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Journal of Research in Crime and Delinquency
49(1) 31-55

DOI: 10.1177/0022427810397951
http://jrcd.sagepub.com

# Age Matters: Race Differences in Police Searches of Young and Older Male Drivers

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**Abstract**

Prior research on police searches of motorists has consistently found that Black drivers are more likely to be searched than White drivers. The authors argue that race differences in police searches depend on the driver's age. In logistic regression and propensity-score matching analyses of St. Louis police traffic stops, the authors find that young Black males are subjected to discretionary searches at higher rates than are young White males. By contrast, among drivers age 30 and older, Black males are no more likely, and in some analyses are *less* likely, than White males to be subjected to a discretionary search. The study findings are consistent with studies of young Black males' negative experience with and attitudes toward the police. If replicated in future research, however, the findings suggest that it may be difficult to prove that police searches of young Black males result primarily from racial bias or unlawful discrimination.

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In recent years, researchers have amassed evidence that Black and Hispanic motorists stopped by the police are more likely than White motorists to be subjected to a search (e.g., Close and Mason 2007; Durose, Schmitt, and Langan 2005; Ridgeway 2006). Little dispute exists regarding the fact of race and ethnic disparities in police searches; the contentious issue is whether these disparities constitute impermissible discrimination (see Engel 2008).

But the empirical question of racial disparities in police searches may have been closed prematurely. In a study of traffic searches in St. Louis, we find contrasting effects of the driver's age on race differences in traffic searches. Black male drivers over the age of 30 are no more likely than similarly situated Whites to be subjected to discretionary searches by the police. Some analyses suggest that Black males age 30 and over are significantly *less* likely than Whites of the same age to be searched. The opposite result holds for younger Black male drivers, who are more likely than younger Whites to be searched when stopped by the police, regardless of the discretionary quality of the search. These results call for a more nuanced view of the role of race in police search behavior and for positioning the racial profiling literature in the broader context of research on encounters between the police and young minority males.

## Background

Racial bias in traffic stops has emerged over the past fifteen years as an important policy issue confronting law enforcement agencies in the United States. Widely publicized lawsuits claiming racial bias in traffic stops conducted by the Maryland State Police and New Jersey State Police stimulated public and political opposition to such practices during the 1990s. Public opinion surveys reveal strong disapproval of racial profiling by the police, particularly among African Americans (Carlson 2004; Newport 1999). These public perceptions and attitudes not only raise potential constitutional issues of illegal search and seizure and equal protection in police traffic stop behavior (Fagan 2002; Oliver 2000; Rudovsky 2001; Smith 2005) but also foster public doubt about the legitimacy of law enforcement agencies (Tyler and Wakslak 2004). Some law enforcement agencies have attempted to address this legitimacy crisis and increase agency transparency by voluntarily collecting and publishing data on their traffic stop activity. Many other agencies have been mandated to compile and disseminate traffic stop data through legislation and court orders. These voluntary and nonvoluntary efforts have produced a wealth of official data on traffic stops that have

been used by government agencies, advocacy groups, and researchers to evaluate racial bias in policing. Initial studies focused largely on the role of driver race in the decision to stop (e.g., Alpert, Smith, and Dunham 2004; Engel and Calnon 2004a; Harris 1999; Meehan and Ponder 2002; Rojek, Rosenfeld, and Decker 2004). However, these investigations were plagued by difficulties in developing accurate comparison or "benchmark" distributions of drivers at risk for traffic stops needed to determine whether the observed distribution of stops constitutes racial disparity or bias (Fridell 2004; Ridgeway and MacDonald 2009; Walker 2001).

As a result, some researchers have turned their attention to the analysis of poststop outcomes, such as the decision to cite, search, or make an arrest. A methodological benefit of analyzing poststop activity is that it is conditional on having been stopped and therefore traffic stop data contain all drivers who are at risk for arrest, search, or other action, eliminating the need to develop external demographic benchmarks (Ridgeway and MacDonald 2009). Assuming the data on traffic stops collected by law enforcement agencies are reasonably accurate,[1] in principle valid comparisons can be made between race or ethnic groups to determine disparity in poststop outcomes.

Although each type of poststop activity provides the opportunity to explore differential treatment across race or ethnic groups, the current study focuses on the decision to search. Searches represent a highly intrusive form of police action with important consequences for the perceived legitimacy of the police when individuals stopped by the police believe the search is unwarranted. Young Black men interviewed by Brunson (2007) resented being stopped but were particularly distressed by the frequent searches of their person. The negative consequences of being removed from the vehicle and patted down are magnified when they occur in the presence of family or friends, creating shame or embarrassment. These searches can create a ripple effect in the community as they are experienced vicariously by others in the individual's social network (Brunson 2007; Stewart 2007).

The decision to search may involve stereotypes that link group characteristics with particular forms of criminal activity. In his classic discussion of the *symbolic assailant*, Skolnick (1966) maintains that police officers often operate on generalized cues, such as demeanor, language, and attire, to quickly determine whether an individual should be considered a threat to the officer or the community. Although Skolnick did not specifically identify race as a cue used by officers, more recently researchers have suggested that race may be the most salient determinant of this assessment in the context of traffic stops (Jones-Brown 2007; Welch 2007). On this account,

police officers would be more likely to search minority drivers and passengers because they believe this population is disproportionately engaged in criminal activity and thereby more likely to have incriminating evidence in their possession (e.g., illegal drugs and weapons).

Studies that compare search rates in traffic stops across state (Engel and Johnson 2006) and local (Cordner, Williams, and Velasco 2002; Gains 2006; Schafer, Carter, and Katz-Bannister 2004; Schlosberg 2002; Withrow 2007) law enforcement agencies reveals a consistent pattern of minority drivers being searched at higher rates than White drivers. However, the ability to draw conclusions from these findings is limited without simultaneously accounting for other factors that may influence search patterns. For example, searches are more likely in traffic stops that involve male drivers (Engel and Calnon 2004b; Lundman 2004; Paoline and Terrill 2005; Schafer et al. 2004); young drivers (Engel and Calnon 2004b; Lundman 2004; Paoline and Terrill 2005; Schafer et al. 2004; Withrow 2004); White officers (Anwar and Fang 2006); officers in certain specialized units (Zingraff et al. 2000); and stops made at night (Pickerall, Mosher, Pratt 2009; Withrow 2004).

Researchers must also consider the degree of discretion officers have in deciding to conduct a search (Pickerall et al. 2009; Ridgeway 2006). Consistent with case law, agencies often have policies directing officers to conduct searches of vehicles or occupants incident to arrest, prior to vehicle impound, or pursuant to a search warrant. Racial bias may have only minimal effects on search decisions made under such low-discretion search circumstances.[2] By contrast, officer discretion plays a greater role, and therefore so may racial bias, in searches based on requests for consent or reasonable suspicion ("Terry" stops). As a result, studies of race–ethnic bias in searches should separately analyze searches conducted under high- and low-discretion circumstances to determine whether observed disparities are a product of possible racial bias or of a correlation between race and other influences.

An additional consideration that has received less attention in prior research is whether the population at risk for biased treatment has been properly specified. Driver race is generally discussed as a one-dimensional influence, as reflected in the term "driving while Black." The implicit assumption is that race or ethnicity is an unqualified master status that determines the likelihood an individual is stopped or is subjected to poststop disparate treatment. In statistical terms, the assumption is that driver's race or ethnicity has a "main effect" on police behavior but no significant "interaction effect" with other driver characteristics, such as age or

gender. However, the more detailed discussion of race in relation to the concept of the symbolic assailant often narrows the focus to young Black males (Jones-Brown 2007; Skolnick 2007; Welch 2007). This raises the question of whether disparities in general search rates are actually a product of a more refined decision-making process that is specifically directed at young minority males.

The importance of this distinction is found in Brunson's (2007) interviews of young Black males in St. Louis. They attribute the experience of continual harassment through repeated stops and unwarranted searches to the presumption on the part of the police that they are far more likely than other groups to be engaged in serious criminal activity. Brunson and others (Brunson and Miller 2006; Brunson and Weitzer 2008) also find that White male and Black female youth believe that they are more likely to be stopped when in the company of young Black males because of the heightened criminal suspicion applied to the latter. Weitzer and Tuch's (2002) analysis of 1999 Gallup poll data on perceptions of racial profiling finds that Black males between the ages of 18 and 34 are more likely than older Black males and Black females to report they have been stopped because of their race. Similarly, predicted probabilities of searches from Engel and Calnon's (2004a) multivariate analysis of the Police-Public Contact Survey reveal that the specification of young Black male driver as opposed to simply Black driver increased the search rate from 12.19 percent to 32.84 percent. Similar results were found when comparing the search probabilities of young Hispanic male drivers and all Hispanic drivers (see, also, Pickerall et al. 2009).

In sum, the limited empirical literature does provide support for a disparity in the rate of searches of young minority males, compared with other minority drivers. However, evidence also suggests that Black and Hispanic drivers are more likely to be searched than same-age Whites. It is difficult to determine from prior research, then, whether the effects of driver's race–ethnicity and age on searches are additive or interactive. The distinction has important theoretical and policy implications. A finding of additive effects implies that the police may target both minority drivers and young drivers, regardless of race or ethnicity, for disparate treatment. Alternatively, a finding of interactive effects could imply that the construction of the symbolic assailant by the police is not based on minority status or age alone but rather their intersection. We investigate this issue in the current study by evaluating age-specific race differences in searches pursuant to traffic stops made by St. Louis police officers in 2007. As in prior research, we analyze these differences in high- and

low-discretion searches with multiple controls for other conditions that may influence the probability that a search is conducted.

## Data and Methods

The data used in this study are from records of traffic stops of male drivers by the St. Louis Metropolitan Police Department (SLMPD) in 2007. The data consist of attributes of the driver stopped, characteristics of the stop, and attributes of the officer making the stop. Driver attributes include race and age, whether the driver was a resident of the city of St. Louis, whether he was wanted on an outstanding arrest warrant when the stop was made, and whether he was arrested by the officer making the stop. Characteristics of the stop include time of day and location (city street, interstate highway, other roadway), and whether the police officer searched the driver or vehicle.[3] Officer attributes include the officer's sex, age, race, education, and duty assignment: district patrol, Traffic Safety, or special unit.

Our analysis is limited to stops of male drivers and drivers identified as Black (African American) or White. We exclude female drivers from the current study because they are far less likely to be searched than male drivers and because prior research and policy have focused on differential treatment of minority males. Hispanic drivers and those whose race is identified as neither Black nor White are excluded due to small sample size. Omitting female drivers from the analysis reduces the total number of cases from 68,773 to 49,983 traffic stops, or by 27.3 percent. Excluding Hispanic drivers reduces the number of cases by another 3.6 percent to 48,210.

Our primary focus in this study is on traffic stops permitting a discretionary search, which we define as searches by SLMPD district patrol and Traffic Safety officers of drivers who were not wanted on an outstanding arrest warrant and who were not arrested. These cases constitute just under 80 percent of all traffic stops recorded by the SLMPD in 2007. Note that we exclude from the category of discretionary searches drivers who were arrested *after* being searched as well as those who were searched incident to an arrest. Arguably, cases in which a search was conducted before an arrest was made should be classified as discretionary.[4] With the exception of arrests of drivers with an outstanding warrant, however, the data do not permit us to reliably distinguish arrests that led to a search from those that resulted from a search. Just over half of the searches conducted prior to arrest also were coded in the SLMPD data as searches conducted incident to an arrest. But, even if we ignore the possible confounding of the two types of searches and include those occurring prior to arrest in the analysis

**Table 1.** Percentage of Traffic Stops Resulting in a Search by Age and Race of Driver, Officer's Assignment, and Driver's Legal Status

| | Driver Under Age 30 | | | Driver Age 30 and Over | | |
|---|---|---|---|---|---|---|
| | Black | White | $p^a$ | Black | White | $p^a$ |
| All stops (*N*) | 13.7 (17,146) | 7.9 (7,080) | .000 | 8.8 (14,761) | 6.3 (9,223) | .000 |
| Excluding special units (*N*) | 9.9 (13,551) | 5.8 (6,149) | .000 | 6.3 (12,436) | 5.2 (8,228) | .000 |
| Excluding drivers wanted or arrested (*N*) | 5.6 (12,582) | 3.5 (5,924) | .000 | 2.5 (11,644) | 2.7 (7,919) | .379 |

[a]Evaluated by chi-square.

of discretionary searches, the results reported in Table 1 do not change. We continue to find a significant race difference in discretionary searches of drivers under the age of 30 and no significant race difference in searches of drivers age 30 and older.

Also, excluded from our definition of a discretionary search are searches by officers assigned to special units. These officers typically investigate or respond to reports of serious crimes and are far more likely than district or Traffic Safety officers to search drivers they stop.[5] But drivers stopped by special unit officers were not always searched and, regardless of duty assignment, SLMPD officers did not invariably conduct (or record) searches even for stops of drivers who were wanted or arrested.[6] Some discretion evidently exists in the decision to search in nearly all traffic stops, including those made by tactical officers who respond to serious crimes and those of drivers whose legal status would seem to warrant a search. For this reason, we report analyses of searches based on all SLMPD stops of Black and White male drivers ($N = 48{,}210$) for comparison with those based on the large subset of traffic stops by district and Traffic Safety officers of drivers not wanted on an outstanding warrant or arrested ($N = 38{,}069$).

Our primary research question is whether race differences in the likelihood of a search differ by the driver's age, controlling for the other characteristics of drivers, stops, and officers described above. We therefore present separate logistic regression analyses for stops of young (under the age of 30) and older (age 30 and above) Black and White male drivers. We also present the results of propensity score matching analyses of the probability that a driver stopped by the police was subject to a discretionary search. These analyses compare the observed search rate of the "treatment group," in this case, Black male drivers, with the estimated search rate of a "control group," White male drivers of the

same age, matched on salient characteristics with the treatment group (Apel and Sweeten 2009; Rosenbaum and Rubin 1983).

## Results

The SLMPD stopped over 48,000 Black and White male motorists in 2007. About 10 percent (4,780) of these drivers or their vehicles were searched (see Appendix A). Stops of Black males were more likely than stops of White males to result in a search (11.4 percent versus 7.0 percent, respectively). Stops of Black males also differ from those of White males in several other respects. Compared with White males, Black males stopped by the SLMPD were younger, more likely to live in the city of St. Louis, and more likely to be wanted on warrant or arrested by the officer making the stop. They also were more likely than Whites to be stopped on a city street as opposed to an interstate highway and to be stopped during the evening or night. Black males were no more likely than Whites to be stopped by male officers and not much more likely to be stopped by Black officers, but they were far more likely to be stopped by officers under the age of 30 and correspondingly less likely to be stopped by officers age 50 and older. Finally, although relatively few traffic stops were made by officers assigned to special units, Black males were stopped by special unit officers at consistently higher rates than Whites.

Many of these differences could plausibly explain why Black drivers are more likely than Whites to be searched when stopped by the police. For example, drivers wanted on warrant or arrested are much more likely to be searched than other drivers, as are those stopped by special unit officers. Table 1 shows the impact of these non- (or less) discretionary searches on the search rates of Black and White male drivers, partitioned by driver's age.

Considering first all police stops of Black and White male drivers, we observe a significant race difference in searches of drivers under the age of 30. Just under 14 percent of the stops of young Black males resulted in a search, compared with about 8 percent of the stops of young White males. Older drivers of both races were less likely than young drivers to be searched, but, again, Blacks were searched more often than Whites. When stops by special unit officers and those of drivers wanted or arrested are excluded from the data, search rates drop by half or more in each race–age group. Stops of young Black drivers were more likely than those of young Whites to result in a discretionary search but the same is not true for older drivers. As shown in Table 1, no significant race difference exists in the probability of a discretionary search among drivers age 30 and older. Analyses not shown indicate that

older Black males were more likely than older Whites to be searched because they were more likely to be wanted on an outstanding arrest warrant. With the drivers wanted on an outstanding warrant excluded from the analysis, the race difference in searches of older drivers disappears.[7]

These analyses include all searches of Black and White male drivers, regardless of whether contraband was found or whether the driver consented to the search. It could be argued that our operational definition of a discretionary search should exclude searches yielding contraband and those to which the driver did not consent. We have elected to retain these cases to maximize the number of searches available for multivariate analysis and because discretionary searches of Black and White male drivers did not differ appreciably with respect to whether they yielded contraband or were conducted with the driver's consent. The police found contraband in less than 3 percent of discretionary searches they conducted, and discretionary searches of Black males were no more likely than those of White males of similar age to yield contraband. Not surprisingly, most discretionary searches were based on the driver's consent rather than other reasons (e.g., drug or alcohol odor, inventory search of an impounded vehicle). Black male drivers subject to a discretionary search were somewhat less likely than White males to consent to the search (74 percent versus 80 percent, respectively, among drivers under age 30; 78 percent versus 86 percent among older drivers). These small race differences are unlikely to affect the results of the multivariate analyses.

In summary, the bivariate analyses offer some indication of a race-by-age interaction in discretionary searches. The question remains whether this result persists when other race differences in traffic stops are taken into account. We first present the results of logistic regression analyses of the likelihood of a search by driver, stop, and officer characteristics. We then augment these analyses with propensity score analyses based on matched samples of stops of Black and White male drivers.

## *Logistic Regression Results*

The results of our logistic regression analyses of traffic searches are presented in Table 2. Separate regression analyses are shown for stops of young and older drivers and for nondiscretionary and discretionary searches (columns 1 and 2, respectively, in each age category). The unit of analysis is the traffic stop. The outcome is a dichotomous (1,0) indicator of whether the officer conducted a search. All of the variables shown in Table 2 are

**Table 2.** Logistic Regression of Searches on Male Driver's Race and Controls, by Driver's Age[a]

| | Driver's Age | | | |
|---|---|---|---|---|
| | Under Age 30 | | Age 30 and Older | |
| | (1)[b] | (2)[c] | (1)[b] | (2)[c] |
| Driver characteristics | | | | |
| Black | 1.584* (.082) | 1.384* (.115) | 1.217* (.066) | .782* (.074) |
| City resident | 1.591* (.069) | 1.538* (.112) | 1.320* (.067) | .875 (.082) |
| Stop characteristics | | | | |
| City street | 2.007* (.212) | 3.574* (.779) | 2.129* (.243) | 4.400* (1.101) |
| Night (6:00p.m.–5:59a.m.) | 1.428* (.058) | 1.269* (.088) | 1.593* (.079) | 1.800* (.165) |
| Officer characteristics | | | | |
| Male | 1.312* (.088) | 1.066 (.119) | 1.430* (.115) | 1.811* (.320) |
| Black | .530* (.025) | .507* (.042) | .478* (.027) | .388* (.044) |
| Under age 30 | .683* (.030) | .784* (.058) | .889 (.049) | 1.168 (.118) |
| Over age 49 | .464* (.055) | .662* (.116) | .580* (.065) | .874 (.155) |
| Log likelihood | –8,479 | –3,522 | –6,286 | –2,228 |
| Pseudo $R^2$ | .046 | .036 | .044 | .050 |
| *N* | 24,226 | 18,506 | 23,984 | 19,563 |

[a]Coefficients expressed as odds ratios (standard errors in parentheses).
[b]All stops.
[c]Discretionary searches: special unit officers and drivers wanted or arrested excluded.
*$p < .05$.

dichotomous measures with the variable label equal to one and the contrast set to zero. The coefficients are odds ratios (OR).

Turning first to the results for stops of young drivers, with other influences controlled, we observe a significant race difference in the odds that the officer conducted a search for all traffic stops and the subset of stops excluding those by special unit officers and those of drivers who were wanted or arrested. The odds of a search are 58 percent greater in stops of young Black drivers than in those of young Whites (OR = 1.584, $p < .05$). A somewhat smaller but still sizeable race difference in the likelihood of a search remains with the nondiscretionary stops excluded from the analysis (OR = 1.384, $p < .05$). Most of the other measures shown in Table 2 also have a significant effect on the likelihood of a search in stops of young drivers. The odds of a search are greater for stops of city residents, stops on city streets, and those occurring between 6:00 p.m. and 5:59 a.m.[8] Young drivers were also more likely to be searched by male officers but this difference disappears when the analysis is confined to discretionary searches. Finally, the odds of a search are significantly lower for stops by Black officers and by those under the age of 30 and over the age of 49, contrasted with officers between 30 and 49 years old.

Turning now to stops of older drivers, we find a significant race difference in the odds of a search, with other influences controlled. Older Black drivers were about 22 percent more likely than older Whites to be searched when stopped by the police (OR = 1.217, $p < .05$). But the race difference in the odds of a search reverses in the subset of stops excluding nondiscretionary searches. The odds of a discretionary search are 22 percent lower for older Black drivers compared with older Whites (OR = .782, $p < .05$). Recall that we found no significant race difference in discretionary searches of older drivers in the bivariate analysis (see Table 1). This implies that other characteristics of the driver, stop, or officer suppress the effect of the driver's race on the risk of a discretionary search.

Stops of older drivers occurring on city streets and at night were more likely to result in a search than those on interstates or during the day. Older drivers were searched more often by male than female officers and less often by Black than non-Black officers. These results hold for all stops of older drivers and for those excluding special unit officers and drivers wanted or arrested. The odds of a search are significantly greater for stops of city residents and significantly smaller in those by officers age 50 and older only in the full sample of traffic stops of older drivers, including the special unit officers and drivers wanted or arrested. Older drivers were not searched more often by officers under the age of 30 in either sample.

Traffic stops by Black SLMPD officers were consistently less likely than those by officers of other races to result in a search, regardless of the driver's age. Prior research has found a significant interaction between the driver's and officer's race in traffic searches (Close and Mason 2007). To investigate that possibility in the current study, we reestimated the models shown in Table 2 on subsamples partitioned by the race of the officer who made the stop (Black, other race). The results (not shown) are consistent with those reported in Table 2. Both Black and non-Black officers were more likely to search young Black drivers than young Whites, in all traffic stops and in the subset of stops excluding special unit officers and drivers who were wanted or arrested. The same result holds for searches of older drivers in all traffic stops. For the subset of stops excluding special unit officers and drivers who were wanted or arrested, both Black and White officers were less likely to search older Black drivers than older Whites. In our data, then, Black officers were less likely than those of other races to conduct a search in traffic stops but no less likely to search Black than White drivers.

In summary, the logistic regression results reveal contrasting race effects on the likelihood of a discretionary search depending on the driver's age. Young Black drivers stopped by the police face an elevated search risk compared with young Whites. Older Black drivers also face a greater likelihood than older Whites of being searched, but that result is attributable to the inclusion in the sample of stops by special unit officers and drivers who were wanted on warrant or arrested. When the analysis is limited to discretionary searches, we find that older Black drivers were less likely than older Whites to be searched. The latter result emerges only when other characteristics of the driver, the stop, and the officer are controlled.

These findings are far from definitive. Although we have statistically controlled for a relatively large number of covariates in our regression analyses, it is well-known that this approach can produce misleading results due to selection bias. Selection bias exists in nonexperimental research when individuals in the treatment condition—in the current study, Black male drivers stopped by the police—are not statistically equivalent to those in the control condition—White male drivers in this study. Certainly there is no reason to believe that police stops of Black males resemble those of White males in all relevant respects other than the driver's age and race. We know from Appendix A, for example, that, compared with White males, Black males stopped by the SLMPD in 2007 were more likely to be stopped on a city street and during the evening or night. We also know from Table 2 that these characteristics increase the likelihood of a search. The standard regression approach to conditioning the estimated treatment effect on such

confounders may produce inaccurate results because of its linear functional form and because it relies on information on all untreated cases, including those that may have little resemblance to the treated cases (Apel and Sweeten 2009; Ridgeway 2006; Rosenbaum and Rubin 1983).

Propensity score matching is an alternative to the conventional regression approach that addresses both of these problems. In propensity score matching analyses, treated and untreated cases are typically matched using nonparametric methods and the treatment effects are estimated using a subset of untreated cases that are equivalent (or nearly so) to the treated cases on potential confounders. Alternative propensity score matching protocols employ somewhat different methods to achieve equivalence between the treated and untreated cases, and it is advisable to estimate propensity scores using several of these methods to evaluate the robustness of results (Apel and Sweeten 2009). We therefore compare the results of propensity score analyses based on three separate matching algorithms. Given our focus on discretionary searches, these analyses are limited to stops by district and Traffic Safety officers of drivers who were not wanted on an outstanding warrant or arrested.

## *Propensity Score Matching Results*

The first step in propensity score matching is to specify the criteria used to match the treated and untreated cases. We did this by estimating logistic regression models of the likelihood that a police traffic stop involved a Black male driver, controlling for other observed characteristics of the driver, characteristics of the stop, and characteristics of the officer making the stop. Separate models were estimated for stops of drivers under age 30 and 30 and older. Our models contained seven covariates: city resident, stopped on city street, stopped during the evening or night, male officer, Black officer, officer under age 30, and officer age 50 or older. In addition, the models contained all two-way interactions of the seven covariates.

We used these models to generate *propensity scores*: "the predicted probability of receiving treatment" (Apel and Sweeten 2009).[9] The second step in propensity score analysis is to determine whether, conditional on their propensity score, the untreated and treated cases are *balanced*. This involves the selection of a subset of the untreated cases with an identical (or similar) distribution of propensity scores to the distribution of the treated cases on potential confounders. We invoked the condition of *common support* in this exercise, which generally improves the quality of matches by restricting the range of cases eligible for matching to the intersection of the

propensity scores of the treated and untreated cases on the confounders (Apel and Sweeten 2009; Becker and Ichino 2002:360).

We obtained close matches on the seven covariates and interactions for both the younger and older male drivers. In no case is there a significant difference between the matched treatment and control cases, and the distributions of the matched cases are identical or nearly so in most instances. These results likely reflect the large sample sizes for Black and White male drivers and the use of the common support criterion when estimating the propensity scores.[10]

The final step in propensity score matching is to use the propensity scores to estimate the *average treatment effect* on the outcome of interest. The average treatment effect is the difference between the treated cases and the matched control cases on the outcome. The outcome of interest in this study is the mean search rate, which is observed for Black male drivers stopped by the police and estimated for White male drivers who have been matched with Black males based on their propensity scores. As noted, alternative matching algorithms are used. We compare the results of nearest neighbor, radius, and kernel matching in Table 3.

The nearest neighbor method matches each treated case with one or more untreated cases having the closest propensity score. A variant randomly draws untreated nearest neighbors for matching (Becker and Ichino 2002:362-3). Both approaches produce the same results in our analysis of searches of male drivers under the age of 30. We find a significant difference between the mean search rate among Black males and the estimated rate for White males (the matched controls) based on nearest neighbor matching. Radius matching selects control cases with propensity scores that lie within a predefined distance of the treated cases. We conducted separate analyses with the radius set at .1, .01, and .001. At each radius value, we again find that young Black males were significantly more likely than young White males to be searched. Finally, kernel matching weights the propensity score of each control case proportional to its location under a probability density function (the "kernel") centered on each treated case. Control cases closer to the treated case are weighted more heavily than those at a greater distance from the treated case (Apel and Sweeten 2009). We used the Gaussian function (the "normal curve") in our analysis. As with the other matching protocols, we observe a significant difference between the mean search rates of young Black and White male drivers based on kernel matching. In all analyses, the mean search rate among young Black male drivers is significantly greater than the estimated search rate for the matched controls, results consistent with those from the regression analysis of searches of young drivers reported above (see Table 2).

**Table 3.** Estimated Mean Search Rates of Male Drivers by Age and Race From Propensity Score Matching: Treatment = Black Driver[a]

| Model | Black Driver | Matched Controls | Difference (*SE*) | *t* |
|---|---|---|---|---|
| Drivers under 30 | | | | |
| Nearest neighbor match[b] | .056 | .043 | .013 (.004) | 3.809 |
| Radius match | | | | |
| Radius = .10 | .056 | .044 | .012 (.004) | 3.623 |
| Radius = .01 | .056 | .044 | .012 (.004) | 3.361 |
| Radius = .001 | .056 | .045 | .011 (.004) | 3.161 |
| Kernal match[c] | .056 | .042 | .014 (.004) | 3.654 |
| Drivers age 30 and older | | | | |
| Nearest neighbor match[b] | .025 | .032 | –.007 (.003) | –2.465 |
| Radius match | | | | |
| Radius = .10 | .025 | .034 | –.009 (.003) | –3.202 |
| Radius = .01 | .025 | .030 | –.005 (.003) | –1.709 |
| Radius = .001 | .025 | .028 | –.003 (.003) | –1.225 |
| Kernel match[c] | .025 | .032 | –.007 (.003) | –2.436 |

[a]The analysis is limited to stops of male drivers not wanted on warrant or arrested by district and Traffic Safety officers. Matching criteria: city resident, stopped on city street, stopped during the evening or night, male officer, Black officer, officer under age 30, officer age 50 or older, and all two-way interactions.
[b]Nearest neighbor matching with random draw. Nearly identical results obtained for nearest neighbor matching with equal weights.
[c]Bootstrapped standard errors.

The propensity score matching results for older drivers are also consistent with those from the search analyses reported earlier. For the nearest neighbor and kernel matching algorithms, we find a significantly lower mean search rate among Black than White male drivers age 30 and older. We also find a significantly lower search rate for older Black drivers in the radius matching analysis with the radius value set at .1. The difference in search rates is not quite significant at the conventional .05 probability threshold at a radius value of .01 and is nonsignificant at a radius value of .001. In other words, as the matched distribution of older White drivers converges with the distribution of older Black drivers on the covariates of traffic stops, the difference between their search rates diminishes. A prudent conclusion from these results is that older Black male drivers are no more likely, and may be less likely, than similarly situated older Whites to be subjected to a discretionary search when stopped by the police.

### Summary

Each of our analyses points to the same general conclusion: Race differences in the probability that a driver stopped by the police is searched depend on the driver's age. Among younger drivers, Blacks are more likely to be searched than Whites. This difference disappears for drivers age 30 and older and, in some analyses, reverses. The results hold for "low-risk" drivers who are not wanted on an outstanding arrest warrant or arrested by the officer making the stop or stopped by officers assigned to special units that target serious criminals. The results are from analyses that control for multiple characteristics of the driver, the stop, and the officer making the stop, and they persist when stops of Black drivers are matched with those of White drivers on several relevant dimensions. We therefore have reasonable confidence in our findings. Nonetheless, several limitations of the current study warrant caution in interpreting the results.

As with most studies of police traffic stops, our analysis is limited to a single city and a single year of data. Our study is limited to male drivers stopped by the police, and we do not know whether similar results would have been found for females. The available data certainly do not exhaust the characteristics that may influence the decision to search. An important omission is information on the driver's demeanor when pulled over by the police (see Engel 2008). We did not have the data needed to match stops of Black and White male drivers with respect to their behavior or demeanor during the traffic stop, and the remaining selection bias attributable to other unobserved characteristics of drivers, stops, and officers is unknown. The extent to which bias from "unobservable confounding factors" is reduced, as Becker and Ichino (2002:358) point out, "depends crucially on the richness and quality of the control variables on which the propensity score is computed and the matching performed." The current study extends prior research with additional information pertinent to the decision to search, especially regarding the age of the driver, but several important questions remain for future research on race disparities in police stops and law enforcement policy and practice.

## Discussion

Traffic stops remain the primary point of contact between Americans and the police. As such, they have far-reaching consequences for the nature of police–citizen relationships. What happens during traffic stops conditions attitudes toward the police, justice system legitimacy, and ultimately the level and nature of citizen cooperation with the justice system. If the belief is widespread

in subgroups of the population that they are subject to inappropriate or unjustified legal intervention, they are likely to limit their participation in the legal system by not reporting crimes, cooperating with police investigations, or serving as a witness in criminal proceedings. The consequences of reluctance to engage with the legal system also may include increased vulnerability to criminal victimization, if citizens fail to mobilize legal protections or engage in acts of self-help to redress wrongs (Black 1983).

The results of the current research imply that race alone may not be the critical ingredient in the imagery of the "symbolic assailant" that frames police–citizen encounters in traffic stops. Recall that, at the margin, young White males are subject to discretionary searches (those conducted by district and traffic officers of drivers not wanted on warrant or arrested) at a slightly higher rate than older Black males (see Table 1). But young Black males are searched at consistently higher rates than young White males and older Black males. The *intersection* of age and race matters in the decision to search. If police searches involve statistical discrimination—the unequal treatment of individuals based on their group membership—the target is the *young* Black male. If suspect demeanor is the controlling criterion in the decision to conduct a discretionary search, the pertinent issue is perceived disrespect for the police by young Black men.

Discriminatory police practices that target young minority suspects may not result from overt racial bias. Engel and Johnson (2006) suggest that officers base the decision to search on cues linked to characteristics of vehicles, occupants, and the "stories" they construct to account for their presence and purpose in the vehicle. They argue that many of these cues have a cultural context that differs across race and ethnic groups. Race or ethnic differences in communication styles or differential patterns of consumer preference for vehicles, dress, jewelry, or other accessories may be misunderstood as signs of misbehavior or disrespect for the police. We might expect such cultural differences to be especially pronounced among younger persons. Regardless of intent or conscious bias on the part of the police, such cues are not race neutral. When they are used to make search decisions, they may exacerbate differences in search patterns by race and ethnicity.

Discrimination and demeanor are likely to be mutually reinforcing. After repeated encounters with the police that young Black men experience as unfair or degrading, they may approach future encounters with considerable hostility (Brunson 2007). The police, in turn, take this as a sign that young Black men pose a special danger to law enforcement or the community and respond with harsh treatment. As these vicious cycles ramify through the social networks of both minority youth and the police, subcultures of

disrespect emerge on both sides, resulting in categorical expectations of mutual mistrust that frame the encounters between the police and young Black men, in a sense, before they begin.

The good news in this otherwise troubling story is that this pattern does not appear to apply to encounters between the police and older Black men. We must be careful not to stray too far from the limits of our data and prior research on this point. First, older Black men are more likely than older Whites to be subject to nondiscretionary searches by the police because they are more likely to be wanted on an outstanding arrest warrant, a circumstance more often than not that results in a search. Second, there may be many reasons why older Black men are no more likely than older White men to be subjected to discretionary searches in traffic stops, and of course, searches do not exhaust the range of post-stop police actions that may involve racial bias.

Yet, following on the reasoning introduced above, older Black men stopped by the police—at least the greater majority not wanted on an outstanding arrest warrant—may not display the cultural characteristics that the police interpret as signs of defiance or generalized deviance. They either do not fit the image the police hold of the symbolic assailant, or they do not exhibit more hostility or disrespect in their encounters with police than do older Whites. If they do harbor negative attitudes toward the police, they are probably better than younger men at keeping their feelings to themselves. Or they may be more adept at ''code switching'' in their encounters with the police, having learned from experience when ''street'' vernacular and displays of toughness are protective or status-enhancing and when they only lead to more trouble (Anderson 1999).

Finally, it may be the case that older Black men are *more* deferential than older Whites when interacting with the police. If so, that could explain why in some of our analyses we find that older Black males are less likely to be searched than older White males. Although highly speculative, it is not unreasonable to assume that African American men who grew up during a period when de jure racial segregation remained in force, police forces were almost entirely White, and racism was more overt and widespread acquired lifelong habits of extreme deference to formal authority. Future research on police stops and poststop actions should investigate this possibility by expanding the focus of inquiry to include age-related variation in encounters with and attitudes toward the police that may be obscured by an all-encompassing focus on race.

Future research on police stops also should seek to unravel the reasons why Black officers are less likely than their White counterparts to

search the motorists they stop, regardless of the driver's race (for similar results, see Alpert Group 2004; Anwar and Fang 2006; Close and Mason 2007). We suggest that researchers direct attention to differences in background, experience, or perspective that apply generally to the decision to search, as well as to how officers respond to motorists of differing race or ethnic groups.

If future research confirms the results of the current study, what are the implications for law enforcement policy and practice? Certainly police officers should be sensitized to how the differential treatment of young Black men may trigger vicious cycles of mutual mistrust and reduce the perceived legitimacy of law enforcement. Law enforcement agencies should also consider adopting managerial strategies to reduce potential bias in police encounters with minority citizens, especially in disadvantaged communities. Smith and Alpert (2007) maintain that the differential treatment of minority citizens in traffic stops often results from unconscious stereotypes officers develop from working in high-crime, minority communities. They propose changing patrol assignments on a regular basis so that officers cycle through communities with different demographic characteristics and levels of criminal activity in order to counter the formation of stereotypes that may come from prolonged assignment in disadvantaged minority communities.

Citizens also have redress through the courts if they believe their rights to fair and equal treatment by the police have been violated, and the legal system affords special protections to victims of racial discrimination. In principle, such protections apply to persons regardless of age. In practice, however, the legal rights of young adults as well as juveniles are strongly circumscribed. Public accommodations have considerable latitude in setting minimum age requirements for entry or access. States may impose age-related restrictions or special conditions on licenses to operate a motor vehicle, permits to carry concealed firearms, and the purchase of fireworks, tobacco, and other hazardous products. Perhaps most importantly, in recent years, law enforcement agencies have been encouraged to devote special attention to youth violence through curfews, youth gang taskforces, and partnerships with juvenile justice and social service agencies. It is not surprising that young Black men are heavily caught up in this web of heightened scrutiny, especially given their disproportionate rates of violent victimization and offending (Fox 2006). In light of the intense public focus on youth violence and evidence that race disparities in police searches are not invariant across age, it may be difficult to prove that discretionary searches of young Black men are motivated primarily by racial bias or constitute unlawful discrimination.

**Appendix A**

Descriptive Statistics for Black and White Male Drivers Stopped by the SLMPD in 2007[a]

| | Mean | *SD* | Black Percentage | White Percentage | *N* |
|---|---|---|---|---|---|
| Total stops | — | — | — | — | 48,210 |
| Stops resulting in search | .099 | .299 | 11.4 | 7.0 | 4,780 |
| Driver characteristics | | | | | |
| Under age 18 | .029 | .168 | 3.2 | 2.3 | 1,404 |
| Age 18–29 | .473 | .499 | 50.5 | 41.1 | 22,822 |
| Age 30–39 | .246 | .431 | 24.3 | 25.1 | 11,857 |
| Over age 39 | .252 | .434 | 21.9 | 31.5 | 12,127 |
| City resident | .499 | .500 | 56.9 | 36.1 | 24,036 |
| Wanted | .043 | .202 | 5.4 | 2.0 | 2,057 |
| Arrested | .068 | .251 | 8.2 | 4.0 | 3,261 |
| Stop characteristics | | | | | |
| City street | .886 | .318 | 94.4 | 77.2 | 42,697 |
| Interstate[b] | .096 | .294 | 4.1 | 20.3 | 4,619 |
| Day (6:00a.m.–5:59p.m.) | .579 | .494 | 54.4 | 64.8 | 27,905 |
| Evening (6:00p.m.–11:59p.m.) | .256 | .437 | 27.6 | 21.8 | 12,368 |
| Night (12:00a.m.–5:59a.m.) | .165 | .371 | 18.0 | 13.5 | 7,937 |
| Officer characteristics | | | | | |
| Male | .872 | .334 | 87.0 | 87.6 | 42,040 |
| Black | .384 | .486 | 39.6 | 36.0 | 18,522 |
| Under age 30 | .300 | .458 | 34.6 | 20.9 | 14,441 |
| Age 30–49 | .610 | .488 | 59.1 | 64.8 | 29,428 |
| Over age 49 | .089 | .284 | 6.2 | 14.1 | 4,274 |
| District/Traffic Safety | .836 | .370 | 81.3 | 88.0 | 40,297 |
| Mobile reserve | .019 | .138 | 2.4 | 1.1 | 935 |
| Crime suppression | .041 | .199 | 4.9 | 2.6 | 1,988 |
| Housing | .035 | .184 | 4.3 | 1.9 | 1,693 |
| Other special unit[c] | .067 | .250 | 7.0 | 6.2 | 3,230 |

*Note*: SLMPD = St. Louis Metropolitan Police Department.

[a]All variables dichotomous (1,0).

[b]State highways and other roadways not shown.

[c]Stops by the Motor Carrier Safety Assistance Program excluded (see fn 2).

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

## Funding

The author(s) received no financial support for the research and/or authorship of this article.

## Notes

1. Critics have raised questions about the accuracy of traffic stop data collected by law enforcement agencies (e.g., Lundman and Kaufman 2003; Meeks 2000), but there is little empirical literature that documents the amount or types of error in the data.
2. It is important to acknowledge the opportunity for bias to affect stop outcomes even when officer discretion appears to be limited. For example, bias may enter the decision to arrest drivers on misdemeanor warrants or offenses or to conduct a search incident to arrest. Schafer et al. (2004) found that Black and Hispanic drivers are more than twice as likely as Whites to be searched incident to arrest or vehicle impound.
3. Throughout this article, we use the term ''search'' to refer to police searches of the driver, vehicle, or both. No information was provided by the St. Louis Metropolitan Police Department (SLMPD) regarding searches of passengers in vehicles stopped by the police.
4. A reviewer of a previous version of this article made this important point.
5. For example, 54 percent of Black male drivers and 55 percent of White males stopped by Mobile Reserve officers in 2007 were searched. The comparable figures for stops by the Crime Suppression Unit are 29 percent and 19 percent, respectively. We exclude from all analyses mandated vehicle inspections of commercial carriers by the Motor Carrier Safety Assistance Program.
6. In some of these cases, a search may have been conducted after the driver had been taken into custody and transported to the station house rather than at the scene of the traffic stop.
7. Results are available from the authors on request.
8. Preliminary analyses revealed no difference in results when traffic stops occurring between 6:00 p.m. and 11:59 p.m. and those occurring between 12:00 a.m. and 5:59 a.m. are entered separately.
9. Our analyses were conducted using the propensity score and matching programs written by Becker and Ichino (2002) and the PSMATCH2 program written by Edwin Leuven and Barbara Sianesi, both implemented in Stata 11.0.
10. Results are available from the authors on request.

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