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RACIAL BIAS IN TRAFFIC STOPS: THE CITY OF CHARLOTTE

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Abstract

This study analyzes the traffic stops data published by the City of Charlotte in the years 2016-2017 and 2019-2020 to determine if there was any racial bias in the policing. *R* was used to examine 213,475 stops that involved Black and White drivers. The analysis showed that Black drivers were more likely to be searched, and more likely to be let off with a lighter consequence (e.g., verbal warning). White drivers were more likely to get a citation while Black drivers were more likely to get arrested. When restricted to stops with searches, White drivers were more likely to be given a citation or arrested while Black drivers were more likely to be let off without action. These results are further skewed against Black males between the ages of 18-25. Implications are discussed. The *R* script and dataset are made available to facilitate reproducible research.

Keywords: traffic stops, police bias, statistics, dataset

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Introduction

Traffic stops remain the most common way of interaction between the police and members of the community and shapes the perception that members have about police (Baumgartner, Epp, & Shoub, 2018). Black drivers are stopped more frequently, even when they make up a smaller part of the driving population, which has led to debates over whether police are racially biased. Based on the arrest data, African Americans[01] are arrested at higher rates for street crimes. Police use this data to justify stopping a disproportionate number of Black drivers, assuming that they will have a higher chance of finding contraband (Harris, 1999). Over time the policy has created a distrust of the police among Black communities. The issue is that Black drivers feel targeted, and not only those who may have committed crimes. For example, Philandro Castile, a 32-year-old African American school cafeteria worker, was stopped at least 49 times for minor offenses over a 13-year period before he was shot in a traffic stop by an officer who assumed he was reaching for a gun instead of his identification (Capecchi & Furber, 2016). Usually referred to as "driving while Black", Castile's experience of being stopped multiple times, usually for minor infractions, is not unusual for young Black males who are often the targets of traffic stops in the U.S. (Capecchi & Furber, 2016). The debate over police bias even extends outside the U.S. Consider Toronto, which exemplifies some of the conflicts in this debate. In 1989, the Toronto police prohibited gathering and publishing race-based statistics collected at traffic stops because they felt it might promote racial stereotyping (Toronto Police Service, 2003). In 2002 the department was internationally recognized as one of the leaders in promoting civil rights and relationships with the community (Rankin, Quinn, Shephard, & Duncanson, 2002). However, research conducted by *Toronto Star* reported that the department used racial profiling and reasoned that several differences across

01 A note on language
We will use the terms "African American" and "Black" interchangeably. We are aware that the two are not the same and that there is no agreement on their use, but in absence of better language we decided to go with what is commonly used.

racial groups were the result of discrimination against Blacks (Rankin, Quinn, Shephard, & Duncanson, 2002). Following the article, Melchers (2003) raised questions about the analysis that was conducted and pointed to the use of the baseline of the Black population of Toronto as problematic. In the U.S. there were similar concerns raised by MacDonald (2010) about the *Interim Report of the State Police Review Team Regarding Allegations of Racial Profiling* from then-attorney general Peter Verniero. Overall, we see that the matter of racial profiling is complex, and assumptions and analyses should be transparent to foster an environment of dialogue.

Racial bias is a pressing matter for both communities and their police forces with serious consequences on both sides. Studies reveal that unjustified accusations of racial bias against police leads to greater forced coercion, abuse, and holding a cynical view on their work (Trinkner, Goff, & Kerrison, 2019). These views are held by both Black and White officers. On the other hand, frequent stops without good justification yields frustration and mistrust of the police in the community. The negative views of officers in adolescents increases the likelihood of delinquency and decreases public confidence in the criminal justice system (Walters, 2019; Maryfield, 2018). This leads to less cooperation from the community and a decline in democratic citizenship, like voting (Tyler & Jackson, 2014). Decreased political engagement can further worsen conditions for the Black community as Baumgartner, Epp and Shoub (2018) found that detrimental disparities in traffic stops data were greatest in areas in North Carolina where the Black community had little political power and representation. All police departments must make institutional decisions that carry the potential to exacerbate this issue. They must decide when and where to target their patrolling efforts or may decide to target specific kinds of stops. If it is the case that these decisions place a disproportionate amount of policing efforts onto a Black community (or any group) then a racial bias will be reflected in the data. Baumgartner et al. (2018) posit that the ramifications of over policing minority communities through higher stop and search rates are underestimated, and

that the consequences greatly outweigh any potential benefits. Thus, more thorough and transparent research is needed to examine racial bias in traffic stops to understand the impacts of policing and inform the development of interventions.

This research study examines traffic stops data in the city of Charlotte collected in 2016-2017 and 2019-2020. After cleaning our data, 98% of the traffic stops involved a Black or White driver. As such, we decided to limit the scope of our analysis to those instances with either a Black or White driver. Baumgartner, Epp and Shoub (2018) theorize four causes of racial bias in traffic stops data: Differences in driving habits between racial groups, differences in how officers treat racial groups, "bad apple" officers skewing the data, or institutional practices. From their study, we conjecture that institutional factors are likely to have the largest and most detectable effect on racial bias. For this reason, we split officers into separate groups to detect institutional factors, such as outcomes based on years of service rather than the races of the officers. This study seeks to answer the research question: Is racial bias a factor in the disparities observed between Black and White drivers in the traffic stops in the City of Charlotte?

One of the earlier studies on traffic stops was done by Lamberth (1991). His research team recorded the information of 42,000 cars on the New Jersey Turnpike, along with police data about stops that were made. They found that both Black and White drivers had the same rates of speeding. However, Black drivers were stopped at a higher rate. Blacks made up 35% of the drivers who were stopped, even though they were 13.5% of those on the road. Further, the Black drivers were 73.2% of those who were stopped and arrested. In another study, this time in Maryland, Lamberth found similar results. Even though Black drivers constituted 17.5% of traffic violators, 72% of those stopped and searched were Black. Further, he also found that upon searches being conducted, there was a similar hit rate for finding drugs in vehicles driven by Black or White drivers. Gross and Barnes (2002) did another study in Maryland that spanned five years and

found that Black drivers were twice as likely to be stopped than White drivers, and five times as likely to be searched. In general, the concerns about racial bias in the policing around traffic stops prompted the Department of Justice to suggest states collect race and ethnicity data in traffic stops for analysis (Hernández-Murillo & Knowles, 2004). North Carolina was one of the first states to participate in the data collection.

Building on data that was collected by the state, Baumgartner, Epp and Shoub (2018) examined the 20 million traffic stops in North Carolina between 2002 and 2016. Looking more closely at the year 2010, when the Census data was available for comparison, they found that Black drivers had a 63% higher chance of being pulled over compared to White drivers. Given that Census data includes children below the legal driving age and senior citizens without a driving license, 63% would underestimate the rate. Further, based on driving habits, the researchers observed that Blacks drove 84 miles for every 100 miles by Whites. Adjusting for the driving behavior, the researchers found that the rates of traffic stops were 94% more likely for Black drivers when compared to Whites. They also found that Blacks were consistently over-policed across various agencies and demonstrated that this can increase overall crime rates yet decrease criminal conviction rates. Further, the researchers also used the data to debunk common theories that Black drivers broke traffic rules at a higher rate than White drivers, and that there are a few "bad apple" officers responsible for the disparities in the stops. Their analysis showed that there were large disparities between the treatment of Black and White drivers.

One issue raised in relation to traffic stops studies is that of the baseline comparison to determine disproportionality. Comparisons to aggregate city demographics have been raised by Melchers (2003) who argues that traffic stops measure incidence, yet are compared to population statistics, which measure prevalence, can cause errors. Repeat offenders would also skew the interpretation. Thus, Melchers cautions analysts to consider establishing careful baselines for

their comparisons. Using population statistics as a baseline typically means we assume that the incidence statistics we are measuring are happening at random, and thus should reflect population demographics. However, incidence statistics involving police interactions are far from random. Police forces intentionally deploy patrols to specific times and locations to coincide with crime rates, which is another issue of bias. Examining the prior studies of Baumgardner et al. (2018) and Harris (1999), and considering the concerns of Melchers (2003), we are confident that using population statistics as baselines for certain comparisons lead to conservative estimates for many disparities observed. Therefore, if racial groups are observed to have differing proportions of incidents in traffic stops data, it is not reasonable to claim racial bias is the cause without considering the nuances above. Because of the complexities surrounding baselines for comparison, we chose to only use baselines that could be derived from the dataset.

One way to determine racial bias given traffic stops data is through the outcome test. Proposed by Gary Becker, this test compares rates of searches that turn up contraband between groups. If searches of minority groups turn up contraband at lower rates than searches of White drivers, then it suggests that racial bias is at play, causing officers to search minorities with less reason (Simoiu, Davies, & Goel, 2017). To improve the accuracy of the outcome test, we can combine it with a benchmark test. The benchmark test considers the different likelihoods that groups will be searched. The combination of these tests would indicate racial bias if a group were more likely to be searched than others, but also turns up contraband at a similar or lower rate than others. We considered these tests in our analysis of searches. We used arrests and citations to proxy contraband and infer the legitimacy of searches since the data set that we worked with lacks this information.

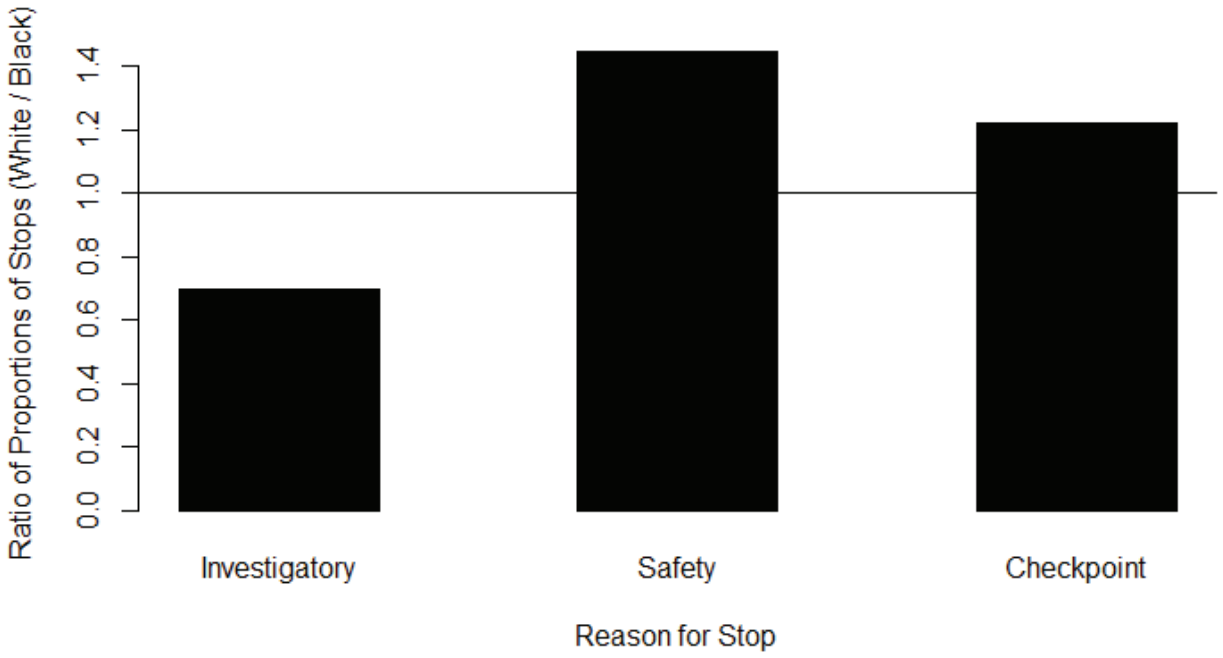
Materials & Methods

The script and data sets used for analysis are available at the following link: https://github.com/carsongroulx/TafficStopsAnalysis. Two data sets from The Charlotte Open Data Portal were combined for analysis in *R*. One from 2016-2017 contained 68,488 instances, and the other from 2019-2020 contained 158,917. Note that the 2018 data were not available. After combining the data sets, less than 5% of rows contained some missing value or had an unknown driver race, and such rows were removed. The instances of driver's race in this data set are 58% Black, 40% White, 2% > Asian, 1% > Native American, while officer's race are 73% White, 16% Black, 6% Asian/Pacific Islander, 4% Hispanic/Latino, 1% two or more races, 1% not specified, and < 1% American Indian/Alaska Native and Hawaiian/other Pacific Islander. Since Black and White drivers made up 98% of instances, we decided to focus on only those 213,475 instances for analysis.

Given our interest in possible bias against Black drivers, we used the numbers for Black drivers as baselines to visualize the data. Reasons for stops were grouped into the same three categories used by Baumgartner et al.'s (2018) study. Investigatory reasons included vehicle regulatory, vehicle equipment, seat belt, and investigation. Safety reasons included speeding, safe movement, stop light/sign, and driving while impaired. When considered in these groups, stops for the reason 'other' were left out. Out of the 125,323 instances for Black drivers, 0.59 (74,373) were for investigatory reasons, 0.40 (50,750) were for safety reasons, and < 0.01 (200) were for checkpoints. Out of the 84,044 instances for White drivers, 0.41 (34,691) were for investigatory reasons, 0.59 (49,189) were for safety reasons, and < 0.01 (164) were for checkpoints. Figure 1 shows the ratios of these proportions using those for Black drivers as the bases. For example, the category of investigatory is approximately 0.69 which is the ratio of 0.41 divided by 0.59.

Figure 1

Reasons for Stops Compared



Black drivers were stopped more for investigatory reasons, while White drivers were stopped more for safety reasons (Figure 1). Two-tailed, two proportion tests were conducted to determine if the proportions of stops for each reason were significantly different between Blacks and Whites. Each test was conducted with the null hypothesis that proportions were the same: P1 = P2, and the alternative hypothesis that proportions were not the same: P1 ≠ P2. For example, for investigatory reasons we tested the null hypothesis: P1 (0.59) = P2 (0.41) vs. the alternative hypothesis: P1 (0.59) ≠ P2 (0.41). We found that Black and White drivers were stopped at significantly different proportions for investigatory reasons and safety reasons, but not at checkpoints. Thus, we see that the observed differences in the proportions are likely not by chance. The results of these tests can be found in Table 1.

Table 1

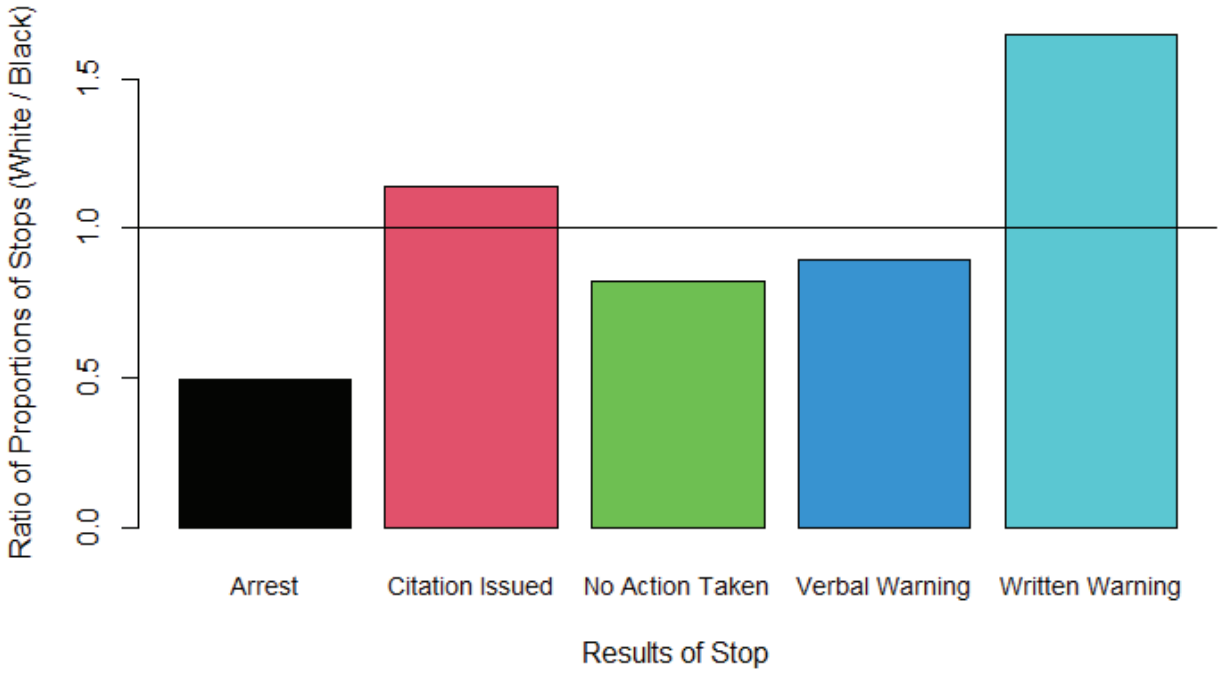
Test Statistics from Two Proportion Tests for Reasons for Stops

Variable	Chi-Square	*df*	*p*-value
Investigatory	6579.90	1	< .001
Safety	6556	1	< .001
Checkpoint	3.46	1	0.06283

Looking at the outcomes of the traffic stops, out of the 127,301 instances for Black drivers, 0.0289 (3,684) resulted in arrest, 0.3641 (46,351) resulted in citations, 0.0203 (2,590) resulted in no action taken, 0.5470 (69,628) resulted in verbal warnings, and 0.0397 (5,084) resulted in written warnings. Out of the 86,174 instances for White drivers, 0.0143 (1,230) resulted in arrest, 0.4142 (35,692) resulted in citations, 0.0168 (1,444) resulted in no action taken, 0.4895 (42,180) resulted in verbal warnings, and 0.0653 (5,628) resulted in written warnings. Figure 2 shows the ratios of these proportions using those for Black drivers as the bases. For example, the category of arrests is approximately 0.5 which is the ratio of 0.0143 divided by 0.0289.

Figure 2

Results of Stops Compared



Black drivers were arrested at twice as much (Figure 2). Black drivers were also more frequently given verbal warnings and let go without any action taken (Figure 2). White drivers were more frequently given citations and written warnings (Figure 2). Two-tailed, two proportion tests were conducted with a null hypothesis that proportions were the same: P1 = P2, and an alternative hypothesis that proportions were not the same: P1 ≠ P2. For example, for arrests, we tested the null hypothesis: P1 (0.0143) = P2 (0.0289) vs. the alternative hypothesis: P1(0.0143) ≠ P2 (0.0289) All results of a stop were found to occur at significantly different rates for Black and White drivers. The results of these tests can be found in Table 2.

Table 2

Test Statistics from Two Proportion Tests for Results of Stops

Variable	Chi-Square	*df*	*p*-value
Arrest	490.82	1	< .001
Citation Issued	544.46	1	< .001
No Action Taken	35.503	1	< .001
Verbal Warning	680.46	1	< .001
Written Warning	711.41	1	< .001

Figures 1 and 2 indicate that there were significant differences between the Black and White populations in both the reasons that they were stopped and the results of those stops. Next, we examine searches.

Figure 3.0

Proportions of Stops with a Search Conducted

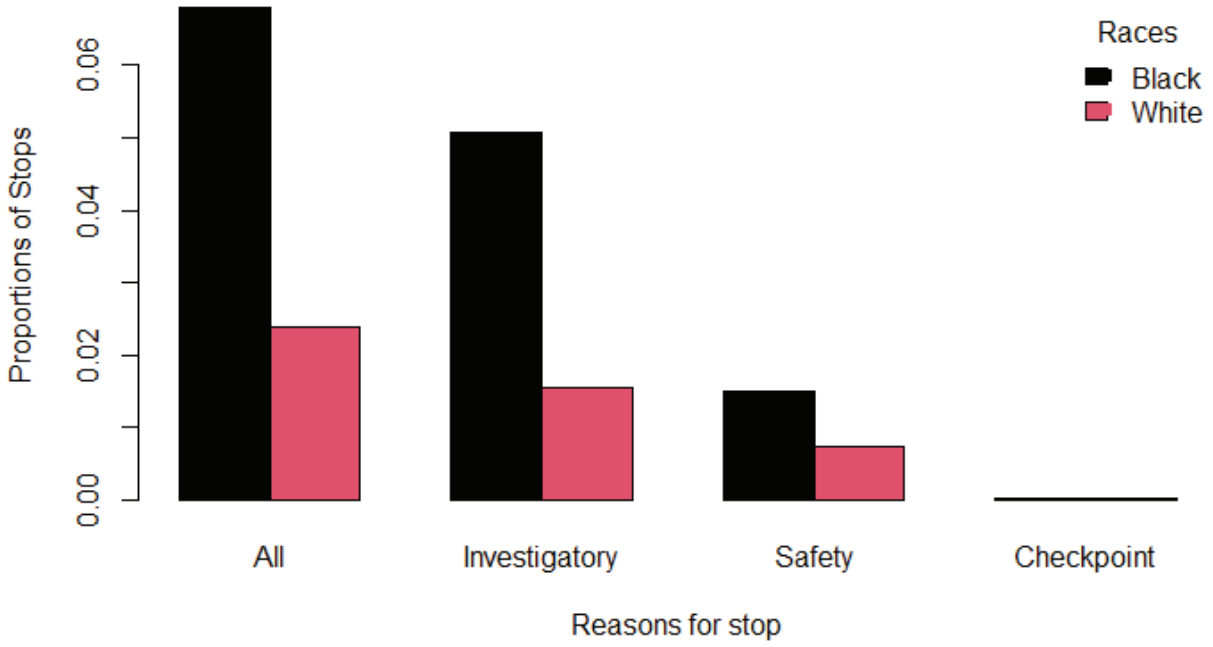


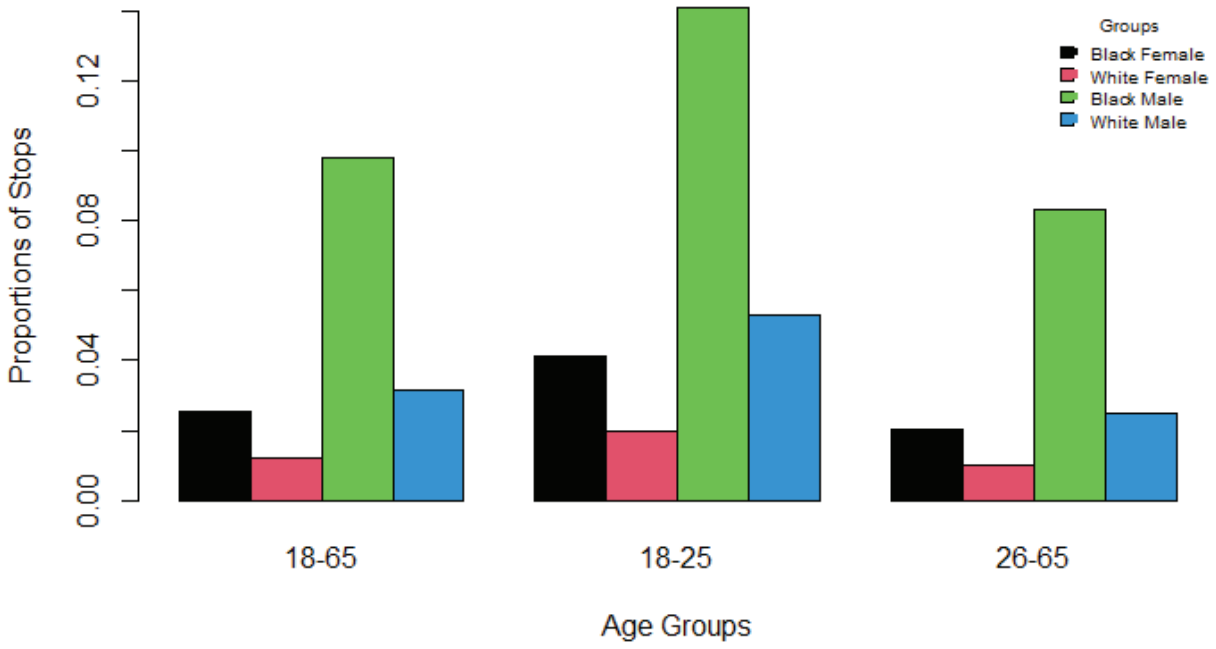
Figure 3.0 reports the search rates for Black and White drivers. Black drivers were searched three times more frequently than White drivers (Figure 3.0). Searches were conducted most disproportionately for investigatory stops (Figure 3.0). Only the checkpoint contained an equal ratio of searches conducted (Figure 3.0). A two-tailed, two proportion test was conducted with a null hypothesis that proportions were the same: P1 = P2, and an alternative hypothesis that proportions were not the same: P1 ≠ P2. Results indicated that overall search rates were significantly different for Black and White drivers (*Chi-Square* = 2092, *df* = 1, *p*-value < .001).

Based on the prior research, we had reason to expect that there were discrepancies in search rates, not just among racial groups, but also sex and age groups. Baumgartner et al. (2018) reported that younger Black males were more likely to be stopped and searched based on officer suspicion. As such, we were interested in examining the experience of young Black males. To

investigate this, we grouped the drivers by race, sex, and age. Figure 3.1 highlights the proportions of searches conducted within groups broken into race, sex, and age groups 18-65, 18-25, and 26-65.

Figure 3.1

Proportions of Stops with a Search Conducted: Grouped by Age



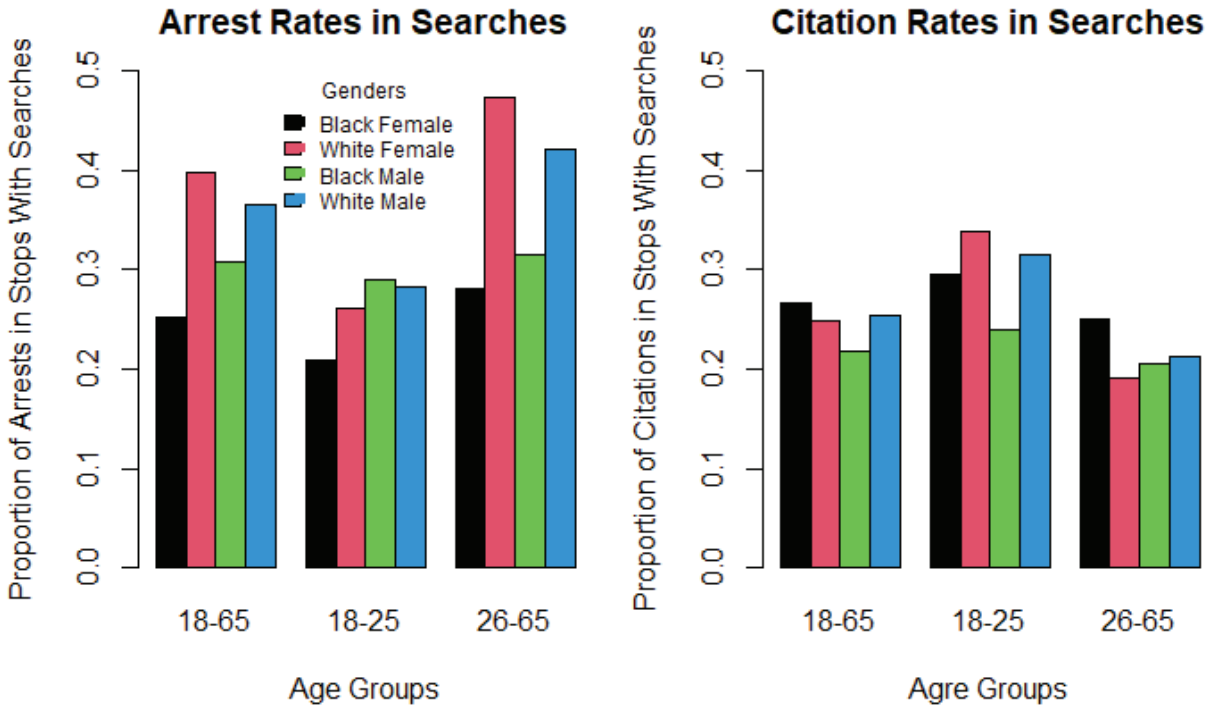
We see men were searched more frequently than women of the same race, Black drivers were searched more frequently than White drivers of the same gender, and younger drivers were searched more frequently than older drivers of the same race and gender (Figure 3.1). As expected, Black males aged 18-25 were searched three to eight times more often than any other group (Figure 3.1).

As explained before by the outcome and benchmark tests, higher search rates alone do not

indicate a racial bias if the searches appear warranted by higher consequence rates. To investigate if these higher search rates were justified, in Figure 3.2 we considered the rate of arrests and citations within the same groups but restricted to only stops where a search was conducted.

Figure 3.2

Arrest & Citation Rates in Stops with Searches



Examining overall rates, we see Black males received the fewest citations and Black drivers collectively received the fewest arrests (Figure 3.2). Most of these differences are not extremely large and may not be too alarming on their own. However, when combined with Figure 3.0 and Figure 3.1 we have a concern. Black drivers were searched more frequently, yet when searched Black drivers were also let off without consequence more frequently. We link these outcomes to the impact of two rulings *Terry vs Ohio* (1968) and *Whren vs U.S.* (1996) discussed later in the

conclusions. Together the rulings made it easier for unconscious bias to creep into the officers' decision making.

After 1999, traffic stops data was collected, and racial profiling was prominent in the news. Counties started training police officers to manage unconscious bias. We were interested if there was an impact on the searches based on the experience of the officers. We conjectured that with possible police training on unconscious bias, the racial disparities would begin to close.

Figure 4

Driver's Race Binned on Officers' Years of Service

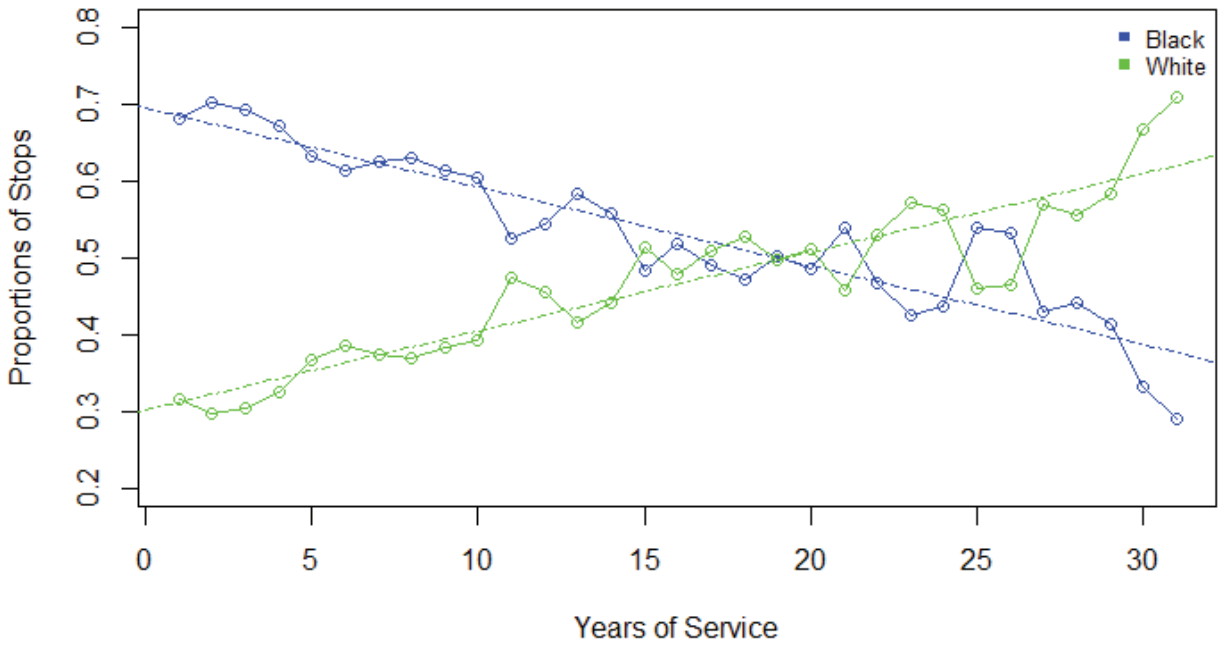


Figure 4 shows a clear trend in the proportion of drivers' race binned on the years of the officers' service. Officers with less than 15 years of service stopped a higher proportion of Black drivers compared to White drivers (Figure 4). These proportions remain about the same for of-

ficers between 15 to 26 years in the force (Figure 4). The pattern reverses for officers with more than 26 years of service (Figure 4). This data set included instances up to 39 years of service, but all bins beyond year 31 had far fewer instances, so they were removed. We believe that the police training could be a reason for the decrease in racial bias.

To further investigate the disparities in the stops based on the years of service of the officers, the analyses conducted for Figures 3.0-3.2 were replicated while considering stops made by different groups of officers. Group 1 consisted of officers with one or two years of experience, Group 2 with officers with 15-21 years of experience, and Group 3 with officers with 27 or more years of experience to capture the three trends of Figure 4, with as similar sample sizes as possible. The groups contained 34,169, 31,510, and 8,590 instances, respectively. All groups showed similar trends, but there were notable differences. Group 1 and 2 showed more equitable ratios for investigatory and safety stops of Black and White drivers. While Black drivers were still searched and arrested at higher rates, the ratio compared to White drivers was closer to equal than the overall average. However, Group 1 was far more likely to conduct a search, make an arrest, or give a citation. Group 2 seemed to target their searches more accurately since their searches resulted in an arrest or citation more frequently than did Group 1. Note that Group 3 made only 21 arrests and 23 searches total. Group 3 stopped Black drivers for investigatory reasons twice as often as White drivers, more so than the average rate. Overall, reasons for stops for Group 3 were more skewed than the averages. More disproportionate rates of stops for investigatory reasons combined with more outcomes of no action taken and verbal warnings for Black drivers could indicate, according to Baumgartner et al. (2018), a higher level of suspicion for the stop of Black drivers from Group 3, as opposed to probable cause, a stronger condition for making the stop. However, we would need more instances and more detailed data (e.g., whether contraband was found or not) to draw a stronger conclusion.

We were interested in better understanding what different factors interacted with the likelihood of a search. To investigate this, we turned to logistic regression. These models can consider many variables together to compare their influence on the likelihood of a specific outcome. Our model was trained to predict if a search was conducted from the race and sex of the driver and officer, the years of service of the officer, the age of the driver, and the reason for the stop. Officer races were recoded as White and non-White to improve the interpretability of the model. The data set was reduced to only stops for investigatory or safety reasons, and reasons for the stop were recoded as investigatory or safety. All predictor variables were statistically significant ($p < .01$). The predictors in order of most influential to least influential were as follows: driver sex, officer years of service, driver race, reason for stop, driver age, officer race, officer sex. The influence of these predictors was analyzed by considering residual deviation and a dominance matrix using the McFadden index. Note that the influence of driver sex and officer years of service was great enough such that both predictors completely dominated the influence of all following predictors (note that in later analysis we uncover that officers with one to three years of service made over a quarter of the stops recorded in the dataset, hence the strong influence of this predictor in our model). In contrast, driver race was only influential enough to dominate officer race and officer sex. These results tell us that the driver's race was not nearly the most important factor, but it still had a strong relationship with the likelihood of a search. The model indicated that if all else remained constant, changing from a White driver to a Black driver would increase the odds of a search by more than 130%. Similarly, changing from a female driver to a male driver would increase the odds of a search by more than 250%. In general, the likelihood of a search increased for the following groups compared to their counterparts: male drivers, drivers stopped by less experienced officers, Black drivers, drivers stopped for investigatory reasons, younger drivers, drivers stopped by White officers, drivers stopped by male officers. In Table 3 we see the odds ratio, degrees of freedom, change in residual deviation, and *p*-value for each predictor from the logistic regression

model. An odds ratio of one indicates that the likelihood of the search does not change based on a change for that predictor. A ratio of 1.5 indicates a change in that predictor would result in a search being 50% more likely, while a ratio of 0.5 would result in a search being 50% less likely.

Table 3

Logistic Regression Summary

Term	Odds Ratio	*df*	Change in Res. Dev.	*p*-value
Intercept	0.055	NA	NA	NA
Driver Race: Black	2.337	1	2227.09	< .001
Driver Sex: Male	3.583	1	3096.5	< .001
Driver Age	0.961	1	1718.94	< .001
Officer Race: White	1.586	1	170.53	< .001
Officer Sex: Male	1.419	1	19.26	< .001
Officer Years of Service	0.92	1	2360.26	< .001
Reason for Stop: Safety	0.493	1	1732.25	< .001

Discussion & Conclusions

In this study we sought to answer the following research question: Is racial bias a factor in the disparities observed between Black and White drivers in the traffic stops in the City of Charlotte? To answer the question we investigated, using *R*, 213,475 stops involving Black and White drivers in the years 2016-2017 and 2019-2020. The most convincing evidence to suggest there was a racial bias is reflected in the rate at which Black drivers (males aged 18-25 in particular)

were searched and released without consequence. As a collective, Black drivers were searched nearly three times the rate White drivers were, and Black males aged 18-25 were searched three to eight times the rate of any other group (Figures 3.0, 3.1). Reasoning from outcome and benchmark tests suggests we should see higher rates of offense or contraband from these groups to justify this increased search rate. Since we did not have information about offenses and contraband, we used arrests and citations as a proxy. Our analysis shows that Black drivers who were stopped were collectively arrested at twice the rate of White drivers but were searched at three times the rate of White drivers (Figures 2 & 3.0). When looking at citations, Black drivers who were stopped were cited at a lower rate than White drivers (0.88), however, they were searched at three times the rate of White drivers (Figures 2 & 3.0). Though the arrest rates could be used to support a higher search rate, the citation rates would not support the higher search rates. This analysis supports institutional biases as a major reason for the differences.

Restricting the stops to vehicles that were searched, we see that the arrest and citation rates were more similar across Black and White drivers. In-fact, Black drivers were collectively arrested the least, and Black males were cited the least (Figure 3.2). Black males aged 18-25 were searched and arrested most frequently (0.29), but the difference is marginal compared to White males (0.28) and White females (0.26). This supports the claim that ramifications of over policing minority communities through higher stop and search rates are underestimated, and that the consequences likely outweigh any potential benefits (Baumgartner et al., 2018). If it can be reasoned that officers are justified in targeting Black motorists for searches because of their higher arrest rates in all stops, then we should see higher rates of arrests and citations in searches. However, this was not the case, Black drivers were searched at three times the rate of White drivers, even though Black and White drivers had comparable rates of arrests and citations. The results from this study align with the results from the previous studies by Lambeth (1991), Gross and Barnes

(2002), and Baumgartner et al. (2018). All the studies point to bias in policing that leads to disproportionate impact on Black drivers.

To account for the patterns of disparities, we turn to institutional factors, specifically Court rulings that impacted the way policing was conducted. The literature points to two Supreme Court rulings - *Terry vs Ohio*, 392 U.S. 1 (1968) and *Whren vs United State*s, 517 U.S. 806 (1996). *Terry vs Ohio* allowed officers to use "reasonable suspicion" rather than "probable cause" to conduct stops (even stop and frisk). Suspicion is a lower standard compared to probable cause. Further, *Whren vs United State*s did not require the stops to be made equitably (e.g., stopping all speeders). The police could choose to stop any driver for any traffic violation, and then follow up on their suspicion (Baumgatner et al., 2018). If the suspicion was unfounded, the driver would be let go with lighter consequences, a pattern that we see in our analysis with Black drivers. These rulings together, give officers the flexibility to stop a driver on one of hundreds of minor violations and then conduct a search of the vehicle, driver, and passengers. The literature concludes, and we agree, that this flexibility allows unconscious bias to creep into the officers' decision making.

There are some limitations to this study. The information available in the dataset constrains the analysis and interpretation. It does not mean that we cannot make inferences, however, a more comprehensive dataset could provide a more nuanced view about the impact of race in traffic stops. It is important to keep in mind that if this data set included additional variables (such as the reason for the search, contraband, or repeat offenders) then further analyses could be conducted to uncover deeper relationships or support new conclusions. For example, individual officer data could help us understand if some officers contribute to many Black drivers being stopped.

There is promise in training efforts and programs implemented by Charlotte-Mecklenburg Police Department. The department shows an awareness and concern over public relations and

disparities found in research. The department has multiple community engagement programs directed at fostering dialogue and interactions within the community. Programs like Cops & Barbers, Juvenile Diversion Program, Reach Out, Right Moves for Youth, and Academy of Safety & Protection allow for everything from open-ended discussions and academic success to survival training (City of Charlotte, n.d.). This allows for personal connections between the police and the community to be established, as well as community concerns to be directly expressed to officers and department leaders. In 2020 and 2021, the department implemented new training courses for implicit bias training and customer service-oriented interactions (Louis, 2020; Morris, 2021). Implicit bias training is directly targeted at resolving some of the disparities between racial groups reflected in crime and traffic data, while customer service-oriented training seeks to improve daily interactions officers have with civilians by implementing techniques used in customer service. In our own analysis we noted that officers with greater years of experience showed signs of better choosing when to conduct a search. Further, we showed that the ratio of Black to White stopped drivers decreased and inverted as years of experience increased (Figure 4). Improved training of officers combined with departments' willingness to listen and implement change are hopeful signs of resolve. Inferring bias from traffic stops will always remain complex, however, our Black communities, and society as a whole, need transparency to trust authority and foster democratic citizenship. Thus, there is a need for more data, more studies, and more open dialogue about these matters.

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