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A Social Scientific Approach toward Understanding Racial Disparities in Police Shooting: Data from the Department of Justice (1980–2000)

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We analyze data from 213 metropolitan areas over a 21-year period, and examine two possible reasons for the disproportionately high number of Black suspects killed in police officer-involved shootings. One account suggests that such shootings reflect racial bias on the part of police. A second account suggests that Black suspects behave differently (perhaps more aggressively) than White suspects, and that police respond to suspects' behavior (but not race). Our analysis statistically controls for racial differences in criminal activity (a proxy for behavior) and provides a statistical test of the effect of race on police shootings. Results suggest that officers are more likely to shoot Black suspects, even when race-based differences in crime are held constant.

In the United States, Black people make up approximately 15% of the population but constitute roughly 40% of the suspects who are shot and killed by police

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officers. Data from the U.S. Department of Justice (U.S. DOJ, 2001) indicate that, per capita, police are approximately five times more likely to shoot a Black suspect than a White suspect. This massive discrepancy has been documented using a variety of methodologies and across a variety of locations, ranging from a number of specific cities to the United States as a whole (e.g., Inn, Wheeler, & Sparling, 1977; Jacobs & O'Brien, 1998; Smith, 2004; Sorenson, Marquart, & Brock, 1993; Terrill & Mastrofski, 2002; Terrill & Reisig, 2003). Overall, the data consistently show that a police officer's use of force—both lethal and nonlethal—differs as a function of suspect race such that Black suspects receive harsher treatment than White suspects.

Potential Causes Underlying Discrepant Use of Force

While the *existence* of racial discrepancies in police officers' use of force seems indisputable, identifying the underlying *causes* of this discrepancy has been the focus of intense debate and scrutiny. Many factors impact police shooting behavior, including the context in which the officer encounters the suspect (Kahn & Davies, 2018; Sorensen et al., 1993), whether the sitting mayor is Black (Jacobs & O'Brien, 1998), number of hours a police officer has of field training (Smith, 2004), and officer characteristics (Terrill & Mastrofski, 2002). However, for the purposes of this article, we closely examine the impact of race and behavior on police use of force. Theoretical arguments have largely focused on two perspectives in relation to police use of force. The first perspective suggests that racial bias on the part of police officers prompts officers to employ more extreme force with Black suspects. This account, which we refer to as the *Racially Biased Policing* (RBP) account, suggests that officers will use more force against a Black suspect than a White suspect, all else being equal (e.g., behavior, clothing, location, etc.; Fachner & Carter, 2015; Liska & Yu, 1992; Takagi, 1974). Within the criminal justice literature, RBP has been labeled the bias hypothesis, Quasi-Labelling Hypothesis, and differential processing hypothesis (Goldkamp, 1976; Piquero & Brame, 2008). Sociological theories that are consistent with RBP postulate that officers use force to suppress minorities and maintain the status quo (e.g., Jacobs & O'Brien, 1998; Sorensen et al., 1993).

The second perspective suggests that the relationship between suspect race and use of force is spurious. According to this account, the discrepancy, which may appear to be an effect of race, actually results from some other variable. For example, Blacks and Whites may engage in different behaviors, and these behaviors themselves may elicit more or less hostile responses on the part of law enforcement. This account suggests that the discrepancy in police behavior is driven primarily or entirely by the behavior of the suspect and that racial bias is therefore not the cause of the discrepancy in shooting. Evidence suggests that Black people are more likely to be arrested for violent crime and, when suspects kill police officers, that suspect is disproportionately likely to be Black (U.S. DOJ, 2001). According to this account, police may ultimately use more extreme force with Black suspects because Black suspects, on average, behave in a more violent, threatening manner than White suspects (e.g., committing more crime, more violent crime, and/or acting in a more belligerent fashion).[1] In its strongest form, this position holds that police do not respond to race, per se, rather, they respond to the behavior of the suspect, and that behavior differs as a function of race. We will refer to this account as *differential criminal activity* (DCA; Fyfe, 1982; MacDonald, Kaminski, Alpert, & Tennenbaum, 2001). This position is consistent with community violence theories, which suggest that police use of force is commensurate with the level of threat or violence in the community (e.g., Smith, 2004). Based on these theories, higher crime areas ought to correspond with greater use of force and if location and suspect behavior are controlled for, any racial discrepancy will be eliminated. Within the criminal justice literature, the DCA is akin to the threat hypothesis in which police respond with greater force toward groups that threaten them (Jacob & Britt, 1979).

The RBP and DCA accounts are not mutually exclusive; it is conceivable that police might react to *both* the suspect's behavior and race when deciding to shoot. With respect to the former, officers are certainly sensitive to the behavior of the people with whom they interact. Typically, police should and do respond with greater force to suspects who act in a threatening manner than to compliant suspects (Terrill & Mastrofski, 2002); however, the question of whether race matters even *after* accounting for differences in criminal activity remains. If we could perfectly understand how suspect behavior affects officers' use of force, we might ask: over and above the effects of a suspect's behavior, does the officer still use greater force with Black suspects than Whites suspects? Another way to phrase this question is to ask whether police respond more aggressively to Black suspects than to White suspects when the two suspects behave similarly. It is also noteworthy that different bias may influence some kinds of police behavior more than others—more discretionary police actions, such as traffic stops, may be characterized by more pronounced discrepancies. Other research projects have focused on less severe examples of police use of force, as well as discretionary police–citizen interactions (e.g., Terrill & Reisig, 2003). In this research, we confine ourselves to the most extreme measure of police behavior—police shootings in which a suspect is killed. Researchers have attempted to determine whether race has an effect in police shootings by statistically controlling for the effect of suspect behavior in

[1]This account need not specify why race is correlated with behavior. From our perspective, a plausible explanation for such a difference might be that race-based disparities in income exist and that poorer people are more likely to engage in criminal activity. For the present argument, though, the two critical claims are simply that (i) Black people and White people engage in different kinds of behavior (for whatever reason), and (ii) police respond accordingly.

different ways. Next, we review some of this research and describe the various analytic strategies that have been employed. Then, we outline what we believe is a novel and valuable method for testing the RBP versus DCA accounts.

Evidence for Racially Biased Policing

Sorenson et al. (1993) examine police shootings from 1980 to 1984 in 169 U.S. cities with populations of 100,000 or more and, in a separate analysis, 56 cities with populations of 250,000 or more. The focus of their analysis is on the effects of community conflict (as measured by income inequality and the prevalence of minorities) and violent crime. They reason that if police respond solely or predominantly to the behavior of suspects, there should be more shootings in cities with higher rates of violent crime, but there should not be strong effects of income inequality or prevalence of minorities. After statistically controlling for violent crime rates in individual cities, their analysis reveals effects of both income inequality and racial diversity. Police killed suspects at a higher rate when there was a bigger gap between the rich and the poor, and, in the largest population centers, when there were more Black residents. These results offer some evidence for the RBP account by showing that police respond with greater force as a function of social inequality and the presence of minorities, not simply to crime rates. However, this work did not test a crucial question: in situations with higher levels of social inequality and presence of minorities, do police respond with greater force towards all suspects, or only Black suspects?

Jacobs and O'Brien (1998) and Smith (2004) replicate and extend these basic findings in analyses of archival data from 170 and 179 large U.S. cities, respectively. Consistent with Sorensen et al. (1993), the results of both studies suggest that police are sensitive to the prevalence of violent crime in a city, such that they kill more suspects in cities with greater levels of violence. Jacobs and O'Brien find that the percentage of the population identified as Black does not predict overall police shootings, but the discrepancy in Black versus White income does. However, when examining police shootings of Black suspects, the percentage Black and the change in the Black population become significant predictors. Smith reports that the proportion of Blacks in the population is positively related to the number of police killings, such that a one standard deviation increase in the Black population increases the prediction of police killings of all suspects by one shooting. The population of Blacks also predicts an increase in police shootings of Black suspects. But increases in the Black population might also predict an increase of police shootings of White suspects. Such a pattern would go some way to addressing whether, in a high-crime city with a large minority population, police shoot everyone or just Blacks at a higher rate. Unfortunately, Smith does not include the percentage Black population measure in his analysis of police shootings of Whites. Answering this question requires a comparison of officers' behavior toward Blacks and Whites in the same area. The studies described thus far do not provide such a comparison. They assess the treatment of Black suspects without a relevant comparison. Accordingly, it is impossible to determine whether police in cities with more Black residents are disproportionately likely to shoot *Black suspects, in particular*, or whether they are more likely to respond to kill *any* suspect—regardless of race. We are aware of several analyses that offer this critical comparison. The first is provided by Ross (2015) who recently analyzed data from the U.S. Police-Shooting Database (USPSD; Wagner, 2014), an open contribution database that aims to catalog detailed information of every instance of a police-involved shooting. Ross's analysis focused on 721 cases from 2011 to 2014, which included information about the race of the suspect, whether the suspect was armed or unarmed, and where the shooting occurred (at the level of county). The analysis revealed that, on average, unarmed Blacks were 3.49 times more likely to be shot than unarmed Whites, and this discrepancy was more pronounced in counties with higher proportions of Black residents and more economic inequality. Ross also examined whether race-specific crime rates (e.g., arrests of Black suspects for assault and weapons violations) predict the magnitude of bias in police shootings, but found no evidence for a relationship (see Correll, Hudson, Guillermo, & Ma, 2014 for a review of complementary experimental research).

Second, Nix, Campbell, Byers, and Alpert (2017) recently published an analysis of police-involved shootings in 2015. The data that they analyzed were gathered by The Washington Post and consisted of 990 shootings that resulted in the death of the suspect. The data included the race of the suspect, whether the suspect was armed, and information about whether the suspect was attacking the officer(s) who were involved in the shooting. They found that Blacks were no more likely than Whites to be attacking the officer(s), and that Blacks were significantly more likely than Whites to be unarmed at the time of the shooting—suggesting, if anything, that Blacks who were killed by police were less threatening than Whites at the time of the shootings. Again, this is consistent with the RBP account.

Finally, using a very different approach, Charbonneau, Spencer, and Glaser (2018) investigated fatal shootings of off-duty police officers by on-duty police officers recorded by the New York State Task Force. Although their analysis is based on a very small sample of instances ($n = 10$), they use Bayesian estimation procedures to argue that off-duty Black officers are 52 times more likely to be fatally shot than their White counterparts. Assuming that off-duty officers do not engage in behaviors that warrant police use of force, these data offer support for the RBP account.

Evidence for Differential Criminal Activity

In contrast to the findings of Ross (2015) and the others discussed above, Inn et al. (1977) compare the use of force against Black versus White suspects, finding support for the DCA perspective. The researchers examine incidents of police shooting in an analysis of a single large police department and explicitly compare the incidents involving Black versus White suspects. The data show a pronounced racial discrepancy: per capita, police were much more likely to open fire on Black suspects than on White suspects. Though Blacks accounted for only about 25% of the city's population, Black suspects were involved in 63% of the police shootings. However, the researchers also examine arrest rates and find that Black suspects account for 60% of the arrests, and once the analyses control for racial discrepancies in arrest rates, the effect of race on shootings disappears. In fact, the adjusted means suggest that police shot at and hit Whites more frequently than Blacks (evidence for "counter-bias"; see also James, Vila, & Daratha, 2013). The authors conclude that police shootings are roughly in line with other indices of criminal activity, and thus do not support the argument that police show bias when they decide to pull the trigger (see White, 2002, for a similar argument based on more recent data from Philadelphia, PA).

This conclusion is also supported by Terrill and Reisig (2003) who sent observers into the field in Indianapolis, Indiana, and St. Petersburg, Florida. For several months, these observers rode in squad cars and assessed the behavior of police officers and the suspects/citizens with whom the officers interacted. Though this study analyzes nonlethal force rather than officer-involved shootings, it provides a direct test of the way both the neighborhood context and the suspect's race affect the officer's behavior. Analysis of approximately 3,300 police-suspect encounters suggests that as the percentage minority population increases, so does the police use of force. However, the researchers suggest that this bias is largely accounted for by environmental variables such as the concentrated disadvantage of the area and the homicide rate. It is therefore not *who* the police encounter, but *where* the person is encountered, that determines the amount of force used by police. According to Terrill and Reisig's findings, police treat Black suspects more harshly largely because they encounter them in parts of town where more crimes are committed—and police treat White suspects similarly when they encounter them in similar contexts (see Correll, Wittenbrink, Park, & Goyle, 2011, for a complementary experimental finding).

The Current Research

There are several differences between the studies that find evidence consistent with RBP (e.g., Jacobs & O'Brien, 1998; Nix et al., 2017; Ross, 2015; Sorenson et al., 1993) and those that, in the absence of effects of race, seem to support DCA (Inn et al., 1977; Terrill & Reisig, 2003). First, the former generally involve much larger datasets, whereas the latter involve smaller areas, conducting a more detailed analysis of one or two cities. There are advantages and disadvantages to both approaches. The more extensive datasets tend to offer less detailed information and examine relatively coarse measures of the variables of interest over a short period of time. Smith (2004) looked at the relatively gross 5-year average of police shootings in more than 100 large cities, and Ross (2015) examined a 4-year period analyzed at the level of county. Nix et al. (2017) only examine 1 year of shootings. Despite their coarseness, these large datasets have greater power to detect small effects and are likely more representative of the nation as a whole. By contrast, the smaller scale studies offer greater detail but may not be representative of the nation as a whole and may suffer from lower statistical power. Inn et al. (1977) examine a single city in such detail that they actually assess the number of bullets fired, and Terrill and Reisig (2003) are able to code the precise environment and police behavior with single suspects. Second, with the exception of Ross (2015) and Nix et al. (2017), the studies that suggest RBP rarely compare Black shootings to White shootings, whereas studies that suggest DCA do directly compare the two groups.

All in all, it is unclear whether differences in the results of previous work stem from differences in resolution (detailed vs. gross-level information), power (small vs. large numbers of cases/geographic units), or analytic approach (direct vs. indirect comparison of the treatment of Black and White suspects). In an attempt to explore at least some of these issues, we conduct an analysis of a large archival dataset over a much longer time period, including 213 metropolitan statistical areas (MSAs), using an analytical approach that, to the best of our knowledge, has not previously been applied to the question of race and police shootings. It also has the ability to examine more regions than simply the largest metropolitan areas (cities over 250,000 population). This approach should assist in providing a broader, more representative sample of the entire nation. While the MSA, as a unit of analysis, does have its limitations, we believe that this is a reasonable and useful way to examine racial bias and police use of force. It allows for inclusion of diverse areas as well as areas with smaller populations excluded from some macrolevel studies. It also represents a consistent unit of analysis over the time frame (1980–2000). This analysis also allows us to explicitly compare police shootings of Black versus White suspects. Thus, this approach offered a large-scale, inclusive, high-power test that directly tested the effect of race.[2]

This analysis allows us to examine several other questions related to both RBP and DCA. First, we are able to assess the degree to which the proportion of Black residents in an MSA predicts a racial discrepancy in shootings. As others argue, there is no particular reason that the mere presence of more Blacks in an area should have any influence on the rate at which police shoot Black suspects, per capita (Jacobs & O'Brien, 1998; Smith, 2004), unless the percentage of Blacks is

[2]Like other large-scale studies, we do not have access to the kind of fine-grained data available to Inn et al. (1977). We return to this issue in the Discussion.

also correlated with other indexes such as arrest rates or crime arrests. Controlling for factors like arrest, any relationship between the size of the Black population and the discrepancy in shooting would suggest RBP. Second, we can assess the degree to which the racial discrepancy in police shootings increases in MSAs where Black suspects commit more crime (as measured by arrest rates). Such a relationship would support a DCA account, because it would suggest that racial differences in police shootings are in line with racial differences in other indices of crime (this would be consistent with the argument advanced by Inn et al., 1977, though Ross, 2015, found no evidence for this pattern). Finally, our approach allowed us to conduct a third important test, which to our knowledge has not been conducted in previous work. This test allows us to more directly distinguish between the RBP and DCA accounts. In particular, we statistically controlled for crime rates and population characteristics in a model that explicitly compared police shootings of Black suspects to police shootings of White suspects. By conducting this analysis, we can address the critical question posed above: over and above racial differences in criminal activity, are police more likely to shoot Black suspects than White suspects. In our view, this analysis represents an important test of racial bias in police use of force.

Method

No single resource contains a thorough compilation of officer-involved shooting records (an issue we return to in the Discussion). Although the government maintains some databases that catalog police shootings, these files are often incomplete, censored, and do not include data that would allow one to determine whether systematic racial bias exists (e.g., officer race, suspect race, a description of the mitigating circumstances, etc.). Due to the paucity of a singular database, we combined data from three separate sources to test the RBP and DCA accounts. These included: (1) the Uniform Crime Report (UCR), a comprehensive dataset managed by the Federal Bureau of Investigation based on data provided by law enforcement agencies throughout the United States; (2) data from the U.S. Census; and (3) the Supplementary Homicide Report (SHR), a subset of the UCR, which provided data on suspects killed by police (the SHR does not include any data involving nonfatal shootings). Data were collected from 1980 to 2000. Each dataset is discussed in detail below.

The unit of analysis for this research is the MSA. MSAs are defined by the U.S. Office of Management and Budget and are typically centered on one large city, including the surrounding areas and suburbs over which that city has a significant impact. MSAs provide a unit of analysis through which the datasets can be combined with a strong degree of confidence. There are some limitations in the use of MSAs. For example, each is a large area covering different police departments and both city and county governments. Still, MSAs provide

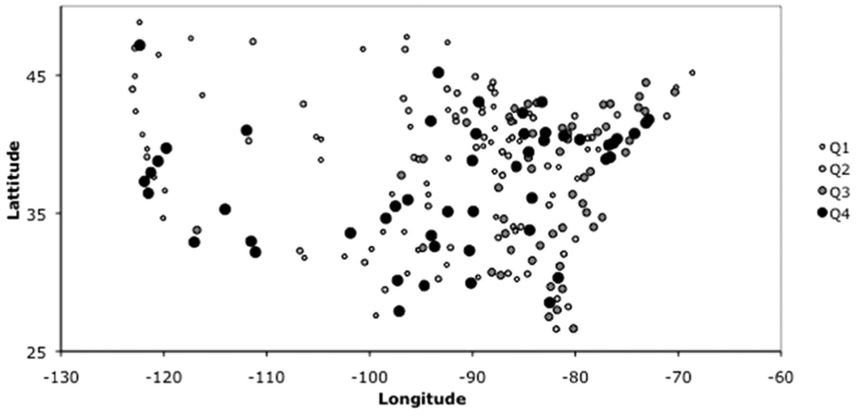

Fig. 1. Mean latitude and longitude of MSAs in sample (one MSA in Alaska has been excluded from the scatter plot) plotted as a function of quartile. Q1 represents MSAs with Differential Homicide Rates in the lowest 25% of the dataset; Q4 represents MSAs with the highest Differential Homicide Rates, suggesting that Black suspects are shot more frequently than Whites.

a large but fairly homogenous area that is defined relatively consistently across time.

The scope of the analysis was, to some extent, determined by the data available consistently for MSAs across the time period. MSAs were reported in all datasets. On several occasions, smaller geographical areas, for which data were available in one report (e.g., 1980), were aggregated to form a larger MSA in subsequent reports. Whenever possible, we retroactively estimated the UCR and census data to maintain a consistent geographic region. In all, we were able to obtain estimates for 225 consistently defined MSAs across the 21-year period. MSAs that were defined inconsistently across the three time points (in ways that we could not retroactively address) were dropped from the analysis (e.g., changes to or additions in area covered by an MSA). MSAs are plotted according to latitude and longitude in Figure 1.

Supplementary Homicide Report

The SHR includes data on homicides committed for a variety of reasons. From this broad dataset, we extracted incidents in which police officers killed suspects (one particular class of homicides in the report). The data thus include only instances in which a person died—they do not measure firearm discharges or nonfatal shootings, which would be a purer measure of police shooting behavior. In addition to this, the SHR is an incomplete report. Although estimates of how well the included data reflect the actual number of cases vary, we do know that large portions of the data are not reflected in the SHR. There is currently, however, no national database for these events (but see Wagner, 2014) and therefore this imperfect measure is used as one approximation to examine police shooting behavior. However, this limitation should be noted in relation to the conclusions drawn. This dataset does not reliably report whether or not the suspect was armed (we return to this issue in the Discussion). Shootings from 1980 to 2000 were included in the analysis.

Within the SHR, the nature of police shootings is categorized into the following situational categories: felon[3] attacked officer, felon attacked fellow police officer, felon attacked a citizen, felon attempted flight from a crime, felon killed in commission of a crime, felon resisted arrest, and not enough information to determine. There is a possibility that certain classifications would be underreported due to the potential negative public response. However, models (not reported here) examining elective shootings (shootings categorized as felon attempting flight from a crime, felon resisting arrest and not enough information to determine) versus nonelective shootings (shootings categorized as felon attacked officer, felon attacked fellow officer, felon attacked citizen, and felon killed in the commission of a crime) do not reverse any of our findings. The dataset also includes the race of the officer involved in the shooting. Previous researchers have suggested that the race of the officer may also impact the decision to shoot (Fryer, 2015). This variable will be the subject of further analysis and reported in future papers.

Uniform Crime Reports

Arrest data were compiled from the UCR. Data from 1980 to 2000 were included. Arrests for violent and property crimes, which are reported by age, sex, and race, were collapsed across age groups and sex in order to estimate total arrest data for each race. Consistent with census categories, arrests were computed for Black, White, and "Other" racial groups. Arrest rates are clearly distinct from crime rates and may also be subject to racial biases. However, arrest rates may provide a proxy for the number of White, Black, and Other ethnic groups suspected by police of involvement in criminal activity. As with the SHR, the UCR is an incomplete resource and we cannot assume that the data reported perfectly reflect the actual arrest data.

Census Data

Census data were compiled from the 1980, 1990, and 2000 census reports. Estimates were interpolated for the intervening years to estimate individual

[3]The SHR uses the term, felon, to describe suspects killed by police. In as much as these individuals were never formally convicted, we feel that the term is inaccurate. We use it, here, only to maintain consistency with the SHR categories.

population data for all 21 years. The Census Bureau revised its demographic variables in 1990, so less detailed information was available in the 1980 report, relative to 1990 and 2000. For consistency, we included population estimates only for ethnic groups that could be analyzed over the entire time period: White, Black, and Other. Categories from the 1990 and 2000 reports (which were more detailed) were combined to obtain these grosser categories.

Census variables also included poverty measures. Once again, the detail in the 1990 and 2000 census was much greater than in that of the 1980 census. Consistent with the 1980 report, we used the number of individuals living below 125% of the poverty level as our measure of poverty.

Results

Variables

We computed the mean number of officer-involved homicides in each MSA across all years for which data were available. This average was computed once for Black suspects and once for White suspects. To derive homicide rates, these numbers were divided by the average of the population estimates across that time period for the appropriate MSA and racial category. For example, the mean number of officer-involved shootings of Black suspects from 1980 to 2000 in the MSA comprising Abilene, Texas, was divided by the average census estimate of Black people living in that MSA from 1980 to 2000. These proportions were multiplied by a factor of 1,000,000, so the rates reported reflect the number of officer-involved homicides per million of the relevant population. Our primary question involved the *difference* in rates for Black and White suspects, so the primary dependent variable in this study is the difference in the homicide rates for Black versus White suspects. We call this variable *Differential Homicide*. Positive numbers indicate that the rate for Black shootings exceeded the rate for White shootings. On average, Black suspects ($M_{Black} = 2.29$) were shot at a significantly higher rate than White suspects ($M_{White} = 0.83$), $t(212) = 7.40$, $p < .001$. In a similar fashion, we computed arrest rates for Black and White suspects and derived a difference score reflecting the extent to which Black suspects are arrested more often than White suspects per 100,000 population. We refer to this index as *Differential Arrest*. On average, Blacks ($M_{Black} = 362.57$) were arrested at a significantly higher rate than Whites ($M_{White} = 81.04$), $t(212) = 26.43$, $p < .001$.

The two measures described above involve difference scores. They estimate the extent to which, per capita, Blacks are killed or arrested more frequently than Whites. We also estimated *overall* likelihood of police shootings and crime in each MSA by computing the number of shootings and arrests that involved either a White suspect or a Black suspect. These sums were then divided by the sum

Table 1. Means and Bivariate Correlations

	Mean	*SD*	1	2	3	4	5	6
1. Combined Homicide	1,060.41	1,316.55						
2. Differential Homicide	1.46	2.88	$+0.44^{***}$					
3. Combined Arrest	0.01	0.004	$+0.51^{***}$	$+0.11^{\dagger}$				
4. Differential Arrest	281.53	155.48	-0.02	$+0.03$	$+0.36^{***}$			
5. Proportion Black	0.10	0.10	$+0.12^{\dagger}$	$+0.22^{**}$	$+0.07$	-0.37^{***}		
6. Total Population	516,557	698,091	$+0.40^{***}$	$+0.47^{***}$	$+0.06$	-0.06	$+0.18^{*}$	
7. Proportion Poverty	0.16	0.05	$+0.13^{\dagger}$	$-0.13^{\dagger}$	$+0.26^{***}$	-0.26^{***}	$+0.34^{***}$	-0.26^{***}

Note. All *N*s equal 213. $^{\dagger}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

of the census estimates for the Black and White population of the relevant MSA. *Combined Homicide* represents the rate at which police shot either a Black or a White suspect (per million population). *Combined Arrest* represents the rate at which police arrested either a Black or a White suspect (per 100,000 population). These variables provide measures of the general, rather than differential, likelihood of police shooting and arrest.

Finally, across the 21 years of data, we computed the mean size of the population (*Total Population*), the mean proportion of the population with household incomes below 125% of the poverty level (*Proportion Poverty*), and the mean proportion of the population that identified as Black or African American (*Proportion Black*). See Table 1 for means and bivariate correlations.

Data Preparation

Twelve MSAs were identified as problematic. First, the primary dependent measure (Differential Homicide) and the residuals of the multiple regressions reported were highly positively skewed ($\text{skewness}_{\text{Differential Homicide}} = 11.01$). Exclusion of eight cases reduced the skewness of the remaining sample to acceptable levels (.997). We adopted this approach rather than a nonlinear transformation of the variable in order to retain MSAs in which Whites were shot more frequently than Blacks and preserve a conceptually meaningful zero point. Two other cases had extreme positive values on Differential Arrest Rate and proportion of people in poverty, respectively (both more than three standard deviations above their means, yielding leverage values > 0.16 in the primary analysis), and two others emerged as outliers in the primary analysis below (Cook's *D*s > 1.54). Notably, inclusion or exclusion of the outliers did not change the primary results concerning the intercept (reported below). The results reported here exclude all outliers, leaving a sample of 213 MSAs. Footnotes are provided in cases where inclusion of outliers changed the pattern of significant effects.

Table 2. Regression Analyses of the Total Homicide Rate and Racial Discrepancy in Homicide Rates (Per 1 Million People) as a Function of Total Population (Raw Number), Proportion Below Poverty, Proportion of the Population That Is Black, and the Total and Racial Discrepancies in Arrests

	Parameter	*SE*	*t*	*p*
Combined Homicide (B + W)				
Intercept	1,057.01	69.90	15.12	<.001
Combined Arrest	1.49×10^5	1.81×10^4	8.23	<.001
Total Population	.001	.0001	7.07	<.001
Proportion Poverty	3,514.46	1,688.13	2.08	.039
Proportion Black	−421.64	762.49	−0.55	.59
Differential Homicide (B − W)				
Intercept	1.75	0.40	4.37	<.001
Differential Arrest	0.002	.001	1.69	.09
Total Population	1.74×10^{-6}	2.69×10^{-7}	6.45	<.001
Proportion Poverty	−3.36	4.05	−0.83	.41
Proportion Black	5.70	1.96	2.90	.005

Note. $N = 213$. All predictors were centered except Differential Arrest.

Predicting the Overall Homicide Rate (Combined Homicide)

We examined the independent contributions of MSA characteristics to overall homicide rates. Combined Homicide rate was regressed on Combined Arrest, Proportion Black, Proportion Poverty, and Total Population. As shown in Table 2, homicide rates increased significantly in MSAs with more arrests, $b = 1.49 \times 10^5$, $t(208) = 8.23$, $p < .001$, larger populations, $b = .001$, $t(208) = 7.07$, $p < .001$, and higher proportions living below the poverty line, $b = 3{,}514.46$, $t(208) = 2.08$, $p < .039$. In contrast, there was no evidence in these data that the proportion of Black people in an area was related to the overall homicide rate in an MSA, $b = -421.64$, $t(208) = -0.55$, $p < .59$.

Predicting the Racial Discrepancy in Homicide Rate (Differential Homicide)

Next, we examined the independent relationships between MSA characteristics and Differential Homicide. The Black versus White difference in homicide rates was regressed on Differential Arrest, Proportion Black, Proportion Poverty, and Total Population. For this analysis, we centered the last three variables at their grand means. For example, we calculated the mean value of Total Population for all 213 MSAs, then subtracted this value from each MSA's actual Total Population. As a result of this transformation, scores below zero represent smaller-than-average MSAs, scores above zero represent larger-than-average MSAs, and scores close to zero represent MSAs with values of Total

Population (or Proportion Black or Proportion Poverty) that are very close to the grand mean. Centering these variables allowed us to meaningfully test the intercept of the regression model—a test that is critical to our goals in this article. There are two components to our reasoning. First, the intercept in a regression model represents an estimate of Differential Homicide (the dependent variable) *when all of the predictor variables equal zero*. Because we have mean-centered three of our predictors (Proportion Black, Proportion Poverty, and Total Population), the intercept provides an estimate of Differential Homicide for an MSA that is completely average in these demographic characteristics: an average proportion of Black residents, an average level of poverty, and an average overall population. However, we did *not* mean-center Differential Arrest. Accordingly, the intercept represents the prediction for an MSA that (though normal in other ways) has a Differential Arrest rate of zero—that is, an MSA where Blacks and Whites are *equally likely to be arrested*. By strategically centering our predictors, we obtain an estimate of Differential Homicide in an MSA that is average in every way except that there is no racial difference in criminal activity. Second, regression analysis not only estimates the intercept, it tests that intercept statistically. Our model thus determines whether Differential Homicide differs from zero. This is an absolutely critical point. If Differential Homicide is significantly greater than zero, it suggests that police are significantly more likely to shoot Black suspects than White suspects. Taken together, our model tests whether or not police shoot Black suspects more frequently than Whites removing differences in criminal activity (i.e., when Differential Arrest equals zero) in an otherwise average MSA.

Demographic variables. The analysis revealed several relationships between demographic characteristics and Differential Homicide. Mirroring the zero-order correlations, the racial discrepancy in homicides was positively related to Total Population, $b = 1.74 \times 10^{-6}$, $t(208) = 6.45$, $p < .001$. In more populated areas, the disparity in shooting Blacks versus Whites increased. Thus, our results show that the impact of larger populations is twofold: in larger cities, police are more likely to kill suspects in general (Combined Homicide), and they are especially likely to kill Black suspects as opposed to Whites (Differential Homicide). In addition, Proportion Black was associated with the racial discrepancy in police shootings, $b = 5.70$, $t(208) = 2.90$, $p < .005$. The fact that Proportion Black predicts the racial *discrepancy* in homicide, but not the overall homicide rate, seems to support a RBP account.[4] Finally, in contrast to the zero-order

[4]If the eight MSAs dropped to address the skewness of differential homicides are included in the analysis, the relationship between Proportion Black and Differential Homicide Rates does not reach significance, $b = .002$, $t(216) = 0.97$, $p < .33$. Importantly, the test of the intercept (which is the critical test of our study) remains significant even when the eight MSAs are included, $b = 1.39$, $t(216) = 2.32$, $p < .02$ (and the remaining variables show the same pattern of significance as well).

correlations, Proportion Poverty was not related to Differential Homicide when controlling for Total Population, Proportion Black, and Differential Arrest, $b = -3.36$, $t(208) = -0.83$, $p < .41$. These results suggest that poverty may impact the overall homicide rate, but not racial discrepancies in police shootings.

Criminal activity. In the zero-order correlations, we observed effectively no relationship ($r = .03$) between racial differences in arrest rates and homicide rates (Differential Arrest and Differential Homicide). In the multiple regression analysis, which controls for community demographics, we observed a slightly more robust relationship, though the effect was marginal, $b = .002$, $t(208) = 1.69$, $p < .09$. Thus, there is a trend in these data that supports a DCA account of police shootings: in communities in which Blacks are more likely to be arrested, Blacks are also marginally more likely to be shot.

The intercept. Finally, we turned to the crucial test, examining the intercept as an estimate of racial discrepancies in police shootings. This intercept represents the predicted value of Differential Homicide in an MSA with typical demographic characteristics—having an average value for Total Population, Proportion Poverty, and Proportion Black—but *no racial difference in arrest rates.* Given this model, the intercept tests a critical question: in a normal MSA, does race affect police shooting even when we equate Black and White criminal activity? The intercept was both positive and significant, $b = 1.75$, $t(208) = 4.37$, $p < .001$, suggesting that, in an otherwise average MSA, police are more likely to shoot a Black suspect than a White suspect, even in the absence of racial differences in criminal activity.[5]

Discussion

The current research sought to test a simple, yet important question—are police significantly more likely to shoot Black suspects than White suspects after controlling for racial differences in criminal activity. Previous research has provided mixed evidence regarding this issue. Some research finds that police officers are not only sensitive to the criminal activity of suspects, but also to economic inequalities and racial composition in their decision to shoot Black suspects (Jacobs & O'Brien, 1998; Ross, 2015; Smith, 2004; Sorenson et al., 1993).

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[5] We also tested a regression model including Combined Arrest as an additional predictor of Differential Homicide. Combined Arrest showed a marginal zero-order correlation with Differential Homicide, but it did not emerge as a significant predictor in the multiple regression, $b = 46.20$, $t(207) = 0.90$, $p < .37$. Regardless of this additional predictor, the test of the intercept remained significant and positive, $b = 1.90$, $t(207) = 4.38$, $p < .001$. Indeed, the only change in the results is that the effect attributable to Differential Arrest weakens to nonsignificance when Combined Arrest is included, $b = .001$, $t(207) = 1.03$, $p < .31$.

Critically, however, much of the existing research lacks direct comparisons between the shooting of White and Black suspects, making it difficult to determine whether officers shoot Black suspects more than White suspects or whether officers simply shoot more suspects overall. A few studies have compared the rate at which police officers employed deadly and nondeadly force with Black and White suspects. While these studies found evidence of racial discrepancies in officers' use of force with Blacks relative to Whites (Ross, 2015), the data examined did not cover large sections of the country, only spanned a 5-year period, and the data were collected from crowd-sourcing entries of police shootings. Additionally, differences by suspect race were usually explained by differences in criminal behavior between Blacks and Whites (Inn et al., 1977) or environmental factors (Terrill & Reisig, 2003). In an attempt to elucidate whether or not officers are influenced by suspect race over and above racial differences in criminal activity, we examined police shootings of Black suspects relative to White suspects from 213 metropolitan areas as a function of criminal activity, total population, poverty levels, and proportion of Black residents. Our analysis spanned a 21-year period, offered fairly inclusive coverage of the United States, and focused on verified information. Consistent with the RBP account, we found that officers tended to use deadly force more in response to Black compared to White suspects even after criminal activity was equated. These results converge with Ross (2015) and Nix et al. (2017), suggesting that the result is not dependent on the data source. Below, we discuss some experimental research findings and theories that may help to interpret the above findings. These theories also have important considerations for future research and investigation into racial discrepancies in police shootings.

The current findings appear somewhat inconsistent with experimental research documenting the effectiveness of training in reducing racial bias in the decision to shoot (Correll et al., 2007; Kahn & McMahon, 2015; Sim, Correll, & Sadler, 2013). These studies employ a computer-based first-person-shooter task (FPST) in which participants are asked to adopt the role of a police officer patrolling public spaces. Armed and unarmed Black and White males appear on a computer screen and participants are instructed to press a button to indicate a "shoot" response if the target is armed and a separate button to indicate a "don't shoot" response if the target is unarmed (Correll, Park, Judd, & Wittenbrink, 2002). Lay participants were more likely to shoot Black targets than White targets and they were quicker to respond to armed Black compared to armed White targets. However, trained participants—undergraduates who received practice on the FPST and sworn police officers—showed no difference in the decision to shoot White and Black targets, although they too show bias in the speed with which they could make responses. These studies suggest that highly trained police officers are basically egalitarian in their behavior despite the fact that they may activate cultural stereotypes (as evidenced by bias in their response times, see

Correll, Wittenbrink, Crawford, & Sadler, 2015 for a review). Importantly, Plant and Peruche (2005) utilized a different computer task in which they superimposed weapons and nonweapons on faces of Black and White males and instructed participants to "shoot" or "don't shoot" targets using a key press. Police officers who completed this task were more likely to mistakenly indicate shoot on nonweapon trials if the target was Black.

To shed light on the discrepancy between the analyses reported here and some of the existing experimental work, we consider three potentially important factors that may determine whether or not police officers' decisions to shoot are influenced by race. First, we consider the nature of the officers' training and on-the-job experience. Second, we consider features of the context in which officer-involved shootings may occur. Third, we consider the impact that high-stress situations may have on the officers' psychological processes.

The Nature of Officer Training and Experience

Across several studies, Sim et al. (2013) demonstrated that, although training can mitigate bias in the FPST, training can increase bias if the nature of that training reinforces the association between Blacks and danger. In one of their studies, undergraduate participants received extensive practice on the FPST. However, the nature of practice varied. Some participants were exposed to a large number of armed Black targets (and only a few armed Whites), thereby reinforcing the cultural stereotypes linking Blacks to danger. Other participants were exposed to a higher number of armed Whites (and only a few armed Blacks), thereby undermining the cultural stereotype. Participants who were trained on the stereotype-reinforcing version of the FPST showed a marked increase in racial bias, whereas participants in the stereotype-disconfirming condition showed no evidence of racial bias. A separate study examined "special unit" officers—officers assigned to gang units and street-crime units. Compared to normal patrol officers, the special unit officers showed more pronounced racial bias in their decisions to shoot. The authors suggest that this bias may derive from gang unit officers' exposure to instances that reinforce cultural stereotypes or from day-to-day experiences that emphasize more aggressive approaches (and deemphasize controlled evaluation). Knowing more about the training and experience of the officers represented in the SHR data could be critical to understanding whether (i) training simply fails to prevent biased shooting in real-world scenarios (a question about the external validity of laboratory-based studies) or (ii) whether particular subsets of officers are overly represented in the SHR data (a question about moderation by a factor not available in our dataset). Unfortunately, as we briefly discussed in the Introduction, the use of large-scale archival data limits the detail we have about each shooting incident. We do not know the background of the officers involved, so we cannot determine whether the present results are driven by a subset of officers.

Contextual Features Surrounding Officer-Involved Shootings

A second important feature to consider involves the context surrounding these shootings, which is unavailable in the SHR dataset. Although we know the MSA, for example, we have no information about the particular neighborhood in which the shooting took place. This contextual information is critical. As Terrill and Reisig (2003) showed, race-based discrepancies in nonlethal use of force may be mediated by the nature of the environment. Black suspects may receive harsher treatment because of contextual factors like neighborhood. On this point, laboratory-based research using the FPST shows that individuals lower their threshold to shoot White targets to comparable levels of Black targets when Whites are presented in dangerous contexts (Correll et al., 2011, see also Kahn & Davies, 2018). Because the data reported here are aggregated at a fairly gross level (MSAs), we cannot assess the impact of the immediate environment. This is a limitation of the current study and future work should attempt to examine datasets that combine sufficient data to increase statistical power while including context variables such as the environmental context and officer training. Recent databases, such as crowd-sourced databases (www.fatalencounters.org; Wagner, 2014) or those created by news outlets (www.washingtonpost.com/graphics/national/police-shootings; www.projects.scpr.org/officer-involved), may be useful in achieving these ends.

High-Stress Situations

A third reason why our findings may diverge from experimental research involves the extreme conditions involved in real-world shootings. As one can imagine, these situations are highly arousing to officers (Alpert, Rivera, & Lott, 2012; Artwohl, 2002). This arousal may impair executive function and lead officers to respond based on prepotent, dominant responses (Zajonc, 1965). Research on the FPST shows that although officers show no evidence for bias in terms of the decisions that they ultimately make, they do show bias in the speed with which they respond to Black and White targets (Correll et al., 2007). Officers, just like lay participants, are faster to “shoot” an armed target if that target is Black than White. This suggests that officers, while still activating cultural stereotypes, are able to exert executive control to override stereotypes when implementing their responses. However, under extreme conditions of stress, the ability to override stereotypes may break down, leading officers to respond in a more biased manner (Hudson, Mellinger, Wittenbrink, Axt, & Correll, in preparation). James et al. (2013) recently utilized an immersive first-person shooter simulation to overcome some of the external validity concerns of the FPST and better emulate the real-world stressful conditions in which officers make actual shoot/do not shoot decisions. The simulator that they used projected high-definition video scenarios featuring Black, Latino, and White suspects armed with guns or knives, and participants (police officers, civilians, and military personnel) made shoot decisions using a modified Glock, which allowed researchers to capture shot placement and response time. Among the many findings reported was the observation that participants took more time to shoot Black suspects than Latino and White suspects and participants were five times more likely to fail to shoot an armed Black than White target. This is consistent with the counter-bias hypothesis we alluded to in the Introduction; however, use of this simulator in research is relatively new, the relatively small sample was limited in geographic scope, and the paradigm gave participants a fairly long time to formulate (and potentially edit) their responses to each trial. Replications are needed to more gain confidence in these results.

Methodological and Social Policy Concerns

It is important to note an important concern surrounding the statistical method we employed in the current research. The first concern involves extrapolation. Extrapolation occurs when one develops a statistical model based on a set of observations and uses the resulting model to predict outcomes for values outside the observed range. In the current study, for example, we tested the intercept of Differential Homicide when the Differential Arrest rate for an MSA was set to zero, meaning there was no difference in the arrest rates of Blacks and Whites. Although there were a few MSAs in our dataset in which the arrest rate difference was near or below zero, this value is quite extreme in our dataset. Because the model that we are using to predict outcomes for this hypothetical MSA is based on data that only scarcely cover this range, we should be cautious about these estimates. Nonetheless, given the available data, we view this analysis as the most direct test of the question we are seeking to answer: does race influence decisions to shoot when there are no race-based differences in criminal activity. These data clearly suggest that equating criminal behavior does *not* eliminate the racial discrepancy in police shootings.

It is also important to note that all of our analyses rely on fairly gross measurements. We examine yearly totals for the numbers of Black and White suspects arrested and killed in a given MSA. These data do not, however, afford the capacity to analyze the behavior of a particular suspect at the moment when police officers make their decisions about use of force (cf. Nix et al., 2017; Terrill & Reisig, 2003). And indeed, other factors may lead officers to police and arrest some citizens more than others. For example, in our analysis, we consider the effect of arrest rates, but these statistics include arrests resulting from a variety of criminal activities, which would warrant different levels of force. To more fully disentangle the effects of a suspect's race and behavior, it would clearly be valuable to obtain such data. Though we discussed the point in the Introduction, we again hasten to acknowledge that these more fine-grained analyses seem to provide minimal evidence for the RBP account in cases of nonlethal force. It may be that a more detailed dataset would suggest different conclusions (but see Nix et al., 2017). This also relates closely to an issue we have alluded to throughout this article; specifically, the severe lack of readily analyzable, comprehensive data surrounding police-involved shootings. As new, more detailed reporting (e.g., National Incident Based Reporting System) and emergent open contribution sources becomes available (www.fatalencounters.com; Wagner, 2014), it may be possible to examine police shooting behavior with both a large sample and greater precision. We urge that better, unbiased systems be developed for recording these data. Indeed, if there was any policy recommendation, we would make it would be this. Maintaining complete and accurate records is paramount if policy makers, government agencies, and researchers are to fully understand the role of race in these life and death decisions.

Finally, we relied on the SHR for the current analysis, and as such, the data only include instances of fatal police shootings. Although officers are trained to shoot to kill, there are many cases in which the suspect survives and the officer discharges at a suspect, but misses. The SHR excludes these instances. One could imagine that the lethality of a shot could be influenced by factors over and above how much threat a suspect poses, and a thorough examination of these cases would shed light on our current understanding of whether race influences these important decisions. However, as we describe, no database currently exists that would allow us to test the RBP and DCA when these other outcomes are considered.

Future Analyses

The current research reflects average trends across a 21-year span. We hope to examine the same data sources using latent growth modeling to investigate *changes* in shooting patterns as a function of changes in population (e.g., influx of minorities, wealth, city size, etc.) or criminal activity (e.g., mean-level criminal activity, changes in the arrest rates of different racial groups, amount of violent crime, etc.). These questions are orthogonal to the tests reported here (which involve the *average* over the 21 years). Using these time series data, we may even be able to examine the effect of discrete events, like high-profile shootings, changes in police leadership, or social movements (e.g., Black Lives Matter campaign). For example, one could investigate whether use of force is affected by shooting deaths of unarmed Black targets. Using this dataset, further lines of investigation may also include the influence of political leaders (such as mayors or governors), state-wide training and policies, or the number of officers being killed. Comparisons across different parts of the country would also be examined to identify any differences in trends across time. The current study provides an overview of this dataset, while further research will seek to identify finer detail in relation to patterns of police shooting behavior.

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