Connecticut RACIAL PROFILING PROHIBITION PROJECT

STATE OF CONNECTICUT

TRAFFIC STOP DATA ANALYSIS AND FINDINGS, 2019

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This report was written by the Institute for Municipal and Regional Policy (IMRP) at Central Connecticut State University with the help of Matthew B. Ross and Jesse Kalinowski who applied the statistical tests known as the "Veil of Darkness", "Synthetic Control", "Stop Disposition", and "KPT Hit Rate."

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PREAMBLE

This preamble was written by an ad-hoc committee of the Connecticut Racial Profiling Prohibition Project advisory board and endorsed unanimously by the board on December 6, 2018.

1. Racial Profiling has historically occurred and continues to occur throughout America.
2. The Alvin W. Penn Racial Profiling Law enacted by the Connecticut General Assembly in 1999 required state and local police to collect traffic stop data and report the data to the state.
3. The 2011 federal investigation into the East Haven Police Department brought this issue to the forefront in Connecticut again and led to the Connecticut General Assembly updating the Profiling Legislation in 2012.
4. Disparities across racial and ethnic groups occur in traffic stops in Connecticut.
5. Enforcing the law's data reporting requirement and collecting and analyzing racial disparities in traffic stop records in the primary charge of the advisory board.
    a. A broader analysis, utilizing multiple methodologies in the preferred method for measuring for the presence of racial disparities in traffic enforcement;
    b. Although no measure is 100% accurate in measuring disparities, the analysis utilized in Connecticut is sufficient in determining the presence of disparities;
    c. We will continue to modify and refine our methodologies based on the best available research and accepted practices in the field.
6. We will take a proactive approach in understanding, explaining and addressing disparities found in the analysis by:
    a. Utilizing input from all stakeholders to understand the underlying causes for such disparities;
    b. Clearly explaining to the public and stakeholders if there are justifiable reasons for such disparities;
    c. Reporting to the Office of Policy and Management instances where the Connecticut Racial Profiling Prohibition Project Advisory Board believes that a police department is in violation of the Alvin W. Penn law.

EXECUTIVE SUMMARY OF FINDINGS

The Alvin W. Penn Racial Profiling Prohibition Act (Public Act 99-198) was first enacted in 1999 in the State of Connecticut. The law prohibits any law enforcement agency in the state from stopping, detaining, or searching motorists when the stop is motivated solely by considerations of the race, color, ethnicity, age, gender, or sexual orientation of that individual (Connecticut General Statutes Sections 54-1l and 54-1m). In 2012 and 2013, the Connecticut General Assembly made several major revisions to the law in an effort to ensure its effective implementation. In accordance with these changes, police agencies began collecting data pertaining to all traffic stops on October 1, 2013.

In 2012, the Racial Profiling Prohibition Project Advisory Board was established to advise the Office of Policy and Management (OPM) in adopting the law's standardized methods and guidelines. The Institute for Municipal and Regional Policy (IMRP) at Central Connecticut State University was tasked to help oversee the design, evaluation, and management of the racial profiling study mandated by Public Act No. 12-74 and Public Act No. 13-75, "An Act Concerning Traffic Stop Information." The project staff worked with the state's Criminal Justice Information System (CJIS) to develop a system to collect consistent and universal traffic stop information and submit it to CJIS electronically on a monthly basis.

In Connecticut, there are a total of 94 municipal police departments: 29 departments employing more than 50 officers, 50 employing between 20 and 50 officers, and 15 with fewer than 20 officers. State police are comprised of 11 distinct troops. Although there are an additional 80 jurisdictions that do not have organized police departments and are provided police services by the state police, either directly or through provision of resident troopers, these stops were categorized with their overarching state police troops. Additionally, a total of 13 special agencies has the authority to conduct traffic stops.

As per section 54-1m of the Connecticut General Statutes, the IMRP is required to submit an annual report analyzing traffic stops records for all police departments in Connecticut. This is the sixth annual report published by the IMRP and presents the results from an analysis of approximately 512,000 traffic stops conducted during the 12-month study period from January 1, 2019 through December 31, 2019. It also presents a three-year aggregate analysis of the approximately 1,500,000 traffic stops conducted between January 1, 2017 to December 31, 2019. This report serves as a screening tool, essentially highlighting areas where disparities between races and ethnicities are greatest in traffic enforcement throughout the state.

All departments and communities would benefit from carefully reviewing the findings in this report. Addressing statewide racial and ethnic disparities will require a collective effort of all law enforcement and community stakeholders. An atmosphere of open-mindedness, empathy, and honesty from all stakeholders remains necessary to create sustained police legitimacy and a safer, more just society. The authors of this report are hopeful that the information contained herein will be valuable to the citizens of Connecticut as they seek to fulfill the promise of the Alvin W. Penn Act. We are both humbled and grateful for the opportunity to be part of this important effort.

E.1: 2019 AND 2017-19 STATEWIDE TRAFFIC STOP ANALYSIS AND FINDINGS

Assessing racial disparities in policing data has been used for the last two decades as a policy tool to evaluate whether there exists the possibility that racial and ethnic bias is occurring within a given jurisdiction. The statistical evaluation of policing data in Connecticut is an important step towards developing a transparent dialogue between law enforcement and the public at large. As such, it is the goal of this report to present the results of that evaluation in the most transparent and unbiased manner possible. The report is organized to lead the reader through seven distinct analytical tests that vary in their assumptions and level of scrutiny. The intent behind this approach is to apply multiple tests as a screening filter for the possibility that any one test (1) produces false positive results or (2) reports a false negative.

The research strategy underlying the statistical analysis presented in chapters three through seven of this report was developed with three guiding principles in mind. Each principle was considered throughout the research process and when selecting the appropriate results to display publicly. A better understanding of these principles helps to frame the results presented in the technical portions of the analysis. In addition, by presenting these principles at the onset of the report, readers have a better context to understand the overall framework of the approach.

> *Principle 1: Acknowledge that statistical evaluation is limited to finding racial and ethnic disparities that are indicative of racial and ethnic bias but that, in the absence of a formal procedural investigation, cannot be considered comprehensive evidence.*
>
> *Principle 2: Apply a holistic approach for assessing racial and ethnic disparities in Connecticut policing data by using a variety of approaches that rely on well-respected techniques from existing literature.*
>
> *Principle 3: Outline the assumptions and limitations of each approach transparently so that the public and policy makers can use their judgment in drawing conclusions from the analysis.*

We emphasize the message that any statistical test is only truly capable of identifying racial and ethnic disparities. Such findings provide a mechanism to indicate possible racial profiling, but they cannot, without further investigation, provide sufficient evidence that racial profiling exists.

E.1 (A): Findings from the Statewide Analysis

Municipal and State Police departments in Connecticut made 512,679 traffic stops in 2019 (1,563,846 in 2017-19) of which 63% (64%) were of White non-Hispanic motorists while 18% (17.7%) were Black and 15.8% (15%) were of Hispanic motorists. At the aggregate level, we present estimates from applying the veil of darkness analysis, a search hit-rate analysis, and a post-stop disposition analysis. The veil of darkness analysis exploits quasi-random variation in the timing of sunset to identify potential discrimination in the decision to stop a motorist. According to the results from applying this test, the estimated change from daylight to darkness in the odds a stopped motorist is a Black was 1 in 2017, 0.96 in 2018, and 0.97 in 2019. The change from daylight to darkness in the odds a stopped motorist is Hispanic was 1 in 2017, 1.06 in 2018, and 1.06 in 2019.

The key identifying assumption of this test is that police officers who are inclined to racially profile motorists are better able to do so during daylight when motorist race is more easily observed prior to making a traffic stop. Following this logic, the results suggest that police in Connecticut are no more likely to stop minority motorists in daylight relative to darkness. Although this is indicative of equal treatment on the part of Connecticut police as a whole in the decision to stop a minority motorist, these results do not necessarily indicate that all departments or officers in the state behave this way as these are aggregate estimates of the mean officer's behavior. In general, the disparity in the decision to stop a minority motorist has remained relatively stable in terms of magnitude and statistical precision from 2017 through 2019.

Municipal and State Police departments in Connecticut searched 16,438 or 3.2% (50,370 or 3.2% in 2017-19) of which 38.6% (41%) were of White non-Hispanic motorists while 34.4% (34%) were of Black and 25.8% (25.1%) were of Hispanic motorists. At the aggregate level, we present estimates comparing the likelihood a search resulted in contraband being found for White non-Hispanic motorists relative to minority motorists. In addition, we compare the disposition of traffic stops across these groups after conditioning on the motivating reason for the traffic stop. The rate at which discretionary searches of White non-Hispanic motorists yielded contraband was 28.7% in 2017, 31.3% in 2018, and 31.2% in 2019. The rate at which searches of Black and Hispanic motorists yielded contraband was 19.6% and 19.1% respectively in 2017, 24.7% and 26.9% respectively in 2018, and 19.1% and 22.5% respectively in 2019. The significant lower hit-rate for minority motorists suggests the potential presence of a preference on the part of police for searching minority motorist. Similarly, the stop disposition analysis suggests minority motorists are more likely to receive a warning and less likely to be searched overall even after condition on the motivating reason for the stop. In general, the disparity in the decision to search a minority motorist has remained relatively stable in terms of magnitude and statistical precision from 2017 through 2019.

Veil of Darkness Analysis Findings, 2019 and 2017-19

In an effort to better identify the source of these racial and ethnic disparities, each analysis was repeated at the department level for both the 2019 calendar year and the 2017 to 2019 aggregate sample. The threshold for identifying individual departments was the presence of a disparity that was statistically significant at the 95 percent level in the Black or Hispanic alone categories.[1] By construction, the departments that were identified as having a statistically significant disparity are the largest contributors to the overall statewide results. Here, the unit of analysis is a municipal department or State Police Troop where disparities could be a function of a number of factors including institutional culture, departmental policy, or individual officers.[2]

In total, we identify only one State Police Troop in the 2019 sample and one State Police Troop in the three-year aggregate sample. We also identified two municipal police departments in the three-year aggregate sample. Of the two municipal police departments identified in the three-year aggregate sample, one department was identified in a previous annual study. For all departments identified in either the 2019 or three-year aggregate samples, we conclude that there is strong evidence that a

[1] Put simply, there must have been at least a 95 percent chance that the motorists were more likely to be stopped at a higher rate relative to white Non-Hispanic motorists.

[2] Since department or state police barrack estimates represent an average effect of stops made by individual officers weighted by the number of stops that they made in 2018, it is possible that officer-level disparities exist in departments which were not identified.

disparity exists in the rate of minority traffic stops made during daylight conditions. These departments include:

State Police Troop L

State Police Troop L was identified using the veil of darkness analysis in the 2019 sample for Hispanic motorists. The veil of darkness analysis exploits quasi-random variation in visibility to identify potential discrimination controlling for day of week and time of day. During the sample window for this test, the probability a stopped motorist in State Police Troop L was Hispanic totaled 6.4 percent in darkness when we presume that police are less able to detect the race of a motorist prior to making a traffic stop. Conditioning on day of the week and time of day, the probability a stopped motorist was Hispanic grew to 39.5 percent during daylight when we presume that police are better able to detect race.

State Police Troop C

State Police Troop C was identified using the veil of darkness analysis in the combined 2017-19 sample for Black and Hispanic motorists. The veil of darkness analysis exploits quasi-random variation in visibility to identify potential discrimination controlling for day of week and time of day. We leverage the combined three-year sample in order to obtain a more precise estimate of a disparity for Black and Hispanic motorists. During the sample window for this test, the odds a stopped motorist in Troop C was Black and Hispanic totaled 9.2 and 8.5 percent in darkness respectively when we presume that police are less able to detect the race of a motorist prior to making a traffic stop. Conditioning on day of the week and time of day, the odds a stopped motorist was Black and Hispanic grew to 16.3 and 24.1 percent during daylight respectively when we presume that police are better able to detect race.

Old Saybrook:

Old Saybrook was identified using the veil of darkness analysis in the combined 2017-19 sample for Hispanic motorists. The veil of darkness analysis exploits quasi-random variation in visibility to identify potential discrimination controlling for day of week and time of day. We leverage the combined three-year sample in order to obtain a more precise estimate of a disparity for Hispanic motorists. During the sample window for this test, the odds a stopped motorist in Old Saybrook was Hispanic totaled 7 percent in darkness when we presume that police are less able to detect the race of a motorist prior to making a traffic stop. Conditioning on day of the week and time of day, the odds a stopped motorist was Hispanic grew to 31.2 percent during daylight when we presume that police are better able to detect race.

Ridgefield:

Ridgefield was identified using the veil of darkness analysis in the combined 2017-19 sample for Black motorists. The veil of darkness analysis exploits quasi-random variation in visibility to identify potential discrimination controlling for day of week and time of day. We leverage the combined three-year sample in order to obtain a more precise estimate of a disparity for Black motorists. During the sample window for this test, the odds a stopped motorist in Ridgefield was Black totaled 6.7 percent in darkness when we presume that police are less able to detect the race of a motorist prior to making a traffic stop. Conditioning on day of the week and time of day, the odds a stopped motorist was Black grew to 26 percent during daylight when we presume that police are better able to detect race.

Other Statistical and Descriptive Measure Analysis Findings, 2019 and 2017-19

In addition to the two municipal police departments and two State Police troop identified to exhibit statistically significant racial or ethnic disparities in the Veil of Darkness analysis, a number of other departments were identified using either the descriptive tests, stop disposition test or KPT hit-rate analysis. Identification in any one of these tests alone is not, in and of itself, sufficient to be identified for further analysis. However, these additional tests are designed as an additional screening tool to identify the jurisdictions where consistent disparities exceed certain thresholds that appear in the data. Although it is understood that certain assumptions have been made in the design of each of these measures, it is reasonable to believe that departments with consistent data disparities that separate them from the majority of other departments should be subject to further review and analysis with respect to the factors that may be causing these differences.

The results from estimating whether individual departments stopped more minority motorists relative to their requisite synthetic control found 31 municipal police departments to have a disparity that was statistically significant at the 95 percent level in the Black or Hispanic alone categories and withstood doubly robust estimation, and had a false discovery rate below 10%. *Bristol, East Hartford, Enfield, Glastonbury, Hamden, Meriden, New Britain, New Haven, New London, Newington, Norwich, Stratford, Vernon, West Hartford,* and *Wethersfield* were identified in the 2019 sample and the aggregate 2017 to 2019 sample. *Bethel, Branford, Danbury, New Canaan, Orange,* and *Windsor* were identified only in the 2019 sample. Lastly, *Cromwell, Derby, Fairfield, Greenwich, Middletown, Redding, Ridgefield, Waterbury, Willimantic,* and *Windsor Locks* were identified only in the three-year aggregate analysis.

The descriptive tests are designed as an additional tool to identify disparities that exceed certain thresholds that appear in a series of census-based benchmarks. Those three benchmarks are: (1) statewide average, (2) the estimated commuter driving population, and (3) resident-only stops. Although 66 municipal police departments were identified with racial and ethnic disparities when compared to one or more of the descriptive measures, only *Stratford, Wethersfield, Vernon, Derby, Newington, East Hartford, Meriden,* and *Waterbury* exceeded the disparity threshold in more than half the benchmark areas.

The results from the Stop Disposition test shows minority motorists stopped by municipal police departments were found to have a statistically different distribution of outcomes conditional on the basis for which they were stopped. In the departmental analysis, there were four municipal departments found to have a disparity in the distribution of outcomes. However, none of these towns had a false discovery rate that was below the maximum threshold for formal identification of ten percent. These differences were statistically significant at the 95 percent level or above in the Black or Hispanic alone categories. However, we note that the number of violations might be corelated with more severe outcomes and race. Since this variable is unobservable in the current data and we are unable to rule out the possibility that the identified towns arose from chance, we strongly caution the reader about drawing any conclusions from this section alone.

Finally, the results of the KPT hit rate test, applied to the aggregate search data for all departments in Connecticut show that departments are less successful in motorist searches across all minority groups, which is a potential indicator of disparate treatment. There was a total of four municipal police departments found to have a disparity in the hit-rate of minority motorists relative to White non-Hispanics motorists for the 2019 sample, but only the results for one department survived the

robustness test. In addition, there were eight municipal police departments and two State Police troops found to have a disparity in the hit-rate of minority motorists relative to White non-Hispanic motorists for the three-year aggregate sample. Only two municipal police departments survived the robustness test for the three-year aggregate sample. The two municipal departments identified to exhibit a statistically significant racial or ethnic disparity in searches across all robustness tests were:

Hartford:

Hartford was identified on the search hit-rate analysis in the 2019 sample as well as the combined 2017-19 sample for Black and Hispanic motorists. This analysis compares the rate at which searched minority motorists are found with contraband relative to the same majority rate. In the 2019 data for Hartford, contraband was found in 18.1% of Black and 20.5% of Hispanic all discretionary searches compared to the 45.9% of non-Hispanic White motorists. In the combined 2017-19 data, contraband was found in 22.0% of Black and 24.1% for Hispanic discretionary searches compared to the 42.3% of non-Hispanic White motorists. Searches of minority motorists were less successful which is suggestive of potential adverse treatment. The 2019 sample indicates that only the difference for Black motorists survived the restriction of a false discovery rate lower than 10%, but both estimates were found to be statistically significant at the 99% level. The 2017-19 sample indicates that the differences for Black and Hispanic motorists survived the restriction of a false discovery rate lower than 10% and the estimates were found to be statistically significant at the 99% level. The results unambiguously indicate that Hartford police is disproportionately less likely to be successful searching minority motorists relative to their White non-Hispanic peers.

Vernon:

Vernon was identified on the search hit-rate analysis in the combined 2017-19 sample for Black motorists. This analysis compares the rate at which searched minority motorists are found with contraband relative to the same majority rate. In the combined 2017-19 data for Vernon, contraband was found in 58.9% of Black discretionary searches. Relative to the 69.0% of non-Hispanic White motorists, searches of minority motorists were less successful which is suggestive of potential adverse treatment. This difference was found to be statistically significant at the 99% level. The results unambiguously indicate that Vernon is disproportionately less likely to be successful when searching minority motorists relative to their White non-Hispanic peers.

E.1 (B): Conclusions from the Statewide Analysis

The analysis presented in chapters III through VII of this report should be utilized as a screening tool by which researchers, law enforcement administrators, community members and other appropriate stakeholders focus resources on those departments displaying the greatest level of disparities in their respective stop data. As noted previously, racial and ethnic disparities in any traffic stop analysis do not, by themselves, provide conclusive evidence of racial profiling. Statistical disparities do, however, provide significant evidence of the presence of idiosyncratic data trends that warrant further analysis.

In order to determine if a departments racial and ethnic disparities warrant additional in-depth analysis, researchers review the results from some of the analytical sections of the report. The threshold for identifying significant racial and ethnic disparities for departments is described in each

section of the report (ex. departments with a disparity that was statistically significant at the 95 percent level in the black or Hispanic alone categories in the Veil of Darkness methodology were identified as statistically significant). A department is identified for a follow-up analysis if they meet any one of the following criteria:

1. A statistically significant disparity in the one-year or three-year Veil of Darkness analysis
2. A statistically significant disparity in the one-year or three-year KPT hit rate and Stop Disposition analyses

It is worth noting that past reports have relied on results from the Synthetic Control method and Descriptive Statistics to identify departments for additional analysis. Although results from those methods are provided in the report, the authors believe that since 2010 census information forms much of the foundation of these measures, it would be more appropriate to limit the use of these tests until 2020 census data is published. The authors also believe that the inclusion of a three-year rolling analysis significantly improves our ability to utilize the more sophisticated statistical techniques, especially on departments with small annual sample sizes. Improvements have also been made to the post-stop measures to make them more rigorous and statistically sound.

In general, we continue to identify far fewer departments in this report relative to prior year's studies with only two municipal department and two State Police troops. Of the 2 municipal departments, both were identified in the three-year aggregate sample only. One of the two State Police Troops was identified in the 2019 sample and the other State Police Troop was identified in the three-year aggregate sample only. Researchers are not recommending an in-depth follow-up analysis for any of the identified departments this year.

The **Old Saybrook** police department was identified with a marginally significant statistical disparity in the three-year veil of darkness aggregate sample, which is one of seven tests used to identify disparities. Statistical disparities were not identified in the six other tests used to measure departmental disparities. The department's disparity primarily appeared in the veil of darkness robustness tests, which focus primarily on moving violations, and is used to evaluate the strength of the initial assessment. While normally this process results in the disparity decreasing slightly as the robustness measures are applied, in the case of Old Saybrook the opposite effect was observed. In initially assessing Old Saybrook's data, we observed what appears to be a significant seasonal variation in data patterns which is more observable than we have previously encountered in other shoreline communities that we have analyzed. Because the overall disparities are of a marginal nature, we believe there is not a compelling need for a full follow-up analysis at this time. However, gaining a better understanding of the seasonal effects on Old Saybrook's data will help us form a clearer picture of these influences for potentially all shoreline communities. Consequently, our plan is to continue to monitor and assess the annual and three-year aggregate data for another year while working with Old Saybrook to gather more pertinent information as to any potential policy or operational differences between the summer season and other months that could contribute to the observed disparity.

In addition to being identified with racial and ethnic disparities in this study, the **Ridgefield** (2017-19 sample) police department was identified with racial and ethnic disparities in the 2015-16 Traffic Stop Data Analysis and Findings report. An in-depth analysis, with recommendations, was completed and published as part of the 2015-16 Traffic Stop Data Analysis and Findings Supplemental report released in October 2018. The follow-up analysis and subsequent departmental interventions were

not completed until the end of 2018. Therefore, it is reasonable that any changes made by the department would not be reflected in their data until late 2018 or early 2019. Since the three-year aggregate analysis covers a significant portion of time prior to our intervention, it is unsurprising that the department would continue to show statistically significant racial and ethnic disparities. We will continue monitoring the departments data to determine if improvements were made.

Although this year we formally identified **Troop C** (2017-19 sample) and **Troop L** (2019 sample) with statistically significant racial and ethnic disparities, a comprehensive five-year analysis of traffic stop disparities for the entire State Police was published in May 2020 as part of the 2018 Traffic Stop Data Analysis and Findings report. There are very different challenges associated with assessing the racial and ethnic disparities identified for the State Police compared to municipal police departments. We will continue to monitor State Police aggregate and Troop level trends for significant variations and to determine if additional comprehensive analysis is warranted.

Another major component of addressing concerns about the possibility of racial profiling in Connecticut is bringing law enforcement officials and community members together in an effort to build trust by discussing relationships between police and the community. Public forums should be held in each identified community to bring these groups together. They serve as an important tool to inform the public of the findings and outline steps for moving forward with additional analysis. The IMRP is committed to utilizing both data and dialogue to enhance relationships between the police and community.

BACKGROUND

First enacted in 1999, Connecticut's anti-racial profiling law entitled, the Alvin W. Penn Racial Profiling Prohibition Act (Public Act 99-198), prohibits any law enforcement agency from stopping, detaining, or searching any motorist when the stop is motivated solely by considerations of the race, color, ethnicity, age, gender or sexual orientation of that individual (Connecticut General Statutes Sections 54-1l and 54-1m). In 2012 and 2013, the Connecticut General Assembly made several changes to this law to create a system to address racial profiling concerns in Connecticut.

In 2012, the Racial Profiling Prohibition Project Advisory Board was established to advise OPM in adopting the law's standardized methods and guidelines. The Institute for Municipal and Regional Policy (IMRP) at Central Connecticut State University was tasked to help oversee the design, evaluation, and management of the racial profiling study mandated by PA 12-74 and PA 13-75, "An Act Concerning Traffic Stop Information." The IMRP worked with the advisory board and all appropriate parties to enhance the collection and analysis of traffic stop data in Connecticut.

Through September 30, 2013, police agencies collected traffic stop information based on requirements outlined in the original 1999 Alvin W. Penn law. Beginning October 1, 2013, police agencies had to submit traffic stop data for analysis under the new methods outlined by the Office of Policy and Management (OPM), as required by the amended racial profiling prohibition law. The law also authorized the OPM secretary to order appropriate penalties (i.e., the withholding of state funds) when municipal police departments, the Department of Emergency Services and Public Protection (DESPP), and other police departments fail to comply.

The National Highway Traffic and Safety Administration (NHTSA) provided resources for this project through a grant administered by the Connecticut Department of Transportation. The Racial Profiling Prohibition Project Advisory Board and the project staff have been meeting since May 2012 in an effort to outline a plan to successfully implement the requirements of the 2012 and 2013 legislation. The focus of the project's early phase was to better understand traffic stop data collection in other states. After an extensive review of best practices, working groups were formed and met monthly to discuss the different aspects of the project. These working groups included Data and System, Public Awareness, and Training work groups. The full advisory board held more than 20 meetings and the working groups met approximately 50 times.

The advisory board and IMRP also worked with law enforcement officials to create a data collection system that is efficient, not burdensome to the police collecting it, and provides information that is easy to work with when it is submitted. Police agencies in Connecticut vary in their levels of sophistication and technological capacity with respect to how they collect and report data. The project staff worked with the state's Criminal Justice Information System (CJIS) to develop a system to collect consistent and universal traffic stop information and submit it to CJIS electronically on a monthly basis.

The IMRP developed and maintains a project website (www.ctrp3.org) that informs the public of the advisory board's activities, statewide informational forums, and related news items on racial profiling. The website includes meeting agendas and minutes, press releases, and links to register for events. The website is updated weekly. In addition to the project website, the IMRP partnered with the Connecticut Data Collaborative to publish all traffic stop data on a quarterly basis. The public can

download the information in its original form or view summary tables for easy use. A full set of analytical tools will be available for more advanced users who are interested in data analysis.

Although much of the initial focus of this project was to develop a standardized method for data collection and analysis, there are other important components. The initiatives include a public awareness and education campaign, effective training for officers and departments, and a rigorous complaint process. Information about all of these initiatives is provided on the project website. These initiatives collectively represent different tools available for education and the prevention of racial profiling in policing. These tools were implemented in the hope of building and enhancing trust between communities and law enforcement in Connecticut.

In February 2014, the U.S. Department of Justice, Community Oriented Policing Services Division, sponsored a train-the-trainer program in Connecticut on "Fair and Impartial Policing (FIP)." The FIP program was established to train police officers and supervisors on fair and impartial policing by understanding both conscious and unconscious bias. This program was offered to police agencies throughout the state over the next year.

Lastly, a major component of addressing concerns about the possibility of racial profiling in Connecticut is bringing law enforcement officials and community members together to discuss relationships between police and the community. The project staff has conducted several public forums throughout the state to bring these groups together and will continue these dialogues in the foreseeable future. They serve as an important tool to inform the public of their rights and the role of law enforcement in serving their communities.

I: METHODOLOGICAL APPROACH UNDERLYING THE ANALYSIS

Assessing racial disparities in policing data has been used for the last two decades as a policy tool to evaluate whether racial bias exists within a given jurisdiction. Although there has always been widespread public support for the equitable treatment of individuals of all races, recent national headlines have brought this issue to the forefront of American consciousness and prompted a contentious national debate about policing policy. The statistical evaluation of policing data in Connecticut is an important step towards developing a transparent dialogue between law enforcement and the public. As such, this report's goal is to present the results of that evaluation in a transparent and unbiased manner.

The research strategy underlying this statistical analysis was developed with consideration to three guiding principles. Each principle served as an important foundation for the research process, particularly when selecting the appropriate results to disseminate to the public. A better understanding of these principles helps to frame the results in the technical portions of the analysis. Further, presenting these principles at the outset of the report provides readers with the appropriate context to understand our overall approach.

> *Principle 1: Acknowledge that statistical evaluation is limited to finding racial and ethnic disparities that are indicative of racial and ethnic bias but that, in the absence of a formal procedural investigation, cannot be considered comprehensive evidence.*
>
> *Principle 2: Apply a holistic approach for assessing racial and ethnic disparities in Connecticut policing data by using a variety of approaches that rely on well-respected techniques from existing literature.*
>
> *Principle 3: Outline the assumptions and limitations of each approach transparently so that the public and policy-makers can use their judgment in drawing conclusions from the analysis.*

The report is organized to lead the reader through a host of descriptive and statistical tests that vary in their assumptions and level of scrutiny. The intent behind this approach is to apply multiple tests as a screening filter for the possibility that any one test (1) produces false positive results or (2) reports a false negative. Seven distinct analytical tools were used to evaluate whether racial and ethnic disparities are present in the Connecticut policing data. In the analysis, the demography of motorists was grouped into four overlapping categories to ensure a large enough sample size for the statistical analysis. Although much of the analysis focuses on stops made of black (Hispanic or non-Hispanic) and Hispanic motorists (any race), the analysis was also conducted for aggregated groupings of all non-white motorists (Hispanic or non-Hispanic) as well as a combined sample of black and Hispanic motorists. In terms of identifying departments or state police barracks in individual tests, the estimated disparity (i.e. the higher likelihood of stopping a minority motorist) must have been estimated with at least a 95 percent level of statistical significance for either black or Hispanic motorists alone. Put simply, under the rigorous conditions set by each test, there must have

been at least a 95 percent chance that either black or Hispanic motorists were more likely to be stopped (or searched) at a higher rate relative to Caucasian non-Hispanic motorists.

The analysis begins by first presenting a method referred to as the Veil of Darkness was used to assess the existence of racial and ethnic disparities in stop data. The test is a statistical technique that was developed by Jeffery Grogger and Greg Ridgeway (2006) and published in the *Journal of the American Statistical Association*. The Veil of Darkness analysis examines a restricted sample of stops occurring during the "inter-twilight window" and assesses relative differences in the ratio of minority to non-minority stops that occur in daylight as compared to darkness. The inter-twilight window restricts stops to a fixed window of time throughout the year when visibility varies due to seasonality as well as the discrete daylight savings time shift. This technique relies on the idea that, if police officers are profiling motorists, they are better able to do so during daylight hours when race and ethnicity is more easily observed. After restricting the sample of stops to the inter-twilight window and controlling for things like the time of day and day of week, any remaining difference in the likelihood a minority motorist is stopped during daylight is attributed to disparate treatment. This analytical approach is considered the most rigorous and broadly applicable of all the tests presented in this report.

The second analytical tool used in the analysis is the synthetic control where the number of minority traffic stops in a given department is evaluated against a benchmark constructed using stops made by all other departments in Connecticut. Since departments differ in terms of their enforcement activity (i.e. time of stops, reason for stops, etc.) and the underlying demographics of the population on the roadway, this analysis relies on the rich statistical literature on propensity scores. Here, a propensity score is a measure of how similar a stop made outside a given department is to a stop made by the department being analyzed. These measures of similarity are used to weight stops when constructing an individual benchmark for each department. For example, if the department being analyzed has a high minority population and makes most of their stops on Friday nights at 7PM for speeding violations then stops made for speeding violations by departments with a similar residential population at this time and day will be given more weight when constructing the benchmark. This methodology ensures that there is an apples-to-apples comparison between the number of minorities stopped in a given town relative to their benchmark and allows for the interpretation of any remaining differences to be attributed to possible disparate treatment.

The three techniques contained in Chapter 5 are descriptive in nature and compare department-level data to three benchmarks (statewide average, estimated commuter driving populations, and resident population). These methods are referred to as population benchmarks and are commonly used to evaluate racial disparities in police data across the country. The statewide average comparison provides a simple and effective way to establish a baseline for all departments from which the relative differences between department stop numbers and the average for the state are compared. A comparison to the statewide average is presented alongside the context necessary to understand differences between local jurisdictions. Next, researchers adjust "static" residential census data to approximate the estimated driving demographics in a particular jurisdiction. Residential census data can be modified to create a reasonable estimate of the possible presence of many nonresidents likely to be driving in a given community because they work there and live elsewhere. This estimate is a composition of the driving population during typical commuting hours based on data provided by the U.S. Census Bureau. The final population benchmark comparison limits the analysis to stops involving only residents of the community and compares them to the community demographics

based on the most recent decennial census for residents age 16 and over. Although any one of these benchmarks cannot provide by itself a rigorous enough analysis to draw conclusions regarding racial disparities, if taken together with the more rigorous statistical methods they do serve as a useful tool.

The sixth analytical tool used in the analysis tests for disparities in the outcomes of traffic stops using a model that examines the distribution of dispositions conditional on race and the reason for the stop. Specifically, we test whether traffic stops made of minority motorists result in different outcomes relative to their white non-Hispanic peers. We provide one important cautionary note about interpreting this test as causal evidence of discrimination. Ideally, this test would be performed on data containing *all* violations observed by the police officer prior to making a traffic stop and where we would include a control for the number of total violations. In practice, data on traffic stops typically only contain the most severe reason that motivated the stop. In the absence of data on the full set of violations observed by police officers, we suggest that the reader interpret results from this test as providing descriptive evidence to be viewed in concert with other such empirical measures.

Lastly, an analysis of post-stop outcomes using a hit-rate approach following a technique published in the *Journal of Political Economy* by Knowles, Persico and Todd (2001). The hit-rate approach relies on the idea that motorists rationally adjust their propensity to carry contraband in response to their likelihood of being searched by police. Similarly, police officers rationally decide whether to search a motorist based on visible indicators of guilt and an expectation of the likelihood that a given motorist might have contraband. According to the model, a demographic group of motorists would be searched by police more often than white non-Hispanic motorists if they were more likely to carry contraband. However, the higher level of searches should be exactly proportional to the higher propensity for this group to carry contraband. Thus, in the absence of racial animus, we should expect the rate of successful searches (i.e. the hit-rate) to be equal across different demographic groups regardless of differences in their propensity to carry contraband. [3] In this test, discrimination is interpreted as a preference for searching minority motorists that shows up statistically as a lower hit-rate relative to Caucasian motorists. Note that this test inherently says nothing about disparate treatment in the decision to stop motorists as it is limited in scope to vehicular searches.

In short, we move forward with the overall goal of identifying the statistically significant racial and ethnic disparities in Connecticut policing data. A variety of statistical tests are applied to the data in the hope of providing a comprehensive approach based on the lessons learned from academic and policy applications. Our explanations of the mechanisms and assumptions that underlie each of the tests are intended to provide policymakers and the public with enough information to assess the data and draw their own conclusions from the findings.

Finally, we emphasize the message that any statistical test is only truly capable of identifying racial and ethnic disparities. Such findings provide a mechanism to indicate possible racial profiling but they cannot, without further investigation, provide sufficient evidence that racial profiling exists.

[3] Although some criticism has risen concerning the technique and extensions have suggested that more disaggregated groupings of searches be used in the test, the ability to implement such improvements is limited by the small overall sample of searches in a single year of traffic stops. Despite these limitations, the hit-rate analysis is still widely applied in practice and contributes to the overall understanding of post-stop police behavior in Connecticut.

II: CHARACTERISTICS OF TRAFFIC STOP DATA

This section examines general patterns of traffic enforcement activities in Connecticut for the study period of January 1, 2019 to December 31, 2019. Statewide and agency activity information can be used to identify variations in traffic stop patterns to help law enforcement and local communities understand more about traffic enforcement. Although some comparisons can be made between similar communities, we caution against comparing agencies' data in this section of the report. Please note that the tables included in this report present information from only a limited number of departments. Complete tables for all agencies are included in the technical appendix.

In Connecticut, more than 512,000 traffic stops were conducted during the 12-month study period. Almost 68% of the total stops were conducted by the 94 municipal police departments, 31% of the total stops were conducted by state police, and the remaining 1% of stops were conducted by other miscellaneous policing agencies. Figure 2.1 shows the aggregate number of traffic stops by month along with each demographic category. As can be seen below, the volume of traffic stops has a seasonal variation pattern. However, the proportion of minority stops remained relatively consistent across the year.

Figure 2.1: Aggregate Traffic Stops by Month of the Year

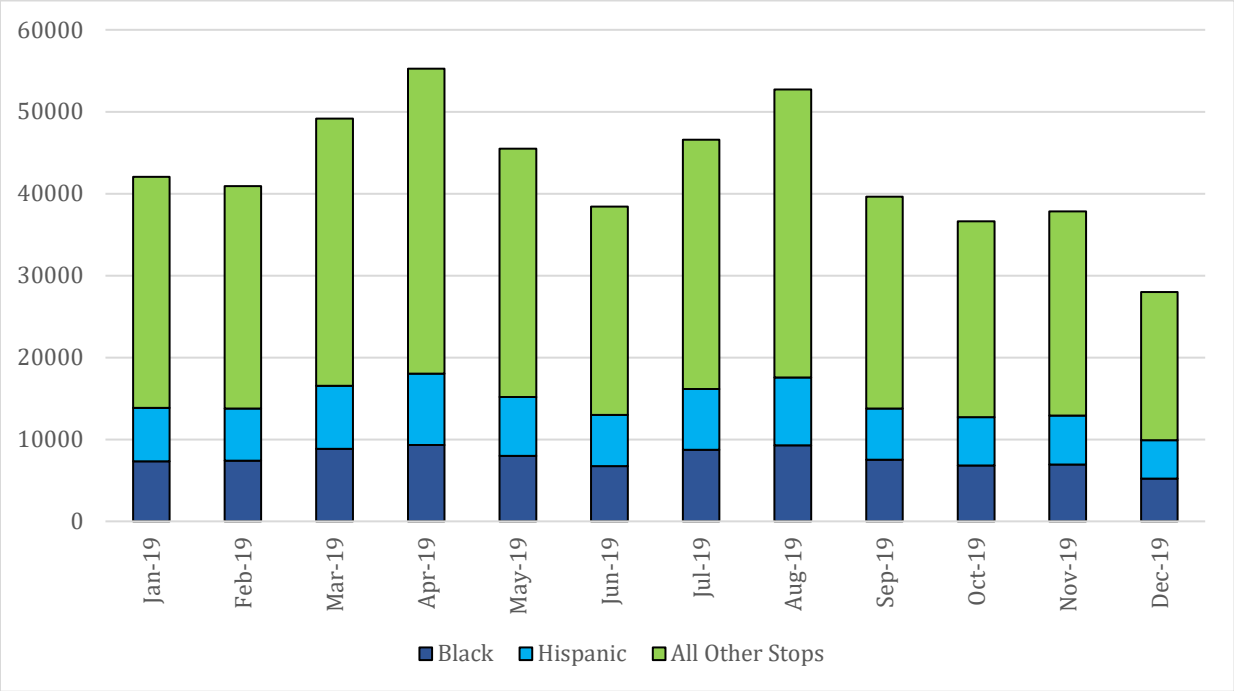


Figure 2.2 displays traffic stops by time of day for the entire analysis period. As can be seen from the figure, the total volume of traffic stops fluctuates significantly across different times of the day. The highest hourly volume of traffic stops in the sample occurred from five to six in the evening and accounted for 7.2% of all stops. It is not surprising that the volume of traffic stops increases between these hours as this is a peak commuting time in Connecticut. The lowest volume of traffic stops occurred between four and five in the morning and continued at a suppressed level during the

morning commute. The low level of traffic stops during the morning commute is likely due to an interest in maintaining a smooth flow of traffic during these hours. Discretionary traffic stops might be less likely to be made during these hours relative to others in the sample.

The evening commute, in contrast to the morning commute, represents a period when a significant proportion of traffic stops are made. The surge seen between the hours of four and seven at night represents the most significant period of traffic enforcement. In aggregate, stops occurring between these hours represented 19.7% of total stops. Interestingly, there seems to be a significant correlation between the proportion of minority stops and the overall volume of stops. In particular, the share of Hispanic and Black stops increases when the total volume of stops decreases.

Figure 2.2: Aggregate Traffic Stops by Time of Day

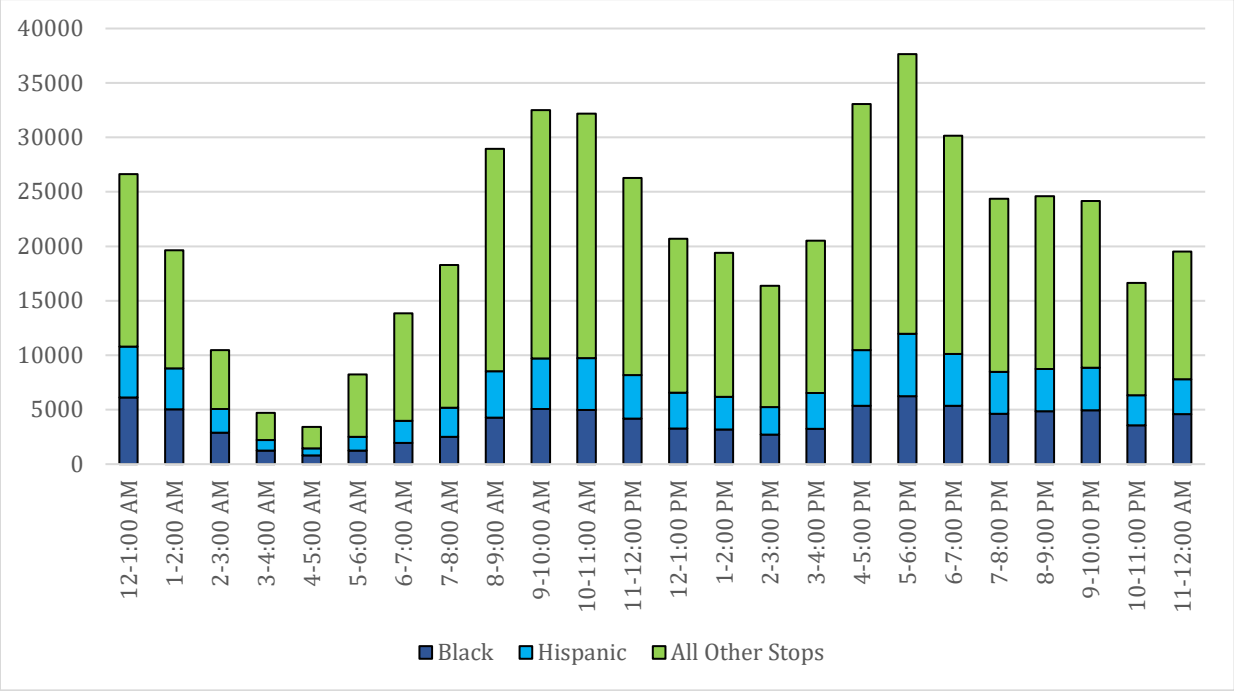
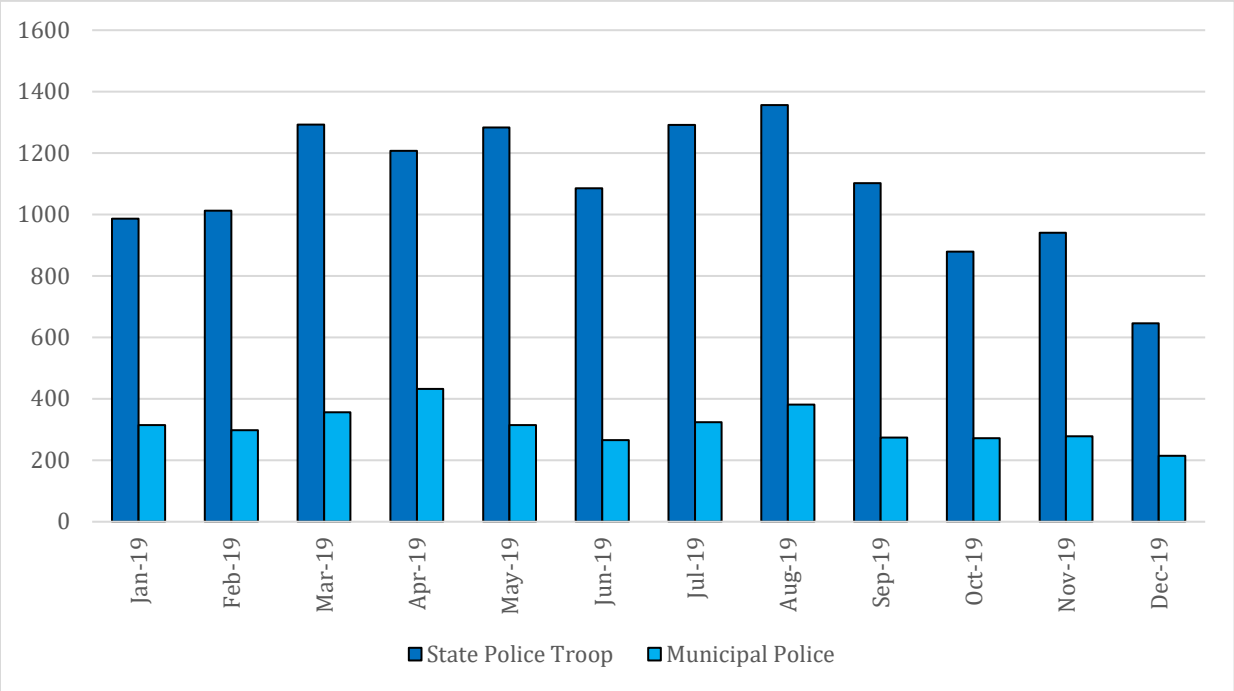


Figure 2.3 illustrates the average number of traffic stops by month for municipal police agencies and the state police. The data illustrates a fairly stable pattern of municipal traffic stop enforcement with the average number of traffic stops ranging from 215 to 432 each month for each agency. State police traffic stops are less stable by month relative to the municipal departments and range from a low of 646 to a high of 1356. This may be due to the nature of state police traffic enforcement activity that fluctuates for a variety of reasons including enforcement campaigns around the holidays.

Figure 2.3: Average Number of Traffic Stops by Month for Police Agencies



The level of and reason for traffic stop enforcement varies greatly across agencies throughout the state for a number of reasons. For example, some enforcement is targeted to prevent accidents in dangerous areas, combat increased criminal activity, or respond to complaints from citizens. Those agencies with active traffic units produce a higher volume of traffic stops. The rate of traffic stops per 1,000 residents in the population helps to compare the stop activity between agencies. The five municipal police agencies with the highest stop rate per 1,000 residents are Windsor, Waterford, Orange, Ledyard, and Seymour. Conversely, Shelton, Weston, Granby, Wolcott, and Avon have the lowest rate of stops per 1,000 residents. Table 2.1 shows the distribution of stops for the highest and lowest level of enforcement per 1,000 residents for police agencies. All department results are contained in the Table B.1 of Appendix B.

Table 2.1: Municipal Police, Highest and Lowest Rates of Traffic Stops

Town Name	16+ Population*	Traffic Stops	Stops per 1,000 Residents
Connecticut	2,825,946	512,697	181
Municipal Departments with the Highest Rate of Traffic Stops			
Windsor	23,222	14,846	639
Waterford	15,760	6,535	415
Orange	11,017	4,370	397
Ledyard	11,527	4,154	360
Seymour	13,260	4,555	344
Municipal Departments with the Lowest Rate of Traffic Stops			
Shelton	32,010	575	18
Weston	7,255	201	28
Granby	8,716	348	40
Wolcott	13,175	529	40
Avon	13,855	634	46

* The population 16 years of age and older was obtained from the United States Census Bureau 2010 Decennial Census.

Table 2.2 presents some basic demographic data on persons stopped in Connecticut between January 1, 2019 and December 31, 2019. Nearly two-thirds (62.4%) of drivers stopped were male and the vast majority of drivers (86%) were Connecticut residents. Of the stops conducted by police departments other than state police, 89% were Connecticut residents. Of the stops made by state police, 79% were Connecticut residents. About one-third (36%) of drivers stopped were under the age of 30 compared to 25% over 50. The vast majority of stops in Connecticut were White Non-Hispanic drivers (63.0%); 18.0% were Black Non-Hispanic drivers; 15.8% were Hispanic drivers; and 3.2% were Asian/Pacific Islander Non-Hispanic and American Indian/Alaskan Native Non-Hispanic drivers.

Table 2.2: Statewide Driver Characteristics

Race and Ethnicity		Gender		Residency		Age	
White	63.0%	Male	62.4%	CT Resident	86.4%	16 to 20	7.8%
						21 to 30	27.8%
Black	18.0%					31 to 40	22.2%
						41 to 50	17.1%
Hispanic	15.8%	Female	37.6%	Non-Resident	13.6%	51 to 60	14.6%
						Older than 61	10.4%
Other	3.2%						

Table 2.3 presents data on the characteristics of the traffic stops in the state. Most traffic stops were made for a violation of the motor vehicle laws (88%) as opposed to a stop made for an investigatory purpose or motorist assist. The most common violation drivers were stopped for was speeding (28%). After a driver was stopped, over 40% were given a ticket while most of the remaining drivers received some kind of a warning (51%). Statewide, less than 1 percent of traffic stops resulted in the arrest of a driver and only 3 percent of stops resulted in a search being conducted.

Table 2.3: Statewide Stop Characteristics

Classification of Stop		Basis for Stop	
Motor Vehicle Violation	88.0%	Speeding	28.0%
Equipment Violation	10.0%	Registration	10.8%
Investigatory	2.0%	Defective Lights	9.5%
Outcome of Stop		Cell Phone	7.9%
Uniform Arrest Report	0.8%	Misc. Moving Violation	7.7%
Misdemeanor Summons	5.4%	Stop Sign	7.6%
Infraction Ticket	40.9%	STC Violation	7.0%
Written Warning	13.9%	Traffic Control Signal	6.7%
Verbal Warning	37.6%	Display of Plates	3.2%
No Disposition	1.4%	Seatbelt	2.7%
Vehicles Searched	3.2%	All Other	8.9%

In addition to the difference in the volume of traffic stops across communities, agencies stopped drivers for a number of different reasons. Police record the statutory reason for stopping a motor vehicle for every stop. Those statutes are then sorted into 15 categories from speeding to registration violation to stop sign violation. For example, all statutory violations that are speed related are categorized as speeding. Although speeding is the most often cited reason for stopping a motor vehicle statewide, the results vary by jurisdiction.

The average municipal police department stops for speeding violations was 29% compared to the state police average of 32%. Due to the nature of state police highway operations, it is reasonable that its average for speeding is higher. In Middlebury, Portland, Suffield, Redding, Ledyard, Thomaston, Waterford, Guilford, Ridgefield, Easton, and Enfield, more than 50% of the traffic stops were for speeding violations. On the other hand, Wester Connecticut State University, Eastern Connecticut State University, Yale University, and the State Capitol Police stopped drivers for speeding less than 5% of the time. These four special police agencies have limited jurisdiction and it is reasonable that they are not stopping a high percentage of drivers for speeding violations. Table 2.4 shows the top 10 departments where speeding (as a percentage of all stops) was the most common reason for the traffic stop. All department results are contained in the Table B.2 of Appendix B.

Table 2.4: Highest Speeding Stop Rates across All Departments

Department Name	Total Stops	Speeding Violations
Middlebury	927	68.4%
Portland	622	65.8%
Suffield	596	60.4%
Redding	1,219	57.3%
Ledyard	4,154	56.8%
Thomaston	1,669	54.8%
Waterford	6,535	52.6%
Guilford	1,473	52.1%
Ridgefield	4,737	51.7%
Easton	1,667	51.1%

Registration violations have been cited as a low discretion reason for stopping a motor vehicle, particularly due to the increased use of license plate readers to detect registration violations. Statewide, 10.8% of all traffic stops are for a registration violation. Table 2.5 presents the top 10 departments with the highest percentage of stops for registration violations. All department results are contained in the Table B.3 of Appendix B.

Table 2.5: Highest Registration Violation Rates across All Departments

Department Name	Total Stops	Registration Violations
Shelton	575	36.3%
Woodbridge	2,398	35.0%
Southern CT State University	259	33.2%
North Haven	3,506	27.3%
Newington	4,264	25.3%
Farmington	2,969	22.9%
Troop G	16,612	22.8%
Central CT State University	1,563	22.6%
Troop A	16,934	22.3%
West Hartford	7,925	21.3%

The Connecticut Department of Transportation and the National Highway Safety Administration work together every year to fund a variety of different driver safety campaigns. Some of the campaigns that we are most familiar with include: “Click it or Ticket,” “Drive Sober or get Pulled Over,” and “Move Over.” Each year law enforcement agencies receive federal grants to fund targeted traffic safety campaigns. Over the past few years there has been an increase in federal funding for distracted driver campaigns. This past year, Connecticut continued to see a significant number of traffic stops for distracted driving. Stops as the result of a cell phone violation are the fourth most common reason for stopping a driver. Statewide, 8% of all stops were the result of a cell phone violation and this rate varies across departments. Table 2.6 presents the top 10 departments with the highest percentage of stops for cell phone violations. All department results are contained in the Table B.4 of Appendix B.

Table 2.6: Highest Cell Phone Violation Rates across All Departments

Department Name	Total Stops	Cell Phone Violations
Danbury	6,357	30.1%
Brookfield	1,777	26.4%
Hamden	5,109	25.9%
Putnam	1,324	24.8%
Plymouth	1,745	23.4%
Stamford	10,191	22.2%
Glastonbury	3,886	19.7%
Groton City	1,432	18.4%
Canton	1,017	18.4%
Darien	3,552	18.0%

Some Connecticut residents have expressed concern about the stops made for violations that are perceived as more discretionary in nature; therefore, potentially making the driver more susceptible to possible police bias. Those stops are typically referred to as pretext stops and might include stops for defective lights, excessive window tint, or a display of plate violation each of which, though a possible violation of state law, leaves the police officer with considerable discretion with respect to actually making the stop. A statewide combined average for stopping drivers for any of these violations is 14.3%. Fifty-six municipal police departments exceeded that statewide average. The departments with the highest percentage of stops conducted for these violations are State Capitol Police (43.5%), Torrington (38.0%), Clinton (36.9%), Plainfield (30.6%), and West Haven (28.9%).

In communities with a larger proportion of stops due to these violations, it is recommended that the departments be proactive in discussing the reasons for these stops with members of the community and examine for themselves whether or not such stops produce disparate enforcement patterns.

Many have argued that it is difficult for police to determine the defining characteristics about a driver prior to stopping and approaching the vehicle. Similar to variations found across departments for the reason for the traffic stop, there are variations that occur with the outcome of the stop. These variations illustrate the influence that local police departments have on the enforcement of state traffic laws. Some communities may view infraction tickets as the best method to increase traffic safety, while others may consider warnings to be more effective. This analysis should help police departments and local communities understand their level and type of traffic enforcement when compared to other communities.

Less than half (41%) of drivers stopped in Connecticut received an infraction ticket, while 51% received either a written or verbal warning. Individual jurisdictions varied in their post-stop enforcement actions. Danbury issued infraction tickets in 63% of all traffic stops, which is the highest in the state. Thomaston only issued infraction tickets in 4.3% of all traffic stops, which is the lowest rate in the state. For state police, officers not assigned to a troop issued the highest infractions (89%) and Troop L issued the lowest number of infractions (46%). Table 2.7 presents the highest infraction rates across all departments. All department results are contained in the Table B.5 of Appendix B.

Table 2.7: Highest Infraction Rates across All Departments

Department Name	Total Stops	Infraction Ticket
Highest Municipal Departments		
Danbury	6,357	63.3%
Hamden	5,109	51.6%
Norwalk	6,316	48.7%
Waterbury	5,805	48.6%
Fairfield	7,952	47.8%
Groton Long Point	51	47.1%
Hartford	18,195	46.2%
Woodbridge	2,398	45.8%
East Hartford	4,585	45.2%
Branford	3,362	45.1%
Highest State Police Troops		
CSP Headquarters	16,343	89.2%
Troop G	16,612	70.4%
Troop H	13,598	69.7%
Troop F	14,325	69.6%
Troop D	9,274	69.2%

On the other hand, Thomaston issued warnings 91% of the time (the highest rate) and Danbury issued warnings 33% of the time (the lowest rate). For state police, Troop L issued the highest percentage of warnings (45%) and the group of officers not assigned to a troop issued the lowest percentage of warnings (7.8%). Table 2.8 presents the highest warning rates across all departments. All department results are contained in the Table B.6 of Appendix B.

Table 2.8: Highest Warning Rates across All Departments

Department Name	Total Stops	Resulted in Warning
Highest Municipal Departments		
Thomaston	1,669	91.4%
Weston	201	89.6%
Seymour	4,555	89.2%
Plainfield	1,524	88.8%
Putnam	1,324	88.7%
Simsbury	4,199	88.1%
Redding	1,219	87.9%
Torrington	6,118	86.1%
Windsor	14,846	84.7%
Winsted	1,439	84.6%
Highest State Police Troops		
Troop L	8,860	44.6%
Troop B	5,395	39.7%
Troop K	12,777	32.4%
Troop A	16,934	31.6%
Troop E	15,105	29.6%

Statewide, less than 1% of all traffic stops resulted in the driver being arrested. As with infraction tickets and warnings, municipal departments varied in the percentage of arrests associated with

traffic stops. The Groton Town Police Department issued the most uniform arrest reports from a traffic stop, with 4.2% of all stops resulting in an arrest. Willimantic and Naugatuck also arrested more than 3% of all drivers stopped. The variation in arrest rates for state police is much smaller across troop levels. Table 2.9 presents the highest arrest rates across all departments. All department results are contained in the Table B.7 of Appendix B.

Table 2.9: Highest Arrest Rates across All Departments

Department Name	Total Stops	Arrests
Groton Town	5,562	4.2%
Naugatuck	5,084	3.2%
Willimantic	2,609	3.0%
Waterbury	5,805	2.9%
Vernon	3,455	2.7%
Plymouth	1,745	2.6%
West Hartford	7,925	2.4%
East Haven	2,137	2.3%
Clinton	1,976	2.3%
Bridgeport	6,490	2.2%

Rarely do traffic stops in Connecticut result in a vehicle being searched. During the study period, only 3.2% of all traffic stops resulted in a search. Although searches are rare in Connecticut, they do vary across jurisdictions and the data provides information about enforcement activity throughout the state. When they search a vehicle, officers must report the supporting legal authority, and whether contraband was found. Forty-one departments exceeded the statewide average for searches, but the largest disparity was found in Stratford (19.0%), Waterbury (18.8%), Yale University (13.5%), and Vernon (13.4%). Of the remaining departments, 20 searched vehicles more than 5% of the time, 17 searched vehicles between 3.2 % and 5% of the time, and the remaining departments searched vehicles less than 3.2% of the time. No State Police Troops exceeded the statewide average for stops resulting in a search. Table 10 presents the highest search rates across all departments. All department results are contained in the Table B.8 of Appendix B.

Table 2.10: Highest Searches Rates across All Departments

Department Name	Total Stops	Resulted in Search
Highest Municipal Departments		
Stratford	2,285	19.0%
Waterbury	5,805	18.8%
Yale University	473	13.5%
Vernon	3,455	13.4%
Derby	1,127	12.7%
Naugatuck	5,084	10.6%
Clinton	1,976	10.2%
Middletown	2,887	9.8%
Norwich	3,704	9.7%
Bridgeport	6,490	9.4%

III: ANALYSIS OF TRAFFIC STOPS, VEIL OF DARKNESS

The Veil of Darkness analysis relies on seasonal variation in the timing off sunset to test for evidence of racial and ethnic disparities in police traffic stops. The test operates under the key assumption that police officers are marginally better able to observe the race and ethnicity of motorists during daylight relative to darkness (Grogger and Ridgeway 2006; Ridgeway 2009; Horace and Rohlin 2018; Kalinowski et al. 2017, 2019a, 2019b).[4] The test relies on seasonal variation in the timing of sunset as well as the discrete daylight savings time shift to compare stops made at the same time in darkness versus daylight. The advantage of this methodology, relative to population-based benchmarks, is that it does not require any assumptions about the underlying risk-set of motorists on the roadway. Rather, the test presumes that the composition of motorists does not vary in response to changes to visibility.[5] Within a fixed window when the timing of sunset varies throughout the year, the racial composition of stops in darkness is used as a counterfactual for stops in daylight, i.e. when officers can better observe the race of the motorist.

More specifically, the Veil of Darkness test evaluates whether statistically significant disparities exist in the likelihood that a stopped motorist is a minority during daylight relative to darkness. As detailed explicitly in Appendix A.2, Grogger and Ridgeway (2006) illustrate that under certain conditions the odds-ratio of a stopped motorist being a minority in daylight vs. darkness is equivalent to the odds-ratio that a minority motorist is stopped during daylight vs. darkness. In a practical context, these assumptions are that variation in travel and enforcement patterns (abject of discrimination) do not change differentially by race in response to daylight. To ensure that these conditions are met, the estimates condition on time and day of the week. To further control for inherent differences in daylight and darkness, the sample is restricted to the inter-twilight window, a period of time during the day when solar visibility varies throughout the year (i.e. between the earliest eastern sunset and the latest western end to civil twilight). Conveniently, this window of time falls within the evening commute where we might expect the risk-set of motorists to be less susceptible to seasonal variation.

III.A: AGGREGATE ANALYSIS WITH VEIL OF DARKNESS, 2019 AND 2017-19

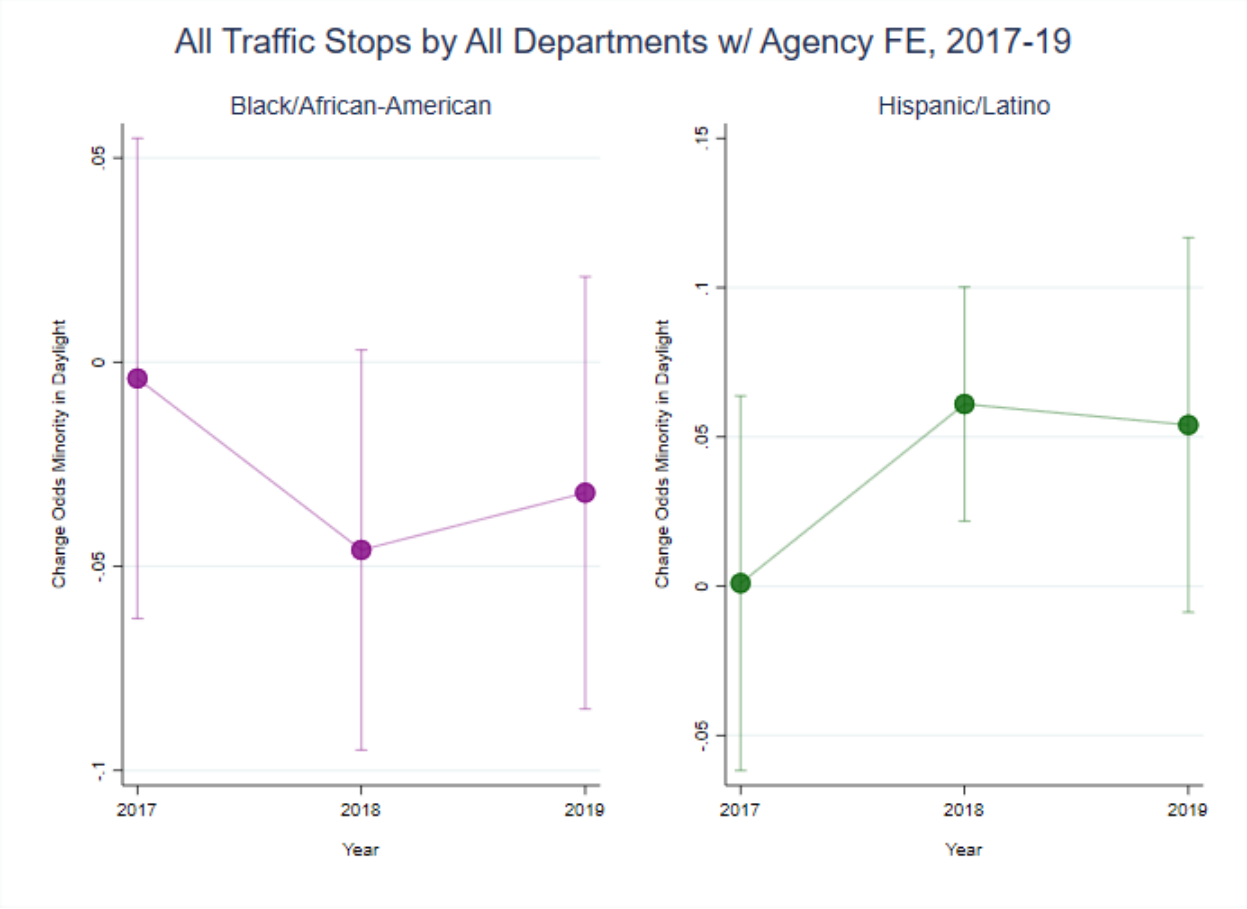
Figure 3.1 presents the results from applying the veil of darkness test to the aggregate sample of traffic stops made within the inter-twilight sample in Connecticut in 2017, 2018, and 2019. The vertical axis on the figure plots a 95% confidence interval around the coefficient estimate of a logistic regression of motorist race/ethnicity on daylight and includes controls for time of day, day of week, and department. The figure plots the estimated change in the odds that a Black (left panel) or Hispanic (right panel) motorist is stopped in daylight relative to darkness. Under the assumptions of this test, an increase in the odds that a minority motorist is represented in the traffic stop data during

[4] Applications of the so-called "Veil of Darkness" method include: Grogger and Ridgeway (2006) in Oakland, CA; Ridgeway (2009) in Cincinnati, OH; Ritter and Bael (2009) and Ritter (2017) in Minneapolis, MN; Worden et al. (2010; 2012) in Syracuse, NY while Horace and Rohlin (2016) in Syracuse, NY; Renauer et al. (2009) in Portland, OR; Taniguchi et al. (2016a, 2016b, 2016c, 2016d) in Durham, Greensboro, Raleigh, and Fayetteville; Masher (2016) in New Orleans, LA; Chanin et al. (2016) in San Diego, CA; Ross et al. (2015; 2016; 2017a; 2017b) in Connecticut and Connecticut; Criminal Justice Policy Research Institute (2017) in Corvallis PD, OR; Milyo (2017) in Columbia, MO; Smith et al. (2017) in San Jose, CA; and Wallace et al. (2017) in Maricopa, AZ.

[5] Note that this assumption allows for differential rates of traffic stops to exist across races and the potential for differences in guilt and driving behavior.

daylight is suggestive of potential adverse treatment on the part of police. Across the period 2017-19, the likelihood a stopped motorist was Black or Hispanic within the inter-twilight window averaged 17.16 and 14.95 percent respectively as compared to 66.43 percent non-Hispanic Caucasian. Exponentiating the coefficient estimates from below, we find that the annual estimated change in the odds a Black or Hispanic motorist is stopped in daylight relative to darkness ranged from a factor of 0.96 to 1.00 and 1.00 to 1.06 respectively. With the exception of the result for Hispanic motorists in 2018, the results show little evidence of a statistically significant disparity. According to this test, on average, there are no measurable differences in the likelihood a minority motorist is stopped by Connecticut police during daylight relative to darkness.

Figure 3.1: Aggregate VOD Analysis by Year, All Traffic Stops 2017-19



Notes: Coefficient estimates are obtained from Table 3.1 of the 2017 and 2018 annual report as well as the 2019 estimates from the table below.

Table 3.1 presents the comprehensive set of results from the 2019 veil of darkness test applied to the aggregate sample of traffic stops made by all Connecticut police departments within the inter-twilight window. The results were obtained by estimating Equation 4 of Appendix A.2 with the standard errors clustered by department. The estimates include controls for the hour, day of week, and department. The estimates rely on four minority definitions which are not mutually exclusive, e.g. the first specification includes all non-Caucasian motorists (regardless of ethnicity) while the third includes all Hispanic motorists (regardless of race). The second specification is restricted to only Black motorists (regardless of ethnicity, i.e. a subset of the first specification) and the fourth

specification which includes both Black and Hispanic motorists (i.e. combines the second and third specifications). The omitted control group across all specifications include only stops made of motorists who were observed to be Caucasian and non-Hispanics. Note that the results for the Black and Hispanic alone categories are also portrayed graphically in Figure 3.1.

The coefficient estimates for all categories in Table 3.1 are relatively inconsistent in terms of sign and statistical significance across specifications. Under the identifying assumptions of this test, see Appendix A.2, we should expect that there will be a direct correspondence between changes to the odds for stopped motorists and that of motorists at risk of being stopped. Thus, a positive change in the odds that a minority motorist is stopped during daylight is indicative of discrimination under the premise that all else is held fixed and the only thing changing is the officer's ability to perceive race. In the aggregate, the results below do not consistently show any disparity in terms of the likelihood that minority motorists are stopped by Connecticut police as a whole in daylight relative to darkness. As noted before, these estimates represent an aggregate statewide estimate across all departments and State Police troops in the state.

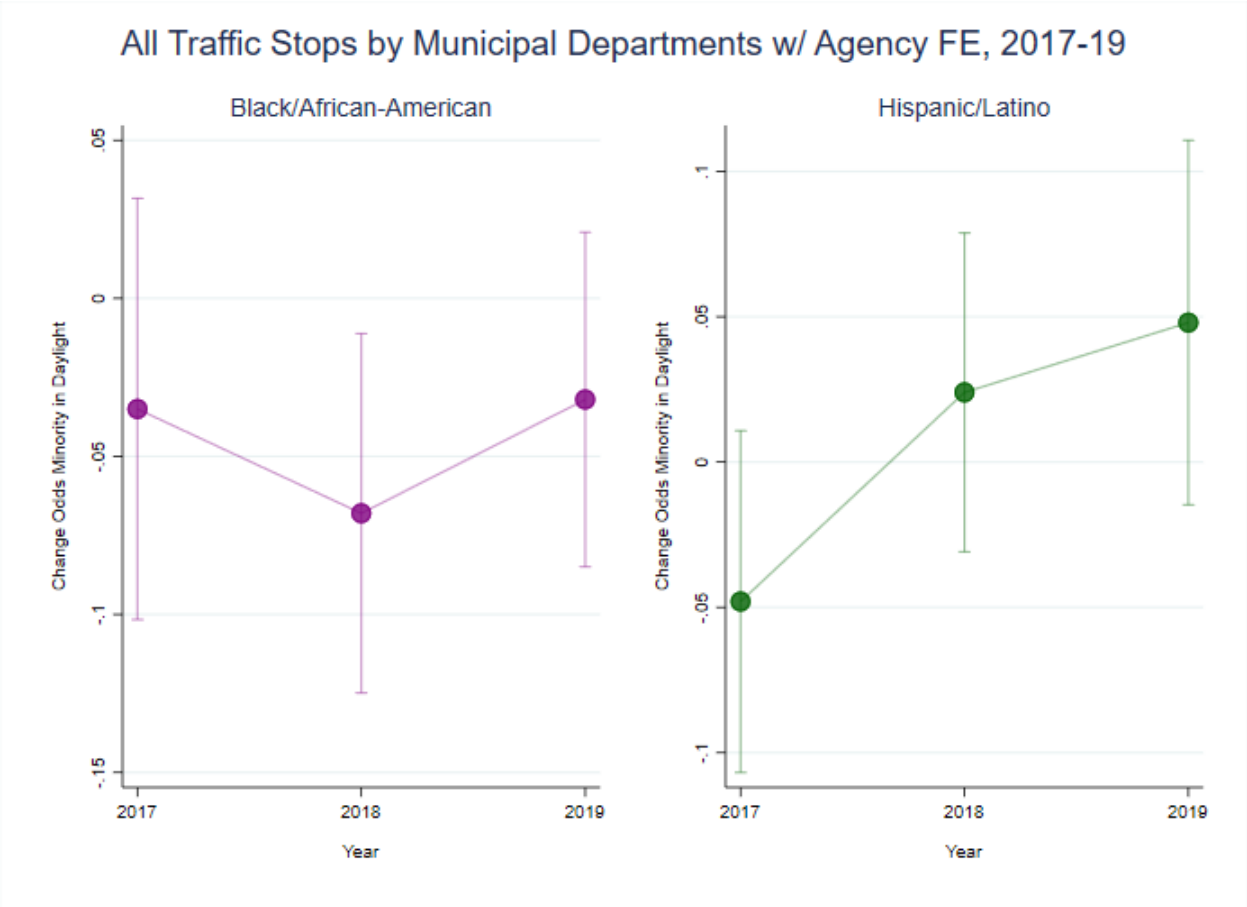
Table 3.1: Logistic Regression of Race/Ethnicity on Daylight with Department Fixed-Effects, All Traffic Stops 2019

LHS: Minority Status		Non-Caucasian	Black	Hispanic	Black or Hispanic
Daylight	Coefficient	-0.046*	-0.032	0.054*	0.010
	Standard Error	(0.026)	(0.027)	(0.032)	(0.026)
Sample Size		104,192	100,098	96,880	118,969
Pseudo R^2		0.151	0.184	0.115	0.150

Note 1: The coefficients are presented as log odds-ratios along with standard errors clustered at the department level. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance.
Note 2: All specifications include controls for time of the day, day of the week, analysis year, and department fixed-effects.
Note 3: Sample includes all traffic stops made during the inter-twilight window in 2019.

Figure 3.2 presents the results from the veil of darkness test applied to the combined sample of municipal departments from 2017, 2018, and 2019. As before, the vertical axis on the figure plots a 95% confidence interval around the coefficient estimate of a logistic regression of motorist race/ethnicity on daylight and controls for time of day, day of week, and department. A positive coefficient represents an increase in the odds a minority motorist was represented in the traffic stop data during daylight which is suggestive of potential adverse treatment on the part of police. Across the period 2017-19, the likelihood a stopped motorist was Black or Hispanic within the inter-twilight window averaged 17.31 and 15.08 percent respectively as compared to 65.98 percent non-Hispanic Caucasian. Exponentiating the coefficient estimates from below, we find that the annual estimated change in the odds a Black motorist is stopped in daylight ranged from a factor of 0.93 to 0.97. The difference in the likelihood of being stopped was negative and marginally statistically significant in 2018 but imprecisely estimated in both 2017 and 2019. The change in the odds a Hispanic motorist is stopped in daylight relative to darkness ranged from a factor of 0.95 in 2017 to 1.05 in 2019 and were statistically insignificant in all years. According to this test, on average, there are no measurable differences in the likelihood a minority motorist is stopped by municipal police in Connecticut during daylight relative to darkness with the exception of Black motorists in 2018 which was negative.

Figure 3.2: Aggregate VOD Analysis by Year, Municipal Traffic Stops 2017-19



Notes: Coefficient estimates are obtained from Table 3.2 of the 2017 and 2018 annual report as well as the 2019 estimates from the table below.

Table 3.2 presents the full set of results estimated from the sample of all municipal police departments during the inter-twilight window in 2019. As discussed above with respect to Figure 3.2, we find very little evidence of a statistically significant disparity for minority motorists in the combined sample of municipal police departments. Under the identifying assumptions of this test, see Appendix A.2, we should expect that there will be a direct correspondence between changes to the odds for stopped motorists and that of motorists at risk of being stopped. Thus, a positive change in the odds that a minority motorist is stopped during daylight is indicative of discrimination. In the aggregate, the results below do not consistently show any disparity in terms of the likelihood that minority motorists are stopped by Connecticut municipal police during daylight relative to darkness.

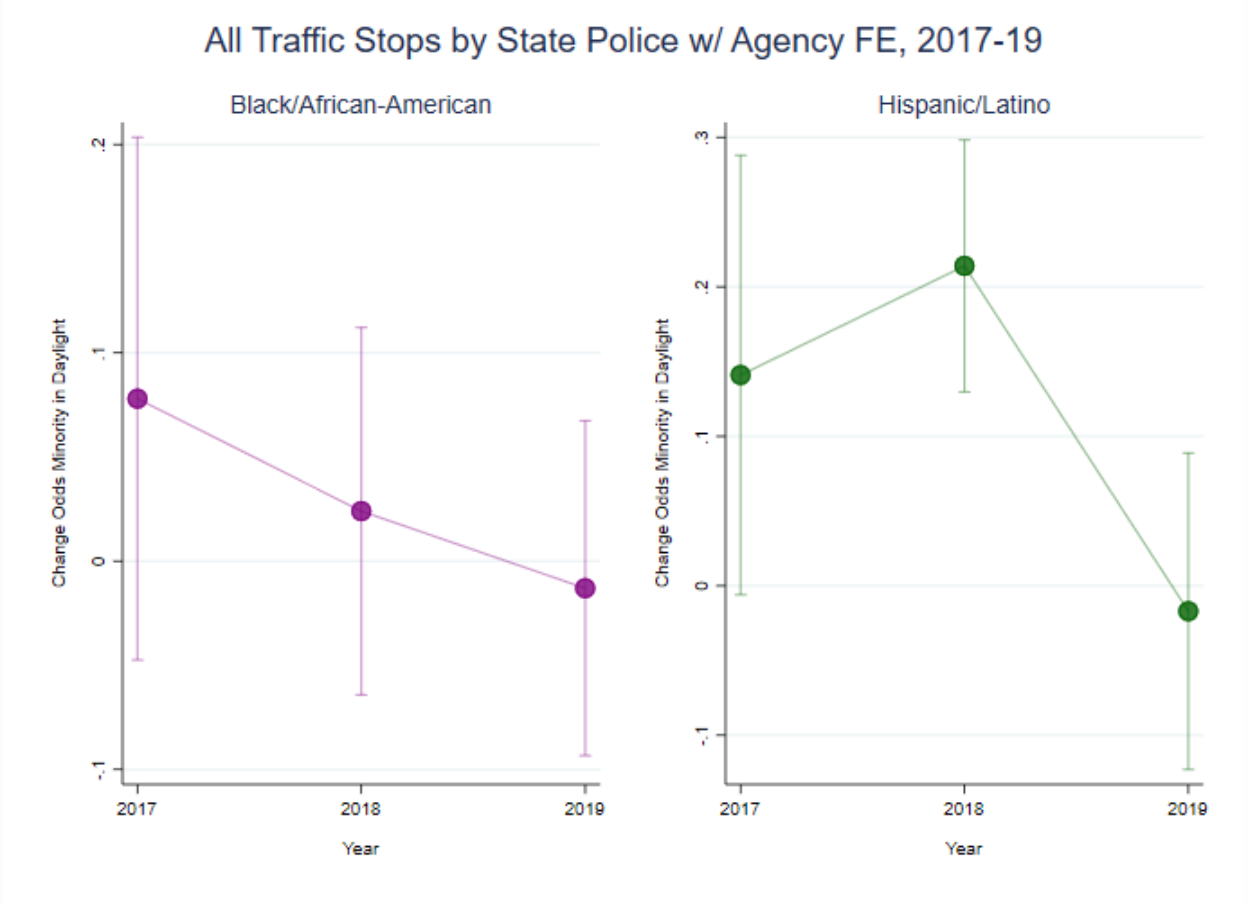
Table 3.2: Logistic Regression of Race/Ethnicity on Daylight, Municipal Traffic Stops 2019

LHS: Minority Status		Non-Caucasian	Black	Hispanic	Black or Hispanic
Daylight	Coefficient	-0.054**	-0.032	0.048	0.006
	Standard Error	(0.027)	(0.027)	(0.032)	(0.025)
Sample Size		74984	72356	68912	87042
Pseudo R^2		0.172	0.199	0.128	0.163

Note 1: The coefficients are presented as log odds-ratios along with standard errors clustered at the department level. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance.
Note 2: All specifications include controls for time of the day, day of the week, analysis year, and department fixed-effects.
Note 3: Sample includes all traffic stops made during the inter-twilight window in 2019.

Figure 3.3 presents the results from the veil of darkness test applied to the combined sample of State Police troops from 2017, 2018, and 2019. As before, the vertical axis on the figure plots a 95% confidence interval around the coefficient estimate of a logistic regression of motorist race/ethnicity on daylight and controls for time of day, day of week, and department. A positive coefficient represents an increase in the odds a minority motorist was represented in the traffic stop data during daylight which is suggestive of potential adverse treatment on the part of police. Across the period 2017-19, the likelihood a stopped motorist was Black or Hispanic within the inter-twilight window averaged 16.79 and 14.86 percent respectively as compared to 65.56 percent non-Hispanic Caucasian. Exponentiating the coefficient estimates from below, we find that the annual estimated change in the odds a Black motorist is stopped in daylight ranged from a factor of 1.08 in 2017 to only 0.99 in 2019. These differences were statistically insignificant in all years. The change in the odds a Hispanic motorist is stopped in daylight relative to darkness ranged from a factor of 1.15 in 2017 to 0.98 in 2019. The difference in the likelihood of being stopped was positive and statistically significant in 2018 but imprecisely estimated in both 2017 and 2019. According to this test, on average, there are no measurable differences in the likelihood a minority motorist is stopped by State Police in Connecticut during daylight relative to darkness with the exception of 2018 for Hispanic.

Figure 3.3: Aggregate VOD Analysis by Year, State Police Traffic Stops 2017-19



Notes: Coefficient estimates are obtained from Table 3.3 of the 2017 and 2018 annual report as well as the 2019 estimates from the table below.

Table 3.3 presents the full set of results estimated from the sample of all State Police troops during the inter-twilight window in 2019. As discussed above with respect to Figure 3.3, we find no evidence of a statistically significant disparity against minority motorists in the combined sample of Connecticut State Police. Under the identifying assumptions of this test, see Appendix A.2, we should expect that there will be a direct correspondence between changes to the odds for stopped motorists and that of motorists at risk of being stopped. Thus, a positive change in the odds that a minority motorist is stopped during daylight is indicative of discrimination. In the aggregate, the results below do not consistently show any disparity in terms of the likelihood that minority motorists are stopped by Connecticut State Police during daylight relative to darkness.

Table 3.3: Logistic Regression of Race/Ethnicity on Daylight, State Police Traffic Stops 2019

LHS: Minority Status		Non-Caucasian	Black	Hispanic	Black or Hispanic
Daylight	Coefficient	-0.013	-0.017	0.087	0.041
	Standard Error	(0.041)	(0.054)	(0.057)	(0.048)
Sample Size		28,137	26,762	27,067	30,756
Pseudo R^2		0.059	0.078	0.064	0.078

Note 1: The coefficients are presented as log odds-ratios along with standard errors clustered at the department level. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance.
Note 2: All specifications include controls for time of the day, day of the week, analysis year, and department fixed-effects.
Note 3: Sample includes all traffic stops made during the inter-twilight window in 2019.

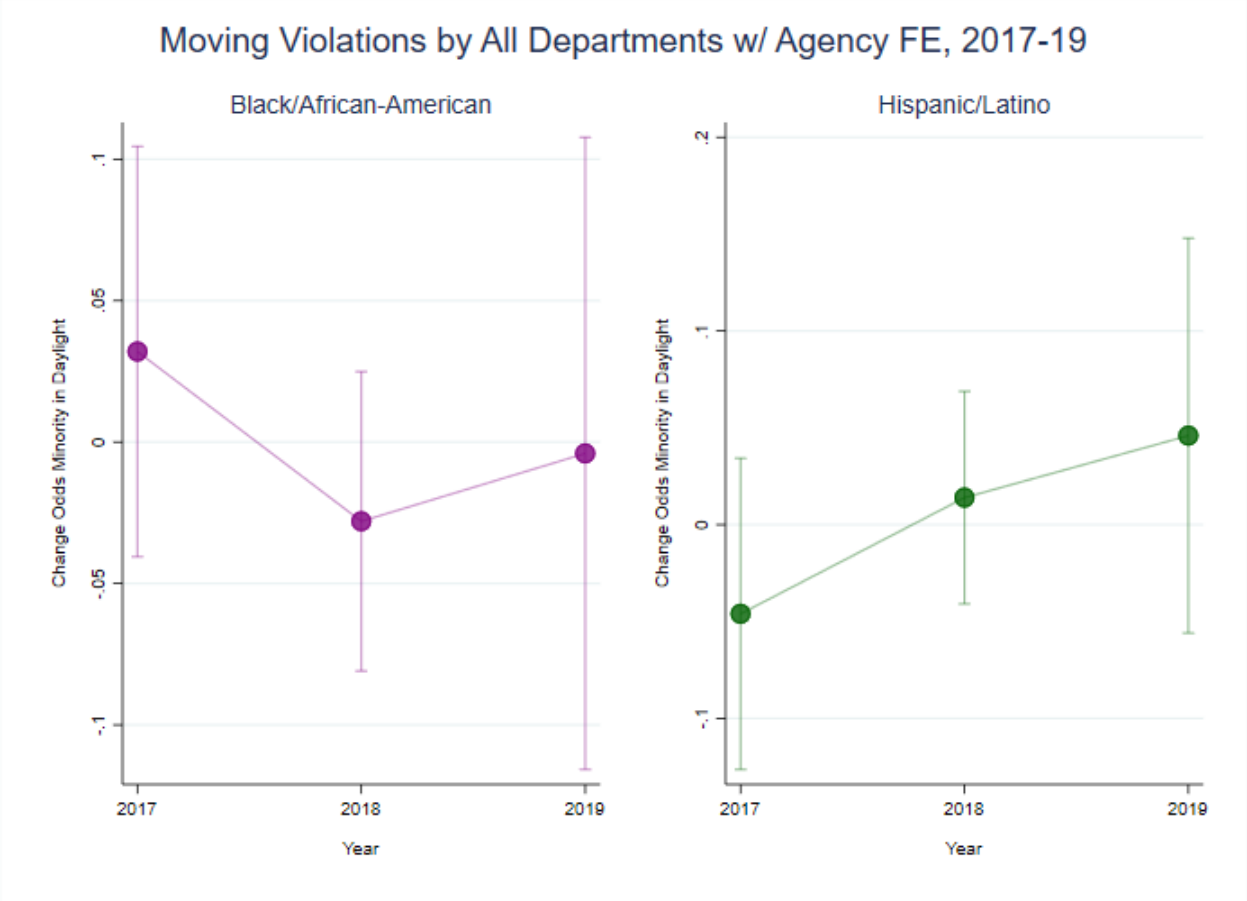
As mentioned, the prior set of results aggregate all traffic stops across multiple departments and should be considered an average treatment effect estimated from quasi-random variation in the timing of sunset. Although the results from this section indicate a statistically significant disparity in the rate of minority traffic stops, they do not identify the specific underlying department(s) that are potentially driving the disparity. Note that the findings of this test pertain exclusively to the inter-twilight window and cannot be generalized to other times of the day when different officers might be on duty or different enforcement activities are taking place. The results of a department-level analysis are presented in a later section and allow us to better identify specific sources of the overall disparity identified in this section. The next section provides an additional set of robustness checks using a select sample of moving violations. As will be discussed subsequently, these robustness checks are necessary because certain types of violations (e.g. headlight, seatbelt, and cell phone) may be correlated with daylight/darkness and race/ethnicity. As a result of the strong possibility that this correlation exists in the data and including these types of stops could potentially bias the coefficient estimates towards zero. Thus, including these stops would make it less likely that we would detect discrimination even when it exists.

III.B: AGGREGATE ROBUSTNESS CHECKS WITH VEIL OF DARKNESS, 2019 AND 2017-19

This section presents a robustness check on the initial specification using a more restrictive subsample of only moving violations. As mentioned, an analysis using all violations is potentially biased against finding discrimination because specific types of violations are likely to be correlated with daylight/darkness and race/ethnicity. For example, imagine that minority motorists are more likely to have a broken headlight and that these violations are only observable and enforced by police during darkness. In that instance, comingling equipment violations with moving violations might make it likely that more minorities are stopped at night relative to a sample of only moving violations. Thus, these types of violations might have a large enough effect to bias the test statistic towards zero even in the presence of discrimination. In contrast, one might also imagine that cellphone and seatbelt violations have the potential to bias the results upward if they are only observable to police in daylight and also correlated with race/ethnicity. Since both scenarios seem reasonable and the net-effect of the two sources of bias is impossible to quantify, a natural robustness check on our initial findings is to simply limit the estimation sample to only moving violations.

Figure 3.4 presents the results from the veil of darkness test applied to the subsample of moving violation made by all policing agencies within the inter-twilight window from the last three annual reports in 2017, 2018, and 2019. As before, the vertical axis on the figure plots a 95% confidence interval around the coefficient estimate of a logistic regression of motorist race/ethnicity on daylight as well as controls for time of day, day of week, and department. A positive coefficient indicates an increase in the odds a minority motorist was represented in the traffic stop data during daylight which is suggestive of potential adverse treatment on the part of police. Across the period 2017-19, the likelihood a stopped motorist was Black or Hispanic within the inter-twilight window averaged 16.83 and 14.79 percent respectively as compared to 65.57 percent non-Hispanic Caucasian. Exponentiating the coefficient estimates from below, the annual estimated change in the odds a Black motorist is stopped in daylight ranged from a factor of 0.97 to 1.03 but was statistically insignificant in all years. The change in the odds a Hispanic motorist is stopped in daylight relative to darkness ranged from a factor of 0.96 to 1.05 but was statistically insignificant in all years. In the aggregate, the results below do not consistently show any disparity in terms of the likelihood that minority motorists are stopped by Connecticut police during daylight relative to darkness.

Figure 3.4: Aggregate VOD Analysis by Year, All Moving Violations 2017-19



Notes: Coefficient estimates are obtained from Table 3.4 of the 2017 and 2018 annual report as well as the 2019 estimates from the table below.

Table 3.4 presents the aggregate results estimated from the subsample of moving violations made by all departments during the inter-twilight window in 2019. As before, these results were estimated

with the standard errors clustered by department and include controls for the hour, day of the week, and department. Relative to Table 3.1, the results are significantly attenuated and statistically insignificant. In general, these results suggest that our prior set of results using the full sample were at least partially driven by a correlation between race, visibility, and specific types of enforcement. In the aggregate, the results below do not consistently show any disparity in terms of the likelihood that minority motorists are stopped by Connecticut police in daylight relative to darkness.

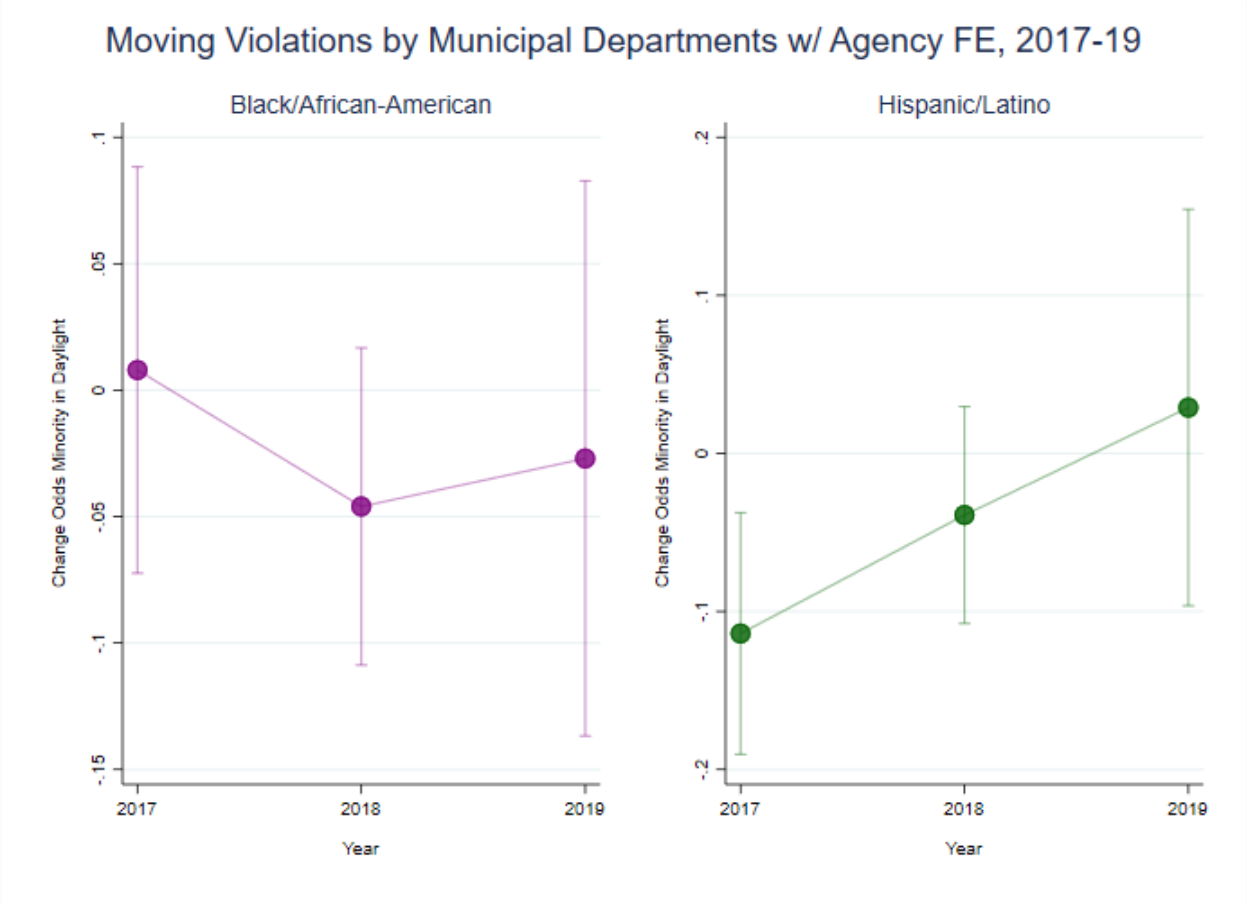
Table 3.4: Logistic Regression of Race/Ethnicity on Daylight with Department Fixed-Effects, All Moving Violations 2019

LHS: Minority Status		Non-Caucasian	Black	Hispanic	Black or Hispanic
Daylight	Coefficient	0.001	-0.004	0.046	0.027
	Standard Error	(0.054)	(0.057)	(0.052)	(0.050)
Sample Size		58,107	55,420	54,011	64,097
Pseudo R^2		0.143	0.182	0.104	0.145

Notes: The coefficients are presented as log odds-ratios along with standard errors clustered at the department level. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance. All specifications include controls for hour, day of the week, and department fixed effects. Sample includes all moving violations made during the inter-twilight window in 2019.

Figure 3.5 presents the results from the veil of darkness test applied to the subsample of moving violation made by municipal police departments within the inter-twilight window in 2017, 2018, and 2019. As before, the vertical axis on the figure plots a 95% confidence interval around the coefficient estimate of a logistic regression of motorist race/ethnicity on daylight as well as controls for time of day, day of week, and department. A positive coefficient indicates an increase in the odds a minority motorist was represented in the traffic stop data during daylight which is suggestive of potential adverse treatment on the part of police. Across the period 2017-19, the likelihood a stopped motorist was Black or Hispanic within the inter-twilight window averaged 16.96 and 14.90 percent respectively as compared to 65.38 percent non-Hispanic Caucasian. Exponentiating the coefficient estimates from below, we find that the annual estimated change in the odds a Black motorist is stopped in daylight ranged from a factor of 0.96 to 1.01 but these differences were statistically insignificant across all years. The change in the odds a Hispanic motorist is stopped in daylight relative to darkness ranged from a factor of 0.89 to 1.03 but was only statistically significant in 2017 but was also negative. In the aggregate, the results below do not consistently show any disparity in terms of the likelihood that minority motorists are stopped by municipal police in Connecticut during daylight relative to darkness.

Figure 3.5: Aggregate VOD Analysis by Year, Municipal Moving Violations 2017-19



Notes: Coefficient estimates are obtained from Table 3.5 of the 2017 and 2018 annual report as well as the 2019 estimates from the table below.

Table 3.5 presents the aggregate results estimated from the subsample of moving violations made by municipal police departments during the inter-twilight window in 2019. As before, these results were estimated with the standard errors clustered by the department and include controls for the hour, day of the week, and department. Relative to Table 3.2, the results are mildly attenuate and statistically insignificant. In general, these results suggest that our prior set of results were somewhat driven by a correlation between race, visibility, and specific types of enforcement. The results in both Table 3.2 and Table 3.5 do not consistently show any disparity in terms of the likelihood that minority motorists are stopped by municipal police in Connecticut during daylight relative to darkness.

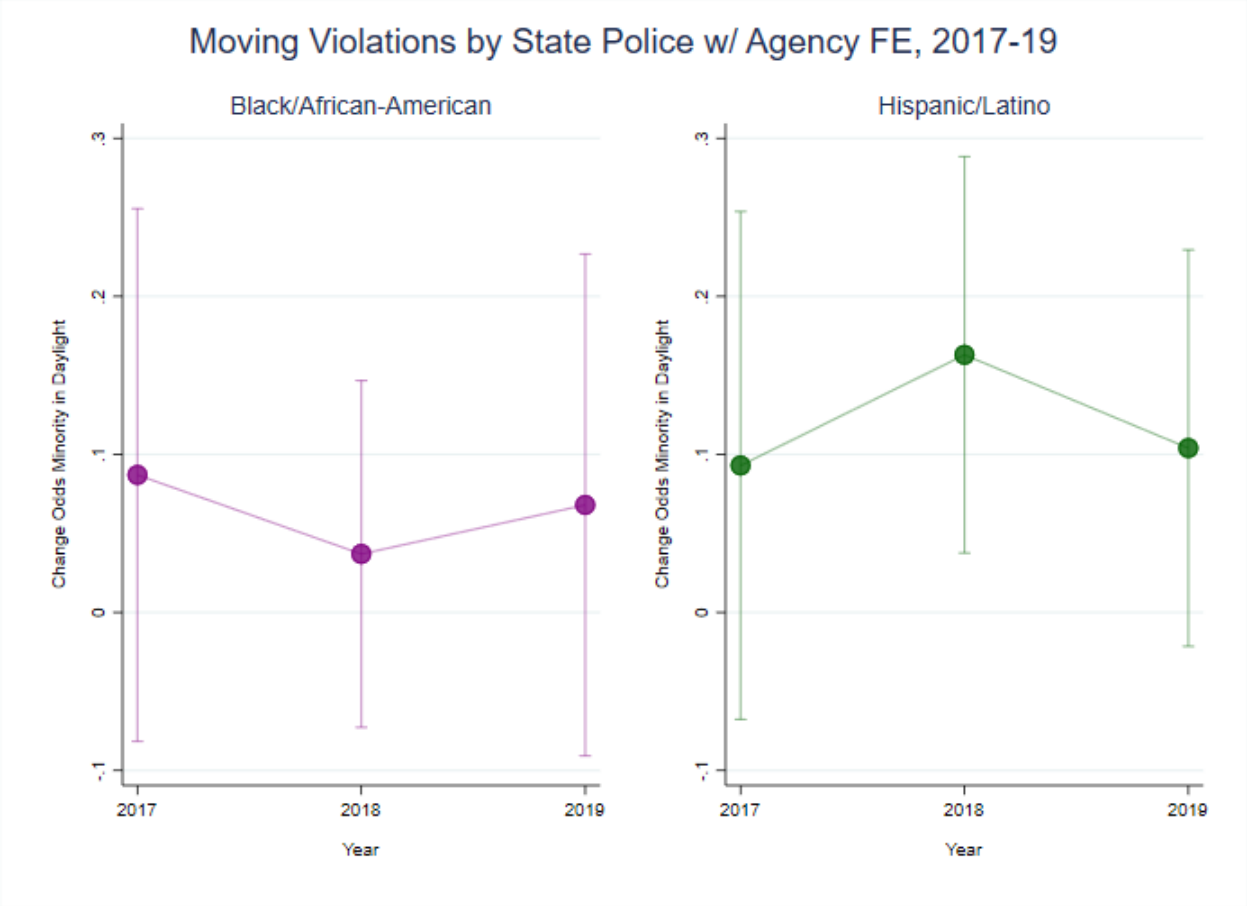
Table 3.5: Logistic Regression of Race/Ethnicity on Daylight, Municipal Moving Violations 2019

LHS: Minority Status		Non-Caucasian	Black	Hispanic	Black or Hispanic
Daylight	Coefficient	-0.030	-0.027	0.029	0.008
	Standard Error	(0.057)	(0.056)	(0.064)	(0.056)
Sample Size		40,512	38,844	37,429	45,378
Pseudo R^2		0.174	0.211	0.123	0.168

Notes: The coefficients are presented as log odds-ratios along with standard errors clustered at the department level. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance. All specifications include controls for hour, day of the week, and department fixed effects. Sample includes all moving violations made during the inter-twilight window in 2019.

Figure 3.6 presents the results from the veil of darkness test applied to the moving violation subsample of all State Police troops in 2017, 2018, and 2019. As before, the vertical axis on the figure plots a 95% confidence interval around the coefficient estimate of a logistic regression of motorist race/ethnicity on daylight as well as controls for time of day, day of week, and department. A positive coefficient indicates an increase in the odds a minority motorist was represented in the traffic stop data during daylight which is suggestive of potential adverse treatment on the part of police. Across the period 2017-19, the likelihood a stopped motorist was Black or Hispanic within the inter-twilight window averaged 16.83 and 14.88 percent respectively as compared to 65.51 percent non-Hispanic Caucasian. Exponentiating the coefficient estimates from below, we find that the annual estimated change in the odds a Black motorist is stopped in daylight ranged from a factor of 1.04 to 1.09 but statistically insignificant across the entire period. The change in the odds a Hispanic motorist is stopped in daylight relative to darkness ranged from a factor of 1.10 to 1.18 but was only statistically significant in 2018. In the aggregate, the results below do not consistently show any disparity in terms of the likelihood that minority motorists are stopped by Connecticut State Police during daylight relative to darkness.

Figure 3.6: Aggregate VOD Analysis by Year, State Police Moving Violations 2017-19



Notes: Coefficient estimates are obtained from Table 3.6 of the 2017 and 2018 annual report as well as the 2019 estimates from the table below.

Table 3.6 presents the results from the subsample of moving violations made by State Police during the inter-twilight window in 2019. As discussed above with respect to Figure 3.6, we find evidence of a statistically significant disparity for all minority groupings considered. Under the identifying assumptions of this test, see Appendix A.2, we should expect that there will be a direct correspondence between changes to the odds for stopped motorists and that of motorists at risk of being stopped. Thus, a positive change in the odds that a minority motorist is stopped during daylight is indicative of discrimination. In the aggregate sample of State Police moving violations, we find little evidence of a statistically significant disparity in the likelihood of a minority motorist being stopped in daylight relative to darkness.

Table 3.6: Logistic Regression of Race/Ethnicity on Daylight, State Police Moving Violations 2019

LHS: Minority Status		Non-Caucasian	Black	Hispanic	Black or Hispanic
Daylight	Coefficient	0.094*	0.068	0.104	0.087
	Standard Error	(0.057)	(0.081)	(0.064)	(0.056)
Sample Size		17110	16140	16199	18218
Pseudo R^2		0.048	0.063	0.048	0.059

Notes: The coefficients are presented as log odds-ratios along with standard errors clustered at the department level. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance rate greater than 10% All specifications include controls for hour, day of the week, and department fixed effects. Sample includes all moving violations made during the inter-twilight window in 2019.

Across Figures 3.1-3.6, it is clear that the disparity for both Black and Hispanic motorists is imprecisely estimated and close to zero in most of the recent years. Although restricting the sample to moving violations slightly attenuated the point estimates and further reduced estimation power, we found little evidence in this robustness check or the main estimates that minority motorists are treated differently on average by Connecticut police during daylight. However, these aggregate results are not necessarily representative of all individual policing agencies or officers within the state and should only be interpreted as an average estimate. In the preceding section, the test will be applied to both individual municipal departments and State Police troops.

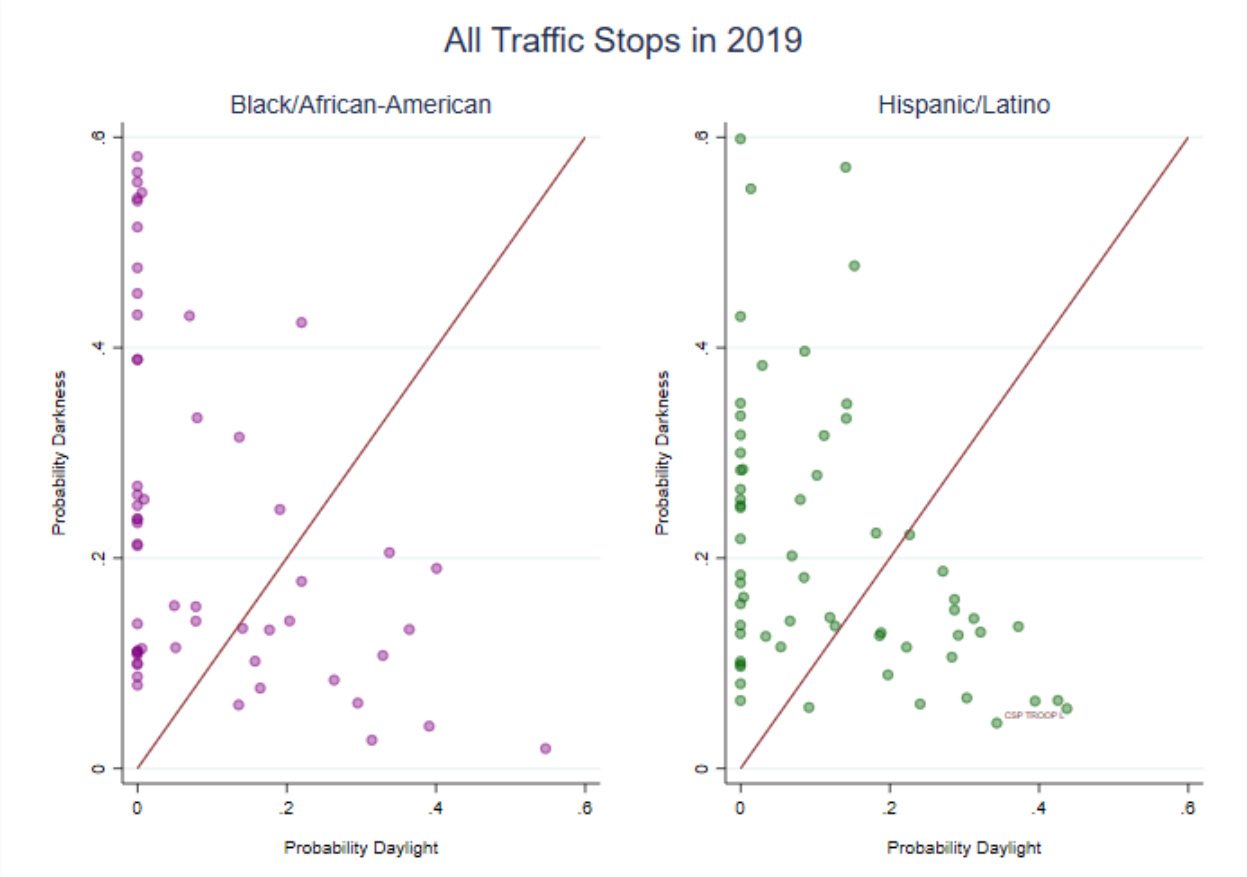
III.C: DEPARTMENT ANALYSIS WITH VEIL OF DARKNESS, 2019 AND 2017-19

The analysis presented at the state-level found little evidence that minority motorists are treated differently on average by Connecticut police during daylight relative to darkness. However, these aggregate results are not necessarily representative of all individual policing agencies. As noted in the introduction and detailed in Appendix A.2, we can assess departmental disparity by evaluating a change in the odds that a minority motorist is stopped in daylight relative to darkness under reasonable assumptions about the counterfactual. By construction, the aggregate analysis from Section III.A and III.B does not investigate the source of disparities in terms of specific municipal police departments or State Police troops. The analysis presented in this section seeks to test for disparities within each jurisdiction.

In this section, we graphically present estimate of the veil of darkness test (i.e. Equation 4 of Appendix A.2) separately for each municipal department and State Police troop. We first provide results for the 2019 sample of the data as we have done in the prior three reports. However, we also leverage the full three-year sample from 2017-19 and graphically present estimates of the effect of daylight for

smaller departments which previously had an insufficiently small sample to run the test annually. Although restricting the sample of stops to the inter-twilight window is necessary to mitigate the risk of violating the identifying assumptions of the veil of darkness test, it is a relatively onerous sample restriction and significantly reduces the estimation power in small samples. In the figures and discussion below, we highlight only the departments found to have a statistically significant disparity in the Black or Hispanic alone categories for either the 2019 or combined 2017-19 samples. The full results can be found in Table C.7 and C.9 of Appendix C. For both sets of estimates, we calculate robust standard errors and include a vector of controls for hour and day of the week. Identification requires that departments and State Police troops have a disparity that is statistically significant at or above the 95% level in either of the Hispanic or Black alone minority groups. Further, we only highlight departments that withstand the scrutiny of restricting the sample to only moving violations and that have a false discovery rate below 10% in both specifications. We provide the full set of results in Tables C.1 and C.3 and the moving violation robustness tests in C.2 and C.4 of Appendix C.

Figure 3.7: Veil of Darkness Analysis, All Departments 2019



Notes: Coefficient estimates are obtained from Table C.7 of Appendix C, exponentiated and converted into a probability, and then imposed on the likelihood a minority is stopped in darkness for each department. The change in the odds a minority motorist was represented in the traffic stop data is estimated with controls for hour and day of the week. Annotated departments include only those with a statistically significant disparity estimated with a confidence level at or exceeding the 95% in the combined sample of all traffic stops within the inter-twilight window as well as in a robustness check focusing on moving violations (Table C.8 of Appendix C). Identified departments also had a false discovery rate below 10% estimated following Simes (1986), Benjamini and Hochberg (1995), and Benjamini and Yekutieli (2001).

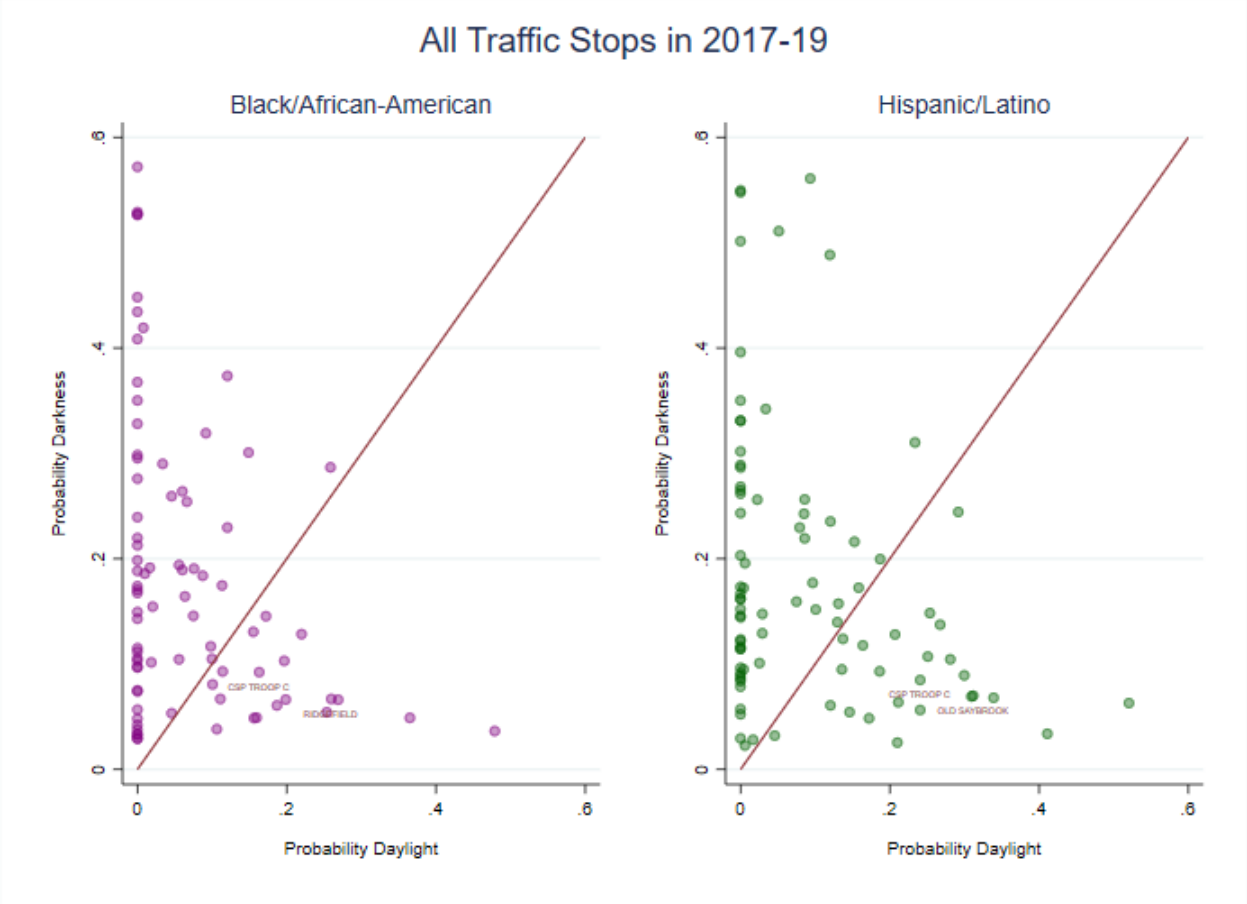
Figure 3.7 plots the probability a Black (left panel) or Hispanic (right panel) motorist is stopped relative to a non-Hispanic Caucasian motorist in daylight versus darkness by town in 2019. Individual points on the figure represent specific municipal departments and State Police troops. The vertical axis plots the probability a stopped motorist is a minority in darkness and the horizontal axis plots the same probability in daylight. For ease of presentation in the figure, we approximate the regression results by imposing the coefficient estimate of daylight from Table C.8 of Appendix C on the unadjusted odds a minority motorist is stopped in darkness during the inter-twilight window and convert everything to probabilities.[6] The red 45-degree line represents parity (equal treatment) between daylight and darkness amongst minorities and non-Hispanic Caucasians. Thus, only departments falling below this line (bottom right quadrant) are more likely to stop minority motorists during daylight when their race is more easily observed. We annotate only those departments where the difference is statistically significant at or above the 95% confidence level in the overall sample of traffic stops as well as the robustness test using only moving violations. In 2019, we only identify State Police Troop L as having a statistically significant disparity for Hispanic motorists. However, we note that Cheshire (Black and Hispanic) and Fairfield (Hispanic) show up as having statistically significant disparities but only in the robustness test where we restrict the sample to moving violations alone. As before, we note that the lack of statistical precision in the main estimates for these two towns may simply be due to a correlation between race, specific types of violations, and darkness/daylight.

In order to test for disparities in smaller departments where we are unable to precisely estimate the effect of daylight in the annual report due to an insufficiently small sample within the inter-twilight window, we leverage data from 2017-19. As with the previous figure, Figure 3.8 plots the probability a Black (left panel) or Hispanic (right panel) motorist is stopped relative to a non-Hispanic Caucasian motorist in daylight versus darkness by department in the 2017-19 sample. Individual points on the figure represent specific municipal departments and State Police troops. The vertical axis plots the probability a stopped motorist is a minority in darkness and the horizontal axis plots the same probability in daylight. For ease of presentation in the figure, we approximate the regression results by imposing the coefficient estimate of daylight from Table C.9 of Appendix C on the unadjusted odds a minority motorist is stopped in darkness during the inter-twilight window and convert everything to probabilities.[7] The red 45-degree line represents parity (equal treatment) between daylight and darkness amongst minorities and non-Hispanic Caucasians. Thus, only departments falling below this line (bottom right quadrant) are more likely to stop minority motorists during daylight when their race is more easily visible. We annotate only those departments where the difference is statistically significant at or above the 95% confidence level in the overall sample of traffic stops as well as the robustness test using only moving violations. Applying the test to the combined 2017-19 data, we find evidence of a statistically significant disparity in State Police Troop C (Black and Hispanic), Old Saybrook (Hispanic), and Ridgefield (Black). As with the 2019 sample, Cheshire (Black) and State Police Troop D (Black) appear but only in the results run on the subsample of moving violations.

[6] More specifically, the odds of a minority stop in darkness is the uncontrolled raw level rather than the regression adjusted level. We do this for simplicity and ease of exposition.

[7] More specifically, the odds of a minority stop in darkness is the uncontrolled raw level rather than the regression adjusted level. We do this for simplicity and ease of exposition.

Figure 3.8: Veil of Darkness Analysis, All Departments 2017-19



Notes: Coefficient estimates are obtained from Table C.7 of Appendix C, exponentiated and converted into a probability, and then imposed on the likelihood a minority is stopped in darkness for each department. The change in the odds a minority motorist was represented in the traffic stop data is estimated with controls for hour and day of the week. Annotated departments include only those with a statistically significant disparity estimated with a confidence level at or exceeding the 95% in the combined sample of all traffic stops within the inter-twilight window as well as in a robustness check focusing on moving violations (Table C.8 of Appendix C). Identified departments also had a false discovery rate below 10% estimated following Simes (1986), Benjamini and Hochberg (1995), and Benjamini and Yekutieli (2001).

In total, we identify one department in the 2019 sample and three departments in the 2017-19 sample. For these departments, we conclude that there is strong evidence that a disparity exists in the rate of minority traffic stops made during daylight conditions. These departments include State Police Troop L (Hispanic) for the 2019 sample and State Police Troop C (Black and Hispanic), Old Saybrook (Hispanic), and Ridgefield (Black) in the 2017-19 sample. We also found that Cheshire (Black and Hispanic), Fairfield (Hispanic), and State Police Troop D (Black) appeared but only in the estimates using the subsample of moving violations, not in the main estimate, from either the 2019 or 2017-19 data. We also note that all disparities identified in this section are limited to those occurring within a window of time during the evening commute when the timing of sunset varies throughout the year. Although it is impossible to link these observed disparities to racial profiling as the differences could be driven by policing policy or individual bad actors, these results provide strong evidence police in these areas are treating that minority motorists differently during daylight.

IV: ANALYSIS OF TRAFFIC STOPS, SYNTHETIC CONTROL

Traditional approaches that rely on population-based benchmarks to evaluate policing data must make a variety of very strong assumptions about the underlying risk-set of motorists. These approaches, despite their flaws, are intuitively appealing because they offer tangible easily interpreted measures of potential discrimination. This section presents the results of a synthetic control analysis that has the same intuition as traditional population-based benchmarks or relative rate/disparity indices but remains grounded in rigorous statistical theory. A synthetic control is a unique benchmark constructed for each department using various stop-specific and town-level demographic characteristics as captured through inverse propensity score weighting. The synthetic control is then used to assess the effect of treatment on an outcome variable(s), in this case the probability that a minority motorist is involved in a stop.[8]

Departments differ in terms of their enforcement activity (i.e. timing of stops and types of violations, etc.) and the underlying demographics of the population on the roadway. This analysis accounts for these differences by estimating a measure of similarity called a propensity score. Here, a propensity score is a measure of how similar a stop made outside a given department is to a stop made by the department being analyzed. These measures of similarity are used to weight stops when constructing an individual benchmark for each department. For example, if the department being analyzed has a high minority population and makes most of their stops on Friday nights at 7 PM for speeding violations then stops made for speeding by departments with a similar residential population at this time and day will be given more weight when constructing the benchmark. This methodology ensures that there is an apples-to-apples comparison between the number of minorities stopped in a given town relative to their benchmark and allows for the interpretation of any remaining differences to be attributed to possible disparate treatment.

Weighting the observations by the inverse of the propensity score ensures that the distribution of observable characteristics is consistent between the department of interest and the so-called "synthetic control". As long as these observed variables fully capture selection into treatment, inverse propensity score weighting allows for an unbiased estimate of the effect of treatment on the outcome of interest. In the present context, constructing a synthetic control using inverse propensity score weights allow for an assessment of whether specific departments are disproportionately stopping minority motorists. A detailed description of the mechanics underlining this methodology as well as the current application can be found in Appendix A.3. Generally speaking, the synthetic control approach follows a rich and extensive literature spanning the fields of statistics, economics, and public policy. The application of similar methodologies to policing data has recently entered the criminal justice literature through notable applications by McCaffrey et al. (2004), Ridgeway (2006), and Ridgeway and MacDonald (2009).

[8] In the methodological discussion here and in the appendix, the details of the estimation procedure are presented as if a single treatment effect were estimated using a single outcome variable. However, the estimates were constructed for each municipal department using four different outcome variables for the minority groupings used throughout the report

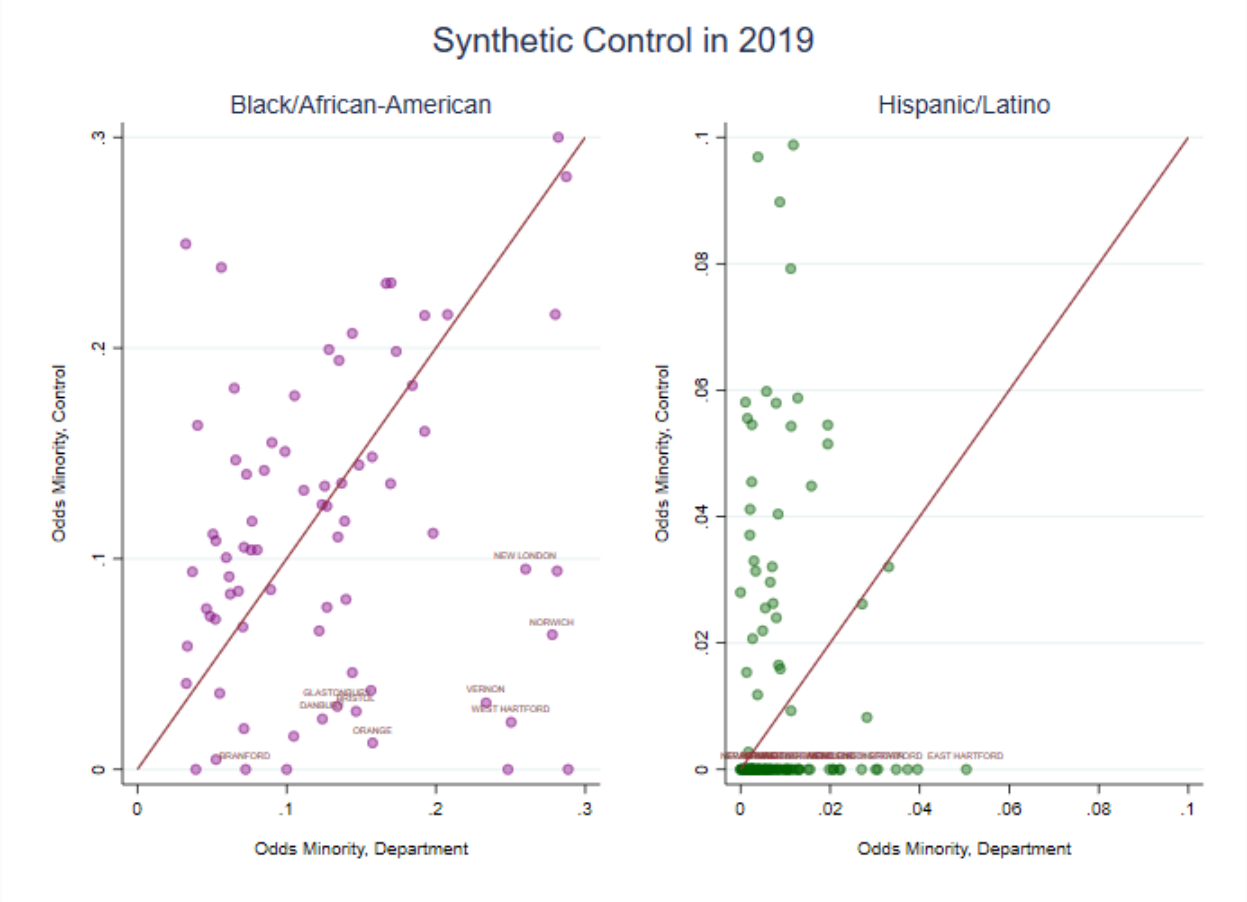
IV.A: AGGREGATE ANALYSIS WITH SYNTHETIC CONTROL, 2019 AND 2017-19

Each municipal police department was examined independently by weighting observations with inverse propensity scores estimated using Equation 7 of Appendix A.3. The variables used to estimate the propensity scores are detailed in Table A.2 (1) of Appendix A.3. Treatment effects were estimated using Equation 8 of Appendix A.3 for individual departments and State Police troops across four demographic subgroups relative to Caucasian non-Hispanics. As before, we identify all departments found to have a disparity that is statistically significant at the 95% level in either the Hispanic or Black alone minority group. In this section, we graphically present the results from the synthetic control analysis and annotate towns with a statistically significant disparity in the rate of Black or Hispanic stops. We first provide results for the 2019 sample of the data as we have done in the prior three reports. However, we also leverage the full three-year sample from 2017-19 and graphically present estimates for smaller departments which previously had an insufficiently small sample to run the test on an annual basis. In the figures and discussion below, we highlight only the departments found to have a statistically significant disparity in the Black or Hispanic alone categories for either the 2019 or combined 2017-19 samples. Identification requires that departments and State Police troops have a disparity that is statistically significant at or above the 95% level in either of the Hispanic or Black alone minority groups. Further, we only highlight departments that withstand more rigorous doubly-robust estimation and that have a false discovery rate below 10% in both specifications. We provide the full set of results in Tables D.1 and D.2 of Appendix D.

Figure 4.1 plots the odds a Black (left panel) or Hispanic (right panel) motorist is stopped relative to a non-Hispanic Caucasian motorist in the focal town versus a synthetic control in 2019. Individual points on the figure represent specific municipal departments and State Police troops. The vertical axis plots the odds a stopped motorist is a minority in the synthetic control and the horizontal axis plots the same odds for the focal department. For ease of presentation in the figure, we approximate the regression results by imposing the estimated difference from Table D.1 of Appendix D on the unadjusted odds a minority motorist is stopped in focal department such that we obtain an estimate of the odds for the control. The red 45-degree line represents parity (equal treatment) between the focal department and control amongst minorities and non-Hispanic Caucasians. Thus, only departments falling below this line (bottom right quadrant) are more likely to stop minority motorists relative to their synthetic control. We annotate only those departments where there is a more than one percentage point difference in the rate at which minority motorists and where this difference is statistically significant at or above the 95% confidence level.

Applying this test to the 2019 data, we identify the departments of Bethel (Hispanic), Branford (Black and Hispanic), Bristol (Black), Danbury (Black), East Hartford (Hispanic), Enfield (Hispanic), Glastonbury (Black), Hamden (Black), Meriden (Hispanic), New Britain (Hispanic), New Canaan (Hispanic), New Haven (Black), New London (Black and Hispanic), Newington (Hispanic), Norwich (Black and Hispanic), Orange (Black), Stratford (Black and Hispanic), Vernon (Black), West Hartford (Black), Wethersfield (Hispanic), Windsor (Hispanic). All of these departments had a disparity in the Black or Hispanic alone category that was large than one percentage point and significant at a level exceeding 95% confidence, withstood doubly-robust estimation, and had a false discovery rate below 10%. See Table D.1 of Appendix D for the full set of double-robust estimates.

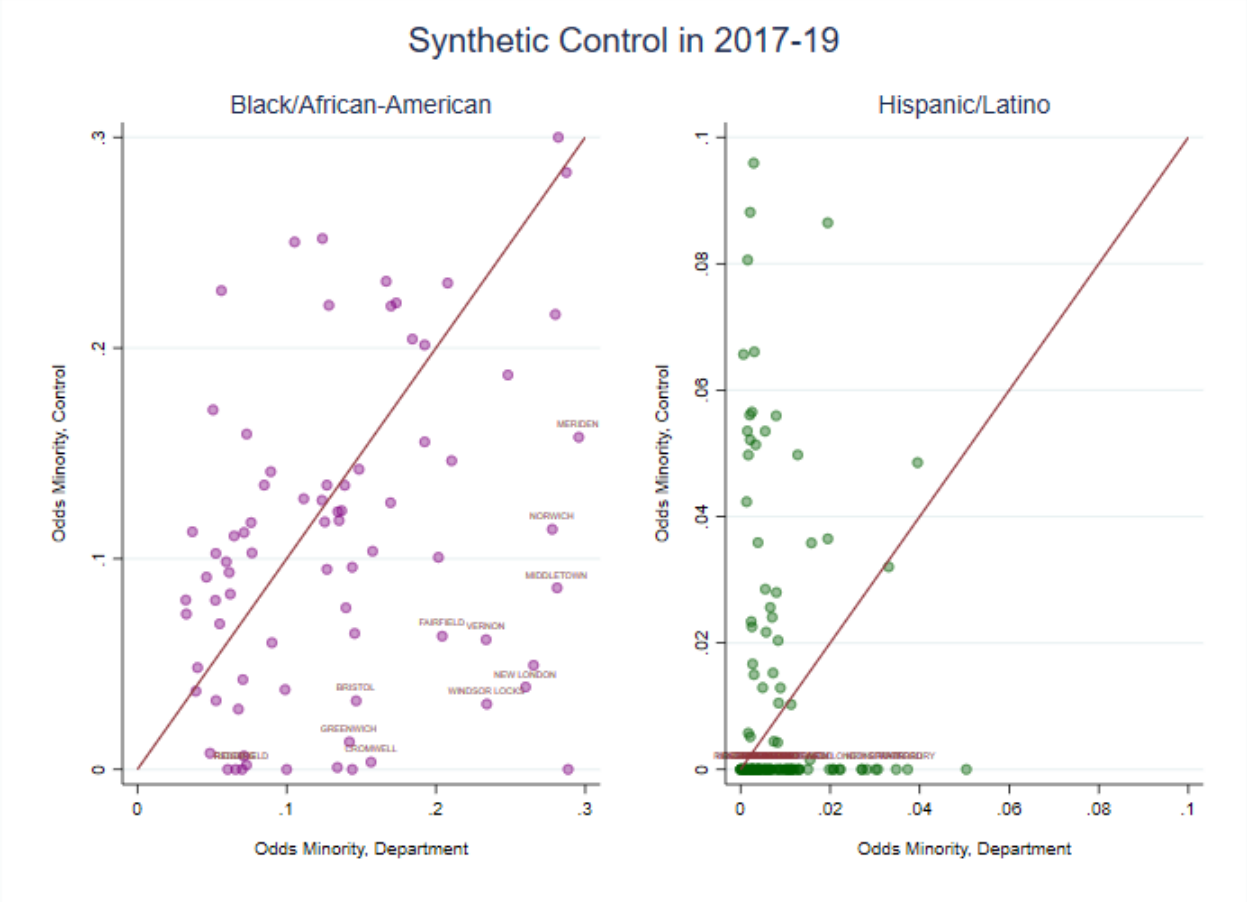
Figure 4.1: Synthetic Control Analysis, All Departments 2019



Notes: Coefficient estimates are obtained from Table D.1 of Appendix D and imposed on the raw odds that a minority is stopped in the focal department. The change in the odds a minority motorist was represented in the traffic stop data in the focal town is estimated using Equation 7 of Appendix A.3 where the variables used to estimate the propensity scores are detailed in Table A.2 (1) of Appendix A.3. Annotated departments include only those with a statistically significant disparity estimated with a confidence level at or exceeding the 95% in the combined sample of all traffic stops as well as in a robustness check with doubly-robust estimation (Table D.2 of Appendix D). Identified departments also had a false discovery rate below 10% estimated following Simes (1986), Benjamini and Hochberg (1995), and Benjamini and Yekutieli (2001).

Figure 4.2 contains estimates for the aggregate 2017-19 and follows the same format discussed above in reference to Figure 4.1. Applying this test to the 2017-19 data where we gain precision by utilizing a larger sample of traffic stops, we identify the departments of Bristol (Black), Cromwell (Black and Hispanic), Derby (Hispanic), East Hartford (Black), Enfield (Hispanic), Fairfield (Black and Hispanic), Glastonbury (Hispanic), Greenwich (Black and Hispanic), Hamden (Black), Meriden (Black), Middleton (Black), New Britain (Hispanic), New Haven (Black), New London (Black and Hispanic), Newington (Hispanic), Norwich (Black and Hispanic), Redding (Black and Hispanic), Ridgefield (Black and Hispanic), Stratford (Hispanic), Vernon (Black), Waterbury (Black and Hispanic), West Hartford (Hispanic), Wethersfield (Hispanic), Willimantic (Hispanic), and Windsor Locks (Black and Hispanic). All of these departments had a disparity in the Black or Hispanic alone category that was large than one percentage point and significant at a level exceeding 95% confidence, withstood doubly-robust estimation, and had a false discovery rate below 10%. See Table D.2 of Appendix D for the full set of double-robust estimates.

Figure 4.2: Synthetic Control Analysis, All Departments 2017-19



Notes: Coefficient estimates are obtained from Table D.3 of Appendix D and imposed on the raw odds that a minority is stopped in the focal department. The change in the odds a minority motorist was represented in the traffic stop data in the focal town is estimated using Equation 7 of Appendix A.3 where the variables used to estimate the propensity scores are detailed in Table A.2 (1) of Appendix A.3. Annotated departments include only those with a statistically significant disparity estimated with a confidence level at or exceeding the 95% in the combined sample of all traffic stops as well as in a robustness check with doubly-robust estimation (Table D.4 of Appendix D). Identified departments also had a false discovery rate below 10% estimated following Simes (1986), Benjamini and Hochberg (1995), and Benjamini and Yekutieli (2001).

V: ANALYSIS OF TRAFFIC STOPS, DESCRIPTIVE STATISTICS AND INTUITIVE MEASURES

The descriptive statistics and benchmarks presented in this section help to understand patterns in Connecticut policing data. Although these simple statistics present an intriguing story, conclusions should not be drawn from any one measure alone. The two previously applied statistical tests of racial and ethnic disparities in the policing data are based solely on the policing data itself and rely on the construction of a theoretically derived identification strategy and a natural experiment. These results have been applied by academic and police researchers in numerous areas across the country and are generally considered to be the most current and relevant approaches to assessing policing data.

In all the benchmark analysis, the demography of motorists was grouped into three overlapping categories to ensure a large enough sample size for the analysis. Much of the analysis focuses on stops made of black (Hispanic or non-Hispanic) and Hispanic motorists (any race), the analysis also was conducted for aggregated groupings of all non-white motorists (Hispanic or non-Hispanic).

V.A: STATEWIDE AVERAGE COMPARISON

Comparing town data to statewide average data is frequently the first thing the public does when trying to understand and assess how a police department may be conducting traffic stops. In this section, a comparison to the statewide average is presented alongside the context necessary to understand the information. This benchmark does provide a simple and effective way to establish a baseline for all towns from which the relative differences between town stop numbers become more apparent. A detailed explanation of the methodology can be found in Appendix A.4. The analysis presented in this report only identified the departments for which the statewide average comparison indicated the largest distances between the net stop percentage and net resident population using 10 or more points as a threshold. Tables showing the calculations for all departments, rather than just those showing distance measures of more than 10 points, can be found in Appendix E of this report. Readers should note that this section focuses entirely on departments that exceeded the statewide average for stops in these racial groups.

Comparison of Racial/Ethnic Minority Drivers to the State Average

The racial/ethnic minority category includes all racial classifications except for white drivers. Specifically, it covers Blacks, Hispanics, Asian/Pacific Islander, American Indian/Alaskan Native, and Other Race classifications included in the census data.

For the study period from January 1, 2019 through December 31, 2019, the statewide percentage of drivers stopped by police who were identified as Minority was 37%. A total of 30 departments stopped a higher percentage of Minority drivers than the state average, 15 of which exceeded the statewide average by more than 10 percentage points. The statewide average for Minority residents (16+) is 25.2%. Of the 30 towns that exceeded the statewide average for Minority drivers stopped, 20 also have Minority resident populations (16+) that exceeded the statewide average.

After the stop and resident population percentages were adjusted using the method described in Appendix A.3 (2), a total of 14 departments were found to have a relative distance between their net Minority driver stop percentage and net Minority driving age population percentage of more than 10 points. Table 5.1 shows the data for these 14 departments. All department results are contained in the Table E.1 of Appendix E.

Table 5.1: Statewide Average Comparisons for Minority Drivers for Selected Towns

Municipal Department	Minority Stops	Difference Between Town and State Average	Minority Residents Age 16+	Difference Between Town and State Average	Distance Between Net Differences
Stratford	64.9%	27.9%	27.2%	2.0%	26.0%
Wethersfield	49.7%	12.7%	12.5%	-12.8%	25.4%
Newington	46.6%	9.6%	14.5%	-10.7%	20.3%
Orange	39.4%	2.4%	10.7%	-14.5%	16.9%
Fairfield	38.4%	1.4%	10.0%	-15.2%	16.6%
Trumbull	40.1%	3.1%	11.9%	-13.3%	16.5%
West Hartford	47.4%	10.4%	21.8%	-3.4%	13.9%
Darien	32.0%	-5.0%	7.2%	-18.1%	13.1%
Wilton	32.4%	-4.6%	8.1%	-17.1%	12.5%
Woodbridge	37.1%	0.1%	12.8%	-12.4%	12.5%
Berlin	29.6%	-7.4%	5.8%	-19.5%	12.1%
Derby	43.8%	6.8%	20.6%	-4.7%	11.5%
Vernon	37.3%	0.3%	14.1%	-11.2%	11.5%
East Haven	36.6%	-0.4%	14.0%	-11.3%	10.8%
Connecticut	37.0%	0.0%	25.2%	0.0%	NA

Comparison of Black Drivers to the State Average

For the study period, the statewide percentage of motorists stopped by police who were identified as Black was 18 percent. A total of 29 departments stopped a higher percentage of Black motorists than the state average, 10 of which exceeded the statewide average by more than 10 percentage points. The statewide average for Black residents (16+) is 9.1%. Of the 29 towns that exceeded the statewide average for Black drivers stopped, 17 also have Black resident populations (16+) that exceeded the statewide average.

After the stop and resident population percentages were adjusted using the method described in Appendix A.3 (2), a total of 4 departments were found to have a relative distance between their net Black driver stop percentage and net Black driving age population percentage of more than 10 points. Table 5.2 shows the data for these 4 towns. All department results are contained in the Table E.2 of Appendix E.

Table 5.2: Statewide Average Comparisons for Black Drivers for Selected Towns

Municipal Department	Black Stops	Difference Between Town and State Average	Black Residents Age 16+	Difference Between Town and State Average	Distance Between Net Differences
Stratford	39.9%	21.9%	12.8%	3.6%	18.3%
Orange	23.2%	5.2%	1.3%	-7.8%	13.0%
Woodbridge	23.1%	5.1%	1.9%	-7.2%	12.3%

Municipal Department	Black Stops	Difference Between Town and State Average	Black Residents Age 16+	Difference Between Town and State Average	Distance Between Net Differences
Trumbull	23.5%	5.5%	2.9%	-6.2%	11.7%
Connecticut	18.0%	0.0%	9.1%	0.0%	NA

Comparison of Hispanic Drivers to the Statewide Average

For the study period, the statewide percentage of drivers stopped by police who were identified as Hispanic was 15.8%. A total of 29 towns stopped a higher percentage of Hispanic drivers than the state average, 10 of which exceeded the statewide average by more than 10 percentage points. Four of the 29 departments exceeded the statewide average by one percentage points of less. The statewide Hispanic resident population (16+) is 11.9%. Of the 29 towns that exceeded the statewide average for Hispanic drivers stopped, 14 also have Hispanic resident populations (16+) that exceeded the statewide average.

After the stop and resident population percentages were adjusted using the method described in Appendix A.3 (2), a total of 3 towns were found to have a relative distance between their net Hispanic driver stop percentage and net Hispanic population percentage of more than 10 points. Table 5.3 shows the data for the towns named above. All department results are contained in the Table E.3 of Appendix E.

Table 5.3: Statewide Average Comparisons for Hispanic Drivers for Selected Towns

Municipal Department	Hispanic Stops	Difference Between Town and State Average	Hispanic Residents Age 16+	Difference Between Town and State Average	Distance Between Net Differences
Wethersfield	28.2%	12.4%	7.1%	-4.8%	17.2%
Newington	23.1%	7.3%	6.4%	-5.5%	12.8%
Wilton	17.3%	1.5%	2.7%	-9.2%	10.7%
Connecticut	15.8%	0.0%	11.9%	0.0%	NA

V.B: ESTIMATED DRIVING POPULATION COMPARISON

The EDP analysis was confined to the 94 municipal police departments in Connecticut. There are 80 municipalities in Connecticut that either (1) do not have their own departments and rely upon the state police for their law and traffic enforcement services or (2) have one or more resident state troopers who either provide their police services or supervise local constables or law enforcement officers. Most of these communities are smaller and located in Connecticut's more rural areas. Once the state police stops made on limited access highways were removed from the data, we found that these towns generally had too few stops during the 6am to 10am and 3pm to 7pm periods to yield meaningful comparisons. Consequently, these towns were not considered appropriate candidates for the EDP analysis.

The only traffic stops included in this analysis were stops conducted Monday through Friday from 6:00am to 10:00am and 3:00pm to 7:00pm (peak commuting hours). Overall, when compared to their respective EDP, 88 departments had a disparity between the Minorities stopped and the

proportion of non-whites estimated to be in the EDP. For many of these departments (25) the disparity was very small (less than five percentage points). In the remaining 6 communities, the disparity was negative, meaning that more whites were stopped than expected in the EDP numbers. However, the negative disparities were also very small in most communities. There were 92 departments with a disparity for Black drivers stopped and 81 departments with a disparity for Hispanic drivers stopped when compared to the respective EDPs.

Due to the margins of error inherent in the EDP estimates, we established a reasonable set of thresholds for determining if a department shows a disparity in its stops when compared to its EDP percentages. Departments that exceed their EDP percentages by greater than 10 percentage points in any of the three categories: (1) Minority (all race/ethnicity), (2) Black non-Hispanic, and (3) Hispanic, were identified in our tier one group. Table 5.4 shows the data for the departments meeting the tier one criteria. In addition, departments that exceeded their EDP percentage by more than five but less than 10 percentage points were identified in our tier two group for this benchmark if the ratio of the percentage of stops for the target group compared to the baseline measure for that group also was 1.75 or above (percentage of stops divided by benchmark percentage equals 1.75 or more) in any of the three categories: (1) Minority (all race/ethnicity), (2) Black non-Hispanic, or (3) Hispanic. Table 5.5 shows the data for the departments meeting the tier two criteria. Results for all departments are available in Tables E.4, E.5, and E.6 of Appendix E.

Table 5.4: Highest Ratio of Stops to EDP (Tier I)

Department Name	Number of Stops	Stops	EDP	Absolute Difference	Ratio
Minority (All Non-White)					
Stratford	724	59.9%	27.9%	32.1%	2.15
East Hartford	1,871	67.8%	40.0%	27.8%	1.69
Wethersfield	704	42.5%	16.6%	25.9%	2.56
New Haven	2,536	69.6%	46.3%	23.3%	1.50
Waterbury	1,997	62.0%	40.1%	21.9%	1.55
New Britain	1,889	60.1%	38.9%	21.3%	1.55
Fairfield	4,363	38.6%	17.5%	21.1%	2.20
Windsor	5,085	53.3%	33.2%	20.2%	1.61
Trumbull	729	37.7%	18.2%	19.5%	2.07
Hartford	6,120	69.4%	50.1%	19.3%	1.39
Manchester	1,922	45.7%	26.7%	19.0%	1.71
Derby	324	40.1%	21.1%	19.0%	1.90
West Hartford	2,741	42.6%	24.1%	18.5%	1.77
Vernon	543	33.3%	15.4%	17.9%	2.16
Easton	513	25.3%	7.5%	17.8%	3.38
Orange	1,634	36.7%	19.5%	17.1%	1.88
Newington	953	35.8%	19.0%	16.8%	1.88
Meriden	1,210	48.2%	31.4%	16.7%	1.53
West Haven	1,461	51.3%	35.6%	15.7%	1.44
Darien	1,587	30.5%	15.9%	14.6%	1.92
East Haven	803	31.1%	16.6%	14.6%	1.88
Wolcott	199	22.6%	8.2%	14.4%	2.77
Norwich	809	39.1%	24.7%	14.4%	1.58
Naugatuck	1,605	31.0%	16.9%	14.1%	1.83
South Windsor	1,677	31.3%	17.9%	13.4%	1.75
Berlin	1,655	26.2%	12.9%	13.3%	2.03

Department Name	Number of Stops	Stops	EDP	Absolute Difference	Ratio
Weston	103	22.3%	9.5%	12.9%	2.36
Wallingford	1,605	28.0%	15.6%	12.4%	1.79
Bloomfield	1,183	55.0%	42.7%	12.4%	1.29
Windsor Locks	611	30.9%	18.8%	12.2%	1.65
Woodbridge	969	29.2%	17.3%	11.9%	1.69
Waterford	2,155	25.4%	13.9%	11.5%	1.83
Wilton	1,078	28.8%	17.4%	11.4%	1.65
New Milford	762	22.4%	11.3%	11.2%	1.99
New Canaan	1,394	24.8%	13.8%	11.0%	1.80
Hamden	2,893	40.5%	29.5%	11.0%	1.37
Newtown	1,621	20.5%	9.5%	11.0%	2.16
Redding	407	17.7%	7.6%	10.1%	2.34
Black					
New Haven	2,536	48.5%	22.6%	25.9%	2.15
Stratford	724	34.3%	12.1%	22.1%	2.83
East Hartford	1,871	37.4%	17.0%	20.5%	2.21
Hartford	6,120	41.1%	21.6%	19.5%	1.90
Windsor	5,085	37.6%	20.1%	17.5%	1.87
Trumbull	729	21.8%	5.9%	15.9%	3.72
Manchester	1,922	25.3%	9.9%	15.4%	2.55
Waterbury	1,997	29.2%	14.3%	14.9%	2.04
Orange	1,634	20.4%	6.3%	14.2%	3.27
Bloomfield	1,183	44.6%	31.1%	13.5%	1.43
Norwich	809	20.9%	7.5%	13.4%	2.78
Bridgeport	2,561	38.9%	26.5%	12.4%	1.47
Derby	324	18.8%	6.7%	12.1%	2.80
Fairfield	4,363	17.3%	5.3%	12.1%	3.29
Vernon	543	17.3%	5.3%	12.0%	3.26
Wethersfield	704	16.8%	4.9%	11.9%	3.42
Woodbridge	969	16.6%	4.8%	11.8%	3.48
Hamden	2,893	27.9%	16.1%	11.8%	1.73
West Haven	1,461	27.9%	16.4%	11.5%	1.70
Windsor Locks	611	17.3%	7.1%	10.2%	2.43
Hispanic					
New Britain	1,889	42.1%	26.0%	16.1%	1.62
Wethersfield	704	23.6%	8.7%	14.9%	2.72
Stratford	724	25.0%	12.7%	12.3%	1.97
Easton	513	15.8%	3.5%	12.3%	4.52
Danbury	2,536	30.0%	18.6%	11.5%	1.62
Meriden	1,210	32.2%	21.1%	11.1%	1.53
East Hartford	1,871	28.0%	17.8%	10.2%	1.58
Fairfield	4,363	18.5%	8.2%	10.2%	2.24

Table 5.5: High Ratio of Stops to EDP (Tier II)

Department Name	Number of Stops	Stops	EDP	Absolute Difference	Ratio
Minority (All Non-White)					
Brookfield	601	19.6%	10.3%	9.3%	1.90
Plymouth	660	12.1%	4.6%	7.5%	2.64
Clinton	613	15.0%	8.4%	6.6%	1.79

Department Name	Number of Stops	Stops	EDP	Absolute Difference	Ratio
Portland	243	13.6%	7.0%	6.6%	1.94
Black					
West Hartford	2,741	17.3%	7.6%	9.7%	2.27
Middletown	894	18.9%	9.7%	9.2%	1.95
Darien	1,587	12.0%	3.6%	8.4%	3.35
Waterford	2,155	12.3%	3.9%	8.4%	3.15
Ledyard	1,188	12.5%	4.3%	8.3%	2.94
Newington	953	13.6%	5.5%	8.1%	2.47
Shelton	76	13.2%	5.3%	7.9%	2.50
North Haven	1,395	14.2%	6.3%	7.9%	2.26
Bristol	1,013	11.6%	3.9%	7.7%	2.96
East Haven	803	11.6%	4.2%	7.4%	2.76
Meriden	1,210	14.8%	7.7%	7.0%	1.91
Cromwell	334	12.6%	5.6%	6.9%	2.23
Avon	125	10.4%	3.5%	6.9%	2.99
Easton	513	7.8%	0.9%	6.9%	8.88
Groton City	504	12.3%	5.5%	6.8%	2.25
East Windsor	490	14.7%	7.9%	6.8%	1.85
South Windsor	1,677	12.4%	5.8%	6.6%	2.15
Wolcott	199	9.0%	2.5%	6.5%	3.57
Naugatuck	1,605	11.3%	4.9%	6.4%	2.30
Berlin	1,655	9.7%	3.5%	6.2%	2.78
Wallingford	1,605	9.8%	3.8%	6.0%	2.59
Newtown	1,621	7.5%	2.0%	5.5%	3.80
Enfield	1,791	9.3%	4.1%	5.2%	2.25
Glastonbury	1,467	9.3%	4.3%	5.0%	2.15
Hispanic					
Newington	953	18.4%	8.9%	9.5%	2.06
New Milford	762	15.4%	6.2%	9.1%	2.46
East Haven	803	18.2%	9.1%	9.1%	2.00
Derby	324	20.7%	11.8%	8.8%	1.75
Naugatuck	1,605	17.6%	8.8%	8.8%	2.00
Brookfield	601	13.5%	5.0%	8.5%	2.71
New Canaan	1,394	14.8%	6.4%	8.4%	2.32
Wolcott	199	12.6%	4.3%	8.2%	2.90
West Hartford	2,741	18.5%	10.3%	8.2%	1.80
Wilton	1,078	16.2%	8.1%	8.1%	2.00
Berlin	1,655	14.4%	6.6%	7.9%	2.20
Vernon	543	13.8%	6.0%	7.8%	2.30
Darien	1,587	15.8%	8.0%	7.8%	1.97
Bethel	904	15.7%	8.5%	7.2%	1.84
Wallingford	1,605	15.8%	8.6%	7.1%	1.82
Ridgefield	1,863	13.5%	6.7%	6.8%	2.02
Redding	407	10.6%	4.0%	6.6%	2.65
Weston	103	10.7%	4.2%	6.4%	2.52
Groton Town	803	13.1%	7.3%	5.8%	1.80
Newtown	1,621	10.4%	4.8%	5.5%	2.15

V.C: RESIDENT ONLY STOP COMPARISON

Overall, when compared to the census, 82 departments stopped more non-white resident drivers than their non-white resident population. Again, the disparity for many of these departments was very small. In the 7 communities, the disparity was negative, meaning that fewer non-white drivers were stopped than expected based on the population numbers. However, the negative disparities were also very small in most communities. Almost all departments (90 of 94) had a disparity for Black drivers stopped and 58 departments had a disparity for Hispanic drivers stopped when compared to the resident driving age population.

Departments with a difference of 10 percentage points or more between the resident stops and the 16+ resident population in any of the three categories: (1) Minority (all race/ethnicity), (2) Black non-Hispanic, and (3) Hispanic, were identified in our tier one group. Table 5.6 shows the data for the departments meeting the tier one criteria. In addition, departments that exceeded their resident population percentage by more than five but less than 10 percentage points were identified in our tier two group for this benchmark if the ratio of the percentage of resident stops for the target group compared to the baseline measure for that group also was 1.75 or above (percentage of stopped residents divided by resident benchmark percentage equals 1.75 or more) in any of three categories: (1) Minority (all race/ethnicity), (2) Black non-Hispanic, and (3) Hispanic. Table 5.7 shows the data for the departments meeting the tier two criteria. Results for all departments are available in Tables E.7, E.8, and E.9 of Appendix E.

Table 5.6: Highest Ratio of Resident Population to Resident Stops (Tier I)

Department Name	Number of Residents	Residents	Resident Stops	Minority Resident Stops	Difference	Ratio
Minority (All Non-White)						
Waterbury	83,964	48.1%	3,018	81.0%	32.9%	1.68
Stratford	40,980	27.2%	823	58.2%	31.0%	2.14
Derby	10,391	20.6%	258	48.1%	27.5%	2.34
New Britain	57,164	45.0%	4,096	70.8%	25.8%	1.57
Willimantic	20,176	34.6%	1,328	58.8%	24.3%	1.70
Meriden	47,445	34.9%	2,026	57.1%	22.2%	1.64
Norwich	31,638	29.1%	2,027	51.1%	22.0%	1.76
Vernon	23,800	14.1%	1,406	35.6%	21.5%	2.53
Windsor	23,222	43.9%	4,828	65.2%	21.3%	1.48
New Haven	100,702	62.8%	4,950	83.6%	20.7%	1.33
Manchester	46,667	27.9%	3,042	48.5%	20.6%	1.74
East Hartford	40,229	51.6%	1,797	71.6%	20.0%	1.39
Hamden	50,012	30.9%	1,331	50.3%	19.4%	1.63
Danbury	64,361	38.6%	1,604	57.6%	19.0%	1.49
New London	21,835	43.6%	1,616	62.2%	18.6%	1.43
Bloomfield	16,982	61.5%	1,007	79.5%	18.0%	1.29
Bristol	48,439	12.7%	1,465	29.0%	16.3%	2.28
Naugatuck	25,099	15.2%	2,526	31.0%	15.8%	2.04
Wethersfield	21,607	12.5%	498	27.5%	15.0%	2.21
Ansonia	14,979	25.6%	2,004	40.6%	15.0%	1.59
West Hartford	49,650	21.8%	1,705	36.3%	14.5%	1.67
Groton City*	7,960	26.9%	499	40.9%	14.0%	1.52

Department Name	Number of Residents	Residents	Resident Stops	Minority Resident Stops	Difference	Ratio
East Windsor	9,164	14.6%	358	27.7%	13.1%	1.90
New Milford	21,891	9.7%	1,845	22.6%	12.9%	2.33
Stamford	98,070	43.9%	5,652	56.2%	12.3%	1.28
Middletown	38,747	23.5%	2,725	35.5%	12.0%	1.51
West Haven	44,518	37.6%	2,682	49.2%	11.6%	1.31
Enfield	33,218	8.7%	3,197	20.2%	11.5%	2.33
Newington	24,978	14.5%	858	25.6%	11.1%	1.77
South Windsor	20,162	14.6%	1,543	25.6%	11.0%	1.75
Norwalk	68,034	40.8%	2,983	50.8%	10.0%	1.25
Black						
New Haven	100,702	32.16%	4,950	58.4%	26.3%	1.82
Stratford	40,980	12.76%	823	37.9%	25.2%	2.97
Waterbury	83,964	17.37%	3,018	38.5%	21.1%	2.21
Hamden	50,012	18.28%	1,331	38.9%	20.6%	2.13
Windsor	23,222	32.20%	4,828	52.7%	20.5%	1.64
Derby	10,391	6.03%	258	26.4%	20.3%	4.37
Bloomfield	16,982	54.76%	1,007	75.0%	20.2%	1.37
Norwich	31,638	8.96%	2,027	28.0%	19.1%	3.13
East Hartford	40,229	22.52%	1,797	41.0%	18.5%	1.82
Bridgeport	109,401	31.82%	3,542	50.1%	18.3%	1.57
Manchester	46,667	10.15%	3,042	26.2%	16.0%	2.58
Vernon	23,800	4.70%	1,406	19.4%	14.7%	4.13
New London	21,835	15.18%	1,616	29.1%	14.0%	1.92
Groton City*	7,960	7.70%	499	21.6%	13.9%	2.81
Ansonia	14,979	9.74%	2,004	22.8%	13.1%	2.34
Middletown	38,747	11.68%	2,725	23.7%	12.0%	2.03
East Windsor	9,164	5.96%	358	17.0%	11.1%	2.86
Stamford	98,070	12.86%	5,652	23.7%	10.9%	1.84
Hartford	93,669	35.80%	16,256	46.3%	10.5%	1.29
Hispanic						
Danbury	64,361	23.25%	1,604	45.6%	22.3%	1.96
Willimantic	20,176	28.88%	1,328	49.2%	20.4%	1.71
New Britain	57,164	31.75%	4,096	51.3%	19.6%	1.62
Meriden	47,445	24.86%	2,026	39.6%	14.7%	1.59
Waterbury	83,964	27.54%	3,018	41.8%	14.3%	1.52

Table 5.7: High Ratio of Resident Population to Resident Stops (Tier II)

Department Name	Number of Residents	Residents	Resident Stops	Minority Resident Stops	Difference	Ratio
Minority (All Non-White)						
Clinton	10,540	6.1%	824	15.4%	9.3%	2.52
Torrington	29,251	11.0%	3,498	20.2%	9.2%	1.84
Plymouth	9,660	2.5%	460	9.8%	7.3%	3.95
Brookfield	12,847	8.1%	504	15.3%	7.2%	1.88
Cheshire	21,049	8.6%	2,816	15.1%	6.5%	1.75
Black						
Meriden	47,445	7.80%	2,026	16.5%	8.7%	2.12

Department Name	Number of Residents	Residents	Resident Stops	Minority Resident Stops	Difference	Ratio
Bristol	48,439	3.24%	1,465	11.9%	8.7%	3.69
Groton Town	31,520	6.07%	1,794	14.5%	8.5%	2.40
Naugatuck	25,099	4.11%	2,526	12.2%	8.1%	2.97
Enfield	33,218	2.63%	3,197	9.4%	6.8%	3.59
West Hartford	49,650	5.65%	1,705	12.3%	6.6%	2.17
Newington	24,978	2.99%	858	9.4%	6.4%	3.15
Ledyard	11,527	3.10%	1,038	9.2%	6.1%	2.95
Rocky Hill	16,224	3.77%	1,006	9.5%	5.8%	2.53
Cheshire	21,049	1.27%	2,816	7.0%	5.7%	5.49
Windsor Locks	10,117	4.27%	582	9.8%	5.5%	2.29
Shelton	32,010	2.07%	264	7.6%	5.5%	3.66
Hispanic						
New Milford	21,891	5.46%	1,845	15.2%	9.7%	2.78
Norwich	31,638	10.59%	2,027	19.8%	9.2%	1.87
Wethersfield	21,607	7.10%	498	16.3%	9.2%	2.29
Naugatuck	25,099	7.77%	2,526	16.8%	9.0%	2.16
Manchester	46,667	9.89%	3,042	18.3%	8.4%	1.85
Bristol	48,439	7.65%	1,465	15.8%	8.1%	2.06
Vernon	23,800	5.21%	1,406	12.9%	7.7%	2.48
East Haven	24,114	8.43%	918	15.0%	6.6%	1.78
Bethel	14,675	6.65%	842	12.4%	5.7%	1.86
Clinton	10,540	4.41%	824	10.0%	5.5%	2.26
Brookfield	12,847	3.79%	504	9.1%	5.3%	2.41
Torrington	29,251	6.92%	3,498	12.1%	5.2%	1.76
Enfield	33,218	4.00%	3,197	9.2%	5.2%	2.29

V.D: CONCLUSIONS FROM THE DESCRIPTIVE COMPARISONS

The descriptive tests outlined in the above sections are designed to be used as a screening tool to identify those jurisdictions with consistent data disparities that exceed certain thresholds. The tests compare stop data to three different benchmarks: (1) statewide average, (2) the estimated driving population, and (3) resident-only stops that each cover three driver categories: Black, Hispanic, and Minority. Department data is then measured against the resulting total of nine descriptive measures for evaluation purposes.

In order to classify the disparities within the descriptive benchmarks, any disparity greater than 10 percentage points for a measure was given a weight of one (1) point. Any disparity of more than five, but less than 10 percentage points accompanied by a disparity ratio of 1.75 or above was given a weight of 0.5 points. Therefore, a department could score no more than nine (9) total points.

Table 5.8 identifies the eight departments with significant disparities. A department was identified if the stop data was found to exceed the disparity threshold level in at least two of the three benchmark areas and a weighted total score of 4.5 or more. All department results are contained in Table E.10 of Appendix E.

Table 5.8: Departments with the Greatest Number of Disparities Relative to Descriptive Benchmarks

Department Name	Statewide Average			Estimated Driving Population			Resident Population			Point Total
	M	B	H	M	B	H	M	B	H	
Stratford	26.0%	18.3%		32.1%	22.1%	12.3%	31.0%	25.2%		7.0
Wethersfield	25.4%		17.2%	25.9%	11.9%	14.9%	15.0%		9.2%	6.5
Vernon	11.5%			17.9%	12.0%	7.8%	21.5%	14.7%	7.7%	6.0
Derby	11.5%			19.0%	12.1%	8.8%	27.5%	20.3%		5.5
Newington	20.3%		12.8%	16.8%	8.1%	9.5%	11.1%	6.4%		5.5
East Hartford				27.8%	20.5%	10.2%	20.0%	18.5%		5.0
Meriden				16.7%	7.0%	11.1%	22.2%	8.7%	14.7%	5.0
Waterbury				21.9%	14.9%		32.9%	21.1%	14.3%	5.0
Manchester				19.0%	15.4%		20.6%	16.0%	8.4%	4.5
Norwich				14.4%	13.4%		22.0%	19.1%	9.2%	4.5
West Hartford	13.9%			18.5%	9.7%	8.2%	14.5%	6.6%		4.5

VI. ANALYSIS OF STOP DISPOSITIONS

In this section, we test for disparities in the outcomes of traffic stops using a model that examines the distribution of dispositions conditional on race and the reason for the stop. Specifically, we test whether traffic stops made of minority motorists result in different outcomes relative to their Caucasian non-Hispanics peers following the model outlined in Equation 10 of Appendix A.6. Since ex-ante it is unclear whether discrimination would create more or less severe traffic stop outcomes in the data, we simply test for equality in the distribution of outcomes across demography conditional on the motivating reason for the stop. Rather than making unreasonable assumptions about how discrimination should affect outcomes, we simply assume that the overall distribution will not be equal across race. The intuition is similar to hit-rate style tests but where we are unable to ex-ante sign the direction that we expect bias to take. We implement the test by applying a multinomial logistic regression on the four possible stop outcomes and condition on race and the reason for the stop. We then conduct a joint hypothesis test on the interaction between an indicator of race and the reason for the stop.

We account for differences in outcomes not related to this interaction term by including additional controls for age, gender, hour, day of week, week of year, and officer fixed-effects. In terms of possible outcomes, we regress indicators for warning (no search), arrest (no search), ticket/misdemeanor (search), warning (search), arrest (search), and where ticket/misdemeanor (no search) is the omitted category. We condition on the basis of the stop using five indicators for stops made on the basis of equipment violation, seatbelt/cellphone, registration/license, all other violations, and where speeding violations are the omitted category. We provide one important cautionary note about interpreting our test as causal evidence of discrimination. Ideally, this test would be performed on data containing *all* violations observed by the police officer prior to making a traffic stop and where we would include a control for the number of total violations. In practice, data on traffic stops typically only contain the most severe reason that motivated the stop. In the absence of data on the full set of violations observed by police officers, we suggest that the reader interpret results from this test as providing descriptive evidence to be viewed in concert with other such empirical measures.

VI.A: AGGREGATE ANALYSIS OF STOP DISPOSITION, 2019

Table 6.1 presents the results of applying a multinomial logit to a sample of all traffic stops with six distinct stop outcomes regressed on race, basis for the stop, and their interaction. Unlike prior sections where we utilized the historical timeseries data in the aggregate analysis and a three-year combined sample for the department analysis, we focus on only the 2019 data in this section. Our focus on the 2019 data is due to the fact that this test relies on the full sample of traffic stops, rather than a smaller and more restrictive subsample. Below, we present the coefficient estimates on the interaction between race and the stop basis for each outcome relative to the omitted category, i.e. no search- ticket/misdemeanor issued. As in prior years, we find strong evidence suggesting that minority motorists are treated differently than their Caucasian non-Hispanics counterparts even when they are stopped for the same reason. A joint hypothesis test across all the interaction terms across all outcomes indicates that the difference in outcomes are statistically significant at the 99% level for each demographic group relative to Caucasian non-Hispanics motorists.

Table 6.1: Multinomial Logistic Regression of Outcome on Race/Ethnicity and Reason for Stop, All Traffic Stops 2019

	Non-White		Black		Hispanic		Black or Hispanic	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
No Search, Warning or No Action								
All Other	0.179	(0.215)	0.124	(0.206)	0.064	(0.106)	0.008	(0.153)
Equip.	0.188*	(0.097)	-0.082	(0.11)	-0.194**	(0.084)	0.03	(0.089)
Reg. or Lic.	0.358***	(0.084)	0.35***	(0.095)	0.231***	(0.076)	0.255***	(0.081)
Signal or Stop	0.324***	(0.09)	0.366***	(0.091)	0.213**	(0.082)	0.249***	(0.084)
Moving	0.408***	(0.087)	0.415***	(0.103)	0.301***	(0.073)	0.375***	(0.081)
No Search, Arrest								
All Other	-1.427***	(0.18)	-0.334*	(0.175)	-0.472***	(0.131)	-1.332***	(0.183)
Equip.	0.25*	(0.14)	-0.018	(0.153)	-0.159	(0.184)	-0.045	(0.139)
Reg. or Lic.	0.563***	(0.159)	0.471***	(0.166)	0.278*	(0.152)	0.378***	(0.126)
Signal or Stop	0.345**	(0.134)	0.287*	(0.17)	-0.037	(0.167)	0.187	(0.131)
Moving	-0.403***	(0.123)	-0.397**	(0.156)	-0.194	(0.144)	-0.243**	(0.122)
Search, Ticket or Misdemeanor								
All Other	1.54***	(0.199)	-0.277**	(0.134)	-0.539***	(0.117)	0.22	(0.147)
Equip.	0.456***	(0.15)	-0.434***	(0.135)	-0.57***	(0.139)	-0.265	(0.161)
Reg. or Lic.	0.957***	(0.108)	-0.01	(0.107)	0	(0.113)	0.216	(0.207)
Signal or Stop	0.169	(0.142)	-0.139	(0.145)	-0.281**	(0.11)	0.025	(0.102)
Moving	0.283*	(0.165)	-0.261*	(0.154)	-0.28**	(0.135)	-0.044	(0.161)
Search, Warning								
All Other	0.186	(0.258)	-0.157	(0.238)	-0.231	(0.28)	-0.11	(0.283)
Equip.	0.93***	(0.18)	-0.52***	(0.187)	-0.308*	(0.181)	-0.053	(0.139)
Reg. or Lic.	0.297*	(0.164)	0.318	(0.286)	0.352	(0.284)	0.217	(0.165)
Signal or Stop	0.31***	(0.108)	-0.008	(0.186)	0.174	(0.213)	0.158*	(0.084)
Moving	0.669***	(0.118)	-0.213	(0.244)	0.016	(0.209)	0.25	(0.189)
Search, Arrest								
All Other	0.506***	(0.145)	-0.392**	(0.182)	-0.469**	(0.189)	0.062	(0.181)
Equip.	0.157	(0.15)	-0.504***	(0.155)	-0.8***	(0.167)	-0.371**	(0.149)
Reg. or Lic.	0.232	(0.154)	0.077	(0.22)	0.028	(0.222)	0.146	(0.173)
Signal or Stop	0.093	(0.104)	-0.256	(0.157)	-0.359*	(0.185)	-0.059	(0.121)
Moving	-0.222**	(0.09)	-0.759***	(0.135)	-0.455***	(0.132)	-0.129	(0.099)
Chi^2	641.99		285.87		168.63		226.47	
P-Value	0.000		0.000		0.000		0.000	
Sample Size	383,132		368,009		352,865		437,130	

Note 1: The coefficients are presented as log odds-ratios along with standard errors clustered at the department level. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance.

Note 2: All specifications include controls for gender, age, hour, day of the week, and week of year fixed effects.

Note 3: Q-Values were estimated using a false discovery rate procedure following Simes (1986) and later refined by Benjamini and Hochberg (1995) and Benjamini and Yekutieli (2001).

Table 6.2 presents the results of applying a multinomial logit to a subset of traffic stops made by municipal police departments. As before, we test for differences across six distinct stop outcomes for motorists of different races but who were stopped for the same reason. Across all specifications, we again find strong evidence suggesting that minority motorists are treated differently than their Caucasian non-Hispanics counterparts even when they are stopped for the same reason. For the sample of municipal stops, we find that minority motorists are more frequently given a warning relative to their non-Hispanic Caucasian counterparts. As with the overall sample, a joint hypothesis

test across all the interaction terms and all outcomes indicate that the difference in outcomes is statistically significant at the 99% level for each demographic group relative to Caucasian non-Hispanics motorists.

Table 6.2: Multinomial Logistic Regression of Outcome on Race/Ethnicity and Reason for Stop, Municipal Traffic Stops 2019

	Non-White		Black		Hispanic		Black or Hispanic	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
No Search, Warning or No Action								
All Other	0.216	(0.234)	0.173	(0.253)	0.069	(0.13)	0.103	(0.18)
Equip.	-0.01	(0.124)	-0.065	(0.139)	-0.182*	(0.097)	-0.143	(0.104)
Reg. or Lic.	0.474***	(0.112)	0.475***	(0.125)	0.39***	(0.089)	0.424***	(0.096)
Signal or Stop	0.359***	(0.097)	0.382***	(0.104)	0.21**	(0.09)	0.271***	(0.093)
Moving	0.487***	(0.147)	0.464***	(0.172)	0.301***	(0.111)	0.37***	(0.13)
No Search, Arrest								
All Other	-0.209	(0.226)	-0.255	(0.234)	-0.411**	(0.181)	-0.363**	(0.164)
Equip.	-0.147	(0.223)	-0.204	(0.219)	-0.215	(0.205)	-0.255	(0.182)
Reg. or Lic.	0.501**	(0.229)	0.475**	(0.24)	0.231	(0.191)	0.332*	(0.184)
Signal or Stop	0.185	(0.233)	0.223	(0.232)	-0.001	(0.181)	0.1	(0.178)
Moving	-0.092	(0.224)	-0.11	(0.238)	0.084	(0.208)	-0.013	(0.192)
Search, Ticket or Misdemeanor								
All Other	-0.16	(0.168)	-0.223	(0.179)	-0.442***	(0.155)	-0.329**	(0.15)
Equip.	-0.385**	(0.172)	-0.459**	(0.185)	-0.52***	(0.164)	-0.509***	(0.146)
Reg. or Lic.	-0.024	(0.142)	-0.018	(0.15)	0.161	(0.139)	0.055	(0.125)
Signal or Stop	-0.106	(0.168)	-0.093	(0.174)	-0.223*	(0.127)	-0.154	(0.135)
Moving	-0.122	(0.201)	-0.159	(0.208)	-0.187	(0.172)	-0.177	(0.163)
Search, Warning								
All Other	-0.027	(0.249)	-0.099	(0.259)	-0.273	(0.304)	-0.185	(0.254)
Equip.	-0.441**	(0.222)	-0.512**	(0.232)	-0.338	(0.211)	-0.485**	(0.201)
Reg. or Lic.	0.344	(0.31)	0.339	(0.318)	0.368	(0.313)	0.333	(0.291)
Signal or Stop	-0.014	(0.199)	-0.011	(0.203)	0.144	(0.23)	0	(0.192)
Moving	-0.167	(0.307)	-0.2	(0.323)	0.004	(0.244)	-0.165	(0.26)
Search, Arrest								
All Other	-0.14	(0.21)	-0.254	(0.222)	-0.352	(0.239)	-0.32	(0.211)
Equip.	-0.32*	(0.173)	-0.436**	(0.178)	-0.662***	(0.192)	-0.579***	(0.157)
Reg. or Lic.	0.104	(0.252)	0.031	(0.249)	0.177	(0.244)	0.101	(0.218)
Signal or Stop	-0.184	(0.17)	-0.21	(0.172)	-0.218	(0.198)	-0.242	(0.151)
Moving	-0.568***	(0.166)	-0.715***	(0.167)	-0.353**	(0.15)	-0.578***	(0.129)
Chi^2	267.43		308.87		200.45		304.87	
P-Value	0.000		0.000		0.000		0.000	
Sample Size	263,511		254,928		242,018		305,363	

Note 1: The coefficients are presented as log odds-ratios along with standard errors clustered at the department level. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance.

Note 2: All specifications include controls for gender, age, hour, day of the week, and week of year fixed effects.

Note 3: Q-Values were estimated using a false discovery rate procedure following Simes (1986) and later refined by Benjamini and Hochberg (1995) and Benjamini and Yekutieli (2001).

Table 6.3 presents the results of applying a multinomial logit to a subset of traffic stops made by State Police troops. Again, our goal is to test for differences across six distinct stop outcomes for motorists of different races but who were stopped for the same reason. Across all specifications, we again find evidence suggesting that minority motorists are treated differently than their Caucasian non-

Hispanics counterparts. For the sample of State Police stops, we find statistically significant differences in the way that minority motorists are stopped and are more likely to be given a warning. In particular, a joint hypothesis test across all the interaction terms and all outcomes indicate that the difference in outcomes is statistically significant at the 99% level.

Table 6.3: Multinomial Logistic Regression of Outcome on Race/Ethnicity and Reason for Stop, State Police Traffic Stops 2019

	Non-White		Black		Hispanic		Black or Hispanic	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
No Search, Warning or No Action								
All Other	0.308***	(0.105)	0.164	(0.124)	0.25*	(0.142)	0.187	(0.115)
Equip.	0.179	(0.13)	0.028	(0.116)	-0.096	(0.1)	-0.052	(0.1)
Reg. or Lic.	0.319***	(0.079)	0.233***	(0.067)	0.075	(0.077)	0.149***	(0.055)
Signal or Stop	0.208	(0.157)	0.217	(0.162)	0.052	(0.138)	0.111	(0.135)
Moving	0.467***	(0.05)	0.412***	(0.041)	0.402***	(0.071)	0.41***	(0.045)
No Search, Arrest								
All Other	-0.341*	(0.195)	-0.347*	(0.198)	-0.419**	(0.189)	-0.385***	(0.137)
Equip.	0.248	(0.255)	0.165	(0.29)	-0.177	(0.449)	-0.01	(0.332)
Reg. or Lic.	0.399	(0.306)	0.307	(0.286)	0.449*	(0.248)	0.394*	(0.21)
Signal or Stop	-0.226	(0.593)	0.01	(0.605)	-0.697*	(0.373)	-0.306	(0.408)
Moving	-0.669***	(0.121)	-0.738***	(0.186)	-0.477***	(0.146)	-0.573***	(0.087)
Search, Ticket or Misdemeanor								
All Other	-0.544***	(0.154)	-0.571***	(0.161)	-0.892***	(0.139)	-0.73***	(0.122)
Equip.	0.268	(0.27)	0.157	(0.272)	-0.269	(0.361)	-0.055	(0.234)
Reg. or Lic.	0.328***	(0.115)	0.265**	(0.118)	-0.359*	(0.195)	-0.02	(0.14)
Signal or Stop	-0.437	(0.378)	-0.323	(0.413)	-0.082	(0.615)	-0.145	(0.447)
Moving	-0.404	(0.269)	-0.425	(0.281)	-0.441**	(0.189)	-0.444**	(0.211)
Search, Warning								
All Other	-2.35*	(1.22)	-2.403*	(1.227)	0.059	(0.889)	-0.95	(0.795)
Equip.	-0.108	(0.331)	-0.331	(0.305)	0.377	(0.41)	-0.103	(0.316)
Reg. or Lic.	0.778	(0.764)	0.525	(0.793)	0.682	(0.756)	0.58	(0.729)
Signal or Stop	0.025	(0.554)	0.05	(0.54)	0.555	(0.995)	0.244	(0.635)
Moving	-0.081	(0.251)	-0.176	(0.248)	0.107	(0.606)	-0.106	(0.323)
Search, Arrest								
All Other	-0.565**	(0.269)	-0.552*	(0.303)	-0.652**	(0.275)	-0.558**	(0.272)
Equip.	-0.343	(0.433)	-0.406	(0.454)	-1.297***	(0.368)	-0.732**	(0.359)
Reg. or Lic.	0.462	(0.428)	0.435	(0.409)	-0.283	(0.656)	0.187	(0.446)
Signal or Stop	0.614	(0.475)	0.816*	(0.432)	-17.437***	(0.649)	0.02	(0.54)
Moving	-0.751***	(0.263)	-0.71**	(0.288)	-0.681**	(0.322)	-0.619**	(0.259)
Chi^2	191.69		55.56		2684.99		112.24	
P-Value	0.000		0.000		0.000		0.000	
Sample Size	114,477		108,282		106,531		126,051	

Note 1: The coefficients are presented as log odds-ratios along with standard errors clustered at the department level. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance.
Note 2: All specifications include controls for gender, age, hour, day of the week, and week of year fixed effects.
Note 3: Q-Values were estimated using a false discovery rate procedure following Simes (1986) and later refined by Benjamini and Hochberg (1995) and Benjamini and Yekutieli (2001).

The previous set of estimates aggregate all traffic stops across multiple departments and should be considered an average effect. Although the results from this section find a statistically significant

disparity in the way that minority motorists are treated by Connecticut police even after we condition on the motivating reason for the traffic stop, they do not identify the sources of that disparity in terms of specific departments or officers. The results of a department-level analysis are presented in the next section and better identify the source of specific disparities.

VI.B: DEPARTMENT ANALYSIS OF STOP DISPOSITION, 2019

The analysis presented at the state-level shows that minority motorists are treated differently, in terms of disposition, relative to their Caucasian non-Hispanics counterparts, even when they are stopped for the same reason. By construction, the aggregate analysis does not investigate the source of these disparities in terms of specific municipal police departments or State Police troops. The analysis presented in this section seeks to better identify the sources of that disparity by running the same test for individual municipal departments and State Police troops. In this section, we estimate Equation 10 of Appendix A.6 separately for each municipal department and State Police troops. Thus, each set of estimates includes a vector of town-specific controls for the hour, day of the week, gender, age, and week of year fixed effects. We identify all departments and State Police troops found to have a disparity that is statistically significant at the 95% level in either of the Hispanic or Black alone minority groups. The full set of results is contained in Table F.1 of Appendix F.

Table 6.4 presents the results from estimating the test of equality in stop dispositions for minority motorists relative to their Caucasian non-Hispanics peers. As before, our test statistic is generated from a joint hypothesis test on the interaction between race and the basis for a traffic stop across all possible outcomes. For parsimony, we omit the coefficient estimates on these interaction terms and present only the chi-squared and level of significance for the joint hypothesis test. As shown above, we find that four municipal departments have a statistically significant disparity in the distribution of stop outcomes for minority motorists, but they do not survive the requirement of a ten percent or lower false discovery rate. Specifically, we identify East Hartford (Black), Fairfield (Hispanic), Hartford (Black and Hispanic), and Madison (Hispanic). However, we are unable to rule out the possibility that these departments were identified by chance.

Table 6.4: Multinomial Logistic Regression of Outcome on Race/Ethnicity and Reason for Stop by Department, All Traffic Stops 2019

Department	Variable	Non-White	Black	Hispanic	Black or Hispanic
East Hartford	Chi^2	296.601	162.009+++	1	142.888+++
	P-Value	N/A	0	1	0
	Observations	3013	2926	2265	3859
	Pseudo R2	0.273	0.27	0.291	0.239
Fairfield	Chi^2	1	1	215.867+++	1
	P-Value	1	1	0	1
	Observations	5524	5318	5210	6453
	Pseudo R2	0.239	0.244	0.206	0.225
Hartford	Chi^2	99.024+++	85.575+++	102.054+++	1
	P-Value	0	0	0	1
	Observations	9294	9153	6274	12865
	Pseudo R2	0.219	0.221	0.187	0.194

Department	Variable	Non-White	Black	Hispanic	Black or Hispanic
Madison	Chi^2	3550.43	9812.663	85.751+++	3750.649
	P-Value	N/A	N/A	0	N/A
	Observations	1990	1938	1981	2048
	Pseudo R2	0.236	0.234	0.233	0.246

Note 1: The coefficients are presented as log odds-ratios along with standard errors clustered at the department level. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance. Variables concatenated with a + in place of a *, were found to have a false discovery rate greater than 10%.
Note 2: All specifications include controls for gender, age, hour, day of the week, and week of year fixed effects.
Note 3: Q-Values were estimated using a false discovery rate procedure following Simes (1986) and later refined by Benjamini and Hochberg (1995) and Benjamini and Yekutieli (2001).
+ Results are not robust across subsequent

VII: ANALYSIS OF VEHICULAR SEARCHES

This section contains the results of an analysis of post-stop outcomes using a hit-rate approach following Knowles, Persico and Todd (2001). The hit-rate approach relies on the idea that motorists rationally adjust their propensity to carry contraband in response to their likelihood of being searched by police. Similarly, police officers rationally decide whether to search a motorist based on visible indicators of guilt and an expectation of the likelihood that a given motorist might have contraband. According to the model, we should expect police to search a demographic group of motorists more often than Caucasians if they were also more likely to carry contraband. However, the higher level of searches should be exactly proportional to the higher propensity of this group to carry contraband. Thus, in the absence of racial animus, we should expect the rate of successful searches (i.e. the hit-rate) to be equal across different demographic groups regardless of differences in their propensity to carry contraband. [9]

In this test, discrimination is interpreted as a preference for searching minority motorists that shows up in the data as a statistically lower hit-rate relative to Caucasian motorists. In technical terms, the testable implication derived from this model is that the equilibrium search strategy, in the absence of group bias, will result in an equalization of the rate of contraband that is found relative to the total number of searches (i.e. the hit-rate) across motorist groups. In our application, we test for the presence of a disparity in the rate of successful searches using a nonparametric test, the Pearson X^2 test. Note that this test inherently says nothing about disparate treatment in the decision to stop motorists, as it is limited in scope to vehicular searches. Our primary analysis focuses on discretionary searches which we define as those identified as consent or probable cause searches and exclude inventory searches since those are likely correlated with other offenses and race. However, we primarily identify departments based on a robustness using only consent searches. Although there is a compelling case to be made that probable cause searches involve officer discretion, these searches aren't identified explicitly in the data and the category also includes plain view searches. Plain view searches have the potential to bias the results in the same way as inventory searches since they are likely correlated with other offenses and race.

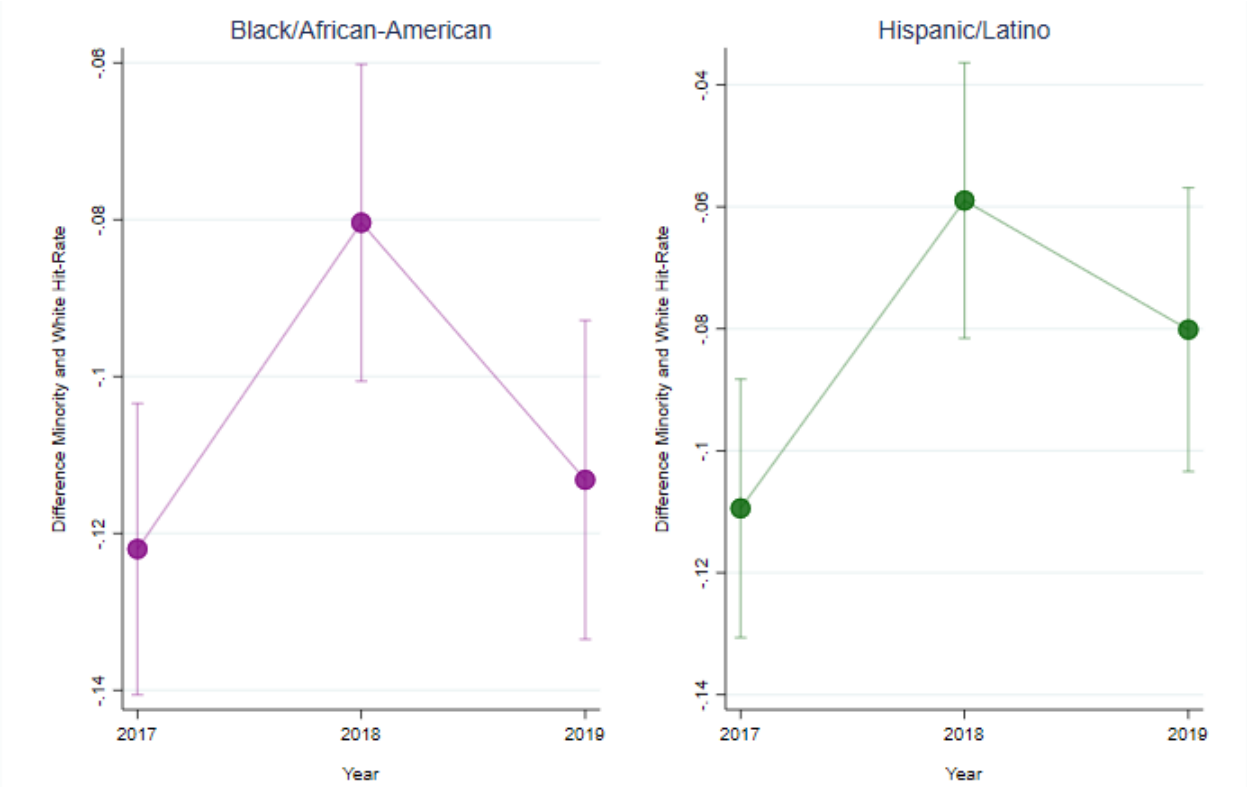
VII.A: AGGEGATE ANALYSIS WITH HIT-RATES, 2019 AND 2017-19

Figure 7.1 presents a confidence interval between the difference in the hit-rate for Black (left panel) and Hispanic (right panel) motorists using data on the outcome of probable cause and consent searches in 2017, 2018, and 2019. The vertical axis on the figure plots a 95% confidence interval around differences in the rate at which contraband is found for discretionary searches of minority motorists relative to non-Hispanic Caucasian motorists. A negative difference indicates that minorities are searched disproportionately often relative to the rate at which police find contraband when compared with their majority peers. Across the period 2017-19, the share of discretionary searches when contraband is found for Black motorists ranged from 33.6% to 40.4% and from 34.8%

[9] Although some criticism has risen concerning the technique and extensions have suggested that more disaggregated groupings of searches be used in the test, the ability to implement such improvements is limited by the small overall sample of searches in a single year of traffic stops. Despite these limitations, the hit-rate analysis is still widely applied in practice and contributes to the overall understanding of post-stop police behavior in Connecticut.

to 42.5% for Hispanic motorists. The range in both minority hit-rates stood dramatically lower than that for non-Hispanic Caucasians motorists which ranged from 45.8% to 49.1% over the period. The difference in the rate of successful searches between both Black and Hispanic relative to Caucasian non-Hispanic motorists was negative and highly significant at the 99 percent level in all years. In general, the test consistently shows a disparity in the likelihood a minority motorist is searched by police in Connecticut which is relatively large in magnitude.

Figure 7. 1: **Aggregate Hit-Rate Analysis by Year, All Discretionary Searches 2017-19**



Notes: Coefficient estimates are obtained from Table 7.1 of the 2017 and 2018 annual report as well as the 2019 estimates from the table below.

Table 7.1 contains the results of the hit-rate test formally applied to all departments in Connecticut in 2019. As seen below, the rate of successful consent and probable cause searches for Caucasian non-Hispanics motorists was 47.6% in 2019. Relative to Caucasian non-Hispanics motorists, the hit-rate for each of the four minority subgroups was lower and ranged from 37.1% to 39.4%. The difference in hit-rates for each group was statistically significant at the 99% level. In aggregate, Connecticut police departments are less successful when conducting searches of minority motorist relative to their majority peers which indicates potentially adverse treatment on the part of police.

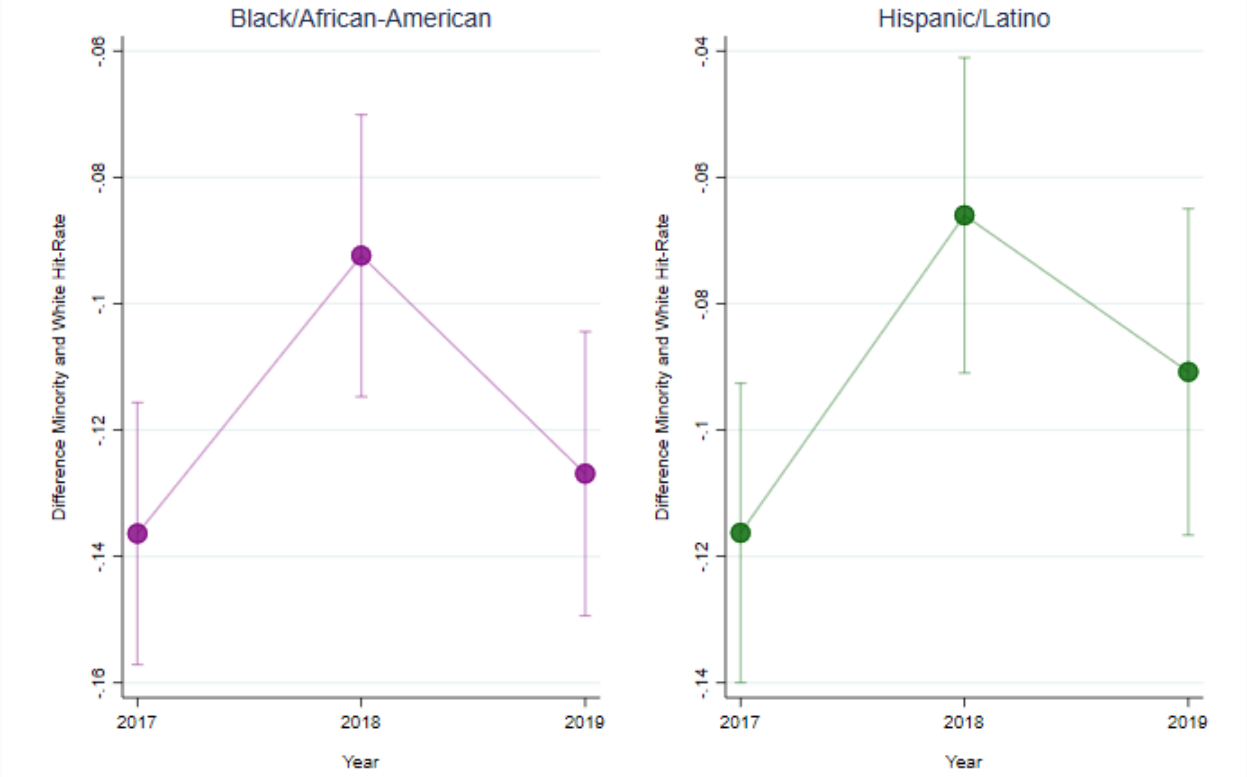
Table 7. 1: Chi-Square Test of Hit-Rate, All Discretionary Searches 2019

Variable	Caucasian	Non-Caucasian	Black	Hispanic	Black or Hispanic
Hit Rate	47.638%	37.418%***	37.144%***	39.422%***	38.020%***
Contraband	7,432	5,111	4,949	3,451	8,227
Searches	15,601	13,659	13,324	8,754	21,638
Chi^2	N/A	0.001	0.001	0.001	0.001
P-Value	N/A	310.554	323.285	153.139	344.049

Notes: The coefficients are presented along with robust standard errors. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance. Sample includes all consent and probable cause searches in 2019.

Figure 7.2 presents a confidence interval between the difference in the hit-rate for Black (left panel) and Hispanic (right panel) motorists using data on the outcome of consent and probable cause searches for municipal departments in 2017, 2018, and 2019. As before, the vertical axis on the figure plots a 95% confidence interval around differences in the rate at which contraband is found for consent and probable cause searches of minority motorists relative to non-Hispanic Caucasian motorists. A negative difference indicates that minorities are searched disproportionately often relative to the rate at which police find contraband when compared with their majority peers. Across the period 2017-19, the share of consent and probable cause searches when contraband is found for Black motorists ranged from 33.6% to 41.1% and from 35.6% to 43.7% for Hispanic motorists. The range in both minority hit-rates stood dramatically lower than that for non-Hispanic Caucasians motorists which ranged from 47.2% to 51.2% over the period. As with the aggregate state level results, the results for municipal departments indicate that searches of minority motorists are more likely to be unsuccessful relative to Caucasian non-Hispanic motorists. All of disparities were significantly different than zero at a level greater than 99% confidence. In general, the test consistently shows a disparity in the likelihood a minority motorist is searched by municipal police in Connecticut.

Figure 7. 2: Aggregate Hit-Rate Analysis by Year, Municipal Discretionary Searches 2017-19



Notes: Coefficient estimates are obtained from Table 7.2 of the 2017 and 2018 annual report as well as the 2019 estimates from the table below.

Table 7.2 contains the results of the hit-rate test formally applied to all municipal departments in Connecticut in 2019. As seen below, the rate of successful consent and probable cause searches for Caucasian non-Hispanics motorists was 49.4% in 2019. Relative to Caucasian non-Hispanics motorists, the hit-rate for each of the four minority subgroups was lower and ranged from 37.6% to 40.4%. The difference in hit-rates for each group was statistically significant at the 99% level. In aggregate, Connecticut municipal police departments are less successful when conducting searches of minority motorist relative to their majority peers which indicates potential adverse treatment.

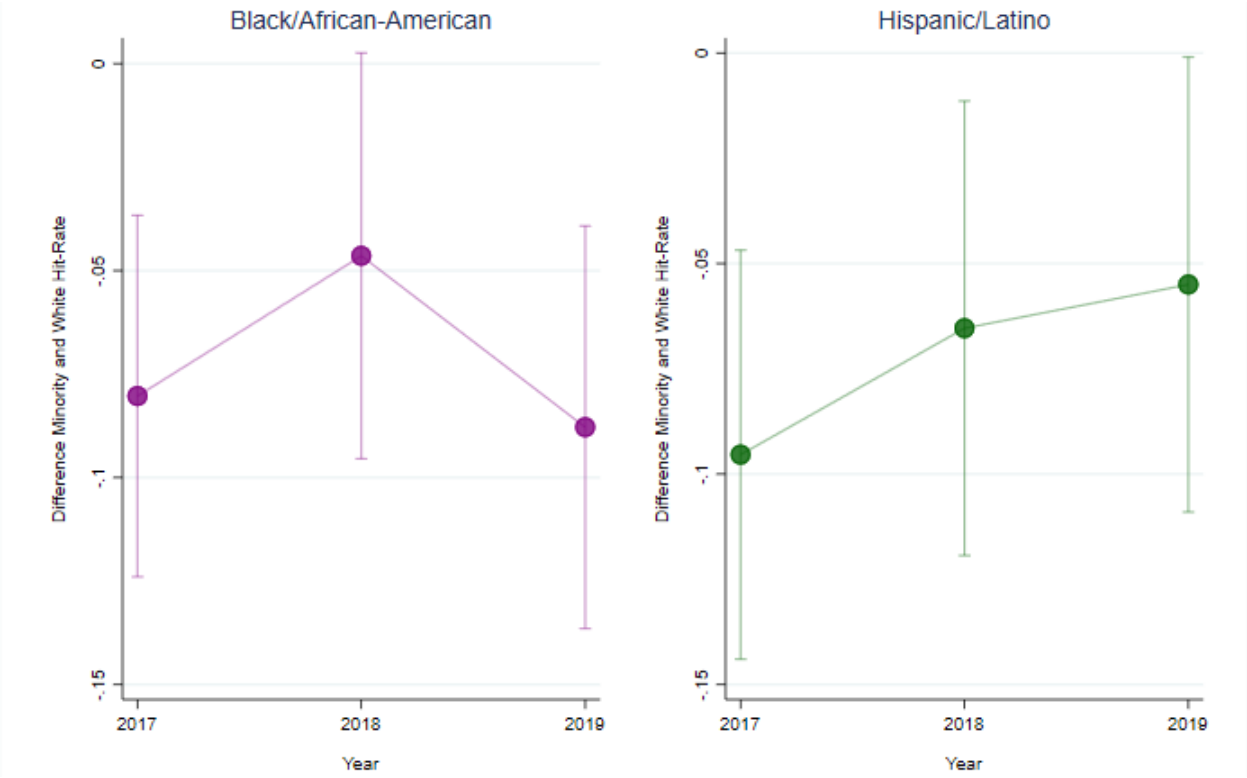
Table 7. 2: Chi-Square Test of Hit-Rate, Municipal Police Discretionary Searches 2019

Variable	Caucasian	Non-Caucasian	Black	Hispanic	Black or Hispanic
Hit Rate	49.431%	37.904%***	37.612%***	40.416%***	38.673%***
Contraband	6,045	4,364	4,239	2,948	7,050
Searches	12,229	11,513	11,270	7,294	18,230
Chi2	N/A	0.001	0.001	0.001	0.001
P-Value	N/A	320.015	332.86	149.449	345.696

Notes: The coefficients are presented along with robust standard errors. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance. Sample includes all discretionary searches in 2019.

Figure 7.3 presents a confidence interval between the difference in the hit-rate for Black (left panel) and Hispanic (right panel) motorists using data on the outcome of consent and probable cause searches by State Police in 2017, 2018, and 2019. As before, the vertical axis on the figure plots a 95% confidence interval around differences in the rate at which contraband is found for consent and probable cause searches of minority motorists relative to non-Hispanic Caucasian motorists. A negative difference indicates that minorities are searched disproportionately often relative to the rate at which police find contraband when compared with their majority peers. Across the period 2017-19, the share of consent and probable cause searches when contraband is found for Black motorists ranged from 31.9% to 34.9% and from 30.6% to 35.1% for Hispanic motorists. The range in both minority hit-rates was periodically lower than that for non-Hispanic Caucasians motorists which ranged from 39.6% to 40.6% over the period. The results for State Police indicate that searches of minority motorists were only more likely to be unsuccessful relative to Caucasian non-Hispanic motorists in 2017 (Black and Hispanic) and 2019 (Black). The differences for these years and minority groups were significant at the 99% confidence level for all years except for Black motorists in 2018.

Figure 7. 3: Aggregate Hit-Rate Analysis by Year, State Police Discretionary Searches 2017-19



Notes: Coefficient estimates are obtained from Table 7.3 of the 2017 and 2018 annual report as well as the 2019 estimates from the table below.

Table 7.3 contains the results of the hit-rate test formally applied to all departments in Connecticut in 2019. As seen below, the rate of successful consent and probable cause searches for Caucasian non-Hispanics motorists was 40.1% in 2019. Relative to Caucasian non-Hispanics motorists, the hit-rate for each of the four minority subgroups was lower and ranged from 32.9% to 33.3%. The

difference in hit-rates was found to be statistically significant only for Black motorists. In aggregate, Connecticut State Police are less successful when conducting searches of Black motorist relative to their majority peers which indicates potential adverse treatment for that group in 2019.

Table 7.3: Chi-Square Test of Hit-Rate, State Police Discretionary Searches 2019

Variable	Caucasian	Non-Caucasian	Black	Hispanic	Black or Hispanic
Hit Rate	40.118%	33.265%***	32.912%***	32.874%***	32.893%***
Contraband	1,295	662	626	453	1,045
Searches	3,228	1,990	1,902	1,378	3,177
Chi2	N/A	0.001	0.001	0.001	0.001
P-Value	N/A	24.655	26.524	21.52	36.048

Notes: The coefficients are presented along with robust standard errors. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance. Sample includes all discretionary searches in 2019.

VII.B: AGGREGATE ROBUSTNESS CHECKS WITH CONSENT SEARCHES, 2019 AND 2017-19

This section presents a robustness check on the initial specification using a more restrictive subsample of only consent searches. As mentioned, the prior analysis which probable cause searches is potentially biased against finding discrimination because these searches are not explicitly distinct in the data from plain view searches. Figure 7.4 presents a confidence interval between the difference in the hit-rate for Black (left panel) and Hispanic (right panel) motorists using data on the outcome of consent searches in 2017, 2018, and 2019. The vertical axis on the figure plots a 95% confidence interval around differences in the rate at which contraband is found for consent searches of minority motorists relative to non-Hispanic Caucasian motorists. A negative difference indicates that minorities are searched disproportionately often relative to the rate at which police find contraband when compared with their majority peers. Across the period 2017-19. The share of consent searches when contraband is found for Black motorists ranged from 19.2% to 24.8% and from 19.2% to 27.0% for Hispanic motorists. The range in both minority hit-rates stood dramatically lower than that for non-Hispanic Caucasians motorists which ranged from 28.9% to 31.8% over the period. The difference in the rate of successful searches between both Black and Hispanic relative to Caucasian non-Hispanic motorists was negative and highly significant at the 99 percent level in all years. In general, the test consistently shows a disparity in the likelihood a minority motorist is searched by police in Connecticut which is relatively large in magnitude.

Figure 7. 4: Aggregate Hit-Rate Analysis by Year, Consent Searches 2017-19

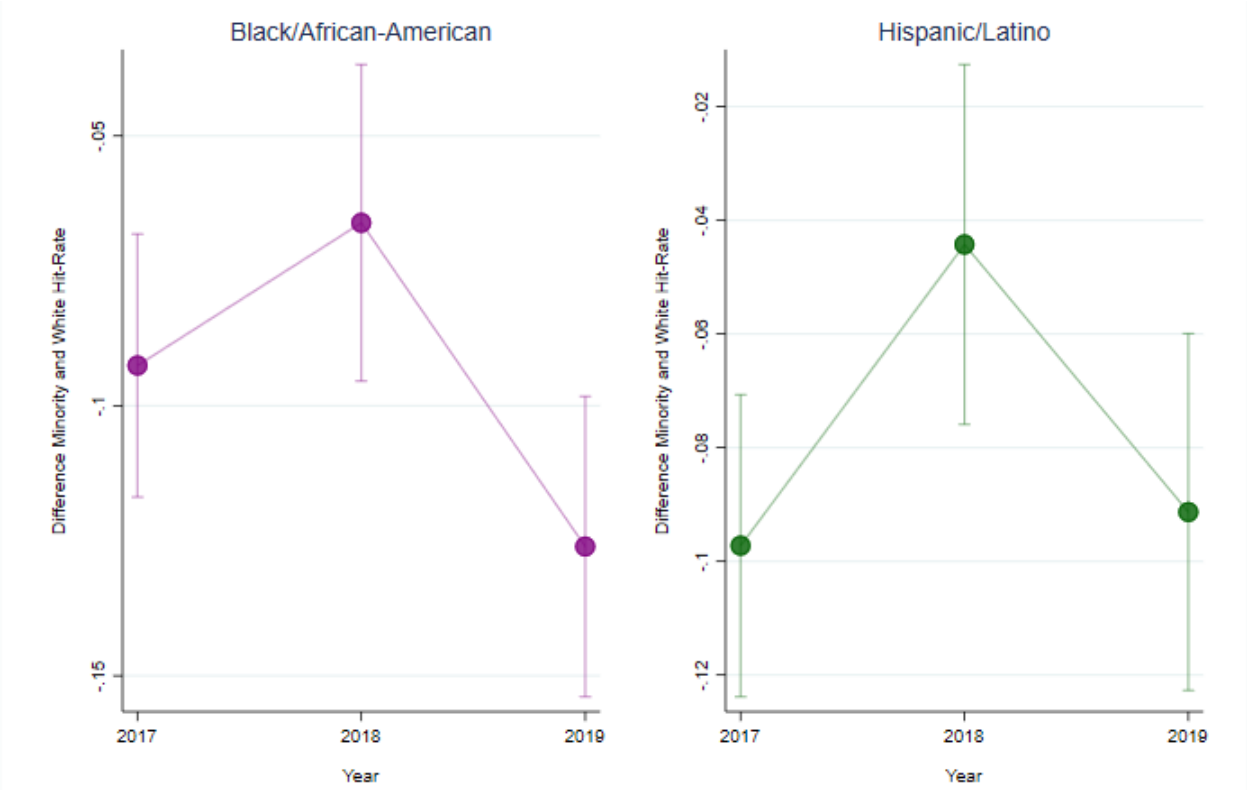


Table 7.4 contains the results of the hit-rate test formally applied to all departments in Connecticut in 2019. As seen below, the rate of successful consent searches for Caucasian non-Hispanics motorists was 31.8% in 2019. Relative to Caucasian non-Hispanics motorists, the hit-rate for each of the four minority subgroups was lower and ranged from 19.2% to 22.7%. The difference in hit-rates for each group was statistically significant at the 99% level. In aggregate, Connecticut police departments are less successful when conducting searches of minority motorist relative to their majority peers which indicates potentially adverse treatment on the part of police.

Table 7. 4: Chi-Square Test of Hit-Rate, Consent Searches 2019

Variable	Caucasian	Non-Caucasian	Black	Hispanic	Black or Hispanic
Hit Rate	31.794%	19.502%***	19.187%***	22.660%***	20.655%***
Contraband	599	360	345	281	612
Searches	1,884	1,846	1,798	1,240	2,963
Chi^2	N/A	73.763	76.684	30.826	76.249
P-Value	N/A	0.001	0.001	0.001	0.001

Notes: The coefficients are presented along with robust standard errors. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance. Sample includes all consent searches in 2019.

Figure 7.5 presents a confidence interval between the difference in the hit-rate for Black (left panel) and Hispanic (right panel) motorists using data on the outcome of consent searches for municipal

departments in 2017, 2018, and 2019. As before, the vertical axis on the figure plots a 95% confidence interval around differences in the rate at which contraband is found for consent searches of minority motorists relative to non-Hispanic Caucasian motorists. A negative difference indicates that minorities are searched disproportionately often relative to the rate at which police find contraband when compared with their majority peers. Across the period 2017-19. The share of consent searches when contraband is found for Black motorists ranged from 18.0% to 24.4% and from 18.1% to 25.1% for Hispanic motorists. The range in both minority hit-rates stood dramatically lower than that for non-Hispanic Caucasians motorists which ranged from 27.5% to 32.2% over the period. As with the aggregate state level results, the results for municipal departments indicate that searches of minority motorists are more likely to be unsuccessful relative to Caucasian non-Hispanic motorists. All of disparities were significantly different than zero at a level greater than 99% confidence. In general, the test consistently shows a disparity in the likelihood a minority motorist is searched by municipal police in Connecticut.

Figure 7. 5: Aggregate Hit-Rate Analysis by Year, Municipal Consent Searches 2017-19

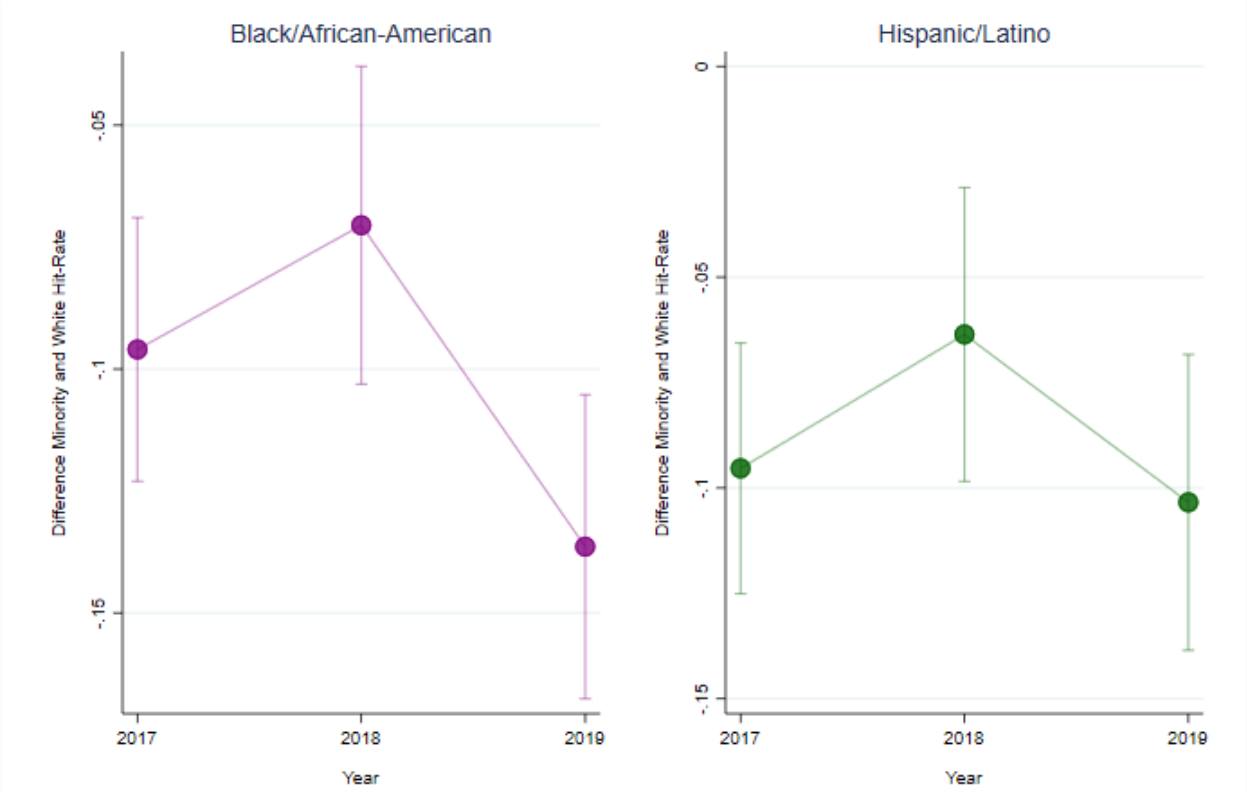


Table 7.5 contains the results of the hit-rate test formally applied to all municipal departments in Connecticut in 2019. As seen below, the rate of successful consent searches for Caucasian non-Hispanics motorists was 32.2% in 2019. Relative to Caucasian non-Hispanics motorists, the hit-rate for each of the four minority subgroups was lower and ranged from 18.5% to 21.8%. The difference in hit-rates for each group was statistically significant at the 99% level. In aggregate, Connecticut municipal police departments are less successful when conducting searches of minority motorist relative to their majority peers which indicates potential adverse treatment.

Table 7. 5: Chi-Square Test of Hit-Rate, Municipal Consent Searches 2019

Variable	Caucasian	Non-Caucasian	Black	Hispanic	Black or Hispanic
Hit Rate	32.193%	18.811%***	18.551%***	21.850%***	19.902%***
Contraband	461	288	279	222	491
Searches	1,432	1,531	1,504	1,016	2,467
Chi^2	N/A	70.146	72.418	31.601	74.156
P-Value	N/A	0.001	0.001	0.001	0.001

Notes: The coefficients are presented along with robust standard errors. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance. Sample includes all consent searches in 2019.

Figure 7.6 presents a confidence interval between the difference in the hit-rate for Black (left panel) and Hispanic (right panel) motorists using data on the outcome of consent searches by State Police in 2017, 2018, and 2019. As before, the vertical axis on the figure plots a 95% confidence interval around differences in the rate at which contraband is found for consent searches of minority motorists relative to non-Hispanic Caucasian motorists. A negative difference indicates that minorities are searched disproportionately often relative to the rate at which police find contraband when compared with their majority peers. Across the period 2017-19, the share of consent searches when contraband is found for Black motorists ranged from 20.1% to 24.0% and from 23.0% to 29.2% for Hispanic motorists. The range in both minority hit-rates was periodically lower than that for non-Hispanic Caucasians motorists which ranged from 27.5% to 31.2% over the period. The results for State Police indicate that searches of minority motorists were only more likely to be unsuccessful relative to Caucasian non-Hispanic motorists in 2017 (Black and Hispanic) and 2019 (Black). The differences for these years and minority groups were significant at the 99% confidence level while the remaining estimates were statistically indistinguishable from zero.

Figure 7. 6: Aggregate Hit-Rate Analysis by Year, State Police Consent Searches 2017-19

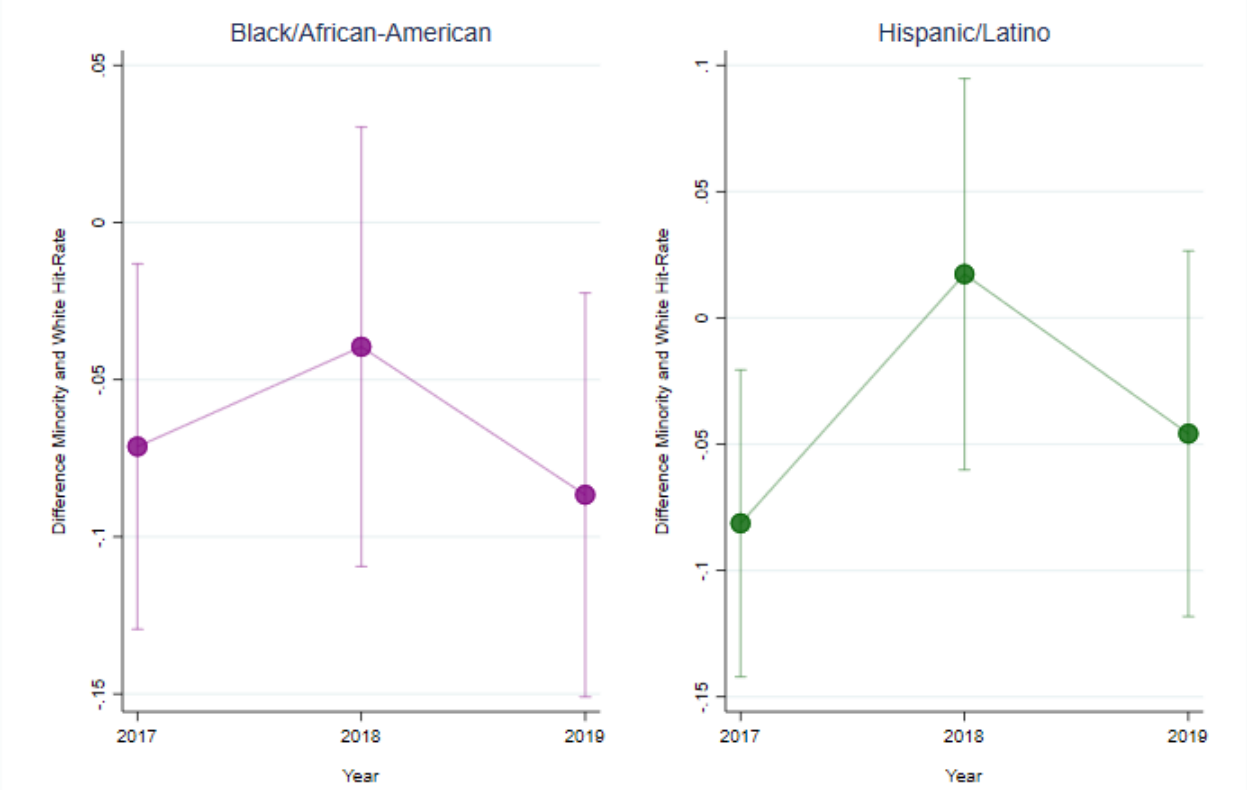


Table 7.6 contains the results of the hit-rate test formally applied to all State Police Troops in Connecticut in 2019. As seen below, the rate of successful consent searches for Caucasian non-Hispanics motorists was 28.7% in 2019. Relative to Caucasian non-Hispanics motorists, the hit-rate for each of the four minority subgroups was lower and ranged from 20.1% to 24.2%. The difference in hit-rates was found to be statistically significant only for Black motorists. In aggregate, Connecticut State Police are less successful when conducting searches of Black motorist relative to their majority peers which indicates potential adverse treatment for that group in 2019.

Table 7. 6: Chi-Square Test of Hit-Rate, State Police Consent Searches 2019

Variable	Caucasian	Non-Caucasian	Black	Hispanic	Black or Hispanic
Hit Rate	28.738%	20.760%**	20.073%**	24.155%	21.978%**
Contraband	123	60	54	50	100
Searches	428	289	269	207	455
Chi^2	N/A	5.775	6.545	1.478	5.339
P-Value	N/A	0.016	0.010	0.224	0.020

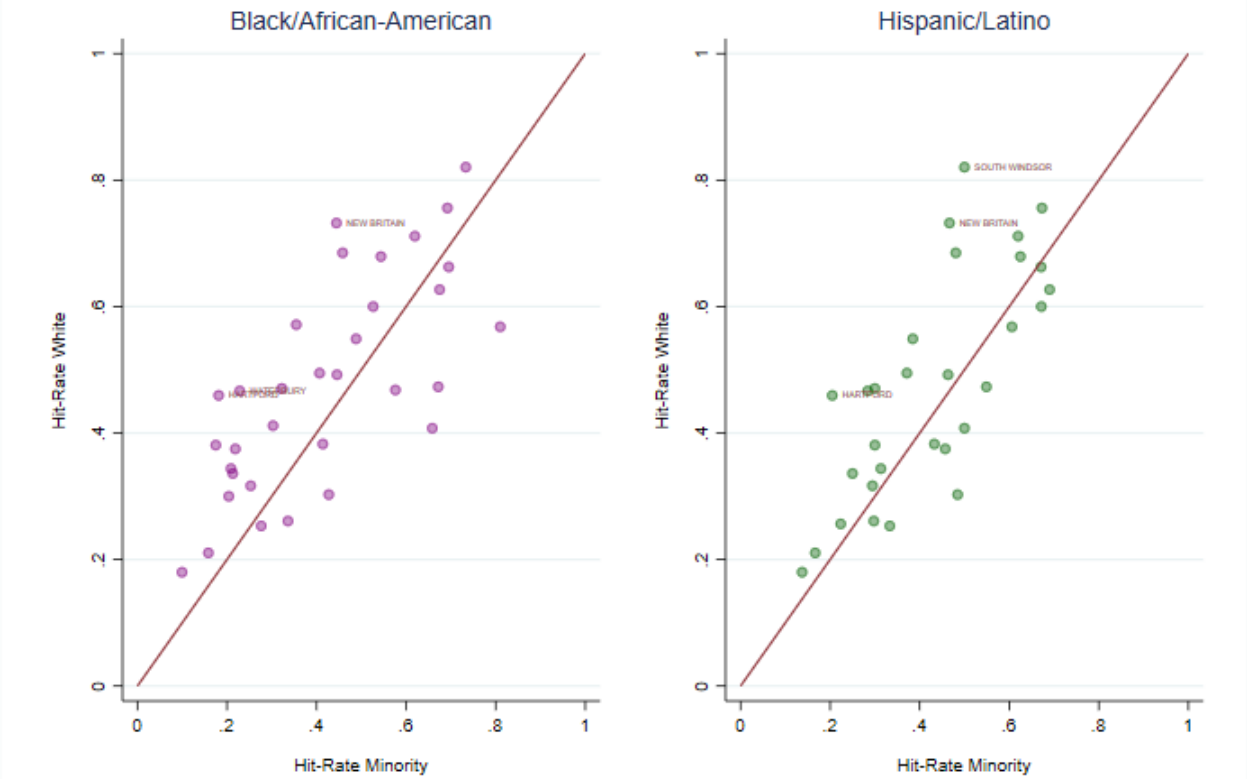
Notes: The coefficients are presented along with robust standard errors. A coefficient concatenated with * represents a p-value of .1, ** represents a p-value of .05, and *** represents a p-value of .01 significance. Sample includes all consent searches in 2019.

VII.C: DEPARTMENT ANALYSIS WITH HIT-RATES, 2019 AND 2017-19

The analysis presented for Connecticut police as a whole showed that the likelihood a police search of a minority results in contraband being found is significantly lower relative to searches of their non-minority peers. In this subsection, differences in hit-rates are estimated independently for each municipal department and State Police troop. We graphically present estimate of the hit-rate test separately for each municipal department and State Police troop. We first provide results for the 2019 sample of the data as we have done in the prior three reports. However, we also leverage the full three-year sample from 2017-19 and graphically present estimates of the effect of daylight for smaller departments which previously had an insufficiently small sample to run the test annually. In this test, it is necessary to restrict the sample to only motorists stopped and subsequently searched by police. However, this restriction significantly reduces the estimation power in small samples. In the figures and discussion below, we highlight only the departments found to have a statistically significant disparity in the Black or Hispanic alone categories for either the 2019 or combined 2017-19 samples. Identification requires that departments and State Police troops have a disparity that is statistically significant at or above the 95% level in either of the Hispanic or Black alone minority groups. Further, we only highlight departments that have a false discovery rate below 10% in both specifications. We provide the full set of results in Tables G.1, G.2, G.3, and G.4 of Appendix G.

Figure 7.7 plots the likelihood a Black (left panel) or Hispanic (right panel) motorist is searched by police relative to their non-Hispanic Caucasian peers. Individual points on the figure represent specific municipal departments and State Police troops. The vertical axis plots the likelihood that a discretionary search of a non-Hispanic Caucasian motorist results in contraband being found and the horizontal axis plots the same likelihood for minority motorists. The red 45-degree line represents parity (equal treatment) between police searches of minorities and non-Hispanic Caucasians. Thus, only departments falling above this line (top left quadrant) are more likely to search minority motorists relative to non-minorities. We annotate only those departments where the difference is statistically significant at or above the 95% confidence level in the main specification and with a false discovery rate below 10%. The full results are contained in Table G.1 of Appendix G. Applying this test to the 2019 data, we identify Hartford (Black and Hispanic), New Britain (Black and Hispanic), South Windsor (Hispanic), and Waterbury (Black). All of these results were statistically significant at a level exceeding 95% confidence and had a false discovery rate below 10%. However, we note that only the results for Hartford survive subsequent robustness checks that restrict the sample to only consent searches. The full results for robustness checks that restrict the sample to only consent searches is contained in Table G.2 of Appendix G.

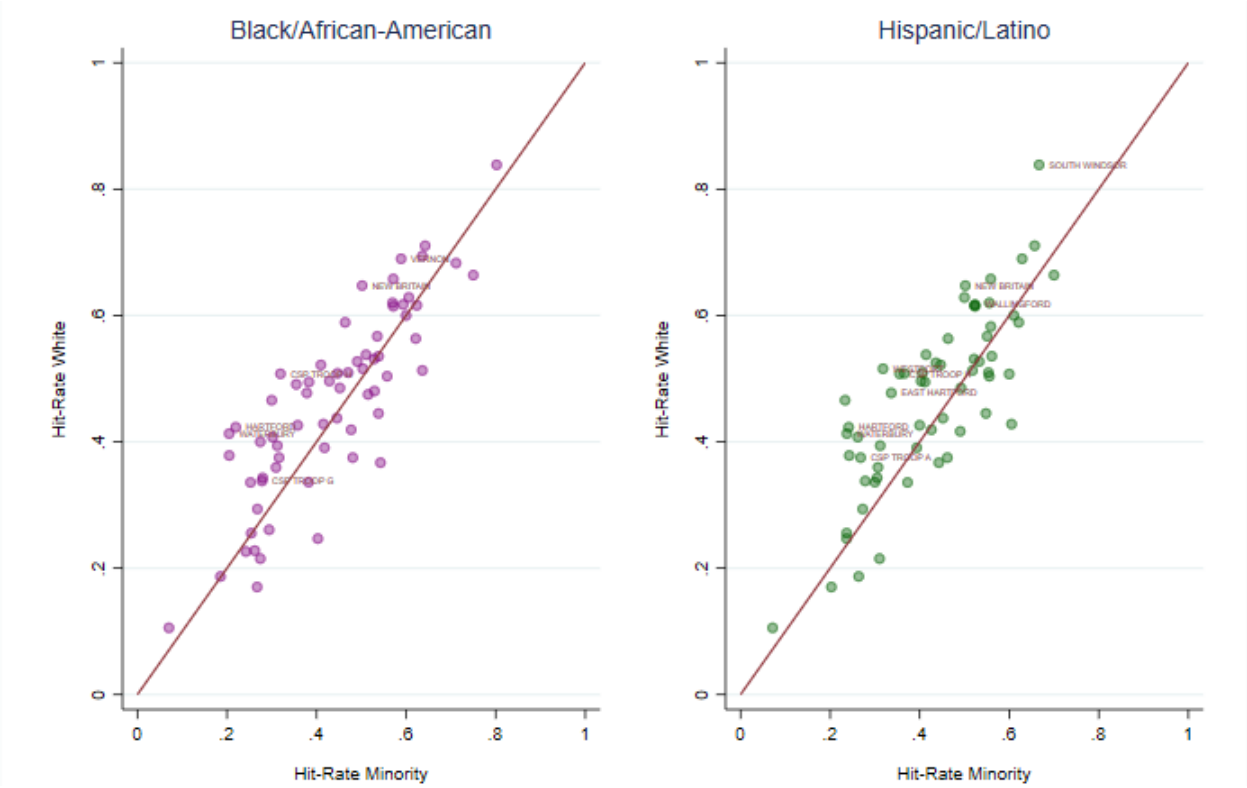
Figure 7. 7: Hit Rate Analysis by Department, All Discretionary Searches 2019



Notes: Hit-rates are obtained from Table F.1 of Appendix F. Annotated departments include only those with a statistically significant disparity estimated non-parametrically with a confidence level at or exceeding the 95% in the combined sample of discretionary searches. Identified departments also had a false discovery rate below 10% estimated following Simes (1986), Benjamini and Hochberg (1995), and Benjamini and Yekutieli (2001).

As discussed, there are too few searches for this test to be applied to a single year of data for many small departments. Thus, Figure 7.8 plots the likelihood a Black (left panel) or Hispanic (right panel) motorist is searched by police relative to their non-Hispanic Caucasian peers in a combined three-year sample. The full results are contained in Table G.2 of Appendix G. Applying this test to the 2017-19 data, we identify, State Police Troop A (Hispanic), State Police Troop H (Black and Hispanic), East Hartford (Hispanic), Hartford (Black and Hispanic), New Britain (Black and Hispanic), South Windsor (Hispanic), Vernon (Black), Wallingford (Hispanic), Waterbury (Black and Hispanic), and Westport (Hispanic). All of these results were statistically significant at a level exceeding 95% confidence and had a false discovery rate below 10%. However, we note that only the results for Hartford and Vernon survive subsequent robustness checks that restrict the sample to only consent searches. The full results for robustness checks that restrict the sample to only consent searches is contained in Table G.4 of Appendix G.

Figure 7. 8: Hit Rate Analysis by Department, All Discretionary Searches 2017-19



Notes: Hit-rates are obtained from Table F.2 of Appendix F. Annotated departments include only those with a statistically significant disparity estimated non-parametrically with a confidence level at or exceeding the 95% in the combined sample of discretionary searches. Identified departments also had a false discovery rate below 10% estimated following Simes (1986), Benjamini and Hochberg (1995), and Benjamini and Yekutieli (2001).

VIII: FINDINGS FROM THE 2019 AND 2017-19 ANALYSIS

This section represents a summary of the findings from both the annual analysis of traffic stops conducted between January 1, 2019 and December 31, 2019 and the 2017 to 2019 three-year aggregate analysis between January 1, 2017 and December 31, 2019.

VIII.A: AGGREGATE FINDINGS FOR CONNECTICUT, 2019 AND 2017-19

Municipal and State Police departments in Connecticut made 512,679 traffic stops in 2019 (1,563,846 in 2017-19) of which 63% (64%) were of White non-Hispanic motorists while 18% (17.7%) were Black and 15.8% (15%) were of Hispanic motorists. At the aggregate level, we present estimates from applying the veil of darkness analysis, a search hit-rate analysis, and a post-stop disposition analysis. The veil of darkness analysis exploits quasi-random variation in the timing of sunset to identify potential discrimination in the decision to stop a motorist. According to the results from applying this test, the estimated change from daylight to darkness in the odds a stopped motorist is a Black was 1 in 2017, 0.96 in 2018, and 0.97 in 2019. The change from daylight to darkness in the odds a stopped motorist is Hispanic was 1 in 2017, 1.06 in 2018, and 1.06 in 2019.

The key identifying assumption of this test is that police officers who are inclined to racially profile motorists are better able to do so during daylight when motorist race is more easily observed prior to making a traffic stop. Following this logic, the results suggest that police in Connecticut are no more likely to stop minority motorists in daylight relative to darkness. Although this is indicative of equal treatment on the part of Connecticut police as a whole in the decision to stop a minority motorist, these results do not necessarily indicate that all departments or officers in the state behave this way as these are aggregate estimates of the mean officer's behavior. In general, the disparity in the decision to stop a minority motorist has remained relatively stable in terms of magnitude and statistical precision from 2017 through 2019.

Municipal and State Police departments in Connecticut searched 16,438 or 3.2% (50,370 or 3.2% in 2017-19) of which 38.6% (41%) were of White non-Hispanic motorists while 34.4% (34%) were of Black and 25.8% (25.1%) were of Hispanic motorists. At the aggregate level, we present estimates comparing the likelihood a search resulted in contraband being found for White non-Hispanic motorists relative to minority motorists. In addition, we compare the disposition of traffic stops across these groups after conditioning on the motivating reason for the traffic stop. The rate at which discretionary searches of White non-Hispanic motorists yielded contraband was 28.7% in 2017, 31.3% in 2018, and 31.2% in 2019. The rate at which searches of Black and Hispanic motorists yielded contraband was 19.6% and 19.1% respectively in 2017, 24.7% and 26.9% respectively in 2018, and 19.1% and 22.5% respectively in 2019. The significant lower hit-rate for minority motorists suggests the potential presence of a preference on the part of police for searching minority motorist. Similarly, the stop disposition analysis suggests minority motorists are more likely to receive a warning and less likely to be searched overall even after condition on the motivating reason for the stop. In general, the disparity in the decision to search a minority motorist has remained relatively stable in terms of magnitude and statistical precision from 2017 through 2019.

VIII.B: VEIL OF DARKNESS ANALYSIS FINDINGS, 2019 AND 2017-19

In an effort to better identify the source of these racial and ethnic disparities, each analysis was repeated at the department level for both the 2019 calendar year and the 2017 to 2019 aggregate sample. The threshold for identifying individual departments was the presence of a disparity that was statistically significant at the 95 percent level in the Black or Hispanic alone categories.[10] By construction, the departments that were identified as having a statistically significant disparity are the largest contributors to the overall statewide results. Here, the unit of analysis is a municipal department or State Police Troop where disparities could be a function of a number of factors including institutional culture, departmental policy, or individual officers.[11]

In total, we identify only one State Police Troop in the 2019 sample and one State Police Troop in the three-year aggregate sample. We also identified two municipal police departments in the three-year aggregate sample. Of the two municipal police departments identified in the three-year aggregate sample, one department was identified in a previous annual study. For all departments identified in either the 2019 or three-year aggregate samples, we conclude that there is strong evidence that a disparity exists in the rate of minority traffic stops made during daylight conditions. These departments include:

State Police Troop L

State Police Troop L was identified using the veil of darkness analysis in the 2019 sample for Hispanic motorists. The veil of darkness analysis exploits quasi-random variation in visibility to identify potential discrimination controlling for day of week and time of day. During the sample window for this test, the probability a stopped motorist in State Police Troop L was Hispanic totaled 6.4 percent in darkness when we presume that police are less able to detect the race of a motorist prior to making a traffic stop. Conditioning on day of the week and time of day, the probability a stopped motorist was Hispanic grew to 39.5 percent during daylight when we presume that police are better able to detect race.

State Police Troop C

State Police Troop C was identified using the veil of darkness analysis in the combined 2017-19 sample for Black and Hispanic motorists. The veil of darkness analysis exploits quasi-random variation in visibility to identify potential discrimination controlling for day of week and time of day. We leverage the combined three-year sample in order to obtain a more precise estimate of a disparity for Black and Hispanic motorists. During the sample window for this test, the odds a stopped motorist in Troop C was Black and Hispanic totaled 9.2 and 8.5 percent in darkness respectively when we presume that police are less able to detect the race of a motorist prior to making a traffic stop. Conditioning on day of the week and time of day, the odds a stopped motorist was Black, and Hispanic grew to 16.3 and 24.1 percent during daylight respectively when we presume that police are better able to detect race.

[10] Put simply, there must have been at least a 95 percent chance that the motorists were more likely to be stopped at a higher rate relative to white Non-Hispanic motorists.

[11] Since department or state police barrack estimates represent an average effect of stops made by individual officers weighted by the number of stops that they made in 2018, it is possible that officer-level disparities exist in departments which were not identified.

Old Saybrook:

Old Saybrook was identified using the veil of darkness analysis in the combined 2017-19 sample for Hispanic motorists. The veil of darkness analysis exploits quasi-random variation in visibility to identify potential discrimination controlling for day of week and time of day. We leverage the combined three-year sample in order to obtain a more precise estimate of a disparity for Hispanic motorists. During the sample window for this test, the odds a stopped motorist in Old Saybrook was Hispanic totaled 7 percent in darkness when we presume that police are less able to detect the race of a motorist prior to making a traffic stop. Conditioning on day of the week and time of day, the odds a stopped motorist was Hispanic grew to 31.2 percent during daylight when we presume that police are better able to detect race.

Ridgefield:

Ridgefield was identified using the veil of darkness analysis in the combined 2017-19 sample for Black motorists. The veil of darkness analysis exploits quasi-random variation in visibility to identify potential discrimination controlling for day of week and time of day. We leverage the combined three-year sample in order to obtain a more precise estimate of a disparity for Black motorists. During the sample window for this test, the odds a stopped motorist in Ridgefield was Black totaled 6.7 percent in darkness when we presume that police are less able to detect the race of a motorist prior to making a traffic stop. Conditioning on day of the week and time of day, the odds a stopped motorist was Black grew to 26 percent during daylight when we presume that police are better able to detect race.

VIII.C: OTHER STATISTICAL AND DESCRIPTIVE MEASURE FINDINGS, 2019 AND 2017-19

In addition to the two municipal police departments and two State Police troop identified to exhibit statistically significant racial or ethnic disparities in the Veil of Darkness analysis, a number of other departments were identified using either the descriptive tests, stop disposition test or KPT hit-rate analysis. Identification in any one of these tests alone is not, in and of itself, sufficient to be identified for further analysis. However, these additional tests are designed as an additional screening tool to identify the jurisdictions where consistent disparities exceed certain thresholds that appear in the data. Although it is understood that certain assumptions have been made in the design of each of these measures, it is reasonable to believe that departments with consistent data disparities that separate them from the majority of other departments should be subject to further review and analysis with respect to the factors that may be causing these differences.

Synthetic Control Analysis

The results from estimating whether individual departments stopped more minority motorists relative to their requisite synthetic control found 31 municipal police departments to have a disparity that was statistically significant at the 95 percent level in the Black or Hispanic alone categories and withstood doubly-robust estimation, and had a false discovery rate below 10%. *Bristol, East Hartford, Enfield, Glastonbury, Hamden, Meriden, New Britain, New Haven, New London, Newington, Norwich, Stratford, Vernon, West Hartford,* and *Wethersfield* were identified in the 2019 sample and the aggregate 2017 to 2019 sample. *Bethel, Branford, Danbury, New Canaan, Orange,* and *Windsor* were identified only in the 2019 sample. Lastly, *Cromwell, Derby, Fairfield, Greenwich, Middletown, Redding,*

Ridgefield, Waterbury, Willimantic, and *Windsor Locks* were identified only in the three-year aggregate analysis.

Descriptive Statistics Analysis:

The descriptive tests are designed as an additional tool to identify disparities that exceed certain thresholds that appear in a series of census-based benchmarks. Those three benchmarks are: (1) statewide average, (2) the estimated commuter driving population, and (3) resident-only stops. Although 66 municipal police departments were identified with racial and ethnic disparities when compared to one or more of the descriptive measures, only *Stratford, Wethersfield, Vernon, Derby, Newington, East Hartford, Meriden,* and *Waterbury* exceeded the disparity threshold in more than half the benchmark areas.

Stop Disposition Analysis:

In aggregate, minority motorists stopped by municipal police departments were found to have a statistically different distribution of outcomes conditional on the basis for which they were stopped. In the departmental analysis, there were four municipal departments found to have a disparity in the distribution of outcomes. However, none of these towns had a false discovery rate that was below the maximum threshold for formal identification of ten percent. These differences were statistically significant at the 95 percent level or above in the Black or Hispanic alone categories. However, we note that the number of violations might be corelated with more severe outcomes and race. Since this variable is unobservable in the current data and we are unable to rule out the possibility that the identified towns arose from chance, we strongly caution the reader about drawing any conclusions from this section alone.

KPT Hit-Rate Analysis:

The results of this test, applied to the aggregate search data for all departments in Connecticut show that departments are less successful in motorist searches across all minority groups, which is a potential indicator of disparate treatment. There was a total of four municipal police departments found to have a disparity in the hit-rate of minority motorists relative to White non-Hispanics motorists for the 2019 sample, but only the results for one department survived the robustness test. In addition, there were eight municipal police departments and two State Police troops found to have a disparity in the hit-rate of minority motorists relative to White non-Hispanic motorists for the three-year aggregate sample. Only two municipal police departments survived the robustness test for the three-year aggregate sample. The two municipal departments identified to exhibit a statistically significant racial or ethnic disparity in searches across all robustness tests were:

Hartford:

Hartford was identified on the search hit-rate analysis in the 2019 sample as well as the combined 2017-19 sample for Black and Hispanic motorists. This analysis compares the rate at which searched minority motorists are found with contraband relative to the same majority rate. In the 2019 data for Hartford, contraband was found in 18.1% of Black and 20.5% of Hispanic all discretionary searches compared to the 45.9% of non-Hispanic White motorists. In the combined 2017-19 data, contraband was found in 22.0% of Black and 24.1% for Hispanic discretionary searches compared to the 42.3% of non-Hispanic White motorists. Searches of minority motorists were less successful which is suggestive of potential adverse treatment. The 2019 sample indicates that only the difference for Black motorists survived

the restriction of a false discovery rate lower than 10%, but both estimates were found to be statistically significant at the 99% level. The 2017-19 sample indicates that the differences for Black and Hispanic motorists survived the restriction of a false discovery rate lower than 10% and the estimates were found to be statistically significant at the 99% level. The results unambiguously indicate that Hartford police is disproportionately less likely to be successful searching minority motorists relative to their White non-Hispanic peers.

Vernon:

Vernon was identified on the search hit-rate analysis in the combined 2017-19 sample for Black motorists. This analysis compares the rate at which searched minority motorists are found with contraband relative to the same majority rate. In the combined 2017-19 data for Vernon, contraband was found in 58.9% of Black discretionary searches. Relative to the 69.0% of non-Hispanic White motorists, searches of minority motorists were less successful which is suggestive of potential adverse treatment. This difference was found to be statistically significant at the 99% level. The results unambiguously indicate that Vernon is disproportionately less likely to be successful when searching minority motorists relative to their White non-Hispanic peers.

VIII.D: FOLLOW-UP ANALYSIS

The entirety chapters III through VII of this report should be utilized as a screening tool by which researchers, law enforcement administrators, community members and other appropriate stakeholders focus resources on those departments displaying the greatest level of disparities in their respective stop data. As noted previously, racial and ethnic disparities in any traffic stop analysis do not, by themselves, provide conclusive evidence of racial profiling. Statistical disparities do, however, provide significant evidence of the presence of idiosyncratic data trends that warrant further analysis.

In order to determine if a departments racial and ethnic disparities warrant additional in-depth analysis, researchers review the results from some of the analytical sections of the report. The threshold for identifying significant racial and ethnic disparities for departments is described in each section of the report (ex. departments with a disparity that was statistically significant at the 95 percent level in the black or Hispanic alone categories in the Veil of Darkness methodology were identified as statistically significant). A department is identified for a follow-up analysis if they meet any one of the following criteria:

3. A statistically significant disparity in the one-year or three-year Veil of Darkness analysis
4. A statistically significant disparity in the one-year or three-year KPT hit rate and Stop Disposition analyses

It is worth noting that past reports have relied on results from the Synthetic Control method and Descriptive Statistics to identify departments for additional analysis. Although results from those methods are provided in the report, the authors believe that since 2010 census information forms much of the foundation of these measures, it would be better appropriate to limit the use of these tests until 2020 census data is published. The authors also believe that the inclusion of a three-year rolling analysis significantly improves our ability to utilize the more sophisticated statistical

techniques, especially on departments with small annual sample sizes. Improvements have also been made to the post-stop measures to make them more rigorous and statistically sound.

In general, we continue to identify far fewer departments in this report relative to prior year's studies with only two municipal department and two State Police troops. Of the 2 municipal departments, both were identified in the three-year aggregate sample only. One of the two State Police Troops was identified in the 2019 sample and the other State Police Troop was identified in the three-year aggregate sample only. Researchers are not recommending an in-depth follow-up analysis for any of the identified departments this year.

The **Old Saybrook** police department was identified with a marginally significant statistical disparity in the three-year veil of darkness aggregate sample, which is one of seven tests used to identify disparities. Statistical disparities were not identified in the six other tests used to measure departmental disparities. The department's disparity primarily appeared in the veil of darkness robustness tests, which focus primarily on moving violations, and is used to evaluate the strength of the initial assessment. While normally this process results in the disparity decreasing slightly as the robustness measures are applied, in the case of Old Saybrook the opposite effect was observed. In initially assessing Old Saybrook's data, we observed what appears to be a significant seasonal variation in data patterns which is more observable than we have previously encountered in other shoreline communities that we have analyzed. Because the overall disparities are of a marginal nature, we believe there is not a compelling need for a full follow-up analysis at this time. However, gaining a better understanding of the seasonal effects on Old Saybrook's data will help us form a clearer picture of these influences for potentially all shoreline communities. Consequently, our plan is to continue to monitor and assess the annual and three-year aggregate data for another year while working with Old Saybrook to gather more pertinent information as to any potential policy or operational differences between the summer season and other months that could contribute to the observed disparity.

In addition to being identified with racial and ethnic disparities in this study, the **Ridgefield** (2017-19 sample) police department was identified with racial and ethnic disparities in the 2015-16 Traffic Stop Data Analysis and Findings report. An in-depth analysis, with recommendations, was completed and published as part of the 2015-16 Traffic Stop Data Analysis and Findings Supplemental report released in October 2018. The follow-up analysis and subsequent departmental interventions were not completed until the end of 2018. Therefore, it is reasonable that any changes made by the department would not be reflected in their data until late 2018 or early 2019. Since the three-year aggregate analysis covers a significant portion of time prior to our intervention, it is unsurprising that the department would continue to show statistically significant racial and ethnic disparities. We will continue monitoring the departments data to determine if improvements are made.

Although this year we formally identified **Troop C** (2017-19 sample) and **Troop L** (2019 sample) with statistically significant racial and ethnic disparities, a comprehensive five-year analysis of traffic stop disparities for the entire State Police was published in May 2020 as part of the 2018 Traffic Stop Data Analysis and Findings report. There are very different challenges associated with assessing the racial and ethnic disparities identified for the State Police compared to municipal police departments. We will continue to monitor State Police aggregate and Troop level trends for significant variations and to determine if additional comprehensive analysis is warranted.

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