EXPLORING OFFICER-INVOLVED SHOOTINGS WITH INTERACTION EFFECTS

A Deeper Understanding of How Race/Ethnicity Interacts With Other Factors in the Use of Deadly Force

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There has been a substantial body of research examining the reasons behind the police officers' use of deadly force. Little research has been done to examine how race and ethnicity interact with other factors in the use of deadly force. With data collected in Dallas, Texas, the present study examines the influence of individual, situational, and neighborhood characteristics on officers' decision to use deadly force. The present study also provides an alternative approach to logistic regression models by estimating predictive probabilities of officers shooting at citizens. The results show that when officers make decisions to shoot at citizens, situational factors are more important than demographic and neighborhood factors. Interactive effects constructed based on the race/ethnicity of the police officer and citizen showed almost no influence on the decision to shoot at a citizen. Finally, the present study concludes with a discussion of implications for policy development and future research.

Keywords: police; use of force; decision-making; law enforcement; quantitative methods

INTRODUCTION

Officer-involved shooting (OIS) incidents have been a subject of increased research in the past decade. The studies often examined correlates explaining an officer's decision to shoot at a citizen[1] (Fryer, 2019; Klinger et al., 2016; Nix et al., 2017; Ridgeway, 2016). Various factors are included in these studies, such as the officer and citizen characteristics (e.g., race/ethnicity and age), situational factors (e.g., the citizen had a weapon or the officer gave a command), and neighborhood features (e.g., poverty level or crime rate). Beyond these scholarly studies examining associations between different variables and the decision

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to shoot is an underlying assumption from some quarters that the police target minorities for the use of deadly force (Goff et al., 2016, as cited in Fridell, 2017; Menifield et al., 2019). Some have argued that police officers have a separate trigger finger for different races or ethnicities (Durán & Loza, 2017; Takagi, 1974), that is, the police decision to shoot is based on prejudice and "driven by racial discrimination by White officers" (Johnson et al., 2019, p. 15877), or there is "a personal taste for racism" from White officers (Lott & Moody, 2016, p. 6).

The literature review provided below will demonstrate that many, but not all, of the studies of OIS fail to report a strong association between the decision to shoot and the citizen's race/ethnicity. These findings are not the last word on whether prejudicial or discriminatory decisions occur in the officer's decisions to shoot. None of these studies consider the interaction effects that might illuminate the association between an officer and citizen's race/ethnicity and the decision of the officer to shoot. It is possible that a citizen's race/ethnicity does not have a direct effect on decision-making but is contingent on the officer's race/ethnicity. Researchers need to explore the interaction effects between the citizen's race/ethnicity and the officer's race/ethnicity to understand more clearly the effects of race or ethnicity on the decision to shoot. This study offers such an approach, suggesting that some combinations of police officer–citizen characteristics may be stronger predictors of the decision to shoot compared with the influence of these characteristics independently.

This study intends to contribute to the growing body of OIS research. First, hypotheses will be provided about the interactive effect of the citizen's race/ethnicity with the officer's race/ethnicity and several other situational and neighborhood variables. Integrating interactive effects in OIS shooting research has been absent. Doing this will allow a comparison of direct and interactive effects in police officer decision-making. Second, the data used for this study come from the Dallas Police Department. The data set includes all OIS shooting incidents regardless of the outcome (e.g., fatal, nonfatal, and misses), as well as when an officer draws their weapon, but does not shoot. Including a comparison of incidents in which the officer shot—regardless of the outcome—with those in which the officer did not shoot, but drew his or her weapon, will further add to the understanding whether police officers of one race or ethnicity are targeting citizens of another race or ethnicity.

LITERATURE REVIEW

Examinations of OIS incidents have occurred for decades. Several of the early descriptive studies, using city-level data, reported that commonly Black males were frequently shot (Fyfe, 1982; Geller & Karales, 1981; Meyer, 1980; Robin, 1963), and that the average age of those citizens who were shot was between 24 years (Milton et al., 1977) and 27 years (Robin, 1963). More recent studies utilized publicly available data gathered by the *Washington Post* to explore patterns within OIS incidents. Shane et al. (2017) found that if a citizen was armed or attacking the officer, they were likely to be shot and killed. Their results, however, do not demonstrate higher fatality rates for Black citizens. Tregle et al. (2019) reported inconsistent outcomes contingent on the benchmark used to calculate OIS rates. Black citizens were more likely than White citizens to be shot when population, police–citizen interactions, or total arrests is the benchmark. When they used violent crime arrests or weapons offense arrests as the benchmark, Black individuals were less likely to be shot by police officers. It is important to note that the *Washington Post* data did not

contain many important control variables, which did not allow estimating valid causal effects (Fryer, 2019; Klinger & Slocum, 2017), resulting in incomplete OIS analysis.

Research conducted in the past few years has substantially expanded upon descriptive and aggregate examinations of OISs. Several studies examined the features of individual shooting incidents. These studies follow the framework of earlier scholarship, examining individual, situational, and neighborhood characteristics to study use-of-force research (i.e., nonlethal verbal and physical force) and arrest decisions.

INDIVIDUAL FACTORS

The characteristics of the officers and citizens involved in a shooting are the most common focus of OIS research. The primary assumption is that the decision to shoot is racially or ethnically biased. Most of the incident-level data used in recent OIS scholarship consist of case-specific variables, allowing for various analytic strategies. For the most part, the findings indicate that Black citizens are no more likely to be shot than other races. Using data from police agencies in Texas, Jennings et al. (2019) reported that a White citizen is significantly more likely to die during an OIS event. Thirty years of data from Denver found that the proportion of people killed during an OIS was significantly higher for White citizens compared with Black citizens (Durán & Loza, 2017). Jetelina and her colleagues (2020) also used 10 years of OIS shooting incidents from the Dallas OIS data and reported no significant racial patterns in the shooting cases.

In 2018, Fryer argued that if research designs are going to uncover why officers might fire their weapons, scholars must also know when an officer "would have been legally justified in using lethal force, but chose not to" (p. 3). To address this problem, Fryer (2019) utilized OIS and Taser deployment records from the Houston Police Department to explore any racial differences in the decision to use lethal or nonlethal force. He reported that Black citizens were about 30% less likely to be shot. He also found no racial differences in the use of Tasers. Other researchers used OIS data and "aimed but did not shoot" data from the Dallas Police Department. These studies (Wheeler et al., 2018; Worrall et al., 2018) found that Black citizens were no more likely, and in some cases less likely, to be shot at than White citizens.

Using "did not shoot" control cases is not only informative, but also suffers from its own limitation. It is possible that when an officer draws their weapon, but does not shoot, that behavior itself is bias. Worrall et al. (2020) explored this using data from the Dallas Police. They reported that when analyzing cases in which an arrest was made, or the citizen was aggressive—cases where a gun might likely be drawn—Black citizens "were no more or less likely to have weapons drawn against them" (p. 15).

Others have used the open-source data gathered by *The Washington Post*, *The Guardian*, and other data-collection projects (i.e., Killed By Police, Mapping Police Violence, and Deadspin) to assess OIS incidents that resulted in death. Fagan and Campbell (2020) reported that Black citizens were more than twice as likely to be shot and killed than are citizens of other racial groups. Ross (2015) found that the probability of being killed as an unarmed Black is 3.49 times the probability of that for an unarmed White. Others found no evidence of bias toward Black citizens in the decision to shoot, but there appeared to be disparity in the number of Black citizens who were killed when holding a harmless object (Cesario et al., 2019).

Some scholars employing open-source data indicated no association between race and the decision to shoot. Lott and Moody (2016) found a "race-neutral" outcome for shootings, in that "Black officers are at least as likely to shoot and kill Black suspects" as officers of other races (p. 15). Johnson et al. (2019) found no evidence for disparity in the shooting deaths of Black or Hispanic people. Rather, their data indicated an anti-White disparity in OIS deaths. When the data are broken up by states, Shjarback and Nix (2020) found that Black citizens were no more likely to be killed in an OIS in Texas, but that they were more likely to be killed by police in California. Nix and his colleagues (2017) explored fatal police shootings when people were not attacking an officer or they were not armed when shot. They found that Black citizens were no different than White citizens to have been attacking an officer when shot. Nix et al. (2017) did report a marginal association for Black citizens who were more likely to be unarmed when shot than White citizens.

Understandably, believing that the police target minorities for deadly force implies that the race/ethnicity of the police officer is important to the decision to shoot at a citizen. The research findings, however, mirror the results of a citizen's race/ethnicity; there is little evidence that officer race/ethnicity contributes to the targeting of minorities. The officer's race/ethnicity was not related to the outcome (i.e., injured or killed) of a shooting in Denver (Durán & Loza, 2017). In Texas, an OIS is significantly less likely to result in citizen death when the officer is Black, but there was no association to death when the officer was White (Jennings et al., 2019). McElvain and Kposowa (2008) used data from the Riverside County Sheriff's Department in California and reported that White officers were more likely to shoot at a citizen as opposed to Hispanic officers (the reference group). New York City Police Department data for OIS incidents between 2004 and 2006 found that Black police officers had "three times greater odds of shooting" than White police officers (Ridgeway, 2016, p. 5). Donner and his colleagues (2017) examined nearly 2,000 personnel records from the Philadelphia Police Department from the 1990s. They reported that Black officers were more likely to have been involved in a shooting incident. Two studies using data from the Dallas Police Department failed to find any association between the decision to shoot and the officer's race or ethnicity (Reingle Gonzalez et al., 2019; Worrall et al., 2018). Others examined the Dallas OIS data, reporting that Black or "Other" officers, relative to White officers, were both positively associated with the decision to shoot (Wheeler et al., 2018).

SITUATIONAL FACTORS

Studies of police behavior in OIS incidents have included situational variables, which are the "structural characteristics of the immediate situation" (Worden, 1989, p. 668). When a citizen possesses a weapon, there is an association to the officer's decision to shoot (Jennings et al., 2019; Menifield et al., 2019; Shane et al., 2017; Wheeler et al., 2018; Worrall et al., 2018). Jetelina et al. (2020), however, found no association between possessing of any type of weapon and the decision to shoot. When a citizen was attacking the officer, they were more likely to be shot and killed (Nix et al., 2017; Shane et al., 2017). Worrall et al. (2018) measured "aggressive," rather than attacked, and found that a citizen characterized in this manner "was 29 times more likely to be shot than a nonaggressive suspect" (p. 13).

Several of the OIS studies examined the precipitating call that led to the officer–citizen interaction. The findings are inconsistent, but this may be an issue with how researchers operationalized the variables. When a call-for-service was the reference category, on-view

incidents were not related to the decision to shoot but "other call types" were less likely to result in a shooting (Wheeler et al., 2018). Jetelina et al. (2020) used "man with gun/active shooter" as a reference category, but traffic stops, robbery/burglary calls, and major disturbances were not related to a shooting outcome. Still, when the responding officer was Hispanic, there was an association with the decision to shoot. Jennings et al. (2019) included calls for crimes in progress, assistance, and traffic stops, but only "suspicious activity" calls were related to the decision to shoot. Furthermore, if a violent crime led to the police–citizen interaction, there was no association to the shooting (Menifield et al., 2019). Worrall et al. (2018), however, measured "high-crime-events" in several ways: calls for assistance, in progress crimes, suspicious activity, or serving a warrant. This variable was related to the decision to shoot in the "incident characteristics only" model, but disappeared when the full model (i.e., citizen and officer characteristics) was analyzed.

NEIGHBORHOOD FACTORS

A final aspect included in the research on OIS incidents is the area where the incident occurred. There is an assumption that environmental characteristics, such as the crime rate, poverty rate, or the racial makeup of the population, can influence the decisions of police officers to fire their weapons. A few studies of OIS examined the effects of the working environment, using aggregate state-level data (Jacobs & Britt, 1979) or city-level data (Jacobs & O'Brien, 1998; Sorensen et al., 1993). They reported that the violent crime rate was related to the decision to shoot. Jetelina et al. (2020) stated that the racial majority in the neighborhood population and the median income of the area were unrelated to the decision to use deadly force. Menifield et al. (2019) found no association between the violent crime rate or poverty rate and the likelihood that people killed by a police officer will be Black or Hispanic. Similarly, in their study of police shootings of Black citizens in large U.S. cities, Nicholson-Crotty et al. (2017) also failed to find an association between police shootings and the murder rate, poverty level, violent crime rate, or percent Black in the population. Wheeler et al. (2018) included similar measures and found that only the neighborhood's violent crime rate was related to the decision to shoot at a citizen. Finally, in a study of police shootings in St. Louis, Klinger et al. (2016) reported that "police shootings are more prevalent in neighborhoods with somewhat higher levels of firearm violence than others, but they occur less frequently in neighborhoods with the highest levels of firearm violence" (p. 19).

INTERACTIVE EFFECTS IN POLICING RESEARCH

The primary assumption inherent in the suggestion that OISs are the result of prejudice or discrimination is that White officers intentionally treat Black citizens differently in the decision to shoot. Mastrofski et al. (1996) explored the interaction effect of officer and citizen race to better understand the behavior of both groups. Relative to White officers and White citizens, citizen compliance with police requests were more likely in White Police/Minority Citizen dyads and less likely in Minority Officer/White Citizen dyads. Similar officer–citizen interaction effect terms were used by Belvedere et al. (2005) to study a citizen's resistance to arrest. They reported that Hispanic citizens resisted arrest from Hispanic officers; none of the other race combinations were significant in their study. Finally, the officer–citizen race combination was not related to the level of coercion used in a police–citizen interaction (Sun & Payne, 2004).

Others have used interaction terms to uncover contingent associations between two theoretically important independent variables and an outcome variable. Engel (2005) hypothesized that a combination of citizens' characteristics (i.e., race/ethnicity and social class) would predict a citizen's perceptions of justice, compared with how these characteristics independently influence perceptions. Engel found that low-income/Hispanic was the only interaction term related to the outcome variable. Klinger (1994) examined citizen demeanor and the arrest decision and included an interaction term combining citizen demeanor and the incidents level of criminality. The variable was not related to the arrest decision. Similarly, Engel et al. (2000) integrated several interaction terms combining demeanor and citizen characteristics (i.e., race/ethnicity and gender). They concluded that "with few exceptions, the effects of demeanor do not appear to be contingent on suspects' characteristics" (p. 256).

CURRENT STUDY

This study extends the body of OIS scholarship by utilizing interaction effects to explore the assumption that White police officers treat Black or Hispanic citizens differently in their decision to use deadly force. The public reaction to police shootings can result in visceral responses and accusations of prejudice in the decision to shoot. Some research suggested bias in the decision to shoot Black and minority citizens (Durán & Loza, 2017); however, as the literature above indicates, the issue is complex and OIS incidents can be influenced by different variables. Furthermore, some policing research suggested that Black police officers are more likely to shoot at a citizen (Johnson et al., 2019; Ridgeway, 2016; Wheeler et al., 2018). Therefore, this study created race or ethnicity interaction variables to determine whether these are significant predictors of the decision to shoot. Furthermore, because the literature review uncovered some association between the decision to shoot and other individual, situational, and neighborhood variables, several interaction terms were constructed around these variables and integrated into the analysis.

METHOD

DATA

This study employed the data utilized by Wheeler et al. (2018) in their examination of OIS incidents in Dallas (see Supplemental Appendix A [available in the online version of this article] for a list of other studies using similar data sets). The agency's Open Data Portal (https://www.dallasopendata.com/) includes all OIS shootings regardless of the outcome (i.e., killed, injured, and missed). Narrative information regarding the incident is included, offering some contextual and situational information about the shooting (e.g., whether the officer gave commands and whether the citizen fled). The narrative information was coded by a member of the Wheeler research team. Their study also included the police agencies' use-of-force data file (distinct from the agencies' open-source OIS data file), which contains incidents when a police officer used physical force against a citizen (i.e., hands, a Taser). The data file included information on whether a police officer drew his or her weapon and pointed it at a citizen (see Wheeler et al., 2018 for greater discussion of their data and their usage).

The time frame for the OIS data file is 2003 to 2016 and the time frame for the police use-of-force data file is 2013 to 2016. The OIS data included 219 cases in which officers shot at citizens, and the use-of-force data entailed 1,736 cases in which officers drew their

firearm, but did not shoot at citizens. Initially, there was a total of 1,955 OIS cases. Due to missing values on other variables (officer race/ethnicity, officer gender, officer experience, and unemployment rates), the present study comprised only 1,075 cases for statistical analysis, including 141 cases in which officers shot at citizens and 934 cases in which officers drew their weapon but did not shoot at citizens.

There was considerable missingness in the original data set, especially due to 852 missing values on officer race/ethnicity and 850 missing values on officer experience. There are 850 overlapping missing cases between officer race/ethnicity and officer experience, that is, all 850 cases with missing values for officer experience also have missing values for officer race/ethnicity. Despite this limitation, the present study is worth attending to at this point due to a lack of prior research on race/ethnicity interactions between officers and citizens in the use of deadly force. Within the author's knowledge, no prior OIS research explored such interactions between officer race/ethnicity and citizen race/ethnicity. This research endeavor can be one step forward to improve our understanding of how race or ethnicity interacts between officers and citizens. It will also stimulate additional research across locations using the more complete form of the data file. Implications for future research will be discussed in more detail later in the "Conclusion" section.

DEPENDENT VARIABLE

The dependent variable used in the present study was OIS, which was measured dichotomously (1 = *actually shot*, 0 = *displayed the weapon but didn't shoot*). It refers to the intentional or accidental discharge of a firearm at citizens by police officers. Among the total of 1,075 cases, there were 141 incidents in which officers shot at citizens. This was 13% of the total number of cases.

INDEPENDENT VARIABLES

Individual (Citizen and Officer) Characteristics

The citizen's race/ethnicity and gender were measured as dichotomous variables. Given that race/ethnicity in this study has four levels, three dummy variables were created for Black, Hispanic, and Other race citizens (each coded as 1, 0 otherwise). They are compared with the White reference group. A single dummy variable was used for gender (0 = female, 1 = male). In addition, the officer's race/ethnicity and gender were dichotomously measured (1 = Black, Hispanic, and Other race; 0 otherwise; 0 = female, 1 = male) as consistent with the citizen's race/ethnicity. It should be noted that race and ethnicity are different, and that a citizen can be both White and Hispanic or Black and Hispanic. The data file, however, does not provide this level of detail for citizens or officers. The officer's years of experience was measured as a continuous variable.

Situational Characteristics

There are four situational variables: citizen gun possession, officer injury, commands prior to shooting, and contact type. All situational variables capture the context settings of when and/or where police–citizen encounters occur. They were measured as dichotomous variables. First, the variable of citizen gun possession indicated whether the citizen in the encounter used any type of firearm (coded 1), as opposed to being unarmed or using other

types of weapon, such as a knife, blunt object, and paint ball guns (coded 0). Second, the variable of officer injury captures whether any officer was injured (coded 1) or not (coded 0). Third, the variable of prior commands demonstrated whether the officer gave any commands to citizens (coded 1) prior to shooting or not (coded 0). Fourth, the variable of contact type indicates whether the police–citizen encounter was initiated by the citizen (coded 1) or by the officer and other routes, such as traffic stops, off-duty jobs, and pedestrian stops (coded 0).

Neighborhood Characteristics

Neighborhood contextual variables were continuously measured at the census block group level. The current study included four indicators of neighborhood economic disadvantage, such as the percentages of people living under the poverty line, households receiving public assistance (food stamps or SNAP), unemployed people, and female-headed households. Each indicator alone, which measures different aspects of economic disadvantage, may not provide enough information to understand the whole picture of census block-level economic disadvantage. Thus, they were combined to a composite scale,[2] which is a more parsimonious and valid measure of neighborhood economic disadvantage. In addition, the percentage of minority populations (Black, Hispanic, and Asian) and the violent crime rate per 1,000 people were included.

PLANNED ANALYSES

This study used logistic regression analyses. The logit model can be written as follows:

$$ln\ \ P(y=1)/1-P(y=1)\ \ = b\_0+b\_1x\_1+b\_2x\_2+b\_3x\_3++b\_ix\_i, \qquad (1)$$

where b is a constant or coefficient. There is a three-step procedure. First, it examined the association between OISs and the individual (citizen and officer), situational, and neighborhood variables. Second, it examined whether the association between citizen race/ethnicity and OISs is moderated by officer race/ethnicity and other variables. Third, it computed the effects of independent variables on the change in the probability of dependent variables based on the logit model. To estimate the probability of a citizen being shot at in police–citizen encounters, the current study exponentiated Equation 1 and transformed the odds to the probability:

$$P(y=1)=e\text{^}\sum(b\_ix\_i)/1+e\text{^}\sum b\_ix\_i. \qquad (2)$$

Finally, it should be noted that the authors considered using multilevel modeling because shooting cases (Level 1) are nested within neighborhood variables (Level 2) that are measured at the census block level. Multilevel modeling is not viable with few individual cases per cluster. There is little or no variance within and between the census blocks.

RESULTS

DESCRIPTIVE ANALYSES

Table 1 reports the frequency counts and percentages of OISs in relation to each independent variable. As a preliminary analysis, this cross-tabulation report helped identify

TABLE 1: Descriptive Statistics: Dependent and Independent Variables, Total *N* = 1,075

Variable	Displayed, *n* (%)	Shot, *n* (%)	Total	χ^2(*df*)/*t*(*df*)
Citizen race/ethnicity				
White	133 (85.81)	22 (14.19)	155	2.83 (3)
Black	539 (88.36)	71 (11.64)	610	
Hispanic	250 (84.46)	46 (15.54)	296	
Other race/ethnicity	12 (85.71)	2 (14.29)	14	
Citizen gender				
Female	51 (91.07)	5 (8.93)	56	1.00 (1)
Male	883 (86.65)	136 (13.35)	1,019	
Officer race/ethnicity				
White	590 (90.08)	65 (9.92)	655	17.21 (3)**
Black	117 (80.14)	29 (19.86)	146	
Hispanic	198 (84.26)	37 (15.74)	235	
Other race/ethnicity	29 (74.36)	10 (25.64)	39	
Officer gender				
Female	83 (94.32)	5 (5.68)	88	5.64 (1)*
Male	851 (86.22)	136 (13.78)	987	
Officer experience (*SD*)	7.30 (7.04)	8.82 (7.70)	1,075	–2.35 (1,073)*
Citizen weapon				
Unarmed and other	884 (92.08)	76 (7.92)	960	146.69 (1)*
Gun	50 (43.48)	65 (56.52)	115	
Officer injury				
No	907 (88.66)	116 (11.34)	1,023	40.10 (1)**
Yes	27 (51.92)	25 (48.08)	52	
Prior commands				
No	567 (89.43)	67 (10.57)	634	8.67 (1)*
Yes	367 (83.22)	74 (16.78)	441	
Contact type				
On view and other	657 (89.75)	75 (10.25)	732	15.75 (1)*
Calls for service	277 (80.76)	66 (19.24)	343	
Neighborhood				
Econ. disadv., % (*SD*)	20.19 (11.15)	20.70 (10.24)	1,075	–0.51 (1073)
Minority pop., % (*SD*)	67.41 (25.49)	65.47 (25.55)	1,075	0.84 (1073)
Violent, per 1,000 (*SD*)	46.16 (72.71)	63.03 (93.16)	1,075	–2.47 (1073)*

*$p < .05$. **$p < .01$.

potential associations between the dependent variable and independent variables. For the citizen variables, Black citizens (11.64%) had a lower percentage of experiencing police shootings during police–citizen encounters, relative to White (14.19%), Hispanic (15.54%), and other race (14.29%) citizens. Male citizens (13.35%) had a higher percentage of officers shooting at citizens, compared with female citizens (8.93%). None of the citizen variables were statistically significant in the likelihood ratio chi-square tests.

For the officer variables, "other race" officers (25.64%) had a higher percentage of shootings during police–citizen encounters, as opposed to White (9.92%), Black (19.86%), and Hispanic (15.74%) officers. Male officers (13.78%) were more likely than female officers (5.68%) to engage in shooting incidents. The average years of work experience were 8.82 for shooting cases and 7.30 for nonshooting cases. Officers with greater experience were more likely to shoot at citizens, compared with officers with lesser experience. Significant associations were found between the probability of OISs and all officer variables.

TABLE 2: OISs by Citizen Race/Ethnicity and Officer Race/Ethnicity, Total *N* = 1,075

Officer race/ethnicity	Citizen race/ethnicity	Displayed, *n* (%)	Shot, *n* (%)	Total
White	White	94 (87.04)	14 (12.96)	108
$\chi^2(df) = 3.20$ (3)	Black	334 (90.03)	37 (9.97)	371
	Hispanic	154 (91.67)	14 (8.33)	168
	Other	8 (100)	0 (0)	8
Black	White	12 (85.71)	2 (14.29)	14
$\chi^2(df) = 3.36$ (3)	Black	83 (83.00)	17 (17.00)	100
	Hispanic	19 (70.37)	8 (29.63)	27
	Other	3 (60)	2 (40)	5
Hispanic	White	24 (88.89)	3 (11.11)	27
$\chi^2(df) = 3.42$ (3)	Black	102 (87.18)	15 (12.82)	117
	Hispanic	71 (78.89)	19 (21.11)	90
	Other	1 (100)	0 (0)	1
Other	White	3 (50)	3 (50)	6
$\chi^2(df) = 7.52$ (2)*	Black	20 (90.91)	2 (9.09)	22
	Hispanic	6 (54.55)	5 (45.45)	11
	Other	0 (0)	0 (0)	0
Total				
$\chi^2(df) = 2.831$ (3)				

Note. OIS = officer-involved shooting.
*$p < .05$.

For the situational variables, the percentages of officers shooting at citizens were much higher when the citizen was armed with a gun (56.52%), and the officer was injured (48.08%), as opposed to being unarmed and using other types of weapon (7.92%), and being not injured (11.34%). In addition, the percentage of officers shooting at citizens was higher when the officer gave commands to citizens prior to shooting (16.78%) than without any prior commands (10.57%). Furthermore, officers were more likely to shoot at citizens when they responded to a call for service (19.24%) than when they initiated the encounter on duty and encountered citizens through other routes (10.25%). There were significant associations between the probability of OISs and gun possession, officer injury, calls for service, and prior commands, respectively.

For the contextual variables, the neighborhoods where shooting cases occurred had higher violent crime rates (63.03 per 1,000 people) than the neighborhoods where no shooting cases occurred (46 per 1,000). Shooting incidents were more likely to occur in the neighborhoods with higher violent rates. The *t* tests showed no significant differences in the percentages of economic disadvantage and minority populations between both shooting and nonshooting cases. However, there was a significant difference for violent crime rates.

Table 2 reports the percentages of shooting cases conditional on the race/ethnicity of officers and citizens. This table helps identify potential interactive effects of race between officers and citizens on the probability of officers shooting at citizens in police–citizen encounters. Overall, the likelihood ratio chi-square test showed no significant association between the probability of OISs, officer race/ethnicity, and citizen race/ethnicity ($\chi^2 = 2.831$, $df = 3$).

When the officer is White, the probability of experiencing police shootings was higher for White citizens (12.96%) than Black (9.97%), Hispanic (8.33%), and "other race" (0%) citizens. When the officer is Black, the probability of experiencing police shootings was

much higher for "other race" citizens (40%). This finding should be interpreted with caution. Given the small number of total cases (five) for the "other race" group, the probability of officers shooting at citizens appeared to be very high (2/5 = .40) relative to White, Black, and Hispanic citizens. The addition of a single case to the shooting category would substantially increase the percentage of shooting cases as a fraction of the total number of cases, as opposed to that of nonshooting cases. The probability of Hispanic citizens being shot at by Black officers (29.63) was also high, relative to the probability of Black (17%) and White (14.29%) citizens.

When the officer is Hispanic, the probability of experiencing police shootings at citizens was higher for Hispanic citizens (21.11%), followed by Black (12.82%), White (11.11%), and "other race" (0%) citizens. When the officer is "other race," White (50.55%) and Hispanic (45.45%) citizens were more likely to be shot at than Black (9.09%) and other race (0%) citizens. The chi-square test indicates that there is a significant association between citizen race/ethnicity and OISs when the officer was "other race." The significant result should be interpreted with caution due to no or few call frequencies. It should be noted that "other race" categories for both citizens and officers were not included in the following logit models. With the addition of other race variables to the models, their standard errors often became enormously large due to the lack of cases for "other race" citizens and/or officers, as shown in Table 2.

MULTIPLE LOGISTIC REGRESSION ANALYSES WITH MAIN EFFECTS

Table 3 provides the results of logistic regression of OISs on individual (citizen and officer), situational, and neighborhood contextual variables. Given all other variables are held constant in the main-effect model, there were six significant results at the level of .01 or .05: officer race (Black), officer gender, citizen gun possession, officer injury, prior commands prior to shooting, and contact type. Unstandardized coefficients, standard errors, and odds ratios (ORs) are reported in Table 3.

For the officer variables, the odds ratio for Black officers was 2.20. The odds for Black officers to shoot at citizens were 2.20 times as high as the odds for White officers. In addition, the odds ratio for gender, 3.27, indicated that the odds for male officers to shoot at citizens were 3.27 times higher than the odds for female officers.

For the situational variables, the odds of citizens experiencing police shootings were 19.23 times higher when they possess any type of firearm than when they are unarmed or possess other types of weapon. The odds of citizens experiencing police shootings were 12.52 times higher when the officer was injured than when he or she was not injured. In addition, the odds for citizens experiencing police shootings were 1.79 and 2.75 times higher when they gave commands prior to shooting and when officers responded to calls for service, respectively.

MULTIPLE LOGISTIC REGRESSION ANALYSES WITH INTERACTION EFFECTS

As seen in Table 3, the present study tested whether the association between citizen race/ethnicity and OISs is moderated by officer race/ethnicity. When all possible interactions between citizen race/ethnicity and officer race/ethnicity are taken into account, none of them reached a conventional level of statistical significance (.05 or .01). In addition, the nonproduct coefficients for citizen race/ethnicity were not statistically significant,

TABLE 3: Logistic Regression of OISs on Individual, Situational, Neighborhood, and Race/Ethnicity Interaction Variables, Total *N* = 1,022 (Full Data, 2003–2016)

	Main			Officer race interaction		
Variable/model	*B*	*SE*	*EXP*	*B*	*SE*	*EXP*
Constant	–4.93**	0.85	0.01	–4.85**	0.88	0.00
Citizen variables						
Race (White ref.)/ethnicity						
Black	0.09	0.37	1.09	0.08	0.43	1.08
Hispanic	0.24	0.38	1.27	–0.51	0.50	0.60
Gender (male)	–0.14	0.54	0.87	–0.14	0.55	0.87
Officer variables						
Race (White ref.)/ethnicity						
Black	0.79*	0.32	2.20	0.59	1.05	1.80
Hispanic	0.37	0.27	1.44	–0.40	0.82	0.67
Gender (male)	1.18*	0.59	3.27	1.24*	0.60	3.46
Experience (years)	0.02	0.02	1.02	0.02	0.02	1.02
Situational variables						
Citizen gun possession	2.96**	0.26	19.23	3.06**	0.27	21.37
Officer injury	2.53**	0.36	12.52	2.47**	0.36	11.81
Prior commands	0.58*	0.23	1.79	0.58*	0.23	1.79
Contact type (CFS)	1.01**	0.24	2.75	1.04**	0.24	2.83
Neighborhood variables						
Economic disadvantage %	0.02	0.01	1.02	0.02	0.01	1.02
Minority population %	–0.01	0.01	0.99	–0.01	0.01	0.99
Violent crime rate	0.00	0.00	1.00	0.00	0.00	1.00
Interaction variables[a]						
B Officer × B Citizen				–0.10	1.11	0.90
B Officer × H Citizen				1.13	1.23	3.09
H Officer × B Citizen				0.24	0.91	1.27
H Officer × H Citizen				1.81†	0.95	6.11
Pseudo R^2		.30			.31	

Note. Other race/ethnicity for citizens (14 obs.) and officers (39 obs.) were dropped from the models due to no or few cases. OIS = officer-involved shooting; CFS = calls for service.
[a]B = Black; H = Hispanic; OR = Other race.
*$p < .05$. **$p < .01$.
†$< .10$.

indicating that citizen race/ethnicity had no overall association with the officers' decision to shoot at citizens.

Additional logistic regression analyses were conducted to examine the interaction effects of citizen race/ethnicity with other variables, such as officer gender, citizen gun possession, officer injury, economic disadvantage, minority population, and violent crime. Only odd ratios (OR) and their significance with asterisks are reported in Table 4. There was no significant interaction between citizen race/ethnicity and any of the moderator variables. Overall, there were no notable differences in their coefficient estimates between the models with and without interaction effects in terms of their magnitude, direction, and significance. As seen in Tables 3 and 4, citizen gun possession, officer injury, prior commands, and contact type remained significant in all models, other variables being held constant. Officer race (Black) and officer gender were also significant in most models. In the main-effects

TABLE 4: Logistic Regression of OISs on Individual, Situational, Neighborhood, and Other Interaction Effects, Total *N* = 1,022 (Full Data, 2003–2016)

Variable	Gender	Gun	Injury	ECON	MPOP	Violent crime
Constant	0.01**	0.01**	0.01**	0.01**	0.00**	0.01**
Citizen variables						
Race (White ref.)/ethnicity						
Black	0.53	1.09	1.37	1.14	1.57	1.12
Hispanic	2.69	1.34	1.64	0.67	1.56	1.07
Gender (male)	0.87	0.86	0.94	0.88	0.87	0.90
Officer variables						
Race (White ref.)/ethnicity						
Black	2.19*	2.20*	2.23*	2.15*	2.21*	2.14*
Hispanic	1.43	1.43	1.49	1.45	1.44	1.40
Gender (male)	3.19	3.31*	3.42*	3.37*	3.25*	3.24*
Experience (years)	1.02	1.02	1.02	1.02	1.02	1.02
Situational variables						
Citizen gun possession	19.54**	20.30**	19.24**	19.65**	19.60**	19.50**
Officer injury	12.37**	12.53**	34.31**	13.15**	12.63**	12.38**
Prior commands	1.79*	1.80*	1.84*	1.76*	1.79*	1.77*
Contact type (CFS)	2.75**	2.75**	2.82**	2.81**	2.77**	2.75**
Neighborhood variables						
Econ. disadvantage %	1.02	1.02	1.02	1.01	1.02	1.02
Minority population %	0.99	0.99	0.99	0.99	1.00	0.99
Violent crime rate	1.00	1.00	1.00	1.00	1.00	1.00
Interaction variables[a]						
Male Officer × B Citizen	2.10					
Male Officer × H Citizen	0.45					
Citizen Gun × B Citizen		1.05				
Citizen Gun × H Citizen		0.91				
Officer Injury × B Citizen			0.33			
Officer Injury × H Citizen			0.22			
Econ Disadv. × B Citizen				1.00		
Econ Disadv. × H Citizen				1.04		
Violent Rate × B Citizen					0.38	
Violent Rate × H Citizen					0.49	
Minority % × B Citizen						1.00
Minority % × H Citizen						1.00
Pseudo R^2	.30	.30	.30	.30	.30	.30

Note. Odds ratios are reported in the table. Other race/ethnicity for citizens (14 obs.) and officers (39 obs.) were dropped from the models due to no or few cases. OIS = officer-involved shooting; ECON = economic disadvantage; MPOP = minority population CFS = calls for service.
[a]B = Black; H = Hispanic.
*$p < .05$. **$p < .01$.

model, officer race (Black) and gender were consistently significant at the .05 level; but they lose their statistical significance when Citizen Race/Ethnicity × Officer Race/Ethnicity and Citizen Race/Ethnicity × Officer Gender interaction terms, respectively, were added to each interaction model. When a product term is added to the model, its constituting non-product terms should be interpreted with great caution. For example, given the presence of the interaction term (Black Officer × Black Citizen) in the model, the coefficient for Black officer no longer represented a nonconditional main effect on the probability of

OISs. Rather, its effect was conditional on the value of the other variable involved in the interaction term being zero. It is thus plausible that the significance of nonproduct terms can change in the presence of an interaction term. Specifically, the exponent of the coefficient for Black officer presents the odds ratio comparing Black with White officers only when the citizen is White. The odds for Black officers to shoot at citizens were 1.80 times as large as the odds of White officers for the case in which the citizen is White. In addition, the odds for male officers to shoot at citizens were 3.19 times larger than the odds for female officers when the citizen race is White.

MULTIPLE LOGISTIC REGRESSION ANALYSES WITH THE BALANCED DATA

The full data file oversampled shooting cases, given that they were collected for the longer period (2003–2016), compared with nonshooting cases (2013–2016). With the overlapping data, the present study conducted additional logistic regression analyses to reduce sampling bias. The frequency (percent) of shooting cases decreased from 141 (141/1,075 or 13%) in the full data to 37 (37/971, 3.8%) in the balanced data. The loss of shooting cases led to increases in the standard errors for both main and interaction effects associated with "other race" citizens and officers. Thus, both categories were dropped from the models. The total number of cases for analysis is 930 and the frequency (percent) of shooting cases is 37/930 (4%).

The results of logistic regression are reported in Table 5. Overall, the effects of most variables remained similar to those in Table 3 in terms of the direction, significance, and magnitude. Situational variables, except prior commands, were consistently significant at the .01 level and have greater effects on the probability of OISs than demographic and neighborhood variables. Given the similarity between the models with the full and balanced data, sampling bias may not be a critical concern in this study.

ESTIMATING THE PREDICTED PROBABILITY OF OISS, GIVEN A SET OF VALUES IN THE SIGNIFICANT INDEPENDENT VARIABLES

Interpreting logit models is controversial in the academic field and it is even more difficult for practitioners to interpret them. To overcome this difficulty, it is useful to transform log odds into probabilities that are often used in our daily life (Kim et al., 2008; Roncek, 1991). As yet, this statistical approach has not been widely used for the study of criminal justice. The present study attempts to go beyond simple logistic regression models by interpreting logit coefficients in terms of probabilities. As police use of force research has critical policy implications for law enforcement and public safety, it is imperative to help police administrators, as well as researchers, to clearly understand whether or how individual, situational, and/or neighborhood variables affect officers' decisions to shoot at citizens. It is anticipated that this approach will bridge the divide between criminal justice research and practice, and stimulate additional research in the study of policing.

Applying the method employed by Kim et al. (2008), this analysis estimated the probability of officers shooting at citizens based on the significant coefficients in the main-effect model in Table 5. Five hypothetical scenarios were created for comparison purposes. First, the probability of an OIS was estimated when the officer was Black (coded 1), the citizen possessed a gun (coded 1), the officer was injured (coded 1), and the officer responded to a call for service (coded 1). As seen in Figure 1, the predicted probability for this scenario was

TABLE 5: Logistic Regression of OISs on Individual, Situational, Neighborhood, and Race/Ethnicity Interaction Variables, Total *N* = 930 (Balanced Data, 2013–2016)

	Main			Officer race interaction		
Variable/model	*B*	*SE*	*EXP*	*B*	*SE*	*EXP*
Constant	–6.34**	1.42	0.00	–6.59**	1.52	0.00
Citizen variables						
Race (White ref.)/ethnicity						
Black	–0.56	0.64	0.57	–0.26	0.77	0.77
Hispanic	0.21	0.61	1.23	0.00	0.81	1.00
Gender (male)	–0.02	1.09	0.98	–0.09	1.09	0.92
Officer variables						
Race (White ref.)/ethnicity						
Black	1.00*	0.49	2.72	1.79	1.32	5.97
Hispanic	–0.14	0.49	0.87	–0.36	1.40	0.70
Gender (male)	0.53	0.81	1.70	0.66	0.85	1.94
Experience (years)	0.04	0.02	1.04	0.04	0.02	1.04
Situational variables						
Citizen gun possession	3.02**	0.43	20.41	3.11**	0.44	22.37
Officer injury	2.25**	0.64	9.49	2.23**	0.64	9.34
Prior commands	0.65	0.40	1.91	0.65	0.40	1.92
Contact type (CFS)	1.41**	0.41	4.09	1.44**	0.41	4.23
Neighborhood variables						
Economic disadvantage %	0.03	0.02	1.03	0.03	0.02	1.03
Minority population %	–0.00	0.01	1.00	0.00	0.01	1.00
Violent crime rate	0.00	0.00	1.00	0.00	0.00	1.00
Interaction variables[a]						
B Officer × B Citizen				–1.42	1.47	0.24
B Officer × H Citizen				–0.18	1.59	0.89
H Officer × H Citizen				–0.11	1.55	0.84
H Officer × B Citizen				0.70	1.59	2.02
Pseudo R^2		.29			.30	

Note. Other race/ethnicity for citizens (12 obs.) and officers (29 obs.) were dropped from the models due to no or few cases. OIS = officer-involved shooting; CFS = calls for service.
[a]B = Black; H = Hispanic.
*$p < .05$. **$p < .01$.

about 79%, serving as a reference point for comparison. All else being equal, this study subsequently changed the code of each variable from 1 to 0, one at a time. This procedure allowed estimating the effect of each variable on the probability of an OIS. The probability of an OIS is 58% when the officer was White (coded 0), 16% when the citizen did not possess a gun (coded 0), 29% when the officer was not injured (coded 0), and 48% when the officer was not dispatched to a call for service (coded 0).

According to the probability difference between the reference and comparison groups, situational characteristics had greater effects on the probability of OISs. The most important variable was gun possession, followed by officer injury, calls for service, and officer race (Black). When officers make decisions to shoot at citizens, situational factors are more important, and are dealt with first, than their personal belief related to demographic and neighborhood characteristics. The probability difference provides readers with a better understanding of OISs and associated individual, situational, and neighborhood influences.

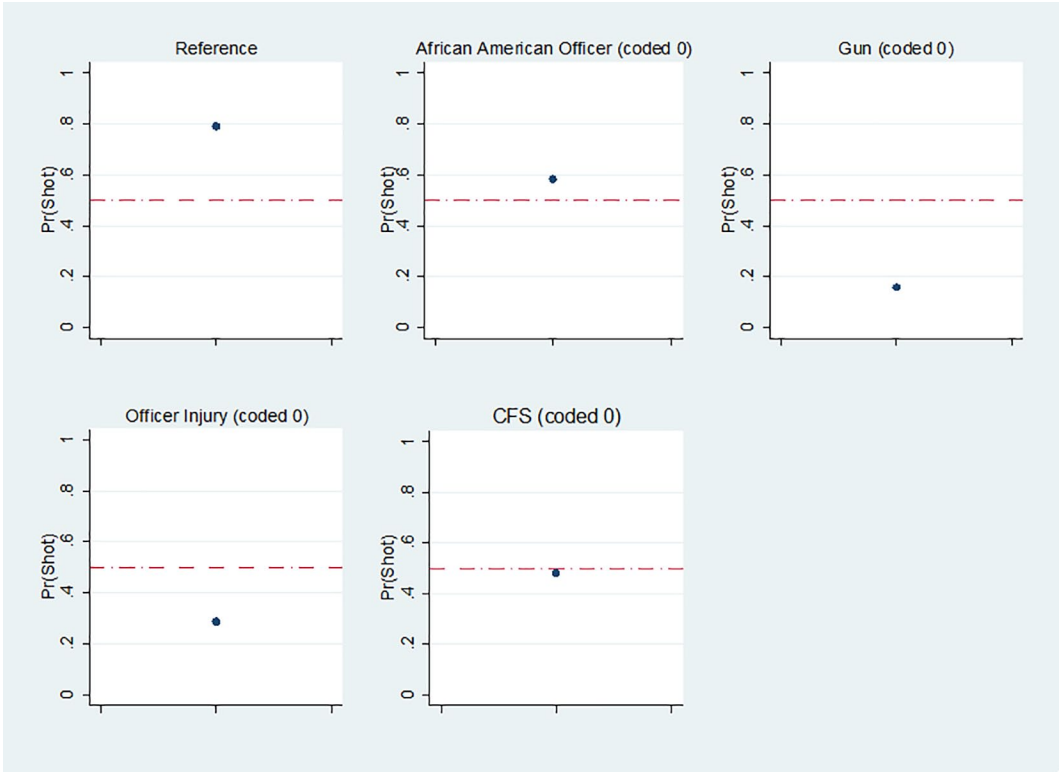

Figure 1: Five Hypothetical OIS Scenarios and Corresponding Predicted Probabilities
Note. OIS = officer-involved shooting; CFS = calls for service.

DISCUSSION

The present study examined the association between citizen race/ethnicity and officer shooting incidents and integrated theoretically important interaction effects into the analysis. Citizen race/ethnicity and gender were not significant determinants of OISs. Instead, officer race (i.e., Black) and gender (i.e., male) were found to be significant in predicting the probability of officers' decision to shoot. Situational variables (i.e., citizen gun possession, officer injury, prior commands, and contact type) were significantly associated with the officer's decision to shoot at citizens, which is in line with prior research (Jennings et al., 2019; Menifield et al., 2019; Shane et al., 2017; Wheeler et al., 2018; Worrall et al., 2018). Furthermore, neighborhood factors were not associated with the likelihood of officers shooting at citizens. These findings are comparable to the work of Jacobs and O'Brien (1998), Klinger et al. (2016), and Wheeler et al. (2018). This study also estimated the predicted probability for five sets of values given in the independent variables, allowing for a greater understanding of the situations in which OISs occur. In sum, officers are more attentive to the immediate situational factors in making their decisions to shoot than demographic and neighborhood factors.

The present study also tested whether the association between citizen race/ethnicity and OISs differs as a function of various moderator variables. None of the interaction effects reached a significance level of .05. As with other research, there is an absence of evidence

to support interaction effects to explain officer behavior (Engel et al., 2000; Klinger, 1994), particularly when the officer and citizen race or ethnicity are used to construct interaction effects (Sun & Payne, 2004).

Given that the results of one interaction term, Hispanic Officer × Hispanic Citizen, was observed at the .056 level, it is worthy of attention for research implications. As seen in Table 2, when the officer is Hispanic, the probability of experiencing OISs was higher for Hispanic citizens (21.11%) than Black (12.82%), White (11.11%), and "other race" (0%) citizens. In addition, the authors built many models with different combinations of independent variables. The interaction term, Hispanic Citizen × Hispanic Officer, was consistently associated at the .10 or .05 level across various model specifications. Given that Hispanic citizens constitute the majority of the Dallas population, further research attention is required to understand the extent and cause of intrarace/ethnicity OISs. This topic has not been fully examined and remains an open question.

These findings contribute to the body of scholarship that questions the public assumptions that police officers have different trigger fingers for other races or ethnicities. It should be noted, also, what this growing body of OIS research leaves open to question. First, a variety of early OIS research employed aggregated data (e.g., Jacobs & O'Brien, 1998; Sorensen et al., 1993) and the more recent studies employed open-source data (e.g., *Washington Post* and *Guardian* newspapers; e.g., Johnson et al., 2019; Nix et al., 2017; Tregle et al., 2019). There are problems, however, with macro-level data for understanding an individual officer's decision to shoot their weapon. Klinger et al. (2016) argued that state, city, or county data aggregates can "mask substantial heterogeneity within the units" (p. 197), and that within-neighborhood characteristics of large cities can uncover police officer behavior that may be related to those attributes. Shane (2018) made the case that aggregate data miss out on other variables of interest in OIS incidents, including officer and citizen characteristics (i.e., age, sex, and race/ethnicity), resistance, officer assignment, and years of service. Thus, there are justifiable concerns "about the veracity of conclusions drawn from national data" (Fridell, 2017, p. 509).

One of the concerns is that assertions of racial bias or discrimination based on macro-level data are touching the margins of the ecological fallacy. Scholars often overlooked the possible inaccuracy of using aggregate data to assert causation for individual officers' decision-making to fire their weapon. Second, this and most all other OIS research using either micro- or macro-level data do not in any way measure officer bias, prejudice, or discrimination. The only OIS research that attempted to integrate some measure of officer bias was James et al. (2016), who used an Implicit Association Test developed by Project Implicit at Harvard University. The authors reported no association between this measure of officer bias and the decision to shoot in a simulated OIS environment. While the literature review above demonstrated that researchers have used a variety of individual, situational, and neighborhood variables to understand the correlates of the shooting decision, none of the studies are able to obtain a measure of what a police officer is thinking at the time of the shooting. Thus, suggestions of bias, implicit or explicit, are speculative. This requires further research on officers' decision-making during police–citizen encounters.

CONCLUSION

The findings of this study indicate that police officers, White officers in particular, do not disproportionally target Black or Hispanic citizens. The results demonstrate consistency

with other research, indicating that situational factors are the force related to the officer's decision to shoot at a citizen. Furthermore, it points out the need for other OIS research to integrate the analytic approach used by Kim et al. (2008), which calculated the probability of recidivism, to estimate the probability of officers shooting at citizens based on the significant findings of logit models.

Using the same data employed by Wheeler et al. (2018), the present study extended it by examining interactions between officer race/ethnicity and citizen race/ethnicity, as well as the influence of officer experience on police shootings. This research, however, has limitations. First, while Dallas is a large police agency, it is only one of many, thus generalizing the findings to other agencies should be done with caution. Relatedly, it might be argued that the data set available from Dallas has been overused (see Supplemental Appendix A). Still, this study contributed to the body of OIS research by including additional officer characteristics (i.e., race/ethnicity, experience) and integrating interactive effects in both shoot and did-not-shoot incidents. In addition, the fear that the "did not shoot" data might itself reflect bias behavior is minimized based on the findings of Worrall et al. (2020). Furthermore, the findings would counter the notion that OISs invariably result from differential treatment of citizens on the basis of their race/ethnicity by officers in the decision to shoot. A second limitation is that there are other important variables that are unavailable for this study. This warrants caution in the inferences drawn from these findings. For example, the time of the shooting may impact outcomes. Grogger and Ridgeway (2006) discussed the "veil of darkness" method for benchmarking racial profiling behavior. It was argued that "if police are more prone to stop Black drivers, evidence of their bias will be more pronounced among stops made in daylight, when drivers' race can be more readily detected" (Worden et al., 2012, p. 94). The fundamental logic of their research can be applied to OIS incidents, in that officers would not be able to easily discern a citizen race during the night. If police officers are targeting Black or Hispanic citizen for deadly force, these incidents would occur most often during daylight hours. Finally, the data do not indicate whether the officers or citizens are of mixed race or mixed ethnicity. A review of the other OIS research shows similar operationalization, which is likely the result of how incidents are documented by the reporting agencies. Knowing this information can add depth to OIS research.

In the present study, sampling bias can be a concern as there are a large number of missing values on the officer variables. To address this problem, this study conducted additional logistic regression analyses without officer variables, using the full and balanced data (see Supplemental Appendix B [available in the online version of this article]), and compared the findings with those in the models with officer variables (Tables 3 to 5). Overall, there is no significant difference between the models with and without officer variables. Situational variables have greater effects on the probability of OISs than citizen demographic and neighborhood variables. Given the similarity between the models with and without officer variables, sampling bias may not be a critical issue in this study. One thing to note is that citizen race (Black) is statistically significant at the .05 level in the model with the balanced data. The odds of Black citizens experiencing OISs is .33 times as low as the odds of White citizens, which is consistent with Wheeler et al.'s (2018) findings. However, it is not clear whether this significant result can be attributable to the effect of citizen race (Black) or the lack of officer variables as controls. The model without officer variables has more cases but cannot control the effects of officer variables and estimate interaction effects of citizen and officer variables on the probability of OISs. The present

study will contribute to the existing literature by examining the interaction effects of citizen race/ethnicity with officer and other variables.

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SUPPLEMENTAL MATERIAL

Supplemental Appendices A and B are available in the online version of this article at http://journals.sagepub.com/home/cjb.

NOTES

1. The current body of officer-involved shooting (OIS) research used different terms to describe the person who is shot at by the police, including suspect, citizen, person, and civilian. Some studies used these terms interchangeably. This study chose to use "citizen."

2. The present study conducted a principal component analysis to decide whether four economic indicators measure the common factor of economic disadvantage. Based on Kaiser's rule, one component (2.54) had an eigenvalue greater than 1 and would be retained. The scree plot also confirmed the one component model. In addition, a reliability test was conducted to examine the property of the composite measurement scale with the four items. Cronbach's alpha was .79, indicating good internal consistency among the indicators.

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