.78	1.94
Dunmore Brgh	I	6.41	14.77	3.46	7.84	1.85	1.88
Roaring Brook Twp	I	7.44	22.74	2.89	4.59	2.57	4.95
Scott Twp	I	6.99	19.58	11.34	16.35	0.62	1.20
Throop Brgh		1.45	1.45	0.64	2.30	2.27	0.63
Lehigh County		**7.54**	**18.60**	**3.86**	**7.20**	**1.95**	**2.58**
City of Allentown	I	12.50	26.04	4.34	8.24	2.88	3.16
City of Bethlehem	SH	0.00	13.64	4.39	9.65	0.00	1.41
Lw. Macungie Twp	I	8.33	11.67	3.37	6.60	2.47	1.77
N. Whitehall Twp		2.39	7.18	1.19	1.85	2.01	3.88
S. Whitehall Twp	SH	4.83	16.91	2.32	5.80	2.08	2.92
Up. Macungie Twp	I	10.86	23.54	5.49	8.65	1.98	2.72
Weisenberg Twp	I	9.43	26.49	5.36	9.72	1.76	2.73
McKean County		**1.15**	**4.28**	**0.51**	**1.05**	**2.25**	**4.08**
Corydon Twp	SH	0.75	1.50	0.56	1.13	1.34	1.33
Eldred Twp	SH	0.00	0.00	1.08	1.98	0.00	0.00
Hamlin Twp	SH	2.42	8.89	0.51	1.39	4.75	6.40
Keating Twp		0.00	0.00	0.33	0.55	0.00	0.00
Lafayette Twp	SH	0.00	0.00	1.07	2.14	0.00	0.00
Mercer County		**9.64**	**19.35**	**2.64**	**5.19**	**3.65**	**3.73**
Deer Creek Twp	I	5.97	13.43	2.13	5.76	2.80	2.33
E. Lackawan. Twp	I	11.11	37.78	4.65	8.61	2.39	4.39
Findley Twp	I	12.45	24.71	2.58	4.40	4.83	5.62
Jackson Twp	I	8.29	13.47	2.29	3.70	3.62	3.64
Lackawannock Twp	I	17.27	29.09	3.87	6.35	4.46	4.58
Springfield Twp	I	3.39	10.17	2.06	4.23	1.65	2.40
Wolf Creek Twp	I	13.42	31.60	2.27	5.26	5.91	6.01
Montgomery County		**12.97**	**21.77**	**5.27**	**10.79**	**2.46**	**2.02**
Limerick Twp	SH	12.08	20.42	4.72	8.69	2.56	2.35
Lower Merion Twp	I	28.45	43.11	7.22	14.83	3.94	2.91
Plymouth Twp	I	12.24	22.15	5.76	11.83	2.13	1.87
Upper Merion Twp	I	9.82	18.47	5.03	7.94	1.95	2.33
Whitemarsh Twp	I	10.52	17.90	5.36	11.88	1.96	1.51
Worcester Twp	C/L	7.53	20.55	6.23	13.99	1.21	1.47

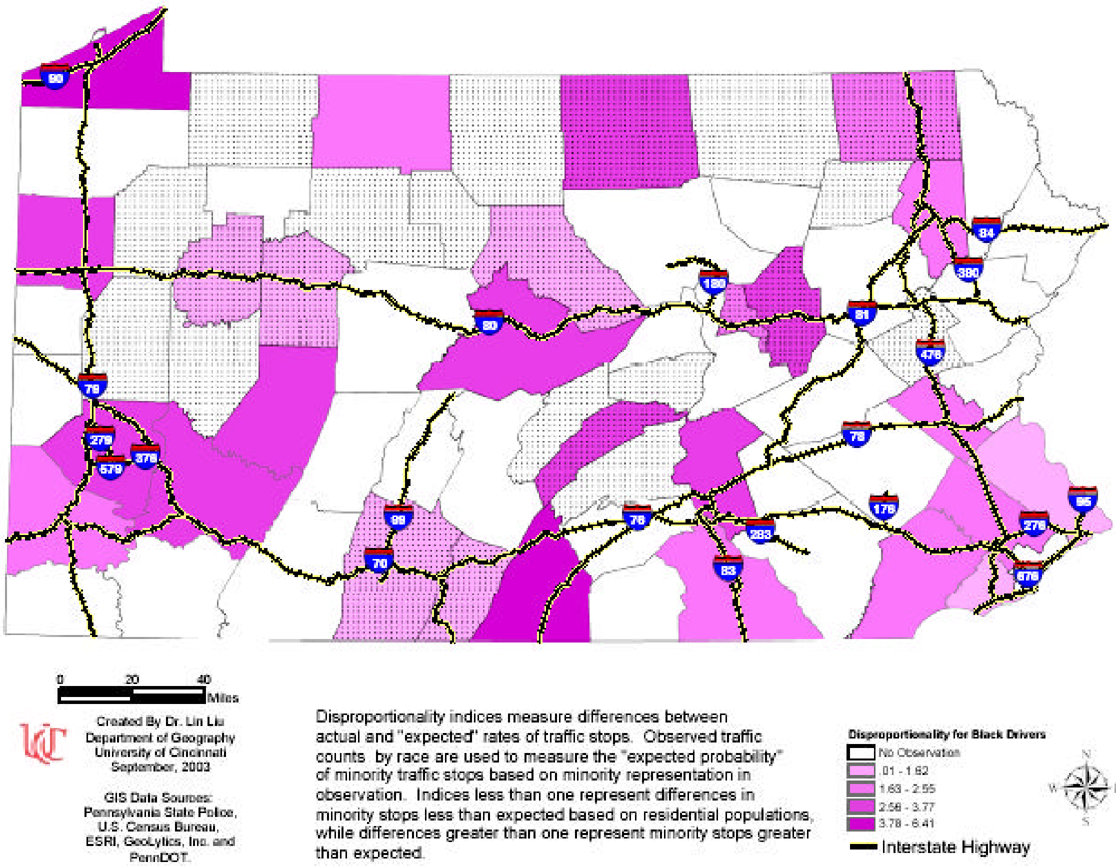
* I = interstate, SH = state highway, C/L = county / local road

Table 5.5 Municipality & County Disproportionality Indices for 27 Observed Counties (p. 4 of 4)

County & Municipality	Road Type*	% of PSP Stops (daytime)		% of Observations		Disproportionality Indices	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Montour County		**8.64**	**20.79**	**4.14**	**8.09**	**2.09**	**2.57**
Liberty Twp	I	6.77	21.35	4.35	9.10	1.56	2.35
Valley Twp	I	13.60	28.80	3.96	7.17	3.43	4.02
Susquehanna County		**9.10**	**21.15**	**3.95**	**11.46**	**2.3**	**1.85**
Lenox Twp	I	8.77	20.45	2.72	11.35	3.22	1.80
New Milford Twp	I	12.37	26.52	5.23	11.57	2.37	2.29
Tioga County		**2.63**	**6.63**	**0.96**	**2.17**	**2.74**	**3.06**
Charleston Twp	SH	0.00	0.00	0.84	1.68	0.00	0.00
Delmar Twp		0.00	0.00	0.00	0.00	1.00	1.00
Liberty Twp	SH	2.78	8.33	2.11	2.91	1.32	2.86
Mansfield Brgh	SH	5.86	9.46	0.39	0.52	15.03	18.19
Richmond Twp	SH	0.62	6.21	0.76	2.45	0.82	2.53
Tioga Twp	SH	3.80	10.33	1.24	3.28	3.06	3.15
Washington County		**6.02**	**8.75**	**3.54**	**5.89**	**1.70**	**1.49**
Amwell Twp	I	4.13	5.31	1.82	2.65	2.27	2.00
Cecil Twp	I	4.45	6.94	5.08	8.08	0.88	0.86
Chartiers Twp	I	6.68	9.86	2.09	3.28	3.20	3.01
Donegal Twp	I	4.55	9.09	3.94	5.59	1.15	1.63
Fallowfield Twp	I	8.18	14.56	3.15	5.59	2.60	2.60
North Strabane Twp	I	5.79	8.46	3.61	6.65	1.60	1.27
Somerset Twp	I	8.77	12.18	2.60	6.38	3.37	1.91
South Strabane Twp	I	5.79	10.26	4.72	7.55	1.23	1.36
Westmoreland County		**7.60**	**11.41**	**2.20**	**4.77**	**3.45**	**2.39**
Derry Twp	SH	3.02	5.52	2.19	4.14	1.38	1.33
E. Huntingdon Twp	SH	2.69	3.76	1.53	2.35	1.76	1.60
Hempfield Twp	I	3.39	4.86	2.05	5.59	1.65	0.87
Hempfield Twp	SH	3.10	4.20	1.83	2.38	1.69	1.76
Mount Pleasant Twp	SH	0.00	1.96	0.95	3.96	0.00	0.49
Penn Twp	I	9.54	12.26	5.28	10.96	1.81	1.12
Salem Twp	SH	5.80	6.88	2.86	3.52	2.03	1.95
York County		**8.80**	**14.20**	**5.01**	**9.12**	**1.76**	**1.56**
Fairview Twp	I & SH	7.85	15.38	4.10	8.19	1.91	1.88
Newberry Twp	I	15.36	21.43	5.58	10.24	2.75	2.09
Shrewsbury Twp	I	12.75	17.53	5.01	8.92	2.54	1.97
Springfield Twp	I	11.72	17.21	6.32	12.56	1.85	1.37
Warrington Twp	SH	1.72	3.45	0.75	2.25	2.29	1.53
York Twp	I	11.27	15.85	4.85	6.10	2.32	2.60

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

Figure 5.13. Observation_Based Disproportionality Indices for Black Drivers By County



Comparisons are also made between the percentage of traffic stops involving non-Caucasians and the observation of non-Caucasians using the roadways. These comparisons are reported in **Table 5.5** above and **Figure 5.14** below. As shown, the disproportionality indices range from a low of 1.14 in Fulton County to high of 6.97 in Franklin County. As is the case for comparisons of black motorists, the range of non-Caucasian observation-based disproportionality indices is smaller than the range of indices based on driving-age population. Notably, the six counties (i.e., Bedford, Clarion, Clinton, Fulton, Jefferson, and Susquehanna) with population-based indices above 9.0, have considerably smaller observation-based disproportionality indices—all less than 1.79 (see **Figure 5.14**).

Figure 5.14. Observation_Based Disproportionality Indices for Non-Caucasian Drivers By County

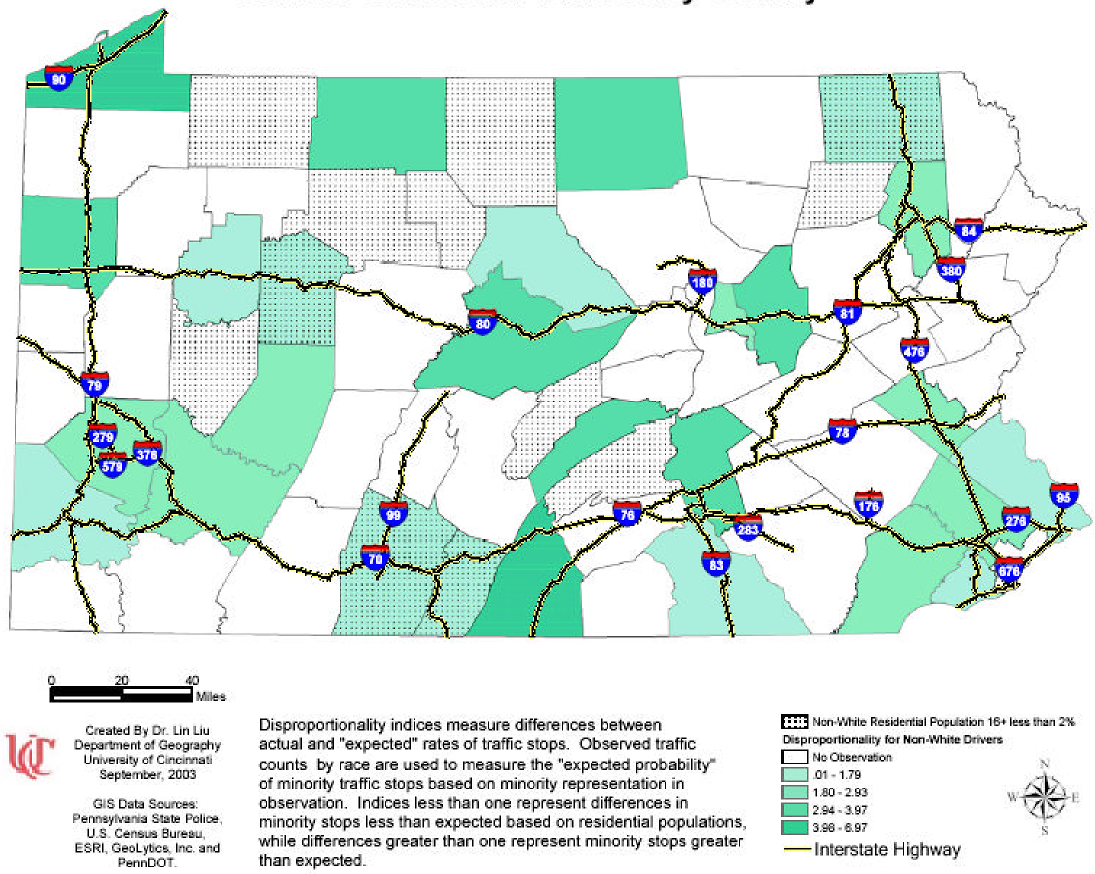


Table 5.5 and **Figures 5.13** and **5.14** show that, in most observed counties, the percent of black and non-Caucasian drivers observed and the percent of black and non-Caucasian drivers stopped are much more similar than the percent of drivers stopped and the residential population. Although some racial disproportionality indices based on observation statistics are larger, the majority of these increases were small. The most important point illustrated by **Table 5.5** and **Figures 5.13** and **5.14** is that the wide disparity between stops and population figures that produced very large disproportionality indices are simply not present when observations of the driving population are used as the benchmark.

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 indices at the county level likely under-represents the percent of minority motorists within those counties. Therefore, disproportionality indices based on these county-level percentages of observed minority drivers represent more conservative estimates of 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 may be even smaller than reported in **Table 5.5**.

COMPARISON #4: 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, 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 reported at the end of Section IV, our observations indicate that black drivers were more likely than white drivers to speed, and more likely to excessively speed.

Table 5.6 displays the information relevant to the final disproportionality index calculated for this study—driver-violating behavior (i.e., speeding). In order to make the numerators and denominators of the disproportionality indices as comparable as possible, the numerators include only PSP stops made for speeding at least 10 miles per hour over the posted speed limit on the specific roadway types observed in each municipality. The denominators, similarly, include only

RADAR observations of drivers that were exceeding the posted speed limit by at least 10 miles per hour within the observed municipalities.[15]

If differences in speeding behavior account for differences in the rates of police stops, then we would expect that the disproportionality indices would be close to 1.0. **Table 5.6** illustrates that the majority of observed counties (n=20) have non-Caucasian disproportionality indices that fall in the range of 1.0 to 3.0. Three non-Caucasian disproportionality indices are less than 1.0 (Clarion, Clinton, and Jefferson counties), and three counties (Erie, Franklin, and McKean) have non-Caucasian violator-based disproportionality indices that are greater than 5.0. Notably, the nine counties that had at least one population-based disproportionality index above 10.0, have violator-based indices that range from slightly less than 1.0 to 2.56. That is, in Bedford, Clarion, Clinton, Columbia, Fulton, Jefferson, Juniata, Montour, and Susquehanna counties, the large disparity between stops and residential statistics for non-Caucasians is virtually eliminated once minorities' roadway usage and speeding behavior are taken into account.

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

Table 5.6 Municipality & County Speeding Disproportionality Indices for 27 Observed Counties. (p.1 of 4)

County & Municipality	Road Type*	% of PSP Speeding Stops (daytime)		% of Speeding Observations		Disproportionality Indices	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Allegheny County		**8.22**	**12.86**	**2.39**	**5.33**	**3.44**	**2.42**
Franklin Park	I	9.92	12.81	2.68	2.68	3.70	4.78
Harmar Twp	I	11.43	20.00	7.69	7.69	1.49	2.60
Marshall Twp	I	7.37	18.95	1.87	2.99	3.94	6.34
Monroeville Brgh	I	7.92	14.19	2.62	7.85	3.02	1.81
Ohio Twp	I	7.91	12.09	2.74	5.94	2.89	2.04
Robinson Twp	I	4.36	7.17	2.21	5.02	1.97	1.43
Bedford County		**12.92**	**21.98**	**12.17**	**20.84**	**1.06**	**1.05**
E. Providence Twp	I	12.13	21.65	12.17	20.84	1.00	1.04
Bucks County		**8.34**	**17.34**	**8.15**	**14.42**	**1.02**	**1.20**
Bensalem Twp	I	12.54	24.07	9.40	14.99	1.33	1.61
Lwr Makefield Twp	I	8.70	18.63	15.57	17.37	0.56	1.07
Middletown Twp	I	20.44	32.44	6.94	12.04	2.95	2.69
Milford Twp	SH	1.94	7.12	0.0	0.0		
Richland Twp	SH	0.0	10.00	0.0	9.21		1.09
West Rockhill Twp	SH	3.60	14.40	1.71	15.91	2.11	0.91
Centre County		**6.13**	**14.55**	**1.02**	**3.57**	**6.01**	**4.08**
Benner Twp	SH	2.14	4.64	0.0	1.52		3.05
Boggs Twp	I	11.22	29.08	0.0	0.0		
Marion Twp	I	9.81	26.17	6.52	15.22	1.50	1.72
Potter Twp	SH	5.24	10.71	0.0	0.0		
Rush Twp	M	9.62	21.22	0.85	4.24	11.32	5.00
Spring Twp	SH	2.19	8.49	0.0	3.03		2.80
Worth Twp	SH	1.55	2.48	0.0	0.0		
Chester County		**10.97**	**19.85**	**5.35**	**9.53**	**2.05**	**2.08**
Charlestown Twp	SH	0.0	0.0	0.0	0.0		
East Whiteland Twp	SH	11.65	19.28	4.64	9.28	2.51	2.08
London Grove Twp	M	10.34	18.60	7.06	12.94	1.46	1.44
Lower Oxford Twp	M	5.45	9.09	2.18	4.35	2.50	2.09
New Garden Twp	SH	10.90	21.79	10.30	14.55	1.06	1.50
Valley Twp	SH	11.69	21.65	4.21	8.43	2.78	2.57
Clarion County		**9.44**	**21.15**	**8.79**	**23.08**	**1.07**	**0.92**
Clarion Twp	I	11.92	26.55	8.79	23.08	1.36	1.15
Clinton County		**8.96**	**19.66**	**14.20**	**29.59**	**0.63**	**0.66**
Lamar Twp	I	9.33	20.63	14.20	29.59	0.66	0.70
Columbia County		**9.71**	**21.34**	**5.05**	**8.33**	**1.92**	**2.56**
Hemlock Twp	I	9.12	23.13	5.61	9.35	1.63	2.47
Mifflin Twp	I	11.61	24.21	6.93	9.90	1.68	2.45
Scott Twp	I	7.23	16.27	3.42	6.84	2.11	2.38
South Centre Twp	I	7.28	19.21	4.23	7.04	1.72	2.73

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

Table 5.6 Municipality & County Speeding Disproportionality Indices for 27 Observed Counties. (p.2 of 4)

County & Municipality	Road Type*	% of PSP Speeding Stops (daytime)		% of Speeding Observations		Disproportionality Indices	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Dauphin County		**6.21**	**11.52**	**2.80**	**5.60**	**2.22**	**2.06**
Jackson Twp	SH	0.0	2.08	0.0	0.0		
Londonderry Twp	I	16.67	25.68	3.70	10.19	4.51	2.52
Lower Paxton Twp	M	6.12	17.35	2.59	4.74	2.36	3.66
Middle Paxton Twp	SH	5.95	10.71	3.64	6.06	1.63	1.77
Reed Twp	M	3.25	6.33	0.0	0.0		
Washington Twp	M	2.78	5.56	0.0	0.0		
Wiconisco Twp	SH	1.96	1.96	0.0	0.0		
Delaware County		**16.52**	**22.34**	**15.82**	**19.95**	**1.04**	**1.12**
Chadds Ford Twp	C/L	0.0	0.0	3.78	5.66	0.00	0.00
Concord Twp	SH	8.93	11.61	9.52	9.52	0.94	1.22
Middletown Twp	M	21.95	26.34	8.49	13.40	2.59	1.97
Radnor Twp	I	17.23	21.75	22.56	27.69	0.76	0.79
Tinicum Twp	I	27.61	37.18	18.83	22.56	1.47	1.65
Erie County		**5.44**	**11.14**	**1.00**	**1.50**	**5.44**	**7.43**
Amity Twp	SH	0.0	1.35	0.0	4.35		0.31
Fairview Twp	M	2.26	5.93	3.03	3.03	0.75	1.96
Franklin Twp	M	9.33	17.33	0.0	0.0		
Girard Twp	SH	0.0	1.41	0.0	0.0		
Harborcreek Twp	SH	2.42	4.84	0.0	0.0		
McKean Twp	SH	5.26	10.53	2.17	2.17	2.42	4.85
Summit Twp	I	5.56	12.41	0.0	0.0		
Summit Twp	SH	5.17	8.62	0.0	0.0		
Franklin County		**8.33**	**14.77**	**0.71**	**1.43**	**11.67**	**10.33**
Antrim Twp	I	9.16	17.40	8.33	8.33	1.10	2.09
Fannett Twp	SH	0.0	0.0	0.0	0.0		
Greene Twp	SH	0.0	2.53	0.0	0.0		
Guilford Twp	SH	0.0	0.0	0.86	2.59	0.00	0.00
Peters Twp	SH	0.0	0.0	0.0	0.0		
St. Thomas Twp	SH	0.0	0.0	0.0	0.0		
Southampton Twp	SH	6.45	6.45	0.0	0.0		
Fulton County		**13.29**	**22.49**	**12.79**	**21.96**	**1.04**	**1.02**
Brush Creek Twp	I	18.76	28.38	12.06	20.57	1.56	1.38
Wells Twp	I	11.58	21.24	19.57	34.78	0.59	0.61
Indiana County		**3.45**	**6.09**	**0.78**	**2.13**	**4.45**	**2.86**
Armstrong Twp	SH	0.0	3.57	0.0	0.0		
Burrell Twp	SH	4.68	10.37	1.21	1.21	3.87	8.57
Cherryhill Twp	SH	3.05	4.57	0.0	0.0		
E. Wheatfield Twp	SH	4.62	8.21	1.41	7.04	3.28	1.17
Pine Twp	SH	4.69	5.73	0.0	0.0		
White Twp	SH	3.45	4.39	1.01	2.02	3.42	2.17

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

Table 5.6 **Municipality & County Speeding Disproportionality Indices for 27 Observed Counties. (p.3 of 4)**

County & Municipality	Road Type*	% of PSP Speeding Stops (daytime)		% of Speeding Observations		Disproportionality Indices	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Jefferson County		**6.47**	**14.74**	**6.41**	**16.67**	**1.01**	**0.88**
Washington Twp	I	10.28	22.68	6.41	16.67	1.60	1.36
Juniata County		**4.0**	**8.63**	**4.37**	**4.92**	**0.91**	**1.76**
Beale Twp	SH	0.0	0.0	0.0	0.0		
Delaware Twp	SH	3.08	6.92	0.0	2.27		3.05
Fermanagh Twp	SH	2.50	6.25	8.08	8.08	0.31	0.77
Walker Twp	SH	5.85	11.69	3.87	4.35	1.51	2.69
Lackawanna County		**5.82**	**14.77**	**6.28**	**12.20**	**0.92**	**1.21**
Clifton Twp	I	10.47	26.16	15.69	23.53	0.67	1.11
City of Scranton	I	4.92	8.74	3.85	5.49	1.28	1.59
Dunmore Brgh	I	6.63	15.74	5.78	13.72	1.15	1.15
Roaring Brook Twp	I	7.26	23.97	9.17	11.67	0.79	2.05
Scott Twp	I	8.43	18.07	10.76	17.09	0.78	1.06
Throop Brgh	M	1.59	1.59	0.0	9.09		0.17
Lehigh County		**7.70**	**19.17**	**5.33**	**8.39**	**1.45**	**2.29**
City of Bethlehem	SH	0.0	10.00	7.69	10.86	0.00	0.92
Lw. Macungie Twp	I	6.67	13.33	5.38	10.75	1.24	1.24
N. Whitehall Twp	M	5.70	11.25	1.46	1.75	3.90	6.43
S. Whitehall Twp	SH	2.54	18.64	1.79	1.79	1.42	10.41
Up. Macungie Twp	I	10.69	23.08	8.09	13.21	1.32	1.75
Weisenberg Twp	I	9.33	27.68	5.23	8.71	1.78	3.18
McKean County		**1.41**	**5.13**	**0.40**	**0.80**	**3.49**	**6.37**
Corydon Twp	SH	0.80	1.60	0.0	0.0		
Eldred Twp	SH	0.0	0.0	0.0	0.0		
Hamlin Twp	SH	2.77	10.08	0.53	1.06	5.23	9.51
Keating Twp	M	0.0	0.0	0.0	0.0		
Lafayette Twp	SH	0.0	0.0	0.0	0.0		
Sergeant Twp	SH	0.99	4.95	0.0	0.0		
Wetmore Twp	SH	0.0	0.0	0.0	0.0		
Mercer County		**10.06**	**19.68**	**4.09**	**8.19**	**2.46**	**2.40**
Deer Creek Twp	I	4.92	13.11	4.23	7.04	1.16	1.86
E. Lackawan. Twp	I	14.29	28.57	7.69	12.82	1.86	2.23
Findley Twp	I	12.22	23.78	4.00	4.00	3.06	5.95
Jackson Twp	I	8.70	14.13	5.88	9.80	1.48	1.44
Lackawannock Twp	I	15.79	25.26	0.0	12.50		2.02
Springfield Twp	I	2.27	6.82	3.70	3.70	0.61	1.84
Wolf Creek Twp	I	13.33	32.38	2.48	8.26	5.38	3.92
Montgomery County		**10.87**	**19.09**	**5.47**	**10.66**	**1.99**	**1.79**
Limerick Twp	SH	13.11	20.87	3.43	7.29	3.82	2.86
Lower Merion Twp	I	22.79	34.42	6.28	14.35	3.63	2.40
Plymouth Twp	I	11.58	21.05	5.56	8.33	2.08	2.53
Upper Merion Twp	I	8.71	17.07	2.98	4.26	2.92	4.01
Whitemarsh Twp	I	10.12	17.68	8.68	14.47	1.17	1.22
Worcester Twp	C/L	8.26	22.94	7.69	15.38	1.07	1.49

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

Table 5.6 Municipality & County Speeding Disproportionality Indices for 27 Observed Counties. (p.4 of 4)

County & Municipality	Road Type*	% of PSP Speeding Stops (daytime)		% of Speeding Observations		Disproportionality Indices	
		Black	Non-Caucasian	Black	Non-Caucasian	Black	Non-Caucasian
Montour County		**9.37**	**23.30**	**6.45**	**13.98**	**1.45**	**1.67**
Liberty Twp	I	7.32	23.17	3.92	11.76	1.87	1.97
Valley Twp	I	15.04	30.97	9.52	16.67	1.58	1.86
Susquehanna County		**10.30**	**24.25**	**8.77**	**15.79**	**1.17**	**1.54**
Lenox Twp	I	9.03	21.30	10.00	20.00	0.90	1.07
New Milford Twp	I	12.79	27.54	7.41	11.11	1.73	2.48
Tioga County		**2.62**	**7.30**	**2.68**	**3.83**	**0.98**	**1.91**
Charleston Twp	SH	0.0	0.0	0.0	0.0		
Delmar Twp	M	0.0	0.0	0.0	0.0		
Liberty Twp	SH	3.13	7.81	4.35	4.35	0.72	1.80
Mansfield Brgh	SH	4.15	8.29	0.0	0.0		
Richmond Twp	SH	0.88	7.96	16.67	16.67	0.05	0.48
Tioga Twp	SH	4.11	11.64	2.30	3.69	1.79	3.15
Washington County		**6.20**	**9.18**	**4.32**	**8.20**	**1.44**	**1.12**
Amwell Twp	I	2.96	3.45	0.0	0.0		
Cecil Twp	I	5.35	8.24	4.02	9.19	1.33	0.90
Chartiers Twp	I	6.88	10.25	2.04	3.40	3.37	3.01
Fallowfield Twp	I	8.53	15.44	0.0	7.69		2.01
North Strabane Twp	I	4.51	7.52	5.65	8.07	0.80	0.93
Somerset Twp	I	9.69	13.35	6.20	11.63	1.56	1.15
South Strabane Twp	I	5.49	11.54	6.85	12.33	0.80	0.94
Westmoreland County		**8.25**	**12.88**	**1.96**	**4.25**	**4.21**	**3.03**
Derry Twp	SH	3.32	6.89	3.35	6.70	0.99	1.03
E. Huntingdon Twp	SH	2.82	3.52	0.0	0.0		
Hempfield Twp	I	3.29	5.17	0.0	0.0		
Hempfield Twp	SH	2.44	3.79	4.44	4.44	0.55	0.85
Mount Pleasant Twp	SH	0.0	0.0	0.0	1.85		0.00
Penn Twp	I	9.88	13.13	0.0	9.09		1.44
York County		**9.51**	**15.55**	**7.27**	**12.07**	**1.31**	**1.29**
Fairview Twp	M	7.05	15.05	3.93	6.55	1.79	2.30
Newberry Twp	I	16.51	23.58	8.94	16.26	1.85	1.45
Shrewsbury Twp	I	11.88	17.33	10.00	13.00	1.19	1.33
Springfield Twp	I	11.24	17.75	10.33	19.02	1.09	0.93
Warrington Twp	SH	2.63	5.26	0.0	0.0		
York Twp	I	10.45	14.55	6.98	9.30	1.50	1.56

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

SUMMARY OF DISPROPORTIONALITY INDICES

Using different available denominators, disproportionality indices can be easily misinterpreted. The degree to which disproportionalities vary differs by county. **Table 5.7** illustrates this variability by comparing this study's four disproportionality indices (driving-age population data, stop of county residents only, observation data, and violator-based data) for blacks and non-Caucasians at the county level. Comparisons for Hispanics are presented only for the first two disproportionality indices.

Given the documented differences in driver residency and driving behavior, we would expect that the county disproportionality indices would be the most inaccurate when based on population statistics. The accuracy of the indices should improve as the numerator and denominator are better matched. Therefore, we would expect that indices based on only stops of county residents would be more accurate when compared to Census data than measures of all traffic stops. Likewise, we would expect that observation based indices are more accurate than population based indices (regardless of the restrictions to the numerator), and finally that indices based on driving behavior (i.e., speeding) would be the most accurate.

The comparisons across disproportionality measures are documented in **Table 5.7**. As shown, for the overwhelming majority of Pennsylvania counties, the disproportionality indices based on driving-age population are the largest. Likewise, the differences between the disproportionality indices based on residential populations and the three other disproportionality measures are fairly large. In addition, the differences in the nine counties identified with very high population-based indices are the most dramatic.

Table 5.7 Comparison of Multiple Disproportionality Indices by County (p.1 of 2)

County Name	Driving-Age Pop Disp. Index #1			Pop > 16 for county res. Disp. Index #2			Observation-based Disp. Index #3		Speeding (= 10 mph) Disp. Index #4	
	BLK	HISP	NON-CA	BLK	HISP	NON-CA	BLK	NON-CA	BLK	NON-CA
Adams	4.03	1.91	2.32	1.85	2.63	1.92				
Allegheny	0.82	1.46	0.93	0.91	0.61	0.93	3.36	2.37	3.44	2.42
Armstrong	2.62	0.72	1.74	1.35	0.00	0.69				
Beaver	1.81	1.66	2.01	1.43	0.68	1.34				
Bedford	40.42	5.18	13.52	2.95	0.40	0.93	1.18	1.17	1.06	1.05
Berks	2.24	1.04	1.57	1.33	1.27	1.24				
Blair	4.02	2.06	3.33	2.44	0.66	1.76				
Bradford	2.83	1.51	1.00	1.03	0.55	0.48				
Bucks	3.03	2.11	2.24	1.54	0.93	1.13	1.27	1.40	1.02	1.20
Butler	5.35	2.22	2.88	1.38	1.09	0.89				
Cambria	1.21	0.65	1.30	0.94	0.31	0.85				
Cameron	2.14	0.36	0.74	4.10	0.00	0.88				
Carbon	11.49	2.70	4.84	4.62	1.38	1.69				
Centre	2.04	1.86	1.38	0.44	0.25	0.39	3.45	3.95	6.01	4.08
Chester	1.82	2.18	1.80	1.49	2.83	1.70	2.11	2.30	2.05	2.08
Clarion	10.84	12.67	9.65	0.83	0.00	0.53	1.65	1.60	1.07	0.92
Clearfield	4.67	6.72	6.17	0.25	0.22	0.29				
Clinton	17.15	9.71	9.95	1.32	0.00	0.50	1.28	1.27	0.63	0.66
Columbia	12.31	6.26	7.87	2.88	0.79	1.26	3.64	3.55	1.92	2.56
Crawford	3.65	1.56	3.43	1.18	0.16	0.73				
Cumberland	4.83	2.82	3.39	1.23	0.82	0.95				
Dauphin	0.46	0.88	0.58	0.51	0.80	0.57	3.19	2.94	2.22	2.06
Delaware	1.36	2.20	1.35	1.18	1.25	1.12	1.52	1.53	1.04	1.12
Elk	14.64	3.72	4.12	2.98	0.00	0.77				
Erie	1.04	0.76	1.26	0.68	0.65	0.72	4.91	5.40	5.44	7.43
Fayette	1.78	0.74	1.49	1.99	0.74	1.61				
Forest	0.29	0.13	0.28	0.00	0.41	0.11				
Franklin	3.95	2.09	3.14	2.35	1.90	1.79	5.86	6.47	11.67	10.33
Fulton	21.56	9.35	13.14	3.41	0.00	1.58	1.18	1.13	1.04	1.02
Greene	0.97	0.49	1.16	0.08	0.10	0.14				
Huntingdon	0.47	0.71	0.51	0.15	0.00	0.15				
Indiana	1.93	2.10	1.62	1.08	1.08	0.93	3.50	3.14	4.45	2.86
Jefferson	64.40	8.94	11.56	1.83	0.91	0.89	1.16	1.19	1.01	0.88

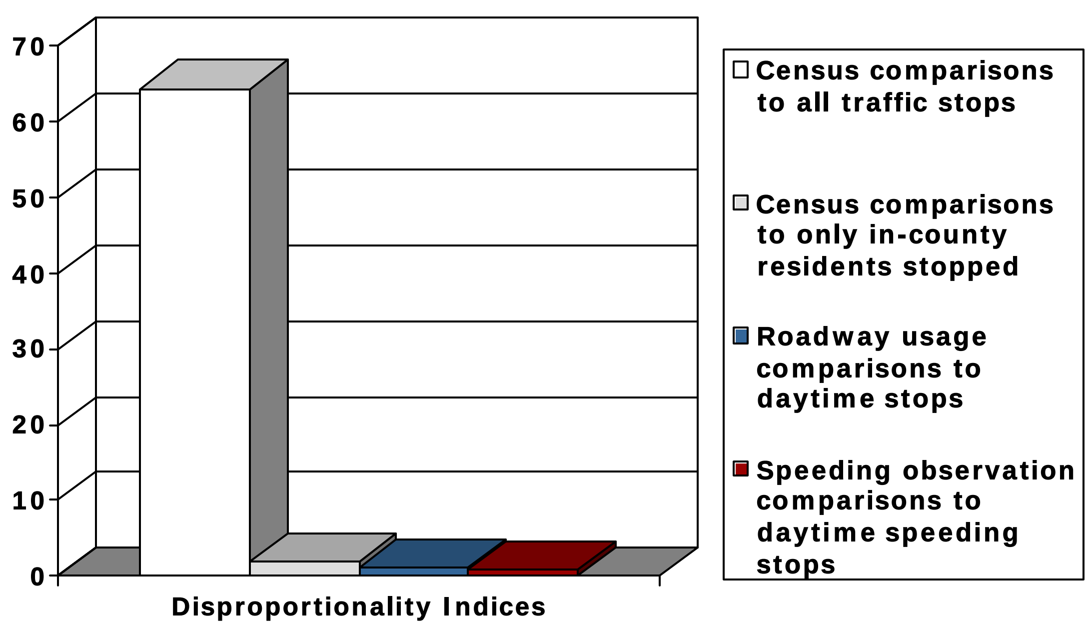
Table 5.7 Comparison of Multiple Disproportionality Indices by County (p.2 of 2)

County Name	Driving-Age Pop Disp. Index #1			Pop > 16 for county res. Disp. Index #2			Observation-based Disp. Index #3		Speeding (= 10 mph) Disp. Index #4	
	BLK	HISP	NON-CA	BLK	HISP	NON-CA	BLK	NON-CA	BLK	NON-CA
Juniata	18.33	1.43	4.11	2.43	1.28	1.27	2.81	3.41	0.91	1.76
Lackawanna	5.82	2.53	4.39	2.53	1.72	1.82	1.63	2.14	0.92	1.21
Lancaster	3.95	1.13	2.16	1.89	1.43	1.52				
Lawrence	2.17	1.14	1.87	2.09	0.22	1.61				
Lebanon	9.39	1.83	3.34	1.38	1.57	1.37				
Lehigh	2.69	0.95	1.48	1.71	0.95	1.23	1.95	2.58	1.45	2.29
Luzerne	3.39	3.70	3.53	1.22	3.50	1.78				
Lycoming	1.02	1.65	1.23	1.08	0.55	1.00				
McKean	0.56	0.56	0.95	0.00	0.23	0.09	2.25	4.08	3.49	6.37
Mercer	2.16	6.51	3.29	0.77	0.00	0.72	3.65	3.73	2.46	2.40
Mifflin	6.27	1.81	3.65	4.32	0.94	1.65				
Monroe	2.24	1.42	1.86	2.19	1.25	1.57				
Montgomery	1.88	2.13	1.63	1.37	1.35	1.28	2.46	2.02	1.99	1.79
Montour	12.44	8.14	7.34	5.99	0.00	2.19	2.09	2.57	1.45	1.67
Northampton	3.36	1.57	2.09	2.15	1.04	1.31				
Northumberland	1.08	0.93	1.03	0.60	0.81	0.69				
Perry	8.55	3.48	4.71	1.21	1.97	1.23				
Philadelphia	0.92	1.00	0.94	1.29	1.06	1.22				
Pike	1.56	0.73	1.12	1.09	1.07	0.94				
Potter	2.79	0.64	0.85	2.43	0.58	0.78				
Schuylkill	1.70	2.14	1.93	0.36	1.00	0.61				
Snyder	5.99	1.54	3.32	1.77	1.83	1.47				
Somerset	6.65	3.82	6.86	0.14	0.25	0.22				
Sullivan	0.43	0.41	0.38	0.00	0.34	0.15				
Susquehanna	39.34	5.68	12.27	6.16	1.52	1.54	2.30	1.85	1.17	1.54
Tioga	5.12	2.77	3.38	0.38	2.12	0.54	2.74	3.06	0.98	1.91
Union	1.14	0.89	1.26	0.23	0.08	0.18				
Venango	2.12	2.04	2.15	0.74	1.08	0.89				
Warren	3.21	1.39	1.07	1.83	0.49	0.59				
Washington	2.14	1.48	2.05	1.62	0.17	1.24	1.70	1.49	1.44	1.12
Wayne	1.41	1.04	1.14	0.82	0.64	0.66				
Westmoreland	4.29	2.68	3.77	1.65	0.63	1.24	3.45	2.39	4.21	3.03
Wyoming	2.81	2.80	1.77	3.51	1.52	1.24				
York	3.04	1.50	2.23	1.77	1.42	1.43	1.76	1.56	1.31	1.29

Using Jefferson County as an example, the differences in disproportionality indices are first described and then graphically displayed in **Figure 5.15**.

- Example: Jefferson County
  - Index based on comparison of all traffic stops with driving-age population
    - PSP traffic stops = 6.17% Black
    - Population 16+ = 0.10% Black
    - **Disproportionality Index # 1 = 6.17 / 0.10 = 64.40**
  - Change the numerator to stops of only county residents, retain denominator of driving age population
    - % of drivers stopped in Jefferson Co. who are county residents = 24.5%
    - Drivers who reside in county stopped = 0.18% Black
    - Population 16+ = 0.10% Black
    - **Disproportionality Index # 2 = 0.18 / 0.10 = 1.83**
  - Change the numerator to daytime stops, change the denominator to daytime observed driving population
    - PSP traffic stops = 5.93% Black
    - % observed on roadways = 5.11% Black
    - **Disproportionality Index # 3 = 5.93 / 5.11 = 1.16**
  - Change the numerator to daytime stops for speeding, change the denominator to daytime observations of speeding population
    - % stopped for speeding 10+ mph over speed limit = 6.46% Black
    - % observed speeding 10+ mph over speed limit = 6.41% Black
    - **Disproportionality Index # 4 = 6.46 / 6.41 = 1.01**

Figure 5.15. Disproportionality Index Comparisons for Jefferson County.



This example clearly demonstrates the problem with relying on Census-based denominators to create disproportionality indices. Overall, patterns of dramatic reductions in the black and non-Caucasian disproportionality indices are evident for 10 of the 27 Pennsylvania counties observed (Bedford, Clarion, Clinton, Columbia, Fulton, Jefferson, Juniata, Lackawanna, Montour, and Susquehanna counties).

CONCERNS OF OBSERVATION / SPEEDING BENCHMARKS

Although it is recommended that traffic stop data be compared to benchmarks other than Census data, no single benchmark is without methodological concerns. For example, the final two disproportionality indices displayed in **Table 5.7** (based on roadway observations and speeding observations) can only be compared to traffic stops that occur in the daytime, and for comparisons to speeding observations, only those traffic stops 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, and these racial disparities would not be calculated in the disproportionality indices 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 on drivers' race. 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. However, this is not a pattern detected in traffic stops made by PSP troopers. Specifically, 14.3% of stops during daylight hours were of minority drivers, compared to 15.5% of stops during non-daylight hours.

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 white drivers. In order to explore this possibility, **Tables 5.8** and **5.9** compare the reasons for stops made by Troopers by drivers' race, gender, and age. **Table 5.8** 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 5.9** 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 5.8 and **5.9** 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 whites. 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 white 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 5.8 and **5.9** 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 and as the result of special traffic enforcement programs. 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 and other reasons, 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 5.8. 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
White Driver	273,685	74.0*	13.8*	9.3*	0.2*	1.5*	0.1*	8.9*	1.1*
Black Driver	25,798	77.6	12.5	7.2	0.3	1.4	0.3	8.1	1.2
Hispanic Driver	9,982	71.9	14.2	10.6	0.5	1.3	0.3	10.1	1.8
Other Driver	12,213	86.2	8.7	3.3	0.1	0.7	0.1	8.8	0.9
Male Driver	231,845	73.5*	14.0*	9.4*	0.2*	1.5	0.2*	8.6*	1.2*
Female Driver	94,140	77.4	12.4	7.8	0.2	1.5	0.1	9.4	0.9
Driver under 25 years old	100,224	77.6*	12.2*	8.0*	0.2	1.2*	0.2	8.1*	0.9*
Driver 25 years old or older	226,667	73.4	14.1	9.4	0.2	1.6	0.2	9.2	1.2
Driver is not resident of municipality where stopped	313,844	76.0*	13.2*	8.2*	0.2*	1.4*	0.1*	8.9*	1.1*
Driver is municipality resident	13,276	43.2	22.6	28.0	0.5	3.9	0.4	7.6	1.6
Driver is not resident of county where stopped	222,255	80.9*	11.6*	5.4*	0.2*	0.9*	0.1*	8.6*	1.1
Driver is county resident	104,865	61.4	17.6	16.5	0.3	2.7	0.3	9.4	1.2
Driver is out of state resident	96,550	84.6*	10.7*	2.8*	0.2	0.5*	0.1*	8.9	1.3*
Driver is PA resident	230,570	70.4	14.8	11.5	0.2	1.9	0.2	8.9	1.1

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

Table 5.9. 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
White Driver	273,685	74.6*	16.0*	12.4*	0.4*	3.7*	2.8*	8.9*	0.0
Black Driver	25,798	78.2	14.6	10.3	0.5	3.3	5.4	8.1	0.1
Hispanic Driver	9,982	72.5	16.6	15.1	0.8	3.2	6.6	10.1	0.0
Other Driver	12,218	87.1	10.6	5.2	0.3	2.1	1.2	8.8	0.0
Male Driver	231,845	74.2*	16.3*	13.0*	0.5*	3.6	3.2*	8.6*	0.0*
Female Driver	94,140	77.9	14.2	9.9	0.3	3.6	2.5	9.4	0.0
Driver under 25 years old	100,224	78.2*	14.5*	11.1*	0.4	3.4	3.8*	8.1*	0.0
Driver 25 years old or older	226,667	74.0	16.3	12.5	0.4	3.7	2.7	9.2	0.0
Driver is not resident of municipality where stopped	313,844	76.6*	15.3*	11.2*	0.4*	3.4*	2.9*	8.9*	0.0
Driver is municipality resident	13,276	43.9	25.0	32.1	0.7	7.6	5.7	7.6	0.0
Driver is not resident of county where stopped	222,255	81.5*	13.7*	8.2*	0.4*	2.6*	2.2*	8.6*	0.0
Driver is county resident	104,865	62.1	20.0	20.3	0.5	5.7	4.7	9.4	0.0
Driver is out of state resident	96,550	85.3*	12.6*	5.3*	0.4	1.6*	1.4*	8.9	0.0
Driver is PA resident	230,570	71.1	17.0	14.9	0.4	4.4	3.7	8.9	0.0

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

A final limitation of the use of observation disproportionality indices 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 white drivers, the infractions are often less severe for minority drivers compared to white 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 5.6** suggest that racial differences in speeding behavior are a plausible explanation for racial differences in traffic stops for speeding. As shown in **Table 5.10** below, traffic stop data collected by Troopers indicates that compared to white drivers, minority drivers are stopped for higher average amounts over the speed limit. The first column in **Table 5.10** documents the average speed over the posted speed limit that drivers of different racial categories were stopped for by PSP Troopers. That is, white drivers were stopped for speeding an average of 18.6 miles per hour over the posted speed limit, compared to 19.9, 19.7 and 19.9 miles per hour over the posted speed limit for blacks, Hispanics, and drivers of other race, respectively. The remaining columns in **Table 5.10** document the percentage of each racial group stopped at each level of severity. For example, 4.3% of white drivers were stopped for exceeding the speed limit by over 30 miles per hour, compared to 7.4% of black drivers stopped for speeding. A comparison of means T-test 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 5.10 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
White	18.6	97.6%	80.5%	39.5%	14.5%	4.3%
Black	19.9	97.9%	84.4%	50.0%	22.1%	7.4%
Hispanic	19.7	98.0%	83.4%	46.7%	19.8%	6.9%
Other	19.9	98.5%	86.9%	48.3%	20.2%	6.2%

The analyses displayed in **Table 5.10** support the findings from our observation study reported in **Table 5.3**, which indicates 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 white drivers may be based on legally relevant behavior.

As noted in Section 4, counties to be observed were selected based on their classification as a High, Medium, Medium/low, or Low county, with respect to three factors: traffic volume, possible minority roadway usage, and the likelihood of driving population not matching residential population. **Table 5.11** again presents these group classifications in order to examine the patterns of the groups' differences between population-based disproportionality indices and observation/speeding-based disproportionality indices. The first column lists the observed counties and their group classification. The next two columns indicate the percent difference between the population and observation based disproportionality indices for blacks and non-Caucasians. The final two columns similarly indicate the percent difference in black and non-Caucasians disproportionality indices between population and speeding based disproportionality indices.

Table 5.11 shows that the overall group differences for black disproportionality indices are smallest for the counties in the "High" group, and increase in size with each group. The pattern holds for the overall group differences in nonwhite disproportionality indices, except that averages for the medium/low group are slightly larger than the averages for the low group. It is important to note, however, that there is rather wide variation in differences within groups also, particularly for the differences in black disproportionality indices. For example, while the range of differences for black disproportionality indices in the high group is only from –1.76 to +3.87, each of the remaining groups have differences between the smallest and largest difference that is at least 30 percentage points (due to particularly high or low outliers).

Nevertheless, a few patterns are clear from the group differences displayed in **Table 5.11**. First, differences in the residential and driving populations are heavily influenced by minority travel on interstates in racially homogeneous and less-populated areas of the state that are located between major metropolitan areas of the state. Second, counties with relatively large percentages of minorities are not subject to the high volatility in disproportionality indices that counties with extremely small minority populations exhibit.

Based on these trends, we can speculate that in the other non-observed counties in each group, the representation of minority drivers in actual driving populations would be similarly under- or over-represented by reliance on driving-age population figures. For example, Census data may be a closer match to actual roadway usage in counties classified as high and medium/high, while Census data would poorly represent the driving populations in counties classified as medium or medium/low. That is, census data appears to be more accurate as a benchmark measure in counties with high minority populations and overall total populations, counties with major attractions, and more roadway and interstate miles. Census data appears to be the least accurate in counties with small minority populations and overall populations, few major attractions, and fewer miles of roadways and instate highways. However, just one major thoroughfare in these types of counties likely results in driving populations that are dramatically different than residential populations, thus making Census data an inappropriate benchmark for measuring racial disparities in traffic stops.

Table 5.11. Percent Differences in Disproportionality Indices for Observed Counties by Sampled Group

County Name	% Difference between driving-age pop. DI & observed pop. DI		% Difference between driving-age pop. DI & speeding pop. DI	
	% Diff Blacks	% Diff Non-Caucasian	% Diff Blacks	% Diff Non-Caucasian
HIGH GROUP				
Group Average	-0.08	+0.61	+0.27	+0.59
Allegheny	+2.54	+1.44	+2.62	+1.49
Bucks	-1.76	-0.84	-2.00	-1.04
Chester	+0.29	+0.50	+0.23	+0.28
Dauphin	+2.73	+2.36	+1.75	+1.48
Delaware	+0.16	+0.18	-0.32	-0.23
Erie	+3.87	+4.14	+4.39	+6.18
Lehigh	-0.74	+1.10	-1.25	+0.80
Montgomery	+0.58	+0.39	+0.11	+0.16
Washington	-0.44	-0.56	-0.70	-0.93
Westmoreland	-0.84	-1.38	-0.09	-0.74
York	-1.28	-0.67	-1.73	-0.94
MEDIUM GROUP				
Group Average	-7.72	-1.65	-6.45	-1.32
Bedford	-39.24	-12.35	-39.36	-12.47
Centre	+1.41	+2.57	+3.98	+2.70
Franklin	+1.91	+3.33	+7.72	+7.22
Lackawanna	-4.19	-2.25	-4.90	-3.18
Mercer	+1.49	+0.44	+0.30	-0.88
MED/LOW GROUP				
Group Average	-11.93	-5.05	-12.75	-5.72
Clarion	-9.19	-8.05	-9.77	-8.73
Clinton	-15.87	-8.68	-16.52	-9.29
Columbia	-8.67	-4.32	-10.39	-5.31
Indiana	+1.57	+1.52	+2.52	+1.24
Susquehanna	-37.04	-10.42	-38.17	-10.73
Tioga	-2.38	-0.32	-4.15	-1.48
LOW GROUP				
Group Average	-21.56	-5.00	-21.88	-5.08
Fulton	-20.38	-12.01	-20.52	-12.12
Jefferson	-63.24	-10.37	-63.39	-10.68
Juniata	-15.52	-0.97	-17.42	-2.35
McKean	+1.69	+3.13	+2.93	+5.42
Montour	-10.35	-4.77	-10.99	-5.67

Given the demonstrated inaccuracy of using residential census data for benchmarking purposes, and the expensive and time-consuming nature of roadway and speeding observations, we will seek an alternative benchmark for comparisons across all counties and municipalities. For the second year of traffic stop data, we will attempt to apply a modified gravity model to estimate interstate highway traffic flows and their racial composition. In a typical gravity model, the magnitude of interaction between two places is positively related to the push factors of the origin and the pull factors of the destination and, at the same time, negatively related to the distance between the two places. In our model, we will use a mixture of demographic variables (such as population and its racial composition) and socio-economic variables (such as income and employment) to represent the push and pull factors. We will also add factors that represent the spatial structure of places in Pennsylvania into the gravity model. These additional factors will increase the accuracy of model estimation. The parameters of the model will be calibrated by using the observed traffic data in this project and other available traffic data sets.

Our goal is to derive reasonable estimates of traffic flows and their racial composition on different highway segment. This is a rather ambitious endeavor that, to the best of our knowledge, has only been attempted in a handful of locations. Nevertheless, we are cautiously optimistic that we will be able to produce useful results given the research team's expertise in spatial interaction modeling and related studies for other agencies.

SECTION V 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 appear 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.

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

- Disproportionality indices 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 indices 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 as the denominator in disproportionality indices, most counties have considerably smaller racial disproportionality indices than those based on population statistics alone.

- Of the 67 counties, nine (7.4%) were identified as having Census–based disproportionality indices that were substantially larger than the other counties. Additional roadway observation and speeding data were collected for these counties. The results suggest that only 3 out of the 27 counties observed (11%) still had observation-based disproportionality indices that were significantly larger than the majority of counties. That is, the racial disparities in traffic stops for these three counties (Centre, Erie, and Franklin) could not be explained with speeding and roadway observations.

- 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 there is 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. Therefore, the evidence suggests that the racial disparities between stopped drivers and residential populations are at least partially explained by racial differences in drivers' residency, roadway usage, and speeding behavior.

VI. ANALYSES OF POST-STOP OUTCOMES

VI. ANALYSES OF POST-STOP OUTCOMES

In this section, differences in post-stop outcomes are examined. That is, once traffic stops are made, differences in the outcomes of those stops (e.g., warnings, citations, arrests, searches, and seizures) are examined. In addition, differences in search success rates are examined for racial and gender groups. Specifically, **Table 6.1** illustrates the number of stops and percentage of drivers' post-stop outcomes by area, troop, and station. **Tables 6.2** and **6.3** report comparisons of post-stop outcomes by drivers' race and gender for each area and troop. **Table 6.4** reports racial differences in post-stop outcomes at the station level.

This section also includes a discussion of the outcome test and the importance of search success rates. A review of national research findings regarding search success rates is provided in **Table 6.5**. More detailed information pertaining to the reasons for search, as well as the amount and types of evidence seized by Troopers, is provided in **Tables 6.6 – 6.9**.

Differences in stop outcomes based on Troopers' characteristics (e.g., race, sex, experience, rank, and education) are explored in **Tables 6.10 – 6.13**.

Finally, this section includes analyses of hierarchical multivariate statistical models in **Tables 6.14** and **6.15** 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 6.1** 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 searches, and 5) percentages of searches resulting in the seizure of contraband.

As shown in **Table 6.1**, for the first twelve months of data (May 2002 – April 2003), Pennsylvania State Troopers stopped 327,120 drivers. During these traffic stops, a large majority of drivers (83.4%) were issued citations, while 26.6% of drivers were issued warnings. Arrests and searches were considerably less frequent during traffic stops. Specifically, the department-wide rates of arrests and searches were 0.5% and 0.8% respectively, department-wide.

Table 6.1 also documents the differences in post-stop outcomes across areas, troops, and stations. For example, Troopers assigned to Area IV issued the most warnings to stopped drivers (40.3%), while Troopers in Area I issued the least (19.5%). Drivers in Areas I and II were the most likely to be cited (87.5%, 88.0% respectively), while drivers in Area IV were least likely to be issued citations (73.3%). Troopers in Area II arrested and searched the smallest percentage of stopped drivers (0.3% and 0.5% respectively). Area III had the highest percentage of drivers arrested (0.8%), while Troopers in Area V searched the largest percentage of drivers (1.2%). At the station level, Troopers assigned to Milton Station had the highest citation rate (citations issued to 96.8% of drivers stopped). Likewise, Troopers assigned to the Huntingdon Station arrested the largest percentage of drivers (4.1%), and Troopers assigned to the Media Station searched the largest percentage of drivers (3.2%).

Table 6.1. 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	327,120	26.6	83.4	0.5	0.2	0.2	0.1	0.8	2,484	25.4
AREA I	120,866	19.5	87.5	0.4	0.1	0.2	0.1	0.6	689	27.9
TROOP H	21,531	25.1	81.0	0.9	0.2	0.2	0.1	1.0	221	20.8
Carlisle	3,081	16.9	90.2	0.2	0.0	0.3	0.1	0.9	29	17.2
Chambersburg	3,798	40.1	68.4	1.7	0.2	0.2	0.3	2.3	89	14.6
Gettysburg	1,962	47.0	60.2	0.9	0.4	0.2	0.1	0.2	4	50.0
Harrisburg	5,269	18.5	87.1	0.1	0.1	0.1	0.0	0.3	14	14.3
Lykens	1,064	32.8	79.7	0.5	0.2	0.0	0.1	0.5	5	40.0
Newport	1,579	16.4	88.2	0.4	0.1	0.0	0.0	0.3	5	20.0
York	4,778	18.0	84.9	1.7	0.3	0.3	0.3	1.6	75	28.0
TROOP J	11,958	28.9	87.3	0.8	0.2	0.2	0.2	1.1	133	32.0
Avondale	3,490	36.0	95.5	0.7	0.3	0.3	0.1	1.2	40	17.5
Embreeville	2,899	37.2	76.8	0.8	0.2	0.2	0.1	1.4	41	36.6
Ephrata	1,654	16.5	91.6	0.8	0.1	0.3	0.1	1.0	17	17.7
Lancaster	3,915	21.8	86.0	0.9	0.1	0.2	0.2	0.9	35	36.6
TROOP L	11,131	31.6	81.5	0.8	0.2	0.2	0.1	1.0	113	34.5
Frackville	2,414	29.0	81.5	1.0	0.3	0.2	0.0	1.0	24	25.0
Hamburg	1,836	35.7	88.2	0.5	0.2	0.3	0.0	0.1	2	0.0
Jonestown	2,817	26.8	81.9	1.2	0.1	0.3	0.2	2.5	69	37.7
Reading	2,502	22.3	85.2	0.6	0.2	0.1	0.1	0.5	12	50.0
Schuylkill Haven	1,562	54.4	67.0	0.6	0.2	0.1	0.1	0.4	6	47.8
TROOP T	76,246	14.7	90.2	0.1	0.1	0.2	0.0	0.3	222	32.0
Bowmansville	10,007	10.8	93.6	0.1	0.0	0.4	0.0	0.2	23	47.8
Everett	12,698	14.7	91.4	0.3	0.2	0.1	0.0	0.3	35	25.7
Gibsonia	7,353	25.7	81.0	0.0	0.0	0.2	0.0	0.2	14	0.0
King of Prussia	7,733	21.1	85.9	0.1	0.0	0.1	0.0	0.2	16	18.8
New Stanton	7,195	15.7	90.0	0.1	0.2	0.1	0.0	0.2	14	14.3
Newville	11,986	13.1	91.7	0.0	0.0	0.2	0.0	0.4	42	23.8
Pocono	7,886	15.1	87.5	0.0	0.1	0.1	0.0	0.1	9	33.3
Somerset (T)	11,370	7.2	95.1	0.3	0.1	0.3	0.1	0.6	69	47.8

Table 6.1. 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	40,831	20.3	88.0	0.3	0.1	0.2	0.1	0.5	182	24.7
TROOP F	23,063	18.2	89.0	0.3	0.1	0.2	0.1	0.3	70	30.0
Coudersport	1,917	49.8	63.0	0.7	0.2	0.2	0.3	1.3	24	33.3
Emporium	1,490	37.1	79.2	0.0	0.0	0.2	0.1	0.1	2	50.0
Lamar	3,851	9.5	94.3	0.1	0.1	0.1	0.0	0.2	7	28.6
Mansfield	1,345	25.5	83.4	0.4	0.0	0.3	0.0	0.2	3	0.0
Milton	3,549	8.4	96.8	0.3	0.1	0.2	0.0	0.3	9	33.3
Montoursville	4,336	10.7	94.6	0.2	0.0	0.1	0.1	0.3	12	33.3
Selinsgrove	4,601	7.3	95.7	0.2	0.0	0.1	0.0	0.3	12	16.7
Stonington	1,974	44.8	73.4	0.5	0.1	0.3	0.0	0.1	1	100.0
TROOP P	7,735	26.9	82.4	0.5	0.2	0.2	0.0	0.4	30	26.7
Laporte	1,298	37.9	72.3	0.6	0.2	0.2	0.0	0.2	3	0.0
Shickshinny	934	27.9	86.8	0.4	0.3	0.1	0.0	0.1	1	0.0
Towanda	1,613	39.2	70.7	0.6	0.2	0.2	0.0	0.7	11	36.4
Tunkhannock	1,152	31.8	78.4	0.7	0.3	0.2	0.0	0.4	5	60.0
Wyoming	2,738	11.9	94.2	0.2	0.0	0.2	0.0	0.4	10	10.0
TROOP R	10,033	20.3	90.1	0.3	0.2	0.2	0.1	0.8	82	19.5
Blooming Grove	2,113	22.4	89.3	0.4	0.1	0.1	0.1	0.7	15	20.0
Dunmore	4,069	15.9	92.8	0.2	0.2	0.3	0.1	0.7	28	14.3
Gibson	1,849	22.5	92.5	0.3	0.1	0.3	0.0	0.7	13	7.7
Honesdale	2,002	24.9	83.1	0.7	0.3	0.2	0.1	1.3	26	30.8
AREA III	61,799	30.2	82.3	0.8	0.3	0.2	0.1	0.7	406	25.1
TROOP A	14,766	34.1	84.4	0.8	0.3	0.3	0.1	0.8	112	25.0
Ebensburg	3,055	19.3	90.3	0.8	0.1	0.2	0.0	0.4	12	16.7
Greensburg	4,798	35.5	89.3	0.4	0.5	0.3	0.0	0.5	24	29.2
Indiana	2,984	34.6	80.2	1.0	0.1	0.5	0.1	1.1	32	25.0
Kiski Valley	2,241	50.9	75.5	0.4	0.5	0.1	0.0	0.8	18	11.1
Somerset (A)	1,688	33.7	78.7	2.3	0.1	0.4	0.2	1.5	26	34.6

Table 6.1. 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	25,031	23.0	86.9	0.9	0.3	0.2	0.0	0.7	181	18.2
Belle Vernon	3,917	23.2	91.8	2.6	0.5	0.3	0.1	0.4	14	35.7
Findlay	7,187	11.4	95.2	0.4	0.0	0.2	0.0	0.3	22	18.2
Uniontown	4,331	38.4	73.5	0.8	0.6	0.2	0.0	1.3	54	16.7
Washington	6,710	19.1	87.3	0.3	0.1	0.3	0.0	0.9	63	17.5
Waynesburg	2,886	37.7	78.9	1.0	1.0	0.2	0.1	1.0	28	14.3
TROOP G	22,002	35.7	75.8	0.8	0.2	0.1	0.1	0.5	113	36.3
Bedford	2,607	38.6	72.4	1.2	0.2	0.2	0.0	0.3	7	28.6
Hollidaysburg	3,020	51.9	67.5	0.7	0.0	0.1	0.1	1.0	29	55.2
Huntingdon	1,819	36.1	78.7	4.1	0.4	0.2	0.2	0.7	13	69.2
Lewistown	3,544	35.9	73.5	0.3	0.1	0.1	0.2	0.5	16	37.5
McConnellsburg	2,395	31.2	78.2	0.4	0.0	0.1	0.0	0.3	8	37.5
Philipsburg	2,499	45.3	69.5	0.1	0.1	0.1	0.0	0.1	2	50.0
Rockview	6,118	24.0	83.4	0.2	0.5	0.2	0.1	0.6	38	10.5
AREA IV	57,275	40.3	73.3	0.7	0.2	0.2	0.1	0.8	468	24.6
TROOP C	28,174	34.0	80.0	0.3	0.1	0.1	0.0	0.6	176	14.8
Clarion	6,302	38.2	76.3	0.6	0.0	0.2	0.1	1.3	82	13.4
Clearfield	5,867	23.5	88.1	0.0	0.1	0.0	0.0	0.5	31	6.5
Dubois	5,321	25.3	85.1	0.2	0.0	0.0	0.0	0.5	25	24.0
Kane	1,978	31.8	87.6	0.6	0.2	0.2	0.0	0.9	17	5.9
Punxsutawney	3,375	34.6	80.4	0.3	0.2	0.1	0.0	0.4	12	25.0
Ridgway	2,681	40.0	78.7	0.2	0.2	0.1	0.0	0.2	4	25.0
Tionesta	2,650	59.6	55.7	0.5	0.5	0.1	0.0	0.2	5	5.9
TROOP D	14,393	47.1	67.2	1.1	0.4	0.2	0.1	1.1	163	21.5
Beaver	3,486	57.0	55.3	1.2	0.5	0.2	0.0	0.3	11	9.1
Butler	4,052	39.9	72.5	1.3	0.5	0.2	0.1	0.7	27	22.2
Kittanning	2,661	47.5	68.5	1.2	0.3	0.2	0.3	1.9	50	30.0
Mercer	2,732	40.0	79.6	0.3	0.1	0.1	0.2	2.5	68	19.1
New Castle	1,462	56.1	55.1	1.3	0.8	0.1	0.0	0.5	7	0.0

Table 6.1. 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	14,708	45.7	66.6	1.0	0.2	0.2	0.1	0.9	129	41.7
Corry	907	53.6	60.9	0.4	0.2	0.1	0.0	0.2	2	50.0
Erie	3,193	35.2	72.9	0.1	0.4	0.3	0.1	0.7	21	33.3
Franklin	1,786	64.6	54.8	0.4	0.2	0.3	0.2	0.5	9	22.2
Girard	4,135	40.0	73.4	0.2	0.3	0.2	0.0	0.4	18	11.1
Meadville	3,815	48.7	61.7	2.9	0.1	0.2	0.3	1.9	72	54.2
Warren	872	50.2	63.2	1.6	0.0	0.1	0.0	0.8	7	42.9
AREA V	44,724	27.9	84.2	0.5	0.3	0.2	0.1	1.2	535	23.6
TROOP K	11,968	29.8	84.8	1.0	0.3	0.3	0.2	2.4	290	29.0
Media	5,922	30.0	81.7	1.1	0.4	0.3	0.3	3.2	188	28.7
Philadelphia	2,861	22.2	92.6	0.7	0.1	0.4	0.2	1.6	47	38.3
Skippack	3,185	36.2	83.8	0.9	0.3	0.1	0.2	1.7	55	21.8
TROOP M	16,325	33.2	78.8	0.5	0.2	0.2	0.1	1.0	164	17.7
Belfast	3,417	37.0	75.9	0.3	0.2	0.1	0.0	1.0	33	12.1
Bethlehem	2,800	30.3	80.8	0.5	0.2	0.3	0.1	0.9	24	25.0
Dublin	3,212	43.8	72.1	0.4	0.2	0.0	0.1	0.8	25	32.0
Fogelsville	3,930	34.0	79.0	0.4	0.2	0.0	0.0	1.1	44	13.6
Trevose	2,966	19.1	87.1	0.7	0.2	0.4	0.2	1.3	38	13.2
TROOP N	16,431	21.4	89.1	0.3	0.4	0.2	0.1	0.5	81	16.1
Bloomsburg	2,963	22.3	96.2	0.2	0.0	0.1	0.0	0.1	2	0.0
Fern Ridge	1,827	11.5	93.3	0.8	0.2	0.1	0.0	0.3	6	16.7
Hazleton	3,723	23.1	85.5	0.2	0.1	0.2	0.1	0.6	21	28.6
Lehighton	1,517	35.4	80.4	0.5	0.1	0.1	0.1	0.4	6	33.3
Swiftwater	6,401	19.4	88.8	0.1	0.9	0.2	0.0	0.7	46	8.7
Canine Unit	1,015	86.0	13.9	2.2	1.4	0.1	0.9	18.8	191	25.7

Table 6.1 also reports the number and percentage of searches, and the percentage of searches that resulted in seizures. The Pennsylvania State Police conducted 2,484 searches department-wide during this twelve-month period, of which 25.4% resulted in a contraband seizure. 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 success rate percentages were generally similar across areas, but demonstrated greater variation at the troop level. For example, Troop E had the highest percentage of searches result in seizure of contraband (41.7%) while Troop C had the lowest (14.8%). Although the percentage of searches that resulted in a seizure varied widely across stations, in many stations the percentages are based on a very small number of searches. Therefore, it is only appropriate to make comparisons of search success rates at the area and troop levels. Research and policy issues surrounding search success rates will be explored in greater detail below.

DIFFERENCES IN STOP OUTCOMES

Table 6.2 illustrates the variation in stop outcomes (i.e., percentage drivers warned, cited, arrested, and/or searched) by drivers' race and gender for the department and areas. Likewise, **Table 6.3** 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 – white, black, Hispanic, and other – where Hispanic includes both white 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 missing on the forms (1.7% of the total number of forms collected) are excluded from these analyses. The asterisks in **Tables 6.2 and 6.3** 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% certain it does not occur by chance.

Table 6.2. 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	White	273,685	27.6*	82.6*	0.5*	0.6*	1,616	28.7*
	Black	25,798	23.2	86.1	0.7	2.0	516	20.5
	Hispanic	9,982	23.1	88.0	0.8	2.5	249	17.3
	Other race	12,218	16.0	90.4	0.1	0.5	61	11.5
	Male	231,845	26.3*	84.0*	0.6*	0.9*	2,175	25.3
	Female	94,140	27.4	81.8	0.3	0.3	301	26.2
AREA I	White	97,408	20.1*	87.0*	0.4*	0.5*	445	29.4
	Black	11,947	18.0	88.5	0.7	1.2	143	27.3
	Hispanic	4,378	20.7	89.5	1.0	1.8	77	22.1
	Other race	5,368	11.9	92.6	0.1	0.1	8	12.5
	Male	85,761	19.3*	87.9*	0.5*	0.7*	583	28.8
	Female	34,672	20.0	86.4	0.2	0.3	102	22.5
AREA II	White	36,103	21.3*	87.4*	0.3	0.4*	148	24.3
	Black	1,865	13.4	92.9	0.4	0.9	17	29.4
	Hispanic	847	13.0	94.6	0.8	0.8	7	28.6
	Other race	1,132	8.3	95.0	0.2	0.3	3	0.0
	Male	29,115	20.1	88.5*	0.4*	0.5*	160	25.0
	Female	11,608	21.0	86.9	0.1	0.2	21	23.8
AREA III	White	55,709	30.8*	81.8*	0.8	0.6*	317	27.8
	Black	3,312	27.1	86.0	0.8	2.1	68	19.1
	Hispanic	697	16.4	91.2	0.4	2.2	15	6.7
	Other race	1,413	18.4	90.3	0.1	0.3	4	0.0
	Male	42,868	29.8*	82.9*	1.0*	0.8*	354	24.3
	Female	18,651	30.9	80.9	0.4	0.3	51	31.4
AREA IV	White	49,532	42.0*	71.9*	0.7	0.7*	329	28.3*
	Black	3,370	32.8	79.2	0.7	2.3	76	15.8
	Hispanic	1,234	28.0	86.8	0.4	3.1	38	10.5
	Other race	2,233	21.8	86.5	0.2	0.8	17	17.6
	Male	41,007	39.8*	74.3*	0.8*	1.0*	423	24.1
	Female	16,138	41.6	70.8	0.4	0.3	45	28.9
AREA V	White	33,892	28.7*	83.3*	0.5	0.8*	275	32.0*
	Black	5,010	27.1	85.7	0.6	3.1	156	16.0
	Hispanic	2,639	27.1	86.7	0.8	3.0	79	15.2
	Other race	2,002	21.4	88.4	0.1	1.0	20	0.0
	Male	31,889	27.4*	85.4*	0.6*	1.5*	480	23.5
	Female	12,656	29.5	81.2	0.2	0.4	53	24.5

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

The results in **Table 6.2** show that department-wide, white drivers are significantly more likely to be issued warnings compared to the other racial groups (27.6% of white drivers, compared to 23.2% of black drivers, 23.1% of Hispanic drivers, and 16.0% of drivers of other races). In contrast, white drivers were significantly *less* likely to be issued citations (82.6%) compared to black drivers (86.1%), Hispanic drivers (88.0%) and drivers of other races (90.4%). In addition, white 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 3.3 times higher than the percentage of white drivers searched, while the percentage of Hispanic drivers searched is 4.2 times higher than the percentage of white drivers. Statistically significant differences in warnings, citations, and searches are observed for racial groups across all five areas. Statistically significant differences in arrests for racial groups were only found in Area I.

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 between male and female drivers were observed for nearly all post-stop outcomes across all five areas.

Table 6.3 documents similar differences in stop outcomes by racial and gender groups at the troop level. The percentage of searches resulting in seizures for racial and gender groups are not reported at the troop level due to the small number of searches conducted in some of these categories. Out of the 16 PSP troops, 15 troops had statistically significant differences among racial groups for warnings, 13 troops had statistically significant differences among racial groups for citations, six troops had statistically significant differences among racial groups for arrests, and 11 troops had statistically significant differences among racial groups for searches. Similar differences were found for differences in outcomes for male and female drivers across troops.

Table 6.3 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	White	18,471	25.5*	80.7*	0.8*	0.9*
	Black	1,424	24.7	80.8	1.5	2.2
	Hispanic	687	19.9	87.2	2.3	2.2
	Other	467	15.6	87.4	0.4	0.4
	Male	14,822	24.5*	81.8*	1.1*	1.2*
	Female	6,628	26.4	79.3	0.4	0.6
Area I, Troop J	White	9,556	28.4*	87.4*	0.7*	0.9*
	Black	1,050	33.0	84.1	1.5	2.0
	Hispanic	896	32.1	90.5	1.5	2.5
	Other	312	23.4	88.5	0.0	0.3
	Male	8,296	29.2	87.5	0.4*	1.3*
	Female	3,631	28.1	87.1	1.0	0.7
Area I, Troop L	White	9,377	32.1*	80.9*	0.8*	0.7*
	Black	682	32.1	82.3	1.2	3.7
	Hispanic	571	30.1	84.2	1.9	3.0
	Other	351	21.7	88.9	0.0	0.3
	Male	7,915	31.3	82.2*	1.0*	1.2*
	Female	3,188	32.0	79.8	0.4	0.5
Area I, Troop T	White	60,004	15.2*	89.8*	0.1*	0.2*
	Black	8,791	14.1	90.7	0.4	0.7
	Hispanic	2,224	13.8	91.1	0.2	1.0
	Other	4,238	9.9	93.7	0.1	0.1
	Male	54,728	14.6	90.5*	0.2*	0.4*
	Female	21,225	14.8	89.5*	0.0	0.1
Area II, Troop F	White	20,390	19.3*	88.3*	0.2*	0.3
	Black	1,122	10.2	94.8	0.4	0.6
	Hispanic	492	8.3	97.6	1.0	0.4
	Other	620	7.6	95.0	0.2	0.2
	Male	16,296	17.9	89.5*	0.3	0.4*
	Female	6,703	18.9	87.8	0.1	0.1
Area II, Troop P	White	7,274	27.3*	82.1	0.5	0.4
	Black	172	20.9	85.5	0.6	0.6
	Hispanic	94	17.0	88.3	1.1	0.0
	Other	73	12.3	89.0	0.0	0.0
	Male	5,531	26.2	82.6	0.6*	0.5*
	Female	2,190	28.5	81.8	0.1	0.0

Table 6.3 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	White	8,439	20.9*	89.8*	0.3	0.7
	Black	571	17.3	91.4	0.5	1.6
	Hispanic	261	20.3	91.2	0.4	1.9
	Other	439	8.7	95.9	0.2	0.5
	Male	7,288	20.3	90.6*	0.4*	0.9
	Female	2,715	20.0	88.8	0.1	0.4
Area III, Troop A	White	13,877	34.0*	84.3	0.9	0.7*
	Black	491	42.4	83.3	0.4	2.2
	Hispanic	80	21.3	90.0	0.0	2.5
	Other	195	23.1	87.2	0.0	0.0
	Male	10,152	34.7	84.1	1.0*	1.0*
	Female	4,582	32.7	84.9	0.3	0.2
Area III, Troop B	White	22,423	22.9*	86.8*	0.9	0.6*
	Black	1,604	24.9	87.5	0.9	2.5
	Hispanic	171	15.8	92.4	0.0	1.2
	Other	495	16.2	92.7	0.0	0.4
	Male	17,391	22.6	87.6*	1.0*	0.9*
	Female	7,464	24.0	85.3	0.5	0.3
Area III, Troop G	White	19,409	37.5*	74.3*	0.8	0.4*
	Black	1,217	23.9	85.1	0.8	1.4
	Hispanic	446	15.7	91.0	0.7	2.5
	Other	723	18.7	89.5	0.1	0.3
	Male	15,325	34.8*	76.9	0.9*	0.6*
	Female	6,605	37.6	73.2	0.4	0.3
Area IV, Troop C	White	23,580	36.5*	78.1*	0.3	0.4
	Black	1,824	22.3	88.1	0.2	2.5
	Hispanic	901	23.8	91.9	0.4	2.2
	Other	1,410	16.3	91.6	0.1	0.6
	Male	20,809	33.4*	81.1*	0.4	0.8*
	Female	7,320	35.5	76.9	0.2	0.1
Area IV, Troop D	White	12,877	47.3*	66.9*	1.1	0.9*
	Black	862	49.0	66.1	1.7	2.8
	Hispanic	183	41.0	69.9	0.5	8.7
	Other	326	35.9	78.5	0.6	2.1
	Male	10,048	47.0	67.7	1.3*	1.4*
	Female	4,321	47.2	66.0	0.6	0.4

Table 6.3 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	White	13,075	46.7*	65.7*	1.1	0.9
	Black	684	40.4	71.8	0.9	0.9
	Hispanic	150	38.0	76.7	0.0	1.3
	Other	497	28.0	77.3	0.4	0.4
	Male	10,150	45.5	67.0	1.2*	1.1*
	Female	4,497	46.1	65.5	0.6	0.4
Area V, Troop K	White	8,779	30.0	84.4	0.9	1.8*
	Black	2,057	30.5	85.7	1.2	4.8
	Hispanic	433	30.3	85.2	1.2	6.5
	Other	545	25.7	87.5	0.4	1.1
	Male	8,382	29.3	85.6*	1.2*	3.1*
	Female	3,542	31.2	82.9	0.5	0.8
Area V, Troop M	White	12,898	33.9*	78.1*	0.4*	0.6*
	Black	1,362	31.3	80.3	0.5	3.5
	Hispanic	1,143	30.9	81.9	1.1	3.3
	Other	706	27.3	83.4	0.0	0.7
	Male	11,519	32.6*	80.0*	0.6*	1.3*
	Female	4,774	34.7	75.9	0.2	0.3
Area V, Troop N	White	12,215	22.2*	88.1*	0.3	0.4*
	Black	1,591	19.0	90.5	0.0	0.6
	Hispanic	1,063	21.6	92.4	0.2	1.2
	Other	751	12.8	93.7	0.1	1.2
	Male	11,988	21.0	90.3*	0.3	0.6*
	Female	4,340	22.3	85.7	0.1	0.2

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

Table 6.4 presents similar information as presented in **Tables 6.2** and **6.3,** however, the percentages are examined at the station level. In **Table 6.4**, the racial categories are presented as a simple Caucasian / non-Caucasian dichotomy. The "non-Caucasian" category in this table includes black, black Hispanic, white Hispanic, Native American, Middle Eastern, and Asian drivers. A Caucasian / non-Caucasian comparison is utilized in **Table 6.4** because the number of stops in some racial groups are too small for individual comparisons at the station level. Once again, differences in across stations are found.

Table 6.4. 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	2,708	16.7	90.3	0.2	0.7***
	Non-Caucasian	348	18.7	88.5	0.3	3.2
Chambersburg	Caucasian	3,302	40.9**	67.7*	1.6	1.9***
	Non-Caucasian	457	34.6	72.9	2.8	5.3
Gettysburg	Caucasian	1,720	49.0***	58.3***	0.8	0.2
	Non-Caucasian	231	31.6	75.3	1.7	0.0
Harrisburg	Caucasian	4,525	18.3	87.4	0.1	0.3
	Non-Caucasian	659	19.3	86.5	0.3	0.2
Lykens	Caucasian	1,026	33.1	79.7	0.5	0.5
	Non-Caucasian	29	17.2	86.2	0.0	0.0
Newport	Caucasian	1,441	16.0	88.7	0.4	0.3
	Non-Caucasian	113	17.7	83.2	0.9	0.0
York	Caucasian	3,984	18.3	84.4**	1.5*	1.5
	Non-Caucasian	741	15.4	88.1	2.6	1.8
AREA I, Troop J						
Avondale	Caucasian	2,673	36.2	95.3	0.6	0.8***
	Non-Caucasian	808	35.4	96.0	1.1	2.4
Embreeville	Caucasian	2,277	37.6	76.5	0.6*	1.2
	Non-Caucasian	604	35.9	77.8	1.5	2.2
Ephrata	Caucasian	1,351	16.4	91.6	0.7	1.0
	Non-Caucasian	292	17.5	91.8	1.0	1.4
Lancaster	Caucasian	3,309	20.7***	86.7**	0.8	0.8
	Non-Caucasian	554	27.6	82.3	1.4	1.4
AREA I, Troop L						
Frackville	Caucasian	2,154	29.8**	80.7***	0.9	1.0
	Non-Caucasian	239	20.9	89.5	1.3	0.4
Hamburg	Caucasian	1,353	38.3***	86.6***	0.6	0.0*
	Non-Caucasian	450	27.8	92.7	0.2	0.4
Jonestown	Caucasian	2,312	26.3	82.3	1.0*	1.3***
	Non-Caucasian	498	28.9	79.9	2.2	8.0
Reading	Caucasian	2,136	21.2***	85.8	0.6	0.6
	Non-Caucasian	335	29.3	82.1	1.2	0.0
Schuylkill Haven	Caucasian	1,473	54.0	67.1	0.7	0.4
	Non-Caucasian	82	61.0	61.0	0.0	0.0

Table 6.4. **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	7,640	10.8	93.5	0.0***	0.1***
	Non-Caucasian	2,272	11.0	94.1	0.4	0.6
Everett	Caucasian	9,612	15.3***	91.1*	0.2*	0.1***
	Non-Caucasian	2,973	12.4	92.6	0.4	0.7
Gibsonia	Caucasian	6,120	26.6***	80.4**	0.0	0.2
	Non-Caucasian	1,213	21.4	84.0	0.0	0.2
King of Prussia	Caucasian	6,214	21.2	85.7	0.1	0.2
	Non-Caucasian	1,478	20.6	86.8	0.1	0.1
New Stanton	Caucasian	6,176	15.5	90.3	0.1	0.2
	Non-Caucasian	929	16.6	88.9	0.3	0.4
Newville	Caucasian	9,272	13.6**	91.4	0.0***	0.2***
	Non-Caucasian	2,631	11.4	92.6	0.2	1.0
Pocono	Caucasian	6,807	15.3	87.2*	0.0**	0.1
	Non-Caucasian	980	13.9	89.7	0.2	0.3
Somerset (T)	Caucasian	8,451	7.2	95.0	0.2	0.6
	Non-Caucasian	2,774	7.0	95.3	0.3	0.7
AREA II, Troop F						
Coudersport	Caucasian	1,883	49.9	62.8	0.7	1.2
	Non-Caucasian	29	44.8	72.4	0.0	3.4
Emporium	Caucasian	1,466	37.2	79.3	0.0	0.1
	Non-Caucasian	13	30.8	76.9	0.0	0.0
Lamar	Caucasian	3,085	9.9	93.9*	0.1*	0.2
	Non-Caucasian	754	7.7	95.9	0.4	0.1
Mansfield	Caucasian	1,231	26.0	82.9*	0.4	0.2
	Non-Caucasian	103	17.5	92.2	0.0	0.0
Milton	Caucasian	2,871	8.9*	96.7	0.2*	0.1**
	Non-Caucasian	629	5.9	97.5	0.6	0.8
Montoursville	Caucasian	3,951	10.6	94.6	0.2**	0.2*
	Non-Caucasian	318	12.3	95.3	0.9	0.9
Selinsgrove	Caucasian	4,210	7.6*	95.5	0.2	0.3
	Non-Caucasian	349	4.3	97.4	0.0	0.0
Stonington	Caucasian	1,923	44.8	73.5	0.5	0.1
	Non-Caucasian	39	46.2	71.8	0.0	0.0

Table 6.4. 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	1,261	37.8	72.6	0.6	0.2
	Non-Caucasian	25	44.0	56.0	0.0	0.0
Shickshinny	Caucasian	902	28.2	86.9	0.4	0.1
	Non-Caucasian	27	22.2	85.2	0.0	0.0
Towanda	Caucasian	1,558	39.3	70.6	0.6	0.7
	Non-Caucasian	31	29.0	74.2	0.0	0.0
Tunkhannock	Caucasian	1,109	31.7	78.5	0.6	0.5
	Non-Caucasian	37	37.8	70.3	2.7	0.0
Wyoming	Caucasian	2,499	12.1	94.1	0.2	0.4
	Non-Caucasian	219	9.6	95.4	0.5	0.5
AREA II, Troop R						
Blooming Grove	Caucasian	1,876	22.3	89.3	0.4	0.6
	Non-Caucasian	219	22.4	90.4	0.9	1.4
Dunmore	Caucasian	3,451	16.5*	92.6	0.1	0.6*
	Non-Caucasian	595	12.4	93.8	0.2	1.3
Gibson	Caucasian	1,450	24.6***	92.1*	0.2	0.8
	Non-Caucasian	371	13.2	95.1	0.5	0.5
Honesdale	Caucasian	1,903	25.1	83.1	0.7	1.2
	Non-Caucasian	86	20.9	83.7	0.0	3.5
AREA III, Troop A						
Ebensburg	Caucasian	2,878	19.2	90.2	0.8	0.3**
	Non-Caucasian	169	18.3	90.3	0.6	1.8
Greensburg	Caucasian	4,531	35.7	89.2	0.5	0.4**
	Non-Caucasian	214	33.6	90.2	0.0	1.9
Indiana	Caucasian	2,800	34.7	80.3	1.1	1.1
	Non-Caucasian	168	33.3	79.8	0.0	0.6
Kiski Valley	Caucasian	2,044	50.3	75.4	0.4	0.6**
	Non-Caucasian	176	56.3	76.1	0.6	2.8
Somerset (A)	Caucasian	1,644	33.8	78.5	2.3	1.6
	Non-Caucasian	39	30.8	84.6	0.0	0.0

Table 6.4. 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	3,490	23.2	91.7	2.8*	0.2***
	Non-Caucasian	395	20.8	92.9	0.8	1.5
Findlay	Caucasian	6,353	10.8***	95.4	0.4	0.2***
	Non-Caucasian	774	15.8	94.1	0.8	1.3
Uniontown	Caucasian	3,999	38.1	73.5	0.7*	1.0***
	Non-Caucasian	270	40.4	74.1	1.9	4.4
Washington	Caucasian	5,991	18.9	87.3	0.3	0.8**
	Non-Caucasian	617	21.1	87.7	0.0	2.1
Waynesburg	Caucasian	2,636	38.0*	78.6**	1.1	0.9
	Non-Caucasian	214	29.9	86.4	0.0	1.4
AREA III, Troop G						
Bedford	Caucasian	2,390	39.8***	71.5***	1.3	0.2*
	Non-Caucasian	204	22.5	84.8	0.0	1.0
Hollidaysburg	Caucasian	2,769	52.7**	66.8*	0.7	0.9
	Non-Caucasian	236	42.8	74.2	1.7	2.1
Huntingdon	Caucasian	1,744	35.8	78.7	4.1	0.6*
	Non-Caucasian	68	42.6	76.5	5.9	2.9
Lewistown	Caucasian	3,241	36.6***	72.7***	0.3	0.4
	Non-Caucasian	253	25.7	85.0	0.8	0.8
McConnellsburg	Caucasian	1,864	35.6***	74.2***	0.3	0.1***
	Non-Caucasian	515	15.5	92.2	0.6	1.2
Philipsburg	Caucasian	2,364	45.8*	68.9**	0.1	0.1
	Non-Caucasian	124	34.7	79.8	0.0	0.0
Rockview	Caucasian	5,103	26.0***	81.9***	0.3	0.5**
	Non-Caucasian	986	13.4	91.3	0.1	1.3
AREA IV, Troop C						
Clarion	Caucasian	4,827	42.4***	72.7***	0.8*	0.8***
	Non-Caucasian	1,458	24.0	88.1	0.2	2.9
Clearfield	Caucasian	4,712	25.1***	87.0***	0.0	0.3***
	Non-Caucasian	1,135	17.0	92.7	0.0	1.5
Dubois	Caucasian	4,232	27.3***	83.7***	0.2	0.3**
	Non-Caucasian	1,067	17.2	91.1	0.3	0.9
Kane	Caucasian	1,887	32.4**	87.0***	0.6	0.8
	Non-Caucasian	84	17.9	100.0	0.0	2.4
Punxsutawney	Caucasian	3,134	35.6***	79.6***	0.3	0.3
	Non-Caucasian	225	19.6	90.7	0.4	0.9

Table 6.4. 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						
Ridgway	Caucasian	2,526	40.4	78.2*	0.2	0.1
	Non-Caucasian	128	32.0	85.9	0.8	0.8
Tionesta	Caucasian	2,583	59.5	55.7	0.5	0.2
	Non-Caucasian	38	60.5	50.0	0.0	0.0
AREA IV, Troop D						
Beaver	Caucasian	3,148	56.9	55.4	1.2	0.2**
	Non-Caucasian	327	59.0	53.8	1.2	1.2
Butler	Caucasian	3,785	40.1	72.3	1.3	0.7
	Non-Caucasian	240	35.4	75.4	0.8	0.4
Kittanning	Caucasian	2,499	47.7	67.9***	1.2	1.8
	Non-Caucasian	156	41.7	80.1	1.9	2.6
Mercer	Caucasian	2,168	40.2	80.5*	0.2	1.5***
	Non-Caucasian	542	38.9	76.0	0.7	6.6
New Castle	Caucasian	1,344	55.9	55.2	1.0***	0.4*
	Non-Caucasian	106	56.6	56.6	4.7	1.9
AREA IV, Troop E						
Corry	Caucasian	873	53.4	60.8	0.5	0.2
	Non-Caucasian	13	61.5	69.2	0.0	0.0
Erie	Caucasian	2,792	35.9*	72.4*	0.1	0.7
	Non-Caucasian	368	29.3	78.0	0.0	0.5
Franklin	Caucasian	1,694	64.7	54.4	0.4	0.5
	Non-Caucasian	63	65.1	58.7	0.0	0.0
Girard	Caucasian	3,644	40.8**	72.5***	0.2	0.4
	Non-Caucasian	451	33.5	79.8	0.4	0.4
Meadville	Caucasian	3,364	50.2***	60.6***	3.2*	2.0
	Non-Caucasian	422	37.0	69.4	1.2	1.4
Warren	Caucasian	849	50.2	63.8**	1.5	0.8
	Non-Caucasian	14	57.1	28.6	7.1	0.0
AREA V, Troop K						
Media	Caucasian	4,440	29.5	81.8	1.1	2.1***
	Non-Caucasian	1,463	31.8	81.1	1.3	6.4
Philadelphia	Caucasian	1,815	21.8	92.7	0.7	1.3
	Non-Caucasian	1,010	23.5	92.1	0.8	2.3
Skippack	Caucasian	2,595	36.5	83.2**	0.8	1.4**
	Non-Caucasian	562	34.9	87.5	0.9	3.0

Table 6.4. 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 M						
Belfast	Caucasian	2,695	37.7	74.9**	0.3	0.4***
	Non-Caucasian	715	34.1	79.6	0.4	3.2
Bethlehem	Caucasian	2,245	30.1	80.8	0.5	0.5***
	Non-Caucasian	536	31.0	81.0	0.6	2.2
Dublin	Caucasian	2,932	43.4	72.3	0.5	0.8
	Non-Caucasian	224	47.3	72.3	0.0	1.3
Fogelsville	Caucasian	2,954	35.1*	77.9**	0.3	0.4***
	Non-Caucasian	943	31.0	82.0	0.6	3.3
Trevose	Caucasian	2,144	18.5	87.6	0.5	0.8***
	Non-Caucasian	793	20.7	85.9	1.0	2.6
AREA V, Troop N						
Bloomsburg	Caucasian	2,318	22.3	96.1	0.1	0.0
	Non-Caucasian	617	22.2	96.8	0.2	0.2
Fern Ridge	Caucasian	1,434	11.4	93.1	0.9	0.3
	Non-Caucasian	361	11.4	94.5	0.0	0.6
Hazleton	Caucasian	2,939	24.6***	83.8***	0.3	0.5
	Non-Caucasian	727	16.6	92.3	0.0	0.8
Lehighton	Caucasian	1,383	36.4***	79.7**	0.4	0.4
	Non-Caucasian	115	20.0	89.6	1.7	0.0
Swiftwater	Caucasian	4,743	19.3	88.6	0.1	0.5***
	Non-Caucasian	1,585	19.4	89.2	0.0	1.5

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

Tables 6.2, 6.3, and **6.4** illustrate the wide variation in outcomes among racial and gender groups at the department, area, troop, and station levels. It is important to note, however, that the relationships reported in these tables are only bivariate. The relationships reported in **Tables 6.2, 6.3,** and **6.4** do not statistically control for other relevant legal and extralegal factors that might be expected to influence officer decision-making. That is, the information provided in **Tables 6.2, 6.3,** and **6.4** cannot determine whether or not differences in outcomes across racial and gender groups is due to discrimination. It is plausible that differences in post-stop outcomes exist between racial and gender groups due to legal and extralegal reasons other than race and gender. To explore these possibilities, more advanced statistical analyses have been performed that examine disparities in stop outcomes while statistically controlling for other legal relevant variables and are reported later in this section. The information reported in **Tables 6.2 – 6.4** is included in this report solely to provide details to PSP administrators regarding differences in 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.

SEARCHES & SEIZURES

Research Issues

One of the most common rationales for targeting minority drivers is the perception that minorities are more likely to be transporting drugs, unregistered weapons, or other contraband. Crime statistics based on arrest data support this proposition. Research consistently shows that young minority males are significantly more likely to be arrested for drug offenses and violent crime. The possibility exists, however, that minorities are disproportionately represented in crime figures because these figures are based on arrest statistics. If officers are more likely to stop, question, and search young minority males, the arrest statistics may become what Harris (1999) has described as a "self-fulfilling prophecy." To examine this issue, one must consider the discovery of evidence during searches of citizens. Often referred to as search "success rates," or "hit rates" (i.e., the percent of searches conducted that produced contraband and/or resulted in arrest), some scholars and police officials have argued that searches of minorities are likely to produce more contraband compared to searches of whites (Herszenhorn, 2000; Knowles, Persico, & Todd, 2001). Others have argued that minority citizens are not more likely to being carrying illegal substances, and that a comparison of hit rates will show that racial profiling policies are ineffective (Cole, 1999; Harris, 2002).

Researchers have typically utilized the "outcome test" to identify racial and ethnic discrimination 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.

Several studies have utilized the outcome test to examine differences in the percentage of searches that produce contraband for minority and white citizens. **Table 6.5** provides a review of seventeen studies that examined search hit rates in traffic, pedestrian, and airport stops. These studies, all conducted and published in the last decade, report findings based on data collected from local police departments, state agencies, and federal agencies. **Table 6.5** summarizes the overall success rate for searches, as well as comparisons of hit rates for racial and ethnic groups. The majority of studies reported that searches of white citizens produced similar, and often, higher hit rates compared to searches of minorities (e.g., Criminal Justice Training Commission, 2001; Decker et al., 2002; Engel & Calnon, 2004a; Lamberth, 1996; Moose, 2002; Spitzer, 1999; TDPS, 2001; Zingraff et al., 2000). Eight other studies, however, reported that black and/or Hispanic citizens had higher hit rates compared to whites (Carter et al., 2001; Cordner et al., 2001; Farrell et al., 2002; Greenwald, 2001; Knowles et al., 2001; Morgan, 2002; Thomas & Carlson, 2001; Verniero & Zoubek, 1999). In addition, the findings from the U.S. Customs study offer mixed evidence regarding the hit rates of different racial groups. Combined, the research findings examining the success of searches conducted during traffic and pedestrian stops for different racial groups have been mixed.

Table 6.5. Studies of Search "Hit Rates" in Traffic and Pedestrian Stops

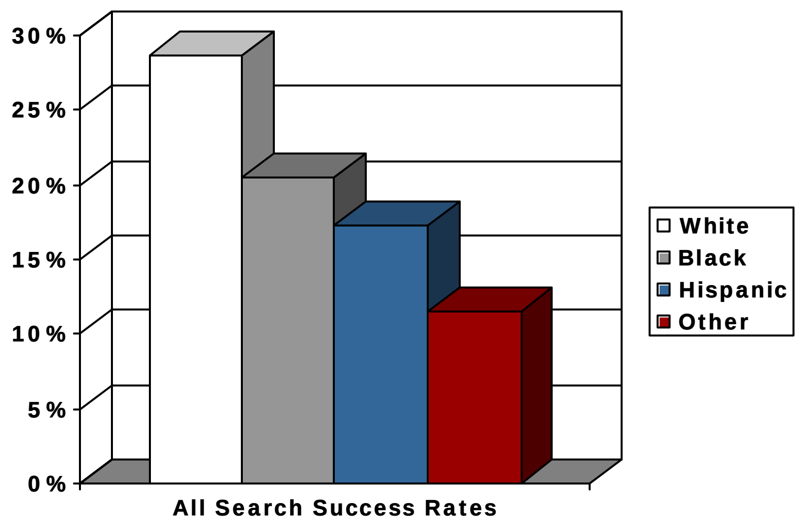
Author & Year Published	Data Collection Site	Data Collection Time Period	Number of Stops	Number of Searches	Dependent Variable	Overall Hit Rates[1]	White Hit Rates	Black Hit Rates	Hispanic Hit Rates
Lamberth (1996)	Maryland	Jan 1995-Sept 1996	2,372[2]	2,372	Contraband	28.1%	28.8%	28.4%	NA
Spitzer (1999)	New York City	Jan 1998-Mar 1999	174,919	69.1% frisk	Arrest	9.0:1[3]	7.9:1	9.5:1	8.8:1
Verniero & Zoubek (1999)	New Jersey	1994-1999	87,489[4]	1,193	Arrest and/or contraband	19.2%	10.5%	13.5%	38.1%
General Accounting Office (2000)	Nationwide airports U.S. Customs	1997-1998	140,000,000	3,872 strip[5] 1,419 x-ray 96,769 frisk	Contraband	23% strip 31% x-ray 3% frisk	25.1% (WM) 19.5% (WF) 58.7% (WM) 58.7% (WF) NA	61.6% (BM) 27.6% (BF) 58.7% (BM) 28.2% (BF) NA	58.8% (HM) 45.7% (HF) 34.1% (HM) 34.1% (HF) NA
Zingraff et al. (2000)	North Carolina	Jan-Dec 1998	906,758	826	Contraband	30.8%	33.0%	26.3%	NA
Carter et al. (2001)	Lansing, MI	Feb-Aug 2001	15,509	1,418	Contraband	17.3%	17.2%	16.7%	19.2%
Cordner et al. (2001)	San Diego, CA	Jan-Dec 2000	168,901	10,754	Contraband (C) and / or property (P)	12.5%	13.1% (C) 12.7% (P)	13.9% (C) 13.0% (P)	5.1% (C) 7.0% (P)
Criminal Justice Training Commission (2001)	Washington	May-Oct 2000	338,885	7,727	Contraband	30.0%	32.6%	25.0%	19.0%
Greenwald (2001)	Sacramento, CA	Jul 2000-Jun 2001	36,854	5,832	Contraband	22.0%	22.2%	23.3%	20.5%
Knowles, Persico, & Todd (2001)	Maryland	Jan 1995-Jan1999	NA	1,590	Drugs	NA	32.0%	34.0%	11.0%
Texas Dept. of Public Safety (2001)	Texas	Jan -Dec 2001	1,873,960	65,916	Drug charge	22.0%	14.6%	3.6%	3.9%o
Thomas & Carlson (2001)	Denver	June -Aug 2001	55,524 Traffic & Pedest.	12,945	Contraband	14.6% (T) 28.4% (P)	17.6% (T) 26.9% (P)	19.6% (T) 30.1% (P)	10.4% (T) 28.9% (P)
Decker et al. (2002)	Missouri	Jan-Dec 2001	1,389,947	99,860	Contraband	20.0%	22.0%	15.0%	11.0%
Moose (2002)	Montgomery Co., MD	Oct 2001-Mar 2002	31,752	383 (consent only)	Contraband	27.7%	40.6%	39.6%	11.3%
Morgan (2002)	Tennessee	Jan-Dec 2001	450,366	approx 7% of stops	Contraband	1.4%[5]	1.2%	1.6%	1.8%
Farrell et al. (2003)	Rhode Island	Jan 2001-Dec 2002	445,593	14,660	Contraband	NA	23.5% (White)	17.8% (Nonwhites)[6]	NA
Engel & Calnon (2004a)	Nationwide (Police Public Contact Survey)	1998-1999	11% of 80,543 weighted survey respondents	6.6% of stops	Contraband	13.3%	16.6%	7.1%	9.4%

NOTES: [1] Unless otherwise noted, the hit rate measures the percent of searches conducted during traffic stops that produced contraband or resulted in arrest.
[2] The Maryland study did not analyze traffic stops without searches.
[3] The NYC study reported hit rates as a ratio of the number of stops per arrest.
[4] The New Jersey study examined searches over a longer time period (1994-1999) than traffic stops (1997-1998).
[5]The Tennessee study measured hit rates as the percentage of all stops (rather than searches) that produced contraband
[6] Note, however, that these percentages are based on statewide statistics. Looking at individual police agencies, the authors found variation in the hit rate patterns. Of the 45 agencies, 2/3 had higher hit rates for whites, and the other 1/3 had higher hit rates for nonwhites.

PSP Search Success Rates

The search success rates for each racial category are measured by examining only the drivers that Troopers reported they had searched. It is presumed that if drivers were being searched strictly based on legal factors and suspicions unrelated to race, similar percentages of searches resulting in seizures should be observed across racial groups. As documented previously in **Table 6.2** and **Figure 6.1** below, however, the searches of white drivers yielded a higher rate of contraband seized compared to other racial groups. Specifically, department-wide 28.7% of the searches of white drivers resulted in the seizure of contraband, compared to 20.5% of the searches of black drivers, 17.3% of the searches of Hispanic drivers, and only 11.5% of the searches of drivers of other racial groups.

Figure 6.1. Search success rates for all searches by racial /ethnic groups (n=2,442).



It is possible that these racial disparities in search success rates are the result of a disproportionate number of minority searches that are mandated and do not result in the discovery of contraband. For example, with searches incident to arrest or as the result of inventory, Troopers are required by departmental policy to conduct a search. If these types of searches are: 1) more likely to be executed on minority drivers, and 2) less likely to result in the discovery of contraband compared to other types of more discretionary searches, then the racial disparities in search success rates could be due to legitimate factors.

To explore these possibilities, 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 and inventory searches (n=316, 12.7% of all searches). The second search category (Type II) includes searches that are not mandatory, but rather based on suspicion and officer discretion. Specifically, Type II searches include plain view searches, canine alert searches, and drug odor searches (n=499, 20.1% of all 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 (n=1,669, 67.2% of all searches). 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.

Figures 6.2, **6.3,** and **6.4** document the racial disparities in search success rates for Type I, II, and III searches. **Figure 6.2** displays the search success rates by racial groups for the Type I searches (i.e., mandatory searches based on PSP policy). Department-wide, 33.7% of Type I searches are successful for white motorists, compared to 23.9% for black motorists, and 19.4% for Hispanic motorists. Note that drivers of “other” race have been eliminated from the figure because only two drivers were searched for mandatory reasons. The Pearson’s chi-square statistic indicates that these differences across racial groups are not statistically significant at the 0.05 level (p=0.181). That is, the differences in Type I search success rates across racial groups displayed in **Figure 6.2** are not statistically significant.

Figure 6.2. Type I search success rates by racial /ethnic groups (n=309).

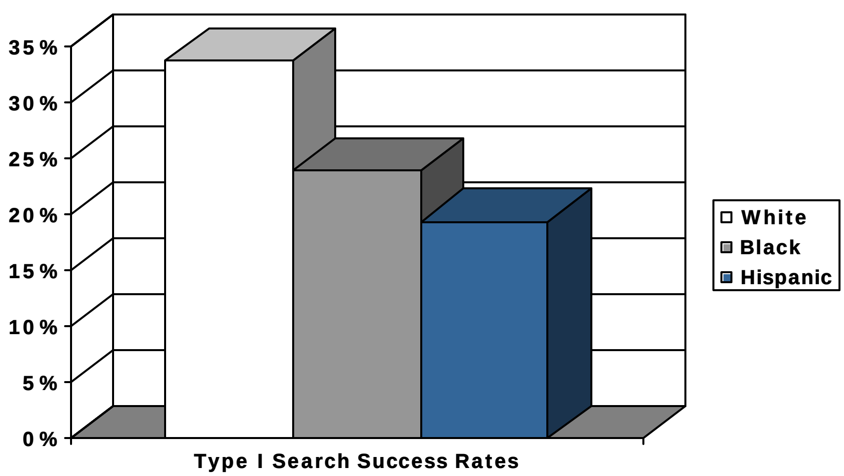


Figure 6.3 below displays the search success rates by racial groups for Type II searches (i.e., searches based on suspicion and officer discretion). The overall success rate of Type II searches is much higher than Type I searches. For Type II searches, 62.6% percent of white motorists searched based on suspicion were found to be carrying contraband, compared to 49.5% of black motorists and 52.6% of Hispanic motorists. Drivers of “other” races have been eliminated from the figure because only three searches based on suspicion were conducted. The Pearson’s chi-square statistic indicates that these differences across racial groups are not statistically significant at the 0.05 level (p=0.098). That is, the differences in Type II search success rates across racial groups displayed in **Figure 6.3** are not statistically significant.

Figure 6.3. Type II search success rates by racial /ethnic groups (n=490).

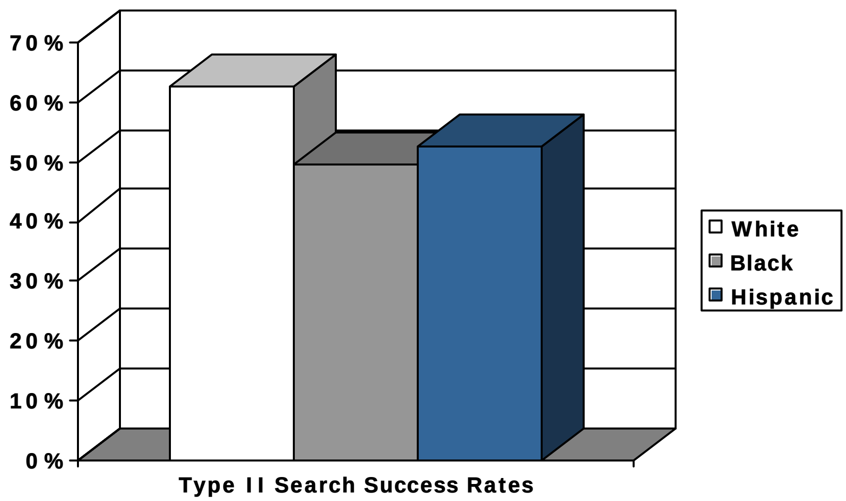
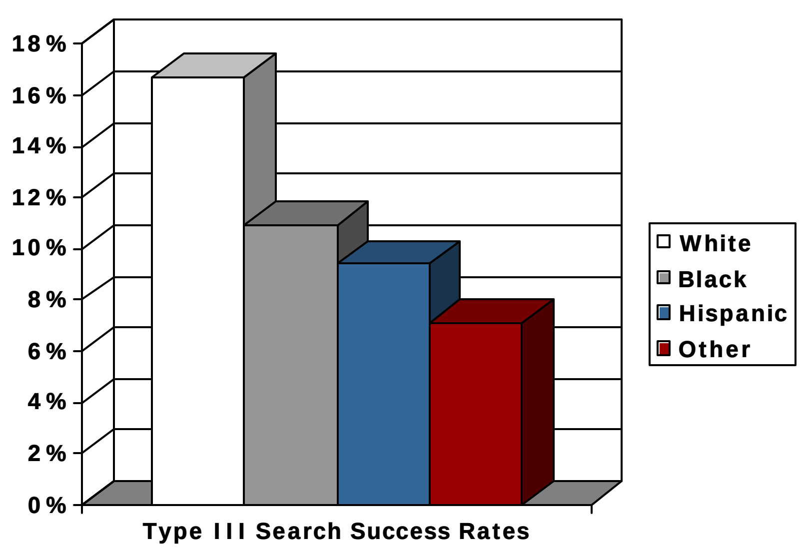


Figure 6.4 below displays the search success rates by racial groups for Type III searches based on the most officer discretion. For these analyses, the "other" race category is included (56 drivers of "other race" were searched based on the most officer discretion). As shown in **Figure 6.4**, overall the search success rates are the lowest for Type III searches although these are the most common types of searches conducted by PSP Troopers. Type III searches were successful for 16.7% of white drivers searched for discretionary reasons, compared to 10.9% of black drivers, 9.4% of Hispanic drivers, and 7.1% of drivers of other race. The chi-square statistic indicates that these differences across racial groups are statistically significant (p=0.003). That is, the racial disparities in search success rates for Type III searches are statistically significant.

Figure 6.4. Type III search success rates by racial /ethnic groups (n=2131).



Based on these analyses, it appears that the searches conducted based on less officer discretion (Type I and II searches) have success rates that are relatively equivalent across racial groups. Yet, when drivers are searched for more discretionary reasons (Type III searches), blacks, Hispanics, and drivers of other races / ethnicities are significantly less likely to be in possession of contraband, compared to whites. The differences in search success rates across racial groups for PSP are similar to differences in national averages and some of the local and statewide studies reviewed above. Thus, although Black and Hispanic drivers are searched at higher rates compared to white drivers, PSP Troopers find less contraband during the most discretionary types of searches of minority drivers compared to searches of white drivers.

Differential searches and success rates of minorities drivers appears to be a department-wide issue for concern, although the gap between the percentages of white 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 white 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 is approximately half of the percentage for white drivers in these areas and troops. Station level differences are also reported in **Table 6.4**, however, the percentage of searches resulting in seizures is not included in this table. At the station level, the number of searches is too small for meaningful comparison.

Reasons for the search and types of evidence seized

Table 6.6 documents the number of searches and eight reasons for the searches (i.e., consent, drug odor, plain view, incident to arrest, canine alert, inventory, reasonable suspicion/ probable cause, and other) by department, area, troop, and station. Of the 2,484 searches conducted, 6.2% were conducted for an unknown reason (i.e., Troopers did not indicate any reason on the form for the search). Troopers may have also indicated that a search was conducted for multiple reasons, thus the sum of percentages across search categories may exceed 100%. The last column in **Table 6.6** indicates the percentage of searches that were conducted only based on the driver's consent.

As shown in **Table 6.6**, the majority of searches across the department (67.8%) were conducted after motorists gave their consent and for 44.4% of searches, consent was the only reason for the search. The second most prevalent reason for a search was reasonable suspicion or probable cause (20.8% of searches), followed by odor of drugs (15.1%), plain view (7.9%), incident to arrest (7.0%), inventory (6.4%), some other (unspecified) reason (2.6%), and canine alerts (2.3%). **Table 6.6** 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 and troops. For example, 78.4% of searches conducted in Area IV were based on consent, compared to only 55.7% in Area V.

Table 6.6 Reasons for Search by Department, Area, Troop, and Station (p.1 of 4)

	# of Searches	% Consent	% Drug Odor	% Plain View	% Incident to Arrest	% Canine Alert	% Inventory	% Reas. Susp./ Prob. Cause	% Other	% Consent Only
PSP Dept.*	2,484	67.8	15.1	7.9	7.0	2.3	6.4	20.8	2.6	44.4
AREA I	689	66.2	15.1	8.0	7.1	2.8	3.8	19.2	3.8	44.7
Troop H	221	67.4	15.4	6.8	5.4	0.0	2.3	14.5	5.4	52.0
Carlisle	29	75.9	6.9	0.0	0.0	0.0	3.5	24.1	10.3	65.5
Chambersburg	89	82.0	14.6	3.4	2.3	0.0	0.0	12.4	1.1	65.2
Gettysburg	4	75.0	0.0	25.0	0.0	0.0	0.0	0.0	25.0	50.0
Harrisburg	14	50.0	0.0	7.1	0.0	0.0	0.0	14.3	0.0	35.7
Lykens	5	40.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	40.0
Newport	5	20.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0	20.0
York	75	54.7	25.3	12.0	10.7	0.0	5.3	16.0	9.3	37.3
Troop J	133	57.1	16.5	10.5	13.5	0.0	6.0	14.3	3.0	40.6
Avondale	40	62.5	17.5	12.5	2.5	0.0	5.0	10.0	5.0	37.5
Embreeville	41	58.5	14.6	7.3	14.6	0.0	9.8	14.6	2.4	46.3
Ephrata	17	29.4	23.5	5.9	41.2	0.0	0.0	29.4	5.9	23.5
Lancaster	35	62.9	14.3	14.3	11.4	0.0	5.7	11.4	0.0	45.7
Troop L	113	75.2	9.7	12.4	6.2	15.0	0.9	13.3	2.7	46.0
Frackville	24	66.7	8.3	8.3	4.2	0.0	0.0	37.5	4.2	41.7
Hamburg	2	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0
Jonestown	69	82.6	11.6	13.0	4.4	24.6	1.5	2.9	2.9	49.3
Reading	12	58.3	8.3	8.3	16.7	0.0	0.0	16.7	0.0	41.7
Schuylkill Haven	6	66.7	0.0	33.3	16.7	0.0	0.0	33.3	0.0	33.3
Troop T	222	65.8	16.7	5.4	5.4	0.9	5.4	29.7	3.2	39.2
Bowmansville	23	56.5	34.8	8.7	0.0	0.0	8.7	21.7	4.4	39.1
Everett	35	80.0	25.7	2.9	11.4	0.0	5.7	31.4	0.0	45.7
Gibsonia	14	42.9	0.0	0.0	7.1	0.0	0.0	50.0	7.1	14.3
King of Prussia	16	37.5	31.3	6.3	12.5	6.3	18.8	25.0	0.0	6.3
New Stanton	14	50.0	0.0	0.0	7.1	0.0	0.0	0.0	7.1	42.9
Newville	42	73.8	26.2	4.8	2.4	2.4	7.1	61.9	4.8	19.0
Pocono	9	33.3	0.0	0.0	0.0	0.0	11.1	22.2	0.0	33.3
Somerset (T)	69	75.4	5.8	8.7	4.4	0.0	1.5	15.9	2.9	60.9

Table 6.6 Reasons for Search by Department, Area, Troop, and Station* (p.2 of 4)

	# of Searches	% Consent	% Drug Odor	% Plain View	% Incident to Arrest	% Canine Alert	% Inventory	% Reas. Susp./ Prob. Cause	% Other	% Consent Only
AREA II	182	65.4	15.9	9.9	1.1	1.1	1.7	15.9	1.7	48.4
Troop F	70	55.7	24.3	14.3	1.4	0.0	0.0	15.7	1.4	34.3
Coudersport	24	54.2	29.2	16.7	4.2	0.0	0.0	12.5	4.2	25.0
Emporium	2	50.0	0.0	50.0	0.0	0.0	0.0	50.0	0.0	0.0
Lamar	7	42.9	0.0	14.3	0.0	0.0	0.0	14.3	0.0	42.9
Mansfield	3	66.7	33.3	0.0	0.0	0.0	0.0	66.7	0.0	0.0
Milton	9	33.3	22.2	11.1	0.0	0.0	0.0	0.0	0.0	22.2
Montoursville	12	83.3	25.0	16.7	0.0	0.0	0.0	16.7	0.0	58.3
Selinsgrove	12	58.3	25.0	0.0	0.0	0.0	0.0	16.7	0.0	50.0
Stonington	1	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Troop P	30	56.7	10.0	13.3	0.0	0.0	6.7	16.7	0.0	46.7
Laporte	3	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.7
Shickshinny	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Towanda	11	54.6	9.1	18.2	0.0	0.0	0.0	36.4	0.0	45.5
Tunkhannock	5	60.0	20.0	40.0	0.0	0.0	0.0	20.0	0.0	20.0
Wyoming	10	50.0	10.0	0.0	0.0	0.0	20.0	0.0	0.0	50.0
Troop R	82	76.8	11.0	4.9	1.2	2.4	1.2	15.9	2.4	61.0
Blooming Grove	15	73.3	0.0	0.0	6.7	0.0	0.0	20.0	0.0	66.7
Dunmore	28	75.0	7.1	3.6	0.0	7.1	3.6	25.0	7.1	46.4
Gibson	13	92.3	7.7	7.7	0.0	0.0	0.0	7.7	0.0	76.9
Honesdale	26	73.1	23.1	7.7	0.0	0.0	0.0	7.7	0.0	65.4
AREA III	406	68.7	17.2	9.1	10.6	0.5	2.5	17.2	2.7	45.6
Troop A	112	63.4	19.6	9.8	12.5	0.9	3.6	24.1	6.3	39.3
Ebensburg	12	58.3	8.3	0.0	16.7	8.3	0.0	25.0	0.0	33.3
Greensburg	24	70.8	16.7	8.3	8.3	0.0	4.2	16.7	4.2	41.7
Indiana	32	53.1	25.0	6.3	9.4	0.0	3.1	15.6	15.6	40.6
Kiski Valley	18	55.6	5.6	5.6	22.2	0.0	11.1	22.2	0.0	38.9
Somerset (A)	26	76.9	30.8	23.1	11.5	0.0	0.0	42.3	3.9	38.5

Table 6.6 Reasons for Search by Department, Area, Troop, and Station* (p.3 of 4)

	# of Searches	% Consent	% Drug Odor	% Plain View	% Incident to Arrest	% Canine Alert	% Inventory	% Reas. Susp./ Prob. Cause	% Other	% Consent Only
Troop B	181	75.7	17.7	5.5	5.5	0.6	2.8	8.3	1.1	55.8
Belle Vernon	14	57.1	57.1	7.1	0.0	7.1	7.1	7.1	0.0	21.4
Findlay	22	63.6	22.7	4.6	13.6	0.0	4.6	4.6	4.6	45.5
Uniontown	54	79.6	7.4	7.4	9.3	0.0	1.9	3.7	0.0	68.5
Washington	63	81.0	22.2	4.8	0.0	0.0	1.6	12.7	0.0	52.4
Waynesburg	28	75.0	3.6	3.6	7.1	0.0	3.6	10.7	3.6	64.3
Troop G	113	62.8	14.2	14.2	16.8	0.0	0.9	24.8	1.8	35.4
Bedford	7	85.7	0.0	14.3	0.0	0.0	0.0	28.6	0.0	57.1
Hollidaysburg	29	48.3	0.0	17.2	24.1	0.0	3.5	20.7	3.5	34.5
Huntingdon	13	69.2	46.2	23.1	53.9	0.0	0.0	23.1	0.0	23.1
Lewistown	16	50.0	0.0	12.5	12.5	0.0	0.0	6.3	6.3	50.0
McConnellsburg	8	87.5	12.5	12.5	0.0	0.0	0.0	0.0	0.0	62.5
Philipsburg	2	0.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0
Rockview	38	71.1	21.1	10.5	5.3	0.0	0.0	42.1	0.0	26.3
AREA IV	468	78.4	15.8	5.3	6.4	2.6	1.5	17.7	1.7	54.3
Troop C	176	80.1	8.0	1.7	3.4	2.3	1.7	25.0	1.1	55.1
Clarion	82	89.0	4.9	3.7	1.2	1.2	0.0	30.5	2.4	61.0
Clearfield	31	90.3	6.5	0.0	3.2	3.2	3.2	25.8	0.0	64.5
Dubois	25	76.0	4.0	0.0	0.0	4.0	8.0	28.0	0.0	44.0
Kane	17	52.9	11.8	0.0	11.8	0.0	0.0	0.0	0.0	41.2
Punxsutawney	12	58.3	25.0	0.0	8.3	8.3	0.0	8.3	0.0	41.7
Ridgway	4	50.0	25.0	0.0	0.0	0.0	0.0	25.0	0.0	50.0
Tionesta	5	60.0	20.0	0.0	20.0	0.0	0.0	40.0	0.0	40.0
Troop D	163	77.9	15.3	6.8	10.4	1.8	1.8	13.5	1.2	60.1
Beaver	11	90.9	9.1	0.0	9.1	0.0	0.0	9.1	9.1	81.8
Butler	27	77.8	7.4	11.1	14.8	0.0	3.7	11.1	0.0	63.0
Kittanning	50	62.0	30.0	8.0	24.0	4.0	4.0	16.0	0.0	36.0
Mercer	68	88.2	10.3	5.9	0.0	1.5	0.0	13.2	0.0	73.5
New Castle	7	71.4	0.0	0.0	0.0	0.0	0.0	14.3	14.3	57.1

Table 6.6 Reasons for Search by Department, Area, Troop, and Station* (p.4 of 4)

	# of Searches	% Consent	% Drug Odor	% Plain View	% Incident to Arrest	% Canine Alert	% Inventory	% Reas. Susp./ Prob. Cause	% Other	% Consent Only
Troop E	129	76.7	27.1	8.5	5.4	3.9	0.8	13.2	3.1	45.7
Corry	2	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	50.0
Erie	21	76.2	19.1	9.5	0.0	4.8	0.0	9.5	4.8	57.1
Franklin	9	66.7	11.1	11.1	0.0	0.0	11.1	11.1	0.0	44.4
Girard	18	55.6	22.2	0.0	16.7	5.6	0.0	16.7	11.1	22.2
Meadville	72	84.7	36.1	6.9	5.6	4.2	0.0	13.9	1.4	47.2
Warren	7	71.4	0.0	28.6	0.0	0.0	0.0	14.3	0.0	57.1
AREA V	535	55.7	15.7	8.8	8.6	0.9	19.1	15.0	2.1	40.4
Troop K	290	51.7	21.0	10.0	6.9	0.7	27.2	12.1	1.0	38.3
Media	188	52.7	20.2	11.7	7.5	0.5	25.5	15.4	0.5	38.8
Philadelphia	47	53.2	23.4	4.3	2.1	2.1	27.7	8.5	4.3	36.2
Skippack	55	47.3	21.8	9.1	9.1	0.0	32.7	3.6	0.0	38.2
Troop M	164	55.5	11.6	8.5	14.0	1.2	10.4	18.9	4.9	36.6
Belfast	33	66.7	9.1	6.1	6.1	0.0	6.1	33.3	3.0	33.3
Bethlehem	24	54.2	16.7	16.7	8.3	0.0	4.2	4.2	0.0	54.2
Dublin	25	44.0	24.0	20.0	24.0	0.0	8.0	24.0	8.0	12.0
Fogelsville	44	77.3	6.8	4.6	2.3	4.6	4.6	20.5	11.4	59.1
Trevose	38	29.0	7.9	2.6	31.6	0.0	26.3	10.5	0.0	18.4
Troop N	81	70.4	4.9	4.9	3.7	1.2	7.4	17.3	0.0	55.6
Bloomsburg	2	100.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	50.0
Fern Ridge	6	66.7	0.0	16.7	0.0	0.0	0.0	16.7	0.0	50.0
Hazleton	21	61.9	9.5	9.5	4.8	4.8	4.8	33.3	0.0	38.1
Lehighton	6	16.7	0.0	16.7	0.0	0.0	16.7	0.0	0.0	16.7
Swiftwater	46	80.4	4.4	0.0	4.4	0.0	8.7	10.9	0.0	69.6
Canine	191	81.7	6.8	7.9	2.1	8.4	3.7	63.4	2.6	23.6

* The total number of searches for the department includes 9 searches resulting from special projects and 4 searches with invalid station codes. These searches are not included in Area or Troop totals.

Table 6.7 explores the differences in reasons for the search by drivers' characteristics (e.g., race, sex, and age) and Troopers' characteristics (e.g., race, sex, years of experience, and education). In addition, **Table 6.7** reports whether or not there were statistically significant differences among these groups using the chi-square statistic.

As shown in **Table 6.7**, white drivers were significantly more likely than minority drivers to be searched based on the odor of drugs or alcohol, contraband in plain view, and incident to an arrest. In contrast, black and Hispanic drivers were statistically significantly more likely than white drivers to be searched based on consent, canine alerts, inventory checks, or reasonable suspicion / probable cause. There are mixed findings regarding racial differences in the percentage of drivers searched only for consent. Drivers of other race were the most likely to be searched based only on consent (59.0% of other drivers), while black drivers were the least likely (40.9% of black drivers).

Table 6.7 also illustrates that although differences in the reasons for searches exist for racial groups, reasons for searches do not differ significantly between male and female drivers. For drivers' age, four reasons for searches differ for younger and older drivers (i.e., odor of drugs, plain view, incident to arrest, and consent only). Specifically, drivers under 25 years old are significantly more likely to be searched based on odor of drugs, evidence / contraband in plain view, and only based on consent, but significantly less likely to be searched incident to an arrest compared to drivers 25 years and older. While the data cannot address the legality of individual searches, it does suggest that different trends exist in the reasons for searching particular racial and age groups, but not by drivers' gender.

Table 6.7 Reasons for Search by Driver and Trooper Characteristics

	Total # of Searches	% Consent	% Odor of Drugs	% Plain View	% Incident to Arrest	% Canine Alert	% Inventory	% Reas. Susp./ Prob. Cause	% Other	% Consent ONLY
Driver Characteristics										
White Driver	1,616	65.3***	17.3***	9.3***	8.2*	1.0***	4.2***	17.5***	2.5	44.7*
Black Driver	516	70.7	13.4	6.6	5.2	3.9	12.6	26.0	2.9	40.9
Hispanic Driver	249	74.3	8.8	4.4	4.4	6.0	8.4	28.5	3.6	46.2
Other Driver	61	83.6	1.6	0.0	3.3	6.6	1.6	29.5	0.0	59.0
Male Driver	2,175	68.1	14.7	8.1	6.9	2.3	6.5	20.8	2.6	45.0
Female Driver	301	66.1	18.3	6.6	7.6	1.7	5.0	20.6	3.0	40.5
Driver 25 years old or under	1,164	68.6	17.4***	10.0***	5.7*	2.1	5.8	19.1	2.2	46.8*
Driver over 25 years old	1,318	67.0	13.2	6.1	8.2	2.4	6.8	22.2	3.0	42.3
Trooper Characteristics										
White Trooper	2,321	68.4**	15.2	8.2*	7.1	2.3	6.0*	21.5**	2.7	44.4
Non-White Trooper	152	57.9	14.5	3.3	5.9	2.0	11.2	11.8	2.0	43.4
Female Trooper	43	58.1	16.3	7.0	11.6	0.0	7.0	14.0	4.7	41.9
Male Trooper	2,430	67.9	15.1	1.9	6.9	2.3	6.3	21.0	2.6	44.4
< 5 Years Experience	775	70.8*	13.5	7.5	7.1	2.5	6.1	13.3***	1.7*	52.5***
>5 Years Experience	1,698	66.4	15.9	8.1	6.9	2.2	6.5	24.3	3.1	4.1
No College	915	65.4	19.0***	8.3	8.0	1.7***	5.5***	23.1*	2.6	4.0**
2 Year Degree	590	70.2	10.8	7.5	5.6	4.7	3.9	22.0	3.4	44.7
4 Year Degree	969	68.6	14.1	7.8	6.9	1.2	8.7	18.1	2.2	47.9

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

It is likely that different reasons for searches might lead to varying search success rates. **Table 6.8** explores this possibility. Specifically, **Table 6.8** illustrates the overall search success rate, and the success rates for each specific type of search at both the department and area levels. Considering the data collected department-wide, the overall search success rate is 25.4 percent. This rate, however, varies from a high of 87.8% for plain view searches to a low of 14.1% for searches based only on consent. Searches based on consent, inventory, reasonable suspicion / probable cause, and "other" unspecified reasons are the types of searches likely to be the least successful in terms of discovering contraband. In contrast, searches based on evidence in plain view and canine alerts are the most successful, while searches based on the odor of drugs or alcohol and searches incident to arrest are moderately successful. These patterns remain relatively consistent across areas within the department.

Table 6.8 Hit Rates by Reasons for Search for Department and Areas

	Total # Searches	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.	2,484	25.4	21.1	49.5	87.8	39.7	66.1	22.8	31.4	21.5	14.1
Area I	689	27.9	25.9	43.3	87.3	40.8	73.7	42.3	37.9	30.8	18.8
Area II	182	24.7	16.8	51.7	94.4	50.0*	50.0*	33.3*	24.1	33.3*	11.4
Area III	406	25.1	20.8	40.0	83.8	46.5	100.0*	40.0	30.0	18.2	13.5
Area IV	468	24.6	21.3	56.8	96.0	26.7	75.0	28.6	30.1	25.0	13.4
Area V	535	23.6	15.1	54.8	89.4	39.1	20.0	15.7	35.0	0.0	7.3
Canine	191	25.7	22.4	76.9	73.3	50.0*	62.5	28.6	25.6	0.0*	15.6

* Five or fewer searches conducted; interpret percentage with caution

Table 6.9 documents the types of evidence and/or contraband confiscated during searches conducted by PSP Troopers. Of the 2,484 searches conducted department-wide during the 12 month data collection period, 631 (25.4%) resulted in the seizure of some type of contraband. A majority of the contraband seized was drug (61.3%) or alcohol (18.2%) related. Approximately 17.9% of the evidence seized was categorized as "other."[16] **Table 6.9** also documents the differences in the types of evidence seized across areas and troops. For example, 6.9% of the seizures in Area III were of weapons, compared to only 3.5% of the seizures in Area IV.

[16] 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) are destroyed as per the contractual agreement with PSP.

Table 6.9. 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.*	631	7.8	61.3	7.9	5.5	2.9	18.2	17.9
AREA I	192	9.9	57.8	10.4	5.7	3.1	19.8	19.8
Troop H	46	2.2	58.7	15.2	6.5	4.4	23.9	15.2
Carlisle	5	0.0	20.0	0.0	20.0	0.0	20.0	60.0
Chambersburg	13	0.0	76.9	7.7	0.0	7.7	15.4	7.7
Gettysburg	2	0.0	50.0	0.0	0.0	0.0	50.0	0.0
Harrisburg	2	0.0	50.0	0.0	0.0	0.0	0.0	50.0
Lykens	2	0.0	0.0	50.0	0.0	0.0	50.0	50.0
Newport	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0
York	21	4.8	61.9	23.8	9.5	4.8	28.6	4.8
Troop J	36	5.6	58.3	5.6	2.8	5.6	19.4	30.6
Avondale	7	0.0	28.6	0.0	0.0	0.0	57.1	14.3
Embreeville	15	0.0	66.7	0.0	6.7	0.0	6.7	40.0
Ephrata	3	0.0	33.3	0.0	0.0	0.0	33.3	66.7
Lancaster	11	18.2	72.7	18.2	0.0	18.2	9.1	18.2
Troop L	39	10.3	59.0	2.5	2.6	2.6	23.1	7.7
Frackville	6	0.0	16.7	0.0	0.0	16.7	33.3	33.3
Hamburg	0	--	--	--	--	--	--	--
Jonestown	26	15.4	61.5	3.9	3.9	0.0	23.1	3.9
Reading	4	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Schuylkill Haven	3	0.0	66.7	0.0	0.0	0.0	33.3	0.0
Troop T	71	16.9	56.3	14.1	8.5	1.4	15.5	23.9
Bowmansville	11	9.1	54.6	18.2	9.1	0.0	27.3	9.1
Everett	9	11.1	55.6	11.1	0.0	0.0	22.2	33.3
Gibsonia	0	--	--	--	--	--	--	--
King of Prussia	3	0.0	33.3	0.0	33.3	0.0	0.0	33.3
New Stanton	2	0.0	0.0	50.0	0.0	0.0	0.0	50.0
Newville	10	40.0	50.0	20.0	20.0	0.0	0.0	10.0
Pocono	3	33.3	0.0	33.3	33.3	0.0	0.0	0.0
Somerset (T)	33	15.2	69.7	9.1	3.0	3.0	18.2	30.3

Table 6.9. 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	45	4.4	53.3	8.9	6.7	2.2	28.9	17.8
Troop F	21	0.0	47.6	4.8	4.8	4.8	38.1	14.3
Coudersport	8	0.0	37.5	0.0	0.0	0.0	50.0	37.5
Emporium	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Lamar	2	0.0	50.0	0.0	50.0	0.0	0.0	0.0
Mansfield	0	--	--	--	--	--	--	--
Milton	3	0.0	66.7	33.3	0.0	33.3	0.0	0.0
Montoursville	4	0.0	50.0	0.0	0.0	0.0	50.0	0.0
Selinsgrove	2	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Stonington	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Troop P	8	12.5	62.5	12.5	0.0	0.0	37.5	0.0
Laporte	0	--	--	--	--	--	--	--
Shickshinny	0	--	--	--	--	--	--	--
Towanda	4	0.0	75.0	0.0	0.0	0.0	25.0	0.0
Tunkhannock	3	0.0	33.3	0.0	0.0	0.0	66.7	0.0
Wyoming	1	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Troop R	16	6.3	56.3	12.5	12.5	0.0	12.5	31.3
Blooming Grove	3	0.0	66.7	0.0	33.3	0.0	0.0	33.3
Dunmore	4	25.0	50.0	50.0	25.0	0.0	0.0	25.0
Gibson	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Honesdale	8	0.0	50.0	0.0	0.0	0.0	25.0	37.5
AREA III	102	6.9	52.9	9.8	6.9	2.0	23.5	16.7
Troop A	28	3.6	53.6	17.9	7.1	3.6	17.9	25.0
Ebensburg	2	0.0	50.0	50.0	0.0	0.0	50.0	0.0
Greensburg	7	0.0	71.4	14.3	0.0	0.0	0.0	28.6
Indiana	8	0.0	50.0	37.5	25.0	12.5	0.0	25.0
Kiski Valley	2	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Somerset (A)	9	11.1	55.6	0.0	0.0	0.0	44.4	11.1

Table 6.9. 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	33	12.1	45.5	3.0	6.1	3.0	21.2	18.2
Belle Vernon	5	20.0	20.0	0.0	0.0	0.0	0.0	60.0
Findlay	4	50.0	75.0	0.0	25.0	0.0	0.0	0.0
Uniontown	9	11.1	55.6	0.0	11.1	0.0	11.1	11.1
Washington	11	0.0	54.6	0.0	0.0	0.0	45.5	0.0
Waynesburg	4	0.0	0.0	25.0	0.0	25.0	25.0	50.0
Troop G	41	4.9	58.5	9.8	7.3	0.0	29.3	9.8
Bedford	2	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Hollidaysburg	16	0.0	56.3	12.5	12.5	0.0	25.0	6.3
Huntingdon	9	11.1	66.7	11.1	11.1	0.0	33.3	0.0
Lewistown	6	16.7	50.0	16.7	0.0	0.0	33.3	33.3
McConnellsburg	3	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Philipsburg	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Rockview	4	0.0	25.0	0.0	0.0	0.0	50.0	25.0
AREA IV	115	5.2	67.0	4.4	3.5	1.7	15.7	21.7
Troop C	26	0.0	65.4	3.9	7.7	3.9	15.4	23.1
Clarion	11	0.0	63.6	9.1	0.0	0.0	27.3	36.4
Clearfield	2	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Dubois	6	0.0	50.0	0.0	0.0	0.0	16.7	33.3
Kane	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Punxsutawney	3	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Ridgway	1	0.0	0.0	0.0	100.0	100.0	0.0	0.0
Tionesta	2	0.0	50.0	0.0	50.0	0.0	0.0	0.0
Troop D	35	17.1	77.1	8.6	2.9	2.9	8.6	17.1
Beaver	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Butler	6	16.7	66.7	16.7	0.0	0.0	0.0	50.0
Kittanning	15	20.0	80.0	13.3	6.7	6.7	0.0	6.7
Mercer	13	15.4	76.9	0.0	0.0	0.0	23.1	15.4
New Castle	0	--	--	--	--	--	--	--

Table 6.9. 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	54	0.0	61.1	1.9	1.9	0.0	20.4	24.1
Corry	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Erie	7	0.0	57.1	14.3	0.0	0.0	42.9	0.0
Franklin	2	0.0	100.0	0.0	0.0	0.0	50.0	0.0
Girard	2	0.0	50.0	0.0	0.0	0.0	50.0	0.0
Meadville	39	0.0	64.1	0.0	2.6	0.0	10.3	30.8
Warren	3	0.0	33.3	0.0	0.0	0.0	66.7	0.0
AREA V	126	4.0	63.5	6.4	6.4	5.6	14.3	16.7
Troop K	84	1.2	75.0	3.6	4.8	3.6	9.5	11.9
Media	54	1.9	70.4	3.7	5.6	5.6	13.0	13.0
Philadelphia	18	0.0	72.2	5.6	5.6	0.0	5.6	16.7
Skippack	12	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Troop M	29	10.3	34.5	13.8	13.8	10.3	31.0	20.7
Belfast	4	25.0	25.0	0.0	0.0	0.0	50.0	0.0
Bethlehem	6	0.0	33.3	0.0	33.3	0.0	16.7	33.3
Dublin	8	0.0	62.5	0.0	0.0	0.0	37.5	25.0
Fogelsville	6	33.3	16.7	16.7	16.7	0.0	33.3	16.7
Trevose	5	0.0	20.0	60.0	20.0	60.0	20.0	20.0
Troop N	13	7.7	53.9	7.7	0.0	7.7	7.7	38.5
Bloomsburg	0	--	--	--	--	--	--	--
Fern Ridge	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Hazleton	6	0.0	66.7	16.7	0.0	16.7	0.0	16.7
Lehighton	2	0.0	0.0	0.0	0.0	0.0	50.0	50.0
Swiftwater	4	25.0	75.0	0.0	0.0	0.0	0.0	50.0
Canine	49	20.4	79.6	6.4	4.1	0.0	8.2	8.2

* 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.

Collectively, the information provided in **Tables 6.6 – 6.9** suggests a number of patterns that might be influencing the department's overall search success rate:

- Most searches conducted by Troopers are based solely on the drivers' consent (44.4%). The second most common reason for a search is reasonable suspicion and/or probable cause (20.8% 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 14.3%, compared to 30.4% for Type I (mandatory) searches and 59.3% for Type II (suspicion) searches. Within the Type III search category, searches based solely on consent were the least successful. Department-wide, 14.1% of searches based solely on consent resulted in the discovery of evidence.

- Hispanic and other non-Caucasian drivers are significantly more likely to be searched based solely on consent compared to white and black drivers. Likewise, all minority drivers are significantly more likely to be searched based on canine alerts, inventory, and reasonable suspicion / probable cause compared to white drivers. In contrast, Caucasian drivers are more likely to be searched based on odor of drugs, contraband in plain view, and incident to an arrest compared to minority drivers.

- PSP searches of minority drivers are less successful in recovering contraband compared to searches of white drivers. Specifically, department-wide 28.7% of the searches of white drivers resulted in the seizure of contraband, compared to 20.5% of the searches of black drivers, 17.3% of the searches of Hispanic drivers, and only 11.5% of the searches of drivers of other racial groups.

- Separate 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 the result of Type III (or the most discretionary) searches. While there are slight differences across racial / ethnic groups search success rates for Type I and Type II searches, these differences are not statistically significant. In contrast, racial differences in search success rates for Type III searches are statistically significant. Department-wide, 16.7% of Type III searches of white drivers resulted in the seizure of contraband, compared to only 10.9% of discretionary searches of black drivers, 9.4% of discretionary searches of Hispanic drivers, and 7.1% of the discretionary searches of drivers of other racial groups.

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

One explanation for the racial disparity reported in search success rates is that minority citizens are simply less likely to be in possession of contraband compared to white citizens. The "carrying rates" of different racial and ethnic groups in the overall population, however, are unknown. This study only provides information on those citizens who were stopped and subsequently searched. Thus, results from these data cannot be used to determine behavior in the population as a whole.

A second explanation for the racial disparity reported in search success rates is that Troopers may impose a lower threshold for black and Hispanic drivers compared to white drivers when determining whether to conduct a search. If Troopers do impose a lower threshold for black drivers (either consciously or unconsciously), the result would likely be a widening of law enforcement's net to include a larger pool of innocent black and Hispanic drivers (Harris, 2002; Russell, 1999; Skolnick & Caplovitz, 2001).

TROOPER DIFFERENCES IN STOP OUTCOMES

It is possible that differences in stop and post-stop outcome patterns exist based on Troopers' characteristics. It is plausible that male and female Troopers, white 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 6.10 – 6.14** present bivariate relationships between Troopers' characteristics and decisions to stop, warn, cite, arrest, and search different racial groups of drivers. Statistically significant bivariate relationships are indicated with an asterisk. As with all the bivariate relations 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 6.10 documents the relationship between Troopers' characteristics and traffic stops of different racial groups. Troopers' characteristics include their sex (male/female), race (Caucasian, non-Caucasian), years of experience (coded as less than five years as a PSP Trooper, and 5 years or more), education (coded as no college degree, 2 years of college, and 4 years or more of college), assignment (including patrol, crime, staff, canine, or other) and rank (coded as Trooper or Corporal or higher). The race/ethnicity of drivers stopped is captured as non-Hispanic white, non-Hispanic black, Hispanic, and a combined category of any nonwhite (which includes black, Hispanic, Asian, American Indian, and Middle Eastern). Across all four drivers' racial categories, Trooper gender does not have a significant effect. That is, male and female Troopers do not have significantly different percentages in the race/ethnicity of the drivers they stop. In contrast, the effects of Troopers' race across the four drivers' racial categories indicates that white Troopers are more likely to stop white drivers, while nonwhite Troopers are significantly more likely to stop black drivers, Hispanic drivers, and all nonwhite drivers. This is likely due to differences in patrol areas and assignments of nonwhite and white Troopers. Trooper education level only matters, albeit slightly, for the percentage of white drivers stopped. **Table 6.10** also shows significant differences in the percentages of each racial group stopped based on Troopers' job assignments. Finally, rank is not significantly associated with drivers' race/ethnicity.

Table 6.10 Trooper Differences in Stops of Racial Groups

Trooper Characteristics	Total # of Stops	% White drivers stopped	% Black drivers stopped	% Hispanic drivers stopped	% Nonwhite drivers stopped
Female	10,166	85.5	7.5	3.1	14.1
Male	312,836	84.4	8.0	3.1	14.8
White	290,842	84.6*	7.8*	3.0*	14.6*
Nonwhite	32,160	82.4	9.1	3.5	16.9
Less than 5 years experience	91,089	84.9*	7.9	3.2	14.5
5 years experience or more	231,913	84.2	8.0	3.0	14.9
No college degree	135,364	84.4*	7.9	3.1	14.9
2 year college degree	68,298	83.8	8.0	3.1	15.1
= 4 year college degree	111,838	84.7	7.9	3.1	14.5
Patrol Assignment	312,518	84.4*	7.9*	3.0*	14.8*
Crime Assignment	3,293	86.7	6.0	3.5	12.5
Staff Assignment	3,436	86.7	6.5	3.2	12.9
Canine Assignment	119	58.8	26.9	6.7	41.2
Other Assignment	3,636	78.2	11.5	5.6	21.3
Rank of Trooper	294,418	84.3	8.0	3.1	14.8
Rank of Corporal or higher	28,584	84.9	7.6	3.0	14.5

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

Table 6.11 documents the relationship between Troopers' characteristics and traffic stop outcomes for all drivers (regardless of race/ethnicity). Post-stop outcomes include the percentage of drivers stopped by Troopers who were warned, cited, arrested, and searched. **Table 6.11** also includes the number of drivers searched by each Trooper category 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 6.11**, with the exception of searches, male and female Troopers warn, cite, and arrest similar percentages of the drivers they stop. Female Troopers search significantly fewer drivers (0.4%) than male Troopers (0.8%). In contrast, there are several significant differences in outcomes based on Troopers' race. White Troopers are significantly more likely to warn drivers, and significantly less likely to issue citations, compared to nonwhite Troopers. In addition, white Troopers are significantly more likely to arrest and search drivers compared to nonwhite Troopers. Differences in the percentages of drivers warned and issued citations also exist based on Troopers' experience. Troopers with less than five years experience are more likely to issue warnings and citations, compared to Troopers with more than five years on the job. **Table 6.11** also shows significant differences in some stop outcomes based on Troopers' education level. Troopers with more education are significantly more likely to issue formal warnings to motorists and significantly less likely to issue citations compared to Troopers with less education. Post-stop outcomes vary dramatically based on Troopers' assignments. This variation is to be expected based on the nature of police work. Troopers' rank is also associated with significant differences in the percentages of drivers warned and cited, as Troopers are significantly less likely to warn drivers, and more likely to cite drivers, as compared to those whose rank is at least Corporal. Troopers' search success rates only differ significantly by rank. Specifically, Troopers with a supervisory rank have a higher search success rate than Troopers who have not been promoted (35.6% for supervisors compared to 24.2% for Troopers).

Table 6.11 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	10,255	27.4	82.6	0.3	0.4*	43	18.6
Male	315,571	26.6	83.4	0.5	0.8	2,430	25.5
White	293,344	27.5*	82.9*	0.6*	0.8*	2,321	25.8
Nonwhite	32,482	18.6	87.6	0.2	0.5	152	19.1
< than 5 years experience	91,724	28.3*	83.8*	0.5	0.8*	775	23.4
= 5 years experience	234,102	26.0	83.3	0.6	0.7	1,698	26.3
No college degree	136,603	25.1*	84.0*	0.5	0.7*	915	24.2
2 year college degree	68,923	24.5	84.9	0.5	0.8	590	27.4
= 4 year college degree	112,745	29.5	82.1	0.6	0.8	969	25.6
Patrol Assignment	315,224	26.0*	84.1*	0.5*	0.7*	2,144	24.5
Crime Assignment	3,337	46.1	61.1	1.2	1.5	49	28.6
Staff Assignment	3,478	42.6	68.1	0.3	1.1	37	45.9
Canine Assignment	120	45.8	55.8	0.0	6.7	8	12.5
Other Assignment	3,667	44.2	60.0	1.6	6.4	235	30.2
Rank of Trooper	296,932	25.8*	84.2*	0.5	0.7*	2,206	24.2*
Rank of Corporal or higher	28,894	35.1	75.0	0.6	0.9	267	35.6

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

Table 6.12 explores these relationships for only non-Hispanic black drivers. That is, the post-stop outcomes for black drivers are examined based on Troopers' characteristics. As the **Table 6.12** demonstrates, no statistically significant differences in stop outcomes for black drivers are evident by Troopers' gender. Troopers' race is, however, associated with the percentage of warnings issued and searches conducted on black motorists. White Troopers are significantly more likely to warn and search black drivers compared to nonwhite Troopers. Likewise, Troopers with less than five years of experience are also significantly more likely to issue warnings and search black drivers compared to Troopers with five or more years of experience. **Table 6.12** also shows significant differences in some stop outcomes based on Troopers' educational backgrounds and job assignments. Specifically, Troopers with less education are 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, Troopers with no supervisory rank are significantly less likely to warn black drivers, but more likely to cite black drivers, as compared to those of higher ranks. There were no significant differences detected in the success rates of black motorists across any of the Trooper comparisons.

Table 6.12 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	758	19.5	89.1	0.3	0.8	6	16.7
Male	24,940	23.3	86.1	0.7	2.0	508	20.5
White	22,766	23.7*	85.9	0.7	2.1*	482	20.5
Nonwhite	2,932	18.8	87.8	0.4	1.1	32	18.8
< than 5 years experience	7,172	25.0*	86.1	0.7	2.5*	180	20.6
= 5 years experience	18,526	22.4	86.2	0.7	1.8	334	20.4
No college degree	10,755	20.5*	87.5*	0.7	1.7	189	21.9
2 year college degree	5,497	22.6	85.9	0.7	2.3	125	28.8
= 4 year college degree	8,830	26.7	84.9	0.6	2.2	200	14.0
Patrol Assignment	24,826	22.4*	87.0*	0.6*	1.8*	447	20.4
Crime Assignment	197	43.1	64.5	4.6	4.1	8	25.0
Staff Assignment	224	41.1	72.3	0.9	1.3	3	66.7
Canine Assignment	32	50.0	53.1	0.0	15.6	5	20.0
Other Assignment	419	49.2	53.0	1.4	12.2	51	17.6
Rank of Trooper	23,516	22.5*	86.8*	0.7	2.0	459	19.6
Rank of Corporal or higher	2,182	30.6	79.4	0.8	2.5	55	27.3

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

Table 6.13 examines the same relationships between Trooper characteristics and stop outcomes, but this time focuses only on Hispanic drivers. No significant differences in stop outcomes for Hispanic drivers are evident based on Troopers' gender and race, and only slight differences were discovered based on experience and education. Troopers with more experience and more education are significantly more likely to issue formal warnings to Hispanic drivers compared to Troopers with less experience and education. Once again, as expected, differences in stop outcomes for Hispanics are evident based on Trooper assignment. Finally, Troopers' rank is associated with the percentage of Hispanic drivers warned and cited, as Troopers with higher rank are more likely to warn and less likely to cite Hispanic drivers compared to Troopers with no supervisory rank.

Table 6.13 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	313	26.2	91.4	0.3	0.3	1	0.0
Male	9,652	23.1	87.9	0.9	2.6	248	17.3
White	8,843	23.5	88.0	0.9	2.6	233	18.5
Nonwhite	1,122	20.1	87.9	0.5	1.4	16	0.0
< than 5 years experience	2,900	25.4*	89.0	1.0	2.8	82	17.1
= 5 years experience	7,065	22.2	87.6	0.8	2.4	167	17.4
No college degree	4,140	20.8*	88.8	0.8	1.9	79	16.5
2 year college degree	2,138	23.5	88.1	1.2	3.2	70	23.2
= 4 year college degree	3,447	25.5	87.3	0.7	2.8	100	14.4
Patrol Assignment	9,530	22.1*	89.3*	0.8*	2.1*	199	16.6
Crime Assignment	114	33.3	71.1	3.5	5.3	6	16.7
Staff Assignment	109	36.7	75.2	0.0	0.9	1	0.0
Canine Assignment	8	62.5	37.5	0.0	0.0	0	20.9
Other Assignment	204	56.9	45.6	3.4	21.1	43	17.3
Rank of Trooper	9,102	22.7*	88.6*	0.8	2.5	228	17.5
Rank of Corporal or higher	863	27.9	82.2	0.9	2.4	21	14.3

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

Finally, **Table 6.14** examines the same relationships between Trooper characteristics and stop outcomes, but this time focuses on all non-Caucasian drivers. Male and female Troopers do not differ significantly in most outcomes of non-Caucasian drivers, but males are more likely to search nonwhites than females are. Troopers' race is also associated with the percentage of searches conducted and warnings issued to nonwhite motorists. Caucasian Troopers are significantly more likely to warn and search non-Caucasian drivers compared to non-Caucasian Troopers. Likewise, Troopers with less than five years of experience are also significantly more likely to issue warnings and search non-Caucasian drivers compared to Troopers with five or more years of experience.

Table 6.14 also shows significant differences in some stop outcomes based on Troopers' educational backgrounds. Specifically, Troopers with less education are significantly less likely to issue formal warnings and more likely to issue citations to non-Caucasian drivers compared to Troopers with more education. Like the findings in **Tables 6.12** and **6.13**,

Table 6.14 shows differences in stop outcomes for non-Caucasians are evident based on Trooper assignment and rank. Troopers' rank is associated with the percentage of non-Caucasian drivers warned and cited, as Troopers with higher rank are more likely to warn and less likely to cite non-Caucasian drivers compared to Troopers with no supervisory rank.

Table 6.14 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	1,431	20.8	90.1	0.2	0.5*	7	14.3
Male	46,401	21.4	87.5	0.6	1.8	816	18.9
White	42,404	21.8*	87.5	0.6	1.8*	769	19.2
Nonwhite	5,428	17.9	88.6	0.3	1.0	54	13.0
< than 5 years experience	13,205	23.6*	87.6	0.6	2.1*	277	18.8
= 5 years experience	34,627	20.5	87.6	0.6	1.6	546	18.9
No college degree	20,128	18.9*	88.8*	0.6	1.4*	289	19.5*
2 year college degree	10,304	20.9	87.6	0.7	2.0	210	27.3
= 4 year college degree	16,247	24.6	86.4	0.5	1.9	324	13.1
Patrol Assignment	46,157	20.6*	88.5*	0.5*	1.5*	698	18.3
Crime Assignment	411	37.0	69.1	3.4	3.4	14	21.4
Staff Assignment	442	36.9	74.2	0.5	0.9	4	50.0
Canine Assignment	49	51.0	51.0	0.0	10.2	5	20.0
Other Assignment	773	48.1	54.2	1.7	13.2	102	20.6
Rank of Trooper	43,700	20.7*	88.2*	0.6	1.7	740	18.4
Rank of Corporal or higher	4,132	27.8	81.3	0.7	2.0	83	22.9

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 reported below.

Collectively, the information provided in **Tables 6.10 – 6.14** suggests a number of patterns in the relationship between Trooper characteristics and stops/stop outcomes:

- Trooper gender has very little impact on type of drivers stopped and stop outcomes.

- Consistent differences in racial groups stopped and stop outcomes are evident for Trooper race. Specifically:
    - White Troopers are more likely to stop white drivers, while nonwhite Troopers are significantly more likely to stop black drivers, Hispanic drivers, and all minority drivers.
    - For all drivers, white Troopers are significantly more likely to warn drivers, and significantly less likely to issue citations, compared to nonwhite Troopers.
    - For all drivers, white Troopers are also significantly more likely to arrest and search drivers compared to nonwhite Troopers.
    - White Troopers are significantly more likely to warn and search black drivers as compared to nonwhite Troopers.

- For all drivers, less experienced Troopers are more likely to issue warnings and citations, compared to Troopers with more than five years on the job. Less experienced Troopers are also more likely to issue warnings and conduct searches of black, Hispanic, and nonwhite drivers, compared to their more experienced counterparts.

- For all drivers, Troopers with more education are significantly more likely to issue formal warnings to motorists and significantly less likely to issue citations compared to Troopers with less education. Troopers with less education are significantly less likely to issue formal warnings, more likely to issue citations, and less likely to search black, Hispanic, and nonwhite drivers compared to Troopers with more education.

- Troopers' assignments significantly affect the percentages of racial groups that are stopped and the outcomes of those stops for blacks, Hispanics, and nonwhites. This variation is to be expected based on the nature of police work.

- For all drivers and for each racial group of drivers, Troopers are significantly less likely to warn and more likely to cite drivers, as compared to those whose rank is at least Corporal. Troopers with a supervisory rank also have a higher search success rate than Troopers who have not been promoted.

MULTIVARIATE ANALYSES OF TRAFFIC STOP OUTCOMES

In **Tables 6.15 & 6.16**, 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.

As with the analyses examining speeding behavior presented in Section V, 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.[17] 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 – white, black, Hispanic, other; white 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
- 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=white), experience (1= over 5 years), education (range 1-5), assignment (1=patrol), rank (1=Trooper)

[17] 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. Hierarchical linear modeling (HLM) is a modeling procedure that can overcome this statistical dilemma (Raudenbush & Bryk, 2002). For more detail on the complexity of hierarchical models, see footnote 9 on page 180 in Section IV.

- 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 6.15 presents the results of four separate HLM analyses of post-stop outcomes during all traffic stops. **Table 6.16** presents the findings for similar multivariate models that assess only traffic stops for speeding. Traffic stops for speeding were singled out for additional analyses for two reasons: 1) the majority of PSP traffic stops were for speeding (74.6%), 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 6.15 & 6.16 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. The total number of stops analyzed includes 316,183 cases for which there was valid data on all the variables 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 white. Thus, the coefficients in the model should be interpreted as compared to whites – that is, the likelihood of black drivers being issued a citation compared to white drivers. The excluded category of the reason for the stop is speeding. The other variables are simply compared against their opposite – for example, male drivers are compared to female drivers.

The first column for each model in **Tables 6.15** & **6.16** 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 (positive or negative) of the coefficient 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 speeding based on that predictor variable, everything else being equal. The odds ratio indicates the strength of the relationship. For example, an odds ratio of 2.0 indicates that the presence of the variable (e.g., being a black driver) leads to twice 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 6.15 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 316,183 traffic stops in 2,568 municipalities for which there was 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 white drivers. Likewise, male drivers, younger drivers, non-county residents, and non-Pennsylvania residents are significantly *less* likely to receive a warning compared to females, older drivers, county residents, and Pennsylvania residents.

Other characteristics of the vehicle and stop also have significant effects on the likelihood of warnings. Drivers of vehicles without registrations, vehicles stopped during the daytime, and vehicles stopped on interstates are significantly *less* likely to receive a warning compared to drivers of registered vehicles, vehicles stopped at night, and vehicles stopped on other types of roads.

The results also show statistically strong and significant 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, vehicle registration, and drivers' license are significantly *more* likely to receive a warning than drivers stopped for speeding are. 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. Not surprisingly, drivers stopped who had evidence seized during a search were significantly *less* likely to receive a warning than drivers with no evidence seizures were.

Troopers' characteristics also influence the likelihood of receiving warnings. Controlling for other factors, less experienced Troopers and more educated Troopers are slightly *more* likely to issue warnings to drivers than their more experienced and less educated counterparts are. On the other hand, Troopers assigned to patrol and Troopers with a non-supervisory rank are significantly *less* likely to issue warnings to drivers than are Troopers with other types of assignments and higher rank.

Finally, most of the municipality characteristics of where the stop was made do not significantly affect the likelihood of drivers being issued warnings, although the traffic/travel factor and average commute do have a statistically significant, but substantively small, negative effect on the likelihood of receiving warnings.

Model 2 – Citations

Model 2 in **Table 6.15** documents the significant predictors of being issued a citation. With the exception of black drivers, all of the driver characteristics exerted a significant impact on being issued a citation. That is, Hispanic drivers, drivers of other races / ethnicities, and males are significantly *more* likely to receive a citation compared to white and female drivers. In addition, younger drivers, non-county and non-state residents are significantly *more* likely to receive a citation compared to older drivers and drivers stopped in their county or state of residence.

Several vehicle and stop characteristics also significantly predict the issuance of a citation. Specifically, drivers in vehicles with few passengers, stopped during the daytime, and drivers stopped on an interstate are significantly *more* likely to receive a citation compared to drivers in vehicles with more passengers, drivers stopped during the evening or night and drivers stopped on state highways, county or local roads.

Nearly all of the reasons for a stop significantly predict being issued a citation. Compared to speeding, 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. That is, being stopped for speeding dramatically increases drivers' risks for being issued a citation.

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, Trooper characteristics – including experience, education, assignment, and rank – significantly predict issuing citations. Troopers with less experience and less education are significantly *less* likely to issue citations compared to more experienced and higher educated officers. In contrast, Troopers with patrol assignments and lower ranks are significantly *more* likely to issue citations.

Model 3 – Arrest

Model 3 in **Table 6.15** reports results for two-level hierarchical model predicting arrests of motorists. The findings show that nearly all of the measured drivers' characteristics have a significant influence on arrest decisions. Specifically, black, Hispanic, male, older, and non-county and non-state residents are statistically significantly more likely to be arrested compared to white, younger drivers, and county and state residents of where the stop occurred.

All of the stop characteristics also significantly predict arrests. The risk of being arrested is statistically significantly *lower* for motorists stopped in the daytime, during rush hour, on a weekday, during a non-summer month, and traveling on an interstate, compared to motorists stopped in the evening or night, not during rush hour, during a weekend, in the summer, and traveling on a non-interstate roadway.

Several reasons for the stop also significantly predict arrest. Drivers stopped for a moving violation, preexisting information, license violations, and other reasons 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 drivers' characteristics.

As expected, the strongest variable predicting arrest is the discovery of contraband during a search. The odds of being arrested are approximately 103 times larger for drivers where 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 discover of evidence is statistically controlled. After holding the discovery of evidence constant in the statistical models, racial disparities in arrest still exist. That is, regardless of whether or not evidence is discovered, black and Hispanic drivers are significantly more likely to be arrested compared to white drivers.

Finally, none of the Trooper characteristics or community characteristics where the stop occurred had a significant influence over arrest decisions.

Model 4 – Searches

Finally, Model 4 in **Table 6.15** displays the significant predictors of conducting searches. As with the previous models, some drivers' characteristics are significant predictors of a driver's likelihood of being searched. After controlling for other relevant factors, blacks, Hispanics, males, younger drivers, and non-Pennsylvania residents are statistically significantly more likely to be searched compared to whites, females, older drivers, and in-state residents. It is important to note that the log odds for the black, Hispanic, and age coefficients are much larger than in previous models. This suggests that the influence of drivers' race and age is substantively more important for predicting searches compared to warnings, citations, and arrests.

Drivers traveling with more passengers, during the evening or night and not during rush hour are also significantly more likely to be searched, compared to drivers traveling with fewer passengers, in the daytime, and during rush hour.

Reasons for the search 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.

Some Trooper characteristics also significantly predict conducting searches. Controlling for other factors, male Troopers, white Troopers, and Troopers with non-patrol assignments are significantly more likely to search motorists compared to females, nonwhites, and 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 6.15 HLM Analyses Predicting Troopers' actions during all traffic stops

Variables	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	0.10	1.11	0.47	1.60	-7.79*	0.00	-5.39*	0.00
Level 1 variables (stop)								
Driver Characteristics								
Black	-0.02	0.98	-0.01	0.99	0.41*	1.50	1.10*	3.01
Hispanic	-0.16*	0.85	0.20*	1.22	0.57*	1.77	1.01*	2.74
Other Race	-0.25*	0.78	0.27*	1.31	-0.62	0.54	-0.21	0.81
Male	-0.14*	0.87	0.23*	1.26	0.68*	1.97	0.96*	2.60
Age	0.01*	1.01	-0.02*	0.98	0.01*	1.01	-0.04*	0.96
County resident	0.15*	1.17	-0.16*	0.86	0.55*	1.74	0.16	1.18
PA resident	0.17*	1.19	-0.15*	0.86	0.38*	1.46	-0.43*	0.65
Vehicle Characteristics								
No registration	-0.43*	0.65	0.19	1.21	-0.16	0.85	-0.06	0.95
Number of Passengers	0.01	1.01	-0.04*	0.96	-0.03	0.97	0.13*	1.14
Stop Characteristics								
Daytime	-0.27*	0.76	0.45*	1.57	-1.64*	0.19	-0.51*	0.60
Rush hour	0.00	1.00	-0.01	0.99	-0.56*	0.57	-0.19*	0.83
Weekday	0.05	1.05	-0.01	0.99	-0.67*	0.51	-0.11	0.90
Summer	-0.02	0.98	-0.03	0.97	0.34*	1.41	0.08	1.09
Interstate	-0.59*	0.55	0.59*	1.81	-0.60*	0.55	0.05	1.05
Reason for Stop								
Moving Violation	0.59*	1.81	-0.71*	0.49	1.81*	6.09	1.03*	2.79
Equipment/Inspection	1.16*	3.20	-1.12*	0.33	0.12	1.13	1.03*	2.80
Preexisting Info.	0.31	1.37	-0.85*	0.43	2.30*	9.98	1.95*	7.05
Registration	0.82*	2.28	-0.80*	0.45	0.22	1.25	0.94*	2.55
License	0.18*	1.20	-0.36*	0.70	0.83*	2.29	1.51*	4.52
Special Traf. Enf. Program	-0.93*	0.39	-0.93*	0.39	0.39	1.47	0.29	1.34
Other	0.11	1.12	-0.87	0.42	2.87*	17.67	1.62	5.06
Other Legal Variables								
Number of reasons for stop	0.93*	2.55	1.10*	2.99	0.03	1.03	-0.45	0.64
Evidence found during search	-0.54*	0.58	-0.70*	0.50	4.63*	102.88	--	--
Trooper Characteristics								
Male	0.03	1.03	-0.02	0.98	0.45	1.57	0.60*	1.82
White	0.33	1.39	-0.21	0.81	0.49	1.63	0.46*	1.58
> 5 years experience	0.01*	1.01	-0.14*	0.87	0.25	1.28	-0.14	0.87
Education scale	0.05*	1.06	-0.05*	0.95	-0.02	0.98	0.05	1.06
Patrol assignment	-0.66*	0.52	0.72*	2.05	-0.26	0.77	-1.18*	0.31
Rank of Trooper	-0.37*	0.69	0.50*	1.65	0.10	1.10	-0.08	0.92
Level 2 variables (municipality) (n=2,568)								
Total Pop =16 (Ln)	-0.07	0.93	0.08	1.08	-0.03	0.97	0.01	1.01
% Pop Male =16	-0.01	0.99	0.01	1.01	0.02	1.02	0.00	1.00
% Pop Black =16	0.01	1.01	0.00	1.00	-0.01	0.99	0.01	1.01
% Pop Hispanic =16	0.01	1.01	0.03	1.03	-0.04	0.96	-0.05	0.95
Poverty Factor	0.01	1.01	-0.06	0.94	0.11	1.12	-0.04	0.96
Resid. Mobility Factor	-0.04	0.96	0.00	1.00	0.06	1.06	0.12	1.12
Traffic/Travel Factor	-0.13*	0.87	0.14	1.15	-0.04	0.97	0.01	1.01
Average Commute	-0.02*	0.98	0.02	1.02	0.01	1.01	-5.39*	0.00

NOTE: * $p \leq .001$

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 6.16**). Unlike other traffic offenses, the severity of speeding can be accurately measured as the miles per hour over the limit that which drivers exceed. That is, in cases of speeding, the severity of the offense is clear and easy to measure. 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 would no longer be statistically significant after directly controlling for the speed motorists were traveling and the number of other violations observed during the traffic stop. **Table 6.16** reports the findings for 237,132 traffic stops for speeding in 2,568 municipalities for which there was valid data on all of the variables included in the model. Even after more directly controlling for legal severity, several of the findings are similar to those reported for all traffic stops.

The influence of gender 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, 2.2, and 3.4 times higher compared to female drivers, respectively.

One of the most important changes between the analyses for all traffic stops and those for only speeding is the significance of race and ethnicity over post-stop outcomes. Models 1 and 2 in **Table 6.16** show that black drivers stopped for speeding are significantly *more* likely to be issued a warning and significantly *less* likely to be issued a citation compared to white drivers. Nevertheless, the most severe sanctions (arrest and searches) are significantly more likely for black motorists compared to white motorists, even after legal severity is more accurately controlled. The log odds suggest these relationships are also substantively important. During speeding stops, the odds of arrest and searches are 1.7 and 3.4 times higher for black drivers compared to white drivers.

There are important differences for Hispanic drivers documented in **Table 6.16** as well. While analyses of all traffic stops suggested that Hispanics were significantly less likely to receive a warning, but more likely to be issued citations, arrested, and searched compared to whites, Hispanic motorists stopped for speeding are only significantly more likely than whites to be searched. Specifically, the odds of being searched are 3.5 times higher for Hispanic drivers compared to white drivers.

Table 6.16 HLM Analyses Predicting Troopers' actions during speeding stops ONLY

	Model 1: Warning		Model 2: Citation		Model 3: Arrest		Model 4: Search	
Variables	Coeff.	Odds Ratio	Coeff.	Odds Ratio	Coeff.	Odds Ratio	Coeff.	Odds Ratio
Intercept	-0.43	0.65	1.94	6.99	-5.84*	0.00	-6.39*	0.00
Level 1 variables (stop) (n=237,132)								
Driver Characteristics								
Black	0.13*	1.14	-0.20*	0.82	0.54*	1.71	1.22*	3.37
Hispanic	-0.04	0.96	0.17	1.18	0.49	1.64	1.24*	3.45
Other Race	-0.19*	0.83	0.14	1.15	-0.46	0.63	-0.07	0.94
Male	-0.05*	0.95	0.22*	1.24	0.78*	2.18	1.22*	3.38
Age	0.00*	1.00	-0.01*	0.99	0.00	1.00	-0.04*	0.96
County resident	0.20*	1.22	-0.18*	0.84	0.62*	1.86	0.21	1.23
PA resident	0.27*	1.32	-0.21*	0.81	0.25	1.28	-0.45*	0.64
Vehicle Characteristics								
No registration	0.44	1.55	-0.04	0.96	0.85	2.34	-0.20	0.82
Number of Passengers	-0.01	0.99	-0.03*	0.97	0.03	1.03	0.07	1.07
Stop Characteristics								
Daytime	-0.32*	0.72	0.37*	1.45	-1.41*	0.24	-0.39*	0.68
Rush hour	-0.01	0.99	0.01	1.01	-0.32	0.72	-0.15	0.86
Weekday	-0.02	0.98	0.02	1.02	-0.57*	0.56	-0.13	0.88
Summer	-0.06	0.94	-0.04	0.96	0.18	1.20	0.01	1.01
Interstate	-0.67*	0.51	0.73*	2.07	-0.30	0.74	0.12	1.13
Other Legal Variables								
Amount over the speed limit	-0.14*	0.87	0.26*	1.29	0.04*	1.04	0.03*	1.03
Number of reasons for stop	1.13*	3.10	0.38*	1.46	1.16*	3.19	0.69*	1.99
Evidence found during search	-0.07	0.93	-1.21*	0.30	4.98*	145.45	--	--
Trooper Characteristics								
Male	0.06	1.06	-0.10	0.91	-0.09	0.91	0.71	2.04
White	0.32*	1.38	-0.12	0.88	0.49	1.63	0.54*	1.71
> 5 years experience	-0.07	0.93	0.00	1.00	0.01	1.01	-0.26	0.77
Education scale	0.07*	1.07	-0.07*	0.93	-0.07	0.93	0.02	1.02
Patrol assignment	-0.76*	0.47	0.98*	2.67	-0.57	0.56	-1.23*	0.29
Rank of Trooper	-0.26*	0.77	0.46*	1.58	-0.26	0.77	-0.04	0.96
Level 2 variables (municipality) (n=2,568)								
Total Pop =16 (Ln)	-0.02	0.98	-0.03	0.97	-0.06	0.94	0.00	1.00
% Pop Male =16	-0.02	0.98	0.02	1.02	-0.01	0.99	0.02	1.02
% Pop Black =16	0.01	1.01	-0.01	0.99	-0.02	0.98	-0.01	0.99
% Pop Hispanic =16	0.02	1.02	0.00	1.00	0.02	1.02	-0.09	0.91
Poverty Factor	-0.05	0.95	0.05	1.05	0.08	1.08	-0.02	0.98
Resid. Mobility Factor	-0.08	0.93	0.02	1.02	-0.09	0.92	0.23	1.26
Traffic/Travel Factor	-0.13	0.88	0.12	1.13	-0.04	0.96	-0.04	0.96
Average Commute	-0.01	0.99	0.01	1.01	-0.01	0.99	-0.01	0.99

NOTE: * $p \leq .001$

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.

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.

- After controlling for other relevant legal and extra legal factors, drivers' race appears to have a significant influence over some types of post-stop outcomes. The odds of being arrested and searched are 1.5 and 3.0 times higher for black drivers compared to white drivers. Likewise, the odds of being arrested and searched are 1.7 and 3.4 times higher for black drivers stopped for speeding compared to white drivers stopped for speeding.

- The odds of Hispanic drivers being issued a warning are reduced by a factor of 1.2 compared to white drivers. Likewise, the odds of citations, arrests, and searches are 1.2, 1.8, and 2.7 times higher for Hispanic drivers compared to white drivers. For speeding stops (where the severity of the offense is more accurately controlled), Hispanic motorists are not significantly more likely than whites to be issued a warning, citation, or arrested. However, the odds of being searched are 3.5 times higher for Hispanic motorists stopped for speeding, compared to white motorists stopped 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 are 1.3, 2.0, and 2.6 times greater for male drivers compared to female drivers, respectively. Likewise, the odds of citation, arrest, and search are increased by 1.2, 2.2 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 on post-stop outcomes.

- Individual Trooper characteristics had mixed effects over post-stop outcomes. In terms of issuing citations, Troopers with less experience, less education, non-patrol assignments, and supervisory ranks were significantly less likely to issue citations compared to troopers with more experience, more education, patrol assignments, and non-supervisory ranks. In addition, male Troopers, white Troopers, and Troopers with non-patrol assignments were significantly more likely to conduct searches compared to female, nonwhite, and patrol assigned Troopers.

- The characteristics of the municipality where the stop occurred do not significantly predict the majority of 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 arrest and search motorists. Specific policy recommendations based on these findings are provided in Section VII.

VII. CONCLUSIONS AND POLICY IMPLICATIONS

VII. CONCLUSIONS AND POLICY IMPLICATIONS

Nationwide, allegations of racial profiling have suggested that police officers specifically target members of particular racial groups for traffic stops, citations, searches, and arrests. Findings from this study conducted for the Pennsylvania State Police cannot substantiate nor refute these claims. It is impossible to determine with these data 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 two separate, but related issues: 1) factors that predict the initial traffic stop, and 2) factors that predict traffic stop outcomes (e.g., citations, searches, and arrests). Regarding the initial stopping decision, it is the conclusion of this report that there is 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 some racial, ethnic, and gender disparities exist for post-stop outcomes (particularly arrests and searches). 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 2002 – April 2003, Troopers in the Pennsylvania State Police Department initiated 327,120 traffic stops, for which we have valid data. Approximately 16% of the drivers stopped were non-Caucasian. 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 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 are a useful tool 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 can become artificially inflated. Despite the interpretation issues that accompany disproportionality indices, they can help identify potentially problematic areas.

Using the population-based disproportionality indices created, nine of the 67 counties were identified for further consideration: Bedford, Clarion, Clinton, Columbia, Fulton, Jefferson, Juniata, Montour, and Susquehanna. These counties all had stop percentages of various minority groups that were dramatically out of proportion to their groups' residential population. Further exploration suggests that these differences are likely due to legitimate factors. First, each of the nine counties has a very small minority population, which results in artificially inflated disproportionality indices based on Census data. Second, each of these counties contains 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 indices 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. Finally, additional roadway and speeding observations were conducted in seven of the nine counties identified for further consideration (two counties were observed as part of the original observation sample). Racial group comparisons of roadway usage and speeding observations to residential Census data indicate that residential Census data for these nine counties dramatically underestimates the percentage of minority drivers. Therefore, the inflated disproportionality indices observed for these nine counties are likely the result of using an inappropriate benchmark. When roadway and speeding observations are utilized as the comparison group, the disproportionality indices for these nine counties are dramatically reduced and are more consistent with the disproportionality indices of the other counties.

Additional findings based on multiple analyses of traffic stops department-wide 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 nonwhite 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 (75%), 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 these findings, it is the conclusion of this report that there is no consistent evidence to suggest that Pennsylvania State Troopers make stopping decisions based on drivers' race and/or ethnicity.

Given the demonstrated inaccuracy of using residential census data for benchmarking purposes and the expensive and time-consuming nature of roadway and speeding observations, we will seek an alternative benchmark for comparisons across counties and municipalities for which we have no roadway observation data. That is, we have determined that Census data alone is an insufficient and potentially inaccurate benchmark for traffic stop analyses. For 40 counties in Pennsylvania, however, we do not have roadway observations to use as an alternative benchmark. The expense of conducting these additional roadway observations is prohibitive. Therefore, for the second year of traffic stop data, we will attempt to apply a modified gravity model to estimate interstate highway traffic flows and their racial composition. This proposed model was described at the end of Section V. Once the traffic flow models are created, they will be compared to residential Census populations, observational roadway usage, and observational speeding measures. Once the appropriateness of this new benchmark is determined, it will be used to assess racial disparities in traffic stops for the remaining 40 counties.

POST-STOP OUTCOMES

As with the findings for previous quarterly reports, the findings at the twelve-month point indicate that racial differences in post-stop outcomes are cause for some concern. Specifically, the data suggest there are some racial, ethnic, and gender disparities in the outcomes motorists receive after the traffic stop is made. Of greatest concern are disparities for the most severe outcomes – arrests and searches. In summary, while it appears that the reasons for the stop and other legal characteristics are the strongest predictors of post-stop outcomes, some differences in outcomes are still attributable to drivers' characteristics. The odds ratios indicate that the differences in outcomes based on drivers' characteristics (particularly race, ethnicity, and gender) merit further consideration. As noted in Sections I and VI, 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' non-compliance and verbal resistance during traffic stops, as well as whether or not there was an arrest warrant.

Despite these limitations, the disproportionate searching of black and Hispanic drivers merits further consideration. The findings also show that although racial and ethnic minorities are significantly more likely than Caucasian motorists to be searched, they are less likely to be in possession of contraband. That is, the search success rates for non-Caucasian drivers are lower than the search success rates for Caucasian drivers. In addition, the findings show that the reasons for searches differ across racial groups. 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.

Based on these findings, it is the conclusion of this report that some racial, ethnic, and gender disparities exist for post-stop outcomes (particularly arrests and searches). It cannot be determined with these data, however, if these disparities are due to discrimination.

The descriptive findings reported in Section VI suggest that some disparities in post-stop outcomes 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.

Training and Policies Implemented by PSP

Some academics have suggested that higher rates of stops, searches, and arrests of minorities are likely due to perceptions by law enforcement officials that minorities are more likely than whites to be carrying or transporting contraband. Results from these data suggest, however, that minorities are not more likely than whites to be in possession of contraband. These findings, documented in Section VI, are among the most important for PSP administrators to consider for training purposes.

In previous reports to PSP, our research team suggested that racial sensitivity training, along with other types of police training designed to reduce individual officer prejudice, would likely not address the core issue of why Troopers may be disproportionately searching nonwhite drivers. Instead, it was argued that to effectively change Troopers' behavior, PSP administrators needed to address the informal policies and organizational cultures that perpetuate the myth of the effectiveness of profiling strategies. PSP administrators' prompt responses to prior recommendations are encouraging.

Based on previous interim reports, it was recommended to PSP administrators that feedback regarding the study's initial findings be distributed to Area, Troop, and Station Commanders. In addition, it was recommended that Troopers be retrained regarding the appropriate use of searches. These suggestions have been implemented by PSP, as documented in detail below.

In response to initial reports regarding potential disparities in searching decisions, an additional policy was adopted by PSP in March 2003. This policy 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. In addition, 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 a refresher on constitutional criminal procedure with a focus on searches and seizures of persons and vehicles. 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.

The Department is also in 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 in three 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.

Additional Training and Policy Recommendations

Although department-wide training of Troopers is certainly important, a more concentrated effort should be focused on Troopers working in areas identified as those of concern. For example, Troopers working in specific stations with higher minority searches than departmental averages, but lower search success rates than departmental averages, should be targeted for more specialized oversight and training. It is recommended the specific findings documented in this report be disseminated to Area, Troop, and Station Commanders and that these supervisors be held accountable for the racial, ethnic, and gender disparities reported in post-stop outcomes. We are optimistic that armed with more information, PSP supervisors will be able to identify and significantly reduce disparities in post-stop outcomes.

PSP administrators should also give further consideration to what have been labeled in Section VI as Type III searches (e.g., searches based solely on consent, reasonable suspicion or probable cause, searches for "other" unspecified reasons, and searches for unknown reasons). Statistically significant racial disparities in search success rates exist only for these types of searches. Search success rates for Type I searches that are mandatory as a matter of PSP policy (e.g., incident to an arrest, inventory searches) and Type II searches based on limited officer discretion (e.g., canine alerts, plain view, drug odor) do not differ significantly across racial groups. Thus, it appears that the racial disparities reported for PSP's 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 training and supervisory oversight should focus on these types of searches to ensure officer compliance with existing departmental rules and regulations.

In addition, PSP administrators should give further consideration to how officers are trained to identify "suspicious" behavior. Research in social psychology has generally found that differences in verbal and non-verbal behavior exist for whites and nonwhites. For example, racial differences exist for behaviors including eye movements, walking, gestures, interactive postures, and personal space (Blubaugh & Pennington, 1976; Fugita, Wexley, & Hillery, 1974; Garratt, Baxter, & Rozelle, 1981; Johnson & Johnson, 1972; Smith, 1983). These differences in verbal and non-verbal behavior could be easily misperceived during police-citizen encounters. For example, studies have shown that Caucasians emphasize direct eye contact during communication, while avoidance of eye contact is more common among those in minority cultures, including African-Americans (Blubaugh and Pennington, 1976; Johnson & Johnson, 1972). Additional research has suggested that white observers and police officers associate particular types of non-verbal behaviors, including the avoidance of eye contact, more aggressive arm movements and other bodily gestures that are more commonly displayed by blacks compared to whites, with deception (DePaulo, Stone, & Lassiter, 1985; Vrij & Winkel, 1992; Zuckerman, DePaulo, & Rosenthal, 1981). It is also plausible that police officers may misinterpret differences in language and nonverbal behavior among nonwhite citizens as signs of disrespect or resistance. As noted by Vrij and Winkel, "police-citizen interactions might easily elicit misunderstandings between white police officers and black citizens concerning the meaning of the latter's nonverbal behavior" and therefore, "negative treatment of blacks may thus be a consequence of nonverbal communication errors, that is, of faulty interpretations of characteristically black nonverbal behavior" (1992:1547). Based on these studies, it is important for police departments to reconsider their training of what constitutes "suspicious" behavior. It is likely that innocent minority drivers are more likely to engage in verbal and non-verbal behaviors that some officers in departments across the country have been trained to identify as deceptive or suspicious, and thus more likely to result in unfruitful searches.

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 also unknown what factors lead to successful versus non-successful searches. Gaining this type of information is critical to produce effective change with the police organization. PSP administrators should consider implementing one (or more) of the following inquiries. First, focus groups could be conducted where Troopers are asked to describe what in their view makes drivers suspicious. These focus groups could be used in and of themselves or to aid in the development of a survey instrument to be administered to other Troopers. Specifically, samples of Troopers working in stations with high, medium, and low search success rates, and Troopers working in stations with high, medium, and low levels of racial disparities in search rates could be identified for the administration of a confidential survey designed to examine what specific types of drivers' verbal and non-verbal behaviors raise Troopers' suspicions. It could then be ascertained whether or not the verbal and non-verbal behaviors identified by Troopers as suspicious differ across racial groups. Finally, a sample of recordings produced from the digital in-car cameras could be reviewed for traffic stops involving person and/or vehicle searches. These recordings could be analyzed to identify any patterns or consistencies in both successful and unsuccessful searches. The information obtained from any of these types of inquires could be extremely important for future training and policy development. Through this type of informed training, it is possible that the information gathered from these sources could be utilized to increase PSP's overall search success rate while simultaneously reducing racial disparities in searches and seizures.

A substantial percentage of PSP searches are based *solely* on motorists' consent (44.4%). Of the nine reasons identified on the Contact Data Report to conduct a search, consent searches are the least productive in discovering contraband. For searches based solely on consent, 14.1% resulted in the discovery of contraband. Hispanics, drivers of other races, and drivers less than 25 years old were significantly more likely than white and black drivers, and drivers over 25 years old, to be searched based solely on consent. It is unknown, however, how many drivers were initially asked for consent to search but refused officers' requests. Since this information is not captured in the data, it is 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, officially adopted department-wide October 1, 2003, has two changes related to searches: 1) a field was included that asks 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. Information gathered with these questions will aid PSP administrators in examining the effectiveness and potential racial disparities in consent searches. When examining the use of consent searches during traffic stops, it will also be important for PSP administrators to consider the amount and quantity of contraband seized during these searches. The quantity of contraband is not recorded on the Contact Data Report or the revised form. This information, however, is available through other departmental reports and documentation.

The use of consent and other types of discretionary searches has been area of concern for other police departments across the country. For example, California Highway Patrol suspended the use of consent searches in April 2003, based on data that suggested that minority drivers were more likely to be stopped and searched compared to white drivers, and these searches were less successful than searches of whites (Egelko, 2003). 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).

PSP's 14% success rate for searches based solely on consent is somewhat higher than consent search success rates reported by other state agencies. During a time when our nation's law enforcement officers are requested to be more vigilant and proactive in providing homeland security, limiting their use of consent searches may not be an advisable policy. Nevertheless, the racial disparities in search success rates for the most discretionary types of searches must be addressed by PSP administrators. It is recommended that PSP administrators consider the establishment of more specific guidelines documenting the circumstances under which it is deemed appropriate for PSP Troopers to request consents to search and what types of specific behaviors constitute reasonable suspicion to conduct searches. In addition, direct supervisory oversight can lessen potential abuse of discretionary searches. It is recommended that field supervisors routinely examine the situations under which their officers are requesting and conducting searches based solely on consent, reasonable suspicion or probable cause, "other" reasons, and for reasons not indicated on the Contact Data Reports.

Finally, by comparing the first year of traffic stop data to data collected after the new training was instituted, it will be possible to determine the relative effectiveness of the new training on the rates of searches and seizures of minority motorists. Likewise, with additional information collected on the Contact Data Report, issues surrounding the use of consent searches will be better informed. Finally, if PSP administrators further examine the reasons Troopers' conduct consent and other discretionary searches, information will likely become available that will assist future training and provide a basis for additional policy recommendations.

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APPENDIX A

APPENDIX A: RADAR OBSERVATION FORM

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

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