ARNOLD & PORTER KAYE SCHOLER

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May 30, 2017

VIA ECF

Honorable Analisa Torres
United States District Judge
United States District Court
Southern District of New York
500 Pearl Street
New York, NY 10007-1312

Re: *Floyd, et al. v. City of New York*, 08-CV-1034 (AT),
Ligon, et al. v. City of New York, et al., 12-CV-2274 (AT),
Davis, et al. v. City of New York, et al., 10-CV-0699 (AT),
Monitor's Fifth Report: Analysis of NYPD Stops Reported, 2013-2015

Dear Judge Torres:

I am pleased to attach the monitor's fifth report, which examines trends in the NYPD's stop, question and frisk data during the period 2013-2015. The report details several possible ways to analyze that data to assess whether during that time-frame NYPD officers were making stops based on race. No conclusions are drawn about the NYPD's constitutional compliance. A firm judgment about that must await the availability of information over a more extensive period, including more current data.

With that important caveat in mind, racial disparities during 2013-15 were trending in the right direction. Most measures showed a diminution of racial disparities, although some did not. These trends are summarized in the report's Introduction and Executive Summary (pp. 1-6), and more fully covered in the body of the report (pp. 7-40). There is also a Technical Appendix beginning at page 41 that contains more of the statistics underlying the analyses.

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The analyses the report presents are not the only ones possible. There are always multiple ways to slice and dice data. In that vein, I have invited the parties to undertake alternative analyses, should they wish to, and stand ready to help facilitate their ability to do so using the same data the report covers. If any suggested alternative usefully confirms, contradicts or adds to the approaches covered in this report, it will be discussed in future monitor reports.

Sincerely,

/s/ Peter L. Zimroth

Peter L. Zimroth
Monitor

Enclosure

Fifth Report of the Independent Monitor

Analysis of NYPD Stops Reported, 2013-2015

Peter L. Zimroth

May 30, 2017

Floyd, et al. v. City of New York
Ligon, et al. v. City of New York, et al.
Davis, et al. v. City of New York, et al.

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I. Introduction

In 2013, following a lengthy trial before a federal district court judge, the New York City Police Department (the NYPD or Department) was found to have violated the Fourteenth Amendment by targeting Blacks and Hispanics for stops based on a lower degree of suspicion than Whites. That finding was based, in part, on a statistical analysis of NYPD stop, question and frisk data from 2004 to 2012. The court ordered remedial actions and appointed a monitor to insure their implementation.

This is the monitor's first report examining trends in the NYPD's stop, question and frisk data. It focuses on the years 2013, 2014, and 2015. Future reports will look at later periods.

At the outset, an important caveat is in order. This report draws no conclusion about the NYPD's constitutional compliance. That determination awaits the availability of statistical data over a more extensive period. The aim here is to explore available data and trends and to inform the parties and the public regarding the kinds of statistical approaches the monitor will be considering to draw conclusions down the road about compliance. It bears noting, moreover, that statistical analysis is just one tool in assessing compliance. Other relevant considerations—like training on racial profiling, changes in how the Department evaluates officers' performance, and the seriousness with which the Department approaches the remedial reforms—are not covered in this report.

Preparation of this report was overseen by Dr. John MacDonald, a member of the monitor team, with input from other team members, and is based on publicly available data provided by the NYPD. Other experts, including those retained by the NYPD and the other parties in the stop and frisk litigation, were consulted and reviewed drafts of the report. Because every statistical analysis is based on assumptions subject to dispute and each has its strengths and weaknesses, it is not surprising that there was not agreement on every aspect of each analysis presented. All the

approaches, however, are reasonable and merit reporting and tracking over time. Moreover, going forward, these experts and the parties have been invited to present alternative or additional analyses for consideration by the monitor.

II. Executive Summary

Overall Trends

During the period 2012 to 2015, reported police stops declined citywide by more than 95 percent. This steep decline began in 2012 and accelerated over the course of 2013 and continued to decline during 2014-2015 at a slower rate. The number of reported stops of Blacks and Hispanics was 159,379 in 2013, 36,808 in 2014, and 18,449 in 2015. Even though the absolute number dropped, stops of Blacks and Hispanics remained roughly the same percentage of stops overall. This is not a statement about racial disparities in stops because it does not account for the many factors other than race that could affect the level of police interaction with communities and therefore the rate of stops, such as crime rates in particular locations, calls for service, and levels of civilian activity on the street. Methods of accounting for these and other variables are discussed beginning in Section III.B at page 17. Nonetheless, it must be acknowledged that the steep decline in stops during this period did disproportionately affect Blacks and Hispanics because they were the subject of the vast majority of stops when the numbers were substantially higher.

Although the number of stops has declined, the crimes suspected by officers when making stops have stayed relatively constant in percentage terms. Stops for suspected property crimes and weapons possession remain the largest categories of stops. During the 2013 to 2015 period, of those who were stopped, Blacks and Hispanics were more likely than Whites to be stopped on suspicion of weapons possession, trespass offenses and violent crimes such as robbery and assault. Among those who were stopped, Whites were more likely than Hispanics

or Blacks to be stopped for suspected property and quality of life offenses. Also, the share of stops of 16- to 19-year-olds was higher for Blacks and Hispanics than for Whites.

This period saw a change in the "outcomes" of stops—the percentage of stops that resulted in frisks, searches, seizures, arrests, and uses of force increased from 2013 to 2015. Of the outcomes tracked, only the percentage of summonses issued decreased.

Racial Disparities in Stops

To explore whether NYPD officers were making stops based on race, the report discusses two different kinds of analysis.

The first approach uses a "multivariate regression model" similar to that used in trial testimony by the plaintiffs' expert, Dr. Jeffrey Fagan of Columbia Law School. The idea is to estimate whether the percentage of the residential population living in a census tract that is Black or Hispanic explains the rate of stops, taking into account the level of crime, precinct location, socioeconomic measures, and monthly trends in the number of stops.

The second approach does not use a regression model to estimate the rate of stops based on the percentage of the residential population living in a census tract that is Black or Hispanic. Instead, it compares the stop rates per reported crime on census blocks for different racial groups on that block. For each census block in the City, the analysis compares the number of crimes that occurred on a particular block in a month to the number of stops of Whites, Blacks and Hispanics on that block during that month. The results are then graphed. From this graph, it is possible to draw conclusions about citywide disparities in stops (but not disparities within individual blocks or census tracts).

If these two different methodologies for analyzing racial disparities resulted in similar findings, that would reinforce any conclusions about the relationship between race and stops.

However, for the period of data analyzed in this report, they do not. The regression analysis indicates that racial demographics of census tracts remained an explanatory factor of stop rates during 2013-2015. Census tracts with populations over 70 percent Black or Hispanic appear to drive the association between a higher stop rate and the percentage of Black or Hispanic population. The second analysis, which compares the average rate of stops per crime for Blacks, Whites, and Hispanics on each block in New York City, indicates statistically significant racial disparities in 2013 that diminish over time. The report contains a full discussion of these two types of analyses and some strengths and weaknesses of each.

Racial Disparities After Stops

A stop might result in different "outcomes" that can shed light on the decision to make a stop in the first place. Possible "outcomes" are a frisk, search, summons, arrest, use of force, or no further action. Moreover, a frisk or search might or might not result in the recovery of a weapon or other contraband (a "hit"). Examining racial disparities in these outcomes and in hit rates is another way of measuring the impact of race on stops. If, for example, the hit rate for weapons is lower for Blacks and Hispanics than for Whites, one could postulate that there was a lower threshold of suspicion for stopping Blacks and Hispanics on suspicion of weapons offenses. To reach this conclusion, though, one would have to control for (attempt to eliminate) reasons for the differences in outcomes other than race.

Those differences might include the time of day of the stops, the neighborhoods in which the stops occurred, and other factors. Again, the methodology used in this analysis is detailed in the report. Here the results are summarized.

Outcomes

The data indicate that there were a few racial disparities in outcomes of stops. The disparities highlighted in this report are ones that would occur by chance less than 1 time in 100.

In 2013, Blacks were frisked in 58.9 percent of the stops compared to 55.6 percent of the stops of Non-Hispanic others (Whites, Asians, Native Americans). Also in 2013, Blacks were subjected to force more frequently, with 14.5 percent of the stops involving force compared to 12.6 percent of the stops for Non-Hispanic Others. In 2014 and 2015, the differences are no longer significant when Blacks are compared to Non-Hispanics stopped in similar circumstances.

A similar disparity was found for Hispanics when compared to Non-Hispanics stopped in similar circumstances. In 2013, 55.3 percent of Hispanics stopped were frisked compared to 53.5 percent of Non-Hispanic others, and 15.2 percent of Hispanics stopped were subject to force compared to 14 percent of Non-Hispanics. In 2014, there were no significant observed differences between stops of Hispanics and stops of Non-Hispanics. However, in 2015, other disparities emerged for Hispanics stopped. In 2015, Hispanics were searched in 20.6 percent of the stops compared to 17.4 percent of stops of Non-Hispanics, and subjected to arrest in 19.8 percent of the cases compared to 17 percent of Non-Hispanics.

All other stop outcomes examined over the three-year period between Blacks and Hispanics and Non-Hispanics revealed non-significant differences. The findings suggest disparities in stop outcomes improved in 2014 and 2015, as the differences between outcomes for Blacks and Hispanics and outcomes for Non-Hispanics are within the range of outcomes that could occur by chance. The diminished differences are not the result of the smaller number of stops in later years, as the analysis has the ability to detect relatively small differences as being statistically significant.

Hit Rates

NYPD stop reports have separate fields for weapons recovered and for other contraband (such as drugs) recovered, so the data for hit rates for weapons is separate from the data for hit rates for contraband. The hit rate analysis in this report provides data for eight different categories for 2013, 2014 and 2015, for a total of 24 circumstances in which the hit rates for Blacks and the hit rates for Hispanics are compared to the hit rates for Non-Hispanic others. There were seven (of 24) circumstances for Blacks and two (of 24) circumstances for Hispanics in which the disparity in hit rates compared to Non-Hispanics was statistically significant, and would occur by chance less than 1 time in 100.

In 2013, the hit rates for weapons were lower for Blacks compared to Non-Hispanics for all stops, stops involving a frisk, and stops involving a search. In 2014, the same disparities existed for those three categories of stops. By 2015, the disparities no longer existed for recovery rates for weapons for Blacks and Non-Hispanics all stops and for stops when a search occurred. However, there was still a significant disparity in hit rates for Blacks compared to Non-Hispanics in 2015 for stops when a frisk was conducted.

For Hispanics, in 2013, the hit rates for weapons for all stops and for stops involving frisks were lower than the hit rate of Non-Hispanics for all stops and for stops with frisks. In 2014 and 2015, the hit rates for weapons were substantially similar for Hispanics and Non-Hispanics for all categories of stops.

Recovery rates of contraband (not weapons) from all stops were similar for Blacks and Hispanics and Non-Hispanics in all three years. When the analysis was limited to certain types of stops (stops for suspected violent crimes or drug transactions or when the officer observed

"casing"), the hit rates for all years for either contraband or weapons were similar for Blacks, Hispanics, and Non-Hispanics.

Overall, the data show that disparities in hit rates diminished over time.

III. Report

A. Trends in Reported Stops

1. Decline in Number of Stops Reported

Table 1 shows the basic breakdown by year of the number of reported stops and the percentage of stops by race. The count of recorded stops dropped substantially but the racial distribution of stops remained largely the same.

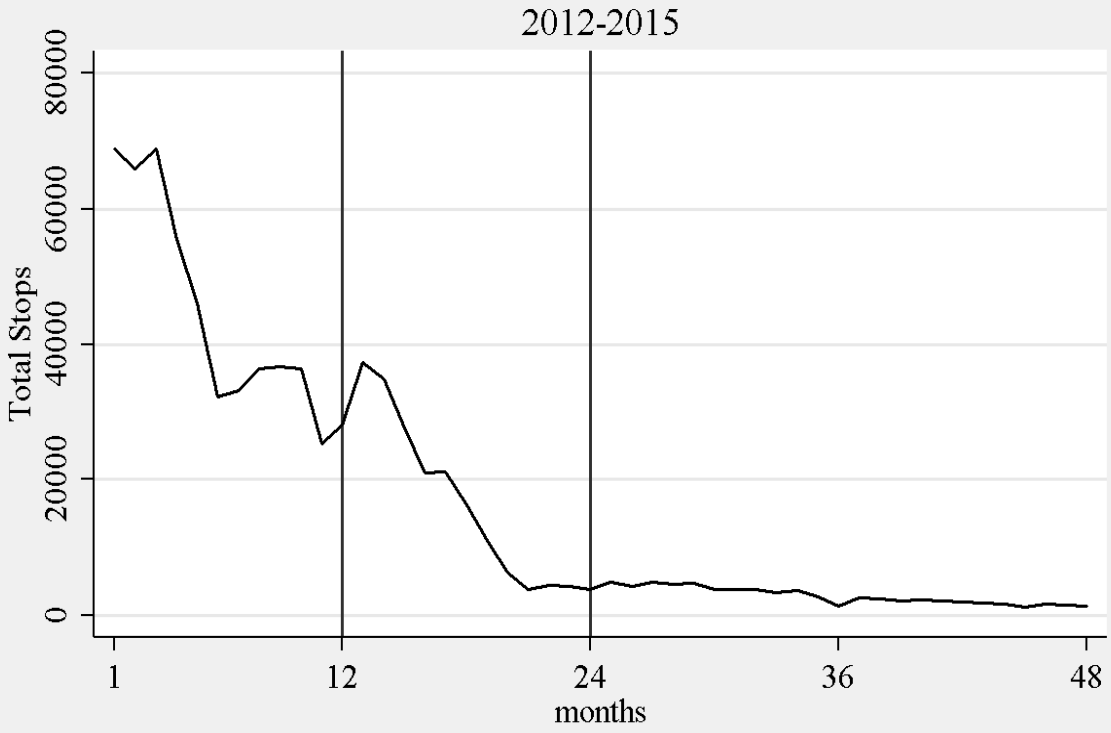
Table 1: Racial Distribution of Suspects Stopped, 2013-2015

Year	Stops (N=)	Black (%)	Hispanic (%)	White (%)	Asian/PI/NA (%)	Other (%)	Unknown (%)
2013	191,851	54.4	28.6	10.8	3.9	1.48	0.6
2014	45,787	53.1	27.2	11.9	5.4	1.6	0.6
2015	22,563	52.9	28.8	11.1	5.2	1.3	0.5

Note: PI=Pacific Islander; NA=Native American.

Figure 1 shows the monthly counts of documented stops reported across New York City between 2012 and 2015. The line graph shows a strong downward trend in the monthly counts starting at the beginning of 2012 and continuing through 2014. The monthly counts continued to decrease over the course of 2015, but at a slightly slower rate. Figure 1 shows that, even after a large drop between 2012 and 2013, the accelerated drop in reported stops continued through 2014. In 2012, approximately 532,911 stop reports were recorded in the City compared to 191,851 in 2013, 45,787 in 2014, and 22,563 in 2015.

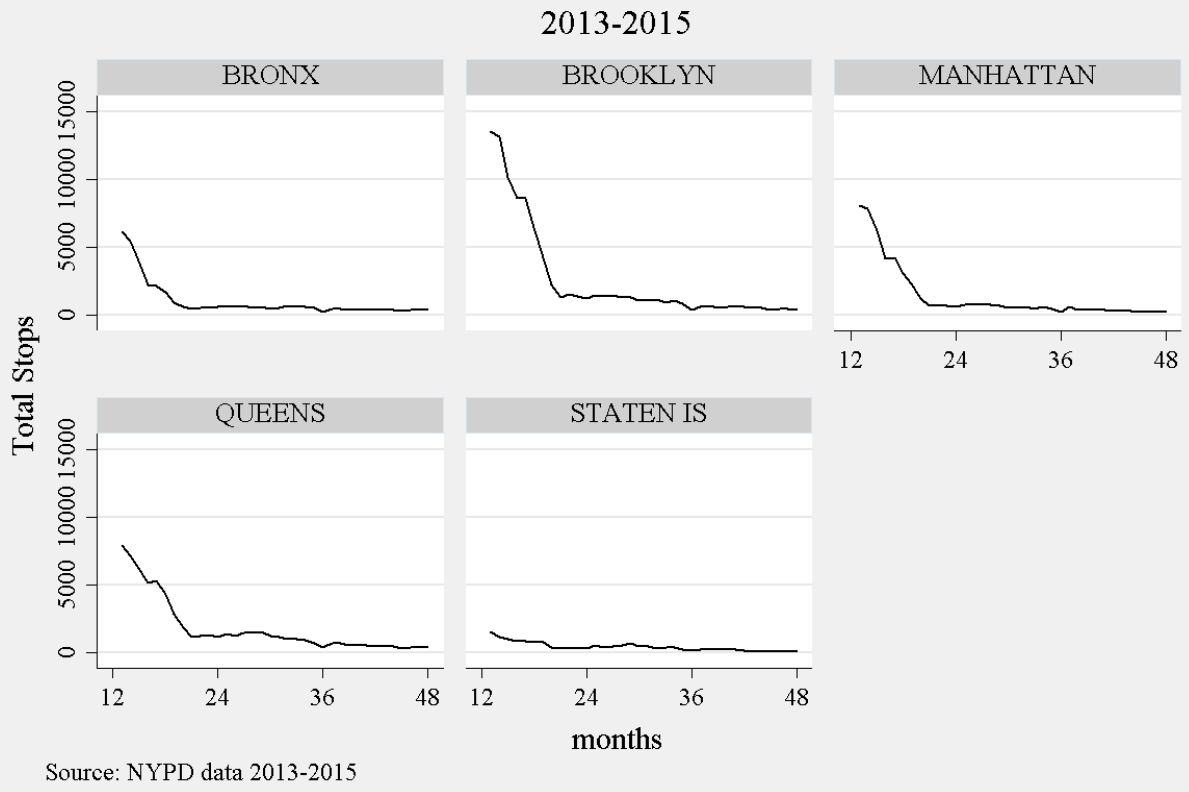
Figure 1: Stops Reported per Month



Source: NYPD data

Figure 2 shows the changes in stops from 2013 to 2015 by borough. The largest drops in stop reports occurred in Brooklyn, Bronx, Manhattan, and Queens, but the proportional reduction was similar in Staten Island as well.

Figure 2: Stops Reported per Month



Source: NYPD data 2013-2015

Table 8 in the attached Technical Appendix (Appendix, Section III.A, pp. 42-43) shows the stops reported in each borough and the City overall by calendar quarter. Consistent with the visual depiction in Figure 2, Table 8 shows that reported stops in the Bronx, Brooklyn, Manhattan, and Queens all dropped significantly in the second quarter (April-June) of 2013, and this reduction accelerated in the third quarter of 2013 (July-September) before leveling off at a new low level of stop reports that carried through 2015. The Technical Appendix also contains maps of crimes in New York City in 2013, 2014, and 2015 and maps of stops in New York City in 2013, 2014, and 2015 (Appendix, Section III.B, pp. 44-45). These maps show that crime and stops were geographically concentrated, and generally occurred in the same neighborhoods. Comparing the areas where crime was highest to where stops were highest, the analysis shows that as the number of crimes in an area increased, the number of stops increased as well (Appendix Section III.B, Figure 1A, p. 47). The analysis also shows that the geographic relationship between stops and crimes diminished between 2013 and 2015, indicating that crime rates in locations no longer share as strong an association with stop rates.

2. The Changing Composition of Crimes Suspected in Stops and of Outcomes

Table 2 shows the crimes suspected by officers when making stops according to eight categories reported on stop reports.[1] From a list of 93 types of crimes noted by officers on the stop reports, Dr. MacDonald classified offenses into one of the following categories: murder, violence,[2] weapons possession,[3] property, drugs, trespass, quality of life (QOL), and other. This is the same categorization used by Dr. Fagan in his expert report in *Floyd*.

[1] There were 93 types of crimes noted in stop reports in the "Crime Suspected" field. From these different codes, Dr. MacDonald created the same eight crime categories used in the reports of the plaintiff's expert, Dr. Jeffrey Fagan (murder, violent crime, weapons possession, property offenses, drugs, trespass, quality of life offenses, other).
[2] Stops for suspected violent crime includes stops for suspected aggravated assault, aggravated harassment, aggravated sexual abuse, assault, kidnapping, rape, and robbery.

Table 2: Crimes Suspected, 2013-2015

Year	Stops (N=)	Murder (%)	Violence (%)	Weapons (%)	Property (%)	Drugs (%)	Trespass (%)	QOL (%)	Other (%)
2013	191,851	0.03	23.53	24.63	32.68	9.08	6.89	1.49	1.66
2014	45,787	0.07	19.19	27.20	34.14	9.02	7.29	0.88	2.21
2015	22,563	0.17	21.10	30.43	31.53	7.67	6.03	0.56	2.52

Note: QOL=quality of life.

The share of stops by type of crime suspected stayed reasonably constant as the decline in stops occurred. The exceptions were a reduction in the percentage of stops based on suspicion of quality of life offenses and an increase in the percentage of stops based on suspected weapons offenses. Stops appear to be only slightly more centered on suspected violence and weapons in 2015 (51.7 percent) than in 2013 (48.2 percent). The difference is due to an increase in stops for weapons and murder, offset by a smaller decrease in stops for other violent crimes suspected. Stops on suspicion of nonviolent crimes (property, drugs, trespass, QOL, and other) went from 51.8 percent in 2013 to 48.3 percent in 2015.

Table 3 shows the percentage of stops that resulted in a frisk, search, summons, arrest, use of force, and the recovery of illegal contraband and weapons. As the number of stops declined substantially, the percentage of stops that resulted in a frisk, search, arrest, and use of force increased. The recovery rate of weapons and of contraband also increased. For example, in 2013, approximately 24.6 percent of stops were based on suspicion of weapons possession, and weapons were found in 1.9 percent of all stops. By 2015, weapons possession was suspected in 30.4 percent of stops, and weapons were found in 4.8 percent of all stops. This was a

[3] 99 percent of these cases (n=59,699) involved criminal possession of a weapon (CPW), while only four stops involved "prohibited use of weapon" (n=3) or "unlawful wearing a body vest" (n=1).

doubling of the fraction of stops where a suspect was carrying a weapon. The recovery of weapons from searches increased from 20.4 percent in 2013 to 25.8 percent in 2015.

Table 3: Outcomes and Recovery of Contraband and Weapons from Stops, 2013-2015

Year	Stops (N=)	Frisk (%)	Search (%)	Summons (%)	Arrest (%)	Force (%)	Contra-band (%)	Weapons All Stops (%)	Weapons Searches (%)
2013	191,851	58.19	9.57	3.61	8.05	14.78	2.32	1.96	20.45
2014	45,787	66.27	15.91	2.65	15.07	21.09	3.96	3.32	20.87
2015	22,563	67.62	18.63	2.61	17.59	27.49	4.99	4.82	25.88

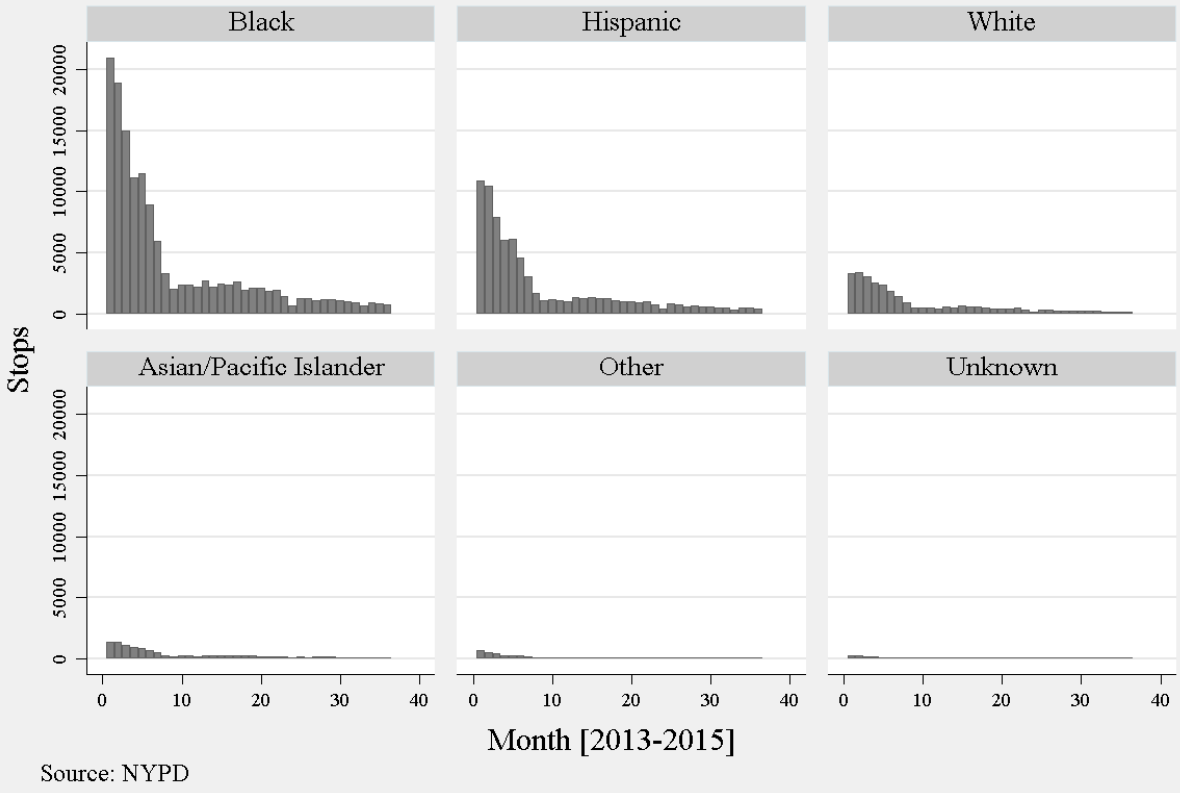
In Sections III.C.1 and III.C.2 below (pp. 33-40), the report analyzes whether there are any racial differences in outcomes of stops and in the recovery of weapons and contraband.

3. Trends in the Number of Stops by Race

Figure 3 (p. 13) shows the racial distribution of reported stops between January 2013 and December 2015. The decline in reported stops was primarily driven by steep decreases in the number of stops of Blacks and Hispanics relative to Whites and other racial and ethnic groups. To put the magnitude of decline for Blacks and Hispanics into perspective, in the last quarter of 2015, the total number of all recorded stops (n=4,485) was lower than the number of stops of Whites in the first quarter of 2013 (n=9,771). In the last quarter of 2015, there were approximately 2,441 reported stops of Blacks. However, while the overall number of stops has dropped substantially, the relative share of stops of minorities has stayed constant. In the first quarter of 2013 (January-March), Blacks (55 percent) and Hispanics (29 percent) made up 84 percent of reported stops, compared to 82 percent (Blacks 53 percent and Hispanics 29 percent) in 2015. Over the three years from 2013, 2014 and 2015, stop activity remained largely of Black and Hispanic subjects. These facts do not themselves establish impermissible racial disparities

because they do not speak to whether there were factors other than race that might have affected the numbers. A discussion of possible ways to account for these other factors begins on page 17.

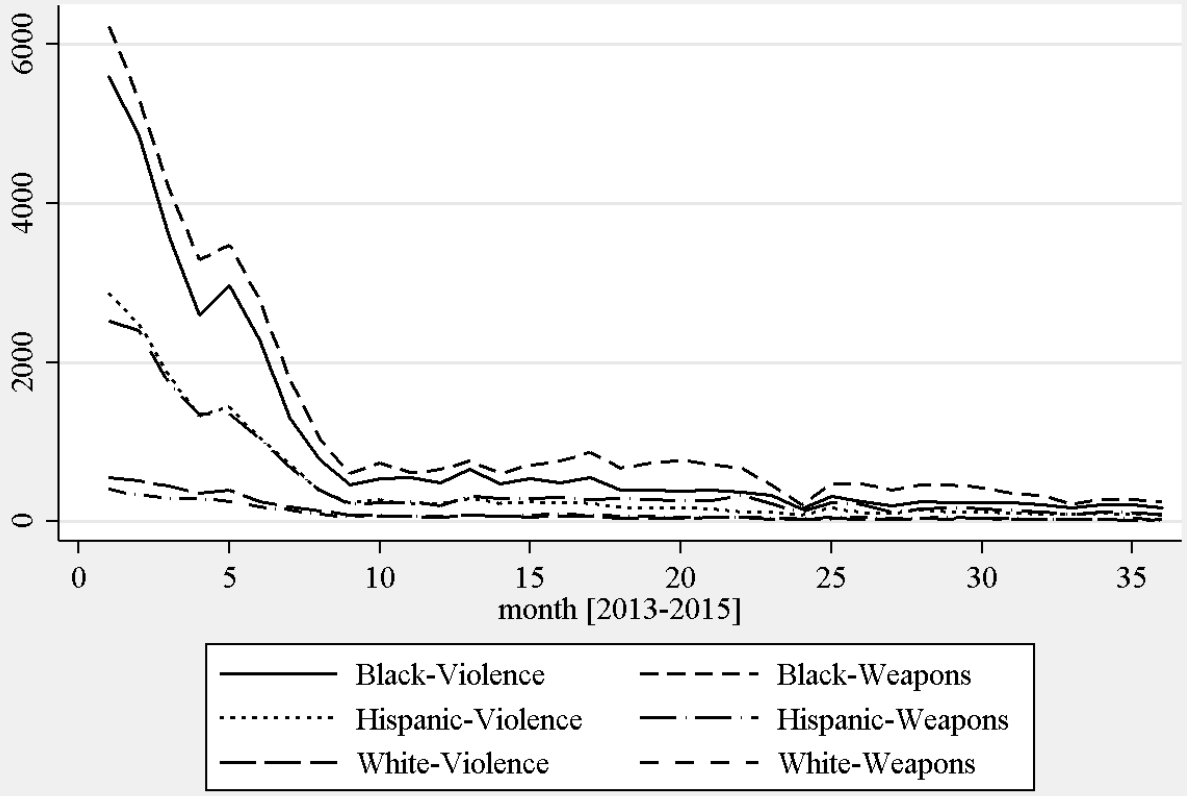
Figure 3: Monthly Counts of Recorded Stops By Race, 2013-2015



Source: NYPD

Figure 4 shows that a large share of the drop in reported stops appears to have been the result of the decline in stops for suspected criminal possession of a weapon or suspected violent crimes.

Figure 4: Monthly Counts of Stops for Violence and Weapons by Race



The decline in reported stops for suspected weapons or violent crimes occurred primarily for Hispanics and Blacks in the Bronx, Brooklyn, Manhattan, and Queens. For Whites, the only borough with a substantial reduction in stops for suspected weapons and violent crimes occurred in Brooklyn. As Figure 4 demonstrates, Whites comprised a minority of the total share of stops for suspected weapons or violent crimes.

4. Differences in Composition of Stops by Race

Figure 5 shows the age distribution of people reported in stop reports from 2013-2015. Young adults represent a large share of stops; this is consistent with profiles of age and crime.[4] The share of stops reported for Black, Hispanic, Asian, and Other youth, ages 16 to 19, appears to be higher than that of White youth.

[4] Farrington, D.P. (1986), Age and Crime. *Crime and Justice* 7, 189-250.

Figure 5: Age Distribution by Race [2013-2015]

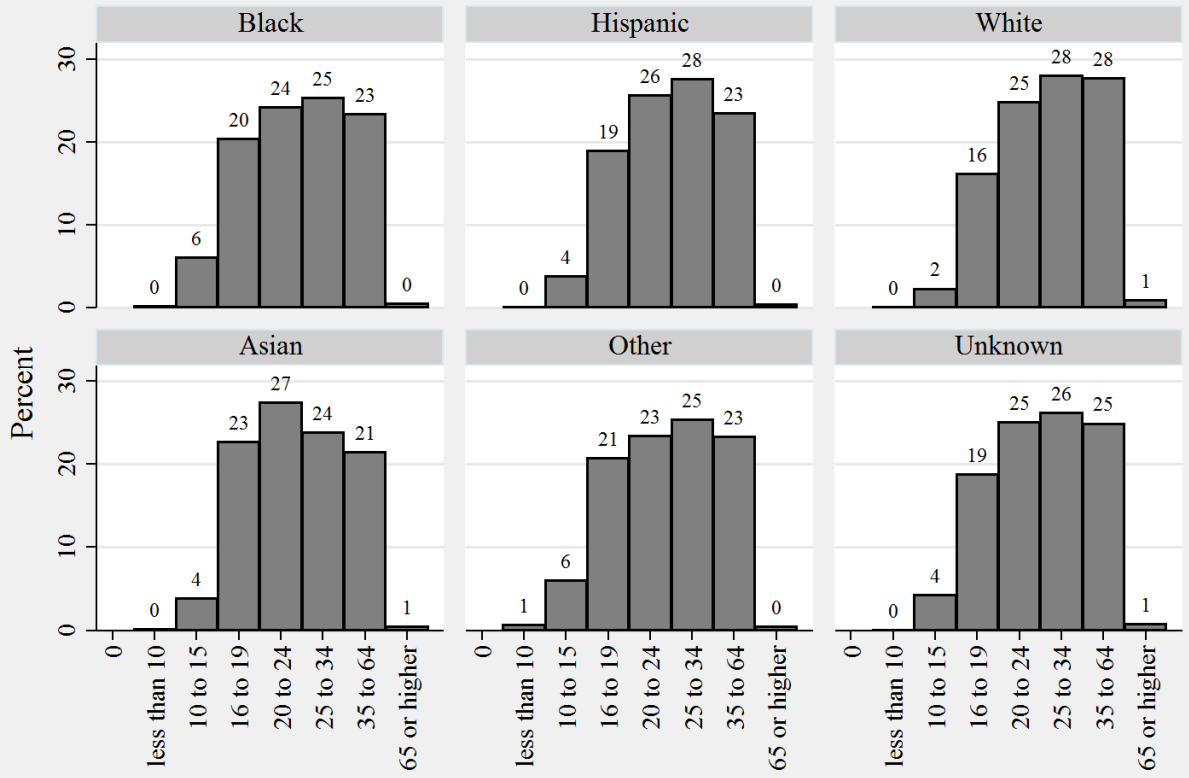


Table 4 shows how the suspected crimes reported by officers on stop report forms differ for Blacks, Hispanics, and Whites across eight major categories of offense classifications. For example, 24 percent of Blacks were stopped for a suspected violent crime, while 22.5 percent of Hispanics and 13.9 percent of Whites were stopped for a suspected violent crime. Whether the difference in percentages is statistically significant is calculated from chi-squared tests—statistical tests that evaluate whether observed differences among sets of variables arose by chance. Blacks and Hispanics who were stopped were significantly more likely to be stopped for suspected violence, weapons, and trespass-related offenses than Whites. Whites who were stopped were significantly more likely than Hispanics or Blacks to be stopped for suspected property and quality of life-related offenses.

Table 4: Stops by Race and Suspected Crime, 2013-2015

N=243,437	Black (%)	Hispanic (%)	White (%)	Total (%)
Crime Suspected				
Violence**	24.0	22.5	13.9	22.5
Weapons**	30.5	23.4	11.8	25.5
Property**	26.4	34.3	55.1	32.8
Drugs**	8.8	9.0	10.0	8.9
Trespass**	7.6	7.2	3.3	6.8
Quality of Life**	0.6	1.5	3.2	1.3
Other	1.7	1.8	2.2	1.83
Murder*	0.06	0.04	0.02	0.05
Males**	93.0	92.9	91.0	92.2
Time of Day				
Shift 1	23.2	25.4	25.4	24.1
Shift 2	23.6	25.7	30.1	25.3
Shift 3**	53.1	48.8	44.3	50.5
Housing**	19.4	13.7	3.2	15.2
Transit**	6.6	6.0	6.5	6.2
Radio Run**	31.9	36.4	42.4	34.8
Day of Week				
Sunday	11.6	11.4	9.5	11.3
Monday	9.8	9.8	9.3	9.7
Tuesday	14.5	14.5	15.7	14.7
Wednesday	16.1	16.3	17.4	16.3
Thursday	15.6	15.8	16.8	15.8
Friday	16.2	16.3	16.4	16.3
Saturday**	15.9	15.5	14.7	15.6
Age				
Less than 10	.2	.1	.1	.1
10-15	6.1	3.8	2.3	4.9
16-19	20.2	19.0	15.9	19.5
20-24	24.3	25.7	24.6	24.9
25-34	25.4	27.4	28.1	26.2
35-64	23.1	23.3	27.9	23.5
65+**	.4	.4	.9	.5
All Stops	54.0	28.4	11.0	100.0

*Difference in percent occur by chance less than 1 in 100.
**Difference in percent occur by chance less than 1 in 1,000.

Table 4 also shows how the context of the stops in terms of the gender, time of day (patrol shift), type of command (Housing, Transit), and day of week differs between Black, Hispanic, and White suspects. Stops of Blacks, Hispanics, and Whites also differ in terms of the

precinct in which the stop occurred. The racial differences in the age of individuals stopped, the reasons for stops (crime suspected), and other contextual factors underscore why it is important to account for these differences in examining racial disparities in outcomes from stops.

B. Analysis of Racial Disparity in Reported Stops

In the following Subsections 1 and 2, different ways to analyze the role of race in the number of stops reported by the NYPD are presented. Subsection 1 uses a multivariate regression analysis approach similar to the approach used by the plaintiffs' expert in the *Floyd* trial to assess racial disparities in New York City. The regression analysis used here focuses on the racial percentage of those living in a census tract and asks whether the stop rate per residential population in a census tract is significantly higher in minority areas. The regression analysis is a statistical model, and it takes into account crime as well as other contextual variables, such as the socioeconomic characteristics of the area, the reason for the stop, and the precinct in which the stop occurred. In theory, if race or ethnicity plays no role in stops, the stop rate that the model estimates should not significantly vary by the race or ethnic composition of census tracts, once one controls for precinct location, reason for the stop, reported crime in the previous month, and the variables noted in Table 4.

In Subsection 2 below, we describe an approach that does not use population data from the census or a regression analysis. It does not estimate stop rates, but rather looks at stops actually recorded. For each census block (for most of New York City, the same as what is commonly referred to as a "block"), the analysis examines the number of reported stops on that block of Blacks, Hispanics, and Whites during each month. For those same blocks, the number of crimes reported on that block in the same month is also counted and a ratio of crimes/stops is calculated. On each individual block, of course, the ratio of crimes/stops could vary by race depending on racial composition on that block. However, if all the blocks in the city are

aggregated, in theory, the average rates of stops/crimes should not vary substantially by the race of persons stopped, assuming stops are being generated because of general crime patterns.

1. Using a Regression Model to Examine Racial Disparity in Stops

In this analysis, Dr. MacDonald linked the stop data with reported crime and demographic data by census block. He used what is known in the statistics field as a "Poisson regression model" to estimate the number of reported stops and type of stops in each census block. This analysis assesses whether the rate of stops is significantly higher depending on the Black and Hispanic population of residents, holding constant the number of crimes in the month before and the socioeconomic status of the census tract, precinct location, and monthly trends in the number of stops. A detailed description of the results of this analysis is contained in the Technical Appendix (Appendix, Section IV, pp. 47-50). The results show that there were more stops on average in census tracts with a greater concentration of Black residents. This was the case in 2013, 2014, and 2015.

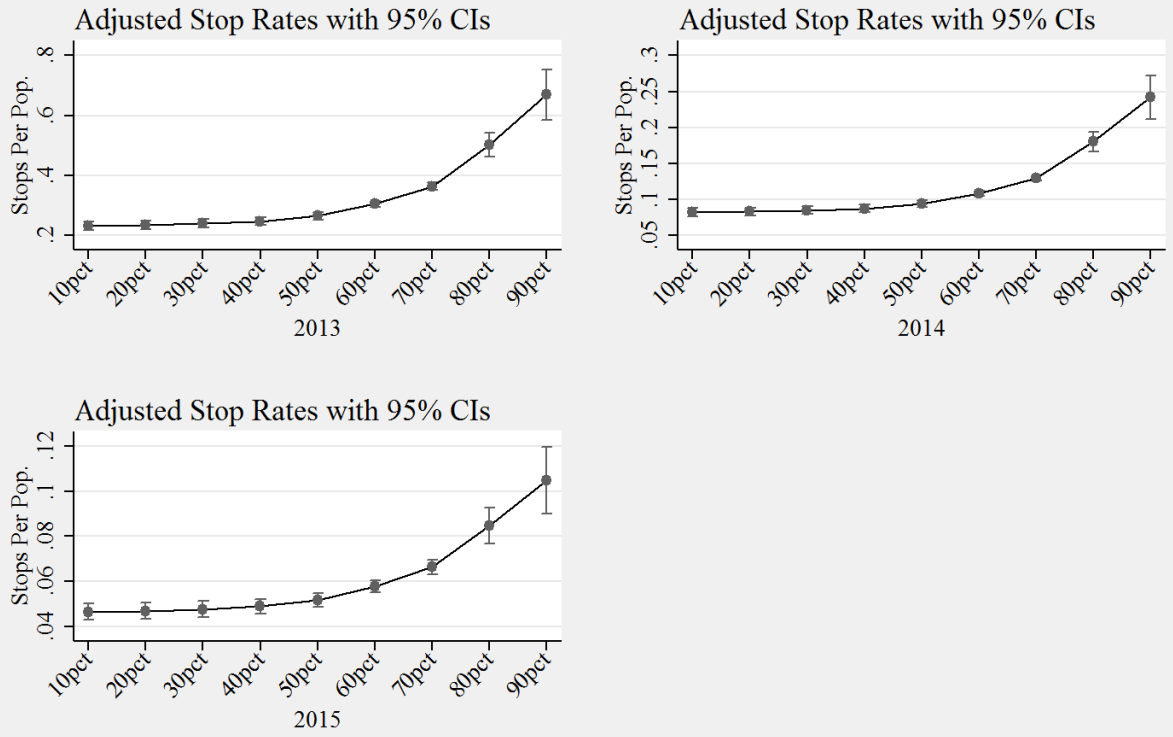
Figure 6 shows the results from the marginal estimates for stop rates by percent Black population in a census tract, after holding all other variables constant at their average value. This graph provides a visualization showing that a higher percentage of Blacks in a census tract is associated with a higher estimated rate of stops. One should note that the correlation of percent Black population and the estimated stop rate is not linear. The line curves upward as it moves farther on the x-axis (as the percentage of Black residents in census blocks increases). The association with a higher estimated stop rate and Black population appears to be driven by highly segregated census tracts where Blacks are more than 70 percent of the residents. To put these numbers back into the context of stop rates, the estimated counts can be converted into estimated rates per population. For 2013, the average stop rate for all census tracts is estimated to be .35

stops per month; this translates into roughly eight stops for every 100,000 residents.[5] For the census tracts where 90 percent or more of the residents are Black, there is an estimated stop rate of .67 stops per month, or roughly 15.53 stops per 100,000 residents.

Figure 6 also shows that although the marginal effect of racial population on the stop rate is significant and increasing in each of the three years, the stop rates have dropped dramatically for all areas, regardless of the demographic of the population. This is evident from the fact that the scales on the y-axes drop in each year. By 2014, census tracts with 90 percent Black residents have estimated stop rates comparable to those with only 10 percent Black population in 2013. By 2015, census tracts with 90 percent Black residents and the highest estimated stop rates continue to have lower estimated stop rates than census tracts with 10 percent Black residents in 2013, and are comparable to tracts with 50 percent Black residents in 2014.

[5] (.35/4313 average tract population)*100,000.

Figure 6: Stops Per Residential Population, by Percent Black in Tract



Note: CI=confidence interval. Marginal effect holding other variables constant at average values.

Figure 7 shows the marginal estimates for the stop rates per residential population by percent of the census tract that is Hispanic, holding all other variables constant at their average value. Here, one can see that stop rates and the percent of the population that is Hispanic rise in a more linear fashion than the graphs showing Black percentage. This reflects the fact that there are relatively fewer census tracts with a high percentage of Hispanic residents with high estimated stop rates. These graphs in Figure 7 also show that the rates of stops as shown on the y-axes declined across the full range of census tracts with Hispanic residents from 2013 to 2015. By 2015, the highest estimated stop rates in census tracts with 90 percent of the population Hispanic were lower than the estimated stop rates in census tracts with only 10 percent of the population Hispanic in 2014.

Figure 7: Stops Per Residential Population, by Percent Hispanic in Tract

Note: CI=confidence interval. Marginal effect holding other variables constant at average values.

Figures 6 and 7, which show the marginal estimates for stop rates per residential population, are consistent with the maps in the Technical Appendix (pp. 44-45) and indicate that as the number of stops dropped overall across NYC, neighborhoods with more minorities living in them remain areas with a higher rate of stops per population. Even as the number of stops declined by more than 90 percent, these findings suggest that reported stops have dropped everywhere systematically, and thus the relative percentage of minorities stopped has remained constant.

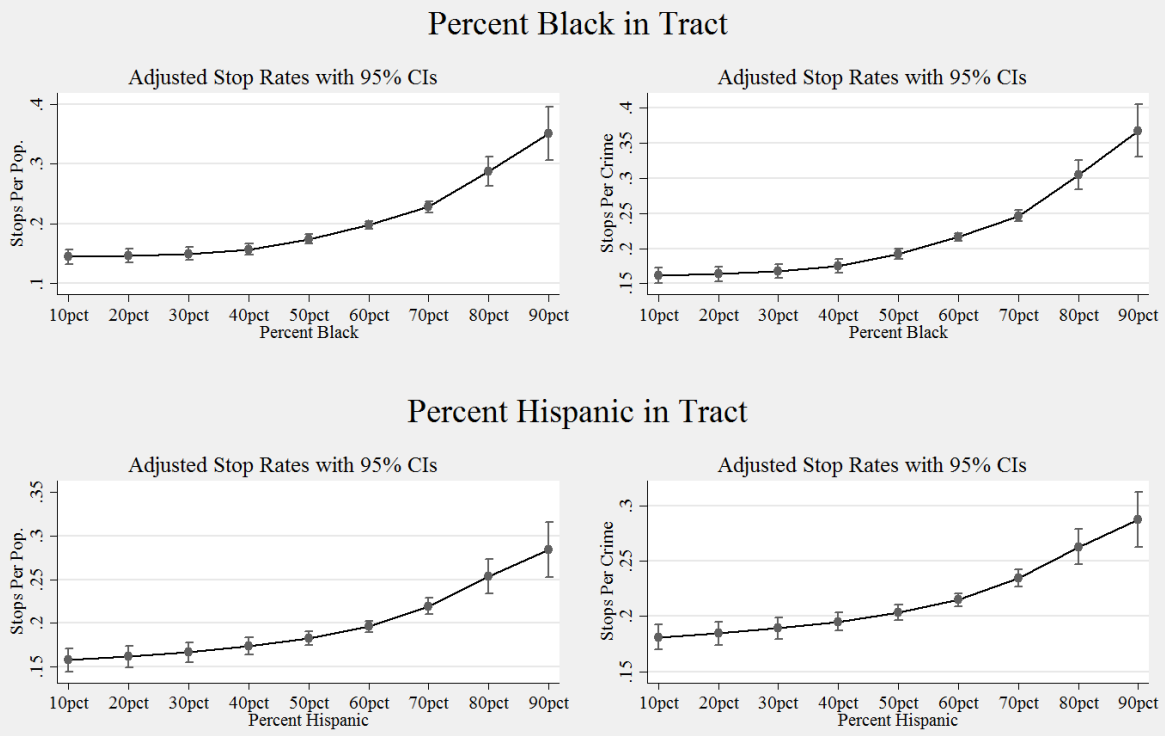
The analysis of stops by population and race can also be broken down by the type of stop. Dr. MacDonald used the same regression analysis to examine subgroups of stops (suspicion of violent crimes, property, drugs, weapons, trespass, and quality of life offenses) to see if the racial percentage of the census tract also explained the stop rates for different types of stops. Detailed

results are in Table 10 of the Technical Appendix (pp. 49-50). These results show that the percentage of Black and Hispanic residents in a census tract was correlated with the estimated stop rate for all categories of stops except one. That single exception was for stops for quality of life crimes, where there were no differences in stop rates based on the Black or Hispanic population percentage of the census tract.

One can also use the regression analysis model to examine whether the Black or Hispanic share of the population was a significant contributing factor in stop rates by using the crime rates in the previous month for the population at risk for stops, as opposed to using the population in the census tract. These results also suggest that areas with a higher percentage of Black or Hispanic residents had higher stop rates. The estimates suggest that the number of stops remained higher in minority neighborhoods than can be explained by crime reported in the prior month.

Figure 8 uses data from all years, 2013-2015, and displays the marginal estimates for the stop rates per residential population or stop rates per crime by percent of the census tract that is Black or Hispanic, holding all other variables constant at their average value. The graph on the top left in Figure 8 shows the estimates based on stop rates per population by percent of the census tract that is Black. The graph on the top right in Figure 8 shows the estimates for the stop rates per crime reported the prior month by percent of the census tract that is Black, holding all other variables constant. The graphs on the bottom left and right are similar, but by Hispanic percentage of the census tract. A comparison of these graphs shows that the stop rates rose for census tracts that have a larger percentage of Blacks or Hispanics, whether stops per population or stops per crime are used as outcome measures.

Figure 8: Comparison of Crime and Population Ratios



Note: CI=confidence interval. Marginal effect holding other variables constant at average values.

These analyses suggest that the overall disparity in estimated stops rates by percent of Black or Hispanic population was driven by highly segregated areas of New York, where Blacks and Hispanics represent more than 70 percent of the residential population.

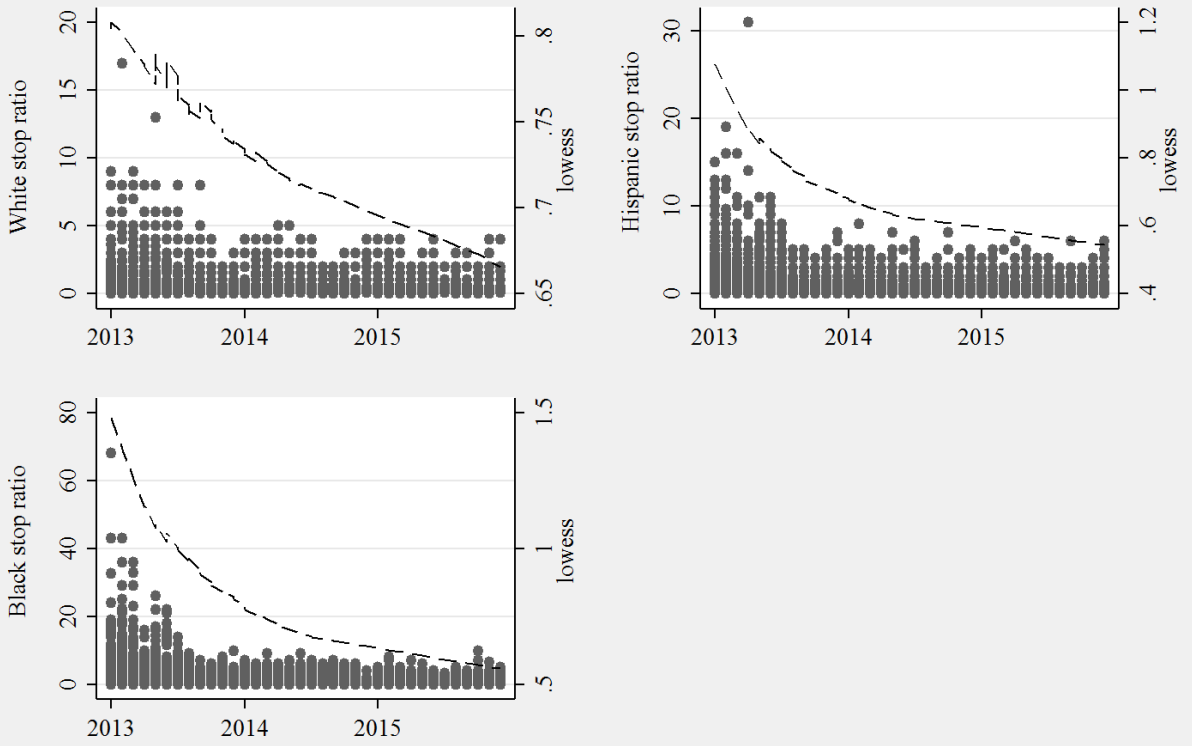
2. Using the Ratio of Stops to Reported Crime to Examine Racial Disparities in Stops

Subsection 2 discusses a different approach from that in Subsection 1. Here, the analysis does not rely on the racial percentage of census tracts as reported by the Census Bureau in order to estimate rates of stops for Blacks, Hispanics, and Whites. Instead, the analysis starts with stops actually recorded in each census block. For each month from January 2013 to December 2015, the number of reported stops and the number of reported crimes on that block are recorded. By simple division, a ratio is calculated—so, if there were ten reported stops and five reported

crimes on a block, the ratio would be 2.0. If there were ten reported stops and 20 reported crimes, the ratio would be 0.5. This exercise is repeated for every month and every block. It is done separately for stops of Blacks, Whites, and Hispanics, so that for a particular month and a particular block, the ratios for stops of Blacks, Whites, and Hispanics might (or might not) differ depending on whether the number of stops of Blacks, Whites, and Hispanics on that block differed.

This method provides a simple way to assess whether Blacks and Hispanics were stopped more frequently than Whites, given the amount of crime reported in the area they were stopped. If there are higher rates of stops per crime for Blacks or Hispanics relative to Whites citywide, this would suggest that stop activity is being driven by more than just the level of crime reported on blocks in New York City. If the rates of stops per crime for Blacks or Hispanics were similar to the rates of stops per crime for Whites, then the analysis would indicate a lack of racial disparity for the City overall.

Figure 9: Stops to Crime Ratio [2013-2015]



Per census block in NYC. Lowess=locally weighted scatter plot smoothing of average value.

Figure 9 shows the amount of stop reports per crime on census blocks in New York City between 2013 and 2015. There is a separate graph for Blacks, Hispanics, and Whites. Each dot on the figure represents a ratio (stops/crime) for that block for a particular month. Because there are more than 38,000 census blocks in New York City and the ratios (dots) cluster, the figures do not display as distinct dots but rather as clusters. With this display, the viewer can see the range of clusters as well as the outliers. As an example, the upper left chart in Figure 9 shows that in the first half of 2013, for Whites, the ratios ranged from 17 stops per crime to 0 stops per crime, with most clustered in the 5 to 0 stops per crime range and a few outliers above 10 stops per crime. For Blacks (lower left chart), the range for that period was from 68 stops per crime to 0 stops per crime, with some outliers above 40 stops per crime. For Hispanics (upper right chart), the range for that period was from 31 stops per crime to 0 stops per crime, with a few outliers

above 15 stops per crime. Note that the chart for Blacks has a different scale in the y-axis because the ratios of stops to crime were much higher than the ratios for Whites. From these charts, one can see that in 2013, Blacks had blocks with the highest rate of stops per crime, with a maximum outlier block of 68 stops per reported crime, compared to a block with 31 stops per crime for Hispanics, and a block with 17 stops per crime for Whites.

Figure 9 also shows in the dotted line the average rate of stops per crime for all census blocks in a given month (locally weighted mean), with the scale to the right of the graph. These charts show that at the beginning of 2013, the average rates at which Blacks were stopped were higher than the rates for Hispanics or Whites. For Blacks, on average, there were more stops on a block than reported crimes on that block, at 1.09 stops per crime, while Hispanics and Whites, on average, had fewer stops on a block than reported crimes, with .859 stops per crime for Hispanics and .774 stops per crime for Whites. The outlier blocks for Blacks and Hispanics can skew the average difference. For nearly 75 percent of all blocks, there were fewer stops than reported crimes for Blacks, Hispanics, and Whites in 2013. The median for the stops per crime ratio was .66 for Blacks and .5 for both Hispanics and Whites in 2013. There is no month from 2013-2015 where, on average, there were more stops than crime on blocks for Whites.

Figure 9 illustrates that the racial differences in stops per crime dropped substantially between 2013 and 2015. In 2014, the median ratios of stops to crime for Blacks, Hispanics, and Whites were all equal at .50. The average ratio of stops to crimes in 2014 was .71 for Whites compared to .69 for Blacks and .63 for Hispanics. By 2015, there were on average more stops per crime for Whites (.70) than there were for Hispanics (.58) or Blacks (.60). These graphs demonstrate that as stops have declined, the stops per crime ratios have dropped more for Blacks

and Hispanics than for Whites. One should note, however, as explained previously, this metric examines only the total citywide disparity, not the disparity in any given location.

This analysis of ratios of stops per crime can also be done at the precinct level instead of at the block level. If one examines the average ratio of stops to crime for Blacks, Hispanics, and Whites by precincts and years, it reveals that there were more stops per crime for Blacks (.96) and Hispanics (.79) than Whites (.64) in 2013. These differences diminished in 2014, with Blacks having a higher average stops per crime ratio (.66) compared to Whites (.58), and Hispanics having an average stops per crime ratio (.60) similar to Whites. In 2015, the differences in ratios continued to diminish, but Blacks still remain slightly higher in stops per crime in precincts (.57) compared to Whites (.53), while Hispanics had a lower average stops per crime ratio (.48). Because averages can be distorted by outliers, it is important to note that the analysis using the medians (50th percentiles) shows a similar trend.

It is important to note that racial differences in the average rate of stops per crime for the City overall or by precinct do not answer the question of whether the amount of stops per crime is similar by racial group in the same location. There are going to be fewer Whites to stop in heavily minority neighborhoods relative to the amount of reported crime, just as there will be fewer minorities to stop in majority White neighborhoods relative to the amount of reported crime. If one makes a direct comparison of stops of Whites to Blacks or Hispanics on the same block or within the same precinct, the comparison can be distorted by the fact that areas with larger minority populations will have more stops of minorities and more crime reported. The denominator will be the same number of crimes reported, but the numerator will be smaller for Whites compared to Blacks or Hispanics.

However, one can compare the stops per crime ratios for blocks that have the same level of reported crime in a month. One way to do that is to use a statistical test called a Wilcoxon matched pair test.[6] Using that test to examine the differences in medians (50th percentiles) of stops per crime for Blacks, Hispanics, and Whites for blocks with the same level of reported crime in a month, this analysis finds that Blacks and Hispanics relative to Whites have significantly higher stops per crime ratios at all levels of reported crime. The differences are statistically significant and would occur by chance less than 1 time in 1,000.[7] This analysis shows that the higher stops to crime ratios for Blacks and Hispanics found in 2013 are mostly driven by areas with lower reported levels of crime where minorities were more subject to stops than Whites in comparably low reported crime blocks. The racial disparities in stops to crime ratios for blocks with similar levels of reported crime continued in 2014 and 2015, although the extent of the disparities decreased.

If the amount of crime reported on blocks throughout the city should reflect the relative risk of being stopped, then the comparison of stops to crime ratios suggests that by 2015 the racial disparity of stops had significantly diminished. This conclusion was apparent in three of the four analyses using the stops to crime ratios (citywide by block, citywide by precinct, and an analysis of the F-tests comparing coefficients for stops to crime ratios for blocks with similar levels of crime). Only in the Wilcoxon matched pair test, examining the medians of stops per crime ratios for blocks with similar levels of reported crime, did the disparities continue into

[6] Wilcoxon, F. 1945, Individual comparisons by ranking methods. *Biometrics* 1: 80-83.

[7] These findings are corroborated by a regression model that estimates the relationship between the average amount of crime reported on blocks in a month and stops to crime ratios for Blacks, Hispanics, and Whites in each year. In 2013, the F-test comparing coefficients for stops to crime ratios for Blacks and Hispanics to Whites shows they are significantly different in 2013 (Black v. White F=9.61; p=.0025; Hispanic v. White, F=10.56; p=.0015). The differences between Blacks, Hispanics, and White stops to crime ratios coefficients appear to be driven by areas with lower reported crime where Blacks and Hispanics are more subject to stops than Whites. However, as with the analysis of stops to crime ratios citywide, the F-tests comparing coefficients show that the differences are no longer significant in 2014 or 2015.

2015, although even in that test, the disparities were reduced by 2015. These findings are different than those using the regression model described in Subsection 1 above.

3. Comparison of Findings for Racial Disparity

This raises a question about why the racial differences in rates of stops per crime show a diminishing racial disparity for the City, in contrast to the regression model findings that show minority neighborhoods remain a significant predictor of estimated stops, even after controlling for crime. This section of the report explores the limitations of each of the analyses.

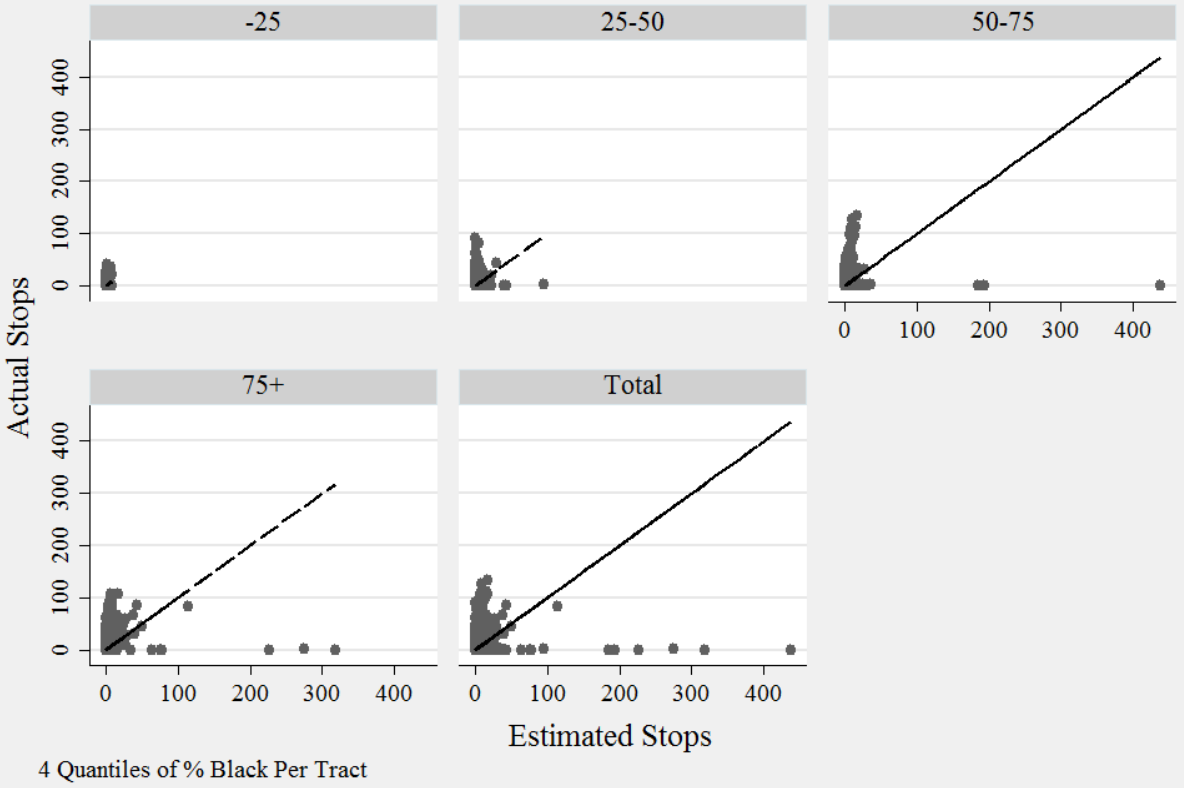
As stated in the section above, the approach using ratios of stops per crime on each block provides a citywide perspective of racial disparities, and identifies outliers of blocks where the number of stops heavily outweigh the number of crimes on that block, but it does not compare neighborhoods and measure racial disparities in particular areas. It does not attempt to take into account other contextual variables, but only provides an accounting of stops.

With respect to the approach using regression analysis, it estimates how much the variation in stops per population in a census tract can be explained by changes in the racial demographics of census tracts, controlling for crime, socioeconomic variables, the precinct location, and the month of the year. The results from all regression models produce a predicted value of the outcome from the model parameters, in this case stops per population. When one compares the predicted stop rate from the regression models to the actual stop rate on that block, the numbers are not always well matched, especially in neighborhoods with large percentages of minorities. Because there are fewer blocks where more than 75% of the population are Black or Hispanic, these predicted values have larger margins of error. Therefore, one has to be more cautious in drawing conclusions from predicted stop rates.

Figure 10 shows the estimated rate of stops after controlling for crime and other variables previously noted relative to actual stop rates by the percentage of Black residents. The y-axis

shows the actual stop rates and the x-axis shows the estimated stop rates from the regression analysis. A comparison of the estimated results per block to the actual reported stops per block shows that there were more actual stops than estimated in both neighborhoods that are heavily Black and those with a small Black population percentage. One should also note that the statistical model estimates outliers above 100 stops per month in some neighborhoods in which the percentage of Black residents was 50% or higher, when there were none or at most only a handful of actual stops in those census blocks.

Figure 10: Actual to Estimated Stops per Month in Census Blocks, 2013-2015



Second, in the analysis using census data, it is not sufficient simply to find that the rate of stops for Blacks or Hispanics was higher than their share of the City's population. That disparity might have been caused by the fact there was a high crime rate in areas that are predominantly minority: so one needs to control for crime, as the regression analysis attempts to do. The

success of this attempt depends in part on whether there are a substantial number of Black and White neighborhoods that shared all the attributes for which one wanted to control—i.e., Black and White neighborhoods in the same precincts, with similar poverty rates, and with similar crime rates. However, in the period 2013-2015, there were almost no predominantly Black and White neighborhoods that shared all these attributes. In particular, there were very few high-crime white neighborhoods located in the same precincts as high-crime Black and Hispanic neighborhoods. For this reason, the regression analysis loses some of its precision in estimating stop rates.

A third caveat relates to deployment. The census-based analysis attempts to take account of NYPD officer deployment by assuming that police deployment reflects precinct location and the amount of crime reported in the previous month. However, deployment decisions may not mirror the previous month's crime trends. For example, the NYPD could deploy 30 percent of its officers to high-crime neighborhoods that contributed only 20 percent of the City's crime the month before. Deploying more officers in a high-crime neighborhood would likely result in more stops in that neighborhood. Higher stop rates for minority neighborhoods could be the result of the NYPD assigning a higher number of officers to high-crime neighborhoods, over and above what the previous month's crime rates would suggest. Because the NYPD does not have computerized data on officer assignments that is routinely updated, the analysis cannot directly control for officer deployment. Thus, it cannot tell us whether a higher rate of stops in minority neighborhoods was due to officers making stops of Blacks and Hispanics at a lower threshold of suspicion than stops of Whites and others, or due to police deployment decisions, or some combination of the two. Going forward, the monitor team will examine whether police

deployment can be approximated using data on the officers' arrests and summonses in different locations.

It is also important to note that the regression model does not examine racial disparities in individuals stopped; it identifies only whether stops are higher per population in areas where the residents are predominantly minority. Finally, the analysis that uses the racial percentage of census tracts assumes that the residential population in a tract is the population that is "available" to be stopped by the police. However, the persons who live in that tract are not necessarily the same as the persons on the street at any given day or time.

Although there are limitations in the regression analysis, another way of looking at the data lends support to this analysis: one can ask whether the racial composition of census tracts is materially important for explaining the rates of stops. Statisticians use a "likelihood ratio test" to answer this question.[8] This test examines how well the regression model with racial demographics of tracts (percent Black, percent Hispanic, percent other races) estimates stop rates compared to a regression model without those factors included. The likelihood ratio test shows that including racial demographics in the model provides significant improvement in estimating stop rates.[9] This suggests that the racial distribution of areas remains an important factor in explaining the variation in stop rates, even while the overall rate of stops per residential population has dropped significantly between 2013 and 2015. Given the results of this test, the population-based regression analysis cannot be ignored, even with its limitations and even though it results in different findings than the analysis of stops to crime ratios.

For this reason, the monitor will continue to report on both methodologies, along with other analyses, and will invite further input from experts. Future data may bring these two

[8] A likelihood ratio test is a statistical test used to compare the goodness of fit of two models, one of which (the null model) is a special case of the other (the alternative model).
[9] Chi-square value =360; df=3; p<.0001.

methodologies to more similar conclusions, or flaws in one or the other may become more apparent.

C. Examining What Happens After the Stop

1. Racial Disparities in the Outcomes of Stops

Another way of measuring the impact of race on stops is to examine what happens after the stop, to see if there are racial disparities in the outcomes of stops and in the hit rates for stops. The following analysis generates estimates of racial disparities from a statistical regression model of the outcomes (frisk, search, summons, arrest, and force) of stops. The analysis statistically controls for features of each stop that could be confounded with race.[10] Specifically, the context of stops are measured by: the major crime suspected (violence, weapons, property, drugs, trespass, and quality of life); the day of the week; the time of day (patrol shift 1, 2, or 3); the type of location (housing, transit, or other); the gender and age of the person stopped (less than 10; 10-15; 16-19; 20-24; 25-34; 35-64; 65+); whether the stop was associated with a radio run; and the precinct location (1, 2…123). The results are displayed in terms of the estimated percentage of outcomes for Blacks and Hispanics relative to others (Non-Hispanic Whites, Asians, Other, or Unknown).[11]

Table 5 shows the results from the regression analysis. Note that these figures are estimates, adjusted for the variables noted above. Table 5 indicates that Blacks were

[10] Standard errors in these logistic regression models are clustered on block groups to control for unobserved serial dependence within blocks.

[11] Statistical power determines the probability of incorrectly rejecting the null hypothesis of no difference (type I error) between groups and incorrectly accepting the null hypothesis (type II error). When analytic databases are large, small differences will be statistically significant, leading one to incorrectly reject the null hypothesis of no difference between groups. When analytic databases are small, differences that are relatively small can lead one to fail to detect differences between groups that are significant (type II error). In the current analysis, the probability of type I error is greater than type II error, because the size of the analytic files examined are relatively large. For differences reported that are not statistically significant (in every case aside from "behavioral" stops), there is more than an estimated .80 power. Therefore, we rely on critical z-value adjusted to 3.02 to guard against type 1 error; *see* McCrary J., Christensen, G., & Fanelli, D. (2016), "Conservative Tests under Satisficing Models of Publication Bias."*PLoS ONE* 11(2): e0149590. doi: 10.1371/journal.pone.0149590.

significantly more likely than other groups in all three years to be subject to frisk, holding all context variables constant. For example, the analysis estimated that in 2013, Blacks were frisked 63.6 percent of the time, while Non-Hispanic Others (Whites, Asians, Others, or Unknown) were frisked 59.2 percent of the time. Estimates in the table that are statistically significant are noted with asterisks. Hispanics were more likely than Non-Hispanics to be frisked in 2013, but by 2014 and 2015, the differences in frisks for Hispanics and for Non-Hispanic Others were not statistically significant. Blacks and Hispanics were both significantly more likely than Non-Hispanics to be subjected to force in 2013. Hispanics were significantly more likely to be subject to a search and arrest in 2015. The majority of the differences are small in percentage terms (below three percentage points).

Table 5: Stop Outcomes for Blacks and Hispanics, Controlling for Contexts

Year	Outcome	Black (%)	Others (%)	N=	Hispanic (%)	Others (%)	N=
2013	Frisk	63.6***	59.2	131,802	58.51***	55.92	83,753
	Search	8.01	8.46		8.19	8.74	
	Summons	2.4	2.8		3.2	3.06	
	Arrest	6.24	6.2		7.1	7.46	
	Force	12.16**	10.0		12.66***	11.56	
2014	Frisk	73.3***	70.4	31,810	67.29	65.3	20,328
	Search	12.81	13.0		14.15	13.47	
	Summons	1.6	1.7		2.11	1.71	
	Arrest	9.8	9.76		11.63	10.96	
	Force	17.96**	16.55		19.8	18.14	
2015	Frisk	74.5***	70.8	15,977	68.74	65.74	10,131
	Search	15.34	14.9		18.46***	15.45	
	Summons	2.1	2.2		1.86	2.16	
	Arrest	12.47	11.68		15.59***	12.59	
	Force	24.55	23.89		25.2	22.77	

Note: All estimates include controls for major crime suspected; day of the week; patrol shift; housing, transit, or other location; gender of person stopped; age of person stopped; stop based on radio run; precinct location.
**Difference in percent occurs by chance less than 1 in 100.
***Difference in percent occurs by chance less than 1 in 1,000.

The statistical analyses used to estimate differences in stop outcomes by race in Table 5 held important contextual variables constant. Nevertheless, these estimates may not accurately remove the influence of context variables that are correlated with race, if there are important unaccounted-for interactions between race and the contextual variables.[12] Omitting important interactions could lead to estimates that over- or understate racial disparities in outcomes. To check this possibility, an analysis was conducted that compared the outcomes for stops of minorities with the outcomes for stops for a comparison group of non-minorities that was similar to Blacks and Hispanics on all variables except for race.[13] This is known as a "doubly robust" estimation model. In essence, this approach attempts to develop comparisons where subjects in comparison groups differ only on race attributes, but were otherwise the same on all other measurable contextual factors. In the analyses reported here, outcomes for Black and Hispanic subjects were compared to outcomes for "similarly situated" Non-Hispanic subjects.[14] This type of analysis has been used by many criminologists, including Dr. Fagan and the RAND Corporation, which conducted an analysis using a similar method to examine racial disparities in New York City stops from 2006 data.[15] Only percentage differences in outcomes that would occur by chance less than 1 time in 100 are flagged to guard against false discovery driven by the large number of cases in these analyses.[16]

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[12] *See* Berk, Richard A. (2004), *Regression Analysis: A Constructive Critique*. Thousand Oaks, CA: Sage Publications, Inc.

[13] *See* Bang, H., & Robins, J. (2005), *Doubly Robust Estimation in Missing Data and Causal Inference Models.* Biometrics 61, 962–972, corrected in 2008, Biometrics, 64, 650; Imbens, G.W., Wooldridge, J.M (2009), Recent developments in the econometrics of program evaluation. *Journal of Economic Literature* 47: 5–86.

[14] The doubly robust method employed relied on augmented inverse-probability weights. StataCorp. 2013. Stata: Release 13. Statistical Software. College Station, TX: StataCorp LP.

[15] See Ridgeway, G., (2007). *Analysis of Racial Disparities in the New York Police Department's Stop, Question, and Frisk Practices. TR-534-NYCPF*. Santa Monica, CA: RAND Corporation.

[16] For an example of how this pertains to publication bias of statistical significance, *see* McCrary J., Christensen G., & Fanelli D. (2016), "Conservative Tests under Satisficing Models of Publication Bias." *PLoS ONE* 11(2): e0149590. doi: 10.1371/journal.pone.0149590. In this case, we use a lower threshold of statistical significance since

Table 6 displays the results from the doubly robust analyses of stop outcomes for Blacks and Hispanics compared to their statistical comparison groups. Table 6 shows the percentage of outcomes for Blacks and Hispanics relative to those who are statistically similar on all stop context variables. The results indicate there are only a few statistically significant racial disparities in outcomes from stops when comparing Blacks and Hispanics to similarly situated Non-Hispanics.

In 2013, Blacks and Hispanics compared to similarly situated Non-Hispanics were two to three percent more likely to experience a frisk and one to two percent more likely to experience uses of force. In 2014 and 2015, the majority of the outcomes were similar between Blacks and Hispanics compared to similarly situated Non-Hispanics. The two exceptions are for Hispanics in 2015, where searches and arrests occurred 20.6 percent and 19.8 percent of the time for Hispanics compared to 17.4 percent and 17 percent for similarly situated Non-Hispanics.

For the majority of outcomes, there was no evidence of racial disparities in stop outcomes for Blacks and Hispanics in 2014 and 2015 relative to similarly situated Non-Hispanics. The differences are noted when they are statistically significant, even though the actual percentage differences appears to be small. Overall, these findings suggest improvement in racial disparities in outcomes reported in stop data.

Table 6: Comparison of Stop Outcomes for Blacks Compared to Similarly Situated Non-Hispanic Comparisons, 2013-2015

Year	Outcome	Black (%)	Comparison (%)	N=	Hispanic (%)	Comparison (%)	N=
2013	Frisk	58.9***	55.6	136,505	55.3***	53.5	87,220
	Search	9.2	10.2		9.9	10.5	
	Summons	3.3	3.9		4.1	4.0	
	Arrest	7.6	8.0		8.8	8.9	

there are multiple outcomes being tested and a large sample size, leading to a higher likelihood of finding differences that would occur by chance fewer than five times out of 100.

Year	Outcome	Black (%)	Comparison (%)	N=	Hispanic (%)	Comparison (%)	N=
	Force	14.5**	12.6		15.2***	14.0	
2014	Frisk	67.4	65.0	33,196	62.9	60.7	21,415
	Search	15.0	16.4		17.1	16.9	
	Summons	2.3	2.4		3.0	2.7	
	Arrest	13.7	14.1		16.3	16.0	
	Force	20.1	18.4		21.9	19.8	
2015	Frisk	68.4	66.5	15,977	64.6	62.4	10,568
	Search	17.4	17.9		20.6***	17.4	
	Summons	2.5	2.5		2.5	2.9	
	Arrest	16.1	16.5		19.8**	17.0	
	Force	26.8	28.1		27.7	26.2	

Note: All estimates include controls for major crime suspected; day of the week, patrol shift, housing, transit, or other location; gender of person stopped; age of person stopped; stop based on radio run; precinct location. Critical z-value adjusted to 3.02 to guard against type 1 error as suggested by McCrary J. et al. (2016).
**Difference in percent would occur by chance less than 1 in 100.
***Difference in percent occur by chance less than 1 in 1,000.

2. Racial Disparities in Hit Rates

A body of research literature on police stops of civilians uses hit rates, or the percentage of searches that turn up contraband, as a test of racial disparities. If the hit rate for searched minority suspects is lower than that of non-minority suspects, it suggests that the police may be applying a lower standard of suspicion to minorities in deciding whether to conduct a search. However, several papers suggest that comparing hit rates from searches between races is not an accurate test of racial disparities if the context of searches is different between racial groups.[17] For example, there may be factors associated with race that explain a greater propensity to search and a lower hit rate, but that have nothing to do with police officers applying a lower threshold of suspicion. To control for this form of "omitted variable bias," the analysis of hit rates controls for variables that measure the context of stops.

[17] Sanga, S., "Reconsidering Racial Bias in Motor Vehicle Searches: Theory and Evidence." *Journal of Political Economy* 117.6 (2009): 1155-159; Anwar, S., and Hanming, F., "An alternative test of racial prejudice in motor vehicle searches: Theory and evidence." *The American Economic Review* 96.1 (2006): 127-151; Ayres, I., "Outcome tests of racial disparities in police practices." *Justice Research and Policy* 4.1-2 (2002): 131-142.

Hit rates from searches are estimated using a regression model that includes the same control variables as were used in the analyses of outcomes (crime suspected categories; gender; age of suspect; housing, transit, or patrol; radio run; day of week; and precinct).[18] This approach reduces the risk that racial differences in hit rates could be explained by these other variables. Comparisons for hit rates are estimated for three different sets of stops: (1) for all stops; (2) for stops in which there was a search; and (3) for stops in which the NYPD officer reported suspecting an individual of being engaged in a drug transaction, violent crime, or "casing" a victim or location, and a search was conducted. This third category is used because these types of stops appear to have a higher likelihood that criminal activity took place.[19] (These stops are labeled "Behavioral" in Table 7 on page 40 below.)

Table 7 shows the results from this analysis of hit rates by year for Blacks and Hispanics compared to Non-Hispanic others, after controlling for stop context. The results are presented in terms of percentage of estimated hit rates for stops made of Blacks and Hispanics compared to Non-Hispanics, holding all other variables constant at their mean values. The data for weapons recovered is collected separately from data on the recovery of other contraband, such as drugs, so the hit rates are also reported separately for each. Table 7 shows the hit rates for eight different categories each year (24 in total). As shown in Table 7, there were seven (of 24) circumstances for Blacks and two (of 24) circumstances for Hispanics in which the disparity in hit rates compared to Non-Hispanics was statistically significant, and would occur by chance less than 1 time in 100. Below are the results laid out for each year, to examine whether there are changes over time.

[18]Standard errors in these logistic regression models are clustered on block groups to control for unobserved serial dependence within blocks.

[19] The same category was used in a paper coauthored with the plaintiff's expert. MacDonald, J., Fagan, J., Geller, A. (2016), "The Effects of Local Police Surges on Crime and Arrests in New York City." *PLoS ONE* 11(6): e0157223. https://doi.org/10.1371/journal.pone.0157223.

In 2013, there were three circumstances where hit rates for Blacks were lower than for Non-Hispanic others. The hit rate for weapons for all stops was 0.7 percent for Blacks compared to 1.3 percent for Non-Hispanic others. The hit rates for weapons for stops involving frisks was 1.5 percent for Blacks and 2.9 for Non-Hispanic others. When a search was made, approximately 8.4 percent of Blacks searched had a weapon compared to 12.5 percent of Non-Hispanic others. Hispanics in 2013 were also less likely to have weapons found on them in all stops (0.7 percent) and for stops involving frisks (1.7 percent) than Non-Hispanic others (0.9 percent for all stops; 2.3 percent for stops involving frisks).

In 2014, the hit rates for weapons were lower for Blacks than for Non-Hispanics in three circumstances: for all stops, for stops with a frisk, and for stops in which a search occurred. However, the hit rates for weapons for Hispanics and Non-Hispanics in 2014 were substantially similar for all categories of stops.

In 2015, there was only one category where the differences in hit rates continued to be statistically significant. For stops involving a frisk, the hit rate for weapons for Blacks was 3.2 percent, compared to a hit rate of 4.9 percent for Non-Hispanic others.

Table 7 also shows that hit rates for weapons were not statistically different for Blacks or Hispanics compared to Non-Hispanic others in any year, when the stops were based on criteria that are more likely to indicate criminal activity. In these stops (stops for suspected violent crimes or drug transactions, or where the officer observed "casing"), the hit rates for weapons were similar for all races.

In sum, the results show that disparities in hit rates were focused on weapons and not other contraband, and that these disparities diminished over time.

Table 7: Suspects Found Having Contraband or Weapons, 2013-2015

Year	Type of Stops	Outcome	Black (%)	Non-Hispanic (%)	N=	Hispanic (%)	Non-Hispanic (%)	N=
2013	All	Any contraband	1.7	1.9	131,802	2.1	2.3	83,489
		Weapons	0.7***	1.3	131,802	0.7***	0.9	83,753
	Frisk	Any contraband	1.8	1.9	76,897	2.3	2.3	45,560
		Weapons	1.5***	2.9	76,897	1.7***	2.3	45,675
	Searches	Any contraband	12.8	13.4	12,184	14.7	14.9	8,340
		Weapons	8.4***	12.5	12,194	8.8	10.6	8,363
	Behavioral	Any contraband	13.8	16.7	4,505	16.6	20.1	3,239
		Weapons	5.8	7.0	4,442	6.6	7.1	3,074
2014	All	Any contraband	2.6	2.6	31,512	2.9	2.9	19,948
		Weapons	1.0***	1.9	31,538	1.3	1.5	19.921
	Frisks	Any contraband	2.6	2.7	21,096	3.2	3.2	12,421
		Weapons	1.8***	3.2	21,055	2.5	2.9	12,364
	Searches	Any contraband	12.9	13.5	4,666	13.1	14.5	3,310
		Weapons	7.0**	9.5	4,659	8.6	8.5	3,316
	Behavioral	Any contraband	15.0	19.1	1,315	14.9	16.4	1,064
		Weapons	5.9	5.1	1,315	7.3	4.8	964
2015	All	Any contraband	3.3	4.2	15,027	4.4	4.4	9,671
		Weapons	2.0	2.7	15,087	2.3	2.3	9,728
	Frisks	Any contraband	3.5	4.4	10,079	5.2	5.0	6,101
		Weapons	3.2**	4.9	10,239	4.2	4.4	6,162
	Searches	Any contraband	14.2	18.0	2,600	18.5	18.8	1,853
		Weapons	11.7	14.2	2,656	11.0	11.8	1,891
	Behavioral	Any contraband	22.0	27.4	581	23.9	18.3	507
		Weapons	11.5	7.8	567	6.5	6.7	435

**Difference in percent occur by chance less than 1 in 100.
***Difference in percent occur by chance less than 1 in 1,000.

TECHNICAL APPENDIX

I. Introduction

This Appendix provides additional information and data relating to the analyses conducted for this report. Section II below describes the data sources used for the analyses. Section III of this Appendix provides additional data related to the trends in reported stops as described in Section III.A of the report, including a table of stops by borough and maps of reported crime and reported stops for 2013, 2014, and 2015. Section IV of this Appendix provides additional data related to the regression analysis of stops using the racial percentage of census tracts as the benchmark.

II. Data Sources

Four primary data sources were used in the report.

- The 2013, 2014, and 2015 Stop, Question, and Frisk database that records the reported stop reports. The same data are posted by the NYPD in open access with a few fields removed.[20]
- The 2010 census block and tract shape files from NYC Department of Planning.[21]
- Census data on the residential population of NYC at the census block and tract level taken from the American Community Survey's (ACS) 2013 five-year estimates.[22]

[20] http://www.nyc.gov/html/nypd/html/analysis_and_planning/stop_question_and_frisk_report.shtml.
[21] http://www.nyc.gov/html/dcp/html/bytes/districts_download_metadata.shtml. Census block groups were used for geographic analyses because they represent clusters of contiguous blocks in the same census tract and are the smallest unit of geography that the Census uses to calculate population estimates (*see* https://www.census.gov/geo/reference/gtc/gtc_bg.html). In New York City, a census block often corresponds to a city block.
[22] http://www.socialexplorer.com/tables/ACS2013_5yr.

- The 2013, 2014, and 2015 NYPD Crime Complaint Report Database for all major offenses.

The stop database contains information on the reason for the reported stop (suspected crime that led the officer to make the stop as noted on the stop form), frisks or searches of individuals if made, and enforcement actions taken (e.g., summons, arrest). Details on the time and location of the stop (latitude and longitude, or "x-y" coordinates) are also provided in the database. The NYPD Crime Complaint Report Database includes information on the location of the reported crime (latitude and longitude, or "x-y" coordinates) of the complaint report, the time of the report, the offense reported, and other details.

III. Trends in Reported Stops

A. Total Reported Stops by Calendar Quarter

Table 8: Stops by Borough by Calendar Year

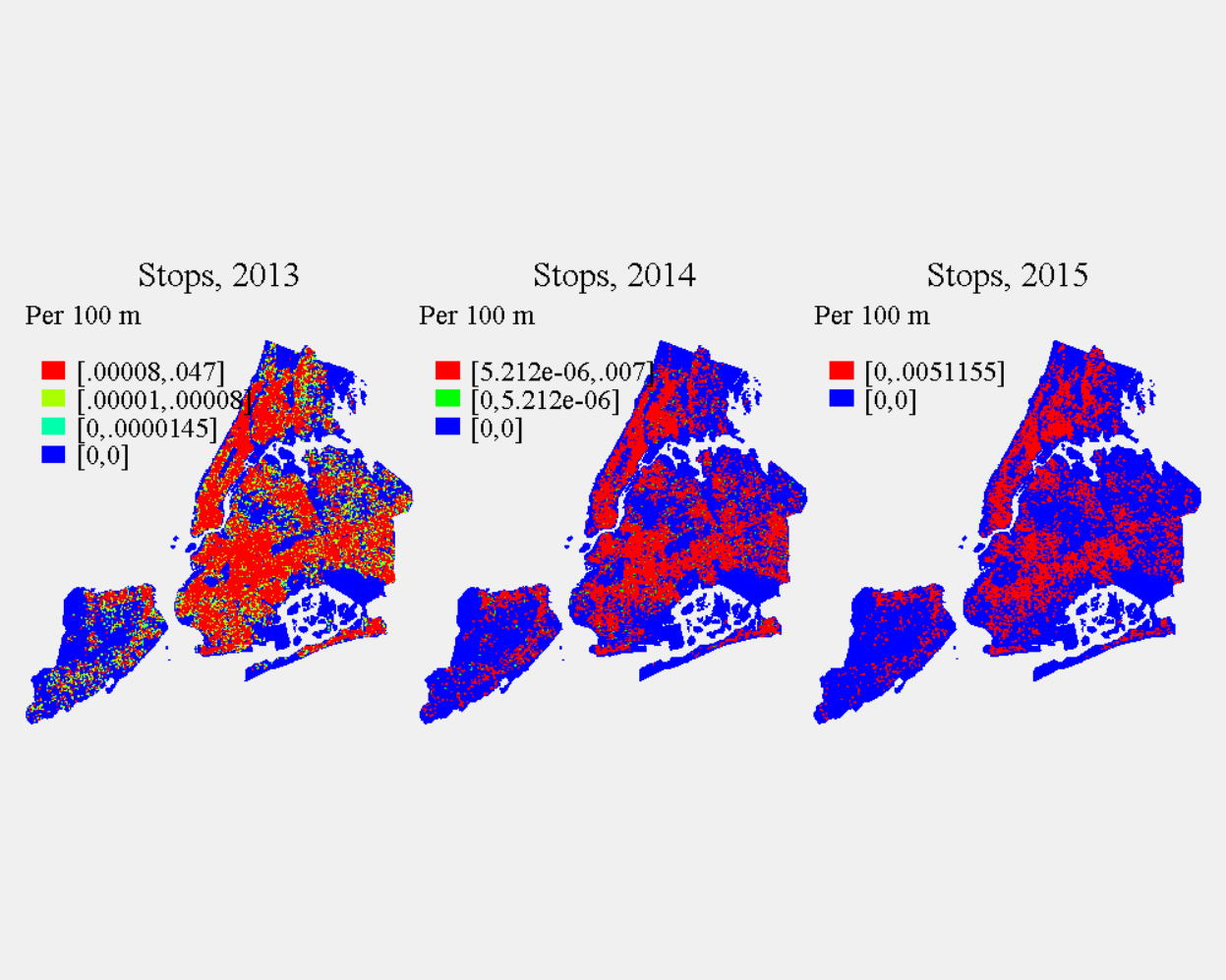
Year	Quarter	Bronx	Brooklyn	Manhattan	Queens	Staten Island	City
2012	Jan-Mar	42,692	70,007	41,904	41,325	7,674	203,602
	Apr-June	23,134	47,742	28,331	29,189	5,412	133,808
	July-Sept	18,495	38,215	21,331	23,349	4,490	105,880
	Oct-Dec	17,822	32,743	18,800	17,095	3,156	89,616
	% Change (Jan-Mar v. Oct-Dec)	-58%	-53%	-55%	-59%	-59%	-56%
2013	Jan-Mar	15,560	36,874	22,237	21,352	3,710	99,733
	Apr-June	5,989	23,710	11,504	14,742	2,474	58,419
	July-Sept	2,033	7,715	4,218	5,791	1,428	21,185
	Oct-Dec	1,718	4,103	1,998	3,671	1,024	12,514
	% Change (Jan-Mar v. Oct-Dec)	-89%	-89%	-91%	-83%	-72%	-87%
2014	Jan-Mar	1,964	4,266	2,364	4,068	1,433	14,095
	Apr-June	1,614	3,647	1,975	4,138	1,758	13,132
	July-Sept	1,863	3,187	1,610	3,124	1,076	10,860
	Oct-Dec	1,384	2,268	1,312	2,005	731	7,700
	% Change (Jan-Mar v.	-30%	-47%	-45%	-51%	-49%	-45%

Year	Quarter	Bronx	Brooklyn	Manhattan	Queens	Staten Island	City
	Oct-Dec)						
2015	Jan-Mar	1,299	1,797	1,349	1,886	721	7,052
	Apr-June	1,248	1,835	1,091	1,611	568	6,353
	July-Sept	1,060	1,465	787	1,130	231	4,673
	Oct-Dec	1,147	1,257	714	1,091	276	4,485
	% Change (Jan-Mar v. Oct-Dec)	-12%	-30%	-47%	-42%	-62%	-36%

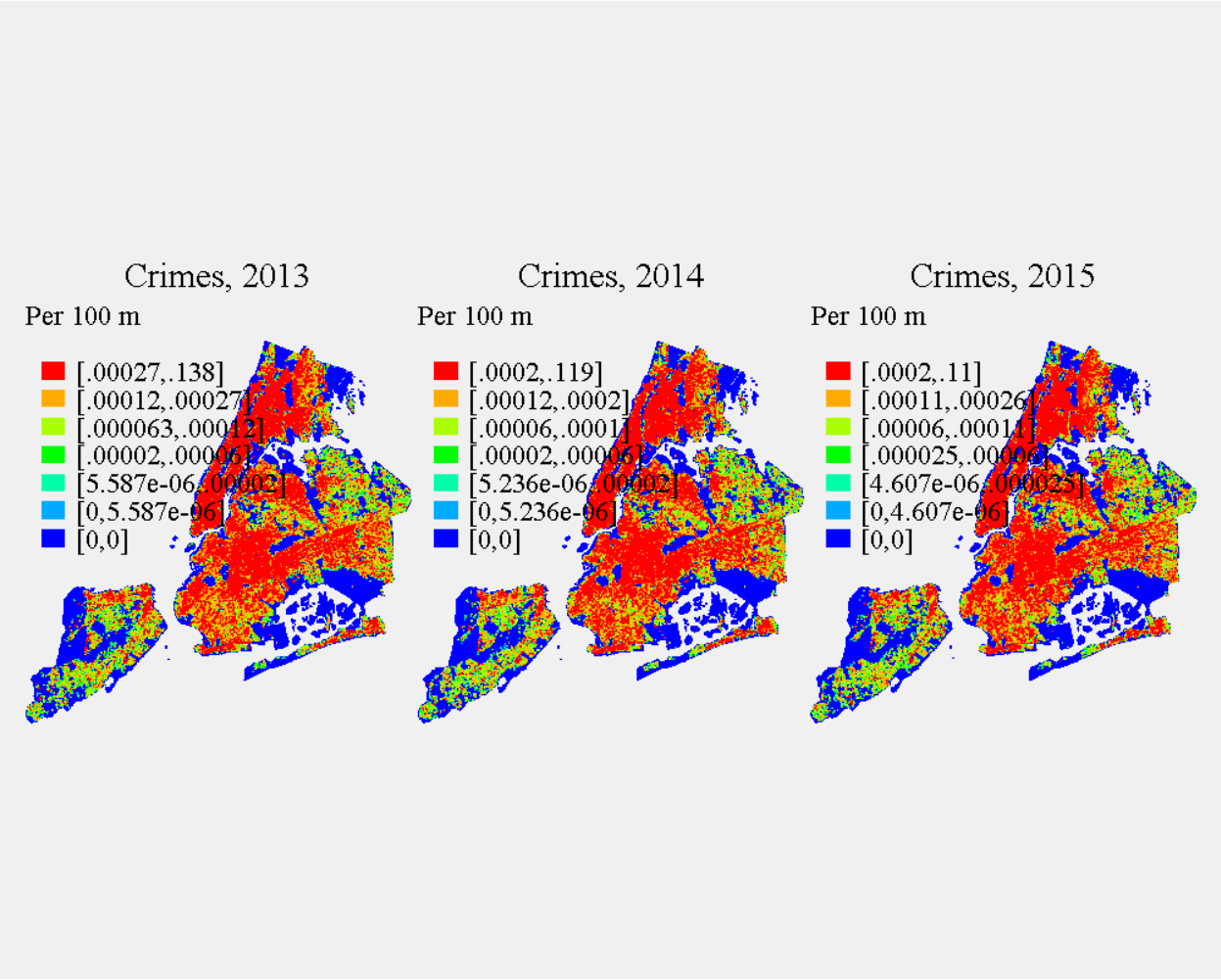
B. Geographic Concentration of Stops and Crime

Map 1 shows the geographic concentration of stops as reported by the frequency of reported stops per 100 square meters in NYC during 2013, 2014, and 2015. Dr. MacDonald superimposed a grid of 100-meter squares on the map of the City of New York and then matched the map with the x-y coordinates of each stop. The maps show that although the number of stops dropped across New York City, areas with higher numbers of stops remained the same over the three years. A Spearman rank correlation coefficient ("rho") measures the association between rank-ordered variables, and ranges between -1 (perfect negative correlation) and +1 (perfect positive correlation). In this comparison, the correlation coefficient suggests a modest but statistically significant correlation (rho=.36; $p<.0001$) between the rank number of stop reports per 100 square meters in 2015 with 2014 and 2013. In other words, there is general stability in the geographic location of higher stop locations.

Map 1: Stops Reported per 100 Meters in NYC

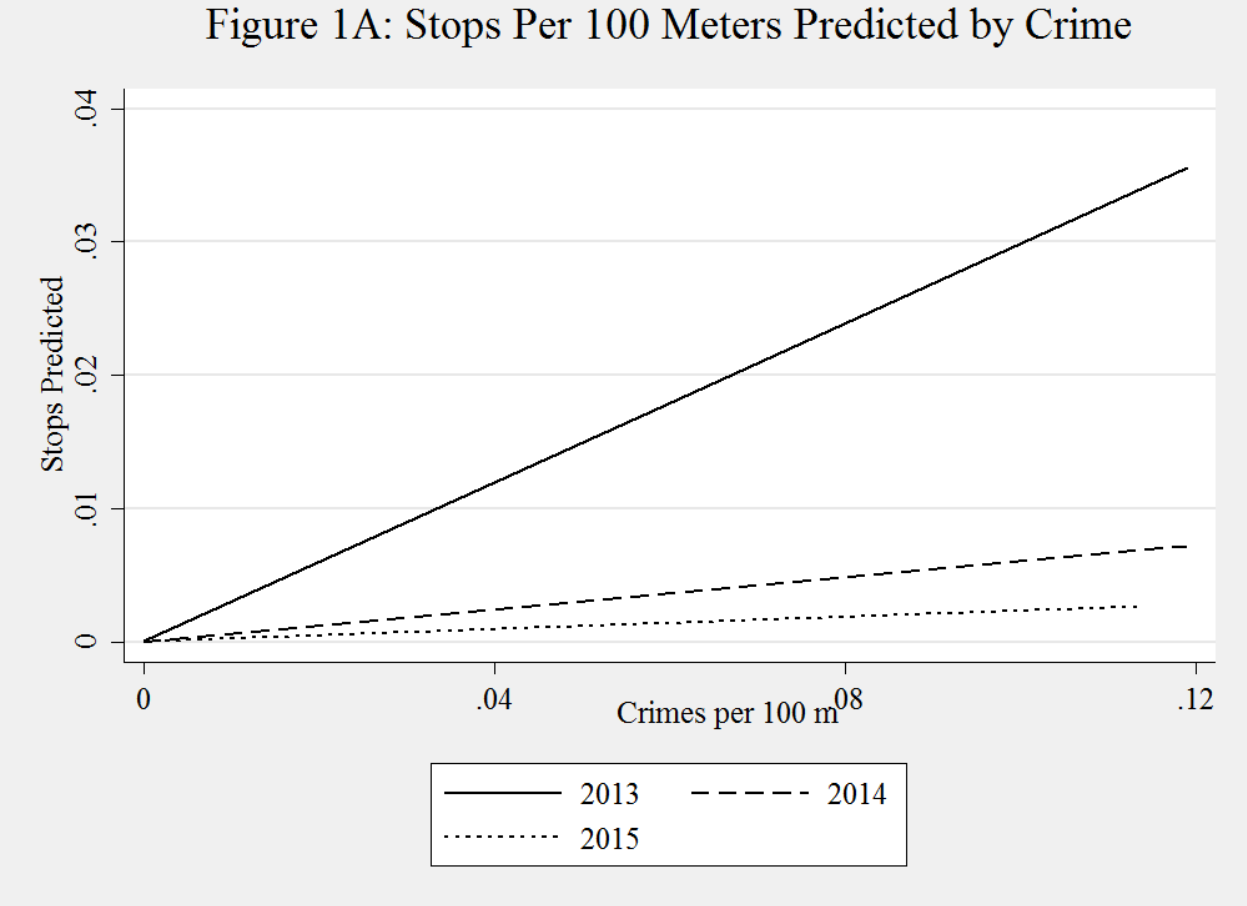


Map 2: Crimes reported per 100 Meters in NYC



Map 2 shows the frequency of reported crimes per 100 square meters in NYC during the same time period. The data also indicates that crime has remained concentrated in the same areas over time. The yearly geographic correlation (rho=.76; p<.0001) is higher among crimes than stops, showing that crime has remained more concentrated year-to-year by location, relative to the year-to-year geographic concentration of stops.

The differences between these two maps shows that the geographic concentration of stops reported by the police has decreased more than the concentration of crimes reported to the police over the course of 2013-2015. Figure 1A shows the results of an analysis comparing the frequency of stops to the frequency of crimes per 100 square meters in NYC. If reported stops and reported crimes are correlated, the graph will show an increase in both the x and y axes, which will result in a diagonal line. In 2013, the amount of crime in a geographic area was a significant predictor of where reported stops were concentrated. By 2015, the correlation (rho) between the amount of crime in these small areas relative to the number of stops in the same areas had diminished substantially, which is demonstrated by the decrease in the slope of the line in Figure 1A representing 2015 (rho=.310) compared to 2014 (rho=.372) and 2013 (rho=.543).



IV. Using Regression Models to Estimate Stop Rates on Census Blocks, Using Both Population and Reported Crime as Measures

The regression analysis used in Section III.B, Subsection 1, of the report examines whether the rate of stops increased as the percent of Black or Hispanic population in a census tract increased. The discussion below provides additional data from this same analysis.

The regression models create an "incident rate ratio" (IRR) that estimates the relative change in stop rates for a 10 percent change in Black or Hispanic population in a census tract, controlling for socioeconomic factors, reported crime in the prior month, precinct in which the stop occurred, and other context variables. Table 9 below shows the results of the regression analysis. For ease of presentation, table 9 shows only the results for the *percent Black* and

percent Hispanic variables.[23] In 2013 and 2014, a 10 percent higher percent Black population was associated with approximately a 14 percent higher stop rate. In 2015, a 10 percent higher Black population in a census tract was associated with a 10 percent higher stop rate. Similarly, the results indicate that a 10 percent higher Hispanic population was associated with an 11 percent higher stop rate in 2013, an eight percent higher stop rate in 2014, and a 10 percent higher stop rate in 2015. All of these effects are statistically significant and would occur by chance less than one time in 1,000.

Table 9: Estimate of Stop Rates on Census Blocks in NYC

Variable	IRR (population)	Lower 5 %	Upper 95 %	IRR (crime)	Lower 5 %	Upper 95 %
2013						
Percent Black	1.14**	1.11	1.16	1.11**	1.08	1.13
Percent Hispanic	1.11**	1.08	1.14	1.08**	1.05	1.10
2014						
Percent Black	1.14**	1.11	1.17	1.12**	1.09	1.15
Percent Hispanic	1.08**	1.05	1.11	1.07**	1.04	1.10
2015						
Percent Black	1.10**	1.08	1.13	1.07**	1.04	1.10
Percent Hispanic	1.10**	1.07	1.14	1.09**	1.05	1.12

Note: population= rate of stops per population; crime=rate of stops per reported crime in previous month. All models control for Percent Other Races, SES, and precinct location.
**p<.001

These results show stability in the disparities of stops per residential population across years, as the 95% confidence intervals overlap, indicating very little change in the risk of stops relative to the residential population.[24]

[23] Each model also includes clustered standard errors at the block level to control for unmeasured dependence within blocks over time.

[24] In all models the number of reported crimes the month before remains a statistically significant predictor of more stops, increasing the rate of stops per resident by 1.04 (p<.0001).

Table 9 above also includes the IRR results from a regression model that examines whether the Black or Hispanic share of the population was a significant predictor of stop rates if the model uses the crime rates in the previous month as the population at risk for stops. Again, the results suggest that areas with higher percentages of Black or Hispanic residents had higher stop rates. These estimates suggest that the number of stops remained higher in minority neighborhoods than could be explained by crime reported the prior month.

As discussed in the body of the report, the regression model can be used to analyze subsets of stops to see if the racial percentage of the census block impacted the stop rates for different categories of stops. Table 10 below shows that the percentage of Black and Hispanic residents in a census tract was significantly correlated with the estimated stop rate across most of the stop categories. The only exception was for stops for quality of life crimes, where there are no differences in stop rates based on the Black or Hispanic population percentage of the census tract.

Table 10: Estimate of Stops on Census Blocks in NYC by Suspected Crimes (2013-2015)

Variable	Estimate	SE	t-stat	p-val	N=	IRR
Property						
Percent Black	0.007	0.001	8.275	0.000	762,440	1.074
Percent Hispanic	0.004	0.001	3.265	0.001	762,440	1.046
Violence						
Percent Black	0.017	0.001	13.880	0.000	762,440	1.182
Percent Hispanic	0.011	0.001	7.650	0.000	762,440	1.119
Quality of Life						
Percent Black	-0.004	0.005	-0.879	0.379	255,940	0.959
Percent Hispanic	0.006	0.006	1.125	0.260	255,940	1.064
Trespass						
Percent Black	0.024	0.005	4.515	0.000	87,758	1.269
Percent Hispanic	0.025	0.006	4.292	0.000	87,758	1.284

Variable	Estimate	SE	t-stat	p-val	N=	IRR
Weapons						
Percent Black	0.008	0.004	2.143	0.032	24,340	1.082
Percent Hispanic	0.018	0.004	4.066	0.000	24,340	1.198
Drugs						
Percent Black	0.015	0.003	4.221	0.000	49,305	1.158
Percent Hispanic	0.010	0.004	2.622	0.009	49,305	1.110

Note: IRR=incident rate ratio per 10 percent change in Black or Hispanic residential population. All models control for reported crime of same type month before, percent Other race, SES, precinct location, and month of each year. N=sample size. Sample size changes due to zero crimes suspected in a given category.