Analyzing Racial Disparities in Traffic Stops Statistics from the Texas Department of Public Safety

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Committee on County Affairs
Rep. Garnet F. Coleman, Chair

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Thank you for the opportunity to present on this important matter. Prof. Baumgartner has been doing research on traffic stops since 2011, and previously testified to this committee on November 18, 2015. He corresponded with Mr. Jeremy Schwartz of the *Austin American Statesman* as that team prepared their September 9, 2016 series of articles that you have seen. He suggested to them various methodologies of ensuring that any analysis of officer-level disparities by filtered to avoid any misleading results.

In this testimony we make four very simple points.

First, we emphasize that differential treatment of White and Minority drivers is by no means restricted to Texas or to any particular agency, including the Department of Public Safety (DPS). Our review of annual reports from agencies across the country confirms this.

Second, we provide the committee with some powerful evidence that goes well beyond what is in the *Austin American Statesman* analysis to show that targeting Black drivers for search is a very serious issue. These results are also consistent with what we see in other police agencies, including in published research based on North Carolina data.

Third, we provide a tool for DPS supervisors to evaluate officer-level disparities.

Fourth, we review in some detail the methodology used by the *Austin American Statesman* and provide reassuring information that the results there are highly robust to various possible ways of eliminating officers with too few traffic stops or searches to generate reliable statistics.

We have also included for the committee's review a number of attachments:
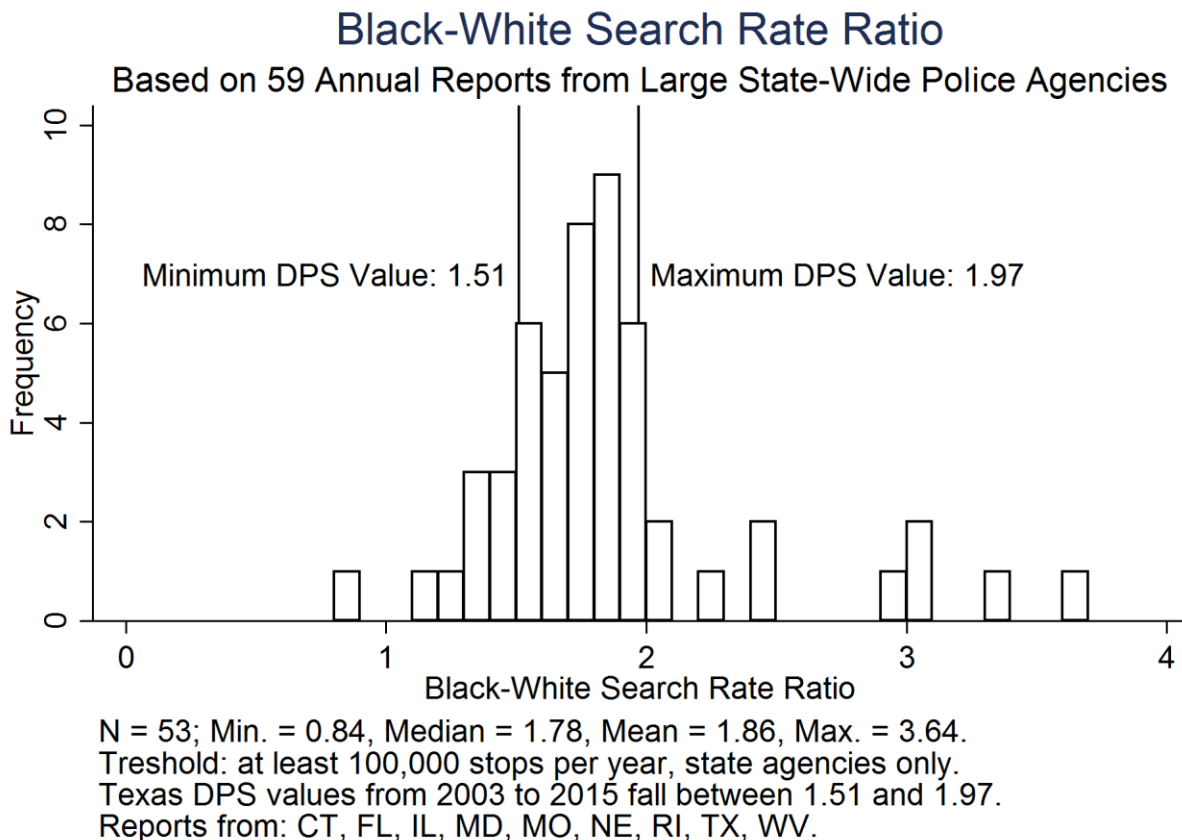- A spreadsheet with officer stop and search information.
- A copy of our 2016 published article based on North Carolina data.
- A copy of Baumgartner's previous testimony from November 2015.

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Part 1. How the Texas DPS compares to other police agencies

As part of our on-going research on police traffic stops and searches, we have compiled published reports from hundreds of police agencies around the nation.[2] Figure 1 compares the rate of search reported in 53 published annual reports from nine state-wide agencies reporting a minimum of 100,000 traffic stops in a given year.

Figure 1. Black-White Search Rate Ratios in annual reports from state-wide police agencies.

Black-White Search Rate Ratio
Based on 59 Annual Reports from Large State-Wide Police Agencies

Minimum DPS Value: 1.51   Maximum DPS Value: 1.97

N = 53; Min. = 0.84, Median = 1.78, Mean = 1.86, Max. = 3.64.
Treshold: at least 100,000 stops per year, state agencies only.
Texas DPS values from 2003 to 2015 fall between 1.51 and 1.97.
Reports from: CT, FL, IL, MD, MO, NE, RI, TX, WV.

Note: Based on published annual reports from police agencies across the nation.

Just a single report showed a rate of searching Black drivers that was lower than that of searching Whites.[3] The median ratio was 1.86, meaning the Black motorist was 86 percent more likely to be searched than the White motorist. Annual reports from the Texas Department of Public Safety show search rate ratios between the values of 1.51 (in 2003) to 1.97 (in 2011).[4] So our first point can easily be summed up. This is an issue that certainly is not confined to the state of Texas nor to the Department of Public Safety. The DPS, in fact, falls within the range of what we see in other state-wide agencies across the country.

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[2] One definitional point: A "Search Rate Ratio" is calculated as follows: Black Search Rate / White Search Rate. Therefore if 5 percent of Black drivers are searched, and 4 percent of White drivers, the rate is 5/4 = 1.25. A ratio of 1.00 indicates the same rate for drivers of both racial groups.
[3] This was Maryland in 2007; annual values ranged from 0.85 to 1.5 over 7 years however.
[4] See Baumgartner's testimony to this committee from 2015; page 11.

There are two ways to look at this. First, one could say the DPS is not an outlier institution and therefore does not deserve particular scrutiny. Second, one could say that the committee's investigation of DPS practices has national import. Our assessment is that trends apparent in the DPS statistics are important, troubling, and reflective of trends nationally.

Part 2. A multivariate analysis of minority risk of search

In a recent published analysis of traffic stops in North Carolina, we documented a 1.75 Black-White Search Rate Ratio, with Blacks searched in 4.57 percent of all traffic stops and Whites searched 2.61 percent of the time (see attachment, table 3, p. 8). We also conducted a more complicated and statistically rigorous logistic regression where we predicted the likelihood of any driver being searched based on all the information available in the state record. This included the driver age, race, ethnicity, 10 different stop purposes (e.g., speeding, unsafe movement, seat belt violation…), the hour of the day, day of the week, and whether the officer who stopped the driver was identified as a "high disparity" officer.[5] Among male drivers, the results from this regression showed that a black driver had a 75 percent increased likelihood of search, compared to a white, after controlling for all those factors (see attachment, table 6, p. 15, where the coefficient for "Black" in the Search model is 1.75).[6]

We have done a similar analysis for Texas and show the results here. We use slightly different variables from what was in our published North Carolina study based on what is available in each state's database. We do our analysis separately for male and female drivers because the racial dynamic appears to be different. Table 1 presents those results.

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[5] We defined a high disparity officer as one with at least the average overall search rate of their agency, at least 50 white and 50 minority stops, and twice the rate of searching drivers of one race as compared to those of another.

[6] It was completely coincidental that the simple search rate ratio and the more complete logistic regression came to exactly the same statistical value, 1.75. But it was not surprising at all that the two were highly similar; the results have proven to be very robust. In general, we have found that search rate ratios correlate very highly with multivariate logistic regression odds-ratios, controlling for all the relevant factors that can be included.

Table 1. Predicting Searches in Texas Highway Stops

Variable	Males	Females
Black	1.586	1.151
Hispanic	1.150	1.010
1-5 mph over limit	4.398	5.421
6-10 mph over the limit	0.711	0.651
11-15 mph over the limit	0.498	0.427
16-20 mph over the limit	0.574	0.487
21+ mph over the limit	0.841	0.832
Out of State	1.354	1.756
Log(Vehicle Age)	1.588	1.755
Black*Out of State	1.232	1.259
Hispanic* Out of State	0.951*	0.831
Black Disparity Officer	1.596	1.692
Hispanic Disparity Officer	1.414	1.324
Black*Black Disparity Officer	1.711	1.762
Hispanic*Hispanic Disparity Officer	1.820	1.748
Constant	0.0129	0.00648
Observations	6,239,282	3,105,515
% of observations where a search occurred	2.31	1.92
Day of the week	Included	Included
Hour of the day	Included	Included
Pseudo R2	0.0525	0.0558

Note: All the coefficients are statistically significant at p. < .01 except one, as indicated; * p. < .05. Entries are logistic odds-ratios. We omit the standard errors here, but can provide them on request. An odds-ratio of 1.5 means the event is 1.5 times more likely (or 50 percent more likely) to occur compared to the baseline; 0.9 means it is 90 percent as likely, or 10 percent less likely. The model predicts which traffic stops will lead to a search of the driver or vehicle. The baseline or reference category is a White driver with in-state plates who is not speeding.

Table 1 shows several important things. Most importantly, controlling for everything that we can include in the model based on data made available by the Texas DPS, Black male drivers are 59 percent more likely to be searched, and Black females are 15 percent more likely to be searched than their White counterparts. We include a variable for Hispanic as well and it shows a lower coefficient, but we know from previous discussions that there are many issues with how Hispanic and White drivers are identified so we do not offer any interpretation of that variable.

The DPS form indicates if the driver was speeding and if so by how many MPH. Those speeding by just a small amount are more than 4 times as likely to be searched. Those speeding by more substantial amounts are much more likely simply to be given a ticket and put on their way.

Out-of-state drivers are more likely to be searched (35 percent increase), especially if they are Black (an additional 23 percent). Those driving older cars have a higher likelihood of search. If the officer has a pattern of searching Blacks or Hispanics at more than twice the rate of White drivers, of course this increases the likelihood of search. We include that variable in the models

to demonstrate, however, that even while controlling for this "bad apple hypothesis," the racial variable at the top of the table remains highly significant, suggesting a 59 percent increased likelihood of search for a Black male driver.

The coefficients in these models are additive. That is, an out-of-state Black male pulled over for speeding while going 68 MPH in a 65 MPH zone would have an extremely high likelihood of search. As the table makes clear, the male model is based on over 6.2 million observations, and the female model, on over 3.1 million traffic stops.

Part 3. Officer-by-Officer Comparisons

It would be very simple for DPS administrators to make use of the data they collect to monitor possible targeting of one race over another. Presumably this is already being done. A simple tool is to generate the figure shown below. Among all those officers with some minimum number of stops and searches, what percent of Black and White drivers do they choose to search? This is not a demonstration of racial bias, of course, as there could be good reasons for the searches. However, administrators could use such patterns to monitor individual officers, target training, or use in periodic performance reviews. A similar process could go on by comparing search rates with contraband hit rates. At the individual level, based on our analyses of other police agencies, many officers search more than average, but find contraband less often than average; similarly, others search rarely and find contraband more often. If all officers were using a similar set of implicit thresholds for contraband search (or followed clearly conveyed department guidelines), one would expect more uniformity in hit rates. Our point here is this: Data collected for the purpose of monitoring possible racial profiling constitute a treasure-trove for performance evaluation. Agency supervisors should routinely review them and look for patterns to ensure that officers are adhering to agency norms and following their training. It is easy to see, for example, that some officers rarely search any drivers. Perhaps this is justified by the types of patrols they routinely conduct. But perhaps it is not; maybe it is just idiosyncratic to that officer. Supervisors can easily make use of these data in regular performance evaluations and review. The figure below shows one such tool.

Figure 2. Black and White Search Rates Compared.
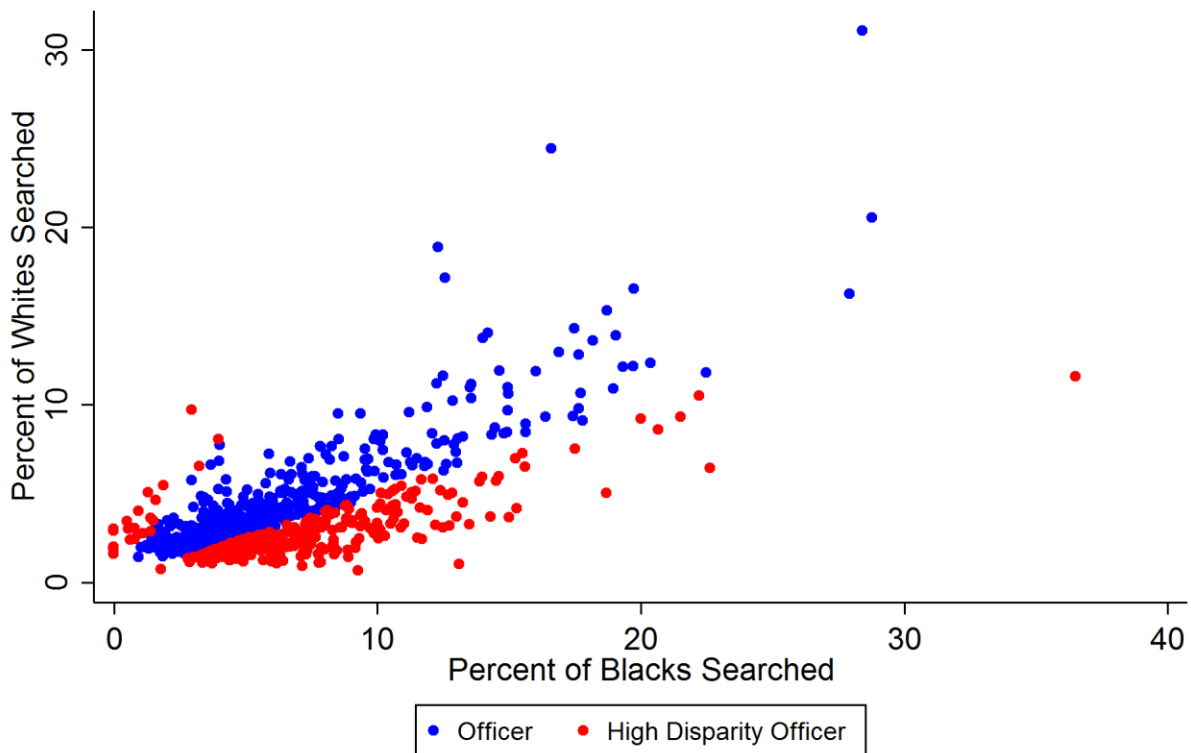
Includes 780 officers with at least 50 stops of Blacks and 50 stops of Whites and a search rate of over 1.92. Of these officers, 271 have rates of searching Blacks more than twice their rate of searching Whites and 23 have rates of searching Whites at twice the rate of Blacks.

We identified all the "high disparity" officers by first identifying all those officers who had stopped at least 50 Black drivers, 50 White drivers, and who had an overall search rate of greater than the DPS average rate of 1.92 percent. This filter identified 780 officers. Among those officers, we simply plot the percent of Black drivers they searched with the percent of White drivers searched. In red are those officers where the pattern shows a disparity of greater than double. Looking along the bottom, for example, we can see two red dots where officers searched 10 or 13 percent of Black drivers, but less than one percent of White drivers. One officer searched over 35 percent of all Black drivers, but only about 10 percent of Whites. Similarly, one officer searched about 10 percent of White drivers but only about three percent of Black drivers. We cannot say whether these patterns for individual officers are justified. But we would imagine that agency supervisors would want to find out. And they have the tools to do so in the massive database that the state has long been collecting.

Part 4. An Overview of the *Austin-American Statesman* Analysis

The September 9, 2016 issue the *Austin-American Statesman* produced the graphic shown in Figure 3, illustrating the degree to which individual troopers in the DPS searched Black and White Motorists. They calculated the same "Minority-White Search Rate Ratio" as we have done here, but for individual troopers rather than for the agency as a whole.

Figure 3. *Austin-American Statesman* graphic from September 9, 2016.

Searching more, finding less

An Austin American-Statesman analysis of five years of data shows that 35 percent of Texas state troopers were at least twice as likely to search a black or Hispanic motorist as they were a white motorist. Of those officers who search minority motorists more frequently, most also found contraband less often than when they searched white motorists. The analysis compared data from 1,138 troopers with at least 100 stops and 20 searches of black or Hispanic motorists from 2009 to mid-2015.

Source: American-Statesman analysis of Department of Public Safety data   STEVE LOPEZ / STAFF
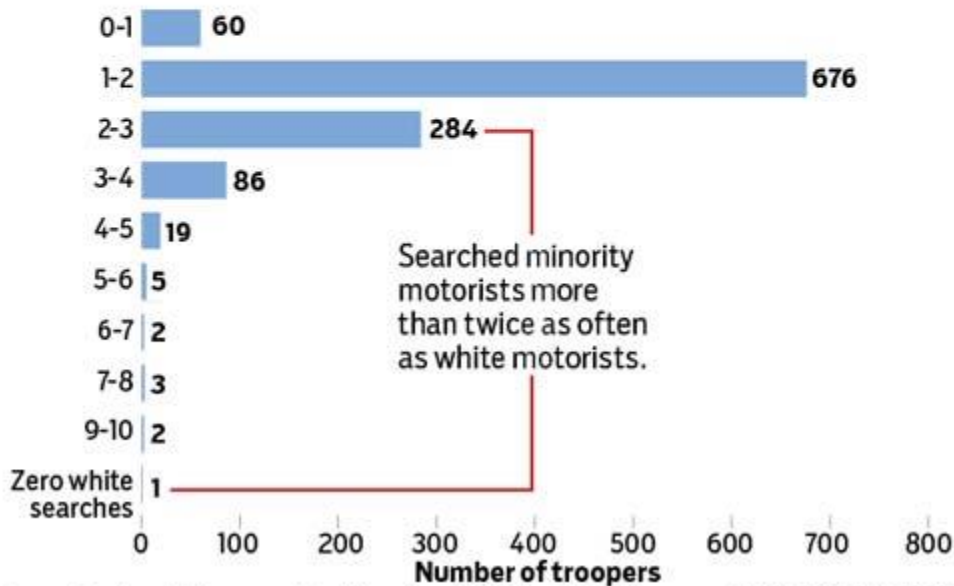
We can confirm that the analysis presented in the *AAS* article is highly robust. We obtained a slightly different dataset from the Texas DPS that covered five years of data, 2011 through 2015. In contrast, the *AAS* time period was 2009 through mid-2015. Figure 4 shows a replication of the distribution from Figure 3 using our database.

Figure 4. Replication of Figure 3 using 2011 to 2015 Texas DPS data.

N= 963. Officers have at least 100 white stops, 100 minority stops and 20 minority searches
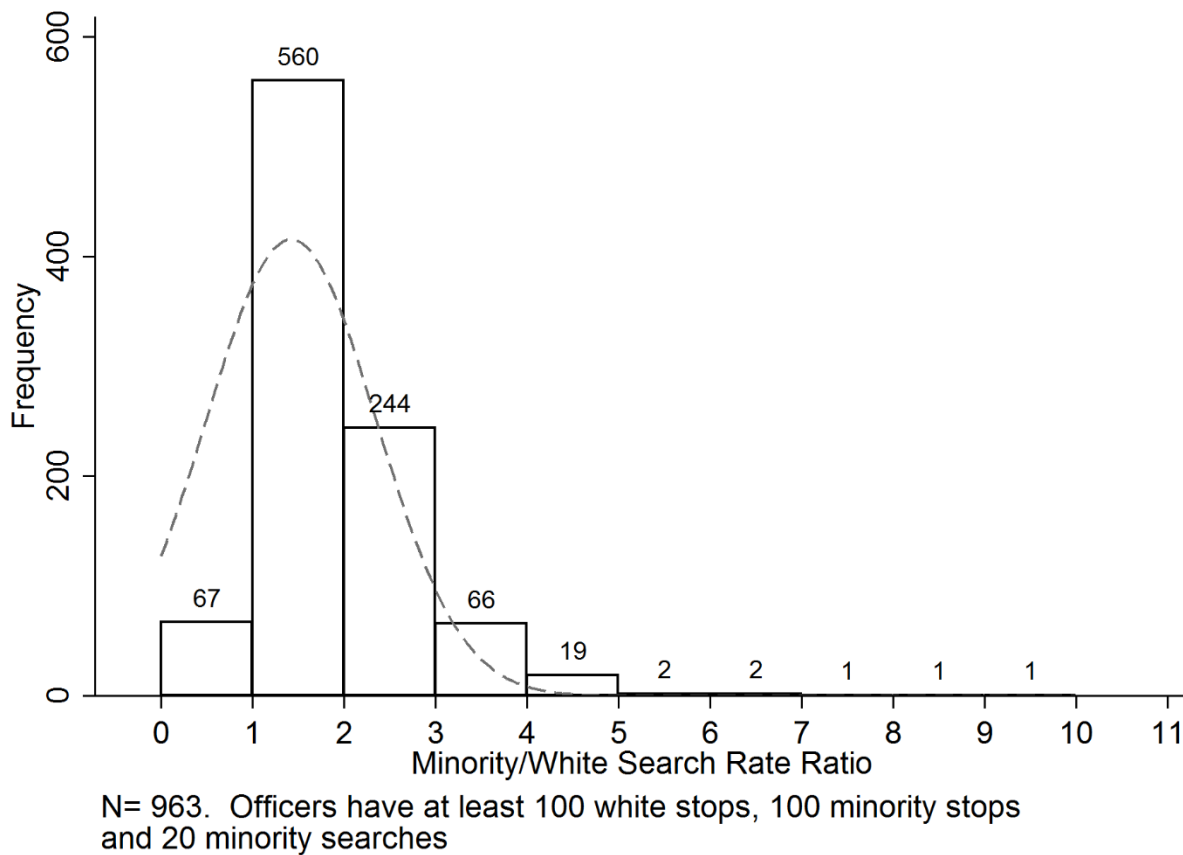
While the numbers are slightly different (the overall N moves from 1,138 to 963), the distribution is virtually identical. The *AAS* analysis showed 35.3 percent of the troopers with 2 times or higher rates of searching Black drivers; our shows 34.8 percent.

Journalists from the *AAS* had contacted Baumgartner about the details of making these comparisons, and Baumgartner advised them to avoid any comparisons that might be based on very low numbers of stops or searches. For example, if a trooper has a very low rate of search, or little contact with drivers of one race or another, the ratio of two percentages can be skewed if either one of those percentages was based on a very low baseline. So he suggested that a minimum of 100 stops of white drivers, 100 stops of minority drivers, and a minimum of 20 minority searches. Any trooper who had not searched 20 minority drivers, in other words, or stopped 100 whites or minorities, would be excluded from the calculation.

It is important to avoid, for example, the following scenario: Trooper *x* stops 1,000 white drivers, searching 1 of them, for a 0.1 percent White Search Rate, and 100 minority drivers, with 5 searches, a 5 percent Minority Search Rate. This generates a Minority-White Search Rate Ratio of 5/0.1 = 50.[7] But the trooper only searched 5 minority drivers. So there has to be some

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[7] In the attached spreadsheet, Officer 11872, who is the second most prolific officer in the dataset, with over 18,000 traffic stops, illustrates this issue. He has conducted only 3 searches from those 18,000+ stops, and has a misleading

minimum threshold applied to avoid such statistical outliers. Exactly which reasonable threshold to apply is less important, and there is no single best way to do it. Table 2 shows the *Austin-American Statesman* data, its replication with the new dataset, and two additional ways it could be done, to illustrate this point.

Table 2. The *Austin-American Statesman* distribution, its replication, and two alternatives.

Ratio	1	2	3	4
0-1	5.27	6.96	12.08	18.09
1-2	59.40	58.15	60.25	43.57
2-3	24.96	25.34	20.95	20.95
3-4	7.56	6.85	4.65	8.10
4-5	1.67	1.97	1.38	3.17
5-6	0.44	0.21	0.38	1.41
6-7	0.18	0.21	0.13	0.53
7-8	0.26	0.10	0.13	0.35
8-9	-	0.10	-	0.53
9-10	0.18	0.10	-	3.30
10+ or no whites searched	0.09	-	-	-
Total	100.00	100.00	100.00	100.00
N	1,138	963	795	2,272
Percent with Ratios of Two or Higher	35.33	34.89	28.12	38.34

Note: Column 1 replicates the *Austin-American Statesman* thresholds of 100 White stops, 100 Minority stops, and 20 Minority searches from their published article. Column 2 replicates these with our 2011-2015 database. Column 3 includes only officers with 1,000 traffic stops and who are above the agency-wide search rate of 1.92 percent. Finally, Column 4 uses all officers with over 1,000 traffic stops. Cell entries indicate the percentage of troopers with the corresponding Minority-White Search Rate Ratio.

Each column sums to 100.00 percent, as shown. The number of troopers (N) differs according to the threshold. Finally, the last row shows the sum of all the ratios of 2 or higher. This was 35.3 in the published article and shows a similar value in each case.

The last column shows both higher numbers of troopers with very low search rate ratios and very high ones. This is because it imposes no minimum search rate or number. While we would not recommend such a methodology, even this does not dramatically skew the results: still above one-third of the troopers are found to search Minority drivers at or more than twice the rate that they search White motorists.

One element to keep in mind in analyzing these data is that comparisons are "cleaner" when we look at Blacks v. Whites, as many Hispanics appear to be coded as White in the DPS database. In general, this tends to inflate the rate at which White drivers experience the same outcomes as

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search rate ratio of over 9. But he has searched just 2 Blacks and 1 White driver. So it is important to exclude such observations in generating any ratio.

minorities. So while a Black-White comparison does not completely eliminate this problem, the comparisons are clearer than when we combine Blacks and Hispanics together as the *Austin American Statesman* analysis did. Table 3 replicates Table 2 but columns 2 through 4 refer only to Black-White comparisons, not Minority-White comparisons.

Table 3. Black-White Search Rate Comparisons.

Ratio	1	2	3	4
0-1	5.27	3.13	14.97	27.27
1-2	59.4	54.17	51.82	31.04
2-3	24.96	28.33	22.64	17.20
3-4	7.56	7.71	6.54	7.59
4-5	1.67	4.79	3.02	4.36
5-6	0.44	1.25	0.50	1.80
6-7	0.18	0.63	0.25	1.05
7-8	0.26	-	-	0.46
8-9	-	-	-	0.38
9-10	0.18	-	0.25	8.85
10+ or no whites searched	0.09	-	-	-
Total	100	100.00	100.00	100.00
N	1138	480	795	2,384
Percent with Ratios of Two or Higher	35.33	42.71	33.21	41.69

Note: Column 1 replicates Column 1 from Table 2, above. Columns 2 through 4 replicate the analysis presented in Table 2, but comparing Blacks to Whites rather than Minorities (Blacks and Latinos) to Whites as in Table 2.

The percentage of officers with greater than twice the search rate of Black drivers is consistently higher than the percent with such a rate of Minority drivers. Table 2 showed percentages of 35, 35, 28, or 38 depending on the thresholds, and here we see 35, 43, 33, and 42. So the disparities become clearer when we focus on the Black-White comparison.