Examining Fairness in the Stops and Citations by the Greenwood Police Department

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EXECUTIVE SUMMARY

- In early August of 2023, the leadership of the Greenwood Police Department contacted the Dolan Consulting Group LLC (DCG) with a request for an outside, independent, and impartial evaluation of its vehicle stops. The leaders indicated that electronic messages deemed to be racist in nature had been discovered being transmitted on police department computers by five individual patrol officers. These messages raised concerns that these five officers had engaged in biased policing against persons of color in their stops and issuing of citations. The situation also raised fears that the behaviors of these five officers might be indicative of a wider pattern of biased policing within the Greenwood Police Department.

- The City of Greenwood contracted with DCG to conduct an independent, objective, and scientifically rigorous analysis of its vehicle stops and citation issuing practices during the twelve months prior to the discovery of these concerning electronic messages. The purpose of this analysis was to determine if evidence existed to indicate that individuals of any race / ethnicity group were treated in a disproportionately biased manner.

- This report describes the detailed analysis of the enforcement actions taken by members of the Greenwood Police Department from July 1, 2022 through June 30, 2023. Specifically, the DCG research team examined whether any racial / ethnic group was treated in a disproportionately punitive manner, through vehicle stops by Greenwood police officers or citations issued by Greenwood police officers, during that time period.

- These enforcement actions were compared against scientifically valid benchmarks estimating the populations at risk for stops and citations. These enforcement action / benchmark comparisons were then statistically analyzed to determine if patterns of bias were discovered against any specific racial / ethnic group.

- This analysis followed established best practices within the social sciences for examining evidence of bias in police behavior. Specifically, these best practices included only exploring proactive (rather than reactive) police activities, using valid benchmarks that have been shown to measure the true populations at risk for the proactive police behaviors, controlling for statistical aggregation bias by disaggregating by district and time of day, and controlling for sampling error through the use of statistical tests for significance.

- Data were gathered on 10,824 proactive vehicle stops that did not result in a criminal arrest, and 430 additional proactive vehicle stops that resulted in the criminal arrest of one of the vehicle's occupants.

- Data were also gathered on two benchmark measures: 2,601 drivers involved in crashes (an estimate of the roadway driving population), and 1,775 criminal suspect descriptions provided by members of the public who were witnesses or victims of crimes (an estimate of the criminal offender population).

- Examination of the drivers involved in crashes within Greenwood revealed that more than half of the drivers on the roadways within Greenwood were not Greenwood residents, suggesting the drivers traveling the roadways of Greenwood do not reflect the city's residential population. In fact, the drivers involved in vehicle crashes within Greenwood from July 1, 2022 through June 30, 2023 were from 155 cities and towns across 21 U.S. states and even three foreign nations. The drivers on the roadways of Greenwood are very racially / ethnically diverse.

- While 4.0% of Greenwood residents were African-Americans, 9.3% of the drivers involved in crashes on the roadways within Greenwood were African-Americans. Approximately 6.7% of Greenwood residents were Asian / Pacific Islander, yet 5.8% of the drivers involved in crashes within Greenwood were Asian / Pacific Islander. Approximately 6.8% of Greenwood residents were Hispanic / Latino, while only 2.5% of the drivers involved in crashes within Greenwood were Hispanic / Latino.

- Examination of the criminal suspect descriptions provided to the police by members of the public (not officers) who had been witnesses or victims of a reported crime also revealed greater diversity than found within Greenwood. While 4.0% of Greenwood residents were African-Americans, 28.2% of these suspect descriptions described the suspect as African-American. African-American representation among the criminal suspects described by crime victims and witnesses was seven times higher than the African-American representation among the residents of Greenwood.

- While 6.7% of Greenwood residents were Asian / Pacific Islander, only 4.1% of these suspect descriptions described the suspect as Asian / Pacific Islander. Approximately 6.8% of Greenwood residents were Hispanic / Latino, and 6.1% of these suspect descriptions described the suspect as Hispanic / Latino.

- When we examined the post-stop issuing of traffic citations, we controlled for differences in the circumstances of various stops. We compared stops for the same offense, and the same number of offenses, to see if persons of color were more likely to be cited than white drivers stopped under similar circumstances.

- We disaggregated these data by each of the two patrol districts across Greenwood, and by 12-hour daily blocks of time, in order to control for aggregation bias. We also analyzed separately the stops made by the five officers of interest from the stops made by the rest of the members of the Greenwood Police Department.

- Within each district, and for each 12-hour time block, we compared the proactive vehicle stops (a combination of unknown proportions of stops for traffic violations only, and criminal-investigative stops) to the benchmarks of crash drivers and criminal offender suspect descriptions. Because it proved impossible to disentangle the traffic-only stops from the criminal-investigative stops, we compared this mixed sample of vehicle stops to both a traffic pattern benchmark (crash drivers) and a criminal population benchmark (criminal suspect descriptions). We compared the vehicle stops to each benchmark

individually, and used the two benchmarks as boundaries with the assumption that the true (unknown) benchmark for this mixed sample of stops would rest between the crash driver and criminal suspect benchmarks.

- In all of these comparisons, we statistically controlled for the influence of sampling error through the use of the binomial proportional test. The binomial test formula takes into account the magnitude of difference between the percentage being examined and the percentage of the benchmark, the sample size, and the laws of probability regarding sampling error. The test determines if two percentages are statistically similar or are true differences.

- Our analysis of the proactive vehicle stops made by the five officers of interest revealed weak and inconsistent evidence of bias regarding the treatment of African-American drivers. While within the margin of error for the highest benchmark limit, the evidence revealed that the percentage of African-American driver stops made by these five officers as a group was higher than expected within the East District during the evening / night hours (6 p.m. to 6 a.m.), and within the West District regardless of time of day.

- When examining the separate sample of known criminal-investigative stops that resulted in a criminal arrest, the percentage of African-American drivers stopped was statistically the same as our benchmark predictions regardless of district or 12-hour time block. This suggested no bias present in these types of stops made by the five officers of interest.

- When examining the citations issued to African-American drivers by these five officers of interest, the evidence revealed that African-American drivers were more likely than non-Hispanic White drivers to receive a traffic citation (as opposed to only a warning) when stopped for speeding. However, the evidence revealed that when stopped for other traffic offenses, African-American drivers were cited at the same rate as non-Hispanic White drivers, suggesting no bias when stopped for other types of traffic offenses.

- Regarding the stops of Asian / Pacific Islander drivers, Hispanic / Latino drivers, and the category of all other non-White groups drivers, no evidence was revealed that these five officers stopped or cited these drivers at higher rates than expected. In fact, there was some evidence of greater leniency towards these other racial / ethnic group drivers at specific times.

- Our analysis of the proactive vehicle stops made by the rest of the officers of the Greenwood Police Department consistently failed to reveal any evidence of bias against non-White drivers of any group.

- We found no evidence that African-American individuals were treated with bias by the rest of the officers of the Greenwood Police Department. African-American drivers were not disproportionately more likely to be stopped than expected in either of the districts or 12-hour time blocks, and at times were stopped less often than predicted by the benchmarks. After being stopped, African-American drivers were either less likely than White drivers to receive a citation, or were treated in a manner equal to White drivers.

- We found no evidence that Asian / Pacific Islander drivers were treated with bias by the rest of the officers of the Greenwood Police Department. Asian / Pacific Islander drivers were stopped at rates predicted by the benchmarks regardless of district or time of day. After being stopped, Asian / Pacific Islander drivers were treated in a manner equal to White drivers.

- We found no evidence that Hispanic / Latino drivers were treated with bias by the rest of the officers of the Greenwood Police Department. Hispanic / Latino drivers were stopped at rates predicted by the benchmarks or, at times, were stopped less often than predicted by the benchmarks. After being stopped, Hispanic / Latino drivers were either less likely than non-Hispanic White drivers to receive a citation, or were treated in a manner equal to non-Hispanic White drivers.

- We found no evidence that drivers categorized as other non-White drivers were treated with bias by the rest of the officers of the Greenwood Police Department. These drivers were stopped at rates predicted by the benchmarks. After being stopped, these drivers were less likely than non-Hispanic White drivers to receive a citation.

- In summary, we found weak and inconsistent evidence to suggest a bias against African-American drivers by the five officers of interest, and no evidence of bias against drivers of other racial / ethnic groups. We also found no evidence that the rest of the members of the Greenwood Police Department targeted persons of color for vehicle stops or citations. In fact, we found evidence to suggest a small degree of hesitancy on the part of the rest of the officers to stop or cite drivers who were persons of color when compared to how they treated non-Hispanic White drivers.

1. PURPOSE

On August 10, 2023, the leadership of the Greenwood Police Department contacted the Dolan Consulting Group LLC (DCG) with a request for an outside, independent, and impartial evaluation of its vehicle stops. Through later discussions, it was learned that electronic messages deemed to be racist, homophobic, and demeaning of persons with disabilities had been discovered being transmitted on police department computers. Investigation into these messages revealed they had been exchanged between five specific officers. In accordance with Greenwood Police Department policy, an internal investigation of these five officers was quickly initiated.

Four of the officers resigned from the Greenwood Police Department before the investigation had been completed or a disciplinary decision made. These officers were Elijah Allen (hired 4/15/2019), Jacob Hagist (hired 10/19/2020), Zane Hennig (hired 6/7/2021), and Tyler Kintzele (hired 8/19/2019). The fifth officer, Sam Bowen (hired 10/19/2020), underwent a hearing by the City of Greenwood Police Merit Commission, which terminated his employment.

This situation raised great concerns that these five officers had engaged in biased policing against persons of color in their stops and issuing of citations. The situation also raised fears that the behaviors of these five officers might be indicative of a wider pattern of biased policing within the Greenwood Police Department. Therefore, the City of Greenwood contracted with DCG to conduct an independent, objective, and scientifically rigorous analysis of its vehicle stops and citation issuing practices during the twelve months prior to the discovery of these concerning electronic messages. The purpose of this analysis was to determine if evidence existed to indicate that individuals of any race / ethnicity group were treated in a disproportionately biased manner.

This report is a detailed analysis of the enforcement actions taken by members of the Greenwood Police Department from July 1, 2022 through June 30, 2023. Specifically, the DCG research team examined whether any racial / ethnic group was treated in a disproportionately punitive manner, through the vehicles stopped by Greenwood police officers or citations issued by Greenwood police officers, during that 12-month time period.

1.1 The Contextual Setting

Greenwood is a suburban Indiana city in Johnson County that rests immediately south of Indianapolis. It had a 2022 U.S. Census Bureau population estimate of 65,406 residents.[1] It covers an area of roughly 28 square miles, and shares a border with Marion County / Indianapolis to the north. Greenwood is bordered to the east by unincorporated Pleasant Township, to the west by Bargersville, and to the south by Whiteland and New Whiteland.

Greenwood contains a diverse array of residential, commercial, and industrial areas. Greenwood contains the headquarters for Endress & Hauser and Nachi America Inc. corporations, as well as operations centers for Amazon and Milwaukee Electric Tool. Greenwood contains many shopping districts, box store complexes, and the primary indoor shopping mall for the Indianapolis

[1] *U.S. Census Bureau QuickFacts: Greenwood City, Indiana; United States*. https://www.census.gov/quickfacts/greenwoodcityindiana Retrieved December 7, 2023.

Metropolitan Area – the Greenwood Park Mall. Many residential neighborhoods, as well as condominium and apartment complexes, span the city. Education services are offered by numerous public and private schools. Greenwood has seventeen separate parks and more than thirty places of worship. The city is crisscrossed with a number of major thoroughfares, the most notable being interstate highway I-65, U.S. Highway 31, and Indiana State Route 135. Such an environment draws people to Greenwood from across the metropolitan area, the rest of Indiana, and the nation.

1.2 The Dolan Consulting Group LLC

The Dolan Consulting Group LLC (DCG) is an organization of public policy experts who address issues related to public service provision organizations, such as law enforcement agencies, corrections agencies, fire departments, emergency medical services, hospitals, and school districts. DCG provides services such as assessments, training, and research with the goal of improving the operations and outputs of these agencies through evidence-based solutions. DCG's staff includes former public safety leaders, attorneys, and statisticians, all of whom also have real world experience working in government.

Regarding traffic stop data analysis projects, DCG has provided training and consulting services to law enforcement agencies since 2016 by helping these agencies gather and track data on potential racial disparities. DCG has assisted more than a hundred law enforcement agencies across the United States with these activities. In addition to helping law enforcement agencies develop ways to gather and report their own traffic stop data, DCG has also provided independent, external, and objective examinations of traffic stop patterns for several law enforcement agencies. DCG employs research scientists on these projects. These researchers possess doctorates in criminal justice from leading universities in that discipline, have strong foundations in statistics and quantitative research methods, and have extensive records of publishing empirical research articles in peer-reviewed quantitative academic research journals.

DCG agreed to review and scientifically analyze 12-months' worth of vehicle stop and citation data for the Greenwood Police Department. This report, therefore, is a detailed analysis of the enforcement actions taken by members of the Greenwood Police Department from July 1, 2022 through June 30, 2023. Specifically, the DCG research team examined whether any racial / ethnic group was treated in a disproportionately punitive manner, through vehicles stopped by Greenwood police officers and citations issued by Greenwood police officers, during that time period. These enforcement actions were compared against valid, scientifically-approved benchmarks estimating the populations at risk for stops and citations. These enforcement action / benchmark comparisons were then statistically analyzed to determine if patterns of bias were discovered against any specific racial / ethnic group.

These analyses were first conducted for the stops and citations made by the five officers of interest that had been implicated in the disturbing electronic messaging communications. The analyses were then repeated with the stops and citations made by all the rest of the officers of the Greenwood Police Department to determine if there was evidence of a wider problem beyond these five former officers.

1.3 The Report Outline

This report will begin with a detailed explanation of the best practices in social scientific research regarding the examination of potential racial / ethnic bias in police enforcement actions. Social scientists have been conducting research in this area for several decades now. Along the way they have developed important practices that should be applied in this type of research. This section will explain why DCG follows these practices – practices often ignored by amateurs who attempt to examine for potential racial profiling. Next, the report will provide a detailed description of the specific research methodology followed in this examination of the Greenwood Police Department and the reasons for this methodology.

The report will then provide a detailed examination of the vehicle stops and citations issued by the five officers of interest to determine if any racial / ethnic group of drivers was treated in a discriminatory manner. Following that analysis, we will repeat this examination of vehicle stops and citations, this time examining the activity of the remaining officers of the Greenwood Police Department to determine if any racial / ethnic group of drivers was treated in a discriminatory manner. The report will then conclude with a summary of the findings, analyzed by each individual racial / ethnic group.

2. BEST PRACTICES

In order to ethically and scientifically examine whether or not evidence existed of racial disparities in enforcement activities by the Greenwood Police Department, proper and approved social science methods must be followed. Social scientists have systematically studied racial disparities in police enforcement activities for more than half a century, dating back to the Civil Rights era of the 1960s.[2] This body of research, subjected to peer-review critiques by other scientists, and even cross-examination in court when used as evidence in civil rights cases, has gradually become more rigorous and robust over time. Several statistical and methodological issues were discovered, addressed, and improved over the decades. These improved practices enhanced scientific confidence in the validity and reliability of the findings. From this research, a general consensus arose among social scientists on the appropriate "best practices" that should be applied when exploring for the presence of racial disparities in police enforcement actions.[3] The present study adhered to these accepted best practices of social science research.[4] Below we review the most crucial of these many "best practices" lessons that social scientists have learned, and that were employed in the present study.

2.1 Proactive and Valid Enforcement Data

First, in order to examine for the presence of officer bias in police enforcement activities, it is important to specifically examine ***proactive*** enforcement decisions by officers. It is only possible for an officer to exercise bias when the officer has discretion in how to act. For example, police officers do not have control over who calls 911 and requests police services. A number of studies by criminologists across various communities have revealed that African-Americans and Hispanics call the police for assistance more often than non-Hispanic Whites and Asians.[5] As a result, police officers would disproportionately encounter African-American and Hispanic complainants and victims, but have no control over this situation as they were summoned to such situations by the very same citizens. Therefore, it is inappropriate to examine racial disparities as evidence of bias in reactive police behavior situations, in which the officer lacks a choice to engage the citizen.[6]

[2] Black, D. (1971). The social organization of arrest. *Stanford Law Review 23*, 1087-1111; Black, D. & Reiss, A. J. (1970). Police control of juveniles. *American Sociological Review 35*, 63-77. LaFave, W. (1965). *Arrest: The Decision to Take a Suspect into Custody*. Boston: Little, Brown, Company; Reiss, A. (1971). *The Police and the Public*. New Haven, CT: Yale University Press.

[3] Smith, M.R., Rojek, J.J., Petrocelli, M. & Withrow, B. (2017). Measuring disparities in police activities: a state of the art review. *Policing: An International Journal 40(2)*, 166-183; Tillyer, R., Engel, R.S. & Calnon-Cherkauskas, J. (2010). Best practices in vehicle stop data collection and analysis. *Policing: An International Journal 33(1)*, 69-92; Withrow, B. L. (2005). *Racial Profiling: From Rhetoric to Reason*. Upper Saddle River, NJ: Pearson-Prentice Hall.

[4] Smith, et al. (2017); Tillyer, et al (2010); Withrow (2005).

[5] Gottfredson, M. R. & Hindelang, M. J. (1979). A study of the behavior of law. *American Sociological Review 44(1)*, 3-18; Klinger, D. A. (1996). Quantifying law in police-citizen encounters. *Journal of Quantitative Criminology 12(4)*, 391-415; Xie, M. & Baumer, E. P. (2019). Crime victims' decisions to call the police: past research and new directions. *Annual Review of Criminology 2*, 217-240; Zaykowski, H., Allain, E.C. & Campagna, L.M. (2019). Examining the paradox of crime reporting: Are disadvantaged victims more likely to report to the police? *Law & Society Review 53*, 1305-1340.

[6] Smith, et al. (2017); Tillyer, et al (2010); Withrow (2005).

Proactive enforcement decisions are another matter. Traffic violations are numerous and abound everywhere. As a result, if officers stopped every vehicle that they observed committing even the slightest traffic violation, they would not have time to handle any other duties. Therefore, officers must use their discretion to triage the traffic offenses they witness and decide which they should address through a traffic stop, and which they are willing to ignore for the moment. This discretionary decision should be based on such factors as the seriousness of the offense, the seriousness of the environment (such as speeding in a school zone when school is in session), and other pending calls for service. It is in such discretionary decisions that racial or ethnic bias may arise. Only in such discretionary decisions, where an officer has the opportunity to decide when to take enforcement action, is the opportunity to exercise bias present. Therefore, best practices in studies examining racial bias in police behavior have focused ***only*** on ***proactive*** police enforcement activities.[7] The present study examined the proactive enforcement activities of traffic stops, criminal-investigative stops, and the issuing of traffic citations.

Traffic Stops – Traffic stops are situations in which a law enforcement officer stops a vehicle for the purposes of traffic safety and enforcement of a traffic statute. Although evidence of a crime may be discovered after the stop has been initiated, a traffic stop is conducted primarily for the purposes of traffic safety. In order to legally initiate a traffic stop, the law enforcement officer must have probable cause to believe that the vehicle being stopped has recently committed a violation of a traffic statute.[8] Probable cause is defined as sufficient reason, based upon known facts, that would cause a reasonable person to believe that an offense has been committed.[9] As traffic violations tend to be plentiful, the issue with regard to biased policing is whether officers are stopping a broad cross-section of the traffic law violators they witness, or are prone to select traffic violators of a particular sex, race, or ethnicity from the variety of traffic violators visible.

Criminal-investigative Stops – Criminal-investigative stops are situations in which a law enforcement officer stops a vehicle or pedestrian for the purposes of conducting further investigation of a potential criminal offense. The Fourth Amendment to the U.S. Constitution grants law enforcement officers the legal authority to seize individuals and search their belongings when probable cause exists that these individuals have committed a crime. Therefore, when a law enforcement officer observes a vehicle occupant commit a criminal act, or a credible victim or witness to a crime identifies to the officer that a vehicle occupant has committed a crime, the officer may immediately stop and detain that vehicle as part of a criminal investigation. In such a situation, the officer does not need to wait for the vehicle to first violate a traffic law before stopping it.

Law enforcement officers may also conduct criminal-investigative stops based on reasonable suspicion of criminal activity. The ruling in the landmark U.S. Supreme Court case *Terry v. Ohio* (1968) established that if law enforcement officers have reasonable suspicion to believe that an occupant of a vehicle has committed a violation of a criminal law, they may stop the vehicle, temporarily detain all of its occupants, and investigate the potential criminal violation.[10]

[7] Smith, et al. (2017); Tillyer, et al (2010); Withrow (2005).
[8] Fourth Amendment to the U.S. Constitution; *Delaware v. Prouse*, 440 U.S. 648 (1979); *Whren v. United States*, 517 U.S. 806 (1996).
[9] Handler, J. G. (1994). *Ballentine's Law Dictionary*. Albany, NY: Delmar.
[10] *Terry v. Ohio*, 392 U.S. 1 (1968).

Reasonable suspicion is a lower standard of proof than probable cause. Reasonable suspicion is defined as the suspicion that an individual is engaged in a crime based on clearly articulable facts (not a mere hunch) and the totality of the circumstances, but viewed from the officer's perspective.[11] A common example of a stop based on reasonable suspicion is the stopping of a vehicle that matches the description of one recently used in the commission of a nearby crime. Again, in such cases the officer does not need to witness a traffic violation to make the stop.

Citations – It has already been mentioned that, because traffic violations are so plentiful, law enforcement officers are permitted discretion when deciding whether or not to stop a vehicle for committing a traffic violation. Law enforcement officers also are permitted the discretion to decide whether or not to issue a traffic citation once the vehicle has been stopped.[12] In a fair society, such discretionary decisions should be based on relevant facts about the situation, such as the seriousness of the offense (i.e., serious offenses are less deserving of leniency than minor offenses), the driver's prior driving record (i.e., drivers with a history of poor driving behavior – such as suspended drivers – are less deserving of leniency than drivers with a clean record), or the driver's remorse (i.e., drivers unwilling to acknowledge or show remorse for their violation imply they are less willing to voluntarily correct their poor driving behavior). What should not be taken into account in a free democracy, however, is the driver's sex, race, or ethnicity. Therefore, drivers of different races who are stopped for the same violations, and under the same circumstances, should receive similar outcomes (i.e., receive citations at similar rates).[13]

2.2 Valid Benchmarks

Proactive police enforcement actions are the first major sources of data in any study examining for bias in proactive police enforcement behavior. The second major source of data required for a credible examination is a measure of the racial / ethnic proportions within the population of individuals at risk for legally and legitimately receiving the particular enforcement action being examined. These measures are often referred to as "benchmarks" and are used as a standard for comparison to the proactive police enforcement actions to see if the enforcement actions appear biased or appropriate.[14]

For example, for police vehicle stops for the purposes of addressing traffic violations, the benchmark should be some sample that reflects the racial proportions of the drivers found on the roadways engaged in traffic violation behaviors within that jurisdiction. In other words, stops of traffic law violators should be compared to some measure of traffic law violators. However, for criminal-investigative stops by the police, the benchmark should be a sample that reflects the racial proportions of the individuals engaged in crimes, ***not*** simply drivers involved in traffic violations.

[11] Handler, J. G. (1994). *Ballentine's Law Dictionary*. Albany, NY: Delmar.
[12] Davis, K. C. (1975). *Police Discretion*. St. Paul, MN: West Publishing; Ingram, J. R. (2007). The effect of neighborhood characteristics on traffic citation practices of the police. *Police Quarterly, 10(4)*: 371-393; Johnson, R.R. (2011). Officer attitudes and management influences on police work productivity. *American Journal of Criminal Justice, 36(4)*: 293–306.
[13] Black, D. (1976). *The Behavior of Law*. New York: Academic Press; Harris, D. A. (1997). Driving while black and all other traffic offenses: the Supreme Court and pretextual traffic stops. *Journal of Criminal Law and Criminology, 87(3)*: 544-576.
[14] Smith, et al. (2017); Tillyer, et al (2010); Withrow (2005).

In other words, stops for criminal-investigative purposes should be compared to some measure of criminals.

For post-stop outcomes, such as whether or not a citation was issued (versus only a warning given), the benchmark is often the proportion of White drivers who were stopped under the same circumstances who received a citation. Persons of other races / ethnicities should be ticketed at similar proportions as non-Hispanic White drivers, if no bias is present.[15] However, specific traffic offenses vary from one another in seriousness, such as speeding being more dangerous to public safety than having an expired license plate. Therefore, citation decisions must compare drivers under similar traffic violation offenses. In other words, speeders ticketed should only be compared to other speeders ticketed, and red-light runners should only be compared to other red-light runners.

Invalidity of Census Data – The earliest research studies conducted during the 1960s, 1970s, and 1980s, relied upon Census data as their benchmarks. However, for the last three decades social scientists have understood that the use of Census data is seriously flawed as a benchmark for comparison with proactive police behaviors.[16] In 2006, the prestigious *Journal of the American Statistical Association* proclaimed, "It is widely recognized that residential population data provide poor estimates of the population at risk of a traffic stop."[17] Regarding traffic stops, those found on the roadways within any jurisdiction are a mixture of residents of that community and people from outside the community who are visiting or traveling through the jurisdiction. The characteristics of these drivers also vary from region to region within the community, and sometimes vary by time of day with commuting patterns.[18]

As early as 1993, the courts recognized that Census statistics regarding the racial composition of a jurisdiction differed greatly from the racial composition of the drivers on the roadways within that jurisdiction. In 1993, the American Civil Liberties Union (ACLU) filed an appeal to overturn the drug trafficking convictions of Pedro Soto and ten other plaintiffs, based on the allegation they had all been victims of racial profiling by the New Jersey State Police (State of New Jersey V. Soto, 324 N.J. Superior Law Div. 1996). As evidence to support the claim of racial profiling, the ACLU hired John Lamberth, Ph.D. of the research firm Lamberth & Associates LLC. Lamberth sought to determine the racial composition of the traffic patterns on the segments of the New Jersey Turnpike. Specifically, he examined the highway segment where all of the plaintiffs had been stopped for speeding, with the stops leading to the discovery of narcotics and their subsequent arrests. Dr. Lamberth and his research assistants conducted observations of drivers on this segment of the turnpike by riding in a car with the cruise control set at the posted speed limit. They recorded

[15] Smith, et al. (2017); Tillyer, et al (2010); Withrow (2005).
[16] Smith, et al. (2017); Tillyer, et al (2010); Withrow (2005).
[17] Grogger, J., & Ridgeway, G. (2006). Testing for racial profiling in traffic stops from behind a veil of darkness. *Journal of the American Statistical Association, 101(475)*: 878-887.
[18] Engel, R. S., & Calnon, J. M. (2004). Comparing benchmark methodologies for police-citizen contacts: traffic stop data collection for the Pennsylvania State Police. *Police Quarterly, 7(1)*: 97-125; Federal Highway Administration. (2000). *Travel Patterns of People of Color*. Washington, DC: U.S. Department of Transportation; Mauch, M. & Taylor, B. D. (1997). Gender, race, and travel behavior: analysis of household-serving travel and commuting in San Francisco Bay Area. *Transportation Research Record 1607(1)*, 147-153; Preston, V. & McLafferty, S. (2016). Revisiting gender, race, and commuting in New York. *Annals of the American Association of Geographers 106(2)*: 300-310.

the races of drivers that passed their car (i.e., speeders) and the races of drivers they themselves passed (non-speeders). They conducted these roadway observations over 21 sessions, each lasting 2.5 hours in length.[19]

Lamberth's measurements of the racial composition of drivers on the roadway were then compared to the racial composition of the traffic stops conducted by the troopers of the New Jersey State Police. Of the "speeders" Lamberth's team observed on the Turnpike between Exits 1 and 7, 15% appeared to be African-Americans, while 46% of the drivers stopped by New Jersey troopers in that region were identified as African-Americans. This comparison revealed dramatic racial disparity in the New Jersey state trooper stops involving African-American drivers on that segment of the turnpike. It also revealed, however, that the racial composition of the drivers on the turnpike did not resemble the racial composition of the Census data for that area. The segment of the turnpike between exits 1 and 7 ran through communities that ranged from 2% African-American, to less than 1% African-American residents (based on Census data of that time), yet the speeders on the turnpike were 15% African-American. In other words, African-American drivers were found to be between 7 and 15 times more likely to be driving on the turnpike than relying on Census data would suggest.[20]

In another case in 1994, the National Association for the Advancement of Colored Persons (NAACP) filed suit against the Maryland State Police, alleging that the agency's state troopers engaged in racial profiling along interstate highway I-95. Representing an African-American law school student who had been stopped for speeding by troopers and subjected to a lengthy vehicle search before being let go with a warning, the NAACP also hired Lamberth Consulting LLC to assist with the case. Identical to their methods in the Soto case, Lamberth and his assistants observed drivers on the segment of I-95 between Baltimore and Philadelphia where the plaintiff had been stopped. They again defined speeders as anyone overtaking and passing the researchers' car while the research vehicle was traveling at exactly the speed limit. Despite the fact that the Census population statistics for the jurisdiction where this roadway segment were located were 6% African-American, Lamberth observed that 17% of all drivers on the roadway, and 18% of the speeders, were African-American drivers. In other words, the proportion of African-American drivers on the roadway was 3 times higher than the Census data population.[21]

Traffic Stop Benchmarks – Criminologist and ACLU activist Samuel Walker proposed that an effective traffic stop benchmark must be scientifically credible, have practical utility, and have political credibility.[22] In pursuit of these ends, a number of legitimate methods have been employed to create valid benchmarks estimating the racial composition of motorists (or violators of traffic laws) on the roadways of a given jurisdiction. As just described above, one method has involved using researchers in a moving vehicle traveling at the speed limit who observe and record the race of the drivers of the other vehicles on the roadway.[23] A variation on this observation method

[19] *State of New Jersey V. Soto*, 324 N.J. Superior Law Div. 1996.
[20] *State of New Jersey V. Soto*, 324 N.J. Superior Law Div. 1996.
[21] *Wilkins v. Maryland State Police* (CCB-93-483, 1996).
[22] Walker, S. (2001). Searching for the denominator: Problems with police traffic stop data and an early warning system solution. *Justice Research and Policy 3(1)*: 63-95.
[23] See for example: Lamberth, J. (1994). *Revised Statistical Analysis of the Incidence of Police Stops and Arrests of Black Drivers / Travelers on the New Jersey Turnpike between Exits of Interchanges 1 and 3 from Years 1988 through 1991*. West Chester, PA: American Civil Liberties Union; Lamberth, J. (1996). *Report of John Lamberth,*

employed by other researchers involved placing researchers at static locations, such as intersections or along major thoroughfares, to observe the races of drivers who passed their static locations.[24] Some researchers using this static point of observation method have employed radar or laser speed timing devices to measure the speeds of the vehicles to determine the racial composition of speeding drivers, rather than just drivers in general.[25]

Alternative methods have been employed to gather benchmark data on traffic law violators or driving populations. One study employed automated cameras linked electronically to radar speed timing devices or traffic signal violation detection devices. This study in New Jersey used these automated devices to photograph the drivers of speeding vehicles along a stretch of highway. Teams of researchers then used the photos to determine the races of the photographed drivers.[26] Another study in Virginia used an automated red-light camera that photographed the license plates of vehicles that violated traffic signals by entering the intersection more than one second after the signal turned red. The researchers used the vehicles' license plate numbers to identify the sex and race of the registered owner, based on the assumption that the person driving the vehicle would likely be the owner or someone of the same race as the owner.[27]

While all of these benchmarks based on roadway driver observations have greater validity than the use of Census data, they all have some limitations. All of these observation methods are very expensive, requiring many research assistants, many hours of labor, and sometimes expensive equipment, such as automated speed or red-light cameras. All of these observational methods rely on trying to visually determine the race and ethnicity of a driver passing at high speed, which may increase validity errors in proper identification. All of these methods tend to focus on only one type of traffic violation, such as speeding or running a traffic signal, rather than the diversity of traffic violations police officers encounter and enforce. Because they require observing a driver in a passing motor vehicle, all of these methods are limited to use during daylight hours on days without inclement weather. They do not measure traffic patterns in inclement weather or at night.

All of these observational methods are limited to use in areas with clear lines of sight where the researchers can easily see the passing drivers, and therefore are less likely to measure traffic patterns on residential side streets or congested urban areas. Because of the need for a clear line of

Ph.D. Washington, DC: American Civil Liberties Union. Unpublished report; Meehan, A. J., & Ponder, M. (2002). How roadway composition matters in analyzing police data on racial profiling. *Police Quarterly, 5(3)*: 306-333; Smith, W., Tomaskovic-Devey, D., Zingraff, M., Mason, H., Warren, P., & Wright, C. (2004). *The North Carolina Highway Traffic Study*. Washington, DC: National Institute of Justice.

[24] See for example: Lamberth, J. C. (2004). *Ann Arbor Police Department Traffic Stop Data Collection Methods and Analysis Study*. Chads Ford, PA: Lamberth Consulting LLC; Lamberth, J. C. (2017). *Grand Rapids Michigan Police:Results from Stop Data Analysis Study*. Chads Ford, PA: Lamberth Consulting LLC; McCabe, J. E., Kaminski, R. J., & Boehme, H. M. (2021). Racial profiling and CT motor vehicle stops: an observational study in three towns. *Police Practice and Research, 22(6)*: 1567-1584.

[25] See for example: Engel, R. S., Calnon, J. M., Tillyer, R., Johnson, R. R., Liu, L. (2005). *Pennsylvania State Police Project on Police-Citizen Contacts: Year 2 Final Report (May 2003-April 2004)*. Cincinnati, OH: University of Cincinnati; Engel, R. S., Frank, J., Tillyer, R., Klahm, C. (2006). Cleveland Division of Police Traffic Stop Data Study: Final Report. Cincinnati, OH: University of Cincinnati.

[26] Lange, J. E., Johnson, M. B., & Voas, R. B. (2005). Testing the racial profiling hypothesis for seemingly disparate traffic stops on the New Jersey turnpike. *Justice Quarterly, 22(2)*, 194-223.

[27] Herbert-Martinez, K. L., & Porter, B. E. (2006). Characterizing red light runners following implementation of a photo enforcement program. *Accident Analysis & Prevention, 38(4)*, 862-870.

sight, all of these methods require that observers (or a radar camera unit) be placed in conspicuous locations within the driver's field of view, thus potentially changing the driver's behavior to drive more cautiously.

As a more convenient and cheaper method for obtaining a benchmark, some researchers have compared the proportions of stops of the drivers during the daylight hours with the stops made during the hours of darkness. This method, called the "veil-of-darkness" method, was first developed by the RAND Corporation. It operates on the assumption that police officers cannot easily determine the race of passing drivers during hours of darkness, thus making it difficult or impossible to stop drivers based on their races at night. The method also assumes that during daylight hours, officers are capable of determining the races of drivers prior to stop. As a result, traffic stops made during hours of darkness (when officers allegedly cannot determine the driver's race prior to stop) become the benchmark measure for comparison to stops made during daylight hours (when officers allegedly *can* determine the driver's race).[28] This method has been utilized by many researchers examining for evidence of racial profiling.[29]

Finally, the most recent form of traffic benchmark to be developed has been the use of drivers involved in vehicle crashes. This method is based on the assumption that drivers involved in crashes represent a "snap shot" sample of drivers on the roadway. Using the drivers from crash reports as a traffic benchmark is less expensive than employing researchers for roadway observations as officers are already taking these crash reports as part of their normal duties. While roadway observations are limited to daylight and areas with good fields of vision (such as only major thoroughfares), crashes occur everywhere across the community and occur during all hours of the day, every day of the week, and in all kinds of weather conditions. Because every crash has at least one driver at fault, they are also a good sampling of who is driving poorly or operating a vehicle with a significant equipment malfunction (i.e., taillights out, no headlights, bumper falling off, etc.). While roadway observations require determining driver race from a fast-moving vehicle, officers taking crash reports interact with the drivers face-to-face and obtain their driver's licenses. This means greater accuracy (scientific reliability and validity) in determining the driver's race / ethnicity.[30] Several studies have recently employed crash drivers as a benchmark measure of the

[28] Grogger, J., & Ridgeway, G. (2006). Testing for racial profiling in traffic stops from behind a veil of darkness. *Journal of the American Statistical Association, 101(475)*: 878-887.

[29] See for example: Hannon, L., Neal, M., Gustafson, A. R., (2021). Out-of-place and in-place policing: an examination of traffic stops in racially segregated Philadelphia. *Crime & Delinquency, 67(6-7)*: 868-890; Lundman, R. J., & Kowalski, B. R. (2009). Speeding while black? Assessing the generalizability of Lange et al.'s (2001, 2005) New Jersey turnpike speeding survey findings. *Justice Quarterly, 26(3)*: 504-527; Taniguchi, T. A., Hendrix, J. A., Levin-Rector, A., Aagaard, B. P., Strom, K. J., Zimmer, S. A. (2017). Extending the veil of darkness approach: an examination of racial disproportionality in traffic stops in Durham, NC. *Police Quarterly, 20(4)*: 420-448; Vito, A.G., Woodward Griffin, V., Vito, G.F. & Higgins, G.E. (2020). Does daylight matter? An examination of racial bias in traffic stops by police. *Policing: An International Journal, 43(4)*: 675-688; Wexler, N. (2020). *Testing for Police Racial Profiling Using Data on Pre-Stop Race Visibility: Evidence from Minneapolis*. Minneapolis, MN: University of Minneapolis; Withrow, B.L. (2007). *The Portland Police Bureau's Stop Data: An Independent Analysis*. Portland, OR: Portland Protective Association; Worden, R. E., McLean, S. J., Wheeler, A. P. (2012). Testing for racial profiling with the veil-of-darkness method. *Police Quarterly, 15(1)*: 92-111.

[30] Withrow, B.L. & Williams H. (2015). Proposing a benchmark based on vehicle collision data in racial profiling research. *Criminal Justice Review, 40 (3)*, 449-469.

racial composition of drivers on the roadway.[31] The present study will rely on crash drivers as the benchmark measure for traffic violation stops.

Criminal-Investigative Stop Benchmarks – It is important to remind the reader that all of the benchmarks described above only pertain to vehicle stops for traffic violations. Law enforcement officers have the legal authority to stop cars when probable cause or reasonable suspicion exists that these individuals inside have committed a crime. When an officer observes a vehicle occupant commit a criminal act, or a victim or witness to a crime identifies to the officer that a vehicle occupant has committed a crime, the officer may immediately stop and detain that vehicle without the need for a traffic law violation.[32]

Law enforcement officers may also stop vehicles and question occupants based on reasonable suspicion of criminal activity, a lower standard of proof than probable cause.[33] A common example of a stop based on reasonable suspicion is stopping a vehicle that matches the description of one recently used in the commission of a nearby crime. Imagine that an officer hears a radio broadcast that an armed robbery has just occurred at a convenience store about 20 blocks away. The radio broadcast indicates a white male in a green sweatshirt robbed the store at gunpoint and fled the scene in a dark Honda Civic or Accord that was driven by a white female accomplice. Moments later, the officer sees a navy-blue Honda Accord pass by with a white male passenger and a white female driver, and the passenger of the car is wearing a green sweatshirt. As the car passes the officer, the officer sees both vehicle occupants staring at her. As the officer follows the car, she observes it make numerous turns down side streets. The male passenger has turned around in his seat, watching the patrol car through the back window of the Honda.

The officer could legally stop the car at this point based on reasonable suspicion (not yet probable cause) alone. However, she may also wait until she witnesses a traffic violation, in order to build a stronger case to justify her stop. These individuals may, or may not, be the armed robbers, but there are enough articulable facts (nervous behavior, physical description match, and vehicle match) to permit an investigative stop. The legal justification and motivation for such stops are for criminal-investigative purposes – regardless of whether the officer makes the stop now or waits until she also observes a traffic violation. Therefore, these stops are unassociated with traffic violations *per se*, and strictly associated with criminal violations. As a result, those who should be legally and ethically at risk for criminal-investigative stops should be those individuals found committing crimes within the jurisdiction – not the general population of persons found driving on the roadways. Therefore, a crime-specific benchmark is needed for any analysis of criminal-investigative stops.

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[31] See for example: Alpert, G.P., Smith, M.R., & Dunham, R. (2004). Toward a better benchmark: Assessing the utility of not-at-fault traffic crash data in racial profiling research. *Justice Research and Policy, 6(1)*: 44-69; Dolan Consulting Group LLC (2018). *Evaluating Fairness in Traffic Stops by the Ann Arbor Police Department*. Raleigh, NC: Dolan Consulting Group; Dolan Consulting Group LLC (2022). Examining Fairness in the Stops, Citations, and Arrests by the Carmel Police Department. Raleigh, NC: Dolan Consulting Group, LLC; Schafer, J. & Carter, D. L. (2018). *An Assessment of the Management Analysis of Traffic Stops (MATS) Program Data for the Lansing, MI Police Department.* East Lansing, MI: Michigan State University; Withrow, B.L. & Williams H. (2015). Proposing a benchmark based on vehicle collision data in racial profiling research. *Criminal Justice Review, 40 (3)*: 449-469.

[32] Fourth Amendment to the U.S. Constitution; *Delaware v. Prouse*, 440 U.S. 648 (1979); *Whren v. United States*, 517 U.S. 806 (1996).

[33] *Terry v. Ohio*, 392 U.S. 1 (1968).

As was the case with the benchmark for traffic violation stops, U.S. Census population data is inappropriate for the same reasons. Not everyone found committing crimes within a jurisdiction resides within that jurisdiction. An unknown proportion of persons committing crimes in any community come from outside that community, so U.S. Census data may not reflect the race / ethnic composition of these criminal offenders. Importantly, we also know through decades of criminological research that criminal offender populations differ from the general population on many demographic measures. For example, we know that the criminal offender population, on average, has a lower education level and lower income level than the general population. We know that criminal offenders are disproportionately male, and disproportionately between the ages of 15 and 40.[34] The offender population differs from the general population in many ways.

Other than agreement that Census data is an invalid estimate of the criminal offending population within a jurisdiction, social scientists have not come to a consensus on the best benchmark techniques for examining criminal-investigative stops or arrests. One study utilized the "hit rates" – the percentage of persons within each race group that were found to possess illegal contraband – as the benchmark for criminal-investigative stops.[35] Another study utilized the racial composition of crime victims as a benchmark, under the assumption that since the majority of crime is intra-racial in nature, the population of victims should represent the population of offenders. This benchmark was then compared against the racial composition of criminal-investigative stops.[36]

Five studies have used crime arrest rates as the benchmark for criminal-investigative stops. These researchers reasoned that the racial proportions of the persons arrested and charged with crimes under all circumstances (both proactive police arrests and reactive arrests in response to the complaint of a crime victim) approximate the racial proportions of the general criminal offending population within the jurisdiction, and therefore serve as a benchmark for investigative stops.[37]

Despite its wide use, some have taken issue with the criminal arrest benchmark. If officers were to act prejudicially against a particular group in their enforcement actions, then that group would be overrepresented among arrests due to this prejudice, not necessarily because of a higher representation among offenders. Because of the possibility that officers could be biased in their contacts and their arrests, using arrests as a benchmark would present a critically important tautological error. Therefore, some have balked at the use of arrests and instead used the

[34] Sampson, R. J., & Laub, J. H. (1995). *Crime in the Making: Pathways and Turning Points through Life*. Cambridge, MA: Harvard University Press; Wright, J. P., Tibbetts, S. G., & Diagle, L. E. (2014). *Criminals in the Making: Criminality across the Life Course*. Los Angeles: Sage.

[35] Coviello, D., & Persico, N. (2013). *An Economic Analysis of Black-White Disparities in NYPD's Stop and Frisk Program, Working Paper 18803*. Cambridge, MA: National Bureau of Economic Research.

[36] Sherman, L. W., & Kumar, S. (2021). Equal protection by race with stop and frisk: a risk-adjusted disparity (RAD) index for balanced policing. *Cambridge Journal of Evidence-Based Policing*, 5, 1–19.

[37] Fradella, H., Morrow, W., & White, M. (2020). An empirical analysis of the racial / ethnic and sex differences in NYPD stop-and-frisk practices. *Nevada Law Journal, 8*, 1-11; Gelman, A., Fagan, J. & Kiss, A. (2007). An analysis of the New York City police department's "stop-and-frisk" policy in the context of claims of racial bias. *Journal of the American Statistical Association, 102(479)*, 813-823; Levchak, P. J. (2017). Do precinct characteristics influence stop-and-frisk in New York City? A multi-level analysis of post-stop outcomes. *Justice Quarterly, 34(3)*, 377-406; Levchak, P. J. (2021). Stop-and-frisk in New York City: estimating racial disparities in post-stop outcomes. *Journal of Criminal Justice, 73*, 101784; Vartanian, A. (2020). Racial disparities in stop and frisk distributions by the Philadelphia police department. *Social Science Research Network*.

descriptions of suspects from non-police crime victims as a benchmark for criminal-investigative stops. This benchmark removed criminal cases in which the police proactively encountered the crime, and limited cases to only situations in which a private citizen (victim or witness) reported the crime to the police, and provided a physical description of the suspect. This benchmark assumes that, when examining concerns that the police may be acting in a biased manner, non-police crime victims and witnesses would be unbiased, thus providing a description of the criminal offenders they encountered.[38] This method also relied upon official reports of crimes, not just citizen complaints of "suspicious persons" or behavior. This method required that the citizen take the formal step of filing a police crime report.

Post-Stop Citations – Only a few studies thus far have examined post-stop outcomes, such as examining for bias in who received a traffic citation versus only a warning.[39] The reason so few studies have examined such post-stop outcomes is the difficulty in comparing similarly situated circumstances. For example, two drivers of different races could have been stopped for speeding, yet one received a citation and the other received a warning. Many factors other than racial bias may have explained such an outcome as one driver may have been traveling 10 miles-per-hour over the speed limit, while the other driver may have been traveling 30 miles-per-hour over the limit. One driver may have been intoxicated or had a suspended driver's license, while the other driver did not. Therefore, when examining differences by race / ethnicity in post-stop outcomes, it is crucial that these intervening variables are controlled as much as possible by comparing similarly-situated instances.

Of the few studies that involved post-stop analyses, all have used the treatment of white drivers as the benchmark for comparison to the treatment of other racial / ethnic groups. For example, if 20% of the white drivers stopped for having a headlight out received a citation, then one would expect that approximately 20% of similarly situated African-American, Asian, or Hispanic drivers would also have received a citation. This is based on the assumption that discriminatory racial and ethnic biases are only applied towards persons of color.

In summary, data on proactive police enforcement behaviors are useless without an appropriate and valid benchmark for comparison. Only through comparison to a benchmark measure that estimates the demographic characteristics of the population at risk for ***this specific enforcement action*** can researchers begin to examine for evidence of the disproportionate treatment of any specific group.

2.3 Control for Aggregation Bias

When the data involving proactive police behaviors and the data for the comparison benchmarks are drawn in different proportions from different subunits of a population, then the statistical problem of aggregation bias arises. Aggregation bias is defined as when the difference for the

[38] Dolan Consulting Group LLC (2018). *Evaluating Fairness in Traffic Stops by the Ann Arbor Police Department*. Raleigh, NC: Dolan Consulting Group; Dolan Consulting Group LLC (2022). *Examining Fairness in the Stops, Citations, and Arrests by the Carmel Police Department*. Raleigh, NC: Dolan Consulting Group, LLC.
[39] Dolan Consulting Group LLC (2018). *Evaluating Fairness in Traffic Stops by the Ann Arbor Police Department*. Raleigh, NC: Dolan Consulting Group; Dolan Consulting Group LLC (2022). *Examining Fairness in the Stops, Citations, and Arrests by the Carmel Police Department*. Raleigh, NC: Dolan Consulting Group, LLC.

group and the individual is confounded by an ecological sampling error.[40] For example, imagine that a study examining police bias in traffic stops used a benchmark of drivers involved in crashes, but the city was divided into two districts that had very different racial demographics and traffic crash patterns. Imagine that District X had 100 crash drivers (of which 0% were African-American), and 50 drivers stopped by the police (of which 0% were African-American). In other words, 0% of the drivers stopped were African-American and 0% of the drivers in the benchmark were African-American, thus no racial disparity existed. The other district, District Y, had 50 crash drivers (of which 25, or 50%, were African-American), and 100 stopped drivers (of which 50, or 50%, were African-American). In other words, 50% of the drivers stopped in District Y were African-American, and exactly 50% of the drivers in the benchmark were African-American, thus (again) no racial disparity existed. In District X there were no racial disparities as 0% of the drivers on the roadway were African-Americans and 0% of the drivers stopped there were African-Americans. Likewise, no disparity existed in District Y as 50% of the drivers and 50% of those stopped by the police were African-Americans.

The problem of aggregation bias occurs when we add all these data together (i.e., "aggregate" the data) at the citywide level. When we combine the District X and Y data at the citywide level, we find that there were 150 total crash drivers (100 from District X and 50 from District Y), and that 25 (16.7%) of these crash drivers were African-Americans. We also find that there were 150 stopped drivers (50 from District X and 100 from District Y) and 50 (33.3%) of these stopped drivers were African-Americans. This aggregated result falsely suggests that African-Americans were disproportionately stopped by the police as African-American drivers made up 33.3% of total drivers stopped citywide, yet only 16.7% of total drivers in the benchmark. But this apparent bias is false as we have just seen that there was absolutely no bias when examined at the disaggregated district level. There were simply more crashes used in the citywide benchmark that came from District X, more stops that came from District Y, and the two districts have very different demographic features.

The same problem of aggregation bias might occur if there are major demographic differences by time of the day (i.e., more crashes occurring when there are fewer African-American drivers on the roadway, and more stops when there are more African-American drivers on the roadway).[41] Also keep in mind that it makes simple sense that there would be more vehicle stops during periods, or in districts, of fewer crashes and calls for service. When law enforcement officers are tied up handling crashes and other calls for service, they have less free patrol time to devote to traffic enforcement duties. When there are fewer crashes and calls for service to handle, officers naturally have more free patrol time to engage in making vehicle stops to enforce traffic laws.

[40] Lubinski, D., & Humphreys, L. G. (1996). Seeing the forest from the trees: When predicting the behavior or status of groups, correlate means. *Psychology, Public Policy, and Law, 2(2)*, 363–376; Rose, D. D. (1973). National and local forces in state politics: The implications of multi-level policy analysis. *American Political Science Review, 67(4)*, 1162–1173; Rosenthal, J. A. (2001). *Statistics and Data Interpretation*. New York: Wadsworth.

[41] Smith, M.R., Rojek, J.J., Petrocelli, M. & Withrow, B. (2017). Measuring disparities in police activities: a state of the art review. *Policing: An International Journal 40(2)*, 166-183; Tillyer, R., Engel, R.S. & Calnon-Cherkauskas, J. (2010). Best practices in vehicle stop data collection and analysis. *Policing: An International Journal 33(1)*, 69-92; Withrow, B. L. (2004). Driving while different: a potential theoretical explanation for race-based policing. *Criminal Justice Policy Review, 15(3)*, 344-364.

As a result, most researchers understand the importance of disaggregating their examinations of proactive police behaviors by geographic locations and times of day whenever possible. This requires a balance between the disaggregating on the one hand, and having a statistically valid sample size of stops or benchmark cases on the other. Nevertheless, it is a best practice to disaggregate by geographic region and time of day whenever possible, and many studies have followed this practice.[42]

2.4 Statistical Controls for Error

In statistics, sampling errors occur when the statistical characteristics of a population are estimated from a smaller sample of that population. Since a sample does not include all members of the population, the characteristics of the sample will differ from the characteristics of the true population from which the sample was drawn. By chance alone, there will be a couple of cases too many of one category, and a couple of cases too few of another when gathering a sample, even a random sample. These differences between the sample and the population are called sampling error. This has been proven so many times throughout the last century that sampling error holds the status of a law within statistics.[43] For example, if a researcher measures the age of 100 individuals from all the people in the U.S., the average age among the sample of 100 individuals typically would be somewhat different than the average age of all 329 million people in the country. Due to sampling error, the sample of 100 individuals would not have ages in the exact same proportion as these ages exist in the entire U.S. population.

Here is a simple way to illustrate the problem of sampling error. In the U.S., we know from Census data that 50.9% of the population is female and 49.1% is male. But pretend that we did not know this. If we took a random sample of three Americans, we could only find that women make up either 0% (no females), 33.3% (one female), 66.7% (two females), or 100% (three females) of the sample. If we did this multiple times, taking random samples of three people each time, the laws of probability and the fact the real percentage of females in the population is 50.9%, the majority of the time we would get samples with either one (33.3%) or two (66.7%) females. But notice that we could never get a sample with the true population reality of 50.9% female. That is mathematically impossible with a sample size of only three individuals. The real percentage in the population is not 33.3% female, nor is it 66.7% female, but these are as close as we can come to the true population percentage due to our sample being so small.

As sample sizes get bigger, however, we are more likely to get a result closer to the true population (i.e., sampling error decreases), but still not quite exactly because sampling error still exists. If, for example, we take a random sample of seven Americans, this would more than double the sample

[42] See, for example: Dolan Consulting Group LLC (2018). *Evaluating Fairness in Traffic Stops by the Ann Arbor Police Department*. Raleigh, NC: Dolan Consulting Group; Dolan Consulting Group LLC (2022). *Examining Fairness in the Stops, Citations, and Arrests by the Carmel Police Department*. Raleigh, NC: Dolan Consulting Group, LLC.; Engel, R. S., Calnon, J. M., Tillyer, R., Johnson, R. R., Liu, L. (2005). *Pennsylvania State Police Project on Police-Citizen Contacts: Year 2 Final Report (May 2003-April 2004)*. Cincinnati, OH: University of Cincinnati; Engel, R. S., Frank, J., Tillyer, R., Klahm, C. (2006). *Cleveland Division of Police Traffic Stop Data Study: Final Report*. Cincinnati, OH: University of Cincinnati; Lamberth, J. C. (2017). *Grand Rapids Michigan Police: Results from Stop Data Analysis Study*. Chads Ford, PA: Lamberth Consulting LLC.

[43] Rosenthal, J. A. (2001). *Statistics and Data Interpretation*. New York: Wadsworth; Sarndal, C. E., Swenson, B., & Wretman, J. (1992). *Model Assisted Survey Sampling*. New York: Springer-Verlag.

size in the first example. Yet we would still not find the true percentage of females in the population. With any random sample of seven individuals, we would find that females make up either 0% (no females), 14.3% (1 female), 28.6% (2 females), 42.9% (3 females), 57.1% (4 females), 71.4% (5 females), 85.7% (6 females), or 100% (7 females) of the sample. Again, if we took multiple random samples of seven individuals, because of the laws of probability the majority of our samples would have three females (42.9% female) or four females (57.1% female), but never the reality of 50.9% female. Even if we took samples of 100 individuals, simply due to chance we would still sometimes get samples with 48 females, 49 females, 50 females, 51 females, or 52 females – it would be close, but still not the exact true percentage. If we were lucky and acquired 50 or 51 females, we still could not get exactly 50.9% females with a sample of 100 individuals. This is all because of sampling error.

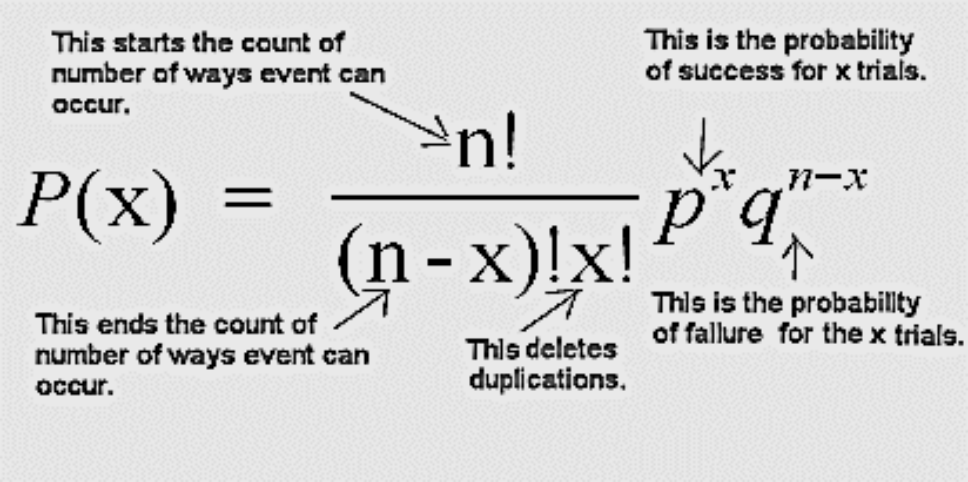
It would take samples of at least 1,000 individuals before it would even be mathematically possible to achieve the true result of 50.9% female in a sample. But due to chance alone, sometimes we would still gather samples that had a few too many, or a few too few, females to match the exact reality of 50.9% female. This inaccuracy that occurs when using samples is sampling error. As the proactive traffic stops we examine are samples, and the benchmark measures of drivers on the roadways are samples, they both have sampling error and do not exactly match the real population. Therefore, if a certain racial group makes up 26.3% of the drivers in the benchmark sample of a few hundred drivers, but that same racial group makes up 30.9% of the drivers stopped in a sample of a few hundred police stops, it is very possible that the 4.6 percentage point difference could be due to sampling error, ***not*** racial discrimination.

When examining proactive police behaviors, we utilize samples of these activities as they are not analyzed in real-time, or for infinity. For instance, researchers usually take a single year's worth of data on vehicle stops. These are a sample and not all of the stops that have ever occurred or ever will occur (the true population). Likewise, the benchmark data are also samples. For example, one cannot measure all of the drivers operating vehicles on all the roadways of the jurisdiction at all times. Therefore, a sample of crash drivers or observed drivers is used to ***estimate*** what the population of all drivers looks like. Since sampling always includes some level of sampling error (i.e., inaccuracy in estimating the population), one must ***always*** control for sampling error when using sample estimates. This is why scientists, including social scientists, engage in mathematical statistical analysis procedures when examining samples. They use statistical tests to determine if a difference between the outcome found (i.e., the percentage of a racial group in the police stops), is different from the outcome in the benchmark, and whether any differences were simply due to sampling error.[44]

The binomial test is one simple statistical test that measures the statistical significance of differences between a sample and a known population, or between two compared samples.[45] For example, when testing a sample of seven Americans from a population that is known to be 50.9% female, the binomial test would reveal that a result of 42.9% (three females) or 57.1% (four females) from our 7-person sample is not significantly different from the true measure of 50.9% female because it can estimate the amount of sampling error in the sample size.

[44] Rosenthal (2001); Sarndal et al. (1992).
[45] Rosenthal, J. A. (2001). *Statistics and Data Interpretation*. New York: Wadsworth.

Figure 2.1. Binomial Test Formula



The formula for the binomial test considers several things. First, it considers how far apart the sample percentage is from the known population percentage (i.e., how far apart the percentage of crash drivers that were African-Americans differs from the percentage of stopped drivers who were African-Americans). Second, it considers the size of the sample, realizing that larger samples better represent the actual population (i.e., have less sampling error).[46] Third, the binomial test formula considers the size of the proportions involved, realizing that with smaller proportions a greater proportional change will occur with a one-unit increase.[47] (For example, if a city averages 1 homicide per year and just happens to have no homicides one year, it experiences a 100% decrease in homicides even though it was only one less homicide than the average. By comparison, for a city that averages 100 homicides per year, one less homicide in a given year would only equate to a 1% decrease in homicides. When dealing with small units, such as 1 homicide versus 100 homicides, a single unit change creates a massive proportional change.)

Fourth, the binomial formula considers the mathematical laws of probability that suggest the expected amount of sampling error in a particular sample, based on all of these other elements above. The binomial test formula calculates all these pieces of information. Its output is the chance (written as a proportion) that the percentage of stops and the percentage of crash drivers are roughly the same, after controlling for sampling error.[48] In other words, it reveals how confident one can be that the difference between the two compared samples is a real difference, and not simply the result of sampling error. If the difference is not statistically significant, the difference between the stops and the benchmark is considered "within the margin of error."

The binomial test is just one test used by researchers who have examined proactive police behaviors for evidence of racial or ethnic bias. There are other statistical tests that are also

[46] Lehmann, E. L., & Romano, J. P. (2005). *Testing Statistical Hypotheses, 3rd Edition*. New York: Springer; Rosenthal (2001).
[47] Lehmann & Romano (2005); Rosenthal (2001).
[48] Lehmann & Romano (2005); Rosenthal (2001).

available, depending on the type of analyses being conducted. The point, however, is that examining the proportions of a racial group in the percentage of stops or citations, and then comparing it to some benchmark sample, ***must always control for sampling error with a statistical test***.[49]

2.5 Summary

The present study is an effort to apply correct scientific procedures to the examination of the stops and citations made by the officers of the Greenwood Police Department. Using a sample of twelve months of data (July 1, 2022 through June 30, 2023), DCG applied all of these widely accepted best scientific practices to appropriately examine these police behaviors.

[49] Lehmann & Romano (2005); Rosenthal (2001).

3. METHODOLOGY

It is crucial that the reader not skip Section Two above that explains the validity of the methods described in this section, and why it is so very important that these methods be followed. The methodology followed by DCG in this report adheres to the proven, best scientific practices for examinations of potential racial bias in proactive enforcement actions by police agencies.[50] Section Two above explains the tremendous amount of research by many, many social scientists over several decades that have discovered the errors in the past methods of amateurs, and found scientifically sound practices to overcome these errors. Section Three will now explain how these best practices were specifically applied to the analyses of the Greenwood Police Department.

In examining the data available from the Greenwood Police Department, we specifically looked for patterns of disproportionately punitive treatment toward people groups commonly portrayed in the sociological literature as being marginalized by the dominant society. This generally refers to members of racial / ethnic minority groups.[51] Therefore, we emphasized comparisons of the treatment of these groups to the treatment of non-Hispanic Whites to see if other people categories were treated more punitively (i.e., more likely to be stopped or ticketed) than non-Hispanic Whites.

We first examined the stop decisions and citation decisions of the five officers of interest who were found to have engaged in unprofessional and apparently racist electronic messaging while working. The concern of the Greenwood Police Department's leaders was whether the explicit biases revealed in the insulting, racially offensive statements communicated between these five officers translated into biased behavior in the treatment of the public. We then examined the stop decisions and citation decisions of the remaining members of the Greenwood Police Department. The leadership of the Greenwood Police Department wanted to see if the behaviors of these five officers were part of a larger problem within the department, or if these five officers were an unfortunate, but isolated, circumstance.

In doing this, we had to utilize the race / ethnicity categories contained within the official data collected by the Greenwood Police Department's records management systems. For example, we recognize that Hispanic / Latino is an ethnicity, and not a race. However, the software systems used by the Greenwood Police Department offers "Latino" as a race option. The parameters of these various databases are determined by the state government for citation and vehicle crash data, and thus beyond the control of the Greenwood Police Department.

As a result, the Greenwood police officers entering the data into these databases were forced to categorize individuals' races by using one of the following categories: "Alaskan Native / American Indian", "Asian / Pacific Islander", "African-American / Black", "Caucasian / White," or "Latino." As a result, we examined these data using the race / ethnicity categories available within the data.

[50] Smith, M.R., Rojek, J.J., Petrocelli, M. & Withrow, B. (2017). Measuring disparities in police activities: a state of the art review. *Policing: An International Journal 40(2)*, 166-183; Tillyer, R., Engel, R.S. & Calnon-Cherkauskas, J. (2010). Best practices in vehicle stop data collection and analysis. *Policing: An International Journal 33(1)*, 69-92; Withrow, B. L. (2005). *Racial Profiling: From Rhetoric to Reason*. Upper Saddle River, NJ: Pearson-Prentice Hall.
[51] Cudd, A. E. (2006). *Analyzing Oppression*. London: Oxford University Press; Silfen-Glasberg, D., & Shannon, D. (2010). *Political Sociology: Oppression, Resistance, and the State*. Los Angeles: Sage.

Also, since there were so few cases marked as "Alaskan Native / American Indian" or "Unknown," these cases were added together as a category we refer to as "All other groups" to simplify the statistical analyses.

3.1 Greenwood Police Enforcement Action Measures

The leadership of the Greenwood Police Department specifically requested that DCG examine their vehicle stop and citation decisions to determine if there were patterns of racially biased policing on the part of their officers. Therefore, the domains that were examined began with proactive vehicle stops made by members of the Greenwood Police Department. Specifically, this involved determining whether members of any race / ethnic group were stopped by officers more often than they appeared within the population of those likely to be stopped if no bias existed. The second domain involved examining whether or not the individuals stopped received a traffic citation, or simply received a warning. Specifically, this involved determining if the drivers of each demographic group, when stopped under similar conditions, were just as likely to receive a citation as non-Hispanic White drivers.

Proactive Vehicle Stops – To pursue the first domain, data were needed on all proactive vehicle stops initiated by members of the Greenwood Police Department. The way the various record-keeping systems had been created over time within the Greenwood Police Department did not easily facilitate downloading a file of "proactive vehicle stops." One database existed of all traffic and non-traffic citations, and another separate database existed for all traffic and non-traffic written warnings issued. Using these databases, data on stops were created manually for the 12-month period from July 1, 2022 through June 30, 2023.

These "proactive vehicle stops" data were created through three steps. First, non-traffic offenses were removed from the separate warning and citation datasets as these were not associated with proactive, officer-initiated vehicle stops. Examples of cases that were removed included warnings or citations for false burglar alarms, noise complaints, dog bites, parking violations involving unattended vehicles, littering, un-mowed lawns, and shoplifting. Offenses such as these are encountered as the result of other circumstances, such as a citizen request for police intervention, not an officer-initiated stop of a motor vehicle.

Second, citations and warnings resulting from vehicle crash investigations were also removed. Citations and warnings issued as part of a crash investigation did not involve an officer proactively stopping a vehicle. Instead, an officer was summoned to the scene of a motor vehicle accident by the parties involved. Therefore, the officer did not make a discretionary decision to stop the vehicles involved, and thus these situations did not constitute "proactive vehicle stops." Using the database of vehicle crashes investigated by the Greenwood Police Department, we examined the dates, times, and locations of the crashes and removed any such cases from the warnings and citations data that corresponded with these crashes.

Third, once the non-traffic offenses and crashes were removed, the traffic offense warning and citation databases were merged together, with each case (i.e., each row of data in the Microsoft Excel spreadsheet) being a traffic offense that received either a citation (i.e., a traffic ticket) or a warning. Some vehicle stops, however, involved only one offense (i.e., one row of data), while

others involved multiple offenses (i.e., multiple rows of data). Yet, since this part of the analysis was only concerned with measuring stops, not offenses, we needed data with only one case (row of data) for each stop. To achieve this, we reduced each multiple-offense stop to only one row of data (i.e., one stop). This was accomplished by sorting all of the cases by officer, date, and time to find instances where multiple offenses were recorded by the same officer at the same date and approximate time. Instances where an individual officer recorded multiple offenses at the same date and approximate time were identified as a *single* stop that simply involved multiple offenses.

The result was 11,254 individual vehicle stops conducted by members of the Greenwood Police Department that occurred during the twelve-month period of study (07/01/2022 – 06/30/2023). Unfortunately, a major issue was discovered when attempting to differentiate between traffic stops and criminal-investigative stops.

Recall from Section 2 of this report that law enforcement officers may legally stop motor vehicles for two purposes – the enforcement of traffic laws and the investigation of crimes. These are two different situations that each require their own benchmark for comparison. Recall that law enforcement officers have the legal authority to stop cars when probable cause or reasonable suspicion exists that the individuals inside have committed a crime. When an officer observes a vehicle occupant commit a criminal act, or a victim or witness to a crime identifies to the officer that a vehicle occupant has committed a crime, the officer may immediately stop and detain that vehicle without the need for the officer to observe a traffic law violation before stopping the vehicle.[52] Law enforcement officers may also stop vehicles and question occupants based on reasonable suspicion of criminal activity, a lower standard of proof than probable cause.[53]

These stops are unassociated with traffic violations *per se*, and strictly associated with criminal violations, yet an officer may also observe a stoppable traffic violation as well. Those who should be legally and ethically at risk for criminal-investigative stops should be those individuals found committing crimes within the jurisdiction – not the general population of persons found driving on the roadways. Therefore, a crime-specific benchmark is needed for any analysis of criminal-investigative stops.

Regrettably, the way the Greenwood Police Department gathers and stores its data did not differentiate between stops initiated for the purposes of a criminal investigation with a traffic violation witnessed, and stops initiated solely for the public safety purposes of traffic enforcement. We were able to identify 430 vehicle stops that resulted in the criminal arrest of at least one of the vehicle's occupants. As a result of the criminal arrests, it is indisputable that those 430 stops were criminal-investigative in nature. We pulled these stop cases that resulted in an arrest aside to be analyzed separately from the remaining vehicle stops, and compared them with the criminal offender suspects benchmark, rather than the crash driver benchmark. This will be described in greater detail below.

However, the reader must realize that the remaining 10,824 "proactive vehicle stops" data contain a mixture of vehicle stops conducted solely for traffic enforcement purposes (for which crash

[52] Fourth Amendment to the U.S. Constitution; *Delaware v. Prouse*, 440 U.S. 648 (1979); *Whren v. United States*, 517 U.S. 806 (1996).
[53] *Terry v. Ohio*, 392 U.S. 1 (1968).

drivers served as the most appropriate benchmark for comparison), and stops for criminal-investigative purposes (for which the criminal suspect descriptions benchmark would be the most appropriate comparison). This matters tremendously as each type of stop is traditionally compared to a different benchmark (driver population for traffic stops, and criminal offender population for criminal-investigative stops). As a result, these 10,824 "proactive vehicle stops" were compared to both the crash driver (driving population) benchmark and the criminal suspect descriptions (criminal offenders) benchmark.

Known Criminal-Investigative Stops – As explained above, the Greenwood Police Department data did not differentiate between stops initiated for the purposes of a criminal investigation (even with a traffic violation witnessed), and stops initiated solely for the public safety purposes of traffic enforcement. However, since we were able to identify 430 vehicle stops that resulted in the criminal arrest of at least one of the vehicle's occupants, we considered these 430 stops as criminal-investigative in nature. While the "proactive vehicle stops" included a mixture of stops for traffic enforcement and stops of a criminal-investigative nature, we can reasonably assume these stops that resulted in arrest were focused on criminal-investigative motives for stop. We pulled these vehicle-stop cases aside to be analyzed separately from the remaining vehicle stops, and compared them with only the criminal offender suspects benchmark, and not the crash driver benchmark.

Post-Stop Citations – The leadership of the Greenwood Police Department also asked DCG to examine post-stop citations to determine if any racial / ethnic group received more punitive enforcement action than that received by non-Hispanic Whites. As described in Section Two of this report, in order to do this, one needs to compare similarly-situated individuals as vehicle stops vary in the seriousness of the type and number of traffic offenses involved.

First, it is important to consider offenses with similar offense seriousness. For example, running a red-light traffic signal at a busy intersection, or speeding through a school zone during school hours, are much more serious offenses than having an expired license plate or a single burned-out headlight. As a result, the serious moving violations are more likely to result in the issuance of a traffic citation, and the minor violations are less likely to result in a citation. If a driver of one race was stopped for dashing through a red light at a busy intersection, and a driver of a different race was stopped for having a tail light burned out, it is likely these two drivers would receive different outcomes with regards to a citation. Nevertheless, this difference in outcomes would have nothing to do with the drivers' races, as they were involved in very different situations. It is extremely necessary to compare stops for the same offense under similar circumstances.

There are also multiple-offense stops. For example, two drivers may both be stopped for having a headlight out. While this may be the only violation for one of the drivers, the second driver may also be intoxicated, have a suspended driver's license, and disregarded a stop sign. Obviously, such differences in circumstances will legitimately result in different outcomes for the two drivers despite their being stopped for the same reason. The intoxicated and suspended driver will likely be cited, placed into custody under arrest, and have his or her vehicle impounded. The other driver will likely only receive a warning, cautioning the driver to have the headlight replaced. The different outcomes would have nothing to do with the drivers' races, only different circumstances of seriousness.

In order to conduct an appropriate analysis, therefore, it was first necessary to isolate stops that involved one – and only one – offense. Once these single-offense stops were isolated, stops for the same offense were then compared with one another. Of the 10,824 "proactive vehicle stops," 9,139 (84.4%) involved only one traffic violation. The 1,685 multiple-violation stops that were removed (only 15.6% of all stops), involved between two and twelve violations each, with a mean of 3.3 violations discovered per stop. Each of these stops varied considerably from the next in terms of combinations of types of violations encountered, number of violations encountered, and seriousness of circumstances. As a result, it was not possible to gather a sufficient sample of comparable multiple-violation stops for each patrol district to analyze properly with comparisons across multiple racial / ethnic groups. However, it was clear that the vast majority of the multiple-violation stops involved drivers with very serious violations. Of the multiple-violation stops, 86.9% of the drivers had a suspended or revoked driver's license, had never received a driver's license, or were found to be driving while intoxicated.

The 9,139 one-violation stops were found to involve 84 different specific violations of traffic laws. The vast majority of these different violations, however, occurred less than 10 times in the data, making it difficult to find comparable stops for persons of each race / ethnicity category. Examples of such rare offenses included stops for a leaky load (i.e., material flying out of the back of a vehicle), missing outside rearview mirror, loud exhaust / muffler, operating a passenger vehicle with a farm animal inside, and illegal blue light display. Such violations were encountered so infrequently that there were not enough similar stops to which they could be compared.

Therefore, among the single-violation stops, we only examined post-stop citation decisions for the six most common reasons for stop across the city. These six most common reasons for stop were:
1.) Speeding (2,402 single-violation stops)
2.) Improper headlights or tail lights (1,817 single-violation stops)
3.) Operating with expired plates (1,225 single-violation stops)
4.) Failure to use seatbelt in front seat (996 single-violation stops)
5.) Disobey / disregard a traffic control signal / sign (996 single-violation stops)
6.) Unsafe lane movement (523 single-violation stops)

These six reasons for stop totaled 7,923 of the single-violation stops, making up 86.7% of the 9,139 single-violation stops by Greenwood officers. The remaining 1,219 single-violation stops were spread across 78 other traffic violation offense categories. Again, the small number of cases within each of these remaining offense categories prevented the comparison of similar offense cases with any hope of racial diversity among the drivers stopped.

3.2 Greenwood Benchmark Measures

As described earlier in Section Two of this report, scholars and researchers have realized that different proactive police behaviors require different benchmark measures to reflect the population legitimately at risk of receiving a specific police enforcement action. As a result, each of the police behaviors examined here – general stops, criminal stops, and citations – needed its own appropriate benchmark measure for comparison.

Crash Drivers – DCG uses crash drivers to estimate the driving population. As explained in Section Two, U.S. Census population data ***do not*** represent the race / ethnic demographic characteristics of the driving population within any geographic region. This has been widely acknowledged by researchers for more than two decades.[54] DCG has found the previously validated benchmark of crash drivers to be a sound method for estimating the demographic characteristics of the driving population in an area – the persons at risk of being stopped for committing a violation of the traffic laws.[55]

Therefore, data were accessed on the race / ethnicity of the drivers involved in all motor vehicle crashes handled by the Greenwood Police Department within the confines of Greenwood city limits, from July 1, 2022, through June 30, 2023. This was a total of 2,601 drivers for which the driver's race / ethnicity was recorded. An examination of these drivers demonstrated how inappropriate U.S. Census population data are for estimating the demographic characteristics of the drivers on the roadways in any specific region.

As Figure 3.1 below reveals, of the 2,601 drivers who were involved in vehicle crashes within the borders of Greenwood, less than half (42.4%) were residents of Greenwood. This estimate means that far more than half (57.6%) of the drivers who travel the roadways of Greenwood were not included within Greenwood's U.S. Census statistics. They would have been contained in the Census data from other communities.

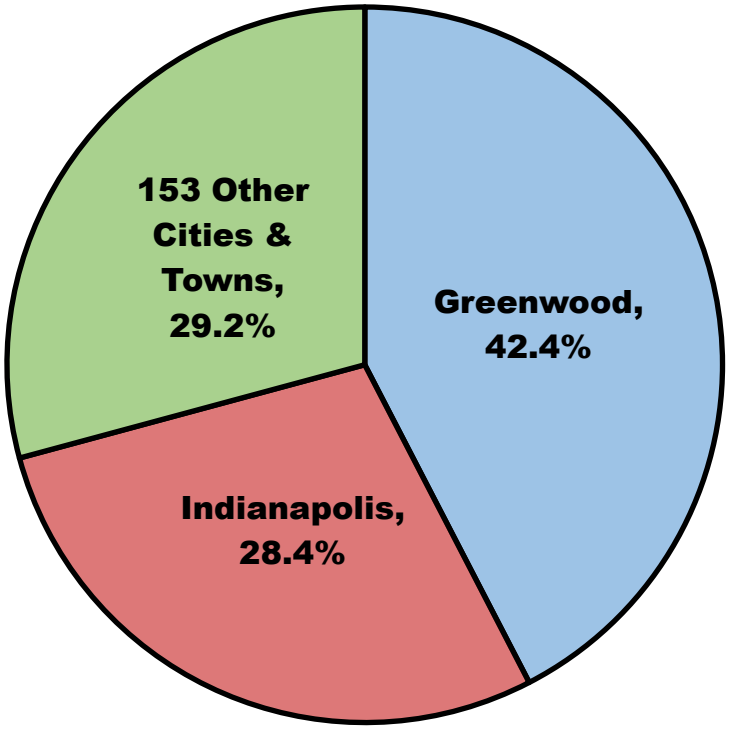
The drivers who were traveling the roadways within Greenwood and had crashes there represented residents from 155 different cities and towns, across 21 different U.S. states and three foreign nations (Canadian, Mexico, and South Korea). Each of these cities have very different racial / ethnic compositions. The six cities of highest representation among the crash drivers were Greenwood (42.4%), Indianapolis (28.4%), Franklin (4.2%), Whiteland (4.0%), Bargersville (3.1%), and Martinsville (1.0%). This clearly demonstrates that the majority of drivers traveling within Greenwood are people from other communities. The Indianapolis metropolitan area is the thirty-third largest metro area in the nation, attracting people from far and wide for business and leisure. The metro area is crisscrossed with major interstate highways, including I-64, I-65, I-69,

[54] Engel, R. S., & Calnon, J. M. (2004). Comparing benchmark methodologies for police-citizen contacts: traffic stop data collection for the Pennsylvania State Police. *Police Quarterly, 7(1)*, 97-125; Federal Highway Administration. (2000). *Travel Patterns of People of Color*. Washington, DC: U.S. Department of Transportation; Grogger, J., & Ridgeway, G. (2006). Testing for racial profiling in traffic stops from behind a veil of darkness. *Journal of the American Statistical Association, 101(475)*, 878-887; Mauch, M. & Taylor, B. D. (1997). Gender, race, and travel behavior: analysis of household-serving travel and commuting in San Francisco Bay Area. *Transportation Research Record 1607(1)*, 147-153; Preston, V. & McLafferty, S. (2016). Revisiting gender, race, and commuting in New York. *Annals of the American Association of Geographers 106(2)*, 300-310; Smith, M.R., Rojek, J.J., Petrocelli, M. & Withrow, B. (2017). Measuring disparities in police activities: a state of the art review. *Policing: An International Journal 40(2)*, 166-183; Tillyer, R., Engel, R.S. & Calnon-Cherkauskas, J. (2010). Best practices in vehicle stop data collection and analysis. *Policing: An International Journal 33(1)*, 69-92; Withrow, B. L. (2005). *Racial Profiling: From Rhetoric to Reason*. Upper Saddle River, NJ: Pearson-Prentice Hall.

[55] Alpert, G.P., Smith, M.R., & Dunham, R. (2004). Toward a better benchmark: Assessing the utility of not-at-fault traffic crash data in racial profiling research. *Justice Research and Policy, 6(1)*: 44-69; Dolan Consulting Group LLC (2018). *Evaluating Fairness in Traffic Stops by the Ann Arbor Police Department*. Raleigh, NC: Dolan Consulting Group; Schafer, J. & Carter, D. L. (2018). *An Assessment of the Management Analysis of Traffic Stops (MATS) Program Data for the Lansing, MI Police Department*. East Lansing, MI: Michigan State University; Withrow, B.L. & Williams H. (2015). Proposing a benchmark based on vehicle collision data in racial profiling research. *Criminal Justice Review, 40 (3)*: 449-469.

I-70, US-31, US-40, and US-421. There is a reason the official slogan of the State of Indiana is the "Crossroads of America" – because it is. It should be no surprise, then, that the driving population within Greenwood, through which several major highways pass, is more racially / ethnically diverse than the population of Greenwood itself.

Figure 3.1 Residence Location of the 2,601 Drivers in Crashes within Greenwood



The race / ethnic composition of the drivers found within Greenwood differed markedly from the Census population for the city. According to the U.S. Census Bureau, the population of Greenwood during 2020 was 4.0% African-American, 6.7% Asian / Pacific Islander, 6.8% Hispanic / Latino, 79.1% non-Hispanic White, and 3.4% all other groups.[56] In comparison, the crash drivers in Greenwood were 9.3% African-American, 5.8% Asian / Pacific Islander, 2.5% Hispanic / Latino, 82.1% non-Hispanic White, and 0.3% all other groups. African-American representation among drivers involved in crashes within Greenwood was 133% higher than the African-American representation among the residents of Greenwood. On the other hand, Asian / Pacific Islanders were 15% less likely to be among the crash drivers as compared to their representation within the population of Greenwood. Hispanic representation among drivers involved in crashes within Greenwood was 63% lower than the Hispanic representation among the residents of Greenwood.

The driving population within Greenwood is clearly very different from the resident population in terms of race / ethnicity. This reinforces the absurdity of using U.S. Census statistics as a

[56] U.S. Census Bureau, 2020 (https://www.census.gov/quickfacts/Greenwoodcityindiana).

benchmark. The employment, shopping, and recreation opportunities Greenwood offers draws people from around the metro area and the nation.

Victim-Reported Criminal Suspect Descriptions – If the data on proactive vehicle stops included traffic stops only, the crash driver benchmark would have been sufficient for a valid comparison. Research has revealed that the vast majority of the driving population engages in minor traffic violations from time to time.[57] As such, a benchmark that simply measures the drivers on the roadways (such as the crash drivers benchmark does) would be sufficient to approximate those individuals at legitimate risk for experiencing a traffic stop. Unfortunately, as described earlier in the section, our data included a mixture of traffic-focused stops and criminal-investigative stops.

The majority of the driving population is ***not*** likely to engage in criminal behavior. We know through a century of criminological research that criminal offender populations differ from the general population on many demographic measures. For example, we know that the criminal offender population, on average, has a lower education and income level than the general population. We know that criminal offenders are disproportionately male, and disproportionately between the ages of 15 and 40.[58] Furthermore, an unknown number of persons committing crimes in any community come from outside that community, as was the case with the majority of drivers coming from outside of the Greenwood community.

Therefore, the U.S. Census data for all the residents of Greenwood would not reflect the demographic characteristics of the criminal offenders committing crimes within Greenwood. Likewise, the measure for the driving population (crash drivers) also would not reflect the demographic characteristics of the criminal offenders committing crimes within Greenwood. A different benchmark was required for stops of a criminal investigatory nature. What was needed was a benchmark that estimated the demographic characteristics of the segment of society that was engaged in crime within the borders of Greenwood, no matter where the offenders lived.

As was described earlier in Section Two, previous studies have used arrested individuals as the benchmark representing the criminal offender population. The DCG staff has been uncomfortable with that benchmark method as it inherently carries a tautological issue. If the police engage in biased enforcement against a particular racial group (which is what we are trying to determine), then that group would be disproportionately stopped and arrested. This bias would therefore create an overrepresentation of that racial group among the arrested offenders and would bias arrested offenders as a benchmark. It would be more trustworthy, therefore, to employ a measure of the criminal offender population that is not determined by police officers.

[57] Blanchard, R. A., Myers, A. M., & Porter, M. M. (2010). Correspondence between self-reported and objective measures of driving exposure and patterns in older drivers. *Accident Analysis & Prevention, 42(2)*, 523–529; Miller, K. (2009). Race, driving, and police organization: Modeling moving and nonmoving traffic stops with citizen self-reports of driving practices. *Journal of Criminal Justice, 37(6)*, 564-575; Stinchcombe, A., & Gagnon, S. (2013). Aging and driving in a complex world: Exploring age differences in attentional demand while driving. *Transportation Research: Traffic Psychology and Behaviour, 17*, 125–133.

[58] Sampson, R. J., & Laub, J. H. (1995). *Crime in the Making: Pathways and Turning Points through Life*. Cambridge, MA: Harvard University Press; Wright, J. P., Tibbetts, S. G., & Diagle, L. E. (2014). *Criminals in the Making: Criminality across the Life Course*. Los Angeles: Sage.

As a result, DCG relies upon the descriptions of criminal offenders provided by non-police individuals. We utilized the physical descriptions of criminal suspects that were provided by crime victims and witnesses to crimes who were not police officers.[59] It should also be noted that these descriptions were not merely "suspicious persons." Each of these descriptions was associated with the filing of a formal police report about a verifiable crime.

Such data were available through reviewing the electronic records of crimes reported to the Greenwood Police Department by members of the public from July 1, 2022, through June 30, 2023. Non-police witnesses and victims who reported crimes that took place within Greenwood provided physical descriptions for 1,775 criminal suspects. These descriptions were provided by private citizens describing the people who stole from them, threatened them, physically assaulted them, or destroyed their property. These descriptions served as our benchmark estimate of the characteristics of the criminal offending individuals operating within Greenwood.

The U.S. Census population of Greenwood in 2020 was 4.0% African-American, 6.7% Asian / Pacific Islander, 6.8% Hispanic / Latino, 79.1% non-Hispanic White, and 3.4% all other groups. The 1,775 criminal suspects described to the police by crime victims and witnesses were 28.2% African-American, 4.1% Asian / Pacific Islander, 6.1% Hispanic / Latino, 60.5% non-Hispanic White, and 1.1% all other groups. This reveals that Census data do not reflect the demographic characteristics of the criminal offender population of a community.

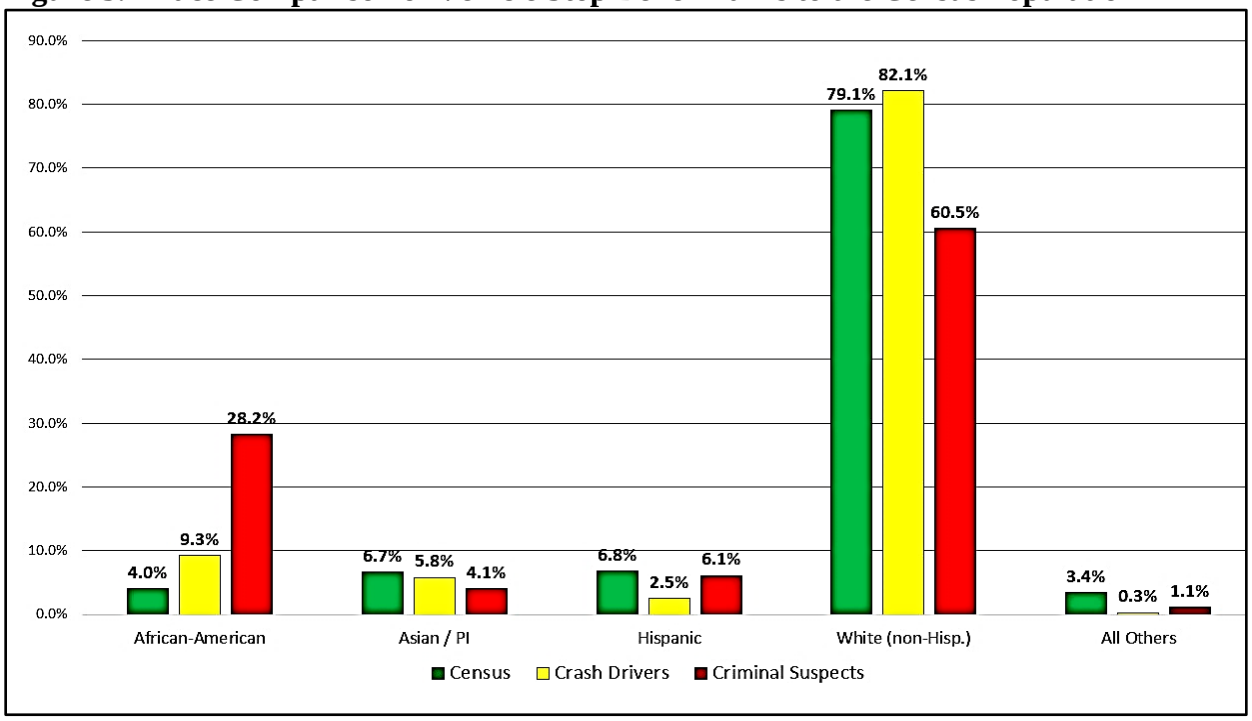
African-American representation among the criminal suspects described by crime victims and witnesses was seven times higher than the African-American representation among the residents of Greenwood. Asian / Pacific Islander representation among the criminal suspects described by crime victims and witnesses was 39% lower than the Asian / Pacific Islander representation among the residents of Greenwood. The criminal-offending population operating within Greenwood is clearly very different from the resident population in terms of race / ethnicity.

Most of these criminal suspects were not apprehended and identified as specific individuals, so it is more difficult to determine their places of residence like we did with crash drivers. Only 870 of these 1,775 described suspects were apprehended. However, of these apprehended individuals, less than half (43.3%) resided in Greenwood. More than a third (36.6%) resided in Indianapolis, and the remaining 20.1% of the apprehended criminal suspects came from 61 other cities and towns across Indiana and ten other states. It would be inaccurate and scientifically unprofessional to assume the criminal offenders committing crimes within Greenwood resembled the U.S. Census population of Greenwood.

Figure 3.2 below compares the racial / ethnic proportions of the U.S. Census resident population for Greenwood, the drivers involved in crashes within Greenwood, and the criminal suspect descriptions reported by the public within Greenwood. The differences between the Census resident population and those driving or committing crimes within Greenwood are most striking, especially for the category of African-Americans. As decades of prior social science research has already demonstrated, U.S. Census population data does not resemble the driving populations or criminal offending populations within a specific jurisdiction.

[59] Dolan Consulting Group LLC (2018). *Evaluating Fairness in Traffic Stops by the Ann Arbor Police Department*. Raleigh, NC: Dolan Consulting Group.

Figure 3.2 Race Comparison of Vehicle Stop Benchmarks to the Census Population



As stated earlier, we were unable to separate out traffic stops (for which crash drivers are an appropriate benchmark) from all the criminal-investigative stops (for which criminal suspects are an appropriate benchmark). We therefore used both benchmarks for comparison to the "proactive vehicle stops" data, with the assumption that the real benchmark percentages for these combined stops fell neatly in-between the traffic (crash driver) and criminal (suspect description) benchmarks. Regarding the "known criminal-investigative stops," the ones that resulted in a criminal arrest, we used only the criminal suspect benchmark for comparison.

Post-Stop Citations – As we explained above, in order to compare drivers under similar circumstances, we only examined single-violation stops, and only stops involving the seven most common traffic violations encountered (which constituted 86.7% of the one-violation stops and 78.5% of all proactive vehicle stops). Each of these seven types of violations was analyzed separately. For each of these categories of stops, we used the outcomes for non-Hispanic White drivers as the benchmark for comparison under the assumption that if punitive bias existed, it would be applied toward persons of color. The percentage of drivers of each demographic category who received a citation was then compared to the percentage of non-Hispanic White drivers who received a citation under similar circumstances (i.e., same offense and single-violation stops). The assumption for this sort of comparison was that if officers were not biased, then persons of color should receive citations at a similar rate as non-Hispanic Whites for similar offenses under similar stop situations.

3.3 Control for Aggregation Bias

As described earlier in Section 2 of this report, when the data involving proactive police behaviors, and the data for the comparison benchmarks, are drawn in different proportions from different subunits of a sample, then the statistical problem of aggregation bias arises.[60] We also were asked to examine the enforcement activities of the five officers of interest separately from the rest of the department to see if the outcomes differed between these officers and the rest of the department. As a result, we disaggregated and analyzed the stops and citations of the five officers of interest first, as its own sample, to see if there were patterns of disparity. We then analyzed the stops and citations of the rest of the department – minus the five officers of interest – to see if there were patterns of disparity in the Greenwood Police Department apart from these five officers of interest.

Importantly, we disaggregated by district and time of day for analyses of stops. Most researchers understand the importance of disaggregating their examinations of proactive police behaviors by geographic locations and times of day. This requires a balance between the disaggregating on the one hand, and having a statistically usable sample size of stops or benchmark cases on the other. Nevertheless, it is a best practice to disaggregate by geographic region and time of day whenever the sample size makes this possible, and many studies have followed this practice.[61]

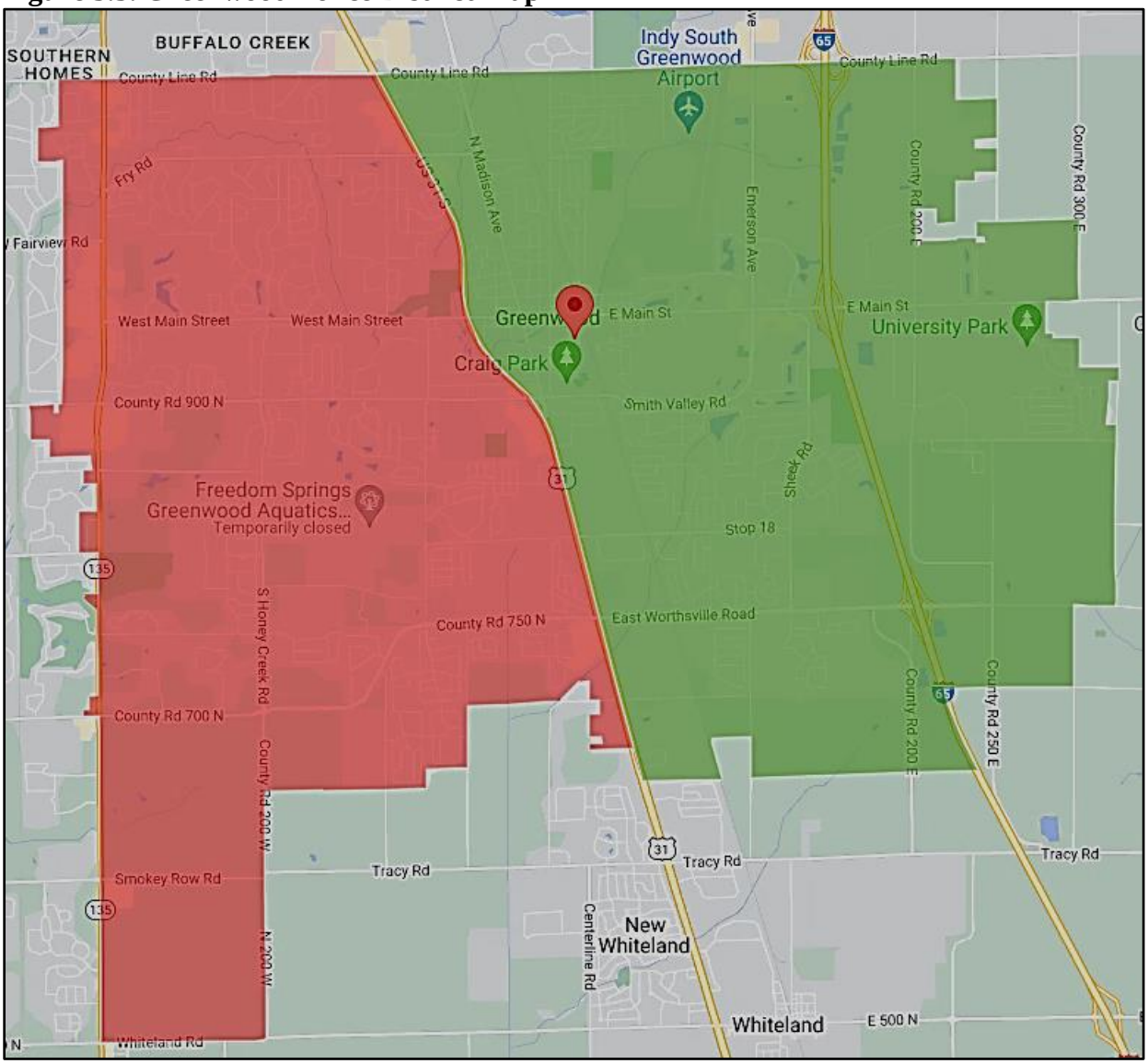
Figure 3.3 below is a district map of the city of Greenwood. Law enforcement agencies routinely divide their jurisdictions into distinct districts. This helps to evenly distribute the workload across the officers working on any shift, allows officers to take responsibility for a specific segment of the community, allows officers to employ community-specific policing strategies based on the unique needs of different neighborhoods, and produces more efficient response times to calls.

The Greenwood Police Department has divided the city into two patrol districts. The city is divided into an East District and a West District, with highway U.S. 31 serving as the dividing line between the districts. We disaggregated our data by these districts. As Figure 3.3 reveals, the East District (shaded in green) is bordered on the north by County Line Rd., which not only is the dividing line between Marion County and Johnson County, it is also the border with the city of Indianapolis. This border with Indianapolis stretches approximately 3.5 miles for the East District. The eastern border of the East District is jagged and reaches slightly beyond County Road 300 East. The southern boundary of the East District is also a jagged line that roughly follows Pushville Road. The western boundary of the East District is U.S. Highway 31.

[60] Lubinski, D., & Humphreys, L. G. (1996). Seeing the forest from the trees: When predicting the behavior or status of groups, correlate means. *Psychology, Public Policy, and Law, 2(2)*, 363–376; Rose, D. D. (1973). National and local forces in state politics: The implications of multi-level policy analysis. *American Political Science Review, 67(4)*, 1162–1173; Rosenthal, J. A. (2001). *Statistics and Data Interpretation*. New York: Wadsworth.

[61] See, for example: Dolan Consulting Group LLC (2018). *Evaluating Fairness in Traffic Stops by the Ann Arbor Police Department*. Raleigh, NC: Dolan Consulting Group; Engel, R. S., Calnon, J. M., Tillyer, R., Johnson, R. R., Liu, L. (2005). *Pennsylvania State Police Project on Police-Citizen Contacts: Year 2 Final Report (May 2003-April 2004)*. Cincinnati, OH: University of Cincinnati; Engel, R. S., Frank, J., Tillyer, R., Klahm, C. (2006). *Cleveland Division of Police Traffic Stop Data Study: Final Report*. Cincinnati, OH: University of Cincinnati; Lamberth, J. C. (2017). *Grand Rapids Michigan Police: Results from Stop Data Analysis Study*. Chads Ford, PA: Lamberth Consulting LLC.

Figure 3.3. Greenwood Police District Map



Source: Greenwood Police Department

While both districts include a mixture of residential and commercial spaces, the East District has the largest amount of commercial territory. The primary indoor shopping mall for the Indianapolis Metropolitan Area – the Greenwood Park Mall – is located within the East District of Greenwood. In addition to sharing the major thoroughfare of U.S. Highway 31, the East District contains a four-mile stretch of interstate highway I-5, including two exits – Exit 99 (Main St. / County Line Rd.) and Exit 97 (E. Worthsville Rd. / County Road 750 North). The many busy roadways of the East District include a Walmart box store, numerous strip malls, small businesses, restaurants, hotels, truck stops, and commercial warehouse complexes. Interspersed amongst all these commercial spaces are many residential areas of houses and large apartment complexes, churches, and schools.

The West District also is a mixture of commercial and residential spaces, but is somewhat more residential in nature than the busier East District. The northern boundary of the West District is also County Line Road, a two mile stretch of border with the city of Indianapolis. The eastern boundary of the district is the 4.5 mile stretch of U.S. Highway 31 that it shares as a border with the East District. The southern boundary of the West District is a jagged line that at one point stretches as far south as Whiteland Road. The western boundary of the West District is also somewhat jagged, but generally follows State Route 135 / Meridian Street, another major thoroughfare for the Indianapolis Metropolitan Area. The West District contains many residential neighborhoods, apartment complexes, schools, and parks. Its commercial zones include many strip malls, small businesses, restaurants, and large shopping centers anchored on a Walmart Marketplace and a Target Department Store.

We also disaggregated our data by time of day. Several studies have revealed temporal travel patterns that often vary by an individual's race and socioeconomic status.[62] For example, one study examining stop disparities in Grand Rapids, Michigan, found major differences in the racial composition of drivers by time of day. That study used research assistants posted at twenty major traffic intersections to collect data on the races of drivers. They found that during the daytime, the proportion of African-American drivers in the traffic stream was quite consistent. However, in every one of the 20 locations examined, the proportion of African-American drivers dramatically increased during the 11:00 p.m. to 3:00 a.m. time frame.[63] If more crashes occurred during the daytime hours, but more traffic stops occurred during the nighttime hours (when there were fewer crashes handled), then failing to disaggregate by time of day would produce aggregation bias. To control for this aggregation bias, we disaggregated by time whenever samples were large enough to do so. Specifically, we disaggregated each district by two, 12-hour time periods: 6:00 a.m. to 5:59 p.m., and 6:00 p.m. to 5:59 a.m.

Figure 3.4 below is a bar graph that illustrates the percentage of each racial / ethnic group found among the crash drivers, disaggregated by the two districts and two 12-hour time periods. Visual inspection of this graph reinforces why it was crucial to disaggregate by district and time of day whenever possible when examining the stops. The racial / ethnic proportions of the crash driver benchmark fluctuated dramatically by district and time of day. Therefore, if significantly more stops are recorded in one district-time block, and more of the crash drivers came from a different district-time block (and this ***was*** the case in this study), the racial / ethnic differences of the two different district-time blocks would cause mathematical aggregation bias to occur.

For example, this benchmark suggested that within the East District, African-Americans made up approximately 11.6% of the drivers on the roadways from 6 a.m. to 6 p.m., but declined by more

[62] Elias, W., & Shiftan, Y. (2017). Ethnic groups differences in regard to social networks, daily activity patterns, and driving behavior. *Transportation Research Part F: Traffic Psychology and Behaviour*, 46, 316-328; Farber, S., O'Kelly, M., Miller, H. J., & Neutens, T. (2015). Measuring segregation using patterns of daily travel behavior: A social interaction-based model of exposure. *Journal of Transport Geography*, 49, 26-38; Federal Highway Administration. (2000). *Travel Patterns of People of Color*. Washington, DC: U.S. Department of Transportation; Yum, S. (2020). The association between minority racial/ethnic groups and travel mode choices. *Growth and Change*, 51(3), 1017-1044.

[63] Lamberth, J. C. (2017). *Grand Rapids Michigan Police: Results from Stop Data Analysis Study*. Chads Ford, PA: Lamberth Consulting LLC, p. 37.

than 10% during the 6 p.m. to 6 a.m. period. The change was even more pronounced in the West District where during the daytime hours African-Americans made of 5.9% of the drivers, but more than doubled to 12.7% during the nighttime hours. Similar variations occurred for Asian / Pacific Islander drivers and Hispanic Drivers. The East District had higher overall proportions of Asian / Pacific Islander drivers than the West District, but within each district the proportion of Asian / Pacific Islander drivers more than doubled from daytime hours to nighttime hours. A similar, but not as dramatic, pattern also occurred for Hispanic drivers.

Figure 3.4. Race / Ethnic Distribution of Crash Drivers by District and Time of Day

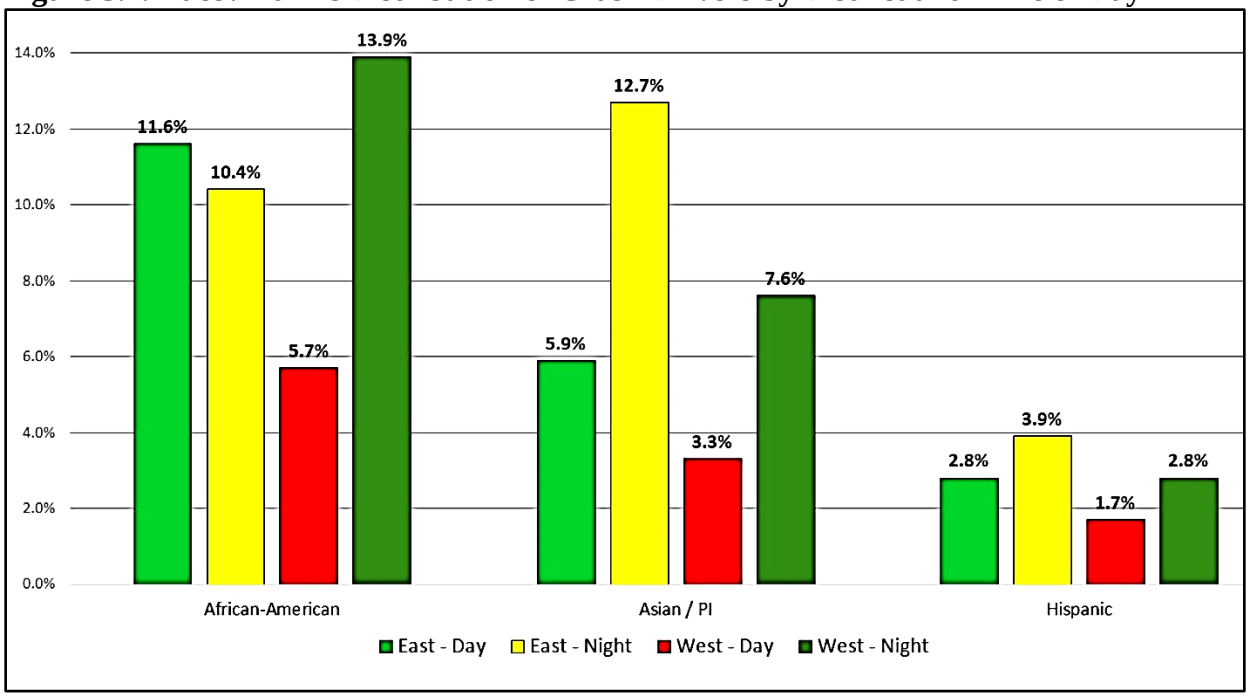
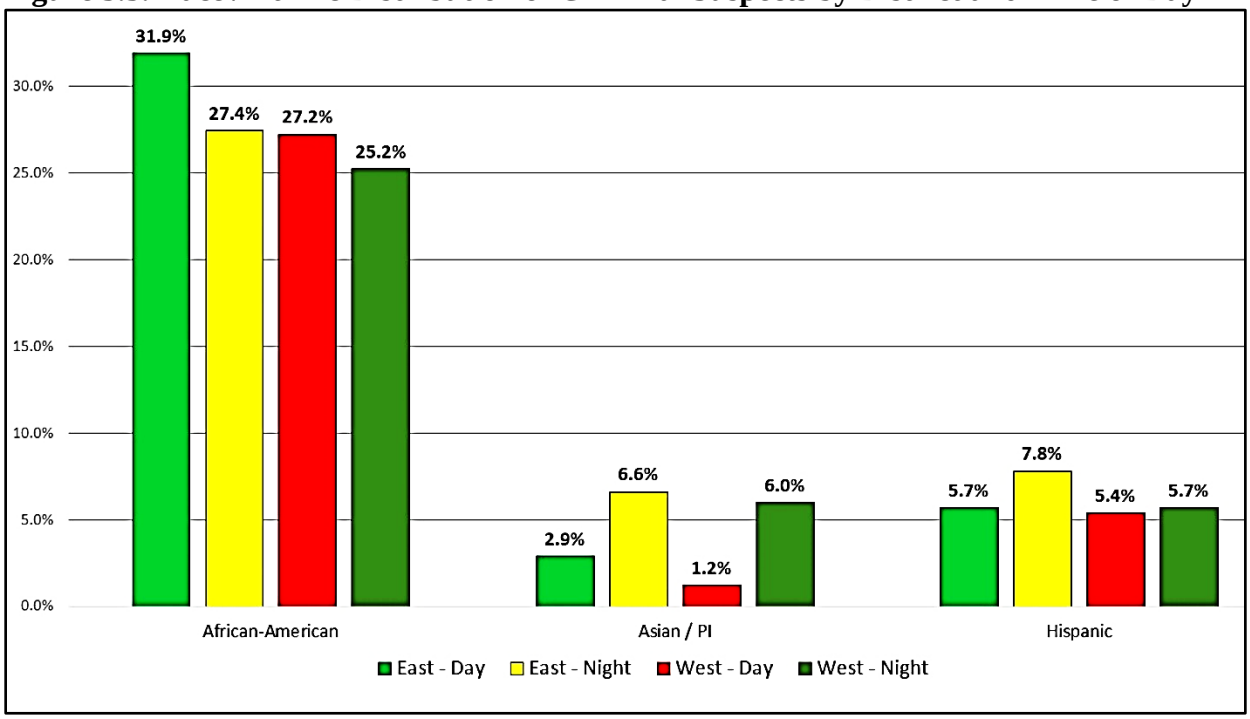


Figure 3.5 below reveals the racial / ethnic distribution of the other stop benchmark, criminal suspect descriptions provided by crime victims and witnesses in Greenwood, disaggregated by district and time of day. Again, we see variation in the proportion of each race represented among the criminal suspect descriptions that varies by district and time of day. These figures reveal the importance of disaggregation whenever mathematically possible.

Figure 3.5. Race / Ethnic Distribution of Criminal Suspects by District and Time of Day



3.4 Binomial Statistical Test

As explained earlier in Section 2, when examining the proportions of a racial group in the percentage of stops or citations, and then comparing it to some benchmark based on another sample, one must always control for sampling error with a statistical test.[64] Sampling errors occur when the statistical characteristics of a population are estimated from a sample of that population. Since a sample does not include all members of the population, the characteristics of the sample will differ from the characteristics of the true population from which the sample was drawn. The difference between the sample and the population is sampling error.[65]

Recall the illustrative example we gave earlier about measuring the female representation in the U.S. using only small samples. In the U.S., 50.9% of the population is female, and 49.1% is male. If we took a random sample of three Americans, we would find that women make up either 0% (no females), 33.3% (one female), 66.7% (two females), or 100% (three females) of the sample. If we did this multiple times, taking samples of three people each time, because of the laws of probability and the real percentage of females in the population, the majority of the time we would get samples with one (33.3%) or two (66.7%) females. Obviously, this does ***not*** mean that the percentage of females in the U.S. population is 33.3% or 66.7%. It simply means our sample was

[64] Rosenthal, J. A. (2001). *Statistics and Data Interpretation*. New York: Wadsworth; Sarndal, C. E., Swenson, B., & Wretman, J. (1992). *Model Assisted Survey Sampling*. New York: Springer-Verlag.
[65] Ibid.

not large enough to mathematically calculate the true percentage of 50.9%, and that by random chance we had one more or one less female in our sample.

Because all of our benchmarks are samples (i.e., not the whole population of all drivers in Greenwood or all criminal offenders committing crimes in Greenwood), we will have the same phenomenon occur in our present study. For example, only 51 (1.96%) of the drivers in our benchmark of 2,601 crash drivers were Asian / Pacific Islander. These 2,601 crashes occurred across four different district-time combinations. Say that these 2,601 crash drivers were divided evenly across the four district-time combinations, which would result in each district-time combination receiving a sample of 650 crash drivers to use as a benchmark. Is it possible for Hispanic / Latino drivers to make up exactly 1.96% of 650 crash drivers? Multiplying 650 by 1.96% (650 x .0196) results in 12.74 drivers. It is impossible to have .74 drivers, so the closest we can come is 12 drivers or 13 drivers. If it was 13 drivers, then the Asian / Pacific Islander drivers now make up 1.85% (13 ÷ 650) of the drivers in the crash driver benchmark, lower than the true proportion of 1.96%. But this is only because the sample is not mathematically large enough to produce an outcome of exactly 1.96%. It would take a sample size of more than 10,000 crash drivers before it would even be mathematically possible to achieve the true result of 1.96% of drivers.

Additionally, what if, by random chance alone and not racial bias, only one less Asian / Pacific Islander driver was in the sample? Purely by random chance, which is a common occurrence when drawing random samples, if there were only 11 Asian / Pacific Islander drivers within each district-time combination, Asian / Pacific Islanders would now drop to 1.69% of drivers. Due to chance alone, we always get sampling error. Samples always have a couple too many, or a couple too few, of any group to match the exact percentages in the true population of drivers on the roadways of Greenwood. Therefore, since sampling always includes some level of sampling error, one must ***always*** control for sampling error when using sample estimates.

This is why scientists, including social scientists, engage in mathematical statistical analysis procedures when examining samples. They use statistical tests to determine if a difference between the outcome we found (i.e., the percentage of a racial group in the police stops), and our benchmark measure was simply due to sampling error, or was likely a true difference (i.e., true racial disparity).[66] To do this, we utilized the binomial statistical test described earlier in Section 2. The binomial test measures the statistical significance of differences between a sample and a known population, or between two compared samples.[67]

The binomial test formula calculates the chance (written as a proportion) that the percentage of stops and the percentage of the benchmark (such as crash drivers) are roughly the same, after controlling for sampling error.[68] In other words, it reveals how confident one can be that the difference between the two compared samples is a real difference, and not simply the result of sampling error. Are these two values distinctly different, or within the ***margin of error***.

[66] Rosenthal (2001); Sarndal et al. (1992).
[67] Rosenthal, J. A. (2001). *Statistics and Data Interpretation*. New York: Wadsworth.
[68] Lehmann & Romano (2005); Rosenthal (2001).

In terms of confidence, social scientists often set one of three thresholds of confidence: 95% confident, 99% confident, or 99.9% confident of the results. In social science research, which of these three confidence levels is selected is usually determined arbitrarily based on the researcher's preference. We, however, wished to pursue a balanced fairness for the officers of the Greenwood Police Department, and fairness for those in the community with concerns that biased treatment is happening. Therefore, we selected the middle value – 99% confidence. This means we accept that the percentage of a group found in the police activity is truly different from the percentage of the group in the benchmark when the binomial test result shows 99% confidence in this claim. As the output number of the binomial test is a proportional likelihood (*p*) that the two percentages (stops and benchmark) likely are basically *the same*, and any observed differences are because of sampling error, we are seeking a *p* score of equal to, or less than, .010 (1.0%). A *p*-value of .010 means we are at least 99% sure the difference is not due to sampling error and outside the margin of error.

In other words, if the binomial is 99% confident that the two percentages are different, even after controlling for sampling error, then we accept that disparity (either stopped more often or less often than should have been the case) exists. Again, recall that this level of surety is a level of confidence commonly applied in the social sciences. Furthermore, as the reputations of the personnel of the Greenwood Police Department are at stake, it is only fair that any accusations of disparity be backed up by a high level of confidence.

3.5 Summary

In review, we gathered data on three types of proactive police activities – proactive vehicle stops (mixture of traffic stops and criminal-investigative stops), criminal-investigative stops resulting in an arrest, and post-stop citations. We also gathered data on various benchmark measures – drivers involved in crashes, criminal suspect descriptions from non-police members of the public, and citations issued to non-Hispanic White drivers. We separated the data from the five officers of interest and the rest of the Greenwood Police Department. We also disaggregated the data into four district-time blocks – East District 6 a.m. - 6 p.m., East District 6 p.m. - 6 a.m., West District 6 a.m. - 6 p.m., and West District 6 p.m. - 6 a.m. blocks. We analyzed each district-time block separately in order to control for aggregation bias.

Within each district-time block, we compared proactive vehicle stops (a combination of unknown proportions of traffic stops and criminal-investigative stops) to both the crash drivers and criminal offender suspect descriptions benchmarks. All of these comparisons were used to determine if any racial / ethnic group was stopped disproportionately more often than these benchmarks would have predicted. We then compared the known criminal-investigative stops (i.e., vehicle stops resulting in a criminal arrest) to only the criminal offender suspect descriptions benchmark to determine if any racial / ethnic group was stopped disproportionately more often than this benchmark would have predicted within these types of stops.

For the examination of citations, we examined the seven most common traffic offenses encountered within the data, and examined only single-violation stops in order to control for different circumstances of offense seriousness. We compared stops of non-Hispanic White drivers to stops of other races / ethnicities to see if any group was disproportionately more likely than

Whites to receive a citation for committing the same offense under similar circumstances. Finally, in all of these comparisons, we statistically controlled for the influence of sampling error through the use of the binomial proportional test. This test revealed whether the proportion of a race within the enforcement action, and the proportion of the race within the benchmark, were statistically significantly different or within the margin of error.

4. OFFICER OF INTEREST GROUP

As described earlier, the Greenwood Police Department discovered within its digital communications equipment that five of its officers sent messages using vulgar racist language. These five officers were immediately suspended, and an internal affairs investigation was initiated due to violations of the department's professional standards. Four of the five officers resigned while under investigation, and the fifth officer's employment was terminated by the city at the completion of the investigation. The disturbing messages raised fears that these officers may also have engaged in enforcement behaviors that matched the racist viewpoints they expressed within these messages.

This section of the report examines the stops and citations of only these five officers. The time period of the analysis – July 1, 2022 through June 30, 2023 – covers twelve months these officers worked on patrol before the discovery of their racist text messages. Over these twelve months, these five officers completed work assignments in both the East and West districts. While primarily assigned to the 6 p.m. to 6 a.m. shift, some of these officers occasionally worked some shifts during the 6 a.m. to 6 p.m. time period while covering the shifts of absent officers, working special overtime projects, or other short assignments.

We disaggregated by the four district-time blocks to avoid mathematical aggregation bias. Recall that Figures 3.4 and 3.5 revealed notable variation in the racial composition of drivers across the four district-time blocks, revealing the necessity for disaggregation. However, disaggregation caused the number of total stops within each district-time block for this group of officers to be small. This was especially the case for the 6 a.m. to 6 p.m. time blocks that the officers worked less frequently. As a result, it would not be mathematically sound to reduce the sample size even further by examining the stops of each individual officer. If we had done so, the sample size would have been so small that the binomial test would likely have indicated that any disparities – no matter how large – were within the margin of error.

First, we compared the proactive vehicle stops (a combination of unknown proportions of traffic stops and criminal-investigative stops) of these five officers to both the crash drivers and criminal offender suspect descriptions benchmarks. This analysis was disaggregated by the four district-time blocks. All of these comparisons were used to determine if any racial / ethnic group was stopped disproportionately more often than these benchmarks would have predicted. Second, we compared the known criminal-investigative stops (i.e., vehicle stops resulting in a criminal arrest) to only the criminal offender suspect descriptions benchmark to determine if any racial / ethnic group was stopped disproportionately more often than this benchmark would have predicted within these types of stops.

Finally, we examined the single-violation stops made by these five officers involving the six most common traffic offenses encountered within the data. In that analysis we compared the stops of the races / ethnicities of color to the benchmark of the treatment of non-Hispanic White drivers. We sought to determine if any group was disproportionately more likely than Whites to receive a citation for committing the same offense under similar circumstances. We were observing for any consistent pattern of disproportionate, punitive treatment of non-White drivers that would have

aligned with the racist attitudes conveyed by these five officers in their official electronic messaging.

4.1 Proactive Vehicle Stops

These five officers completed 1,398 of the 10,824 proactive vehicle stops made by the Greenwood Police Department within the 12-month study period. These stops were found to be distributed across the four district-time blocks in the following manner:
East District, 6 a.m. – 6 p.m. – 198 stops
East District, 6 p.m. – 6 a.m. – 717 stops
West District, 6 a.m. – 6 p.m. – 36 stops
West District, 6 p.m. – 6 a.m. – 447 stops

For benchmark comparisons, we used the data from the 2,601 crash drivers and 1,775 criminal suspect descriptions. The crash drivers benchmark was found to be distributed across the four district-time blocks in the following manner:
East District, 6 a.m. – 6 p.m. – 887 crash drivers
East District, 6 p.m. – 6 a.m. – 307 crash drivers
West District, 6 a.m. – 6 p.m. – 1,089 crash drivers
West District, 6 p.m. – 6 a.m. – 318 crash drivers

The criminal suspect descriptions benchmark was found to be distributed across the four district-time blocks in the following manner:
East District, 6 a.m. – 6 p.m. – 546 suspect descriptions
East District, 6 p.m. – 6 a.m. – 424 suspect descriptions
West District, 6 a.m. – 6 p.m. – 404 suspect descriptions
West District, 6 p.m. – 6 a.m. – 401 suspect descriptions

We compared the proactive vehicle stops against both of these benchmarks for comparisons by race / ethnicity. As these stops were a combination of traffic-focused and criminal-investigative-focused stops, we anticipated that the stops (if no bias was present) would fall neatly between these two benchmarks.

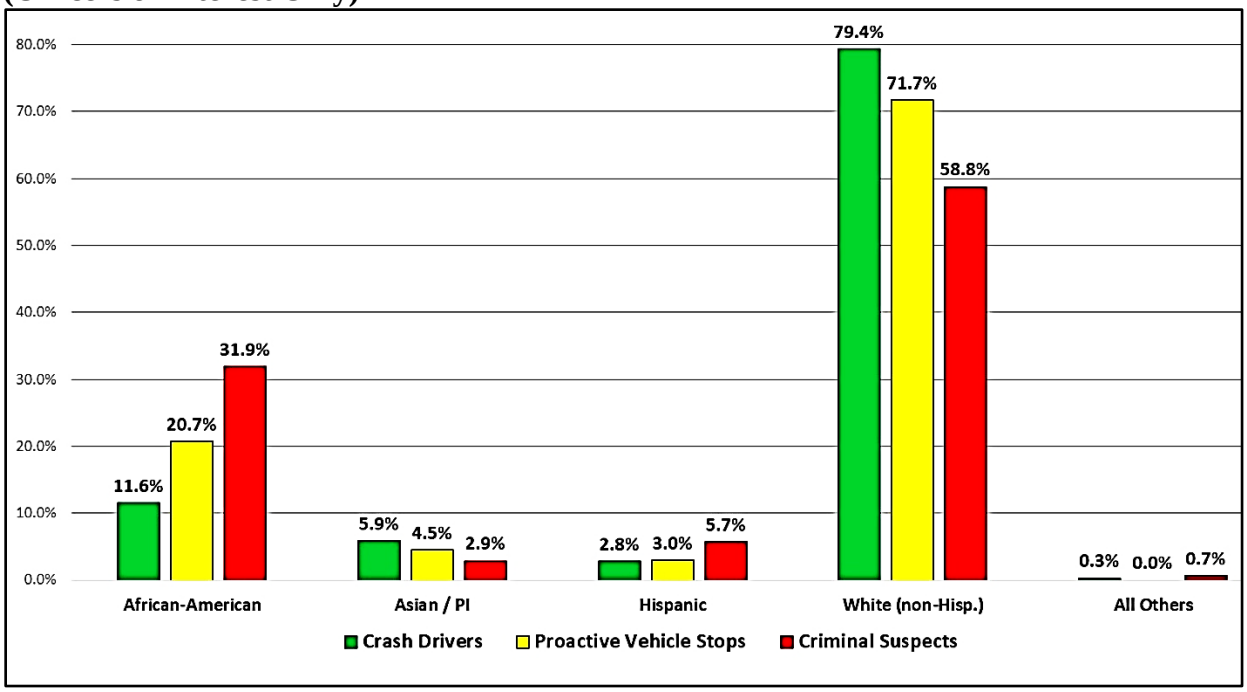
4.1.1 East District from 6 a.m. to 6 p.m.

During the 12-month period of study, 198 proactive vehicle stops took place within the East District during the hours of 6:00 a.m. through 5:59 p.m., performed by these officers of interest. In that same district-time block, 887 drivers were involved in crashes. These drivers served as the benchmark for the driving population estimate. In that same district-time block, descriptions of 546 criminal suspects were provided to the police by members of the public reporting crimes.

As the Greenwood Police Department stops contained a mixture of traffic stops and criminal-investigative stops of unknown proportions, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. Therefore, we anticipated that (if no bias was present) the percentage of each racial / ethnic group found among the stopped drivers would fall neatly between their respective percentages of the two benchmark measures.

Figure 4.1 below reveals how these stops and benchmarks compared for the officer of interest group stops occurring from 6 a.m. to 6 p.m. within the East District. Within this bar graph, the first bar for each race / ethnic group is the proportion of crash drivers that were of that race / ethnicity. The second bar is the proportion of stopped drivers that were of that race / ethnicity. The third bar is the proportion of criminal suspect descriptions that were of that race / ethnicity.

Figure 4.1. Proactive Vehicle Stops and Benchmarks for East District, 6 AM to 6 PM (Officers of Interest Only)



Visual examination of this graph reveals that the percentages of each racial / ethnic group represented within the proactive vehicle stops for these officers fell between the boundaries of these two benchmarks. For example, 20.7% of the drivers stopped were African-American, which fell between the 11.6% of crash drivers, and 31.9% of criminal suspect descriptions that were African-Americans. Similarly, 4.5% of the drivers stopped were Asian / Pacific Islander, which fell between the 5.9% of crash drivers, and 2.9% of criminal suspect descriptions that were Asian / Pacific Islanders. Likewise, 3.0% of the drivers stopped were Hispanic / Latino, which fell between the 2.8% of crash drivers, and 5.7% of criminal suspect descriptions that were Hispanic / Latino. This visual inspection would suggest no evidence of disparities by race / ethnicity in the stops performed by these five officers between 6 a.m. and 6 p.m. within East District.

Table 4.1 below displays the results of the binomial test for these proactive vehicle stops when compared against the crash driver benchmark estimate of the driving population. The first column of data reveals the stopped drivers (both percentage and raw number of stopped drivers), separated by racial / ethnic categories. The second column of data reveals the crash driver benchmark data (both percentages and raw numbers of drivers), separated by racial / ethnic categories. The next

column is the raw percentage-point difference between the stops and the benchmark, followed by a column containing the *p*-value output from the binomial test. Recall that unless this value is equal to, or less than, .010, we can assume that the percentage difference between the drivers stopped and the benchmark was due to sampling error and not a true difference. In other words, if the *p*-value is larger than .010, the difference between the percentage of stops and the percentage in the benchmark is within the margin of error.

Table 4.1 Officers of Interest's Proactive Vehicle Stops, East District, 6 AM – 6 PM (Crash Driver Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Crash Drivers (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	20.7% (41)	11.6% (103)	+9.1	.001	Yes. Stopped MORE often than involved in crashes.
Asian / Pacific Islander	4.5% (9)	5.9% (52)	-1.4	.034	No statistically significant difference.
Hispanic / Latino	3.0% (6)	2.8% (25)	+0.2	.425	No statistically significant difference.
White (Non-Hispanic)	71.7% (142)	79.4% (704)	-7.7	.001	Yes. Stopped LESS often than involved in crashes.
All Other Groups	0.0 (0)	0.3% (3)	-0.3	---	Insufficient cases to compute.

As Table 4.1 reveals, the binomial test indicated that the differences between the stops and only the crash driver benchmark was small enough to be within the margin of error for Asian / Pacific Islander drivers and Hispanic / Latino drivers. As there were no stops of drivers from "all other groups," no analysis could be conducted regarding that category. The binomial test did reveal that the differences between the stops and only the crash driver benchmark for African-American and White drivers was outside the margin of error, revealing statistically significant differences. While 20.7% of the drivers stopped were African-Americans, 11.6% of the drivers involved in crashes within the East District during these times of day were African-Americans. These two percentage values differed by 9.1 percentage points, with African-American drivers stopped at a higher rate than their representation among crash drivers. The binomial test *p*-value being lower than .010 confirms that this difference was outside the bounds of sampling error (i.e., outside the margin of error) after controlling for the differences in percentages, the sample sizes, and the laws of probability. Therefore, as was revealed in the final column, African-American drivers were stopped at a higher rate than their involvement in only crashes would have predicted.

Whites made up 71.7% of the drivers stopped by this group of officers, and 79.4% of the drivers involved in crashes within the East District during these times of day. These two percentage values differed by 7.7 percentage points, with White drivers stopped at a lower rate than their representation among only crash drivers. As the binomial test *p*-value was less than .010 in the second to the last column, this confirmed that the difference was outside the margin of error. Therefore, as was revealed in the final column, White drivers were stopped at a lower rate than their involvement in only crashes would have predicted.

However, as the proactive vehicle stops contained a mixture of traffic stops and criminal-investigative stops, it was necessary to compare these vehicle stops against BOTH benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. Recall that Figure 4.1 revealed these stops fit neatly between the two benchmarks. Table 4.2 below displays the results of the binomial test for these proactive vehicle stops when compared against only the criminal suspect descriptions benchmark estimate of the criminal-offending population.

Table 4.2 Officers of Interest's Proactive Vehicle Stops, East District, 6 AM – 6 PM (Criminal Suspect Descriptions Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	20.7% (41)	31.9% (174)	-11.2	.001	Yes. Stopped LESS often than involved in crimes.
Asian / Pacific Islander	4.5% (9)	2.9% (16)	+1.6	.041	No statistically significant difference.
Hispanic / Latino	3.0% (6)	5.7% (31)	-2.7	.001	Yes. Stopped LESS often than involved in crimes.
White (Non-Hispanic)	71.7% (142)	58.8% (321)	+12.9	.001	Yes. Stopped MORE often than involved in crimes.
All Other Groups	0.0 (0)	0.7% (4)	-0.7	---	Insufficient cases to compute.

Table 4.2 reveals the differences between the stops and the criminal suspect descriptions benchmark for Asian / Pacific Islanders was small enough to be within the margin of error. As there were no stops of drivers from the "All other groups" category, no analysis could be conducted regarding that category. The binomial test revealed that the differences between the stops and criminal suspect descriptions benchmark for African-Americans, Hispanic / Latinos, and non-Hispanic White drivers was outside the margin of error, revealing statistically significant differences. However, the only group stopped more often than expected when compared to this benchmark was Whites, with African-Americans and Hispanic / Latinos being stopped ***less*** likely than expected based on their levels of representation in crimes.

While 20.7% of the drivers stopped by this group of officers between 6 a.m. and 6 p.m. in the East District were African-Americans, 31.9% of the criminal offenders described by crime victims and crime witnesses within the East District during those hours were African-Americans. These two percentage values differed by 11.2 percentage points, with African-American drivers stopped at a ***lower*** rate than their representation among the criminal suspect descriptions. The binomial test *p*-value was less than .010, confirming that this difference was outside the margin of error. Therefore, as revealed in the final column, African-American drivers were stopped at a statistically significant ***lower*** rate than their involvement in crimes would have predicted.

Regarding Hispanic / Latino driver stops, 3.0% of the drivers stopped were Hispanic / Latinos, and 5.7% of the criminal offender descriptions within the East District during those hours were described as Hispanic / Latinos. These two percentage values differed by 2.7 percentage points,

with Hispanic / Latino drivers stopped at a ***lower*** rate than their representation among the criminal suspect descriptions would have predicted. The binomial test *p*-value was lower than .010, confirming that this difference was outside the margin of error. Hispanic / Latino drivers were stopped at a statistically significant ***lower*** rate than their involvement in crimes would have predicted.

As for White driver stops, 71.7% of the drivers stopped by this group of officers between 6 a.m. and 6 p.m. in the East District were non-Hispanic Whites. By comparison, only 58.8% of the criminal offender descriptions within the East District during those hours were Whites. These two percentage values differed by 12.9 percentage points, with White drivers stopped at a ***higher*** rate than their representation among the criminal suspect descriptions would have predicted. The binomial test *p*-value was less than .010, confirming that this difference was outside the margin of error. White drivers were stopped at a statistically significant ***higher*** rate than their involvement in crimes would have predicted.

In summary, the five officers of interest made only 14.2% of all their proactive vehicle stops between 6 a.m. and 6 p.m. within the East District. These stops were a mixture of stops for traffic enforcement purposes and stops for criminal-investigative purposes. As a result, we expected that the proportions of the five race / ethnicity categories represented among these stops would fall between the traffic pattern benchmark (i.e., crash drivers) and criminal offenders benchmark (i.e., criminal suspect descriptions). Indeed, this was the case for this district-time block as the percentage of each racial / ethnic group stopped fell between the percentage of that group among the crash drivers and the percentage of the group among the criminal suspect descriptions.

When examining each benchmark separately, we found that the percentage of proactive vehicle stops involving African-American drivers (20.7%) was statistically higher than the percentage of African-Americans among the crash drivers (11.6%), but statistically lower than the percentage of African-Americans among the criminal suspect descriptions (31.9%). The midway point between the two benchmarks was 21.75% (i.e., (11.6 + 31.9) ÷ 2 = .2175). The actual stops percentage of African-American drivers stopped was 20.7%, ***lower than the midpoint*** and closer to the crash drivers' benchmark.

We found that the percentage of proactive vehicle stops involving Asian / Pacific Islander drivers was statistically similar to both the percentage of Asian / Pacific Islanders among the crash drivers and the percentage among the criminal suspect descriptions. The midway point between the two benchmarks was 4.4% (i.e., (5.9 + 2.9) ÷ 2 = .044). The actual stops percentage of Asian / Pacific Islander drivers was 4.5%, ***almost identical to the midpoint***.

The percentage of proactive vehicle stops involving Hispanic / Latino drivers was statistically the same as the percentage of Hispanic / Latino among the crash drivers, and statistically lower than the percentage of Hispanic / Latinos among the criminal suspect descriptions. The midpoint between the two benchmarks was 4.5% (i.e., (2.8 + 5.7) ÷ 2 = .045). The actual stops percentage for Hispanic / Latinos was 3.0%, ***lower than the midpoint*** and closer to the crash driver benchmark.

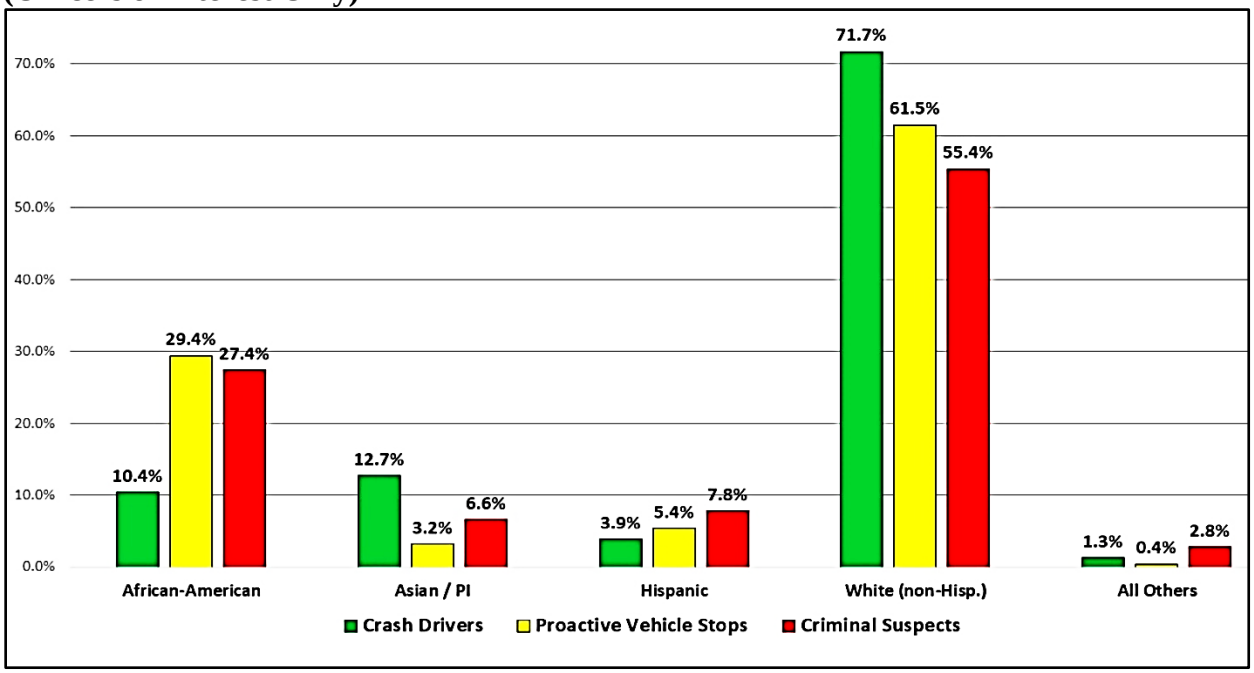
The percentage of proactive vehicle stops involving White drivers was lower than the percentage of Whites among the crash drivers, but higher than the percentage of Whites among the criminal suspect descriptions. The midpoint between these benchmarks was 69.1%, while the actual stops of Whites was 71.7%, ***higher than the midpoint*** and closer to the crash driver benchmark.

We found that for persons of color, and for Whites, the percentage represented within the stops fell between the two benchmarks. This analysis revealed no evidence of racial disparities among the proactive vehicle stops made by these five officers of interest between 6 a.m. and 6 p.m. within the East District.

4.1.2 East District from 6 p.m. to 6 a.m.

During the 12-month period of study, these five officers performed 717 proactive vehicle stops between the hours of 6:00 p.m. through 5:59 a.m. within the East District. This was the district and time period these five officers of interest worked most frequently. In this district-time block, 307 drivers were involved in crashes, and 424 criminal suspect descriptions were provided to the police by members of the public reporting crimes.

Figure 4.2. Proactive Vehicle Stops and Benchmarks for East District, 6 PM to 6 AM (Officers of Interest Only)



As the Greenwood Police Department stops contained a mixture of traffic stops and criminal-investigative stops of unknown proportions, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. Therefore, we anticipated that (if no bias was present) the percentage of each racial / ethnic group found among the stopped drivers would fall neatly between their respective percentages of the two benchmark measures. Figure 4.2 above

reveals how these stops and benchmarks compared for the officer of interest group stops occurring from 6 p.m. to 6 a.m. within the East District.

Visual examination of this graph reveals that the percentages represented within the proactive vehicle stops for these officers fell between the boundaries of these two benchmarks only for Hispanic / Latino drivers and White drivers. African-American drivers appear to have been stopped at a rate higher than both the African-American representation among the crash drivers and the African-American representation among the criminal suspect descriptions. In contrast, Asian / Pacific Islander drivers appear to have been stopped at a lower rate than either benchmark would have predicted. Asian / Pacific Islanders made up a smaller percentage of the drivers stopped than the Asian / Pacific Islander representation among crash drivers or criminal suspect descriptions.

However, we cannot know for sure if these differences were within the statistical margin of error until we conduct the binomial test. This statistical test can reveal if the differences in the percentages of the stops and the percentages in the benchmark are true differences or within the margin for sampling error distortion. Table 4.3 below displays the results of the binomial test for these proactive vehicle stops when compared against only the crash driver benchmark estimate of the driving population.

Table 4.3. Officers of Interest's Proactive Vehicle Stops, East District, 6 PM – 6 AM (Crash Driver Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Crash Drivers (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	29.4% (211)	10.4% (32)	+19.0	.001	Yes. Stopped MORE often than involved in crashes.
Asian / Pacific Islander	3.2% (23)	12.7% (39)	-9.5	.001	Yes. Stopped LESS often than involved in crashes.
Hispanic / Latino	5.4% (39)	3.9% (12)	+1.5	.150	No statistically significant difference.
White (Non-Hispanic)	61.5% (441)	71. 7% (220)	-10.2	.001	Yes. Stopped LESS often than involved in crashes.
All Other Groups	0.4% (3)	1.3% (4)	-0.9	.036	No statistically significant difference.

This table reveals the differences between the stops and the crash driver benchmark was small enough to be within the margin of error for Hispanic / Latino drivers, and for the "All other groups" category drivers. However, the binomial test revealed statistically significant differences between this benchmark and the stops for African-American drivers, Asian / Pacific Islander drivers, and White drivers.

Table 4.3 reveals that 29.4% of the drivers stopped by this group of officers between 6 p.m. and 6 a.m. in the East District were African-Americans, but only 10.4% of the drivers involved in crashes within the East District during these times of day were African-Americans. These two percentage values differed by 19.0 percentage points, with African-American drivers stopped at a rate almost

three times their representation among crash drivers. The binomial test *p*-value was less than .010, confirming that this difference was outside the margin of error. African-American drivers were stopped at a higher rate than only their involvement in crashes would have predicted.

Table 4.3 reveals that Asian / Pacific Islander drivers and White drivers were stopped at rates lower than expected by only the crash driver benchmark. Exactly 3.2% of the drivers stopped were Asian / Pacific Islander individuals, but this group made up 12.7% of the crash drivers. The percentage of Asian / Pacific Islander drivers stopped were only a quarter of the percentage expected by the crash drivers benchmark alone. The binomial test confirmed this difference was statistically significant and outside the margin of error. Likewise, 61.5% of the drivers stopped were Whites, and 71.7% of the drivers involved in crashes within the East District during these times of day were White drivers. These two percentage values differed by 10.2 percentage points, with White drivers stopped at a lower rate than their representation among crash drivers. The binomial test confirmed that this difference was outside the margin of error.

However, as the proactive vehicle stops data contained a mixture of traffic stops and criminal-investigative stops, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. Table 4.4 below displays the results of the binomial test for these proactive vehicle stops when compared against only the criminal suspect descriptions benchmark.

Table 4.4. Officers of Interest's Proactive Vehicle Stops, East District, 6 PM – 6 AM (Crash Driver Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	29.4% (211)	27.4% (116)	+2.0	.193	No statistically significant difference.
Asian / Pacific Islander	3.2% (23)	6.6% (28)	-3.4	.001	Yes. Stopped LESS often than involved in crimes.
Hispanic / Latino	5.4% (39)	7.8% (33)	-2.4	.024	No statistically significant difference.
White (Non-Hispanic)	61.5% (441)	55.4% (235)	+6.1	.006	Yes. Stopped MORE often than involved in crimes.
All Other Groups	0.4% (3)	2.8% (12)	-2.4	.001	Yes. Stopped LESS often than involved in crimes.

Although the stops of African-American drivers were higher than the percentage of African-American crash drivers and African-American representation among the criminal suspect descriptions, the binomial test revealed the difference with the suspect benchmark was within the margin of error. Table 4.4 reveals that 29.4% of the drivers stopped were African-American drivers, while only 27.4% of the criminal suspect descriptions provided in that same district during those hours involved African-American suspects. The stops were 2.0 percentage points ***higher than the suspect descriptions benchmark***, but the binomial test *p*-value was much higher than .010. This indicated the difference between the stops and the benchmark was within the margin of error after controlling for the sample size and the laws of probability.

While the percentage of stops of the Hispanic / Latino drivers was within the margin of error when compared to the crash driver benchmark, this was also the case when compared to the criminal suspect benchmark. However, Asian / Pacific Islander drivers, and drivers categorized as "all other groups," were stopped at rates lower than expected by only the crime suspect benchmark. Asian / Pacific Islander individuals made up 3.2% of the drivers stopped, but 6.6% of the criminal suspect descriptions. The binomial test *p*-value was lower than .010, indicating this difference was outside the margin of error. Drivers categorized as "All other groups" made up only 0.4% of the drivers stopped, but 2.8% of the criminal suspect descriptions. The binomial test revealed a *p*-value lower than .010, indicating this difference was also outside the margin of error.

The only group stopped at a higher rate than expected when compared to the criminal suspect benchmark was Whites. Whites made up 55.4% of the criminal suspect descriptions, but 61.5% of the drivers stopped by the five officers of interest when they worked between 6 p.m. and 6 a.m. in the East District. The binomial test revealed that this 6.1 percentage point difference was statistically significant. The *p*-value was lower than .010, indicating this difference was outside the margin of error.

In summary, the five officers of interest made 51.3% of their proactive vehicle stops between 6 p.m. and 6 a.m. within the East District. These stops were a mixture of stops for traffic enforcement purposes and stops for criminal-investigative purposes. As a result, we expected that the proportions of the five race / ethnicity categories represented among these stops would fall somewhere between the traffic pattern benchmark (i.e., crash drivers) and criminal offenders benchmark (i.e., criminal suspect descriptions). Recall that Figure 4.2 revealed that for Hispanic / Latino drivers and White drivers this was the case.

Hispanic / Latino drivers were stopped at a rate slightly above their representation among crash drivers, but still within the margin of error. They were also stopped at a rate lower than their representation among criminal suspect descriptions, but again within the margin of error. The midpoint between these benchmarks was 5.85%, which was very similar to the 5.4% of stops, but closer to the crash driver benchmark.

Asian / Pacific Islander drivers were stopped at a rate ***much lower*** than their representation among ***both*** benchmarks. Somewhat similar were stops within the category of "all other groups." Stops of this category were slightly lower than expected by the crash driver benchmark, but still within the margin of error. When compared to the criminal offender suspect descriptions benchmark, however, stops within this category were much lower than expected and outside the margin of error.

The findings regarding the racial / ethnic groups just described showed no evidence of disparate treatment against them in stops by these five officers. Either the percentage of stops fit neatly between the two benchmark measures, or the percentage of stops was even lower than both benchmark measures. The findings for African-American drivers were not as clear-cut.

African-American drivers were stopped at a rate almost three times higher than expected when based on the crash driver benchmark, a difference far beyond the margin of error. When compared

to the criminal suspect descriptions benchmark, the percentage of stops of African-American drivers was still higher than the benchmark measure, but this time was within the margin of error. The midpoint between these two benchmarks was 18.9%, and the actual stop rate of 29.4% was much higher than that midpoint. This finding is not definitive proof of "racial profiling" or discriminatory behavior on the part of this group of officers. Nevertheless, it raises concerns about the higher-than-expected rates of African-American stops when compared to the other racial / ethnic groups. This suggested that the stops performed by these five officers between 6 p.m. and 6 a.m. within the East District were primarily focused on criminal-investigative stops if African-American drivers were involved, and not so when drivers of other races were involved.

4.1.3 West District from 6 a.m. to 6 p.m.

During the 12-month period of study, only 36 proactive vehicle stops took place within the West District during the hours of 6:00 a.m. through 5:59 p.m., performed by these officers of interest. These officers rarely worked this shift and this district. In that same district-time block, 1,089 drivers were involved in crashes. These drivers served as the benchmark for the driving population estimate. Descriptions of a total of 404 criminal suspects were provided to the police by members of the public reporting crimes within that district-time block.

As the Greenwood Police Department stops contained a mixture of traffic stops and criminal-investigative stops of unknown proportions, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. Therefore, we anticipated that (if no bias was present) the percentage of each racial / ethnic group found among the stopped drivers would fall neatly between their respective percentages of the two benchmark measures. In the stops of African-American and White drivers, this generally appeared to be the case.

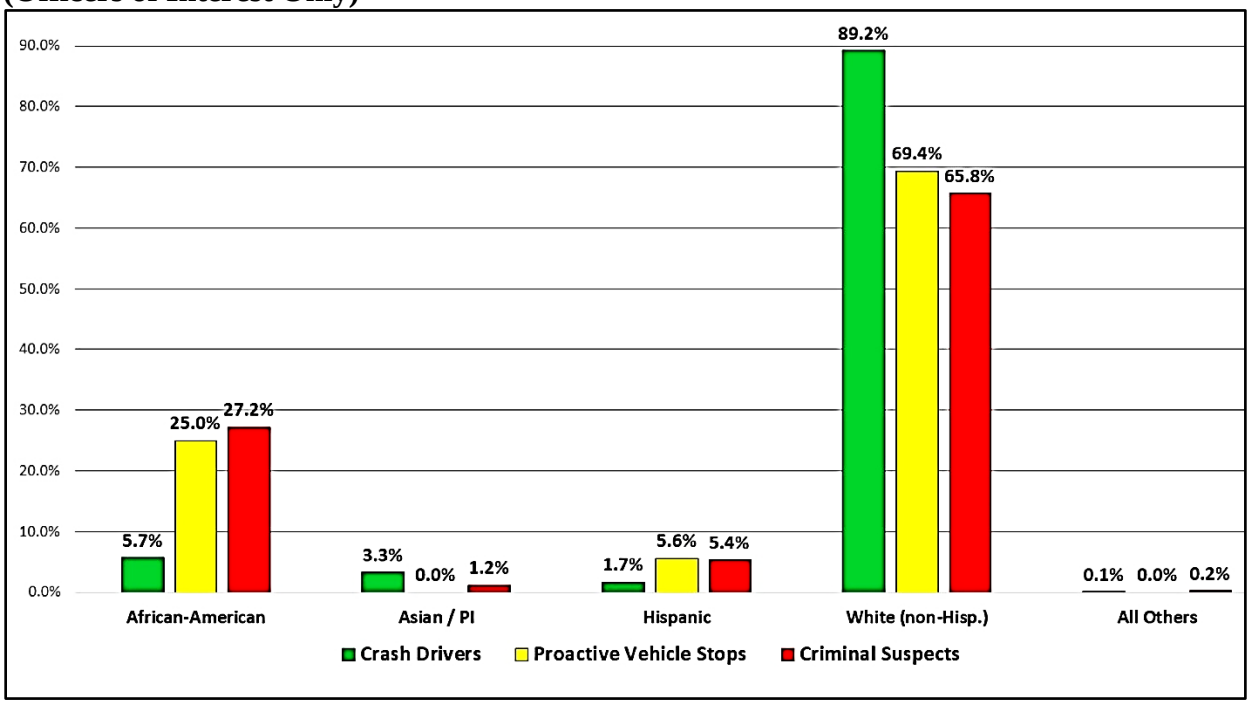
Figure 4.3 below reveals how these stops and benchmarks compared for the officer of interest group stops occurring from 6 a.m. to 6 p.m. within the West District. The percentage of stops of African-Americans was higher than the percentage of African-Americans among the crash drivers, but still lower than the percentage of African-Americans among the criminal suspect descriptions. The percentage of White drivers stopped was much lower than the percentage of White crash drivers, but slightly more than the percentage of Whites among the criminal suspect descriptions.

The percentage of stops of Hispanic / Latino drivers stopped within this district-time block appeared higher than both the percentage of Hispanic / Latino drivers among the crash driver benchmark and the criminal suspect descriptions benchmark. This was similar to the pattern we discovered for African-American drivers between 6 p.m. and 6 a.m. within the East District. Finally, there were no stops made by these officers of Asian / Pacific Islander drivers or drivers categorized as "All other groups" between 6 a.m. and 6 p.m. within the West District. Therefore, no analyses could be conducted for these groups.

Recall that we cannot tell for sure if these differences are within the statistical margin of error until we conduct the binomial test. Also recall that the smaller the sample, the greater the degree of sampling error present. This means that with smaller samples – such as the 36 stops in this case – it is rare for the binomial test to reveal a statistically significant difference between the stops and each respective benchmark. Table 4.5 below displays the results of the binomial test for these

proactive vehicle stops when compared against only the crash driver benchmark estimate of the driving population.

Figure 4.3. Proactive Vehicle Stops and Benchmarks for West District, 6 AM to 6 PM (Officers of Interest Only)



Nevertheless, the Table 4.5 binomial test results indicated that the differences between the stops and the crash driver benchmark were so large for African-American drivers that they were statistically significant and outside the margin of error. African-American individuals made up 25.0% of the 36 drivers stopped, yet only 5.7% of the drivers involved in crashes within this district during this time period. This higher-than-expected stop rate was beyond the margin of error despite dealing with such a small sample of stops.

Conversely, non-Hispanic White drivers were significantly less likely to be stopped than expected when compared to the crash driver benchmark. Whites made up 69.4% of the 36 drivers stopped, yet 89.2% of the drivers involved in crashes within this district during this time period. This lower-than-expected stop rate was also beyond the margin of error, despite dealing with such a small sample of stops.

The binomial test revealed that the percentage of the stops involving Hispanic / Latino drivers was statistically the same as the percentage of crash drivers who were Hispanic / Latino. Although the percentage of Hispanic / Latino drivers stopped was approximately three times larger than the percentage in the crash driver benchmark, the difference between percentages was only 3.9 percentage points and the very small sample size revealed this difference was within the margin of error. Finally, no stops involved drivers categorized as Asian / Pacific Islander individuals or "all other groups," so the percentage of stops for these two categories (0.0%) were lower than the

percentages within the crash driver benchmark. However, since there were no stops to analyze, the binomial test could not be performed.

Table 4.5 Officers of Interest's Proactive Vehicle Stops, West District, 6 AM – 6 PM (Crash Driver Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Crash Drivers (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	25.0% (9)	5.7% (62)	+19.3	.001	Yes. Stopped MORE often than involved in crashes.
Asian / Pacific Islander	0.0% (0)	3.3% (36)	-3.3	---	Insufficient cases to compute.
Hispanic / Latino	5.6% (2)	1.7% (19)	+3.9	.125	No statistically significant difference.
White (Non-Hispanic)	69.4% (25)	89.2% (971)	-19.8	.001	Yes. Stopped LESS often than involved in crashes.
All Other Groups	0.0% (0)	0.1% (1)	-0.1	---	Insufficient cases to compute.

However, as the proactive vehicle stops data contained a mixture of traffic stops and criminal-investigative stops, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. Table 4.6 below displays the results of the binomial test for these proactive vehicle stops when compared against only the criminal suspect descriptions benchmark.

Table 4.6 Officers of Interest's Proactive Vehicle Stops, West District, 6 AM – 6 PM (Criminal Suspect Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	25.0% (9)	27.2% (110)	-2.2	.164	No statistically significant difference.
Asian / Pacific Islander	0.0% (0)	1.2% (5)	-1.2	---	Insufficient cases to compute.
Hispanic / Latino	5.6% (2)	5.4% (22)	+0.2	.502	No statistically significant difference.
White (Non-Hispanic)	69.4% (25)	65.8% (266)	+3.6	.068	No statistically significant difference.
All Other Groups	0.0% (0)	0.2% (1)	-0.2	---	Insufficient cases to compute.

When compared to the crash driver benchmark, African-American drivers were stopped more often than expected, even beyond the margin of error. This was not the case when compared to the criminal suspect descriptions benchmark. Table 4.6 reveals that when compared to the criminal suspect description benchmark, African-American drivers made up 27.2% of the criminal suspect

descriptions, but made up only 25.0% of the drivers stopped. The binomial test revealed that the difference between the percentages was within the margin of error. In other words, the percentage of African-American drivers stopped was higher than the percentage of African-American drivers involved in crashes, and statistically equal to the percentage of African-Americans among the criminal suspect descriptions. The percentage of stops of African-American drivers fell between the two benchmarks, but was also statistically even with the higher benchmark.

When compared to the crash driver benchmark, Hispanic / Latino drivers were stopped within the margin of error for that benchmark. Table 4.6 reveals that when compared to the criminal suspect description benchmark, Hispanic / Latino drivers were also stopped at a similar rate to that second benchmark, as the minor difference of 0.2 percentage points was well within the margin of error.

Finally, White drivers were found to be stopped less often than expected when compared to the crash driver benchmark. Nevertheless, when compared to the criminal suspect descriptions benchmark, the binomial test revealed that the stops of White drivers were within the margin of error of the criminal suspect descriptions benchmark. The percentage of Whites stopped technically fell between the two benchmarks, but the stops were also statistically similar to the lower benchmark. As no stops involved Asian / Pacific Islander drivers or drivers categorized as "all other groups," no statistical analyses were conducted for these two categories.

In summary, very few proactive vehicle stops were made by the five officers of interest between 6 a.m. and 6 p.m. within the West District. These 36 stops made up only 2.6% of the proactive vehicle stops made by these five officers during the study period. These stops were a mixture of stops for traffic enforcement purposes and stops for criminal investigative purposes. As a result, we expected that the proportions of the five race / ethnicity categories represented among these stops would fall between the traffic pattern benchmark (i.e., crash drivers) and criminal offenders benchmark (i.e., criminal suspect descriptions). Technically this was the case, but there is an important caveat for African-American and White drivers.

African-Americans were stopped at a rate four times higher than expected based on the crash driver benchmark, and at a rate statistically the same as the criminal suspect benchmark. The midpoint between these two benchmarks was 16.45%, and the stops of African-Americans were well above this midpoint at 25.0%. This might suggest that the stops performed by these officers between 6 a.m. and 6 p.m. within the West District were primarily focused on criminal-investigative pretextual stops when African-American drivers were involved.

Conversely, the midpoint between the benchmarks for Whites was 77.5%, while the percentage of White stops was much lower at 69.4%. This was statistically equal with the percentage of White crash drivers. This might suggest that the stops performed by these officers between 6 a.m. and 6 p.m. within the West District were primarily focused on traffic enforcement stops when White drivers were involved.

No stops were made by these officers of Asian / Pacific Islander drivers, or drivers categorized as "all other groups," within this district-time block. Stops of Hispanic / Latino drivers were also rare – only 2 drivers stopped – and statistically the same as both benchmarks. No evidence was found for the disparate treatment of Asian / Pacific Islander drivers, Hispanic / Latino drivers, and "All

other groups" drivers. The stops of White and African-American drivers were also technically within the bounds of the two benchmarks, but evidence suggests that these officers emphasized traffic enforcement when stopping White drivers (even with the traffic benchmark) and criminal enforcement when stopping African-American drivers (even with the criminal suspects benchmark).

4.1.4 West District from 6 p.m. to 6 a.m.

During the 12-month period of study, the hours from 6 p.m. to 6 a.m. in the West District had the second highest number of stops by these five officers – 447 proactive vehicle stops. In that same district-time block, 318 drivers were involved in crashes. These drivers served as the benchmark for the driving population estimate. Descriptions of a total of 401 criminal suspects were provided to the police by members of the public reporting crimes within that district-time block. As the Greenwood Police Department stops contained a mixture of traffic stops and criminal-investigative stops of unknown proportions, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks.

Figure 4.4. Proactive Vehicle Stops and Benchmarks for West District, 6 PM to 6 AM (Officers of Interest Only)

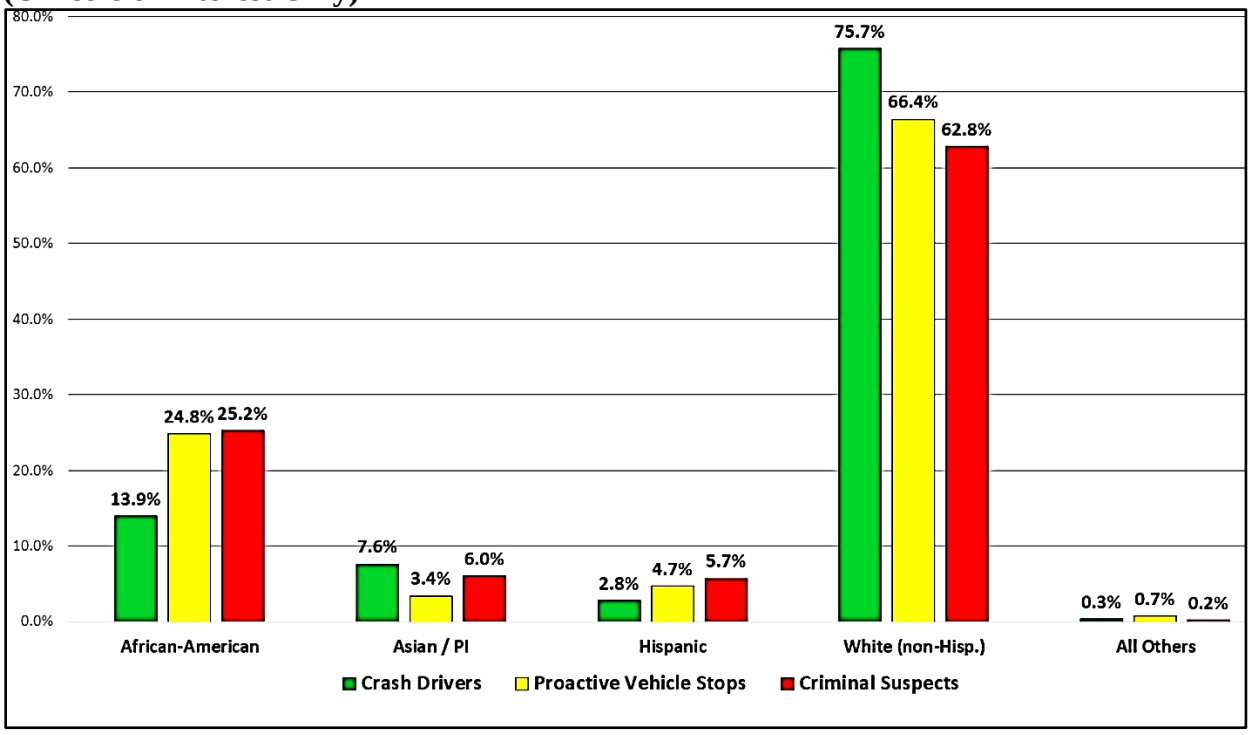


Figure 4.4 above reveals how these stops and benchmarks compared for the officer of interest group stops occurring from 6 p.m. to 6 a.m. within the West District. We would expect that the percentages of each racial / ethnic group represented within the proactive vehicle stops for these officers to fall between the boundaries of these two benchmarks. The stops of African-American

drivers, Hispanic / Latino drivers, and White drivers appeared to fall between these benchmarks, with African-American drivers again very close to the criminal suspect benchmark.

Visual examination of Figure 4.4 also suggests that Asian / Pacific Islander individuals were stopped at a rate lower than either benchmark would have predicted. Conversely, the stops of drivers in the "All other groups" category were slightly higher than this group's representation among crash drivers, and slightly higher than the criminal suspect descriptions benchmark. However, we cannot know for sure if these differences were within the statistical margin of error until we conduct the binomial test. This statistical test can reveal if the differences in the percentages of the stops and the percentages in the benchmark are true differences or within the margin for sampling error distortion.

Table 4.7 Officers of Interest's Proactive Vehicle Stops, West District, 6 PM – 6 AM (Crash Driver Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Crash Drivers (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	24.8% (111)	13.9% (44)	+10.9	.001	Yes. Stopped MORE often than involved in crashes.
Asian / Pacific Islander	3.4% (15)	7.6% (24)	-4.2	.001	Yes. Stopped LESS often than involved in crashes.
Hispanic / Latino	4.7% (21)	2.8% (9)	+1.9	.068	No statistically significant difference.
White (Non-Hispanic)	66.4% (297)	75.7% (240)	-9.3	.001	Yes. Stopped LESS often than involved in crashes.
All Other Groups	0.7% (3)	0.3% (1)	+0.4	.108	No statistically significant difference.

Table 4.7 above displays the results of the binomial test for these proactive vehicle stops when compared against only the crash driver benchmark estimate of the driving population. When compared to only this benchmark, the results suggested that African-American drivers were stopped at higher rates than expected, and Asian / Pacific Islander and White drivers were stopped at lower rates than expected. The results also suggested that Hispanic / Latino drivers and drivers categorized as "other" were stopped at rates statistically similar to the crash driver benchmark.

However, as the proactive vehicle stops data contained a mixture of traffic stops and criminal-investigative stops, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. Table 4.8 below displays the results of the binomial test for these proactive vehicle stops when compared against only the criminal suspect descriptions benchmark.

The results of the binomial test revealed that the percentage of stops of African-American drivers was statistically the same as the percentage of African-American individuals among the criminal suspect descriptions benchmark. The percentage of drivers who were Asian / Pacific Islander was lower than expected when compared to the crash driver benchmark (see Table 4.7), but was also lower than the criminal suspects benchmark at a degree beyond the margin of error.

While the percentage of stops involving Hispanic / Latino drivers was statistically similar to the crash driver benchmark, it was also statistically similar to the criminal suspect benchmark. The same was true for the stops of drivers in the "All other groups" category. Finally, White drivers were stopped at a rate significantly lower than anticipated based on the crash driver benchmark, but the White stop rate was statistically the same as the White criminal suspect benchmark.

Table 4.8 Officers of Interest's Proactive Vehicle Stops, West District, 6 PM – 6 AM (Criminal Suspect Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	24.8% (111)	25.2% (101)	-0.4	.448	No statistically significant difference.
Asian / Pacific Islander	3.4% (15)	6.0% (24)	-2.6	.006	Yes. Stopped LESS often than involved in crimes.
Hispanic / Latino	4.7% (21)	5.7% (23)	-1.0	.192	No statistically significant difference.
White (Non-Hispanic)	66.4% (297)	62.8% (252)	+3.6	.074	No statistically significant difference.
All Other Groups	0.7% (3)	0.2% (1)	+0.5	.229	No statistically significant difference.

In summary, the five officers of interest made many proactive vehicle stops between 6 p.m. and 6 a.m. within the West District. As these stops were a mixture of stops for traffic enforcement purposes and stops for criminal investigative purposes, we expected that the proportions of the five race / ethnicity categories represented among these stops would fall somewhere between the crash drivers benchmark and the criminal offender descriptions benchmark. Technically this was the case for all racial / ethnic group categories except Asian / Pacific Islanders, who were stopped at a rate lower than either benchmark estimate.

The percentage of stops of Hispanic / Latino drivers were statistically the same as the criminal suspect benchmark, and statistically the same as the crash driver benchmark. The midpoint between the two benchmarks was 4.25%, very close to the 4.7% for the actual stops. The percentage of stops of White drivers was lower than the crash driver benchmark estimate, and statistically the same as the criminal suspect benchmark. The midpoint between these two benchmarks was 69.25%, and the percentage of stops of White was a little below this midpoint at 66.4%.

The midpoint between the two benchmarks for African-Americans was 19.55%, and the stops of African-Americans were above this midpoint at 24.8%. African-Americans were stopped at a rate almost twice that expected based on the crash driver benchmark, and at a stop rate statistically the same as the criminal suspect benchmark. These findings might suggest that the stops performed by these five officers between 6 p.m. and 6 a.m. within the West District were primarily focused on criminal-investigative stops if African-American drivers were involved, and not so when drivers of other groups were involved.

4.1.5 Proactive Vehicle Stops Summary

We compared these proactive vehicle stops to two benchmarks. As the Greenwood Police Department proactive vehicle stops contained a mixture of traffic stops and criminal-investigative stops of unknown proportions, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. We anticipated the percentages of each racial / ethnic group represented within the proactive vehicle stops made by these officers would fall neatly between the boundaries of these two benchmarks if no bias was present.

Our results revealed that this was technically the case in all four district-time blocks for stops of African-American drivers. However, the stops of African-American drivers were heavily skewed towards the higher, criminal suspect descriptions benchmark from 6 p.m. to 6 a.m. in the East District, and during both time blocks of the West District. While still within the bounds of the two benchmarks, the strong similarity between the stops and the criminal suspects benchmark suggested that these five officers primarily focused on criminal-investigative stops if African-American drivers were involved, and not so when drivers of other groups were involved.

Asian / Pacific Islander drivers, for example, were stopped at rates lower than both benchmark predictions, or equal to the crash driver benchmark for their group. This revealed that these five officers may have avoided stopping Asian / Pacific Islander drivers or primarily focused on traffic enforcement stops if Asian / Pacific Islander drivers were involved. The same was true for the very few stops involving drivers in the "All other groups" category. In each district-time block, the percentage of drivers in that category was either below both benchmark estimates or equal to both benchmark estimates.

The percentage of proactive vehicle stops involving White drivers fit neatly between the two benchmarks in the West District, but was statistically the same as the lower criminal suspect benchmark in the West District. This suggested that these five officers primarily focused on criminal-investigative stops if White drivers were involved when operating within the West District.

Finally, stops of Hispanic / Latino individuals revealed the least evidence of bias for or against them. The percentage of stopped drivers who were Hispanic / Latino landed near the midpoint of the two benchmarks for three of the district-time blocks, and was only skewed towards the criminal suspects benchmark between 6 a.m. and 6 p.m. in the West District.

These results provide no definitive proof of racial profiling by these five officers. The evidence regarding the disparate stopping of African-American drivers was still within the benchmark boundaries, but raised concerns that drivers of this race were more often the focus of criminal-investigative stops than were drivers of other groups.

4.2 Known Criminal-Investigative Stops

As has been mentioned many times, the Greenwood Police Department data did not easily differentiate between stops initiated for the purposes of a criminal investigation (even with a traffic violation witnessed), and stops initiated solely for the public safety purposes of traffic enforcement. However, we were able to identify 118 vehicle stops made by these five officers that resulted in the criminal arrest of at least one of the vehicle's occupants. As a result, we know these 118 stops were criminal-investigative stops. These 118 known criminal-investigative stops were removed and analyzed separately from the "proactive vehicle stops" that were analyzed in the previous section. We compared these known criminal-investigative stops only with the criminal offender suspects benchmark, and not the crash driver benchmark, as the population at risk for these stops should have been only the criminal offender population.

Because there were so few of these stops, and the vast majority of them occurred between the hours of 6 p.m. and 6 a.m., we only disaggregated by district rather than district and time of day. These 118 known criminal-investigative stops were found to be distributed across the two districts in the following manner:
East District – 86 known criminal-investigative stops
West District – 32 known criminal-investigative stops

The benchmark comparison used the data from the 1,775 criminal suspect descriptions. The criminal suspect descriptions were found to be distributed across the two districts in the following manner:
East District – 970 suspect descriptions
West District – 805 suspect descriptions

4.2.1 East District

During the 12-month period of study, 86 known criminal-investigative stops took place within the East District performed by these officers of interest. During that same period, descriptions of a total of 970 criminal suspects were provided to the police by members of the public reporting crimes within that district. Table 4.9 below displays the results of the binomial test for these known criminal-investigative stops when compared against the criminal suspect descriptions benchmark estimate. The first column of data reveals the stopped drivers (both percentage and raw number of stopped drivers), separated by racial / ethnic categories. The second column of data reveals the benchmark data (both percentages and raw numbers of drivers), separated by racial / ethnic categories. The next column is the raw percentage-point difference between the stops and the benchmark, followed by a column containing the *p*-value output from the binomial test. Recall that unless this value is equal to, or less than, .010, we can assume that the percentage difference between the drivers stopped and the benchmark was due to sampling error and not a true difference. In other words, if the *p*-value is equal to, or less than, .010, the difference between the percentage of stops and the percentage in the benchmark is within the margin of error.

The statistical results within Table 4.9 reveals the percentage point differences between the stops and the benchmark were small for the known criminal-investigative stops of African-American and Asian / Pacific Islander Individuals. Unsurprisingly, the binomial test *p*-values for both of

these groups were greater than .010, revealing any differences between the stops and the benchmark were within the margin of error.

Regarding the "All other groups" category, there were no stops, thus there was no data to examine. The same was true for the stops of Hispanic / Latino drivers as only one stop involved a driver of that category. As the binomial test calculates the comparison between proportions, it requires there be at least two cases to analyze. A lack of cases makes the proportion 0.0%, and one case results in a proportion of 100%. The binomial test requires variation to some degree between these two extremes. This is why the binomial's mathematical formula requires at least two cases to analyze. Nevertheless, even if the binomial test could have been performed, the proportion of drivers stopped who were Hispanic / Latino was lower than expected based on the criminal suspect descriptions benchmark.

Table 4.9 Officers of Interest's Known Criminal-Investigative Stops, East District (Criminal Suspect Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	31.4% (27)	29.9% (290)	+1.5	.165	No statistically significant difference.
Asian / Pacific Islander	3.5% (3)	4.5% (44)	-1.0	.052	No statistically significant difference.
Hispanic / Latino	1.2% (1)	6.6% (64)	-5.4	---	Insufficient cases to compute.
White (Non-Hispanic)	64.0% (55)	57.3% (556)	+6.7	.001	Yes. Stopped MORE often than involved in crimes.
All Other Groups	0.0% (0.0)	1.6% (16)	-1.6	---	Insufficient cases to compute.

The difference between the stops and the benchmark for White drivers was 6.7 percentage points. The binomial test revealed this difference was beyond the margin of error, but in this case non-Hispanic White drivers were ***more likely*** to be stopped than expected. Of the known criminal-investigative stops made by these five officers within the East District, 64.0% involved a White driver while only 57.3% of the criminal suspect descriptions reported to the police within the East District described White individuals.

In summary, within the East District there was no evidence to suggest the disparate treatment of persons of color with regard to known criminal-investigative stops involving enough evidence of a crime to result in an arrest. Only White drivers were stopped more often than expected based on the criminal offender descriptions benchmark. The stop proportions for all of the other groups were either statistically similar to their respective representations within the criminal suspects benchmark, or were stopped ***less*** often than expected based on this benchmark.

4.2.2 West District

During the 12-month period of study, only 32 known criminal-investigative stops took place within the West District performed by these five officers of interest. During that same period, descriptions

of a total of 805 criminal suspects were provided to the police by members of the public within that district. Table 4.10 below displays the results of the binomial test for these known criminal-investigative stops when compared against the criminal suspect descriptions benchmark. The binomial test *p*-value for the stops of African-American drivers was above .010, indicating the stops were within the margin of error of the criminal suspect benchmark.

Although the percentage point difference between the stops and the benchmark was 5.8 percentage points for Asian / Pacific Islanders, this was still within the margin of error for such a small sample of 32 stops. When dealing with a sample of 32 stops, every stop constituted 3.1% of the sample. Only 3 stops involved Asian / Pacific Islander drivers, and if by random chance alone there had been only 2 Asian / Pacific Islander drivers, the percentage of drivers stopped would have fallen from 9.4% to 6.3%. When dealing with small samples there is a high degree of sampling error and a single unit change can result in exaggeratedly large proportional changes. Therefore, a larger percentage point difference is required before the binomial test will produce a statistically significant *p*-value.

Table 4.10 Officers of Interest's Known Criminal-Investigative Stops, West District (Criminal Suspect Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	28.1% (9)	26.2% (211)	+1.9	.124	No statistically significant difference.
Asian / Pacific Islander	9.4% (3)	3.6% (29)	+5.8	.107	No statistically significant difference.
Hispanic / Latino	0.0% (0)	5.6% (45)	-5.6	---	Insufficient cases to compute.
White (Non-Hispanic)	62.5% (20)	64.3% (518)	-1.8	.221	No statistically significant difference.
All Other Groups	0.0% (0)	0.2% (2)	-0.2	---	Insufficient cases to compute.

The percentage of known criminal-investigative stops performed within the West District by these five officers involving White drivers was also within the margin of error when compared to the percentage of Whites among the criminal suspect descriptions benchmark. No such stops involved Hispanic / Latino or "All other groups" drivers, thus they appeared less likely to be stopped than expected, but we were unable to perform any statistical controls for sampling error. In summary, within the West District, all racial / ethnic groups were either not stopped at all, or were stopped at rates similar to their representation among criminal suspect description benchmarks. We found no evidence of disparities in these stops.

4.2.3 Known Criminal-Investigative Stops Summary

While the proactive vehicle stops data included a mixture of purely traffic enforcement stops and stops of a criminal investigative nature, the stops analyzed within this section were purely criminal-investigative in nature. They all resulted in the arrest of at least one occupant of the vehicle for a criminal offense. This is an important point that should not be overlooked – all of these stops

revealed enough evidence to justify an arrest on a criminal charge. If performed for criminal-investigative purposes, the stopping officers found evidence that confirmed their suspicions.

No evidence was revealed in the analyses of these stops to suggest the punitive disproportionate treatment of persons of color. In both the East District and the West District, the proportion of known criminal-investigative stops involving African-American drivers statistically matched the African-American proportion within the criminal suspect benchmark. Likewise, the proportion of Asian / Pacific Islander drivers represented in these known criminal-investigative stops was within the margin of error of the criminal suspect descriptions benchmark. Hispanic / Latino drivers were not stopped at all in the West District and stopped at a rate lower than the benchmark in the East District. Drivers categorized as "All other groups" were not stopped at all. Only White drivers were stopped at a rate higher than expected, and this was only in the East district. In short, we found no evidence to suggest the disparate treatment of persons of color with regard to known criminal-investigative stops involving these five officers.

4.3 Post-Stop Citations

In this last analysis, we examined equity in the treatment of drivers after they had already been stopped. Specifically, we examined if, ***all other things being equal***, people of different demographic groups were treated similarly in terms of the likelihood of receiving a traffic citation after being stopped for a traffic violation. As described in earlier sections of this report, in order to do this, one needs to compare similarly-situated individuals. It is necessary to consider offenses with similar offense seriousness. If a driver of one race was stopped for a minor violation, and a driver of a different race was stopped for a serious violation, then it is likely these two drivers would receive different outcomes with regards to a citation. The driver committing the serious offense could easily receive a citation, and the driver committing the minor offense could easily be let off with only a warning. This difference in outcomes would have nothing to do with the drivers' races as they were involved in very different situations regarding the seriousness of each of their offenses.

Likewise, there is also the issue of multiple-offense stops. If a driver of one race was stopped for committing one traffic violation, and a driver of a different race was stopped for committing several traffic violations, then it is likely these two drivers would receive different outcomes with regards to a citation(s). The driver committing one offense may receive only a warning and a cautioning to stop engaging in this behavior, while the driver stopped while committing multiple violations may receive a warning for some of these violations and citations for other of these violations. These differences in outcomes, again, would have nothing to do with the drivers' races, as they were simply involved in very different behavioral situations. One driver committed one offense, and the other committed multiple offenses.

We needed to compare drivers stopped under similarly-situated circumstances – the same type and number of violations. In order to conduct an appropriate analysis, therefore, it was necessary first to isolate stops that involved one, and only one, traffic law violation offense. It should be noted that such an analysis still does not control for every legitimate difference between stop outcomes that might be unrelated to driver race. For example, one driver may have had a lengthy record of poor driving, while another driver may have had a clean driving record. One driver may have been

speeding 15 miles-per-hour over the speed limit, while another may have been speeding 30 miles-per-hour over the limit. One driver's license plate might have been expired for only a few days, while another driver's license plate was expired for many months. These differences might influence the officer's decision to issue a citation. Nevertheless, this was the best analysis that could be performed with the data available.

Once these single-offense stops were isolated, stops for the same reason were then compared with one another to control for seriousness of offense. Of the 10,824 vehicle stops performed by Greenwood police officers, 9,139 (84.4%) involved only one traffic violation. The remaining 1,685 multi-violation stops that were not tested involved two or more violations each. Each of these multi-violation stops varied from the next in terms of combinations of types of violations encountered, numbers of violations encountered, and seriousness of circumstances. As a result, it was not possible to gather a sufficient sample of similarly comparable cases to analyze properly and make comparisons across multiple racial groups.

As a result, and as we discussed earlier, we only examined post-stop citations for the six most common reasons for stop across the city. These six most common reasons for stop were; 1.) Speeding; 2.) Improper headlights or tail lights; 3.) Operating with expired plates; 4.) Failure to use seatbelt (front seat); 5.) Disobey / disregard a traffic control signal / sign; and 6.) Unsafe lane movement. These six reasons for stop totaled 7,923 stops, making up 86.7% of the 9,139 one-violation stops by Greenwood officers. Of these 7,923 single-violation stops involving one of these six most common reasons for stop, 804 were made by the five officers of interest. These five officers made the following single-violation stops:

1.) Improper headlights or tail lights (339 single-violation stops)
2.) Speeding (160 single-violation stops)
3.) Unsafe lane movement (104 single-violation stops)
4.) Operating with expired plates (93 single-violation stops)
5.) Disobey / disregard a traffic control signal / sign (71 single-violation stops)
6.) Failure to use seatbelt in front seat (37 single-violation stops)

Each of these six types of violations was analyzed separately. As the benchmark for each of these categories of stops, we used the outcomes for non-Hispanic White drivers (i.e., the percentage of non-Hispanic White drivers stopped for that violation that received a citation) as the benchmark for stops of drivers of the other groups. The assumption for this comparison was that if officers were not biased, all racial / ethnic groups would receive citations at a similar rate to White drivers for similar offenses.

It needs to be explained that we did not disaggregate our analysis by district or time of day in this section. The mathematical problem of aggregation bias occurs when benchmark data are gathered in proportions from disaggregated units that differ from the proportions the stops were gathered. An example might be if most of the stops were recorded at night, but most of the benchmark crashes occurred during the day. If the daytime and nighttime had different racial proportions of drivers (as our study did), then the racial composition of the benchmark would be skewed towards what the drivers looked like during the day, and stops would be skewed towards what the drivers looked like during the nighttime hours.

When analyzing citation decisions, however, the benchmark measure (the White driver stops) was gathered from the same districts and times as all other stops, so aggregation bias is less of a concern. In addition, the number of stops involved within each traffic violation category was sometimes so small that when subdivided by the five racial / ethnic groups, there were already few cases to analyze. If subdivided further by district and / or time of day, we would often have no cases to analyze. Therefore, disaggregation was not performed.

4.3.1 Improper Headlight or Tail Light Stop Citations

These five officers made a total of 339 single-violation stops for either a headlight or tail light offense. The statistical details of these stops are displayed in Table 4.11 below. Of these stops, 247 involved non-Hispanic White drivers, only one of whom (0.4%) received a citation for that offense. This White driver 0.4% citation rate served as the benchmark for the stops of all the other racial / ethnic groups.

Table 4.11 Improper Headlight of Tail Light Stop Citations by Race / Ethnicity (Officers of Interest Only)

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	0.0% (74 / 0)	0.4% (247 / 1)	-0.4	.743	No statistically significant difference.
Asian / Pacific Islander	0.0% (11 / 0)	0.4% (247 / 1)	-0.4	.957	No statistically significant difference.
Hispanic / Latino	0.0% (6 / 0)	0.4% (247 / 1)	-0.4	.976	No statistically significant difference.
All Other Groups	0.0% (1 / 0)	0.4% (247 / 1)	-0.4	---	Insufficient cases to compute.

None of the drivers of the other racial / ethnic groups stopped for this offense received a citation, resulting in citation rates of 0.0% for all four groups. Because the benchmark citation rate of 0.4% was so low, and the citation rate of all the other racial / ethnic groups was 0.0%, the binomial test indicated the two percentages were within the margin of error of each other. Furthermore, there was only one stop involving a driver in the "All other groups" category. The binomial test cannot be computed with only one case, revealing why disaggregation to smaller subsamples by district or time of day was not appropriate for this portion of our study. In summary, there was no evidence of disparate treatment regarding the issuing of citations by these five officers during single-violation stops for having an improper headlight or tail light.

4.3.2 Speeding Stop Citations

These five officers made a total of 160 single-violation stops for speed limit violation offenses of various speed limit zones. The statistical details of these stops are displayed in Table 4.12 below. Of these stops, 118 involved non-Hispanic White drivers, of whom 5 (4.2%) received a citation for this offense. This 4.2% citation rate for Whites served as the benchmark for the stops of all the other racial / ethnic group categories.

Thirty-one of the speeding drivers stopped involved African-American drivers, of whom 5 (16.1%) received a citation. This was a difference of 11.9 percentage points, and greater than the citation rate for White drivers. The binomial test *p*-value was lower than .010, indicating this difference was beyond the margin of error. In stops for speeding made by these five officers as a whole, African-American drivers stopped for speeding violations were more likely to receive a citation than were White drivers stopped for the same offense under similar circumstances. We should remind the reader, however, that we could not control for every legitimate difference between stop outcomes that might be unrelated to driver race. For example, one driver may have had a lengthy record of poor driving, while another driver may have had a clean driving record. One driver may have been speeding 15 miles-per-hour over the speed limit, while another may have been speeding 30 miles-per-hour over the limit. These differences might influence the officer's decision to issue a citation, and we could not measure these influences. Nevertheless, this was the best analysis that could be performed with the data available.

Table 4.12 Speeding Stop Citations by Race / Ethnicity (Officers of Interest Only)

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	16.1% (31 / 5)	4.2% (118 / 5)	+11.9	.009	Yes. Cited MORE often than White drivers.
Asian / Pacific Islander	12.5% (8 / 1)	4.2% (118 / 5)	+8.3	.291	No statistically significant difference.
Hispanic / Latino	0.0% (2 / 0)	4.2% (118 / 5)	-4.2	.918	No statistically significant difference.
All Other Groups	0.0% (1 / 0)	4.2% (118 / 5)	-4.2	---	Insufficient cases to compute.

These five officers conducted 8 single-vehicle stops for speeding offenses involving Asian / Pacific Islander drivers. Only one of these drivers (12.5%) received a citation. Although this was 8.3 percentage points higher than the benchmark of 4.2%, because there were only 8 stops of Asian / Pacific Islander drivers, the binomial test revealed this difference was still within the margin of error. Recall the example we gave in Section Two regarding the sampling error inherent in trying to determine the percentage of females in the U.S. based on small samples of 3 or 7 cases. With only 8 stops of Asian / Pacific Islander drivers, every driver accounts for 12.5% of the sample. The closest we can get to the benchmark of 4.2% is to have either 0 drivers cited (0.0%) or 1 driver cited (12.5%). This is why the binomial test revealed this difference was still within the margin of error.

Only two Hispanic / Latino drivers were stopped for speeding violations within these single-violation stops, and none received a citation. Again, because of the very small sample this was within the margin of error. Finally, only one driver within the "All other groups" category was stopped for speeding. This driver did not receive a citation, and the binomial test cannot be computed with only a single case.

In summary, African-American drivers stopped for speeding by these five officers as a group appeared to be cited at a higher rate than were White drivers stopped for the same offense under similar circumstances. However, there was no evidence of disparate treatment of any other racial group regarding the issuing of citations by these five officers during single-violation stops for speeding.

4.3.3 Unsafe Lane Movement Stop Citations

These five officers made a total of 104 single-violation stops for unsafe lane movement offenses, such as changing lanes abruptly and / or without signaling. The statistical details of these stops are displayed in Table 4.13 below. Of these stops, 73 involved non-Hispanic White drivers, only 2 of whom (2.7%) received a citation for that offense. This 2.7% citation rate for White drivers served as the benchmark for the stops of all of the other racial / ethnic groups. None of the drivers of the other racial / ethnic groups stopped for this offense received a citation. The binomial test indicated the two percentages were within the margin of error for African-American, Asian / Pacific Islander, and Hispanic / Latino stops. This was because the benchmark citation rate of 2.7% was so low, the citation rate of all the other racial / ethnic groups was 0.0%, and very few stops were made for each of these races.

Table 4.13 Unsafe Lane Movement Stop Citations by Race / Ethnicity (Officers of Interest Only)

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	0.0% (20 / 0)	2.7% (73 / 2)	-2.7	.578	No statistically significant difference.
Asian / Pacific Islander	0.0% (5 / 0)	2.7% (73 / 2)	-2.7	.872	No statistically significant difference.
Hispanic / Latino	0.0% (5 / 0)	2.7% (73 / 2)	-2.7	.872	No statistically significant difference.
All Other Groups	0.0% (1 / 0)	2.7% (73 / 2)	-2.7	---	Insufficient cases to compute.

There was only one stop involving a driver in the "All other groups" category. The binomial test cannot be computed with only one case, revealing why disaggregation to very small subsamples is not appropriate. In summary, there was no evidence of disparate treatment regarding the issuing of citations by these five officers during single-violation stops for unsafe lane movement.

4.3.4 Expired License Plate Stop Citations

These five officers made a total of 93 single-violation stops for operating a vehicle with an expired vehicle registration license plate. The statistical details of these stops are displayed in Table 4.14 below. Of these stops, 63 involved non-Hispanic White drivers. Four (6.3%) of these White driver stops received a citation for the offense. This 6.3% citation rate for White drivers served as the benchmark for the stops of all of the other racial / ethnic group categories.

Twenty-seven of the expired license plate stops involved African-American drivers, and 3 of these drivers (11.1%) received a citation for the offense. The binomial test found that the difference between these percentages was within the margin of error. As the sample of African-American driver stops for expired plates was so small (27 drivers), every driver made up 3.7% of the sample. If simply by chance only one less African-American driver had been ticketed, the citation rate would have been 7.4% (only 1.1 percentage points away from the White driver benchmark). This is why the binomial test indicated the difference was within the margin of error. The smaller the sample, the larger the proportional change one case can make.

Table 4.14 Expired License Plate Stop Citations by Race / Ethnicity (Officers of Interest Only)

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	11.1% (27 / 3)	6.3% (63 / 4)	+4.8	.240	No statistically significant difference.
Asian / Pacific Islander	0.0% (1 / 0)	6.3% (63 / 4)	-6.3	---	Insufficient cases to compute.
Hispanic / Latino	0.0% (1 / 0)	6.3% (63 / 4)	-6.3	---	Insufficient cases to compute.
All Other Groups	0.0% (1 / 0)	6.3% (63 / 4)	-6.3	---	Insufficient cases to compute.

There was only one stop each involving a driver in the Asian / Pacific Islander, Hispanic / Latino, and "All other groups" categories. The binomial test cannot be computed with only one case. Nevertheless, none of these three drivers received a citation for their expired plate offense. In summary, there was no evidence of disparate treatment regarding the issuing of citations by these five officers during single-violation stops for having an expired license plate.

4.3.5 Disobey / Disregard a Traffic Control Signal / Sign Stop Citations

These five officers made a total of 71 single-violation stops for the violations of various traffic law statutes regarding disobeying a traffic control signal (such as a traffic light) or a traffic control sign (such as a stop or yield sign). The statistical details of these stops are displayed in Table 4.15 below. Of these stops, 49 involved non-Hispanic White drivers. Six (12.2%) of these White driver stops received a citation for the offense. This 12.2% citation rate for White drivers served as the benchmark for the stops of all of the other racial / ethnic group categories.

Twelve stops involved African-American drivers, of whom only one (8.3%) received a citation. This was a lower citation rate than that for White drivers, and the binomial test indicated the difference was within the margin of error. Nine stops involved Asian / Pacific Islander drivers and 4 (44.4%) received a citation. This citation rate was higher than the 12.2% citation rate for non-Hispanic White drivers, but as the binomial test *p*-value was .017, the difference was within the margin of error. As the threshold for the difference to be statistically significant was a *p*-value of .010 or lower, this p-value of .017 came close to that threshold but did not reach it. Because there were only 9 stops of Asian / Pacific Islander drivers, each of these drivers made up 11.1% of the

sample. A single citation more or less by chance alone would raise or lower the citation rate by 11.1 percentage points. This is why the binomial test still indicated the difference was (barely) within the margin of error.

None of the stops for this offence category involved drivers from the "All other groups" category, and only one stop involved a Hispanic / Latino driver. Therefore, the binomial test could not be performed with these two race / ethnicity categories. Nevertheless, the single Hispanic / Latino driver stop did not result in a citation.

Table 4.15 Disobey / Disregard Traffic Signal / Sign Stop Citations by Race / Ethnicity (Officers of Interest Only)

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	8.3% (12 / 1)	12.2% (49 / 6)	-3.9	.560	No statistically significant difference.
Asian / Pacific Islander	44.4% (9 / 4)	12.2% (49 / 6)	+32.2	.017	No statistically significant difference.
Hispanic / Latino	0.0% (1 / 0)	12.2% (49 / 6)	-12.2	---	Insufficient cases to compute.
All Other Groups	0.0% (0 / 0)	12.2% (49 / 6)	-12.2	---	Insufficient cases to compute.

In summary, there was no statistical evidence of the disparate treatment of any group regarding the issuing of citations by these five officers during single-violation stops for disobeying / disregarding a traffic control signal or sign.

4.3.6 Failure to Use Seatbelt (Front Seat) Stop Citations

These five officers made only 37 single-violation stops for failure to use a seatbelt. In Indiana, failing to wear a seatbelt while riding in the front seat of a passenger vehicle is a "primary offense," meaning that a law enforcement officer may stop the vehicle for this offense.[69] The statistical details of these stops are displayed in Table 4.16 below. Of these seatbelt violation stops, 26 involved non-Hispanic White drivers. Only one non-Hispanic White driver within these stops (3.8%) received a citation for this offense. This 3.8% citation rate for White drivers served as the benchmark for the stops of all the other racial / ethnic group categories.

Eleven African-American drivers were among the single-violation stops for failing to wear a seatbelt, with only one (9.1%) receiving a citation. While this citation rate was higher than the White driver citation rate, it was well within the margin of error due to the small number of African-Americans stopped. Because of the very small sample size, each of the 11 African-American drivers made up 9.1% of the sample of African-Americans. The only way the percentage of cited African-American drivers could have been lower was if no drivers (0.0%) had been cited. A score of 9.1% was as close to 3.8% as could be achieved with a sample of only 11 stops.

[69] See Indiana Code 9-19-10-3.1, *Stopping, inspecting, or detaining vehicle; checkpoints*.

No Asian / Pacific Islander drivers were stopped by these officers for a seatbelt violation and thus none were cited. This 0.0% citation rate was lower than the 3.8% citation rate for White drivers. Likewise, no Hispanic / Latino drivers, or "all other group" drivers, were stopped by these five officers in single-offense stops for a seatbelt violation. As a result, none were cited. This 0.0% citation rate was lower than the 3.8% citation rate for White drivers. In summary, there was no evidence of disparate treatment regarding the issuing of citations by these five officers during single-violation stops for failing to wear a seatbelt.

Table 4.16 Failure to Use Seatbelt Stop Citations by Race / Ethnicity (Officers of Interest Only)

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	9.1% (11 / 1)	3.8% (26 / 1)	+5.3	.347	No statistically significant difference.
Asian / Pacific Islander	0.0% (0 / 0)	3.8% (26 / 1)	-3.8	---	Insufficient cases to compute.
Hispanic / Latino	0.0% (0 / 0)	3.8% (26 / 1)	-3.8	---	Insufficient cases to compute.
All Other Groups	0.0% (0 / 0)	3.8% (26 / 1)	-3.8	---	Insufficient cases to compute.

4.3.7 Post-Stop Citations Summary

In this section we examined whether, once stopped, persons of color received traffic citations at similar rates to White drivers. To do so fairly, we had to control for differences in offense seriousness among different types and numbers of violations. We focused on only single-violation stops (the overwhelming majority of stops made by these five officers and the Greenwood Police Department as a whole), and examined only the six most common reasons for stop, which constituted the vast majority of all stops made. In total, 804 stops made by these five officers were examined.

In the vast majority of circumstances, persons of color were cited at similar or lower rates to White drivers when stopped under similar circumstances (single-offense stops for the same violation). In only one instance was this not the case. African-American drivers were found to be more likely cited than were White drivers when stopped for speeding in single-violation traffic stops. However, African-American drivers were cited at rates similar to White drivers during single-offense stops for the other five types of violations examined. Furthermore, Asian / Pacific Islander drivers, Hispanic / Latino drivers, and "all other group" drivers received citations at statistically the same rate, or even lower rates, than the rate at which White drivers were cited.

In short, we found inconsistent evidence regarding the ticketing of African-American drivers. African-American drivers were more likely than White drivers to receive a citation when stopped for speeding, but were not treated differently from Whites in stops for five other offenses. All other racial / ethnic groups were cited at rates similar to those of White drivers. Therefore, we found no

evidence of citation disparity regarding Asian / Pacific Islander, Hispanic / Latino, and "all other group" drivers, and only limited, inconsistent evidence of disparity against African-Americans in the issuing of citations.

4.4 Officer of Interest Group Analysis Summary

Despite the racist thoughts and opinions expressed by these five officers of interest that led to the end of their law enforcement careers, we failed to find conclusive proof that these officers engaged in a pattern of discriminatory behavior in the stopping or citing of persons of color. We examined their discretionary enforcement behaviors (stops and citations) for the 12-month period before the discovery of their disturbing communications and found weak and inconsistent evidence that African-American drivers were treated more punitively than drivers of other racial / ethnic groups. As for Asian / Pacific Islander drivers, we found weak and inconsistent evidence that drivers of this group were treated with greater leniency than all other groups. We found no evidence that Hispanic / Latino drivers were treated differently than White drivers.

First, we examined the proactive vehicle stops made by these officers, disaggregated by district and time of day. We compared these stops to two benchmarks – crash drivers and criminal suspect descriptions – with the anticipation the percentages of stops for each racial / ethnic group would fall neatly between the boundaries of these two benchmarks if no bias was present. Our results revealed that this was technically the case in all four district-time blocks for stops of African-American drivers. However, the stops of African-American drivers were heavily skewed towards the higher, criminal suspect descriptions benchmark in three of the four district-time blocks. While still within the bounds of the two benchmarks, the strong similarity between the stops and the criminal suspects benchmark suggested that these five officers primarily focused on criminal-investigative stops if African-American drivers were involved, and not so when drivers of other groups were involved. The evidence regarding the stopping of African-American drivers was still within the benchmark boundaries, but raised concerns that drivers of this race were more often the focus of criminal-investigative stops than were drivers of other groups.

In these proactive vehicle stops, we found that Asian / Pacific Islander drivers were stopped at rates lower than both benchmark predictions, or equal to the crash driver benchmark. The same was true for stops involving drivers in the "All other groups" category. The percentage of proactive vehicle stops involving White drivers fit neatly between the two benchmarks or was statistically the same as the lower benchmark in these stops. Hispanic / Latino driver stops revealed the least evidence of bias for or against them. The percentage of stopped drivers who were Hispanic / Latino most often landed near the midpoint between the two benchmarks.

Second, we analyzed known criminal-investigative stops – vehicle stops that resulted in a criminal arrest. In this analysis, no evidence was revealed to suggest the punitive disproportionate treatment of persons of color. For all categories of persons of color, the proportion of known criminal-investigative stops statistically matched the proportion of that group within the criminal suspect benchmark, or were stopped at a lower rate than what that benchmark would have predicted. Only White drivers were stopped at a rate higher than expected, and this was only in one district.

Third, we examined whether, once stopped, persons of color received traffic citations at similar rates to White drivers. We examined single-violation stops involving the six most common reasons for stop utilized by Greenwood police officers. In only one instance did we find that persons of color were treated more punitively than Whites. African-American drivers were found to be cited far more often than White drivers when stopped for speeding. For all other traffic offenses examined and all other racial / ethnic groups, drivers received citations at statistically the same rate, or even lower rates, than the rate at which White drivers were cited.

In summary, we found weak and inconsistent evidence that these five officers may have, at times, focused more on criminal-investigative stops when encountering African-American drivers, but not to an extent that exceeded the African-American representation among those committing crimes within Greenwood. We also found evidence that these five officers were more likely to issue a citation to African-American speeders than speeders of other racial / ethnic groups. However, we also found that these five officers did not disproportionately ticket African-American drivers for any other traffic offenses. Finally, we found no evidence to suggest that these five officers treated Asian / Pacific Islander and Hispanic / Latino individuals in a discriminatory way.

5. THE GREENWOOD POLICE DEPARTMENT

Section 5 is a repeat of the analysis performed in Section 4 of this report, however the data analyzed in Section 5 involved the rest of the officers of the Greenwood Police Department, minus the five officers of interest. Stops by a total of 66 different officers were included in this section of analysis. We examined the stops and citations of the rest of the police department personnel for the same time period of the analysis – July 1, 2022 through June 30, 2023. These stops occurred before the racist messages by the officers of interest were discovered.

Within each district-time block, we compared the proactive vehicle stops (a combination of unknown proportions of traffic stops and criminal-investigative stops) of the rest of the officers of the department to both the crash drivers and criminal offender suspect descriptions benchmarks. These comparisons were used to determine if any racial / ethnic group was stopped disproportionately more often than these benchmarks would have predicted. Next, we compared the known criminal-investigative stops (i.e., vehicle stops resulting in a criminal arrest) to only the criminal offender suspect descriptions benchmark to determine if any racial / ethnic group was stopped disproportionately more often than this benchmark would have predicted within these types of stops. Finally, we examined the six most common traffic offenses encountered within the data and compared these stops to the stops of non-Hispanic White drivers to see if any group was disproportionately more likely than Whites to receive a citation for committing the same offense under similar circumstances.

5.1 Proactive Vehicle Stops

The rest of the Greenwood Police Department, minus the five officers of interest, completed 9,426 of the 10,824 total proactive vehicle stops made by the Greenwood Police Department within the study period. These stops by the rest of the department were found to be distributed across the four district-time blocks in the following manner:
East District, 6 a.m. – 6 p.m. – 2,548 stops
East District, 6 p.m. – 6 a.m. – 2,625 stops
West District, 6 a.m. – 6 p.m. – 2,178 stops
West District, 6 p.m. – 6 a.m. – 2,075 stops

For benchmark comparisons, we used the data from the 2,601 crash drivers and 1,775 criminal suspect descriptions. The crash drivers were found to be distributed across the four district-time blocks in the following manner:
East District, 6 a.m. – 6 p.m. – 887 crash drivers
East District, 6 p.m. – 6 a.m. – 307 crash drivers
West District, 6 a.m. – 6 p.m. – 1,089 crash drivers
West District, 6 p.m. – 6 a.m. – 318 crash drivers

The criminal suspect descriptions were found to be distributed across the four district-time blocks in the following manner:
East District, 6 a.m. – 6 p.m. – 546 suspect descriptions

East District, 6 p.m. – 6 a.m. – 424 suspect descriptions
West District, 6 a.m. – 6 p.m. – 404 suspect descriptions
West District, 6 p.m. – 6 a.m. – 401 suspect descriptions

We compared the proactive vehicle stops against both of these benchmarks for comparisons by race / ethnicity.

5.1.1 East District from 6 a.m. to 6 p.m.

The rest of the members of the Greenwood Police Department made 2,548 proactive vehicle stops (combined traffic stops and criminal-investigative stops) within the East District during the hours of 6:00 a.m. through 5:59 p.m. during the 12-month period of study. In that same district-time block, 887 drivers were involved in crashes. These drivers served as the benchmark for the driving population estimate. Descriptions of a total of 546 criminal suspects were provided to the police by members of the public reporting crimes within that district-time block. As the Greenwood Police Department stops contained a mixture of traffic stops and criminal-investigative stops of unknown proportions, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. We anticipated that, if no bias was present, the stops would fall neatly between the two benchmark limits.

Figure 5.1 Proactive Vehicle Stops and Benchmarks for East District, 6 AM to 6 PM

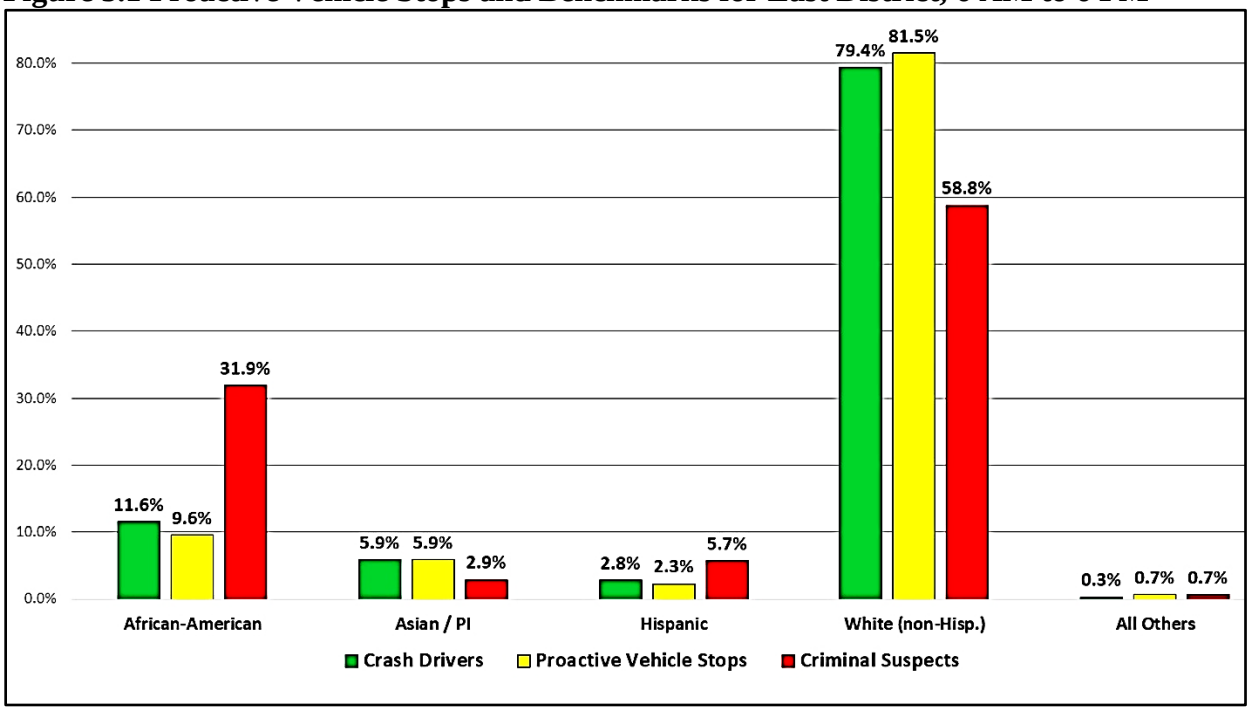


Figure 5.1 above reveals how these stops and benchmarks compared for the stops occurring from 6 a.m. to 6 p.m. within the East District. Within this bar graph, the first bar for each race / ethnic group is the proportion of crash drivers that were of that race / ethnicity. The second bar is the

proportion of stopped drivers that were of that race / ethnicity. The third bar is the proportion of criminal suspect descriptions that were of that race / ethnicity. Our expectation would be that the percentage of stops for each group would fall neatly between the two benchmark measure bars.

Visual examination of Figure 5.1 appears to reveal different outcomes. African-American and Hispanic / Latino drivers appeared to be stopped at a rate ***lower*** than expected for either benchmark. Stops of Asian / Pacific Islander drivers, and drivers in the "All other groups" category fell between the bounds of the two benchmark measures, but were even with one of the two benchmarks. Unlike the persons of color who were stopped at rates between or below the benchmarks, White drivers appeared to be stopped at a rate higher than both benchmarks.

However, we cannot know for sure if these differences are within the statistical margin of error until we conduct the binomial test. Table 5.1 below displays the results of the binomial test for these proactive vehicle stops when compared against only the crash driver benchmark. The first column of data reveals the stopped drivers (both percentage and raw number of stopped drivers), separated by racial / ethnic categories. The second column of data reveals the crash driver benchmark data (both percentages and raw numbers of drivers), separated by racial / ethnic categories. The next column is the raw percentage-point difference between the stops and the benchmark, followed by a column containing the *p*-value output from the binomial test.

Table 5.1 Rest of Department's Proactive Vehicle Stops, East District, 6 AM – 6 PM (Crash Driver Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Crash Drivers (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	9.6% (244)	11.6% (103)	-2.0	.026	No statistically significant difference.
Asian / Pacific Islander	5.9% (150)	5.9% (52)	0.0	.518	No statistically significant difference.
Hispanic / Latino	2.3% (58)	2.8% (25)	-0.5	.177	No statistically significant difference.
White (Non-Hispanic)	81.5% (2,077)	79.4% (704)	+2.1	.057	No statistically significant difference.
All Other Groups	0.7 (19)	0.3% (3)	+0.4	.133	No statistically significant difference.

Recall that unless the *p*-value is equal to, or less than, .010, we can assume that the percentage difference between the drivers stopped and the benchmark was due to sampling error and not a true difference. In other words, if the *p*-value is greater than .010, the difference between the percentage of stops and the percentage in the benchmark is within the margin of error. The reader should also recall from Section 2 of this report that the degree of sampling error tends to decrease as the sample size increases. As the sample of stops made by the rest of the department is almost nine times larger than the sample of stops made by the five officers of interest, the binomial test will be less tolerant of differences between the benchmarks and the stops for this larger sample. In other words, with this larger sample it will not take as great a percentage point difference for the binomial test to indicate that the difference is outside the margin of error.

Table 5.1 reveals for all of the racial / ethnic groups, the percentage of drivers stopped in this district-time block was statistically the same as the percentage of that race / ethnicity among the crash drivers. The binomial test indicated that for every race / ethnicity, the differences between the stops and the crash driver benchmark were small enough to be within the margin of error. Even if this had not been the case, the percentage point difference column reveals that the stops for all race / ethnicity categories were lower than or equal to the crash driver benchmark for all of the groups except for Whites. This reveals that based on the crash driver benchmark alone, no stop disparity existed for any group in the stops made between 6 a.m. and 6 p.m. within the East District.

However, as the proactive vehicle stops data contained a mixture of traffic stops and criminal-investigative stops, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. Table 5.2 below displays the results of the binomial test for these proactive vehicle stops when compared against the criminal suspect descriptions benchmark estimate of the criminal-offending population.

Recall that in Table 5.1, the stops for all racial / ethnic groups were within the margin of error when compared to the crash driver benchmark. This suggests that unlike the five officers of interest, the racial proportions of the stops performed by the rest of the department within this district-time block were much more similar to the driving population than the criminal offending population. Therefore, we would expect differences – perhaps even statistically significant differences – between the stops and the criminal suspect benchmark racial proportions.

Table 5.2 Rest of Department's Proactive Vehicle Stops, East District, 6 AM – 6 PM (Criminal Suspect Descriptions Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	9.6% (244)	31.9% (174)	-22.3	.001	Yes. Stopped LESS often than involved in crimes.
Asian / Pacific Islander	5.9% (150)	2.9% (16)	+3.0	.001	Yes. Stopped MORE often than involved in crimes.
Hispanic / Latino	2.3% (58)	5.7% (31)	-3.4	.001	Yes. Stopped LESS often than involved in crimes.
White (Non-Hispanic)	81.5% (2,077)	58.8% (321)	+22.7	.001	Yes. Stopped MORE often than involved in crimes.
All Other Groups	0.7 (19)	0.7% (4)	0.0	.532	No statistically significant difference.

As anticipated, Table 5.2 reveals that the proactive vehicle stop rates were different from the criminal suspect description benchmarks. These differences, however, benefitted African-American and Hispanic drivers. For example, while African-Americans made up 31.9% of the criminal suspect descriptions for this district-time block, African-American drivers made up only 9.6% of the drivers stopped by the rest of the officers on the department. While Hispanic / Latino individuals made up 5.7% of the criminal suspect descriptions for this district-time block, Hispanic

/ Latino drivers made up only 2.3% of the drivers stopped by the rest of the officers on the department. Both of these differences were beyond the margin of error, but both revealed stopping ***less often*** than expected based on this benchmark.

The binomial test revealed that Asian / Pacific Islander drivers, and White drivers, were stopped more often than expected when compared to the criminal benchmark. One should recall, however, that the percentages of stops for these two groups were statistically the same as the percentages predicted by the crash driver benchmark (see Table 5.1). Although drivers from these two groups were stopped more often than expected when compared to the criminal offenders operating within the area, they were still within the margin of error when compared to the driving population in the area. Finally, the analysis for the "All other groups" category revealed that the percentages of stops, and the percentages of both benchmarks were statistically similar, with no disparity.

In summary, of the 9,426 proactive vehicle stops made by the rest of the officers of the Greenwood Police Department, 2,548 (27.0%) occurred between 6 a.m. and 6 p.m. within the East District. These stops were a mixture of stops for traffic enforcement purposes and stops for criminal investigative purposes. As a result, we expected that the proportions of stops for the five race / ethnicity categories would fall between the traffic pattern benchmark (i.e., crash drivers) and criminal offenders benchmark (i.e., criminal suspect descriptions). Indeed, for all groups other than Whites, their percentage of stops fell either between the two benchmarks, or even lower than both benchmarks. Statistical analyses with the binomial test revealed that the percentage of drivers stopped for each racial / ethnic category was statistically the same as the percentage for the crash driver benchmark.

The midpoint between the two benchmarks for African-American drivers was 21.75%, yet the actual percentage of African-Americans stopped was only 9.6%, far below this estimate. While the midpoint between the two benchmarks for Asian / Pacific Islander drivers was 4.4%, the actual percentage of Asian / Pacific Islanders stopped was 5.9%. This was only 1.5 percentage points higher and still within the margin of error for the crash driver benchmark. The midpoint between the two benchmarks for Hispanic / Latino drivers was 4.25%, and the actual percentage of Hispanic / Latino drivers stopped was only 2.3%, far below the midpoint. Only White drivers (81.5% of stops) were stopped at a rate far above their benchmarks midpoint of 69.1%.

As a result, we found no evidence of racial disparities against persons of color among the proactive vehicle stops made by the rest of the officers of the Greenwood Police Department, between 6 a.m. and 6 p.m. within the East District. All group stop rates were within the margin of error for the crash driver benchmark, suggesting that the stops performed by the rest of the department were focused more on traffic enforcement stops rather than criminal-investigative stops, especially with regard to the stops of African-American, Asian / Pacific Islander, and Hispanic / Latino drivers.

5.1.2 East District from 6 p.m. to 6 a.m.

During the 12-month period of study, the rest of the officers of the Greenwood Police Department made 2,625 proactive vehicle stops between the hours of 6:00 p.m. through 5:59 a.m. within the East District. In this district-time block, 307 drivers were involved in crashes, and 424 criminal suspect descriptions were provided to the police by members of the public reporting crimes. As the Greenwood Police Department stops contained a mixture of traffic stops and criminal-

investigative stops of unknown proportions, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. We anticipated that the percentage of drivers stopped for each race / ethnic category would fall between these two benchmarks.

Figure 5.2 Proactive Vehicle Stops and Benchmarks for East District, 6 PM to 6 AM

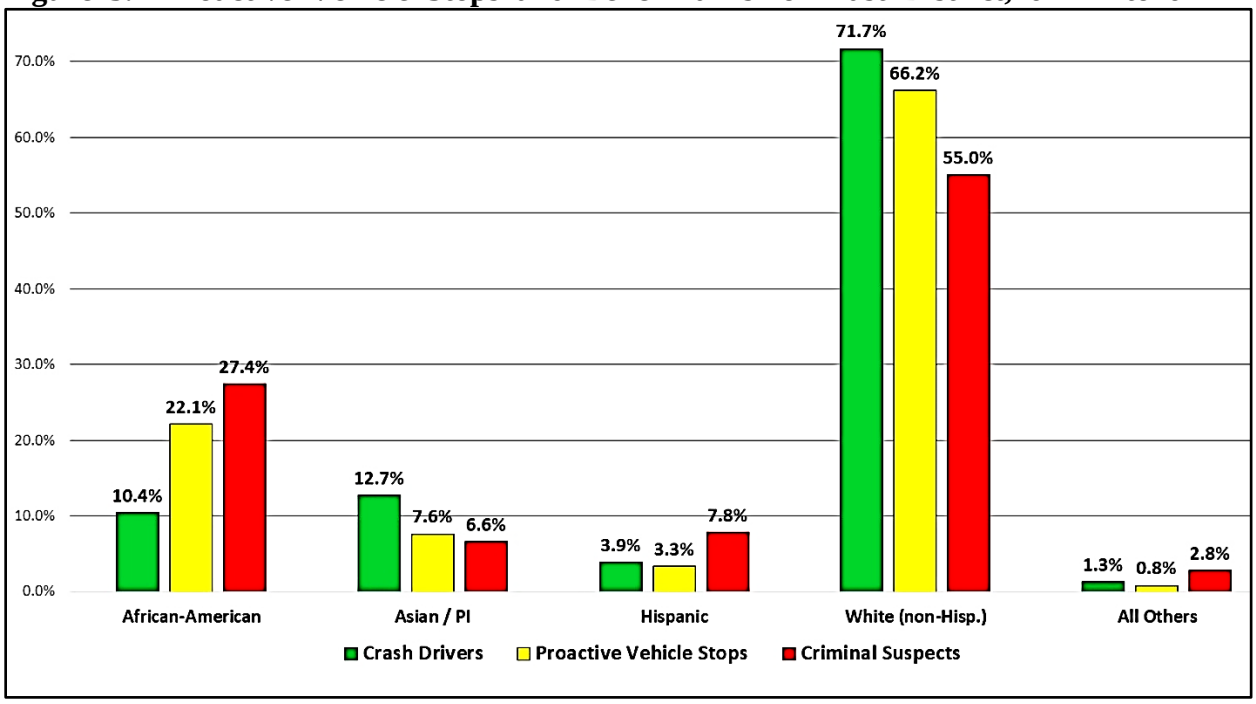


Figure 5.2 above reveals how these stops and benchmarks compared for the proactive vehicle stops occurring from 6 p.m. to 6 a.m. within the East District. Visual examination of this graph reveals that the percentages of stops fell between the boundaries of these two benchmarks, or below both benchmarks, for every racial / ethnic group.

Table 5.3 below displays the results of the binomial test for these proactive vehicle stops when compared against only the crash driver benchmark estimate of the driving population. In this table the binomial test indicated that African-American drivers were stopped at a rate higher than expected when compared to only the crash driver benchmark. Asian / Pacific Islander drivers, on the other hand, were stopped at a rate lower than expected when compared to only the crash drivers benchmark. The stop rates of Hispanic / Latino drivers, White drivers, and the drivers categorized as "All other groups" fell within the margin of error as being statistically the same as the crash driver benchmark.

However, as the proactive vehicle stops data contained a mixture of traffic stops and criminal-investigative stops, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks. Table 5.4 below displays the results of the binomial test for the proactive

vehicle stops when compared against the criminal suspect descriptions benchmark estimate of the criminal-offending population.

Table 5.3 Rest of Department's Proactive Vehicle Stops, East District, 6 PM – 6 AM (Crash Driver Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Crash Drivers (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	22.1% (579)	10.4% (32)	+11.7	.001	Yes. Stopped MORE often than involved in crashes.
Asian / Pacific Islander	7.6% (199)	12.7% (39)	-5.1	.001	Yes. Stopped LESS often than involved in crashes.
Hispanic / Latino	3.3% (87)	3.9% (12)	-0.6	.317	No statistically significant difference.
White (Non-Hispanic)	66.2% (1,738)	71.7% (220)	-5.5	.024	No statistically significant difference.
All Other Groups	0.8% (22)	1.3% (4)	-0.5	.233	No statistically significant difference.

Although the stops of African-American drivers were higher than expected when compared to the crash driver benchmark, the percentage of African-American drivers stopped was ***lower than expected*** (and outside the margin of error) when compared to the criminal suspect descriptions benchmark. As Table 5.4 reveals, only 22.1% of the drivers stopped within the East District between 6 p.m. and 6 a.m. were African-American drivers, while 27.4% of the criminal suspect descriptions provided by crime victims and witnesses in that same district during those hours involved African-American suspects. The stops were 5.4 percentage points ***lower*** than the suspect descriptions benchmark, and as the binomial test *p*-value was lower than .010, this difference was beyond the margin of error.

Table 5.4 Rest of Department's Proactive Vehicle Stops, East District, 6 PM – 6 AM (Criminal Suspects Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	22.1% (579)	27.4% (116)	-5.4	.006	Yes. Stopped LESS often than involved in crimes.
Asian / Pacific Islander	7.6% (199)	6.6% (28)	+1.0	.252	No statistically significant difference.
Hispanic / Latino	3.3% (87)	7.8% (33)	-4.5	.001	Yes. Stopped LESS often than involved in crimes.
White (Non-Hispanic)	66.2% (1,738)	55.4% (235)	+10.8	.001	Yes. Stopped MORE often than involved in crimes.
All Other Groups	0.8% (22)	2.8% (12)	-2.0	.001	Yes. Stopped LESS often than involved in crimes.

The stops of Hispanic / Latino drivers were also ***lower than expected*** when based on this criminal suspect descriptions benchmark, and this difference was beyond the margin of error. While 7.8% of the criminal suspect descriptions involved Hispanic / Latino individuals, only 3.3% of the stops involve Hispanic / Latino drivers. Even the stops of drivers categorized as "All other groups" were at a rate lower than predicted by the criminal suspect descriptions benchmark. The only racial / ethnic group stopped more often than expected in comparison to the criminal suspect descriptions benchmark was White drivers. White individuals were only 55.4% of the criminal suspect descriptions, yet were 66.2% of the drivers stopped, a difference that was beyond the margin of error.

In summary, of the 9,426 proactive vehicle stops made by the rest of the officers of the Greenwood Police Department, 2,625 (27.9%) occurred between 6 p.m. and 6 a.m. within the East District. These stops were a mixture of stops for traffic enforcement purposes and stops for criminal investigative purposes. As a result, we expected that the proportions of the five race / ethnicity categories represented among these stops would fall somewhere between the traffic pattern benchmark (i.e., crash drivers) and criminal offenders benchmark (i.e., criminal suspect descriptions).

Our results revealed that the percentage of each group stopped fell either between the two benchmarks, or below both benchmarks, for all racial / ethnic categories of drivers. The midpoint between the two benchmarks for African-American drivers was 18.9%, and the actual percentage of African-Americans stopped was 22.1%. Although slightly above the midpoint, 22.1% was still well below the upper benchmark limit of 27.4% for criminal suspects. The midpoint between the two benchmarks for Asian / Pacific Islander drivers was 9.65%, but the actual percentage of Asian / Pacific Islanders stopped was 7.6%, lower than the midpoint and between the two benchmark limits.

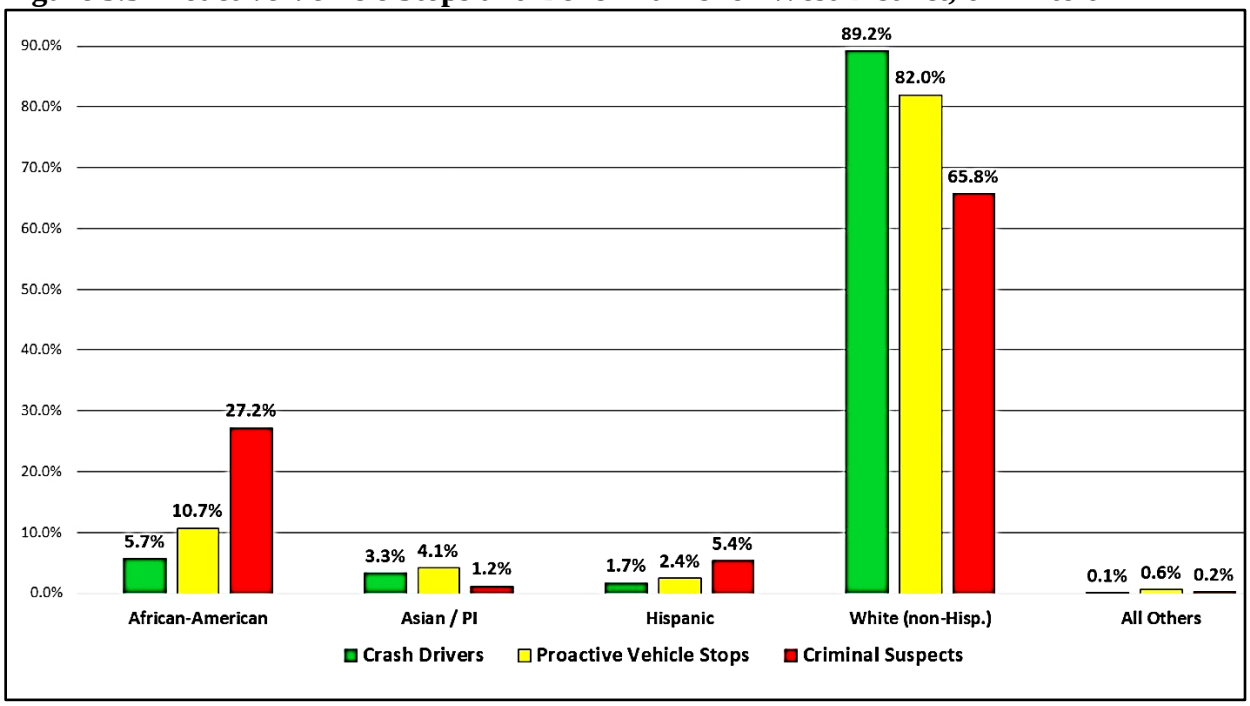
The midpoint between the two benchmarks for Hispanic / Latino drivers was 5.85%, and the actual percentage of Hispanic / Latino drivers stopped was only 3.3%, far below the midpoint and even below both benchmark limits. Likewise, the percentage of stops of drivers categorized as "All other groups" was also lower than both benchmark measures for this category. **As a result, we found no evidence of racial disparities against persons of color among the proactive vehicle stops made by the rest of the officers of the Greenwood Police Department, between 6 p.m. and 6 a.m. within the East District.**

5.1.3 West District from 6 a.m. to 6 p.m.

During the 12-month period of study, the rest of the officers of the Greenwood Police Department made 2,178 proactive vehicle stops between the hours of 6:00 a.m. through 5:59 p.m. within the West District. In that district-time block, 1,089 drivers were involved in crashes. These drivers served as the benchmark for the driving population estimate, and descriptions of a total of 404 criminal suspects were provided to the police by members of the public reporting crimes. As the Greenwood Police Department stops contained a mixture of traffic stops and criminal-investigative stops of unknown proportions, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks.

Figure 5.3 below reveals how these stops and benchmarks compared. We would expect that the percentages of stops for each racial / ethnic group would fall between the boundaries of these two benchmarks. Visual inspection of Figure 5.3 reveals that for African-American, Hispanic / Latino, and White drivers, this was the case. The percentage of stops for each of these groups appeared to fall between the two benchmark percentages.

Figure 5.3 Proactive Vehicle Stops and Benchmarks for West District, 6 AM to 6 PM



Visual examination of Figure 5.3 appears to indicate that Asian / Pacific Islander drivers and drivers of the "All other groups" category were stopped at rates slightly higher than the benchmarks, but in both cases this difference was by less than one percentage point. However, we cannot tell for sure if these differences are within the statistical margin of error until we conduct the binomial test. Table 5.5 below displays the results of the binomial test for these proactive vehicle stops when compared against only the crash driver benchmark estimate of the driving population.

In comparison to only the crash driver benchmark, the binomial test indicated that African-American drivers were stopped at a rate higher than that benchmark. While African-American drivers made up 5.7% of the drivers involves in crashes between 6 a.m. and 6 p.m. within the West District, African-Americans accounted for 10.7% of the proactive vehicle stops. The binomial test also indicated that for Asian / Pacific Islander, Hispanic / Latino, and "All other groups" category drivers, there was no statistically significant difference between the percentage of drivers stopped, and the percentage of crash driver benchmark. The stops were within the margin of error for the crash driver benchmark for these three groups. Finally, White drivers were found to have been stopped less often than the crash drivers benchmark would have predicted. However, as the proactive vehicle stops data contained a mixture of traffic stops and criminal-investigative stops,

it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks.

Table 5.5 Rest of Department's Proactive Vehicle Stops, West District, 6 AM – 6 PM (Crash Driver Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Crash Drivers (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	10.7% (232)	5.7% (62)	+5.0	.001	Yes. Stopped MORE often than involved in crashes.
Asian / Pacific Islander	4.1% (90)	3.3% (36)	+0.8	.519	No statistically significant difference.
Hispanic / Latino	2.4% (52)	1.7% (19)	+1.7	.090	No statistically significant difference.
White (Non-Hispanic)	82.2% (1,791)	89.2% (971)	-7.0	.001	Yes. Stopped LESS often than involved in crashes.
All Other Groups	0.6% (13)	0.1% (1)	+0.5	.011	No statistically significant difference.

Table 5.6 below displays the results of the binomial test for these proactive vehicle stops when compared against only the criminal suspect descriptions benchmark estimate of the criminal-offending population. While Table 5.5 reveals that African-American drivers were stopped at a rate higher than anticipated by the crash driver benchmark, Table 5.6 reveals that African-Americans were also stopped at a statistically significant lower rate than anticipated based on the criminal suspect descriptions benchmark. In both cases the binomial test revealed the difference was beyond the margin for error.

Table 5.6 Rest of Department's Proactive Vehicle Stops, West District, 6 AM – 6 PM (Criminal Suspect Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	10.7% (232)	27.2% (110)	-16.5	.001	Yes. Stopped LESS often than involved in crimes.
Asian / Pacific Islander	4.1% (90)	1.2% (5)	+2.9	.001	Yes. Stopped MORE often than involved in crimes.
Hispanic / Latino	2.4% (52)	5.4% (22)	-3.0	.001	Yes. Stopped LESS often than involved in crimes.
White (Non-Hispanic)	82.2% (1,791)	65.8% (266)	+16.4	.001	Yes. Stopped MORE often than involved in crimes.
All Other Groups	0.6% (13)	0.2 (1)	+0.4	.302	No statistically significant difference.

Likewise, Hispanic Latino drivers were also stopped less often than would have been expected based on the criminal suspect description benchmark. Table 5.6 reveals that Asian / Pacific

Islander drivers, and White drivers, were stopped at a higher rate than would have been expected when based on the criminal suspect description benchmark. Nevertheless, recall from Table 5.5 that Asian / Pacific Islander drivers were stopped at a rate statistically the same as the crash driver benchmark rate, and White drivers were stopped at a rate lower than the rate Whites were represented among the crash drivers. Regarding the "All other groups" category, the percentage of drivers stopped was statistically the same as both the crash driver benchmark and the criminal suspect descriptions benchmark.

In summary, of the 9,426 proactive vehicle stops made by the rest of the officers of the Greenwood Police Department, 2,178 (23.1%) occurred between 6 a.m. and 6 p.m. within the West District. These stops were a mixture of stops for traffic enforcement purposes and stops for criminal investigative purposes. As a result, we expected that the proportions of stops for the five race / ethnicity categories would fall somewhere between the traffic pattern benchmark (i.e., crash drivers) and criminal offenders benchmark (i.e., criminal suspect descriptions). The results revealed the stops of each group fell either between the two benchmarks, or below both benchmarks.

The midpoint between the two benchmarks for African-American drivers was 16.45% and the actual percentage of African-Americans stopped was only 10.7%, well below the midpoint and between the benchmark boundaries. The percentage of Asian / Pacific Islanders stopped was statistically the same as the crash driver benchmark. The midpoint between the two benchmarks for Hispanic / Latino drivers was 3.55%, and the actual percentage of Hispanic / Latino drivers stopped was only 2.4%, below the midpoint and between the benchmark boundaries. The percentage of stops of drivers categorized as "All other groups" was statistically the same as both benchmark measures for this group. **As a result, we found no evidence of racial disparities against persons of color among the proactive vehicle stops made by the rest of the officers of the Greenwood Police Department between 6 a.m. and 6 p.m. within the West District.**

5.1.4 West District from 6 p.m. to 6 a.m.

During the 12-month period of study, the rest of the officers of the Greenwood Police Department made 2,075 proactive vehicle stops between the hours of 6:00 p.m. and 5:59 a.m. within the West District. In the same district-time block, 318 drivers were involved in crashes. These drivers served as the benchmark for the driving population estimate, and 401 criminal suspects were provided to the police by members of the public reporting crimes. As the Greenwood Police Department stops contained a mixture of traffic stops and criminal-investigative stops of unknown proportions, it was necessary to compare these vehicle stops against both benchmarks, under the assumption the correct (unknown) benchmark should lie somewhere between these two other benchmarks.

Figure 5.4 below reveals how these stops and benchmarks compared for the rest of the officers of the Greenwood Police Department. We would expect that the percentages of stops for each racial / ethnic group would fall between the boundaries of these two benchmarks. This appeared to be the case for African-American drivers, Hispanic / Latino drivers, and White drivers. Visual inspection of Figure 5.4 suggests that Asian / Pacific Islander drivers were stopped at a rate lower than both benchmark limits. Drivers in the "All other groups" category appeared to be stopped at a rate higher than both benchmarks, yet the stops and both benchmark limits were very small – below 1.0%.

Visual inspection of Figure 5.4 does not present any evidence of disparate stops of any racial / ethnic group for this district-time block. However, we cannot tell for sure if these differences are within the statistical margin of error until we conduct the binomial test.

Figure 5.4 Proactive Vehicle Stops and Benchmarks for West District, 6 PM to 6 AM

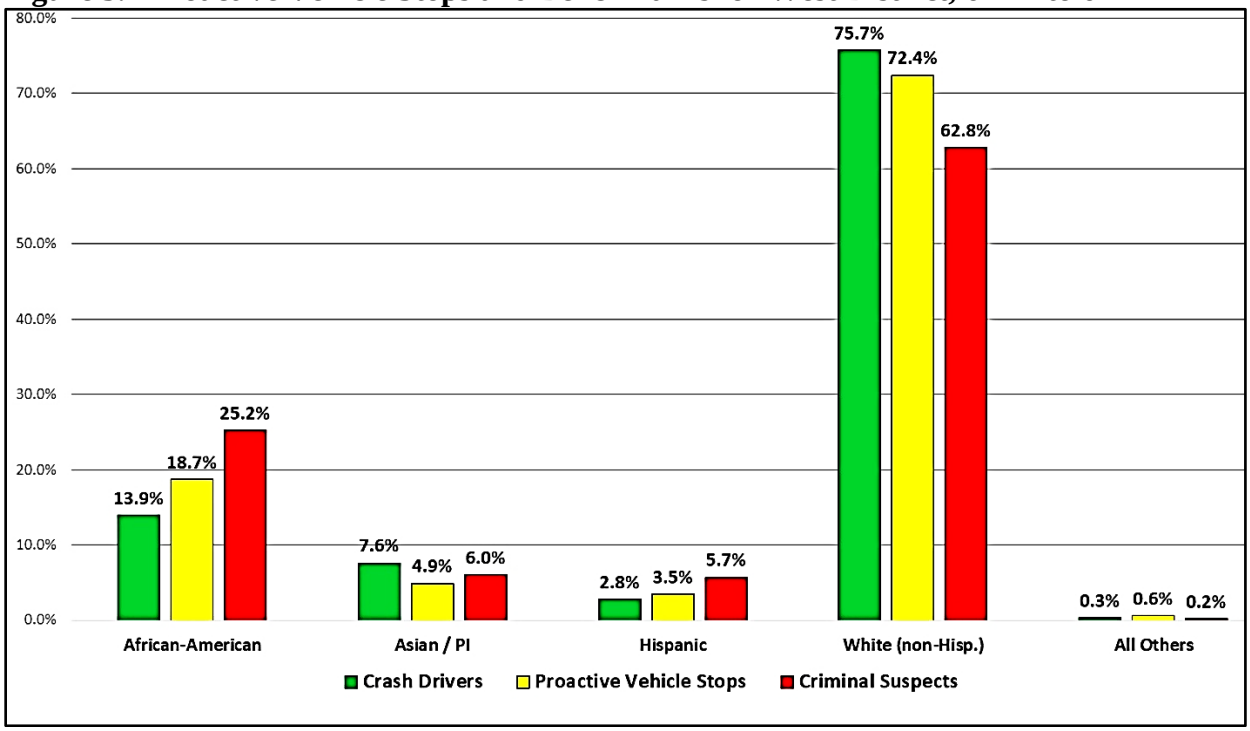


Table 5.7 below displays the results of the binomial test for these proactive vehicle stops when compared against the crash driver benchmark estimate of the driving population. When compared to only the crash driver benchmark, the binomial test revealed that the percentage of proactive vehicle stops for each racial / ethnic group was statistically the same as the crash driver benchmark for that respective group. All the stops were within the margin of error for the crash driver benchmark. Table 5.7 presents no evidence of disparate stops for any racial / ethnic group for this district-time block. It also suggests that when the rest of the officers of the Greenwood Police Department engage in vehicle stops, their focus is on traffic enforcement and safety more than criminal investigations.

Table 5.8 below displays the results of the binomial test for these proactive vehicle stops when compared against only the criminal suspect descriptions benchmark estimate of the criminal-offending population. Recall that when compared to only the crash driver benchmark in Table 5.7, African-American drivers were stopped at a rate statistically the same as the percentage of African-Americans among the crash driver benchmark. It is then unsurprising that when compared against the higher criminal suspect descriptions benchmark, African-Americans were found to be stopped at a lower rate than the criminal offender benchmark would have predicted.

Table 5.7 Rest of Department's Proactive Vehicle Stops, West District, 6 PM – 6 AM (Crash Driver Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Crash Drivers (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	18.7% (388)	13.9% (44)	+6.8	.014	No statistically significant difference.
Asian / Pacific Islander	4.9% (101)	7.6% (24)	-2.7	.024	No statistically significant difference.
Hispanic / Latino	3.5% (72)	2.8% (9)	+0.7	.326	No statistically significant difference.
White (Non-Hispanic)	72.4% (1,502)	75.7% (240)	-3.3	.104	No statistically significant difference.
All Other Groups	0.6% (12)	0.3% (1)	+0.3	.148	No statistically significant difference.

When compared to only the criminal suspects benchmark, the stops of Asian / Pacific Islander drivers, Hispanic / Latino drivers, and drivers in the "All other groups" category were all within the margin of error for the binomial test. The percentage at which each group was stopped was statistically the same as the percentage for that group within the criminal suspect descriptions benchmark.

Table 5.8 Rest of Department's Proactive Vehicle Stops, West District, 6 PM – 6 AM (Criminal Suspect Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	18.7% (388)	25.2% (101)	-6.5	.001	Yes. Stopped LESS often than involved in crimes.
Asian / Pacific Islander	4.9% (101)	6.0% (24)	-1.1	.184	No statistically significant difference.
Hispanic / Latino	3.5% (72)	5.7% (23)	-2.2	.015	No statistically significant difference.
White (Non-Hispanic)	72.4% (1,502)	62.8% (252)	+9.6	.001	Yes. Stopped MORE often than involved in crimes.
All Other Groups	0.6% (12)	0.2% (1)	+0.4	.306	No statistically significant difference.

Only White drivers were revealed to be stopped at a percentage higher than their representation among the criminal suspect descriptions benchmark. Whites made up 62.8% of the criminal suspect descriptions reported to the police by crime victims and witnesses within this district-time block, while White drivers were 72.4% of the drivers stopped.

In summary, of the 9,426 proactive vehicle stops made by the rest of the officers of the Greenwood Police Department, 2,075 (22.0%) occurred between 6 p.m. and 6 a.m. within the West District. These stops were a mixture of stops for traffic enforcement purposes and stops for criminal investigative purposes. As a result, we expected that the proportions of stops for the five race / ethnicity categories would fall between the traffic pattern benchmark (i.e., crash drivers) and criminal offenders benchmark (i.e., criminal suspect descriptions).

Indeed, for all racial / ethnic groups, the percentage of stops was either between the benchmark limits, below both benchmark limits, or was statistically the same as the benchmark limits. The midpoint between the two benchmarks for African-American drivers was 19.55%, yet the actual percentage of African-Americans stopped was only 18.7%, lower than the midpoint estimate. While the midpoint between the two benchmarks for Asian / Pacific Islander drivers was 6.8%, the actual percentage of Asian / Pacific Islanders stopped was 4.9%, lower than the midpoint estimate. The midpoint between the two benchmarks for Hispanic / Latino drivers was 4.25%, and the actual percentage of Hispanic / Latino drivers stopped was a similar 4.9%. Likewise, the midpoint for the "All other groups" category was 0.25% and the stops were only 0.6%. Finally, the benchmark midpoint for White drivers 69.25%, and White drivers made up 72.4% of the stops, a little higher than the midpoint estimate.

As a result, we found no evidence of racial disparities against persons of color among the proactive vehicle stops made by the rest of the officers of the Greenwood Police Department, between 6 p.m. and 6 a.m. within the West District. All stop rates for persons of color were either between or below the stop benchmarks.

5.1.5 Proactive Vehicle Stops Summary

Our analysis of the proactive vehicle stops made by the rest of the members of the Greenwood Police Department revealed no evidence of any pattern of disparate treatment of persons of color. Across the four district-time blocks, the percentage of African-American driver stops either fell between, or even below, the two benchmark boundaries. While the stops of African-American drivers by the five officers of interest were strongly skewed towards the criminal suspects benchmark, the stops of African-American drivers by the rest of the department were skewed towards the crash drivers benchmark, or even lower.

Across the four district-time blocks, the percentage of Asian / Pacific Islander driver stops were either equal to, between, or below the two benchmark boundaries. Asian / Pacific Islander drivers were not stopped more often than expected by these benchmark boundaries. The percentage of Hispanic / Latino driver stops either fell between or below the two benchmark boundaries for that group. Hispanic / Latino drivers were not stopped more often than expected by these benchmark boundaries. Drivers categorized as "All other groups" were stopped at statistically the same rates as the benchmarks for this category. Only White drivers were stopped at a rate higher than anticipated by the benchmarks, and this was only within one district-time block.

In short, we found no evidence of racial disparities against persons of color among the proactive vehicle stops made by the rest of the officers of the Greenwood Police Department, regardless of district or time of day.

5.2 Known Criminal-Investigative Stops

The Greenwood Police Department data did not differentiate between stops initiated for the purposes of a criminal investigation (even with a traffic violation witnessed), and stops initiated solely for the public safety purposes of traffic enforcement. However, we were able to identify 312 vehicle stops made by the rest of the Greenwood police officers that resulted in the criminal arrest of at least one of the vehicle's occupants. As a result, we know these 312 stops were criminal-investigative stops. These 312 known criminal-investigative stops were analyzed separately from the "proactive vehicle stops" that were analyzed in the previous section. We compared these known criminal-investigative stops only with the criminal offender suspects benchmark, and not the crash driver benchmark, as the population at risk for these stops should have been the criminal offender population.

Because there were so few of these stops, we only disaggregated by district rather than district and time of day. This was also the same procedure we followed when analyzing the known criminal-investigative stops of the five officers of interest. The known criminal-investigative stops were found to be distributed across the two districts in the following manner:
East District – 146 known criminal-investigative stops
West District – 166 known criminal-investigative stops

The benchmark comparison used the data from the 1,775 criminal suspect descriptions. The criminal suspect descriptions were found to be distributed across the two districts in the following manner:
East District – 970 suspect descriptions
West District – 805 suspect descriptions

5.2.1 East District

During the 12-month period of study, 146 known criminal-investigative stops took place within the East District performed by the rest of the Greenwood police officers. Descriptions of a total of 970 criminal suspects were provided to the police by members of the public reporting crimes within that district. Table 5.9 below displays the results of the binomial test for these known criminal investigative stops when compared against the criminal suspect descriptions benchmark estimate.

Within Table 5.9, the first column of data reveals the stopped drivers (both percentage and raw number of stopped drivers), separated by racial / ethnic categories. The second column of data reveals the benchmark data (both percentages and raw numbers of drivers), separated by racial / ethnic categories. The next column is the raw percentage-point difference between the stops and the benchmark, followed by a column containing the *p*-value output from the binomial test. Recall that unless this value is equal to, or less than, .010, we can assume that the percentage difference between the drivers stopped and the benchmark was due to sampling error and not a true difference. In other words, if the *p*-value is equal to, or less than, .010, the difference between the percentage of stops and the percentage in the benchmark is within the margin of error. Finally, as the sample of stops is small, the amount of sampling error is assumed to be high. Therefore, the margin of

error is greater, and greater percentage point differences will likely be accepted by the binomial test as within the margin of error.

Table 5.9 Rest of Department's Known Criminal-Investigative Stops, East District (Criminal Suspect Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	30.8% (45)	29.9% (290)	+0.9	.435	No statistically significant difference.
Asian / Pacific Islander	2.7% (4)	4.5% (44)	-1.8	.210	No statistically significant difference.
Hispanic / Latino	5.5% (8)	6.6% (64)	-1.1	.368	No statistically significant difference.
White (Non-Hispanic)	61.0% (89)	57.3% (556)	+3.7	.209	No statistically significant difference.
All Other Groups	0.0% (0.0)	1.6% (16)	-1.6	---	Insufficient cases to compute.

Nevertheless, Table 4.9 reveals the percentage point differences between the percentage of each racial / ethnic group stopped, and the benchmark for that respective group, were small. The difference between the stops and the benchmark for African-American drivers, for example, was less than one percentage point. The difference for Asian / Pacific Islander and Hispanic / Latino drivers, was less than 2 percentage points. Only Whites had a percentage point difference greater than 2, and the binomial test revealed that even this difference was within the margin of error.

None of the East District's known criminal-investigative stops involved a driver categorized as "all other groups," so no statistical analysis could be performed for that group. However, the binomial test revealed that all of the other racial / ethnic category groups were stopped at a rate statistically the same as their representation among the criminal suspect descriptions benchmark. **In summary, within the East District there was no evidence to suggest the disparate treatment of persons of any racial / ethnic group with regard to criminal-investigative stops. Drivers were stopped in proportions statistically the same as predicted by the criminal suspect descriptions benchmark.**

5.2.2 West District

During the 12-month period of study, 166 known criminal-investigative stops took place within the West District performed by the rest of the members of the Greenwood Police Department. Descriptions of a total of 805 criminal suspects were provided to the police by members of the public reporting crimes within that district. Table 5.10 below displays the results of the binomial test for these known criminal investigative stops when compared against the criminal suspect descriptions benchmark. Table 5.10 reveals that within the West District too, drivers were stopped in proportions statistically the same as predicted by the criminal suspect descriptions benchmark.

African-Americans made up 21.7% of the drivers stopped in these known criminal-investigative stops, and 26.2% of the criminal suspect benchmarks. As a result, African-American drivers were

stopped 4.5 percentage points lower than expected based on this benchmark, but the binomial test revealed this difference was still within the margin of error. Again, the percentages of stops and the percentages in the benchmark were less than 2 percentage points apart for Asian / Pacific Islander and Hispanic / Latino drivers – well within the margin of error.

Table 5.10 Rest of the Department's Known Criminal-Investigative Stops, West District (Criminal Suspect Benchmark)

Race / Ethnicity	Stopped Drivers (number)	Benchmark Criminal Suspects (number)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	21.7% (36)	26.2% (211)	-4.5	.107	No statistically significant difference.
Asian / Pacific Islander	4.8% (8)	3.6% (29)	+1.2	.250	No statistically significant difference.
Hispanic / Latino	4.2% (7)	5.6% (45)	-1.4	.283	No statistically significant difference.
White (Non-Hispanic)	69.3% (115)	64.3% (518)	+5.0	.103	No statistically significant difference.
All Other Groups	0.0% (0)	0.2% (2)	-0.2	---	Insufficient cases to compute.

As was the case in the East District, White drivers had the greatest percentage point difference in the West District, being stopped 5.0 percentage points higher than expected by the benchmark, but this difference too was within the margin of error. Finally, none of the stops involved drivers categorized as "all other groups," so no statistical analyses were conducted for that category. **In summary, within the West District there was no evidence to suggest the disparate treatment of persons of any racial / ethnic group with regard to known criminal-investigative stops. Drivers were stopped in proportions statistically the same as predicted by the criminal suspect descriptions benchmark.**

5.2.3 Known Criminal-Investigative Stops Summary

While the proactive vehicle stops data included a mixture of purely traffic enforcement stops and stops of a criminal investigative nature, the stops analyzed within this section were purely criminal-investigative in nature. They all resulted in the arrest of at least one occupant of the vehicle for a criminal offense. This is an important point that should not be overlooked – all of these stops revealed enough evidence to justify an arrest on a criminal charge. All resulted in the discovery of a crime.

This part of our study revealed no evidence to suggest the disparate treatment of persons of any racial / ethnic group with regard to known criminal-investigative stops. Consistently across both districts, drivers were stopped in proportions statistically the same as predicted by the criminal suspect descriptions benchmark. We found no evidence of racial disparities against persons of color among these stops made by the rest of the officers of the Greenwood Police Department.

5.3 Post-Stop Citations

Next, we examined equity in the treatment of drivers after they had already been stopped. Specifically, ***all other things being equal***, are people of different demographic groups treated similarly in terms of the likelihood of receiving a traffic citation after being stopped for a traffic violation? As described in earlier sections of this report, in order to do this, one needs to compare similarly-situated individuals. It is necessary to consider offenses of similar offense seriousness, and stops with the same combination of traffic violations.

In order to conduct an appropriate analysis, therefore, it was necessary first to isolate stops that involved one, and only one, traffic law violation offense. Once these single-offense stops were isolated, stops for the same reason were then compared with one another to control for seriousness of offense. Of the 10,824 vehicle stops performed by Greenwood police officers, 9,139 (84.4%) involved only one traffic violation. The remaining 1,685 multi-violation stops that were not tested involved two or more violations each. Each of these multi-violation stops varied from the next in terms of combinations of types of violations encountered, numbers of violations encountered, and seriousness of circumstances. As a result, it was not possible to gather a sufficient sample of similarly comparable cases to analyze properly and make comparisons across multiple racial groups.

As a result, and as we discussed earlier, we only examined post-stop citations for the six most common reasons for stop across the city. These six most common reasons for stop were; 1.) Speeding; 2.) Improper headlights or tail lights; 3.) Operating with expired plates; 4.) Failure to use seatbelt (front seat); 5.) Disobey / disregard a traffic control signal / sign; and 6.) Unsafe lane movement. These six reasons for stop totaled 7,923 stops, making up 86.7% of the 9,139 one-violation stops by Greenwood officers. Of these 7,923 single-violation stops involving one of these six most common reasons for stop, 7,119 were made by the rest of the Greenwood Police Department, after the stops by the five officers of interest were removed. The rest of the officers of the Greenwood Police Department made the following single-violation stops:

1.) Speeding (2,242 single-violation stops)
2.) Improper headlights or tail lights (1,478 single-violation stops)
3.) Operating with expired plates (1,096 single-violation stops)
4.) Failure to use seatbelt in front seat (959 single-violation stops)
5.) Disobey / disregard a traffic control signal / sign (925 single-violation stops)
6.) Unsafe lane movement (419 single-violation stops)

Each of these six types of violations was analyzed separately. As the benchmark for each of these categories of stops, we used the outcomes for non-Hispanic White drivers (the percentage of White drivers stopped for that violation that received a citation) as the benchmark for stops of drivers of each other group. The percentage of White drivers stopped for that violation who received a citation was compared to the same circumstance for drivers of other races / ethnicities to see if these other groups were treated similarly to Whites. The assumption for this comparison was that if officers were not biased, all racial / ethnic groups would receive citations at a similar rate for similar offenses.

In this analysis, we did not disaggregate by district or time of day. The mathematical problem of aggregation bias occurs when benchmark data are gathered in proportions from disaggregate units that differ from the proportions the stops were gathered. For example, if most of the stops were recorded at night but most of the benchmark crashes occurred during the day. When analyzing citation decisions, the benchmark measure (the White driver stops) was gathered from the same districts and times as all other stops, so aggregation bias is less of a concern. In addition, the number of stops involved within each traffic violation category were so small that when subdivided by the five racial / ethnic groups, there were already few cases to analyze. If subdivided further by district and / or time of day, most of the analyses would leave no cases to analyze. Therefore, disaggregation was not performed.

5.3.1 Speeding Stop Citations

The rest of the officers of the Greenwood Police Department made a total of 2,242 single-violation stops for speed limit violation offenses of various sorts. The statistical details of these stops are displayed in Table 5.11 below. Of these stops, 1,717 involved non-Hispanic White drivers, of whom 285 (16.6%) received a citation for this offense. This 16.6% citation rate for Whites served as the benchmark for the stops of all of the other racial / ethnic group categories.

Table 5.11 Speeding Stop Citations by Race / Ethnicity

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	14.6% (314 / 46)	16.6% (1,717 / 285)	-2.0	.198	No statistically significant difference.
Asian / Pacific Islander	11.9% (168 / 20)	16.6% (1,717 / 285)	-4.7	.058	No statistically significant difference.
Hispanic / Latino	17.4% (23 / 4)	16.6% (1,717 / 285)	+0.8	.545	No statistically significant difference.
All Other Groups	10.0% (20 / 2)	16.6% (1,717 / 285)	-6.6	.332	No statistically significant difference.

The binomial test results in Table 5.11 reveals that for every racial / ethnic group, the drivers were cited statistically the same as White drivers. A total of 314 of the speeding drivers stopped were African-Americans, of whom 46 (14.6%) received a citation. This was 2.0 percentage points ***less*** than the citation rate for White drivers, and the binomial test *p*-value was higher than .010, indicating this small difference was within the margin of error. African-American drivers stopped for speeding violations were just as likely to receive a citation as White drivers stopped for the same offense under similar circumstances.

A total of 168 single-vehicle stops for speeding offenses involved Asian / Pacific Islander drivers, and 20 of these drivers (11.9%) received a citation. This was 4.7 percentage points ***lower*** than the benchmark. This difference was within the margin of error and statistically the same as the benchmark. Of the Hispanic / Latino drivers stopped for speeding, 17.4% received a citation. This was less than a percentage point away from the benchmark of 16.6% and statistically within the

margin of error. Finally, drivers categorized as "All other groups" encompassed 20 of the speeding stops, and 2 of these stops (10.0%) received a citation. This was 6.6 percentage points ***lower*** than the benchmark, but still within the margin of error.

In summary, drivers of all racial / ethnic groups received citations at statistically the same rate as White drivers received citations in single-violation stops for speeding. There was no evidence of disparate treatment of any racial / ethnic group regarding the issuing of citations for speeding.

5.3.2 Improper Headlight or Tail Light Stop Citations

A total of 1,478 single-violation stops were made for either a headlight or tail light offense. The statistical details of these stops are displayed in Table 5.12 below. Of these stops, 1,063 involved White drivers, only 7 of whom (0.7%) received a citation for that offense. This 0.7% citation rate served as the benchmark for the stops of all of the other racial / ethnic group categories.

Table 5.12 Improper Headlight of Tail Light Stop Citations by Race / Ethnicity

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	0.7% (303 / 2)	0.7% (1,063 / 7)	0.0	.644	No statistically significant difference.
Asian / Pacific Islander	0.0% (72 / 0)	0.7% (1,063 / 7)	-0.7	.603	No statistically significant difference.
Hispanic / Latino	6.3% (30 / 2)	0.7% (1,063 / 7)	+5.6	.021	No statistically significant difference.
All Other Groups	0.0% (8 / 0)	0.7% (1,063 / 7)	-0.7	.945	No statistically significant difference.

The binomial test results in Table 5.12 reveals that for every racial / ethnic group, the drivers were cited statistically the same as White drivers when stopped for a headlight or tail light violation. A total of 303 of these drivers were African-Americans, of whom only 2 (0.7%) received a citation. This was the exact same citation rate as White drivers. African-American drivers stopped for headlight or tail light violations were just as likely to receive a citation as White drivers stopped for the same offense under similar circumstances. A total of 72 stops involved Asian / Pacific Islander drivers, and none of these drivers (0.0%) received a citation. Although this was less than the citation rate for Whites, it was still within the margin of error.

Hispanic / Latino drivers made up 30 of the headlight / tail light stops and two of these drivers (6.3%) received a citation. The binomial test indicated that this difference of 5.6 percentage points was statistically within the margin of error. As there were only 30 stops involving Hispanic / Latino drivers, every case constituted 3.33 percent of the sample of stops. If by chance alone there was one more or one fewer citation issued, that would have increased or decreased the Hispanic / Latino citation rate by 3.33 percentage points. This is why a difference of 5.6 points was still within the margin of error. Lastly, only 8 drivers categorized as "All other groups" were stopped for a headlight / tail light violation, and none received a citation. This was a ***lower*** citation rate than the benchmark, but still within the margin of error.

In summary, drivers of all racial / ethnic groups received citations at statistically the same rate as White drivers received citations in single-violation stops for headlight / tail light violations. There was no evidence of disparate treatment of any racial / ethnic group regarding the issuing of citations for this category of traffic offense.

5.3.3 Expired License Plate Stop Citations

There were 1,096 single-violation stops for operating a vehicle with an expired vehicle registration license plate. The statistical details of these stops are displayed in Table 5.13 below. Of these stops, 840 involved non-Hispanic White drivers, of whom 64 (7.6%) received a citation for the offense. This 7.6% citation rate for White drivers served as the benchmark for the stops of all the other racial / ethnic group categories.

Table 5.13 Expired License Plate Stop Citations by Race / Ethnicity

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	7.7% (182 / 14)	7.6% (840 / 64)	+0.1	.521	No statistically significant difference.
Asian / Pacific Islander	14.6% (48 / 7)	7.6% (840 / 64)	+7.0	.069	No statistically significant difference.
Hispanic / Latino	9.5% (21 / 2)	7.6% (840 / 64)	+1.9	.481	No statistically significant difference.
All Other Groups	0.0% (5 / 0)	7.6% (840 / 64)	-7.6	.674	No statistically significant difference.

A total of 182 of the expired license plate stops involved African-American drivers, and 14 of these drivers (7.7%) received a citation for the offense. This was almost the exact same percentage as the White driver citations. There were 48 stops of Asian / Pacific Islander drivers, 7 (14.6%) of whom received a citation. Because of the small sample of stops (48), the binomial test found this citation rate within the margin of error of the White citation rate benchmark.

Twenty-one stops involved Hispanic / Latino drivers, of whom 2 (9.5%) received a citation. This was less than 2 percentage points from the benchmark and within the margin of error. Finally, 5 stops involved drivers of the "All other groups" category, and none received a citation. In summary, there was no evidence of disparate treatment regarding the issuing of citations during single-violation stops for having an expired license plate. Drivers of all racial / ethnic groups received citations at statistically the same rate as White drivers in single-violation stops for expired license plates.

5.3.4 Failure to Use Seatbelt (Front Seat) Stop Citations

There were 959 single-violation stops for failure to use a seatbelt. In Indiana, failing to wear a seatbelt while riding in the front seat of a passenger vehicle in a "primary offense," meaning that

a law enforcement officer may stop the vehicle for this offense.[70] The statistical details of these stops are displayed in Table 5.14 below. Of these stops, 866 involved non-Hispanic White drivers, of whom 816 (94.2%) received a citation for the offense. This 94.2% citation rate for White drivers served as the benchmark for the stops of all the other racial / ethnic group categories.

Table 5.14 Failure to Use Seatbelt Stop Citations by Race / Ethnicity

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	53.3% (60 / 32)	94.2% (866 / 816)	-40.9	.001	Yes. Cited LESS often than White drivers.
Asian / Pacific Islander	61.5% (13 / 8)	94.2% (866 / 816)	-32.7	.001	Yes. Cited LESS often than White drivers.
Hispanic / Latino	55.6% (18 / 10)	94.2% (866 / 816)	-38.6	.001	Yes. Cited LESS often than White drivers.
All Other Groups	50.0% (2 / 1)	94.2% (866 / 816)	-44.2	.113	No statistically significant difference.

Table 5.14 reveals that **drivers of all other groups were cited far less often than White drivers for this offense**. Of these seatbelt violation stops, 60 involved African-American drivers, of whom 32 (53.3%) received a citation. The binomial test revealed that this citation rate was outside the margin of error and significantly lower than the citation rate for White drivers. There were 13 Asian / Pacific Islander drivers stopped for a seatbelt violation, and 8 (61.5%) of these drivers received a citation. The binomial test indicated this citation rate was outside the margin of error and significantly lower than the citation rate for White drivers.

Only 18 of the seatbelt violation stops involved Hispanic / Latino drivers, and 10 of these drivers received a citation. Yet again, the binomial test showed this difference to be beyond the margin of error, and Hispanic / Latino drivers were cited far less often than White drivers stopped for this offense. Only two drivers in the "All other groups" category were included in these seatbelt violation stops, and one (50.0%) received a citation. This time the difference was within the margin of error because the sample size (2) was so small. Each case represented 50% of the sample, so a single citation more or less in the sample could have raised or lowered the citation rate by 50 percentage points.

In summary, there was no evidence of disparate treatment regarding the issuing of citations during single-violation stops for seatbelt violations. Drivers of all racial / ethnic groups received citations at lower rates than White drivers in single-violation stops for seatbelt violations.

5.3.5 Disobey / Disregard a Traffic Control Signal / Sign Stop Citations

There were 925 single-violation stops for the violations of various traffic law statutes regarding disobeying a traffic control signal (such as a traffic light) or a traffic control sign (such as a stop or yield sign). The statistical details of these stops are displayed in Table 5.15 below. Of these

[70] See Indiana Code 9-19-10-3.1, *Stopping, inspecting, or detaining vehicle; checkpoints*.

stops, 730 involved non-Hispanic White drivers, of whom 107 (14.7%) received a citation for the offense. This 14.7% citation rate for White drivers served as the benchmark for the stops of all the other racial / ethnic group categories. Table 5.15 reveals that African-American drivers were cited less often than White drivers for this offense, and drivers of all other race / ethnic groups were cited at statistically the same rate as White drivers.

Table 5.15 Disobey / Disregard Traffic Signal / Sign Stop Citations by Race / Ethnicity

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	8.4% (95 / 8)	14.7% (730 / 107)	-6.3	.010	Yes. Cited LESS often than White drivers.
Asian / Pacific Islander	11.8% (76 / 9)	14.7% (730 / 107)	-2.9	.304	No statistically significant difference.
Hispanic / Latino	14.3% (14 / 2)	14.7% (730 / 107)	-0.4	.660	No statistically significant difference.
All Other Groups	10.0% (10 / 1)	14.7% (730 / 107)	-4.7	.555	No statistically significant difference.

African-American drivers constituted 95 of the stops for this offense category, and 8 (8.4%) of these stops resulted in a citation being issued. This differed from the White driver citation rate by 6.3 percentage points, and the binomial test confirmed that this was beyond the margin of error because the *p*-value was equal to or less than .010. This means that African-Americans drivers were less likely than White drivers to receive a citation when stopped for this category of offenses. Regarding the stops of Asian / Pacific Islander drivers, Hispanic / Latino drivers, and drivers categorized as "all other groups," these drivers were cited at percentages lower than the percentage of White drivers cited. Nevertheless, the differences in percentages were close enough to be within the margin of error.

In summary, there was no evidence of disparate treatment regarding the issuing of citations during single-violation stops for failure to obey a traffic sign or signal. African-American drivers were less likely to receive a citation than White drivers stopped for the same offense. Drivers of all other racial / ethnic groups received citations at percentages statistically equal to White drivers in single-violation stops for disobeying a traffic sign or signal.

5.3.6 Unsafe Lane Movement Stop Citations

The last category of single-violation stops was for unsafe lane movement offenses, such as making erratic lane changes or changing lanes without signaling. There were 419 stops made for this offense. The statistical details of these stops are displayed in Table 5.16 below. Of these stops, 315 involved non-Hispanic White drivers, 11 (3.5%) of whom received a citation for that offense. This citation rate of 3.5% for White drivers served as the benchmark for the stops of all of the other racial / ethnic group categories. As the binomial test results in Table 5.16 reveal, all racial / ethnic groups received citations for unsafe lane movement offenses at statistically the same rate as White drivers. In fact, no Hispanic / Latino drivers stopped for unsafe lane movement were cited at all. The only exception was the "All other groups" category, which had only one unsafe lane

movement stop. As the binomial test formula requires at least two cases for analysis, the binomial test could not be computed. Nevertheless, this single driver did not receive a citation, making this category less likely to be cited than White drivers stopped for this offense.

Table 5.16 Unsafe Lane Movement Stop Citations by Race / Ethnicity

Race or Ethnicity	% Drivers Cited (Stops / Cited)	Benchmark % White Drivers Cited (Stops / Cited)	Difference of Percentage Points	Binomial test *p* value	Is the difference statistically significant?
African-American / Black	3.1% (64 / 2)	3.5% (315 / 11)	-0.4	.611	No statistically significant difference.
Asian / Pacific Islander	7.4% (27 / 2)	3.5% (315 / 11)	+3.9	.244	No statistically significant difference.
Hispanic / Latino	0.0% (12 / 0)	3.5% (315 / 11)	-3.5	.652	No statistically significant difference.
All Other Groups	0.0% (1 / 0)	3.5% (315 / 11)	-3.5	---	Insufficient cases to compute.

In summary, drivers of all racial / ethnic groups received citations at statistically the same rate as White drivers received citations in single-violation stops for unsafe lane movement. There was no evidence of disparate treatment of any racial / ethnic group regarding the issuing of citations for unsafe lane movement.

5.3.7 Post-Stop Citations Summary

In this section we examined whether persons of color received traffic citations at similar rates to White drivers when stopped under similar circumstances. To do so fairly, we had to control for differences in offense seriousness among different types and numbers of violations. We focused on only single-violation stops (the overwhelming majority of stops made by the officers of the Greenwood Police Department), and examined only the six most common reasons for stop, which constituted the vast majority of all stops made.

The evidence failed to reveal a pattern of issuing citations at a higher rate to persons of color. Across these six different categories of traffic violations, the percentage of stopped African-American drivers who received a traffic citation was either statistically the same as the percentages of White drivers who received a citation, or was ***lower*** than the percentage of White drivers who received a citation. Likewise, the percentage of Asian / Pacific Islander drivers and Hispanic / Latino drivers who received a traffic citation were either statistically the same as the percentage of White drivers who received a citation, or were ***lower*** than the percentage of White drivers who received a citation. Finally, drivers in the "All other groups" category were also cited at a rate statistically the same or lower than the rate at which White drivers were cited for the same offense under the same conditions (single-violation stops). Therefore, we found no evidence of racial disparities against persons of color in the citation practices of the rest of the Greenwood Police Department.

5.4 Greenwood Police Department Analysis Summary

After examining the enforcement practices of the five officers of interest, we repeated this same examination for the vehicle stops performed by the rest of the officers of the Greenwood Police Department to determine if the results differed. While we found weak and inconsistent evidence that the five officers of interest treated African-American drivers differently than drivers of other races / ethnicities, we found no such evidence when examining the stops by the rest of the members of the Greenwood Police Department.

Regarding proactive vehicle stops, we examined two benchmark measures (crash drivers and criminal suspect descriptions) to estimate the racial / ethnic proportions that the officers would have been expected to stop if no bias was present. We anticipated that the percentage of each racial / ethnic group would fall neatly between the crash driver benchmark and the criminal suspect benchmark percentages. The data for the rest of the Greenwood Police Department revealed that their proactive vehicle stops consistently fell between or below these benchmark limits for persons of color. In other words, drivers who were categorized as African-American, Asian / Pacific Islander, Hispanic / Latino, and "All other groups" were stopped at percentages predicted by the benchmarks, or at percentages lower than predicted by the benchmarks, depending on the district and time of day. Only White drivers appeared to be stopped more than expected, and this occurred only occasionally.

When examining known criminal-investigative stops that resulted in the arrest of at least one occupant of the vehicle for a criminal offense, we compared these stops to only the criminal suspect descriptions benchmark. The percentage of the stops made by the rest of the officers of the Greenwood Police Department were consistently statistically the same as the percentage of the benchmark for each racial / ethnic group. We found no evidence that persons of color or Whites were stopped more often than predicted by this benchmark when examining known criminal-investigative stops.

Finally, we examined whether persons of color received traffic citations at similar rates to White drivers when stopped under similar circumstances by the rest of the Greenwood Police Department. Focusing on single-violation stops for the six most common traffic offense reasons for stop, we found that drivers who were persons of color received traffic citations at either statistically the same percentage as White drivers, or at ***lower*** percentage than White drivers. Therefore, we found no evidence of racial disparities against persons of color in the stopping or citation practices of the rest of the Greenwood Police Department.

6. SUMMARY AND CONCLUSIONS

This report has covered a large amount of detailed, statistically complex information. This final chapter summarizes the findings as concisely as possible and identifies the general patterns that emerged from the analyses. However, it is crucial that the reader read the earlier sections of the report before reading this section in order to understand the methodology employed and the scientific support for the uses of these methods. Below, we will first examine the overall findings by each racial / ethnic group category. We will then conclude with what these findings mean.

6.1 Review of the Methods

The greatest limitation to our study was the fact that within our vehicle stop data we could not easily differentiate between vehicle stops that occurred for the purposes of traffic enforcement only, and vehicle stops that occurred with a criminal-investigative purpose based on reasonable suspicion or probable cause (as defined by the U.S. Supreme Court). These two different types of stop motives aligned with two different populations legitimately at risk for stops. As the vast majority of the public commits minor traffic violations throughout the course of our weekly lives, the general driving population within the area being studied represents the population at risk for a traffic violation stop, if no officer bias exists. The crash driver benchmark sufficed in estimating that general driving population.

However, decades of criminological research reveals that the segment of the population that engages in crime is very small and differs from the general population on several demographic measures. Therefore, the population that should legitimately be at risk for criminal-investigative stops should be the segment of the population committing crimes within the area being studied. The criminal suspect description benchmark, derived from members of the public who witnessed real crimes, served as the estimate of the criminal population active within the area.

It would have been preferable that each type of stop (traffic versus criminal-investigative) be compared to its own respective benchmark. As this was not possible, we assumed that the mixture of these two types of stops would correspond to a mixture of these two types of benchmarks. Therefore, we compared how the percentage of police stops of each demographic group compared to the representation of that group within each of the two benchmarks. Basically, we assumed that the percentage of actual stops would land somewhere between these two benchmarks, or be at least equal to one of these two benchmarks.

Nevertheless, in a small number of stops a criminal arrest did result, indicating that at least these stops were sure to be criminal investigative in nature. This small sample of known criminal-investigative stops was compared to only the criminal suspect descriptions benchmark representing those actively engaged in crime within Greenwood.

In conducting these analyses, we controlled for aggregation bias by examining the proactive police activities by each individual district and, when appropriate, disaggregated by time of day (6 a.m. to 6 p.m. or 6 p.m. to 6 a.m.). We determined that the proportional representation of each district and time-block differed across the stop data, crash driver data, and suspect description data. If a

greater proportion of benchmark data came from one district or time block, and a greater proportion of the stop data came from another district or time block, any differences between those two districts would cause aggregation bias if the data were examined citywide. This was, in fact, the case within Greenwood, thus our use of disaggregation.

The examination of post-stop outcomes in terms of who received a citation after being stopped was more straightforward. We needed to compare drivers stopped under similar circumstances by controlling for the number of traffic offenses observed and the seriousness of the offense. To do this, we only examined the six most commonly encountered reasons for stop (which made up more than three-quarters of all vehicle stops), and only examined stops that involved one traffic violation (again, which made up more than three-quarters of all vehicle stops). We could then compare drivers stopped for the same offense and under similar circumstances (i.e., only one traffic violation observed). This method still could not control for differences between stops in such things as each driver's prior driving record, demeanor toward the officer, or other aspects of seriousness (such as speeding with pedestrian children present versus speeding on a major highway). Nevertheless, the method we used did control for most of the differences between vehicle stops that would have significantly influenced whether or not a citation was issued, such as a one-violation stop versus a multiple-violation stop, or a serious moving violation stop versus a minor non-moving violation stop.

In all of our analyses – stops and post-stop outcomes – we also controlled for sampling error through the use of the binomial statistical test. As was demonstrated several times, when we found percentages were calculated from samples of only a few stops, the true estimate in the population was not mathematically possible to achieve. Any analysis that did not control for sampling error is fundamentally flawed.

Finally, we examined the stops and citations of the five officers of interest separately from the stops and citations made by the rest of the officers on the Greenwood Police Department. This allowed us to determine if the biased sentiments communicated by the five officers of interest were reflected in their enforcement behaviors. It also allowed us to determine if the Greenwood Police Department was facing a greater issue with biased policing that extended beyond these five officers.

6.2 The Officers of Interest Summary

In this section, we summarize the findings of our analysis regarding the proactive vehicle stops, known criminal-investigative stops, and citation issuing of the five officers of interest. The results are broken down by each racial / ethnic group category.

6.2.1 African-American Drivers

As mentioned earlier in this report, we found weak and inconsistent evidence of the disparate treatment of African-American drivers by these five officers of interest. We say the evidence is weak because even when the raw percentage of African-American drivers stopped was higher than both benchmarks, it was still within the margin of error for the higher benchmark. We say inconsistent because the results leaned towards disparities in proactive vehicle stops for only three

of the four district-time blocks, showed disparity in citations for only one of the six traffic violations examined, and failed to show any disparity in the known criminal-investigative stops.

Table 6.1 African-American Driver Outcomes from the Five Officers of interest

Analysis	Outcome
Proactive Vehicle Stops, East District, 6 AM – 6 PM	Stopped neatly between the benchmark limits, as expected if no bias present.
Proactive Vehicle Stops, East District, 6 PM – 6 AM	Stopped statistically ***equal with the higher criminal suspect descriptions benchmark***.
Proactive Vehicle Stops, West District, 6 AM – 6 PM	Stopped statistically ***equal with the higher criminal suspect descriptions benchmark***.
Proactive Vehicle Stops, West District, 6 PM – 6 AM	Stopped statistically ***equal with the higher criminal suspect descriptions benchmark***.
Known Criminal-Investigative Stops, East District	Stopped statistically equal with the benchmark, as expected if no bias present.
Known Criminal-Investigative Stops, West District	Stopped statistically equal with the benchmark, as expected if no bias present.
Citations from Headlights / Tail Light Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Speeding Stops	Cited at a statistically significant ***higher*** rate than the rate for White drivers.
Citations from Unsafe Lane Movement Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Expired License Plates Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Disregard Traffic Signal / Sign Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Seatbelt Stops	Cited statistically equal with White drivers, as expected if no bias present.

Nevertheless, we cannot say there was no evidence to suggest the disparate treatment of African-American drivers by these five officers of interest. Table 6.1 above summarizes the findings of our analysis for African-American drivers. The evidence revealed that in three of the district-time blocks, the percentage of African-Americans among the drivers in the proactive vehicle stops was far above the percentage of African-Americans among the driving population, and statistically equal to the percentage of criminal suspect descriptions that were African-American. This suggests that the stops of African-American drivers in the East District between 6 p.m. and 6 a.m., and in the West District at any time of day, either disproportionately targeted African-American drivers or focused almost exclusively on criminal-investigative stops if African-American drivers were involved. The evidence also revealed that when stopped for speeding, African-American drivers were more likely than White drivers to receive a traffic citation rather than simply a warning.

Nevertheless, the evidence we examined suggested that these five officers stopped African-American drivers just as expected if no bias was present during proactive vehicle stops from 6 a.m.

to 6 p.m. in the East District, in all known criminal-investigative stops, and in the citations issued during single-violation stops for the other five most common traffic violations in Greenwood. The evidence of biased policing against African-American drivers on the part of these five officers, therefore, raised concerns but failed to offer substantial proof of a pattern of racial discrimination.

6.2.2 Asian / Pacific Islander Drivers

In direct contrast to the treatment of African-American drivers, the evidence we reviewed suggested that these five officers showed statistically significant lenience towards Asian / Pacific Islander drivers. We say lenience because under several circumstances Asian / Pacific Islander drivers were stopped less often than expected by either benchmark, or were cited less often than White drivers. Table 6.2 below summarizes the findings of our analysis for Asian / Pacific Islander drivers.

Table 6.2 Asian / Pacific Islander Driver Outcomes from the Five Officers of interest

Analysis	Outcome
Proactive Vehicle Stops, East District, 6 AM – 6 PM	Stopped neatly between the benchmark limits, as expected if no bias present.
Proactive Vehicle Stops, East District, 6 PM – 6 AM	Stopped at a rate ***lower*** than expected by either benchmark.
Proactive Vehicle Stops, West District, 6 AM – 6 PM	Stopped at a rate ***lower*** than expected by either benchmark.
Proactive Vehicle Stops, West District, 6 PM – 6 AM	Stopped at a rate ***lower*** than expected by either benchmark.
Known Criminal-Investigative Stops, East District	Stopped statistically equal with the benchmark, as expected if no bias present.
Known Criminal-Investigative Stops, West District	Stopped statistically equal with the benchmark, as expected if no bias present.
Citations from Headlights / Tail Light Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Speeding Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Unsafe Lane Movement Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Expired License Plates Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Disregard Traffic Signal / Sign Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Seatbelt Stops	Cited at a ***lower*** statistical rate than White drivers.

The evidence revealed that in three of the district-time blocks, the percentage of Asians / Pacific Islanders among the drivers in the proactive vehicle stops was lower than the percentage of Asians / Pacific Islanders among either the driving population or criminal suspects population. This suggests that in the East District between 6 p.m. and 6 a.m., and in the West District at any time

of day, these five officers may have avoided stops if Asian / Pacific Islander drivers were involved. The evidence also revealed that Asian / Pacific Islander drivers were less likely than White drivers to receive a traffic citation when stopped for having an expired license plate or failing to wear a seatbelt. However, the evidence we examined suggested that these five officers stopped Asian / Pacific Islander drivers just as expected if no bias was present during proactive vehicle stops from 6 a.m. to 6 p.m. in the East District, in all known criminal-investigative stops, and in the citations issued during single-violation stops for the other four most common traffic violations in Greenwood. We found absolutely no evidence to suggest the discriminatory treatment of Asian / Pacific Islander drivers by these five officers, and inconsistent evidence of the lenient treatment of Asian / Pacific Islander drivers.

6.2.3 Hispanic / Latino Drivers

The evidence revealed a somewhat similar trend with regard to Hispanic / Latino drivers. Table 6.3 below summarizes the findings of our analysis for Hispanic / Latino drivers. It suggests these five officers treated Hispanic / Latino drivers without bias, or showed lenience towards them.

Table 6.3 Hispanic / Latino Driver Outcomes from the Five Officers of interest

Analysis	Outcome
Proactive Vehicle Stops, East District, 6 AM – 6 PM	Stopped neatly between the benchmark limits, as expected if no bias present.
Proactive Vehicle Stops, East District, 6 PM – 6 AM	Stopped neatly between the benchmark limits, as expected if no bias present.
Proactive Vehicle Stops, West District, 6 AM – 6 PM	Stopped neatly between the benchmark limits, as expected if no bias present.
Proactive Vehicle Stops, West District, 6 PM – 6 AM	Stopped neatly between the benchmark limits, as expected if no bias present.
Known Criminal-Investigative Stops, East District	Stopped statistically even with the benchmark, as expected if no bias present.
Known Criminal-Investigative Stops, West District	Stopped ***less*** often than predicted by the benchmark.
Citations from Headlights / Tail Light Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Speeding Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Unsafe Lane Movement Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Expired License Plates Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Disregard Traffic Signal / Sign Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Seatbelt Stops	Cited at a ***lower*** statistical rate than White drivers.

Regarding proactive vehicle stops, in all four district-time blocks the percentage of drivers who were Hispanic / Latino fell neatly between the crash driver and criminal suspect benchmarks. This is exactly the result we would have expected to find had there been no bias for or against these drivers. In the analyses of the known criminal-investigative stops, Hispanic / Latino drivers were stopped at a rate statistically the same as the criminal suspects benchmark for the East District, and stopped at a lower rate than expected by that benchmark for the West District, suggesting potential leniency on the part of these five officers.

The analysis of the citations issued to Hispanic / Latino drivers also revealed a pattern of some leniency. When stopping cars for headlight / tail light violations, speeding, or unsafe lane movements, these five officers gave Hispanic / Latino drivers citations just as often as they did when stopping White drivers. When stopping cars for expired license plates, disregarding a traffic signal / sign, or failing to wear a seatbelt, these five officers gave Hispanic / Latino drivers citations less often than they did when stopping White drivers, again suggesting some leniency towards Hispanic / Latino drivers. As a result, we found absolutely no evidence to suggest the discriminatory treatment of Hispanic / Latino drivers by these five officers, and inconsistent evidence of the lenient treatment of Hispanic / Latino drivers.

6.2.4 All Other Groups Drivers

These five officers made very few stops of non-White drivers categorized as "all other groups," at times preventing statistical analyses with the binomial test. Nevertheless, the evidence continued to reveal no evidence of disparate treatment against non-White drivers in this category, and some evidence of leniency was found. Table 6.4 below summarizes the findings of our analysis for this category of drivers.

In all four district-time blocks, the percentage of drivers in proactive vehicle stops who were categorized as "All other groups" was either zero or statistically equal to both the crash driver and criminal suspect benchmarks. This result demonstrated no bias for or against these drivers. In the analyses of the known criminal-investigative stops, drivers categorized as "All other groups" were stopped at a rate statistically the same as the criminal suspects benchmark for that group regardless of district. The analysis of the citations issued to drivers categorized as "All other groups" revealed a consistent pattern of leniency. Depending on the type of traffic violation, either these drivers were not stopped at all (and thus none were cited), or if they were stopped, they were cited at a rate lower than the rate for White drivers stopped for the same violation. As a result, we found absolutely no evidence to suggest the discriminatory treatment by these five officers against non-White drivers categorized as "all other groups."

Table 6.4 "Other Groups" Driver Outcomes from the Five Officers of interest

Analysis	Outcome
Proactive Vehicle Stops, East District, 6 AM – 6 PM	Stopped statistically equal to both benchmark limits, as expected if no bias present.
Proactive Vehicle Stops, East District, 6 PM – 6 AM	Stopped statistically equal to both benchmark limits, as expected if no bias present.
Proactive Vehicle Stops, West District, 6 AM – 6 PM	Stopped statistically equal to both benchmark limits, as expected if no bias present.
Proactive Vehicle Stops, West District, 6 PM – 6 AM	Stopped statistically equal to both benchmark limits, as expected if no bias present.
Known Criminal-Investigative Stops, East District	Stopped statistically equal to the benchmark, as expected if no bias present.
Known Criminal-Investigative Stops, West District	Stopped statistically equal to the benchmark, as expected if no bias present.
Citations from Headlights / Tail Light Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Speeding Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Unsafe Lane Movement Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Expired License Plates Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Disregard Traffic Signal / Sign Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Seatbelt Stops	Cited at a ***lower*** statistical rate than White drivers.

6.2.5 Conclusions

As a result of this evidence, we found weak and inconsistent evidence that these five officers of interest treated African-American drivers differently than they treated other groups. When stopped in the West District, or during the evenings / nights in the East District, these officers stopped African-American drivers at rates as if all of these stops were criminal-investigative focus in nature. Additionally, when stopped for speeding by this five-officer group, African-American drivers were more likely to receive a citation than were White drivers stopped under similar circumstances. However, this evidence of bias was inconsistent as no disparity was revealed against African-American drivers in the daytime proactive vehicle stops in the East District, during known criminal investigative stops, and in the citations issued for the other five reasons for stop.

Furthermore, we found no evidence of punitive bias against any other non-White driver group. In fact, Asian / Pacific Islander drivers, Hispanic Latino drivers, and drivers categorized as "All other groups" were either treated without disparity, or treated with greater leniency than expected. We found no evidence to suggest that any other racial / ethnic group other than African-Americans was treated in a discriminatory manner, and the evidence involving the treatment of African-American drivers was weak and inconsistent.

6.3 The Rest of the Department Summary

In this section, we summarize the findings of our analysis regarding the proactive vehicle stops, known criminal-investigative stops, and citation issuing of the rest of the officers of the Greenwood Police Department, minus the five officers of interest. The results are broken down by each racial / ethnic group category.

6.3.1 African-American Drivers

As mentioned earlier in this report, we found no evidence of the disparate treatment of African-American drivers by the rest of the officers of the Greenwood Police Department. Table 6.5 below summarizes the findings of our analysis for African-American drivers. It suggests the rest of the officers treated African-American drivers without bias, or showed lenience towards them.

Table 6.5 African-American Driver Outcomes from the Rest of the Department

Analysis	Outcome
Proactive Vehicle Stops, East District, 6 AM – 6 PM	Stopped statistically ***equal with the lower crash driver benchmark***.
Proactive Vehicle Stops, East District, 6 PM – 6 AM	Stopped neatly between the benchmark limits, as expected in no bias present.
Proactive Vehicle Stops, West District, 6 AM – 6 PM	Stopped neatly between the benchmark limits, as expected if no bias present.
Proactive Vehicle Stops, West District, 6 PM – 6 AM	Stopped statistically ***equal with the lower crash driver benchmark***.
Known Criminal-Investigative Stops, East District	Stopped statistically equal with the benchmark, as expected if no bias present.
Known Criminal-Investigative Stops, West District	Stopped statistically equal with the benchmark, as expected if no bias present.
Citations from Speeding Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Headlights / Tail Light Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Expired License Plates Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Seatbelt Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Disregard Traffic Signal / Sign Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Unsafe Lane Movement Stops	Cited statistically equal with White drivers, as expected if no bias present.

Regarding proactive vehicle stops, the percentage of drivers who were African-American fell neatly between the crash driver and criminal suspect benchmarks within the East District during evening / night hours, and in the West District during daytime hours. This was the outcome

expected if no bias was present. In the East District during the daytime, and in the West District during the evening / night hours, the percentage of African-American drivers stopped was statistically equal to the lower of the two benchmarks, suggesting a lower representation of African-American drivers than expected among these stops.

In the analyses of the known criminal-investigative stops, African-American drivers were stopped at a rate statistically the same as the criminal suspects benchmark for the East District and the West District. This revealed no disparity in these stops regarding African-American drivers. Analysis of the citations issued to African-American drivers also revealed a pattern of equality and some leniency. When stopping cars for failing to wear a seatbelt or disregarding a traffic signal / sign, the rest of the officers gave African-American drivers citations less often than they did when stopping White drivers under the same circumstances, suggesting leniency. When stopping cars for the other four reasons for stop, the rest of the department gave African-American drivers citations just as often as they did when stopping White drivers. As a result, we found absolutely no evidence to suggest the discriminatory treatment of African-American drivers by the rest of the officers on the Greenwood Police Department, and inconsistent evidence of the lenient treatment of African-American drivers.

6.3.2 Asian / Pacific Islander Drivers

Our examination of the treatment of Asian / Pacific Islander drivers found no evidence of disparity against this category of drivers by the rest of the officers of the Greenwood Police Department. Table 6.6 below summarizes the findings of our analysis for Asian / Pacific Islander drivers. Regarding proactive vehicle stops, the percentage of stopped drivers who were Asian / Pacific Islanders fell neatly between the crash driver and criminal suspect benchmarks, exactly as would be expected if no bias was present. This was the case for all four district-time blocks.

As for the known criminal-investigative stops, within both districts the percentage of stops involving Asian / Pacific Islander drivers was statistically the same as the percentage of Asian / Pacific Islander individuals among the criminal suspect descriptions benchmark. Again, this was exactly what one would expect if no bias was present. Finally, when examining traffic citation decisions, we found that the percentage of Asian / Pacific Islander drivers who received traffic citations was statistically the same as the percentage of White drivers who received citations when stopped for the same offense under similar circumstances. The only exception was stops for failing to wear a seatbelt, for which Asian / Pacific Islander drivers received a citation less often than White drivers stopped for that same offense under similar conditions.

Table 6.6 Asian / Pacific Islander Driver Outcomes from the Rest of the Department

Analysis	Outcome
Proactive Vehicle Stops, East District, 6 AM – 6 PM	Stopped neatly between the benchmark limits, as expected in no bias present.
Proactive Vehicle Stops, East District, 6 PM – 6 AM	Stopped neatly between the benchmark limits, as expected in no bias present.
Proactive Vehicle Stops, West District, 6 AM – 6 PM	Stopped neatly between the benchmark limits, as expected in no bias present.
Proactive Vehicle Stops, West District, 6 PM – 6 AM	Stopped neatly between the benchmark limits, as expected in no bias present.
Known Criminal-Investigative Stops, East District	Stopped statistically equal with the benchmark, as expected if no bias present.
Known Criminal-Investigative Stops, West District	Stopped statistically equal with the benchmark, as expected if no bias present.
Citations from Speeding Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Headlights / Tail Light Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Expired License Plates Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Seatbelt Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Disregard Traffic Signal / Sign Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Unsafe Lane Movement Stops	Cited statistically equal with White drivers, as expected if no bias present.

6.3.3 Hispanic / Latino Drivers

We found no evidence of disparate treatment of Hispanic / Latino drivers by the rest of the officers of the Greenwood Police Department. Table 6.7 below summarizes the findings of our analysis for Hispanic / Latino drivers. It suggests the rest of the officers on the department treated Hispanic / Latino drivers without bias, or showed lenience towards them.

Regarding proactive vehicle stops, the percentage of drivers who were Hispanic / Latino fell neatly between the crash driver and criminal suspect benchmarks within the West District during evening / night hours. This was the outcome expected if no bias was present. In the West District during the daytime, and in the East District during all times of day, the percentage of Hispanic / Latino drivers stopped was statistically equal to the lower of the two benchmarks, suggesting a lower representation of Hispanic / Latino drivers than expected among these stops.

In the analyses of the known criminal-investigative stops, Hispanic / Latino drivers were stopped at a rate statistically the same as the criminal suspect descriptions benchmark. This was the case for both the East District and the West District. This revealed no disparity in these stops regarding Hispanic / Latino drivers.

Table 6.7 Hispanic / Latino Driver Outcomes from the Rest of the Department

Analysis	Outcome
Proactive Vehicle Stops, East District, 6 AM – 6 PM	Stopped statistically ***equal with the lower crash driver benchmark***.
Proactive Vehicle Stops, East District, 6 PM – 6 AM	Stopped statistically ***equal with the lower crash driver benchmark***.
Proactive Vehicle Stops, West District, 6 AM – 6 PM	Stopped statistically ***equal with the lower crash driver benchmark***.
Proactive Vehicle Stops, West District, 6 PM – 6 AM	Stopped neatly between the benchmark limits, as expected in no bias present.
Known Criminal-Investigative Stops, East District	Stopped statistically equal with the benchmark, as expected if no bias present.
Known Criminal-Investigative Stops, West District	Stopped statistically equal with the benchmark, as expected if no bias present.
Citations from Speeding Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Headlights / Tail Light Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Expired License Plates Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Seatbelt Stops	Cited at a ***lower*** statistical rate than White drivers.
Citations from Disregard Traffic Signal / Sign Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Unsafe Lane Movement Stops	Cited statistically equal with White drivers, as expected if no bias present.

The analysis of the citations issued to Hispanic / Latino drivers also revealed a pattern of equality and some leniency. When stopping cars for failing to wear a seatbelt, the rest of the officers on the department gave Hispanic / Latino drivers citations less often than they did when stopping White drivers under the same circumstances, suggesting leniency. When stopping cars for the other five traffic violations examined, the rest of the department's officers gave Hispanic / Latino drivers citations just as often as they did when stopping White drivers. As a result, we found absolutely no evidence to suggest the discriminatory treatment of Hispanic / Latino drivers by the rest of the officers on the Greenwood Police Department, and inconsistent evidence of the lenient treatment of these drivers.

6.3.4 All Other Groups Drivers

The evidence regarding the treatment on non-White drivers categorized as "All other groups" continued to reveal no evidence of disparate treatment against non-White drivers in this category, and some evidence of leniency was found. Table 6.8 below summarizes the findings of our analysis for this category of drivers.

Table 6.7 "Other Groups" Driver Outcomes from the Rest of the Department

Analysis	Outcome
Proactive Vehicle Stops, East District, 6 AM – 6 PM	Stopped neatly between the benchmark limits, as expected in no bias present.
Proactive Vehicle Stops, East District, 6 PM – 6 AM	Stopped statistically ***equal with the lower crash driver benchmark***.
Proactive Vehicle Stops, West District, 6 AM – 6 PM	Stopped neatly between the benchmark limits, as expected in no bias present.
Proactive Vehicle Stops, West District, 6 PM – 6 AM	Stopped neatly between the benchmark limits, as expected in no bias present.
Known Criminal-Investigative Stops, East District	Stopped statistically equal with the benchmark, as expected if no bias present.
Known Criminal-Investigative Stops, West District	Stopped statistically equal with the benchmark, as expected if no bias present.
Citations from Speeding Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Headlights / Tail Light Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Expired License Plates Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Seatbelt Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Disregard Traffic Signal / Sign Stops	Cited statistically equal with White drivers, as expected if no bias present.
Citations from Unsafe Lane Movement Stops	Cited statistically equal with White drivers, as expected if no bias present.

In three of the four district-time blocks, the percentage of drivers in proactive vehicle stops who were categorized as "All other groups" fell between the crash driver and criminal suspect benchmarks, as expected if no bias was present. In the East District during the evening / night hours, the percentage of drivers in this group among the stops was statistically equal to the lower crash driver benchmark. This result demonstrated no bias for or against these drivers.

In the analyses of the known criminal-investigative stops, drivers categorized as "All other groups" were stopped at a rate statistically the same as the criminal suspects benchmark for that group, regardless of district. Analysis of the citations issued to drivers categorized as "All other groups" consistently revealed no bias. Across all six traffic violation types, these drivers were cited at a rate statistically equal to the rate for White drivers stopped for the same violation. As a result, we found absolutely no evidence to suggest the discriminatory treatment by the rest of the department against non-White drivers categorized as "all other groups."

6.3.5 Conclusions

As a result of this evidence, we found absolutely no evidence that the rest of the Greenwood Police Department, minus the five officers of interest, treated non-White drivers punitively. Our

examination of vehicle stops revealed that African-American, Asian / Pacific Islander, Hispanic / Latino, and other non-White drivers were either stopped at rates predicted by appropriate benchmarks, or were stopped less often than expected. Our examination of citation issuing practices revealed that African-American, Asian / Pacific Islander, Hispanic / Latino, and other non-White drivers were either cited at the same rate as White drivers stopped under the same circumstances, or were cited less often than White drivers. We found no evidence to suggest that any racial / ethnic group was treated in a discriminatory manner after the five officers of interest were removed.

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