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What Factors Influence an Officer's Decision to Shoot? The Promise and Limitations of Using Public Data

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Abstract

We analyze a set of 207 Dallas Police Department officer-involved shooting incidents in reference to 1,702 instances in which officers from the same agency drew their firearms but did not shoot at the suspect. We find that situational factors of whether the suspect was armed and whether an officer was injured were the best predictors of the decision to shoot. We also find that African Americans are less likely than Whites to be shot. It is important to collect data on encounters in which weapons are *and are not* discharged. Analyses examining only shootings is fundamentally limited in assessing racial bias.

Keywords

officer-involved shooting, use of force, racial bias, policing

In response to high-profile shooting incidents of unarmed minority suspects in the United States, several scholars have attempted to empirically identify factors influencing police officers' decisions whether to fire their weapons at citizens (James, James,

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& Vila, 2016; Klinger, Rosenfeld, Isom, & Deckard, 2016; Nix, Campbell, Byers, & Alpert, 2017). This research has spawned questions regarding how often police officers shoot, who does the shooting, who is shot, and the circumstances and locations of the shooting incidents. It has also renewed interest in the issue of whether police officers are more likely to shoot at minority suspects relative to nonminorities for either reasons of overt racism (Goldkamp, 1976; Sherman & Langworthy, 1979) or implicit bias (Nix et al., 2017).

Despite recent advances in officer-involved shooting (OIS) research, the body of work in this area is limited in several respects. First, in the United States, there is currently no national database of OIS incidents (Alpert, 2016; Klinger, 2012) because the data currently available from the Federal Bureau of Investigation (FBI; via the supplementary homicide reports) are voluntarily provided by police agencies. These data commonly include only those incidents that resulted in a fatal outcome, which misrepresent our ability to understand the true nature of the decision to shoot (Klinger, 2012). Calls for a standardized national database requiring police agencies to provide details regarding OIS incidents recognize the limitations of voluntary programs for collecting quality data. For example, Alpert (2016, p. 24) stated that:

> without required compliance and financial incentives, it is unlikely that the data from many law enforcement agencies would be received and if many would be of sufficient quality to rely on.

In response to a lack of official national data, various crowd-sourced (e.g., theguardian.com; fatalencounters.org) and media-driven data collections (e.g., *Washington Post* data, e.g. https://www.washingtonpost.com/graphics/national/police-shootings-2016/) have attempted to fill the gap. Such databases, though, have been criticized for which incidents they do and do not include (Selby, Singleton, & Flosi, 2016) as well as how different aspects of the incidents they report are coded (Klinger & Slocum, 2017).

While recently assembled OIS databases claim national samples in the United States, a fuller understanding of the use of deadly force should include all incidents regardless of whether the intended target was killed, injured, or hit (Fyfe, 1978). Whether a suspect is killed in a police shooting appears to be random with respect to many offender and situational characteristics (Zimring, 1972), and officers often miss their intended target (Fachner & Carter, 2015; White, 2006). In Dallas, police officers are trained to shoot for center mass in order to "incapacitate" (Morrison & Vila, 1998; Parent & Verdun-Jones, 1998), so they sometimes injure suspects rather than kill them.

A more fundamental limitation of available OIS data is that they fail to take into account instances in which officers chose not to use deadly force (Reiss, 1980). This is an important consideration in OIS research, as prior work suggests that most police officers do not use deadly force even when it seems justified (Pinizzotto, Davis, Bohrer, & Infanti, 2012). To estimate the probability a suspect will, conditional on their race, be shot, it is necessary to have a set of control cases in which officers had

the opportunity to fire at the suspect but used their discretion not to. Such control cases are sorely missing from databases that only include officer-involved killings (or even databases with all OISs).

We improve upon prior research by using not only a set of over 200 OIS incidents—whether fatal, injured, or missed—compiled from the Dallas Police Department (DPD) from 2003 through 2016 but also a relevant set of over 1,700 control cases in which officers drew their duty weapons and pointed at a suspect but decided not to shoot. This allows us to assess whether extralegal characteristics of offenders, such as their race, as well as several situational and contextual-level variables, result in a higher probability of particular suspects being shot.

While focusing on one city limits our ability to generalize across the United States (or police forces in other nations), our study does have particular implications for prior analyses of national-level OIS data. We demonstrate that without such control cases, shootings in Dallas show evidence of racial bias toward African Americans. However, when we include "don't shoot" control cases, we found the opposite, that there is evidence that African Americans are less likely to be shot at relative to White or Hispanic offenders. Our findings are similar to research using video simulators to examine police officer decision-making in shoot/don't shoot incidents (James et al., 2016). Prior national-level analyses of OIS in the United States (e.g., Nix et al., 2017) could therefore have potentially reported the same reversal of inference had don't shoot cases been included in their analyses.

Prior Use-of-Force Research

Studies of police decision-making have commonly theorized the effects of officer and/or suspect characteristics, situational factors, and neighborhood characteristics on various police officer behaviors. The outcomes of interest commonly included decision-making during stops including the decisions to cite, search, or write a ticket (e.g., Petrocelli, Piquero, & Smith, 2003) and applications of force (e.g., Terrill & Reisig, 2003). The following review condenses individual-, situational-, and neighborhood-level factors that have been studied in relation to how police officers use nonlethal force and extends the same research features to the OIS context. The research in this area, however, is limited. For example, early deadly force studies used FBI data that only included incidents ending in suspects' death (Jacobs & O'Brien, 1998; Sorensen, Marquart, & Brock, 1993). Further, these studies were unable to examine relationships between assorted incident-level variables and the decision to use deadly force because detailed information was not available in the data.

Individual Factors

Characteristics of officers and citizens involved in force encounters are common elements in evaluations of police behavior. In particular, officers' and suspects' age, gender, and race are often the focus of analysis. For example, officers are more likely to use some type of force against younger suspects (Crawford & Burns, 1998; Engel &

Calnon, 2004; Phillips & Sobol, 2011; Reiss, 1972; Terrill, 2005; Terrill & Mastrofski, 2002; Worden, 1995). With respect to race, several prior studies suggest African American suspects are more likely than Whites to have force used against them (Engel & Calnon, 2004; Schuck, 2004; Terrill, 2005; Terrill & Mastrofski, 2002; Worden, 1995). Additionally, the mental health of suspects, as well as whether the suspect is under the influence of drugs or alcohol, is a factor that is sometimes examined in use of force studies (Jetelina et al., 2017; Kesic, Thomas, & Ogloff, 2012; Parent & Verdun-Jones, 1998; Selby et al., 2016). Sun, Payne, and Wu (2008) examined specific types of force (e.g., threaten to use force, restraint, pain compliance, and incapacitation methods), finding "that males, minorities, and poor citizens were more likely to be subjected to coercive activities" (p. 29).

When police officer characteristics are included in use-of-force studies, years of experience are more often considered than age. A few studies (Crawford & Burns, 1998; Rydberg & Terrill, 2010; Terrill & Mastrofski, 2002) have indicated that less experienced officers are more likely to use higher levels of force than their experienced counterparts. Paoline and Terrill (2007), however, found that officers with 3–5 years of experience, not the most inexperienced officers, most frequently used force against suspects. Findings from studies of the effects of officers' gender on use-of-force are mixed. On the one hand, researchers have found that female police officers are less likely to use force during arrests than males (Crawford & Burns, 1998; Garner & Maxwell, 2002; Schuck & Rabe-Hemp, 2007). Yet Paoline and Terrill (2005) reported that "officer gender effects do not produce statistically distinguishable differences in levels of coercion when the likelihood of verbal and physical coercion are compared to no coercion" (p. 111). Rydberg and Terrill (2010) also reported that officers with higher levels of education were less likely to use force when dealing with a suspect.

With respect to OIS incidents, Milton, Halleck, Lardner, and Abrecht (1977) examined OIS incidents in seven larger American cities in 1973 and 1974. Of the 378 shootings, approximately 50% of the suspects shot were 24 years old or younger. OIS incidents in Denver indicated that Black and Hispanic suspects were younger (an average of 18 and 22 years old, respectively) compared to White suspects (an average of 26 years old; Durán & Loza, 2017). Robin (1963) examined 32 fatalities in Philadelphia occurring between 1950 and 1960. Citizens who died were, on average, 27 years old, with a disproportionate number of them being African Americans. Four of the five citizens killed in OIS incidents in Chicago in the mid-1970s were racial minorities (Geller & Karales, 1981). Meyer (1980) found similar results for 584 shootings by the Los Angeles Police Department from 1974 to 1979. For incidents in which the race of the suspect was known, 77% were African American or Hispanic. Fyfe (1982a) also reported that African Americans were disproportionately the subject of shooting incidents in Memphis. In general, it is difficult to identify whether such aggregate demographic differences are due to disproportionate use of force against minorities or whether it is due to differential involvement of minorities in violent crime (Fox & Zawitz, 1999). Examining more detailed incident information, Durán and Loza (2017) concluded that police officers restrained or delayed their decision to

shoot when the suspect was White compared to Blacks and Hispanics. As another possible explanation for police officer decision-making, Donner and his colleagues found a relationship between being involved in a shooting and officers with increased levels of low self-control (i.e., ever fired from a job, being behind on bills; Donner, Maskaly, Piquero, & Jennings, 2017).

Situational Factors

Police behavior is often explained by situational variables, defined by Worden (1989) as the "structural characteristics of the immediate situation" (p. 668). Situational variables have been included in a variety of use-of-force studies, often with inconsistent results. The use of force has been linked to offenders involved in violent crimes (Alpert, Dunham, & MacDonald, 2004; Friedrich, 1980), who possess weapons (Kaminski, DiGiovanni, & Downs, 2004; Terrill, Paoline, & Manning, 2003), or who are arrested after some type of pursuit (Kaminski et al., 2004). Rydberg and Terrill (2010) found proactive officers were more likely to use force. Others have reported that police officers used force in relatively "safe" calls for service, rather than violent or dangerous calls, as might normally be expected (Best & Quigley, 2003; MacDonald, Manz, Alpert, & Dunham, 2003).

The OIS research demonstrated that possession of a weapon is a common component of a police shooting. In Chicago, just over 50% of the shootings occurred because civilians used or threatened the use of guns, and 14% were shot when they used or threatened officers with other weapons (Geller & Karales, 1981). Milton et al. (1977) found that suspects who were shot were armed with guns (45%) or knives (12%). While many OIS incidents occurred when the officer was dealing with a more serious or violent crime (32% were robberies, 20% were burglaries), another 32% were calls for different types of disturbances (e.g., domestic violence, fights, or "man with a gun"; Milton, Halleck, Lardner, & Abrecht, 1977). Further, almost 44% of shootings occurred between 9:00 p.m. and 3:00 a.m., and 78% involved suspects who resisted the officer in some way (Robin, 1963).

Neighborhood Factors

Another feature explaining police officer decision-making is the neighborhood "context" in which police–citizen interaction occurs (Klinger, 1997; Smith, 1986). For example, Smith (1986) found that police are more likely use or threaten to use force in neighborhoods that have a lower socioeconomic status and residential mobility. Similarly, Sun and his colleagues (2008) reported a relationship between the use of coercive behavior and officers working in areas with concentrated disadvantage. Terrill and Reisig (2003) used patrol beats as a proxy for neighborhood and found that

> officers are significantly more likely to use higher levels of force when encountering criminal suspects in high-crime areas and neighborhoods with high levels of

> concentrated disadvantage independent of suspect behavior and other statistical controls. (p. 307)

When examining the police shooting incidents between different areas, the earliest work used aggregate data at the state level (Jacobs & Britt, 1979) or city level (Sorensen et al., 1993). These studies found that the level of crime or violent crime rate in these large geographic areas was related to the decision of an officer to shoot a citizen. When examining the relationship between OIS and neighborhoods, White (2001) reported that the amount of violent crime in a neighborhood was related to "elective" shootings (i.e., less-than-lethal options were also viable). Recently, Klinger, Rosenfeld, Isom, and Deckard (2016) analyzed data from St. Louis, finding that "the level of firearm violence has a direct effect on police shootings" (p. 212). Other neighborhood characteristics, such as racial or socioeconomic compositions, were related to the frequency of OIS.

Simulation Studies of OIS Decision-Making

While the review of prior studies focused on official data of OIS incidents, there have been additional experimental studies examining officer decision-making in simulated environments. In psychological research, the implicit association test shows participants images on computer screens, and the observer is supposed to respond in some particular way to that stimulus such as by pressing a particular button (Greenwald, McGhee, & Schwartz, 1998). The reaction time a participant takes to give that response is often the outcome measure in such tests. To examine implicit racial bias, the images are typically of an African American individual versus a White individual (Correll, Hudson, Guillermo, & Ma, 2014; Correll, Park, Judd, & Wittenbrink, 2002; Correll et al., 2007; Eberhardt, Goff, Purdie, & Davies, 2004). Several studies have subsequently tested officer decision-making whether to shoot or to not shoot in the same manner—by providing images of suspects of different race and in different contexts (e.g., armed vs. unarmed), requiring participants to quickly determine whether they should respond with deadly force such as by pressing a button to indicate shoot or a different button to indicate don't shoot. In a meta-analysis of 16 papers (but over 3,000 different tests), Mekawi and Bresin (2015) found that participants (both civilian and police officers) are quicker to shoot black targets as well as more likely to shoot black targets.

Studies using computer screens to simulate deadly force decision-making have been questioned as to their relevance to actual police behavior in realistic situations (James et al., 2016). Although the implicit association test has been incredibly popular among psychologists, measures of implicit racial bias have little predictive validity for other behaviors outside of the experiment (Singal, 2017). In response to this, James, James, and Vila (2016) conducted a more realistic simulation using high-definition "shoot/don't shoot" projections for officers from the Spokane, WA Police Department. In their experiment, they found officers were less likely to shoot unarmed African American suspects versus White suspects, and officers took longer to shoot

Table 1. Different Recent Study Designs Using Publicly Available Shooting Databases.

Study	Estimates	Source of Data
Ross (2015)	P(Unarmed|Race, City-level factors, Shooting)	Kyle Wagner's U.S. Police Shooting Database, 2011–2014
Nix et al. (2017)	P (Unarmed|Race, Shooting)	*Washington Post* deadly shootings nationwide in 2015
Fryer (2016; table 5)	P(Shooting|Suspect, Race)	Houston PD: shootings, arrests, and Taser uses; 2000–2015
Ridgeway (2016)	P(Shooting|Officer Characteristics)	New York City shootings, 2004–2006
Klinger et al., 2016	E[Shootings|Neighborhood Factors]	Officer-involved shootings in St. Louis, MO, 2003–2012
Legewie and Fagan (2016)	E[Shootings|City-Level Factors]	Burghart fatal encounters Data Set, 2013–2015
This study	P(Shooting|Situational, Offender, Neighborhood)	Dallas officer-involved shootings (2003–2016) and use-of-force instances in which officer drew a gun but did not fire (2013–2016)

at armed African American suspects compared to White suspects (see also James, Vila, & Daratha, 2013). Additionally, they measured officers' implicit bias using the implicit association test with static images and found that measures of implicit bias had no relationship to officers' behavior in the more realistic simulation. James, Klinger, and Vila (2014) also found nonpolice respondents "responded significantly more slowly when confronting black suspects than those who were White or Hispanic" (p. 334) in the more realistic shooting simulations as well.

Understanding Recent OIS Research

With increasing availability of public OIS data, researchers are once again vigorously examining the causes and correlates of police shootings. To date, though, much of the research has been limited to databases of deaths and injuries due to firearms (Klinger et al., 2016; Nix et al., 2017; Ross, 2015). By focusing solely on instances in which officers fired their weapons (or in which deaths occurred), researchers ignore situations in which deadly force may have been authorized but was not ultimately used. This is critically important because without data on situations in which weapons were not discharged but otherwise could have been, it is nearly impossible to draw conclusions about questions of implicit bias in use-of-force decision-making (Fridell, 2016).

Table 1 presents the different models that recent research studies have used to address questions concerning racial bias in police shootings (Fryer, 2016; Klinger et al., 2016; Legewie & Fagan, 2016; Nix et al., 2017; Ridgeway, 2016; Ross, 2015). The table is presented in terms of conditional probabilities or expected numbers, such that:

P(Unarmed|Race, Shooting) = the probability a person is unarmed conditional on their race and whether they were shot at.

E[Shootings|Contextual Factors] = the expected number of shootings conditional on the contextual factors of a particular place.

Table 1 reveals how each research design can potentially answer different questions and result in different inferences. For example, Klinger et al. (2016) estimated the expected number of shootings in neighborhoods in St. Louis, conditional upon neighborhood-level factors such as the number of violent crimes. While a reasonable inquiry in its own right, the design cannot directly address situational factors that lead to police shootings, as the prevalence of those factors may be lower or higher during police encounters in particular neighborhoods. For example, offenders in some neighborhoods may be more likely to defy verbal commands and resist arrest, which would likely result in more OISs.

Ridgeway (2016), in comparing officers who did or did not shoot during the same incident, gains high internal validity in assessing officer characteristics that are more likely to result in shooting. While this is useful for monitoring of officers for early intervention systems, it loses the ability to determine whether neighborhood-level factors or offender behavior changes the probability of a shooting occurring, as those do not vary between matched treatment and control cases.

We submit that prior efforts (Nix et al., 2017; Ross, 2015) to gauge the probability of P(Unarmed|Race, Shooting) fall short of ideal. For example, in a sample consisting solely of shooting cases, the probability of someone being unarmed conditional upon their race does not tell us the probability of someone being shot conditional upon their race and being unarmed. A database consisting solely of OISs (or killings) can only estimate P(Unarmed|Race, Shooting); it cannot estimate P(Shooting|Race, Unarmed).

To further illustrate, imagine one finds that P(Unarmed|African American, Shooting) > P(Unarmed|White, Shooting) (Nix et al., 2017; Ross, 2015). This simply means that in incidents in which individuals are shot, a higher proportion of African American individuals will be unarmed compared to White individuals. Yet whether a suspect is armed is not the only information an officer uses (rightly or wrongly) in deciding to shoot. For example, if an officer arrives at the scene with information from dispatch that the suspect has a prior history of violence, an officer may be more likely to shoot at the suspect (Binder & Scharf, 1980; Mitchell & Flin, 2007). Subsequently, disparities in the criminal histories between different races of those who the police come into contact with during situations in which an OIS may occur could explain the disparity without resorting to any particular theory of racial animus or implicit bias.

To properly identify factors that influence whether officers decide to fire their weapons, it is necessary to gather data on a relevant set of control cases, namely, instances in which officers could have reasonably used lethal force but chose not to. Our study examines, such instances, specifically those in which officers *perceived* a threat of confrontation serious enough to *point their weapons at probable assailants* but saw fit not to fire. These types of incidents would include those where an officer faces an immediate life-threatening event; it would not include incidents where an

officer might draw a weapon as befitting their training.[1] Note also that such an analysis does not distinguish whether an officer was justified in their decision to use deadly force, or even in their decision whether to draw their firearm to begin with. This simply evaluates the factors that influence officer behavior to shoot or not shoot at a suspect.

Our research is roughly similar to that of Fryer (2016) who examined OIS incidents in Houston and compared them with cases in which officers deployed their Tasers. In his work, Fryer found that there is no racial discrimination when examining OIS incidents.[2] It is also similar to the experimental work of James et al. (2016) who employed simulations to determine whether officers decided to shoot or not shoot given similar situations. The current research is observational, though, so while we lose the ability to manipulate the situations in which officers have to decide to shoot, we do gain greater generalizability to circumstances officers actually encounter in the field (Fridell, 2016).

Our set of control cases is, of course, not perfect. First, racial biases may exist a priori in officers' decisions to draw their weapons. That is, officers may be more likely to draw their weapon when interacting with minority suspects. Second, cases in which officers could be reasonably justified in using deadly force need not involve the drawing of a weapon. The obverse of this is true as well—simply because an officer draws their weapon does not necessarily mean that use of deadly force was justified in that situation. Nevertheless, nonshootings constitute viable controls because in a counterfactual world, these are instances in which officers could have reasonably elected to "pull the trigger."

Current Study

Our primary analyses drew on data from two specific DPD sources: the OIS database and the police use-of-force database. The data are publicly available through the Dallas Open Data Portal (https://www.dallasopendata.com/).

The OIS database (as of February 2017) contains information on 223 shootings from 2003 through October 2016, but four were eliminated from our analysis.[3] The OIS data include written narratives to offer situational information and paint a more complete picture of each shooting event. Additionally, the data include a number of officer and citizen characteristics (e.g., race, gender) that are important for statistical controls.

The use-of-force database, which is separate and distinct from the OIS database, includes incidents in which the officer used physical force such as hands, a Taser, or by drawing a duty weapon and pointing it at a suspect.[4] The use-of-force database is currently limited to 2013 through 2016, so our use-of-force controls do not overlap perfectly with OIS incidents. Because the two databases do not temporally overlap, we conduct additional supplementary analysis of only OIS cases from 2013 through 2016 and find near identical results as to using OIS cases going back to 2003 (see Appendix A). Thus, the control cases not overlapping over the same time period do not appear to be a substantive problem.[5] The use-of-force data contain information on over 1,700 incidents in which officers pointed their weapon at a suspect but did not fire.

Both the OIS and the use-of-force data contain the street address where the incident took place. We used this information to geocode incident locations and assign them to census block groups. Demographic data at the block group level were obtained from the 2014 American Community Survey five year estimates, and data on violent crime rates were obtained from the Dallas Open Data Portal from June 2014 through January 2017.[6]

Variables

Individual-level suspect characteristics included in our models were race/ethnicity (White, African American, Latino, and Other) and gender (male or female). While age of the offender is available in some cases in the OIS data, it is not publicly available in the use-of-force data. In the OIS data, there were 12 cases in which suspects were missing race or gender, and for the use-of-force data, there were 34 cases missing race or gender. These were dropped from the analysis, resulting in a total of 207 OIS cases and 1,702 use-of-force cases for the final analysis.[7]

Due to the nature of how the OIS data are disseminated, analysis of officer characteristics is not easily accomplished using the publicly available data. This is because the database is disseminated at the incident level, which means multiple officers could have fired their weapons during a single encounter. In some cases, not all officer information is available in the publicly available OIS database, preventing us from expanding the data set to analysis of officers within incidents. Because of this, we conduct additional analysis including officer race, gender, and years of experience for the subset of incidents in which only one officer was involved. This helps eliminate the need to take into consideration the possibility that multiple shooters were nested within any one event. The majority of OIS cases involve only one officer shooting, and this subset analyzes 141 OIS incidents, compared to a set of 935 use-of-force incidents which also only included one officer.

A key situational variable we included was whether the suspect in a force encounter was armed. Specifically, we distinguish between cases in which the suspect was armed with a gun (which could be any type of firearm, either a hand gun or a long gun), armed with another type of weapon (which could be a knife, blunt object, vehicle, etc.), or unarmed. Those carrying paint ball guns or BB guns were coded in the "other weapon" category, but those listed as "simulating a firearm" in the use-of-force data (such as under clothing) were coded as unarmed.[8] While the use-of-force database contained a specific field referring to whether the suspect was armed with a weapon, it was necessary in the OIS data to code this variable manually from the incident narratives.

Other situation-level variables included (a) the contact type (call for service, officer initiated, or other), (b) whether the officer(s) was/were injured (yes or no), (c) whether more than one officer fired or used force, and (d) whether a command was given prior to shooting.[9] Once again, these variables could be constructed directly from the use-of-force database but had to be coded from the incident narratives from the OIS database.

Contextual-level variables included demographic information obtained from the 2014 5-year American Community Survey estimates at the block group level. These variables included the percentage in poverty, the percentage of female-headed households with children, and the percentage of population that is non-Hispanic White, non-Hispanic African American, and Hispanic. Also included was the violent crime rate per 1,000 population, estimated via the number of murders, aggravated assaults, and robberies at the block group level from crime data for June 2014 through January 2017. Crime data are also publicly available on the Dallas Open Data Portal, but coding crime incidents specifically for gun violence (as done in Klinger et al., 2016) is not easily accomplished from the publicly available data. The geocoding match rate at the address level for the OIS incidents was 100%, and the geocoding match rate for the use-of-force database was over 99%.

Descriptions of the Model

Given the three levels of variables previously mentioned, we first provide descriptive analysis of the differences between each of the variables in the OIS cases (shoot) compared to the use-of-force control cases (don't shoot). Next, we fit a logistic regression model predicting the probability of shooting conditional on the aforementioned individual-, situational-, and contextual-level variables:

$$\text{Prob}(\text{Shoot}) = f[\beta(\text{Individual}) + \gamma(\text{Situational}) + \psi(\text{Contextual})] \quad (1)$$

Here, the anonymous function f is the logistic function. This multiple regression equation allows one to control for different sets of characteristics. For example, one can assess the probability that a Latino individual is more likely to be shot than a White individual, controlling for whether that individual possessed a firearm.

A second logistic regression model incorporates officer characteristics (race, gender, and years of experience) among the subset of cases that only include one officer using force. This is in addition to the same individual-, situational-, and contextual-level variables from before. Because this model only examines incidents in which one officer used force, the situational variable for multiple officers using force is dropped from this analysis.

$$\text{Prob}(\text{Shoot}) = f[\beta(\text{Individual}) + \gamma(\text{Situational}) + \psi(\text{Contextual}) + \delta(\text{Officer})]. \quad (2)$$

Results

Table 2 provides the descriptive statistics for individual-level suspect information and the situational-level variables. Between 2003 and 2016, there was a total of 207 incidents in which officers shot at suspects.[10] From 2013 through 2016, there was a total of 1,702 incidents in which officers drew their service weapons and pointed it at suspects but did not shoot at suspects. For the current sample, then, the shooting rate is 11% (see bottom row of Table 2).[11]

Table 2. Descriptive Statistics for Offender-Level (Individual) Characteristics and Situation Characteristics.

	Shoot	Did Not Shoot	% Shoot
Suspect gender			
Male	201	1,571	11
Female	6	131	4
Suspect race			
White	34	239	12
African American	100	982	9
Latino	71	454	14
Other	2	27	7
Suspect weapon			
Gun	112	114	50
Other	55	1,257	4
Unarmed	40	331	11
Contact type			
Call for service	107	602	15
Officer initiated	52	257	17
Other	48	843	5
Officer injured			
Yes	43	77	36
No	164	1,625	9
More than one officer used force			
Only one officer	145	935	13
Two or more officers	62	767	7
Officer gave commands prior			
Yes	106	753	12
No	101	949	10
Total	207	1,702	11

The "% shoot" column calculates the percentage of cases in the sample that result in a shooting, conditional on the particular offender level or situational characteristics. For example, males were shot in 201 of 1,772 of the incidents, or 11%, compared to only 6 of 137, or 4%, for females. In terms of race, it appears that Whites, Latinos, and "Others" have a higher probability of being shot compared to the overall rate of 11%, but African Americans have a lower probability of being shot (only 9%).

For the racial breakdown of shootings, 100 of the 207 shootings (48%) were of African Americans, 34% were of Latinos, and 16% were of Whites. According to the 2010 Census from Dallas, 25% of the residential population is non-Hispanic African American, 42% is Hispanic, and 29% of the population is non-Hispanic White. In reference to the census data, African Americans are overrepresented in shootings (48% of shootings relative to 25% of the population), while Latinos and Whites are underrepresented (e.g., 34% of shootings for Hispanics relative to 42% of the population). But incorporating the control don't shoot cases alters the narrative. As the last

Table 3. Contextual-Level Variables (Measured at the Block Group Level).

	Shoot		Did Not Shoot	
	Mean (%)	*SD* (%)	Mean (%)	*SD* (%)
Percent in poverty	26	15	27	16
Percent female headed household	21	14	21	16
Percent White	20	24	20	23
Percent African American	35	32	35	31
Percent Hispanic	28	24	29	23
Violent crime rate per 1,000	56	84	46	73

Table 4. Shootings by Suspect Race and Being Armed.

Weapon	Shoot	Did Not Shoot	% Shoot
Armed with gun			
White	18	12	60
African American	55	70	44
Latino	38	30	56
Other	1	2	33
Other weapon			
White	11	194	5
African American	23	695	3
Latino	21	348	6
Other	0	20	0
Unarmed			
White	5	33	13
African American	22	217	9
Latino	12	76	14
Other	1	5	17

column in Table 2 shows, the percentage of shoot cases are roughly similar across racial categories.

For situational variables, when suspects were armed with guns, shootings occurred in 112 of 226 cases (50%). When an officer was injured, a shooting occurred in 43 of 120 cases (36%). These two situational factors appear to be the most significant factors contributing to whether an officer decides to shoot. And while two or more officers using force resulted in fewer shootings (62 of 829 cases, 8%), no such discrepancies were observed in situations in which commands were/were not given.

Table 3 provides means and standard deviations of the contextual-level variables measured at the block group level. The demographic characteristics are quite similar across both shoot and don't shoot cases, but the violent crime rate per 1,000 is slightly higher for shoot cases, suggesting the possibility of a contextual-level effect on officers' decisions to shoot in particular neighborhoods.

Table 5. Logistic Regression Predicting Probability of Officer Shooting at Suspect based on Individual-, Situational-, and Contextual-Level Variables.

Variable	*B*	*SE*	*OR*	CI Lower[a]	CI Upper[a]
Suspect variables					
Suspect male	0.35	0.48	1.42	0.56	3.62
Race (suspect White ref.)					
Suspect African American	−0.60	0.29*	0.55	0.31	0.97
Suspect Latino	−0.07	0.29	0.93	0.53	1.65
Suspect other race	−1.36	0.92	0.26	0.04	1.55
Situational variables					
Armed (not armed ref.)					
Suspect had gun	2.24	0.24***	9.38	5.82	15.10
Suspect had other weapon	−1.13	0.24***	0.32	0.20	0.52
Officer injured	2.01	0.26***	7.49	4.48	12.54
More two officers	−1.35	0.21***	0.26	0.17	0.39
Gave command	0.32	0.18†	1.38	0.96	1.97
Call type (call for serv. ref.)					
On view call type	−0.10	0.23	0.90	0.57	1.42
Other call type	−1.39	0.22***	0.25	0.16	0.39
Contextual variables					
Percent poverty	0.26	0.78	1.30	0.28	5.95
Percent fem. head house.	0.71	0.69	2.02	0.52	7.85
White perc.	−0.25	0.78	0.78	0.17	3.62
African American perc.	−0.13	0.61	0.88	0.27	2.90
Hispanic perc.	−0.47	0.73	0.63	0.15	2.64
Violent rate per 1,000	0.00	0.00†	1.00	1.00	1.00
Constant	−1.54	0.81†	0.21		
Nagelkerke R^2	0.42				

Note. CI = confidence interval.
[a]The CI lower and CI upper columns refer to the 95% CIs around the *OR*. *p* Values are symbolized as follows: †$p < .10$. *$p < .05$. **$p < .01$, ***$p < .001$.

Table 4 displays the probability of a shooting conditional on both race and being armed. For all races, it is clear that the probability of being shot is much higher for those who are armed than those who are not armed. Of suspects who were armed, White suspects were more likely to be shot compared to minority suspects. For those who were unarmed, Latino suspects and those not falling in the other racial categories (Other) were the most likely to be shot but that only varied between 9% (African Americans) and 17% (Other). If one were to employ a similar methodology to that of Nix, Campbell, Byers, and Alpert (2017), whose study focused strictly on shooting cases, one would find the probability of being unarmed and African American is 22% (22 cases of being unarmed and shot compared to a total of 100 African American suspects shot at in total). A synonymous calculation for White suspects is 15%, and for Latino suspects, it is 17%. Again, when focusing solely on shootings, a narrative of implicit racial bias emerges. However, *when don't shoot comparisons*

are included, the implicit bias narrative is substantially undercut, at least in the case of Dallas.

Table 5 provides the multiple logistic regression results including each of the individual-, situational-, and contextual-level variables. The table shows that while controlling for situational and contextual characteristics, African Americans are *less likely* to be shot. The referent category is White suspects, so the odds ratio of 0.55 suggests African Americans are nearly 45% less likely to be shot compared to White suspects in similar situations. The other racial categories do not have any statistically significant differences relative to the White reference category. Despite the unconditional relationship showing males as more likely to be shot than females, a suspect being male does not have a statistically significant effect on the probability of being shot, although the effect estimate is positive.

Compared to being unarmed, an armed suspect is much more likely to be shot, with an odds ratio of 9.38. The other situational variable that has a large impact on whether the officer shoots is whether an officer was injured, with an odds ratio of 7.49.[12] The category of an offender having another weapon beside a gun has a statistically significant *negative* effect on a shooting occurring. This may be partly due to the differences in how suspect weapons are recorded between the two databases; the use-of-force database has a much wider array of weapons noted and subsequently has a higher proportion of those cases. It is possible, though, that brandishing a nonfirearm weapon sends a stronger signal to officers as to the potential level of threat, compared to an unknown situation in which the officers have no information as to whether an offender is armed.

None of the contextual-level variables are statistically significant.[13] This is not surprising for the demographic characteristics of the community, which showed incredible balance in the marginal shoot versus don't shoot comparison. The violent crime rate has a positive effect on the probability of shooting, with a linear coefficient of .002, but fails to reach statistical significance at the $p < .05$ level. Even if the violent crime rate was 100 crimes per 100,000 higher in a particular block group, that would only result in an odds ratio of 1.2, a much smaller effect than either the suspect's race or any of the situational-level variables.

This is in contrast to the findings in Klinger et al. (2016) who found that neighborhoods with more gun violence have an increased number of police shootings. Our findings suggest that if neighborhood characteristics influence officer shootings, it likely occurs *before* the decision to shoot. For example, the neighborhood context may influence officers' decisions to initially draw their firearms during particular incidents but do not subsequently influence the officers' decisions to shoot or not shoot once guns are drawn.

The prior analysis focused on the *incident* level, which makes it difficult to incorporate officer-level characteristics directly into the analysis. This is because one incident can involve multiple officers. Of the 219 OIS incidents, 155 involved only one shooter, 34 involved two shooters, and 30 involved three or more shooters. In many cases, with more than two shooters, the officer-level characteristics (such as race, age, gender, and experience) are not available in the Dallas OIS data. It is for this

Table 6. Descriptive Statistics for Single Officer Events.

Variables	Shoot	Don't Shoot	Shoot (%)
Officer gender			
Male	136	852	14
Female	5	83	6
Race of officer			
White	65	591	10
African American	29	117	20
Latino	37	198	16
Other	10	29	26
Race of officer by race suspect			
White off., White suspect	14	94	13
White off., African American suspect	37	335	10
White off., Latino suspect	14	154	8
White off., other suspect	0	8	0
African American off., White suspect	2	12	14
African American off., African American suspect	17	83	17
African American off., Latino suspect	8	19	30
African American off., other suspect	2	3	40
Latino off., White suspect	3	24	11
Latino off., African American Suspect	15	102	13
Latino off., Latino suspect	19	71	21
Latino off., other suspect	0	1	0
Other off., White suspect	3	3	50
Other off., African American suspect	2	20	9
Other off., Latino suspect	5	6	45
Mean years experience	9	7	
Std. dev. years experience	8	7	
Total	141	935	

reason that we do not simply expand the data and conduct analysis at the *officer level*. Nevertheless, since a sufficient number of cases in which only one officer was involved are available, we were able to conduct a subset analysis of those 141 OIS incidents in which full information on the officer sex, race, and years of experience is available—as well as the race and gender of the suspect. For a comparable set of control cases, we only include instances in the use-of-force database in which one officer reported using force at the incident and drew their weapon. This eliminated around half of the don't shoot control cases, from 1,702 to 935. Table 6 displays the descriptive statistics for officers in this sample, and Table 7 displays a logistic regression analysis including officer gender, race, and years of experience into the regression equation.

Table 6 shows that male officers are more likely to shoot than female officers and that White officers shoot in a smaller percentage of incidents. The table also includes conditional breakdowns for each suspect and officer racial categories, but analysis among so many subsets is difficult given the smaller numbers. The highest noticeable

Table 7. Logistic Regression for Single Officer Events Predicting Probability of Officer Shooting at the Suspect.

Variable	*B*	*SE*	*OR*	CI Lower[a]	CI Upper[a]
Suspect variables					
Suspect male	−0.31	0.57	0.74	0.24	2.25
Suspect race (White ref.)					
Suspect African American	−0.30	0.37	0.74	0.36	1.53
Suspect Latino	0.04	0.38	1.04	0.49	2.20
Suspect other race	−1.00	1.04	0.37	0.05	2.80
Situational variables					
Weapon (not armed ref.)					
Suspect had gun	1.85	0.31***	6.36	3.49	11.56
Suspect had other weapon	−1.55	0.28***	0.21	0.12	0.37
Officer injured	2.55	0.38***	12.86	6.10	27.13
Gave command	0.45	0.24†	1.57	0.99	2.48
Call type (call for serv. ref.)					
On view call type	−0.14	0.30	0.87	0.48	1.56
Other call type	−1.48	0.28***	0.23	0.13	0.39
Contextual variables					
Percent poverty	0.95	0.99	2.58	0.37	18.02
Percent fem. head house.	0.88	0.88	2.42	0.43	13.66
White perc.	−0.24	1.00	0.79	0.11	5.54
African American perc.	−0.76	0.77	0.47	0.10	2.12
Hispanic perc.	−0.46	0.90	0.63	0.11	3.70
Violent rate per 1,000	0.00	0.00*	1.00	1.00	1.01
Officer variables					
Officer race (White ref.)					
Officer African American	0.67	0.33*	1.95	1.02	3.73
Officer Latino	0.31	0.28	1.36	0.78	2.37
Officer other race	1.69	0.48***	5.44	2.12	13.95
Officer male	1.12	0.57*	3.06	1.01	9.27
Years of experience	0.02	0.02	1.02	0.99	1.05
Constant	−2.44	1.12*	0.09		
Nagelkerke R^2	0.45				

Note. CI = confidence interval.
[a]The CI lower and CI upper columns refer to the 95% CIs around the *OR*. *p* Values are symbolized as follows: †$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

numbers, though, are African American officers shooting at Latino and Other suspects a higher proportion of the time. Officers in shoot cases have a slightly higher mean number of years of experience compared to officers in the control did not shoot cases.

Table 7 displays the logistic regression equation predicting whether an officer shoots. An officer being African American or in the Other race category (relative to White), or being male are each positively associated with the decision to shoot. The other suspect and situational variables maintain similar effect estimates compared to the prior analysis of all cases, but given the reduced sample size they also have larger

standard errors. As a result, the effect of African American subjects is not statistically significant in this subset analysis and is of half the magnitude (−.60 vs. −.30 for the linear coefficients). Still, there is no evidence that officers are *more likely* to shoot African American suspects in either sample.

Discussion and Conclusion

Our work adds to recent police shooting scholarship with the addition of control cases consisting of incidents in which officers pointed their weapons at a suspect but did not discharge them. We added these "control" cases to police shooting cases from the city of Dallas, then modeled real-world shoot/don't shoot decisions while controlling for various suspect, situational, and contextual variables deemed important in prior research. Contrary to the national implicit bias narrative, our analysis found that African Americans were less likely to be shot than White subjects, although when restricting the cases to only shootings since 2013 the effect was not statistically significant. Similar findings were observed in prior experimental work (James et al., 2016). Also, two situational factors were most related to the decision to shoot: A suspect having a weapon and whether an officer was injured. Similar findings were observed in early OIS research (Meyer, 1980; Milton et al., 1977) as well as recent scholarship (Nix et al., 2017).

It cannot be overemphasized that the addition of don't shoot control cases to police shooting cases dramatically alters the findings. With a simple census comparison (see Results and Discussion and Conclusion), African Americans were overrepresented in the shootings compared to Whites and Latinos. Similarly, when only examining shooting incidents (see first column of Table 4 and accompanying narrative), of those shot, African Americans had a higher probability of being unarmed compared to White suspects. However, by incorporating control cases in which officers did not shoot, we reached completely opposite inferences, namely, that African Americans have a lower probability of being shot relative to Whites.

We additionally factor in officer-level characteristics for cases in which only one officer used force and still find that the factors of the suspect being armed and an officer being injured were the strongest factors in predicting whether an officer would shoot (Table 7). While the finding of African Americans being less likely to be shot than Whites was smaller in magnitude in this analysis, it is still in the same direction. Thus, neither analysis hints at racial bias against African Americans, and each provides evidence that the opposite is true in officer decisions to use deadly force. One should note though that even if officer characteristics can explain the disparity between different races, it does not justify any observed disparities in shooting outcomes. For example, imagine we found that minorities were more likely to be shot at, but when controlling for officer experience the contrast between Whites and minorities was no longer statistically significant. This still indicates racial disparity for minorities, but one that is potentially explained by differing officer characteristics.

In our analysis, though even in the unconditional data, we find that African Americans are less likely to be shot at than Whites, but they experience more incidents in

which officers draw their weapon. As previously mentioned, an important limitation of the study is the fact that such an analysis is only relevant to officer decision-making *after* they have drawn their firearm. There could be several factors before this occurs that results in disparities between suspects of different races. For example, officers may be more likely to draw their firearm during specific encounters in high-crime neighborhoods. It is also the case that simple geographic policing, such as conducting more traffic stops at hot spots of crime, could result in more incidents in which officers believe they are justified drawing their weapon and using deadly force. Either would likely cause a disparity in the racial distribution of who officers drew and pointed their firearms at. A final plausible factor is that implicit bias may operate at the decision to draw a firearm initially. Our research only examining shoot and don't shoot cases cannot distinguish between these factors. But we provide evidence that at the stage where an officer decides to shoot, there does not appear to be evidence of implicit or overt racial bias, confirming prior simulation studies in a real world, observational setting.

It may of course be the case that officers have biases in one part of the decision-making process but not another. Fryer (2016) interpreted his findings as suggesting there are higher costs to shooting a weapon than to conducting lower levels of use-of-force, and thus officers are less likely to be biased in decisions to shoot. Fridell (2016) suggested that officers are more likely to be influenced by implicit biases in more ambiguous situations and by filtering cases in which officers have drawn and pointed their weapon they may have a more clearly defined context in which an officer acts and reacts. But it is also the case that one should not presume that officers are racially biased in their decision-making, and researchers should incorporate relevant situational and contextual-level information before claiming officers are racially biased (Jetelina, Jennings, Bishopp, Piquero, & Reingle-Gonzalez, 2017).

There are limitations to the current research. Even though Dallas may be a model to emulate for many police departments in terms of open information, its data are limited. For example, factors such as suspect resistance, the age and weight of the suspect and the officer, number of other officers or supervisors at the scene, the location of the incident (such as indoors vs. outdoors), the amount of time an officer has to assess an incident, information initially relayed by dispatch (such as whether the offender was armed), and whether the officer knew of the suspect's criminal history, seem important, but such items are not publicly available in Dallas.

We are pursuing future analyses using additional officer-level data (such as prior officer complaint histories) in coordination with the DPD that is not publicly available, but the limitations of the publicly available Dallas data are important to note. Current research using national-level databases often lack the same situational- and individual-level information (Nix et al., 2017; Selby et al., 2016) and so are subject to many of the same omissions. Understanding such limitations are critical in determining whether a national-level database will be an effective tool for oversight of police use of force. This is both in terms of variables included in such a data collection, as well as which cases are included.

Ultimately, it is difficult (if not impossible) to reduce a dynamic event such as an OIS into a simple set of variables. Even a variable as simple as whether an offender possessed a gun raises many questions such as whether the officer was aware of that fact before the shooting occurred (Binder & Scharf, 1980). Temporal aspects of situations in which officers have to make split second decisions are difficult to codify in any consistent way—or even for officers to know themselves after the fact (Burrows, 2007; Phillips, 2016). Given that many police departments are moving to body worn cameras, though, researchers may eventually be able to tease out such dynamic factors when examining instances of nonshootings. But such cameras should not be viewed as a panacea, as they will not be able to capture all of the contextual information an officer uses to make their decision.[14]

It is also possible that, despite our best efforts to control for differences between cases, the OIS incidents we analyzed were qualitatively different than the "displayed firearm" cases. Indeed, the "shoot/don't shoot" terminology we invoke does not perfectly capture the nuances of our design because we did not analyze individual officers who were faced with decisions of whether to shoot, as James et al. (2016). Their work, however, involved simulations. It would be impossible to discern in real-world cases whether implicit (or even overt) bias influences officers' shooting decisions, as gathering such information would require probing officers' thought processes during the heat of dangerous deadly force encounters. We feel our comparison of separate OIS and displayed weapon cases, while controlling for differences between them, represents the best approach with available data for more fully exploring the implicit bias issue. Instances in which officers pointed their firearm at a suspect are likely as close to control cases one is able to conceive of in realistic situations, in that in a counterfactual situation officers could have decided to shoot at the suspect.

Another limitation is that the analysis only examined one jurisdiction. Dallas is unique in that it provides open access data for shooting and use-of-force incidents, which is not the norm for the majority of police agencies in the United States. In addition, the fact that the DPD requires officers to fill out a use-of-force form may itself be a contributing factor to fewer police shootings (Jennings & Rubado, 2017). As such, it is impossible to make any inferences about racial bias in OIS in other jurisdictions or across the country as a whole—at least not until similar data are available from other jurisdictions. It is additionally limited in making inferences about officer behavior in Dallas over time. While the shooting cases come from 2003 through 2016, the control don't shoot cases are only available from 2013 through 2016. While we conduct analysis limiting shooting cases to the same temporal time period and make equivalent inferences (see Appendix A), we cannot say whether there was racial bias in officer decision-making before this time period, nor whether bias is increasing or decreasing over time.

Such limitations though should be compared to the alternative analyses attempting to identify antecedents to OISs. While recent analyses have attempted to identify racial bias in OISs nationwide (Nix et al., 2017), we believe only examining shooting cases is fundamentally limited in its ability to make such judgments. Such a worm's eye view of one department is necessary to incorporate incidents in which officers make a conscious choice not to shoot given such cases are not available in any national database.

Against a backdrop of current (Klinger et al., 2016) and historical (Fyfe, 1982b) calls for a national police shooting or use-of-force database, one needs to temper the potential benefits of such calls with the knowledge that any standardized database will ultimately be limited in the variables and cases collected. Even if one were to collect data on all police-involved shootings across the nation, along with data on comparable don't shoot cases, it would not afford researchers the opportunity to identify *all* factors figuring into the use-of-force calculus.

Nevertheless, we feel it is critical that future OIS and/or use-of-force data collections include not just instances of police shootings but also comparable don't shoot cases. Ideally, a national database would collect all police use-of-force encounters and contain additional variables for codifying different levels of force such as shootings, weapon draws, Taser applications, and empty-hand use of force. Such reporting could be accomplished as additional variables for the National Incident-Based Reporting System (Akiyama & Nolan, 1999). Such a database would have the added benefit of being able to examine officer use-of-force decisions across a wider array of characteristics (Jetelina, Reingle Gonzalez, & Bishopp, 2018) and to monitor police agencies for excessive use-of-force among a set of more common instances, and not just the rare circumstances in which officers' fire their weapons and/or kill suspects.

While public demand for a national-level registry only containing incidents of police use of deadly force in the United States would be much easier to accomplish in the short term, it is fundamentally limited in its ability to identify racial bias in police shootings. Only with the inclusion of a relevant set of cases when officers choose not to shoot can effective judgments be made about racial bias in police shootings, either for one particular police agency or across the nation as a whole. Having transparency in officer use of force and providing appropriate information for the public to evaluate police officer decision-making can improve the legitimacy of all police agencies.

This advice applies equally to individual agencies as it does to constructing a national-level database. Although more agencies are currently publicly posting OIS incident-level data (see https://www.policedatainitiative.org/), only examining OIS incidents simply focuses on the bad and does not allow one to identify instances in which officers chose to use lesser levels of force. Given that such counterfactual cases are critical in assessing racial bias in police decision-making, we believe it is important for other agencies to follow the Dallas police in releasing detailed lesser uses of force data sets as well as OIS incidents.

Appendix A:

Analysis of Only Cases in 2013–2016

The main analysis consists of officer-involved shooting (OIS) incidents from 2003 to 2016, but the control don't shoot cases are pulled from use-of-force reports from only 2013 through 2016. Use-of-force incidents were not recorded in a standardized database by Dallas Police Department prior to 2013. As such, it is a reasonable question to ask whether the time differential of the sample impacts the results. To address this, we

Table A1. Logistic Regression Predicting Shoot for Cases Only in 2013 Through 2016 (56 Shoot Cases and 1,675 Don't Shoot Cases).

Variable	*B*	*SE*	*OR*	CI Lower[a]	CI Upper[a]
Suspect variables					
Suspect male	0.87	1.07	2.40	0.29	19.54
Suspect race (White ref.)					
Suspect African American	−1.43	0.48***	0.24	0.09	0.62
Suspect Latino	−0.46	0.46	0.63	0.26	1.56
Situational variables					
Weapon (not armed ref.)					
Suspect had gun	2.92	0.48***	18.59	7.26	47.63
Suspect had other weapon	−0.54	0.48	0.58	0.23	1.50
Officer injured	2.10	0.47***	8.17	3.23	20.62
More two officers	−1.26	0.35***	0.28	0.14	0.56
Gave command	0.25	0.31	1.29	0.70	2.37
Call type (call for serv. ref.)					
On view call type	−0.17	0.38	0.84	0.40	1.79
Other call type	−1.75	0.41***	0.17	0.08	0.39
Contextual variables					
Percent poverty	0.81	1.41	2.25	0.14	35.60
Percent fem. head house.	0.40	1.21	1.50	0.14	15.84
White perc.	1.27	1.42	3.56	0.22	57.08
Black perc.	1.52	1.13	4.57	0.50	42.14
Hispanic perc.	1.29	1.36	3.64	0.25	52.58
Violent rate per 1,000	0.00	0.00	1.00	1.00	1.01
Constant	−4.75	1.61***	0.01		
Nagelkerke R^2	0.35				

Note. CI = confidence interval.
[a]The CI lower and CI upper columns refer to the 95% CIs around the *OR*. *p* Values are symbolized as follows: †$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

conduct analysis only on shootings post-2013 in which the temporal period overlaps both samples. Table A1 shows those logistic regression results.

The term for whether the suspect was other race needed to be dropped from this sample, as there were no cases of a suspect of other race being shot in the 2013 through 2016 sample. Because of this, we additionally dropped the 27 don't shoot cases that were recorded as other race. This results in a total of 56 shoot cases and 1,675 don't shoot control cases. The results are very similar to the analysis of the entire sample of shoot cases. The suspect having a gun and whether an officer was injured are again the strongest factors in predicting whether an officer shoots. Again in this sample, African Americans are less likely to be shot at than are White suspects, with the parameter being statistically significant and the effect size even larger in this subset. Inferences are not changed whether one limits the sample to only OISs in 2013 through 2016 or to OISs over the entire time period, suggesting there is no bias by incorporating shooting cases prior to 2013.

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Notes

1. In reference to pointing a firearm at a person, the current Dallas Police Department (DPD) use of force policy states, "officers may draw or display firearms when there is a threat or reasonable belief that there is a threat to life or they have a reasonable fear for their own safety and/or the safety of others." The policy does not require an officer to report drawing a firearm if it is done when the action is consistent with normal training standards. For example, felony traffic stops or building searches are commonly considered high risk and routinely include an officer displaying a firearm during the procedure. There may, however, be no immediate perceived threat to the officer. These types of incidents would not have been included in the use-of-force data files provided by the Dallas Police (see http://www.dallaspolice.net/reports/Shared%20Documents/General-Order-906.pdf, retrieved April 9, 2017). We would like to thank an anonymous reviewer for suggesting this point.
2. Fryer (2016) also examines other less-than-lethal uses of force among various databases and does find evidence of racial disparity.
3. We excluded the tragic incident on July 7, 2016 in which multiple DPD officers were killed and DPD deployed an explosive robot to kill the suspect shooter (incident # 165193-2016). We also excluded an accidental shooting of another officer (incident #199351X), an incident of shooting a dog attacking an officer (incident # 62683Z), and a false OIS report in which the officer was later charged with robbery (incident # 203505V).
4. Officers are not required to make a use-of-force report when they simply unholster their weapon and hold it at their side.
5. As with all case–control studies, changing the ratio of controls to cases only impacts the estimated intercept in logistic regression models, it does not impact the estimated effects for other explanatory variables (Prentice & Pyke, 1979).
6. Two block groups used in the analysis were missing demographic data because they had zero residences in their zones. One was the Dallas-Love airfield and the other was a block group that was entirely commercial area. Demographic data for each of these block groups were imputed based on the neighboring areas, but this was unlikely to influence the analysis, as only nine cases (two OIS and seven use-of-force) occurred in these two block groups.
7. Additionally, eight use-of-force cases that were not able to be geocoded were eliminated from the sample. All OIS cases were geocoded.

8. There were a total of nine cases which listed the suspect as having either a pellet gun, BB gun, paintball gun, or a toy gun. In all nine of these cases, the suspects were shot. Treating these nine cases as actual firearms makes no substantive difference in the reported analysis.
9. With respect to officer injury, it is not likely or common practice for officers to report an injury not sustained while in physical contact with the suspect. An inadvertent injury that would not justify the use of higher levels of force is not documented as part of a use-of-force incident.
10. Over one third of the OIS incidents, the officer did not hit the suspect in Dallas. This is consistent with prior work, such as White's (2006) study of OIS in Philadelphia from 1987 through 1992 that found over 50% of instances in which officers discharged their firearm missed the suspect (noninjurious).
11. When only considering cases where the samples overlap in time, from 2013 through 2016, the shooting rate is only 3%. See Appendix A for further details.
12. An additional situational variable we consider is time of day, although it is not available for all OIS incidents and is currently misreported in the 2016 use-of-force data. In brief, in the unconditional data, there appear to be a slightly higher probability of a shooting when it is dark, but there are no differences across shifts. In a logistic regression equation, the differences between dark and daylight are not statistically significant.
13. We additionally estimated this model as a multilevel logistic regression equation with random effects for block groups. The variance of the random intercept was zero though, so we report on the simpler logistic regression model that just incorporates the contextual-level variables.
14. Body cameras didn't come about in Dallas until 2014 and were provided to only about 200 officers at that time. Currently, approximately 1,000 patrol officers have body cameras. The publicly available data include no information regarding OIS cases in which an officer was, or was not, wearing a camera.

References

Akiyama, Y., & Nolan, J. (1999). Methods for understanding and analyzing NIBRS data. *Journal of Quantitative Criminology*, *15*, 225–238.

Alpert, G. P. (2016). Toward a national database of officer-involved shootings. *Criminology & Public Policy*, *15*, 237–242.

Alpert, G. P., Dunham, R. G., & MacDonald, J. M. (2004). Interactive police–citizen encounters that result in force. *Police Quarterly*, *7*, 475–488.

Best, D., & Quigley, A. (2003). Shootings by the police: What predicts when a firearms officer in England and Wales will pull the trigger? *Policing and Society*, *13*, 349–364.

Binder, A., & Scharf, P. (1980). The violent police–citizen encounter. *The ANNALS of the American Academy of Political and Social Science*, *452*, 111–121.

Burrows, C. (2007). Critical decision making by police firearms officers: A review of officer perception, response, and reaction. *Policing: A Journal of Policy and Practice*, *1*, 273–283.

Correll, J., Hudson, S. M., Guillermo, S., & Ma, D. S. (2014). The police officer's dilemma: A decade of research on racial bias in the decision to shoot. *Social and Personality Psychology Compass*, *8*, 201–213.

Correll, J., Park, B., Judd, C. M., & Wittenbrink, B. (2002). The police officer's dilemma: Using ethnicity to disambiguate potentially threatening individuals. *Journal of Personality and Social Psychology*, *83*, 1314.

Correll, J., Park, B., Judd, C. M., Wittenbrink, B., Sadler, M. S., & Keesee, T. (2007). Across the thin blue line: Police officers and racial bias in the decision to shoot. *Journal of Personality and Social Psychology*, *92*, 1006–1023.

Crawford, C., & Burns, R. (1998). Predictors of the police use of force: The application of a continuum perspective in Phoenix. *Police Quarterly*, *1*, 41–63.

Donner, C. M., Maskaly, J., Piquero, A. R., & Jennings, W. G. (2017). Quick on the draw: Assessing the relationship between low self-control and officer-involved police shootings. *Police Quarterly*, *20*, 213–234.

Durán, R. J., & Loza, O. (2017). Exploring the two trigger fingers thesis: Racial and ethnic differences in officer involved shootings. *Contemporary Justice Review*, *20*, 71–94.

Eberhardt, J. L., Goff, P. A., Purdie, V. J., & Davies, P. G. (2004). Seeing black: Race, crime, and visual processing. *Journal of Personality and Social Psychology*, *87*, 876.

Engel, R. S., & Calnon, J. M. (2004). Examining the influence of drivers' characteristics during traffic stops with police: Results from a national survey. *Justice Quarterly*, *21*, 49–90.

Fachner, G., & Carter, S. (2015). *An assessment of deadly force in the Philadelphia Police Department (collaborative reform initiative)*. Washington, DC: Office of Community Oriented Policing Services, US Department of Justice. Retrieved March 22, 2017, from https://ric-zai-inc.com/Publications/cops-w0753-pub.pdf

Fox, J. A., & Zawitz, M. W. (1999). *Homicide trends in the United States*. Washington, DC: US Department of Justice, Office of Justice Programs, Bureau of Justice Statistics.

Fridell, L. A. (2016). Racial aspects of police shootings. *Criminology & Public Policy*, *15*, 481–489.

Friedrich, R. J. (1980). Police use of force: Individuals, situations, and organizations. *The Annals of the American Academy of Political and Social Science*, *452*, 82–97.

Fryer, R. G Jr. (2016). *An empirical analysis of racial differences in police use of force* (No. 22399). National Bureau of Economic Research.

Fyfe, J. J. (1978). *Shots fired: An examination of New York City police firearms discharges* (No. 78-14335 UMI). Albany, NY: State University of New York at Albany, School of Criminal Justice.

Fyfe, J. J. (1982a). Blind justice: Police shootings in Memphis. *The Journal of Criminal Law and Criminology*, *73*, 707–722.

Fyfe, J. J. (1982b). Introduction. In J. Fyfe (Ed.), *Readings on police use of deadly force* (pp. 3–11). Washington, DC: Police Foundation.

Garner, J. H., & Maxwell, C. D. (2002). *Understanding the prevalence and severity of force used by and against the police: Executive summary*. Rockville, MD: National Criminal Justice Reference Service.

Geller, W. A., & Karales, K. J. (1981). Shootings of and by Chicago police: Uncommon crises part I: Shootings by Chicago police. *The Journal of Criminal Law and Criminology*, *72*, 1813–1866.

Goldkamp, J. S. (1976). Minorities as victims of police shootings: Interpretations of racial disproportionality and police use of deadly force. *The Justice System Journal*, *2*, 169–183.

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, *74*, 1464–1480.

Jacobs, D., & Britt, D. (1979). Inequality and police use of deadly force: An empirical assessment of a conflict hypothesis. *Social Problems*, *26*, 403–412.

Jacobs, D., & O'Brien, R. M. (1998). Determinants of deadly force: A structural analysis of police violence. *American Journal of Sociology*, *103*, 837–862.

James, L., James, S. M., & Vila, B. J. (2016). The reverse racism effect. *Criminology & Public Policy*, *15*, 457–479.

James, L., Klinger, D., & Vila, B. (2014). Racial and ethnic bias in decisions to shoot seen through a stronger lens: Experimental results from high-fidelity laboratory simulations. *Journal of Experimental Criminology*, *10*, 323–340.

James, L., Vila, B., & Daratha, K. (2013). Results from experimental trials testing participant responses to White, Hispanic and Black suspects in high-fidelity deadly force judgment and decision-making simulations. *Journal of Experimental Criminology*, *9*, 189–212.

Jennings, J. T., & Rubado, M. E. (2017). Preventing the use of deadly force: The relationship between police agency policies and rates of officer-involved gun deaths. *Public Administration Review*, *77*, 217–226.

Jetelina, K. K., Reingle Gonzalez, J. M. R., & Bishopp, S. A. (2018). Gradual escalation of use-of-force reduces police officer injury. *Injury Prevention*, *24*, 35–40.

Jetelina, K. K., Jennings, W. G., Bishopp, S. A., Piquero, A. R., & Reingle Gonzalez, J. M. (2017). Dissecting the complexities of the relationship between police officer–civilian race/ethnicity dyads and less-than-lethal use of force. *American Journal of Public Health*, *107*, 1164–1170.

Kaminski, R. J., Digiovanni, C., & Downs, R. (2004). The use of force between the police and persons with impaired judgment. *Police Quarterly*, *7*, 311–338.

Kesic, D., Thomas, S. D., & Ogloff, J. R. (2012). Analysis of fatal police shootings: Time, space, and suicide by police. *Criminal Justice and Behavior*, *39*, 1107–1125.

Klinger, D. A. (1997). Negotiating order in patrol work: An ecological theory of police response to deviance. *Criminology*, *35*, 277–306.

Klinger, D. A. (2012). On the problems and promise of research on lethal police violence: A research note. *Homicide Studies*, *16*, 78–96.

Klinger, D. A., Rosenfeld, R., Isom, D., & Deckard, M. (2016). Race, crime, and the micro-ecology of deadly force. *Criminology & Public Policy*, *15*, 193–222.

Klinger, D. A., & Slocum, L. A. (2017). Critical assessment of an analysis of a journalistic compendium of citizens killed by police gunfire. *Criminology & Public Policy*, *16*, 349–362.

Legewie, J., & Fagan, J. (2016). *Group threat, police officer diversity and the deadly use of police force* (Columbia Public Law Research Paper No. 14-512). Retrieved from ssrn.com/abstract=2778692

MacDonald, J. M., Manz, P. W., Alpert, G. P., & Dunham, R. G. (2003). Police use of force: Examining the relationship between calls for service and the balance of police force and suspect resistance. *Journal of Criminal Justice*, *31*, 119–127.

Mekawi, Y., & Bresin, K. (2015). Is the evidence from racial bias shooting task studies a smoking gun? Results from a meta-analysis. *Journal of Experimental Social Psychology*, *61*, 120–130.

Meyer, M. W. (1980). Police shootings at minorities: The case of Los Angeles. *The Annals of the American Academy of Political and Social Science*, *452*, 98–110.

Milton, C. M., Halleck, J. W., Lardner, J., & Abrecht, G. L. (1977). *Police use of deadly force*. Washington, DC: Police Foundation.

Mitchell, L., & Flin, R. (2007). Shooting decisions by police firearms officers. *Journal of Cognitive Engineering and Decision Making*, *1*, 375–390.

Morrison, G. B., & Vila, B. J. (1998). Police handgun qualification: Practical measure or aimless activity? *Policing: An International Journal of Police Strategies & Management*, *21*, 510–533.

Nix, J., Campbell, B. A., Byers, E. H., & Alpert, G. P. (2017). A bird's eye view of civilians killed by police in 2015. *Criminology & Public Policy*, *16*, 1–32.

Paoline, E. A., & Terrill, W. (2005). Women police officers and the use of coercion. *Women & Criminal Justice*, *15*, 97–119.

Paoline, E. A III, & Terrill, W. (2007). Police education, experience, and the use of force. *Criminal Justice and Behavior*, *34*, 179–196.

Parent, R. B., & Verdun-Jones, S. (1998). Victim-precipitated homicide: Police use of deadly force in British Columbia. *Policing: An International Journal of Police Strategies & Management*, *21*, 432–448.

Petrocelli, M., Piquero, A. R., & Smith, M. R. (2003). Conflict theory and racial profiling: An empirical analysis of police traffic stop data. *Journal of Criminal Justice*, *31*, 1–11.

Phillips, S. W. (2016). Eyes are not cameras: The importance of integrating perceptual distortions, misinformation, and false memories into the police body camera debate. *Policing: A Journal of Policy and Practice*. Online First. doi:10.1093/police/paw/008

Phillips, S. W., & Sobol, J. J. (2011). Police attitudes about the use of unnecessary force: An ecological examination. *Journal of Police and Criminal Psychology*, *26*, 47–57.

Pinizzotto, A. J., Davis, E. F., Bohrer, S. B., & Infanti, B. J. (2012). Law enforcement restraint in the use of deadly force within the context of 'the deadly mix'. *International Journal of Police Science & Management*, *14*, 285–298.

Prentice, R. L., & Pyke, R. (1979). Logistic disease incidence models and case-control studies. *Biometrika*, *66*, 403–411.

Reiss, A. J. Jr. (1972). *The police and the public*. New Haven, CT: Yale University Press.

Reiss, A. J. Jr (1980). Controlling police use of deadly force. *The ANNALS of the American Academy of Political and Social Science*, *452*, 122–134.

Ridgeway, G. (2016). Officer risk factors associated with police shootings: A matched case–control study. *Statistics and Public Policy*, *3*, 1–6.

Robin, G. D. (1963). Justifiable homicide by police officers. *The Journal of Criminal Law, Criminology, and Police Science*, *54*, 225–231.

Ross, C. T. (2015). A multi-level Bayesian analysis of racial bias in police shootings at the county-level in the United States, 2011–2014. *PLoS One*, *10*, e0141854.

Rydberg, J., & Terrill, W. (2010). The effect of higher education on police behavior. *Police Quarterly*, *13*, 92–120.

Schuck, A. M. (2004). The masking of racial and ethnic disparity in police use of physical force: The effects of gender and custody status. *Journal of Criminal Justice*, *32*, 557–564.

Schuck, A. M., & Rabe-Hemp, C. (2007). Women police: The use of force by and against female officers. *Women & Criminal Justice*, *16*, 91–117.

Selby, N., Singleton, B., & Flosi, E. (2016). *In context: Understanding police killings of unarmed civilians*. St. Augustine, FL: Contextual Press.

Sherman, L. W., & Langworthy, R. H. (1979). Measuring homicide by police officers. *Journal of Criminal Law & Criminology*, *70*, 546–560.

Singal, J. (2017). Psychology's favorite tool for measuring racism isn't up to the job: Almost two decades after its introduction, the implicit association test has failed to deliver on its lofty promises. *New York Magazine*. Retrieved June 14, 2017, from http://nymag.com/scienceofus/2017/01/psychologys-racism-measuring-tool-isnt-up-to-the-job.html

Smith, D. A. (1986). The neighborhood context of police behavior. *Crime and Justice*, *8*, 313–341.

Sorensen, J. R., Marquart, J. W., & Brock, D. E. (1993). Factors related to killings of felons by police officers: A test of the community violence and conflict hypotheses. *Justice Quarterly*, *10*, 417–440.

Sun, I. Y., Payne, B. K., & Wu, Y. (2008). The impact of situational factors, officer characteristics, and neighborhood context on police behavior: A multilevel analysis. *Journal of Criminal Justice*, *36*, 22–32.

Terrill, W. (2005). Police use of force: A transactional approach. *Justice Quarterly*, *22*, 107–138.

Terrill, W., & Mastrofski, S. D. (2002). Situational and officer-based determinants of police coercion. *Justice Quarterly*, *19*, 215–248.

Terrill, W., Paoline, E. A., & Manning, P. K. (2003). Police culture and coercion. *Criminology*, *41*, 1003–1034.

Terrill, W., & Reisig, M. D. (2003). Neighborhood context and police use of force. *Journal of Research in Crime and Delinquency*, *40*, 291–321.

White, M. D. (2001). Controlling police decisions to use deadly force: Reexamining the importance of administrative policy. *Crime & Delinquency*, *47*, 131–151.

White, M. D. (2006). Hitting the target (or not): Comparing characteristics of fatal, injurious, and noninjurious police shootings. *Police Quarterly*, *9*, 303–330.

Worden, R. E. (1989). Situational and attitudinal explanations of police behavior: A theoretical reappraisal and empirical assessment. *Law and Society Review*, *23*, 667–711.

Worden, R. E. (1995). The 'causes' of police brutality: Theory and evidence on police use of force. In W. A. Geller & H. Toch (Eds.), *And justice for all: Understanding and controlling police abuse of force* (pp. 31–60). Washington, DC: Police Executive Research.

Zimring, F. E. (1972). The medium is the message: Firearm caliber as a determinant of death from assault. *The Journal of Legal Studies*, *1*, 97–123.

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