2016

Group Threat, Police Officer Diversity and the Deadly Use of Police Force

Joscha Legewie
joscha.legewie@nyu.edu

Jeffrey Fagan
Columbia Law School, jfagan@law.columbia.edu

COLUMBIA LAW SCHOOL

PUBLIC LAW & LEGAL THEORY WORKING PAPER GROUP

PAPER NUMBER 14-512

GROUP THREAT, POLICE OFFICER DIVERSITY AND THE DEADLY USE OF POLICE FORCE

JOSCHA LEGEWIE

&

JEFFREY FAGAN

December 2016

Group Threat, Police Officer Diversity and the Deadly Use of Police Force[1]

Joscha Legewie[2] and Jeffrey Fagan[3]

Abstract

Officer-involved killings and racial bias in policing are controversial political issues. Prior research indicates that (perceived) group threat is an important explanation for variations in police killings across cities in the United States. We argue that a diverse police force mitigates group threat and thereby reduces the number of officer-involved killings. Count models support our argument. They show that group threat is largely driven by the threat of black crime. Black-on-white homicides increase officer-involved killings of African Americans but black-on-black homicides and measures for political and economic threat do not. However, a diverse police force reduces the influence of group threat lowering the number and rate of officer-involved killings of African Americans. The findings represent one of the first analyses of an important contemporary issue based on a recent and high-quality dataset from January 2013 to June 2016. By highlighting the interaction between group threat and the representation of minority groups in police departments, our research advances group conflict and threat theories with important theoretical and policy implications for law enforcement and representative bureaucracies more broadly.

[1] This project was supported by the Russell Sage Foundation (grant no. 93-17-04).

[2] Yale University, Department of Sociology. E-mail: joscha.legewie@yale.edu

[3] Columbia University, Law School. E-mail: jaf45@columbia.edu

Introduction

Around 12.02 pm on August 9, 2014, an 18-year old African-American teenager named Michael Brown was fatally shot by Darren Wilson, a white 28 year-old Ferguson police officer. Accounts of the incident differ widely, but the event and others like it drew national attention to killings of African Americans at the hands of police. The outrage in the American public and the serious nature of the incidents make the use of lethal police force a major concern for racial and ethnic disparities in criminal justice. Yet, research on the structural predictors of police-caused homicides is surprisingly rare and impeded by low quality data (Hirschfield 2015; Klinger 2012; Zimring forthcoming). This article uses a new and contemporary dataset on officer-involved killings to examine variations in police use of deadly force across cities in the Unites States.

Extending theories of intergroup conflict and threat, we argue that a diverse police force mitigates group threat and thereby reduces the number of officer-involved killings. (Perceived) minority threat is a prominent account in research on variations in formal levels of social control such as police use of force. A diverse and inclusive police force, however, has the potential to reduce tensions and weaken the influence of factors that are commonly associated with perceived group threat. Increased police legitimacy, the knowledge and empathy of minority officers, and more frequent interracial interactions within the police might attenuate tensions between the police and African-American communities. Homogenous police departments, in contrast, might strengthen the "us versus them" or "blue versus black" dynamic. This argument implies both a direct effect of police diversity on officer-involved killings of blacks and, more importantly, a negative interaction between factors related to group threat and an inclusive police force.

To test our argument, we examine variations in the number and rate of police-involved deaths of African-Americans and non-Hispanic whites across cities with over 100,000 residents in the United States (supplementary analysis focus on smaller cities

with over 50,000 residents). For this purpose, we construct a comprehensive database of officer-involved killings between January 2013 and June 2016 based on verified crowd-sourced information from "Fatal Encounters" (Burghart 2016). We supplement these data by incorporating information from other sources and by performing our own coding and classification of fatal encounters with the police. Our dataset provides several key advantages compared to previous work based on "justifiable homicides of felons" from the Federal Bureau of Investigation (FBI) (Jacobs and O'Brien 1998; Smith 2003; Willits and Nowacki 2014; Zimring and Arsiniega 2015). First, it is a more complete sample of police-involved killings that integrates information from several sources. Second, it is more representative of the entire United States, overcoming the missing observations that result from the non-participation of some police agencies in some years in the FBI archive. Third, it is based on a clear definition of officer-involved killings that is derived from criminal law. We integrate the dataset on police killings with several other relevant datasets for this analysis. For each major city, we link the number of officer involved killings to population data from the U.S. Census, crime data from the F.B.I. Uniform Crime Reports, and information on police agencies from the Law Enforcement Management and Administrative Statistics (LEMAS) data series collected by the Bureau of Justice Statistics.

Using negative binomial regression, we find that the number and rate of officer-involved killings of African-Americans but not non-Hispanic whites are higher in cities with a larger rate of black-on-white homicides as a measure of black crime threat. Black-on-black homicides, violent crimes more broadly and measures of political and economic threat, however, are unrelated to officer-involved killings of blacks, indicating that the threat of black crime is a major driver of officer-involved killings of African-Americans. We also show that a diverse police force reduces the influence of black crime threat lowering the number of officer-involved killings of blacks. These findings are consistent for the number of officer-involved killings, the rate per population and the rate per arrest.

They make new and substantial contributions to our understanding of a highly contentious social, cultural and political issue, and inform policing behavior more broadly. By highlighting the interaction between group threat and the representation of minority groups in police departments, our research advances group conflict and threat theories with important theoretical and policy implications for law enforcement and diverse workforces in representative bureaucracies more broadly.

Minority Threat and the Deadly Use of Police Force

Over 20 years after the Rodney King beating sparked a public outcry about racism in the police force, the excessive use of force remains a matter of great concern and a divisive political issue making national headlines. A prominent explanation of racial and ethnic disparities in many areas of criminal justice including the deadly use of police force builds on political or threat explanations. Based on broader theories of race relations and group threat (Blalock 1967; Blumer 1958), this explanation focuses on the ways in which dominant or privileged groups use the police, criminal law and other state instruments to maintain racial hierarchies and inequalities when their interests are threatened (Baumer, Messner, and Rosenfeld 2003; Jacobs, Carmichael, and Kent 2005; Jacobs and O'Brien 1998; Liska 1992; Smith and Holmes 2014; Stults and Baumer 2007; Turk 1966). Racial disparities in arrests, sentencing, the use of (deadly) police force and other coercive crime control mechanisms are partly driven by deeply rooted social divisions that separate dominant and subordinate racial and ethnic groups (Chambliss 2001; Liska 1992; Smith and Holmes 2014).

An important empirical prediction from this tradition is the *minority threat hypothesis*. It states that the minority population share increases the perceived level of threat in the general population, which in turn motivates aggressive policing strategies including

the use of police force or at least gives the police additional leeway (Liska 1992). As discussed by Blalock (1967) and elaborated in subsequent work, people feel threatened by the presence of out-group members because of real or perceived competition between ethnoracial groups over scarce resources. The literature generally distinguishes between political mobilization, economic competition, and the fear of minority crime as three distinct sources of racial or minority threat (Blalock 1967; Liska 1987; Liska & Chamlin 1984; Eitle et al 2002; King and Wheelock 2007; Stults and Baumer 2007).

First, *political threat* (also known as power threat) is based on fears of increasing political influence of African-Americans or other minority groups that challenge the political dominance of whites (Blalock 1967). As the share of African-Americans in the population rises or as they gain increasing political power in the form of representation among political officials, political threat becomes salient among whites. They perceive African-Americans as a threat to their political status and influence. However, if the black population or political officials achieve majority, the political influence of blacks should increase and as a result the amount of social control over blacks should decline (Blalock 1969; Horowitz 1985; Turk 1969). This argument implies a curvilinear relation between black population share or political representation and police use of force.

Second, theories of group threat argue that minorities are perceived as posing an *economic threat* (Blalock 1967; Liska and Chamlin 1984; Quillian 1995). This argument is prominent in research on riots, lynchings (Beck & Tolnay 1990; Olzak 1990, 1992), interracial killings (Jacobs & Wood 1999) and police use of force (Liska and Yu 1992). It suggests that a high unemployment rate and competition between whites and blacks for jobs or other finite economic resources results in an increase in perceived economic threat and ultimatively higher levels of social control imposed on blacks.

Third, Turk (1966) and a number of subsequent authors (Eitle, D'Alessio, and Stolzenberg 2002; Liska and Chamlin 1984; Stults and Baumer 2007) argue that perceived threat is not necessaily based on political or economic factors but instead driven by *threat*

of black-on-white crime. Similar to other threat arguments, the threat of black crime hypothesis postulates that the perception of crime threat increases the popular and political demand for social control including the use of police force against African-Americans. From this perspective, the decision making of the police and others actors in the criminal justice system, however, is not based on political or economic factors but instead driven by fear of black crime and white victimination at the hand of minorities.

In short, group threat theories suggest that minority populations trigger perceived political, economic and crime threat among members of the majority population. Perceived threat, in turn, raises popular and political support for aggressive policing strategies including the use of police force or at least gives the police additional leeway. Accordingly, majorities, businesses, and political leaders demand increased social control over minority communities, which ultimately leads to increased use of police force. Empirical studies generally support the idea that the relative size of the black population is related to different aspects of social control such as the size of the police force, arrests, incarceration rates and other (Eitle et al. 2002; Jackson and Carroll 1981; Jacobs and Carmichael 2002; Jacobs and O'Brien 1998; Legewie 2016; Liska 1992; Smith and Holmes 2014; Stults and Baumer 2007). Focusing on the deadly use of force, Jacobs and O'Brien (1998) use data from the early 1980s and find that the number of officer-involved killings of blacks is higher in cities with a larger proportion and recent in-migration of African-Americans. Ross (2015a) similarly links racial disparities in officer-involved shootings to the proportion of black residents and the overall level of inequality. However, previous research on officer-involved killings does not explicitly distinguish between political, economic and crime threat as three distinct dimensions. Related work on race-specific arrests and the size of the police force points at the importance of this distinction (Eitle et al. 2002; King and Wheelock 2007; Stults and Baumer 2007). In particular, Eitle et al (2002) use county-level data from South Carolina and find that black-on-white crime sub-

stantially increases black arrest rates. Black-on-black crime as well as political and economic threat, however, are unrelated to arrests. Along similar lines, Stults and Baumer (2007) explicitly measure perceived economic and political threat, whites' fear of crime and prejudice as key components of the underlying process. They find that fear of crime and perceived economic threat account for a substantial part of the relation between minority population share and police size.

This study examines political, economic and crime threat as three distinct threat-based explanations of police use of (deadly) force. Despite the prominence of racial threat, previous research has largely ignored the racial/ethnic composition of the police department as a potentially important moderating factor. Here, we argue that a diverse police force mitigates group threat and thereby reduces the number of officer-involved killings.

Group threat and the racial composition of the police force

Group threat theories generally emphasize the interest and threat perception of the dominant group as a driving factor for minority threat. Recent work, however, also highlights that police are a distinct social group with their own interests such as concerns about safety, legal protection, and public image (Holmes 2000; Smith and Holmes 2014). These interests influence police behavior including responses to minority citizens on the street such as the use of police force. Indeed, Holmes argues that the "salience of threats perceived directly by the police should be more important than distal threats to the dominant group in predicting their street-level responses to minorities" (Holmes 2000:350). Along similar lines, Legewie (2016) shows that violent attacks against police officers increase the subsequent use of police force against African-Americans but not against other groups. From this perspective, group conflict based on the notion of the police against minority groups and the perceived level of threat among officers are important drivers of police use of (deadly) force. The contemporary debate reinforces this perspective with "blue

lives matter" emerging as a counter movement to "black lives matter". The focus on police as a distinct social group also highlights potentially mitigating factors. Here, we argue that African-American officers in the police force mitigate group threat and thereby reduce the number of officer-involved killings.

Diversifying the force and minority representation in policing emerged as an important issue in the 1960s (Stokes 1997). Partly in response to the urban riots and concerns about tensions between police and minority groups, many argued that law enforcement agencies should ethnically and racially represent the communities they serve. Indeed, "virtually every national report on the police over the past twenty years has recommended increased employment of minorities and women" (Walker 1985:555) including President Obama's Task Force on 21st Century Policing. The increasing calls for a proportional representation of minorities in the ranks of the police led to a series of political and administrative steps to hire African American officers (Stokes 1997; Walker and Katz 2011). As a result, the proportion of African-American officers increased substantially over the last decades. In 2013, it reached 11.0% in our sample of cities compared to 19.2% among residents.[4] The overall increase in minority police conceals substantial variations across cities in the United States. Minority members remain underrepresented in most police departments (see Figure 2 in the results section). Prominently, the protests in Ferguson confronted a largely black community with a nearly all-white police force (3 out of 53 sworn officers in the Ferguson Police Department are African American).

Despite the consistent calls for increased racial diversity in the police force, few empirical studies have examined the relation between the racial composition of police departments and police use of force. The findings are mixed. Smith (2003), for example, examines the relation between police officer racial diversity and the number of officer-

[4] The estimates are based on LEMAS data (see below for further details).

involved killings using F.B.I. data from the Supplementary Homicide Reports. His findings indicate that officer diversity is *unrelated* to the number of police killings. Along similar lines, Hickman and Piquero (2009) and Ozkan et al (2016) find that minority representation in the police force is unrelated to complaints about police use of force and the number of assaults on police officers as a measure of perceived police legitimacy (also see Barrick et al 2014). Smith and Holmes (2014), however, find that the proportional representation of African-Americans in the police force is related to a lower number of complaints about excessive use of police force. Willits and Nowacki (2014) report a similar pattern in their sample of large cities. Aside from revisiting the ongoing debate about the effect of officer diversity, our argument extends previous research by focusing on the link between group threat and the representation of African-Americans in the police force.

Based on previous work on minority representation in police departments and broader sociological theories, we argue that minority representation not only reduces police killings but also mitigates group threat. The presence of African American officers influences policing through four processes. First, minority representation increases police legitimacy among minority residents, which has important implications for police-citizen interactions (Bell 2002; Theobald and Haider-Markel 2008; Weitzer 2000). Following the literature on symbolic representation, public attitudes and behavior towards state bureaucracies can change simply based on the characteristics of representatives or non-elected officials (Gay 2002; Mansbridge 1999; Theobald and Haider-Markel 2008). Minority representation signals that police officers share similar values and experiences. The officers are seen as more knowledgeable about minority concerns and culture, which increases trust among minorities. Recent empirical evidence from police-citizen interactions (Theobald and Haider-Markel 2008) and in other areas such as political institutions (Banducci, Donovan, and Karp 2004; Gay 2002; Scherer and Curry 2010) supports this argument. Increased trust and legitimacy, in turn, attenuate tensions between the police

and African-American communities and potentially de-escalates tensions in police-citizen interactions (Bell 2002; Theobald and Haider-Markel 2008).

Second, minority officers are more knowledge and empathetic about minority concerns and culture. This knowledge and empathy might influence their own behavior and shape the overall department culture spreading to other officers. Similar to substantive representation in parliaments, minority presence in the police introduces different views that are aligned with and reflect minority interests (Sun and Payne 2004). A number of studies indicate that black officers are less biased toward black citizens (Antonovics and Knight 2009; Anwar and Fang 2006; Close and Mason 2007; Fagan et al. 2016; Fagan and Geller 2010) although other findings are mixed (Sun and Payne 2004). The role of black police associations over the last decades highlights the influence on the overall policing community (Walker, Spohn, and DeLone 2012:180). After the Rodney King beating, the National Black Police Association (NBPA), for example, highlighted that racism is widespread in the police. Today, NBPA continues to push for an end to police brutality and supports federal legislation that prohibits racial profiling. This response to recent events stands in contrast to the reaction of other police organizations. It highlights how minority officers provide a different perspective that influences policing culture and eases tensions between the police and African American communities. This perspective may partly be driven by a sense of linked fate between black officers and citizens (Dawson 1994; Simien 2005).

Third, a higher number of minority officers in the police provides opportunities for contact and interactions between white and minority officers. The experiences and information from these interactions increase familiarity and reduce hostility. They contribute to a more positive view of minority communities and potentially alter police culture (Goldstein 1977; Smith 2003). This argument is closely related to inter-group contact theory. Contact theory posits that contact between groups facilitates inter-group relations by improving attitudes towards the out-group and by reducing stereotypes (Pettigrew

1998). Allport's (1954) classical formulation of the theory and many subsequent studies focus on situational factors such as equal status, common goals, and cooperation as conditions for the positive effect of inter-group interactions. Police-citizen interactions usually do not fulfill these conditions with a clear hierarchy and often opposing goals between the officer and the citizen. Interactions between officers, however, do. They are generally among equal or similar status positions. The interactions involve cooperation to achieve a common goal. Accordingly, interactions between white and minority police officers and the direct contact with close friends or coworker can improve attitudes towards the out-group among all officers, mitigate negative sentiments and reduce stereotypes about African-Americans. Bolton and Feagin's (2004 Cha. 6) in-depth interviews with police officers, for example, document how African-American officers from time to time challenge and confront everyday racism and thereby change policing culture.

Fourth, minority officers can weaken the solidarity within the police community particularly when confronted with threats (Smith 2003; Walker et al. 2012:180). The link between solidarity and diversity has been studied across the social sciences. In an influential article, Portes and Sensenbrenner (1993) distinguish between four sources of social capital. They argue that *bounded solidarity* is not based on shared values or reciprocal exchanges between individual, but on "the situated reaction of a class of people faced with common adversities […] It is limited to members of a particular group who find themselves affected by common events in a particular time and place" (Portes and Sensenbrenner 1993:1325). From this perspective, homogenous police departments are likely to respond to perceived threats with higher solidarity that is based on the notion of "us" against "them" or blue versus black. Along similar lines, research on friendship networks suggests denser ties and consequently solidarity in homogenous settings. The response by African American police organizations to the Rodney King beating or recent

events and the linked fate perspective described above support this argument. They highlight how minority officers introduce a different perspective that undermines a uniform response to certain events and perceived threats.

Together these factors might reduce the overall level of police use of (deadly) force and weaken the role of factors that are commonly associated with group conflict and threat. Increased police legitimacy, the knowledge and empathy of minority officers and more frequent interracial interactions within the police might attenuate tensions between the police and African-American communities. Weakened police solidarity might undermine the narrative of the police versus black youth, and reduce the salience of archetypes such as the "symbolic assailant" that shape interactions between police and minority youth (Skolnick, 1968). Homogenously white departments, in contrast, might strengthens the notion of the us versus them or "blue versus black", and reinforce the stereotypes that lead to collective suspicion or actuarial decision making by patrol officers. Based on this argument, we expect that minority representation not only reduces the number of officer-involved killings directly but also mitigates the role of factors that are commonly associated with group threat. This argument implies both a direct effect of police diversity and a negative interaction between various factors of group threat and an inclusive police force.

Data and Methods

To address our questions, we examine variations in the number of police-involved killings of African-Americans and non-Hispanic whites across major cities in the United States. Our sample consists of all 266 U.S. Census designated places with a population over 100,000 in 2010. The focus on large cities provides several advantages. Tensions between the police and minority communities are particularly strained, information on key

independent variables is more complete, and many of the smaller cities have a low number of incidents so that the distribution of the outcome variable is highly skewed. However, only about one third of all officer-involved deaths happen in larger cities raising some concerns about the external validity of our findings. To address this concern, we conduct supplementary analyses that replicate our findings for 635 smaller cities with a population of over 50,000 showing that the findings hold across different city types. As discussed below, one of the key challenges of previous research on officer-involved killings is the limited data available on fatal police violence (Klinger 2012). To address this problem and measure the number of police killings in each city, we construct a comprehensive database of all officer-involved killings between January 2013 and June 2016 based on verified crowd sourced information from "Fatal Encounters" (Burghart 2016), The Counted from The Guardian, and a database on fatal police shootings compiled by the Washington Post. Overall, our database contains 3,833 incidents of officer-involved killings. 1,293 or 33.7% of these cases involved police agencies in our sample and 463 involved African-American victims (1,585 and 526 for the supplementary sample with over 50,000 residents).[6] For each city, we link the number of officer involved killings to population data from the U.S. Census, crime data from the F.B.I. Uniform Crime Reports, and information on police agencies from the Law Enforcement Management and Administrative Statistics (LEMAS) data series collected by the Bureau of Justice Statistics. Using negative binomial regression, we model the number of officer-involved killings of blacks as a function of population characteristics, crime rates, three measures of political, economic and crime threat and the racial/ethnic composition of the police department.

[6] Some incidents involved multiple police agencies. However, there is no overlap in our sample because these cases usually involved a municipal agency together with a federal, state or adjacent sheriff agency.

Definition of Officer-Involved Killings

We define police-involved killings or deaths as any interaction with the police where the officer uses force and the person dies during or immediately after the interaction.[7] Police officers' use of fatal force may be lawful or unlawful, and our definition includes both killings that can be classified as lawful or unlawful.[8] We include cases that result in death as a consequence of being shot, beaten, arrested, restrained, pepper sprayed, tasered, or otherwise harmed by police officers, whether on-duty or off-duty. Following the Model Penal Code (Dubber 2015), this definition includes deaths resulting from acts that may be: (a) intentional, (b) unintentional but result from the reckless use of force, or (c) unintentional but the result of the negligent use of force. In addition to the use of force directly on a suspect, the definition includes acts where one or more police officers set in motion a chain of events that leads to the death of a suspect or another individual if the original act involved the use of police force. These cases might include high speed chases or instances where a police officer kills a bystander when shooting at a suspect. The definition excludes (a) suicides, (b) accidents caused by suspects themselves (e.g. a fleeing suspect who causes a deadly car crash), and (c) police-caused accidents unrelated to the use of force (e.g. a car crash under normal traffic conditions that is not related to the vehicular pursuit of a suspect). Based on this definition, we classify and code officer-involved kill-

[7] The definition is informed by basic concepts in criminal law on the culpability of actors, and by the definitions of homicide that are commonly found in state statutes on the justifiable use of deadly force (Flanders and Welling 2016). The Model Penal Code, a set of legal standards that inform criminal statutes in nearly two thirds of the states in the U.S., sets forth definitions of both acts that result in death and the standards for determining the culpability of actors for those deaths (Dubber 2015). In the special case of police killings, some of these acts are lawful but would be considered unlawful if committed by non-police persons. These are considered "justifiable" or "excusable" homicides. We include these in our definition.

[8] Also see a discussion about lawful and unlawful officer-involved killings by Joseph Goldstein in the New York Times at http://nyti.ms/2a3KEbv.

ings in two categories: "Intentional or purposeful police killing" and "Unintentional police killing but result of extremely reckless, reckless or negligent use of force". The coding scheme includes two additional categories that are excluded from our definition (accidental police killing and self or suspect-inflicted killing). Box 1 describes the four categories in detail.

[Box 1 about here]

Constructing a Comprehensive Database on Police Killings

As widely publicized in the media and discussed in recent academic publications, the federal government in the United States does not collect reliable information on police killings (Hirschfield 2015; Ross 2015a; Zimring and Arsiniega 2015).[9] The most commonly used official information source is the annual F.B.I. Supplementary Homicide Reports (SHR), a special data series that is part of the Uniform Crime Reports (UCR).[10] SHR is an important data source for research on homicides and was essential for previous work on

[9] Here are some of the media reports: Washington Post (http://blogs.wsj.com/numbers/why-the-data-on-justifiable-homicide-just-wont-do-1725/), the New York Times (http://www.nytimes.com/2015/05/01/us/no-sharp-rise-seen-in-police-killings-though-increased-focus-may-suggest-otherwise.html), the Guardian (http://www.theguardian.com/us-news/2015/mar/18/police-killings-government-data-count) and FiveThirtyEight (http://fivethirtyeight.com/features/how-many-americans-the-police-kill-each-year/).

[10] There are two alternative, official data sources. First, the Centers for Disease Control and Prevention's National Vital Statistics System (NVSS) is based on death certificates and includes a category for homicide by "legal intervention". Second, the Bureau of Justice Statistics published an independent count of "arrest-related homicides" from 2003 to 2009 but suspended the data series and acknowledged that the count is not complete (Burch 2011; Planty et al. 2015). The yearly count for both alternative data sources resembles the data from the Supplementary Homicide Reports and is far below recent crowd-sourced and media-initiated data collection projects (Klinger 2012; Loftin et al. 2003). A third official data source with some promise is the Centers for Disease Control and Prevention's National Violent Death Reporting System but as of January 2016 it only covers 32 states (Barber et al. 2016).

officer-involved killings (Jacobs and O'Brien 1998; Liska and Yu 1992; Sorensen, Marquart, and Brock 1993; Willits and Nowacki 2014). However, SHR has limitations for work on officer-involved deaths (Hirschfield 2015; Klinger 2008, 2012; Loftin et al. 2003). It includes a category for "felon killed by police" that tallies about 400 cases per year. Reporting by state and local police agencies is voluntary and "felon killed by police" narrowly defines police killings as justifiable police homicides involving felons (Hirschfield 2015; Loftin et al. 2003). Indeed, comparisons with recent crowd-sourced and media-initiated data collection projects suggest that the SHR only captures a subset of all police-involved killings (Loftin et al. 2003). In particular, SHR includes 40.3% fewer cases compared to our own data in 2013 and 2014 (more recent SHR data is not available). There are two sources of missing information. First, SHR data are missing for 19.5% of the cities in our sample. Second, cities that are part of SHR underreport the number of cases by 29.5%. Biased reporting is a concern considering that police agencies make their own decisions about contributing to SHR. Another possible reason for the discrepancies is that SHR focuses on police-involved homicides whereas our own definition is broader and directly motivated by our research interest. Klinger (2012) discusses these limitations and concludes that previous research is "troubling because it produces findings about the correlates of deadly police violence that are of dubious validity" (Klinger 2012:79). To address this problem, we construct a comprehensive database of officer-involved killings between January 2013 and June 2016. The database is based on our definition of officer-involved killings. It uses crowd-sourced and newspaper collected information from "Fatal Encounters", The Counted from the Guardian, and the Washington Post. We verify and extend this information with our own data collection and coding. The construction of the database proceeded through five steps and is described in Appendix A. We link our database to other data sources about population characteristics, crime and police agencies, which is key to understand the determinants of police killings. There are several

important advantages of our database compared to SHR or other official statistics on officer-involved killings. It is more complete, unaffected by reporting bias, representative of the entire United States, and based on a clear definition of officer-involved killings.

Estimation Strategy and Model Specification

Our analysis uses the number of officer-involved killings of African Americans and non-Hispanic whites in each city as the dependent variable and various group-threat measures, crime rates and minority representation in the police force as the main independent variables. The outcome is a count variable confined to positive integers. Poisson regressions are well suited to model such count data. However, the underlying distribution assumes that the mean and variance are equal (Gelman and Hill 2007:114; Hilbe 2011). An alternative is to model the number of police killings with negative binomial regressions to allow for excess variability (over-dispersion) among the outcome (Long and Freese 2005:Cha. 8).[20] Formally, the model can be expressed as

$$\lambda_i = \exp\left(\alpha + \boldsymbol{D}_i\delta + \theta U_i + \boldsymbol{X}_i\beta + \zeta_i\right)$$

where λ_i is the number of officer involved killings in city i. The coefficients in the vector δ for the different group threat measures in the matrix $\boldsymbol{D}_i$ estimate the relation between the main independent variables and the outcome variable conditional on the covariates in $\boldsymbol{X}_i$. The share of African American officers is represented by U_i with the corresponding coefficient θ. To evaluate our argument that minority representation mitigates group threat, we extend this model with two-way interaction terms between the group-threat measures and the share of African-American officers $\gamma_1(D_i \times U_i)$ etc.

[20] An inflated number of zero counts are another common concern with count data (Gelman and Hill 2007:126). Zero-inflated models address this problem by using two components that correspond to different processes. The first is a binary model to analyze structural zeros and the second is a count model to predict the counts. There is, however, no reason to believe that the number of police killings is driven by two distinct processes (Allison 2012:Cha. 9 also see http://statisticalhorizons.com/zero-inflated-models).

Offset Variables: Modeling the Number, Rate per Population and Rate per Arrest

The negative binomial regressions model the number of officer-involved killings as a function of various city characteristics but fail to standardize for a baseline (Hipp, Tita, and Boggess 2011; Osgood 2000). They do not account for variations in the size of the African-American population across cities or differences across racial groups in their exposure to the police. Offset or exposure variables transform count models of officer-involved killings to a model of per capita or per police-encounter rates (Osgood 2000). The transformed models capture the risk or rate of police killings per population or per police-citizen interaction. We define the exposure variable (also called offset) in two ways. First, the offset is the natural logarithm of the population size in 100,000's with a coefficient that is fixed to 1. With this exposure variable, our models focus on the per capita rate of officer-involved killings. Second, we use the natural logarithm of race-specific arrests in 100,000's as an exposure or offset variable. Race-specific arrests are a proxy for police-citizen interactions and therefore capture the number of officer-involved killings per arrest. Killings per arrest adjust for the disproportionate minority exposure to police. Given the number of arrests, the analyses capture whether police officers act differently and presumably feel more threatened in interactions with minority citizens. They account for an important reason of the disproportionate risk faced by African-Americans (see beginning of results sections for a more detailed discussion). Accordingly, we conduct separate analysis for the *number* of police killings, the *rate per population*, and the *rate per arrest* as three important dimensions for our understanding of officer-involved killings.

Multicollinearity and Influential Outliers

We supplement our analysis with several regression diagnostics. First, we assess the goodness of fit by comparing the empirical with the fitted count of officer-involved killings (Kleiber and Zeileis 2016). The results show a close alignment between the expected

and observed counts indicating that overdispersion and/or excess zero counts are not a problem with our modeling strategy. Various test statistics confirm this conclusion. Second, we test for multicollinearity. Multicollinearity occurs when two or more covariates are highly correlated and can lead to erratic changes in coefficient estimates. To quantify the severity of multicollinearity, we calculate the variance inflation factor (VIF) in ordinary least squares regressions that replicate our main analysis. The results reveal one problem. The VIF value for proportion black is 9.4. This value is close to the critical level of 10 with potentially serious consequences for coefficient estimates (Neter et al. 1996: 387). The main reason for the high VIF value is the close relation between proportion black in the population and among city council members (the Pearson correlation coefficient is 0.85). Removing the proportion of black council members from the regression reduces the VIF value for the proportion black residents to 5.3, which might lead to inflated standard errors but not significant distortions in the coefficient estimates (Neter et al. 1996: 387). To address this problem, we carefully include different combinations of the two variables in the regression models below. The key findings remain the same. For other variables, the VIF value remains below 4.2 so that other variables are not seriously affected by multicollinearity. Finally, we conduct sensitivity analyses to examine whether influential outliers affect our results. An examination of studentized residuals and Cook's D reveals between 1 and 4 potential outliers in the different model specifications. Many of the cases are cities with a small African-American population and one officer-involved killing of African-Americans. As a result, the rate per population (or per arrests) is substantially higher than predicted based on our model. For example, Arvada City in Colorado has 828 African-American residents and one incident in which the police killed an African-American, which translates to about 120 police-killings per 100,000 black residents – the highest rate observed in our sample. To address problems related to influential outliers, we re-estimate our models after removing influential cases. The results do not indicate any changes to our substantive findings.

Variables and Missing Data

The dependent variable is the number of officer-involved killings in each city between January 2013 and June 2016. Aggregating multiple years of data is important considering the low number of cases in many jurisdictions. The main independent variables are population and crime-related measures of group threat, minority representation in police departments, and a comprehensive set of control variables that adjust for other important determinants of police killings. The variables used in the analysis are based on the U.S. Census, crime data from the F.B.I. Uniform Crime Reports, and information on police agencies from the Law Enforcement Management and Administrative Statistics (LEMAS) data series collected by the Bureau of Justice Statistics. Table 1 includes a list of all variables together with basic summary statistics.

[Table 1 about here]

We focus on four measures of group threat. These measures are an important part of our theoretical argument outlined above and capture political, economic and crime threat as distinct dimensions of group threat.

First, we measure the *proportion of African-Americans* in each city based on data from the 2010 United States Census. The size of the minority population is central to the minority threat hypothesis. While the measure is tied to different forms of threat, it is particularly closely related to political threat as a proxy for the voting population (the correlation between the general and voting population is 0.96).

Second, we measure *political threat* as the proportion of African-American political representation in the city council (e.g. LaVeist 1992; Shihadeh and Flynn 1996; Stults and

Baumer 2007).[21] The measure captures whether African-Americans have made inroads in the political system. This challenge to the political status of whites is particularly salient and shapes whites' perception of threat. However, if the black political officials achieve majority, the political influence of blacks should increase and as a result the amount of social control over blacks should decline (Blalock 1969; Horowitz 1985; Turk 1969). To capture this curvilinear linear relation predicted by Blalock and others, we also test for a non-linear relation with a quadratic term in the regression equation.

Third, we measure *economic threat* as the white unemployment rate (Eitle 2002; Jacobs & Wood 1999; Olzak 1992). Many prior studies used measures that are not race-specific such as the Gini index (e.g. Liska and Chamlin 1984). The white unemployment rate is sensitive to race and captures variations across cities in the economic status of whites and therefore the potential level of economic threat posed by minority groups.

Fourth, we use the black-on-white homicide rate based on data from the UCR Supplementary Homicide Report (SHR) from 2009 to 2013 to measure *threat of black crime*. Homicides are salient and induce fear among whites, which is at the core of the argument about black crime threat. Like the outcome variable, cross-racial homicides are rare. To address this problem, we define our measure as the number of black-on-white homicides per 100,000 residents over a five-year period. The models also condition for the black-on-black homicide rate as a control variable defined in the same way.

The second central concept is the *minority representation in police departments*. We measure minority representation with two distinct variables. First, we use the proportion of African-American sworn police officers for our main analysis presented below. The key theoretical argument about increased police legitimacy, the knowledge and empathy of minority officers, and the attenuation of tensions between the police and African-

[21] The data was obtained from the International City/County Management Association (ICMA), which surveys 8,000 cities every five years. Missing information was completed by our own online searches.

American communities is directly related to the presence of black police officers. We code the variable so that a one unit change corresponds to a 10% increase in the share of African-American officers, which allows for an easy and compelling interpretation of the findings. Second, we use the Proportional Representation Index (PRI) based on the Equal Employment Opportunity Index in supplementary analysis with similar results compared to the ones presented below (Hickman and Piquero 2009; Lewis 1989; Ozkan et al. 2016; Smith 2003). It is defined as the proportion of African-American sworn police officers divided by the proportion of African-American residents in the population. Both measures are based on data from the 2013 Law Enforcement Management and Administrative Statistics (LEMAS) data series collected by the Bureau of Justice Statistics.

Our analyses use two distinct offset variables: the logged, race-specific population size in 100,000s and the logged number of race-specific (black or white) arrests from the UCR "Arrests by Age, Sex, and Race" data-series. For details on the offset variables see separate section above.

Finally, we include several control variables that adjust for other important determinants of police killings. First, we include population characteristics based on the U.S. Census and the American Community Survey 2010-2013 3-year estimates. The measures are (a) the population density as the number of residents per square mile, (b) the race-specific unemployment rate, and (c) black-white segregation measured in terms of the dissimilarity index. The unemployment rate is a measure of socioeconomic disadvantage and a key predictor in research on crime, disorder and policing (Jacobs and O'Brien 1998; Sampson and Groves 1989; Taylor and Covington 1988). This link between the unemployment rate and crime, disorder and policing makes it an important, potentially confounding control variable. The segregation or dissimilarity index is based on census tract data from each of the cities in our sample. It is defined as $0.5\times\sum_{i=1}^{N}\left|\frac{b_i}{B}-\frac{w_i}{W}\right|$ where b_i is the black population in census tract i, B is the total black population and w_i and W are

the corresponding counts for whites. The index measures the spatial separation between African-Americans and whites across census tracts in each city. Liska and Yu (1992) and others have argued that segregated neighborhoods with concentrated minority population might be especially threatening to the majority population. Accordingly, controlling for segregation is important to adjust for the spatial arrangement of minority and majority groups.

Next, we control for the violent crime rate based on the Uniform Crime Report data series "Offenses Known and Clearances by Arrest". The measure captures the overall level of crime and is defined as the number of violent crimes per 100,000 residents.[22] Violent crime is an alternative explanation for police use force. In particular, the community violence hypothesis postulates that police-caused deaths are largely driven by the level of crime and violence in communities (Fyfe 1980; Jacobs and O'Brien 1998; Klinger et al. 2016; Liska and Yu 1992; Ross 2015a; Smith 2003). In contrast to subjective perceptions of threat at the center of the group threat perspective, the community violence hypothesis focuses on objective threats related to crime and violence. Adjusting for the general crime rate is essential to rule out that police-caused killings are not just driven by variations in crime across cities in the United States.

Third, we include a set of organizational police department factors. Hiring minority officers might be part of larger police reforms that increase legitimacy and reduce excessive force. Thus, our estimates for minority representation might be confounded by other organizational factors. To address this problem, we include the number of officer per 100,000 residents as a measure of police size, the proportion of female officers, an index for community policing based on six indicators, and two indicator variables for the presence of a personnel performance monitoring or assessment system for officers and a

[22] The definition of violent crimes is based on the Uniform Crime Reports (UCR) part I. Violent crimes include murder, manslaughter, forcible rape, robbery, and aggravated assault.

civilian complaint review board or agency for use of force complaints. The index for community policing is based on eight binary indicators from the LEMAS database (for a similar measure see Smith and Holmes 2014).[23] The two indicator variables are based on the same data source.

Finally, we include indicator variables for geographic region and Black city major.[24] Controlling for geographic region adjusts for historical differences in race relations and inequalities that continue to affect the presence (North, Midwest, South, Southwest, and Northwest). Black city mayor adjusts for political arrangements in the city administration. Cities with an African-American mayor might be more progressive and restraint in their use of police against African-Americans.

Imputation of Missing Data

An important advantage of our database on police-caused deaths is that it covers the entire United States so that there is no missing data on the dependent variable. There is, however, missing information on several of the covariates. Most importantly, some police departments do not report data to the Supplementary Homicide Report used for the five year black-on-white homicide rate (Maltz 1999). Out of 266 cities in our main sample, 71 (27.7%) did not consistently report SHR data every single year and 26 cases (9.8%) never

[23] It includes indicators for whether the mission statement refers to community policing, whether new recruits receive at least eight hours of training in community policing, whether sworn officers receive similar in-service training, whether officers are encouraged to engage in SARA-type problem solving, whether problem solving is part of officer evaluation, whether the police department has problem-solving partnerships with local organizations, whether officers are assigned to specific areas and finally whether the department uses information from a community survey about satisfaction with law enforcement (Cronbach's alpha is 0.72).

[24] The information on black city mayors was obtained from http://blackdemographics.com/culture/black-politics/black-mayors/ (accessed on August 2, 2016).

reported data over the five-year period. Most cases without any reporting are from Florida, which did not report any SHR data over the last decade or so. We took two steps to address this problem of potentially systematic missing data. First, we obtained complete Florida SHR data from 1998 to 2014 through a Freedom of Information Act (FOIA) request from the Florida Department of Law Enforcement. These data have previously been unavailable for research and addresses concerns about systematic missing SHR data. Second, we use data from single years and previous years to impute aggregated information for the entire period.

Specifically, we use multiple imputation based on the chained equation approach to impute missing SHR data and other missing values (Van Buuren and Groothuis-Oudshoorn 2011). Aside from the variables and interaction terms that are part of the final analyses, we include additional covariates based on previous years of UCR data. For example, consider a department that reported SHR data in two years over the five-year period from 2009 to 2013 and in some of the previous years. In this case, the aggregated count is imputed from the two years with available information and from measures of the black-on-white homicides rate in previous years (2004 to 2008). These additional variables substantially improve our imputation model.

Results

[Figure 1 about here]

Across the United States, the police killed 3,833 people between January 2013 and June 2016, including 1,293 incidents in our sample of major cities with over 100,000 residents. Figure 1 shows the geographical distribution of all incidents. African-Americans are disproportionally affected by the lethal use of police force. Indeed, our data show that the rate of police killings per 100,000 residents is 3.05 for African-Americans compared to

1.33 for non-Hispanic whites, a ratio of 2.29 killings of Blacks compared to non-Hispanic Whites. This finding is in line with recent research based on various sampling and measurement conditions (Miller et al. 2016; Ross 2015a; Zimring and Arsiniega 2015).

Several recent studies suggest that these racial disparities in police killings are largely a result of differences by race in police exposure (Fryer 2016; Goff et al. 2016; Miller et al. 2016; Mullainathan 2015). From this perspective, excessive rates of minority arrests and police stops would explain the increased risk of police-caused deaths among African-Americans, and not necessarily racial bias in officer's decisions given a police citizen-interaction. Miller et al (2016), for example, estimate that 1 out of 291 police stops or arrests resulted in hospital-treated injury or death of a suspect or bystander with *no* significant differences between racial and ethnic groups. Our own data show a similar pattern. While the rate of police killings per population is substantially higher for African-American than whites, the *number* of killings per arrest is roughly the same across different racial groups. In particular, Table 2 shows that we find 31.38 police killings per 100,000 arrests for African-Americans compared to 21.69 for whites, again in our set of cities with over 100,000 residents. Accordingly, the rate of police killings per arrests of African-Americans is 45% higher compared to whites, which is substantially below the 130% difference in the risk for the rate per population. Focusing on arrests related specifically to violent crimes further reduces the difference in the rate across racial groups.

[Table 2 about here]

This finding, based on previous research as well as our own data, points to the importance of lowering arrests and police stops to reduce officer-involved killings. It does not, however, rule out structural discrimination in policing or racial bias in the decision to stop or arrest citizens as a driving factor for officer-involved killings. The finding also ignores substantial variations across cities in the United States. Table 2 shows the number

of police killings, police killings per 100,000 residents, and police killings per 100,000 arrests for non-Hispanic whites and African-Americans across major cities in the United States (population over 500,000). The variations are substantial.

For example, Chicago has the highest *number* of officer-involved killings of African-Americans with 36 cases between January 2014 and June 2016. This corresponds to a *rate* of 4.17 per 100,000 residents and 43.12 per 100,000 arrests. For non-Hispanic whites, however, the rate is 0.23 per 100,000 residents and 6.99 per 100,000 arrests indicating that police-caused deaths per arrests are about 6.17 times higher among African-Americans compared to whites. In other cities, however, this ratio between the number of police killings per arrests among African-Americans and whites varies around 1.0, indicating that Blacks and whites are equally likely to be killed by police given arrests as a metric to estimate race differences in police-citizen interactions. These variations across cities in the United States highlight the importance of "locally-resolved studies that address the principle empirical drivers of police killings operating in a given county or [police] department" (Ross 2015b:1). Focusing on cities with over 100,000 residents, the following analysis examines the structural correlates of the numbers of police killings, the rate per 100,000 residents, and rate per 100,000 arrests.

Structural Correlates of Police Killings across U.S. Cities

Focusing on cities with over 100,000 residents, we continue our analysis by reexamining the role of racial threat as a key structural predictor of police use of deadly force. Whereas most prior studies on police use of force focus on the share of the minority population, we measure and examine political, economic and black crime threat as distinct and complementary dimensions of minority threat. Table 3 presents the results from six negative-binomial regression models. They show the relation between the different measures of minority threat, population characteristics, crime rates and other factors with the number

and rate of officer-involved killings between January 2013 and June 2016 across 266 cities in the United States. Table A3 presents the corresponding results for a larger set of cities with over 50,000 residents. Models I – III present the results for African Americans and Models IV and VI for whites.

[Table 3 about here]

Models I – III show that the proportion of African-Americans residents is unrelated to the number and rate of officer-involved killings of blacks after adjusting for a rich set of covariates.[25] This result is consistent across our three models for the number of police killings, the rate per capita and the rate per arrest. In additional analysis, we also examine whether the relation between the proportion of African-Americans residents and officer-involved killings is quadratic as suggested by the power-threat hypothesis. However, we find no support for this argument (the coefficient estimate for the squared term ranges from -0.04 to 0.18 with p-values consistently above 0.10). Instead, the coefficient for the size of the black population in Model I indicates that the number of police killings of blacks is higher in cities with a larger black population. The risk of being killed by the police defined as the rate of killings per population (Model II) or per arrests (Model III), however, is unrelated to the proportion of African-American residents. These results challenge the component of the minority threat hypothesis that is based on population shares.

We next focus on three distinct measures for political, economic and crime threat as more proximate predictors for minority threat that extend the focus on population

[25] The negative point estimates are partly a result of the multicollinearity problems discussed in the data and methods section. Removing the proportion of black council members from the regression model substantially reduces the point estimates for proportion black without other noticeable changes to the coefficient estimates.

shares. In particular, our models include measures for the share of African-American city council members as a measure of political threat, the white unemployment rate as a measure of economic threat, and the black-on-white homicide rate as a measure of crime threat. The findings indicate that group threat is largely driven by the threat of black crime. The incidence-rate ratio for the black-on-white homicide rate is 1.390, indicating that a one standard deviation change in the black-on-white homicide rate is associated with a 39.0% higher number of police killings of blacks.

We find a similar pattern for the rate of police killings per population and per arrests. Indeed, the rate of officer-involved killings per population and per arrests is 28.7% and 51.6% higher in cities with a one standard deviation change in the black-on-white homicide rate respectively. Accordingly, black-on-white crime is associated both with the *number* and with the *rate* of officer-involved killings per population and per arrest. This finding indicates that the relation between black-on-white homicides and police killings of African-Americans is not driven only by changes in the exposure of African-Americans to the police. The relation is also based on changes in the way in which police-citizen interactions play out insofar as the rate of killings per arrest partly captures whether police officers act differently and presumably feel more threatened in interactions with minority citizens.

The black-on-black homicides rate and measures for political and economic threat, however, are unrelated to the number and rate of police killings of African-Americans. Separate models with a quadratic term for the proportion of black council members show no support for a curve-linear relation as suggested by the power-threat hypothesis. Police-caused deaths of whites are driven by different factors (see Model IV and VI). They are unrelated to black-on-white homicide rates, minority population shares and others measures of group threat. Instead, the violent crime rate and economic conditions are an important predictor suggesting that (deadly) force against whites is largely driven by the level of crime and violence in communities.

These findings revisit and improve previous research on group threat and the structural determinants of police-caused deaths. They reveal a clear race-specific pattern. Officer-involved shootings of African-Americans are higher in cities with a higher rate of black-on-white homicides whereas black-on-black homicides and measures for political and economic threat are unrelated to police killings. This pattern suggests a race-specific response to crime with a high value attached to a white victim and racial fears of authorities that lead to both a higher number and rate of police killings. Officer-involved shootings of whites, however, are simply a function of violent crimes and economic conditions indicating that the level of crime and violence is the primary predictor.

Group Threat and the Race Gap in America's Police Departments

[Figure 2 about here]

In the second part of our analysis, we focus on the relationship between minority representation in police departments and the use of deadly police force. Our argument suggests that a high share of African-American police officers in a department not only reduces the number of officer-involved killings, but more importantly mitigates various factors associated with group threat. To examine this argument, we extend our model with the proportion of black sworn officers and also an interaction term of black police officer share with our measure of black-on-white crime. We code the proportion of black officers so that one-unit refers to a 10% change. Supplementary analysis with similar results focus on the proportional representation index (PRI) defined as the share of black police officers divided by the share of the black population.

Figure 2 illustrates the two variables across our sample. It shows the share of black police officers and black population on the left side and the distribution of the index on

the right side across the cities in our sample. A value of one indicates equal representation insofar the share of African-Americans in the police force is the same as the share in the general population. Lower values indicate an underrepresentation of African Americans in the police.

Table 4 presents the results from the negative binomial regressions. Table A2 shows the same results for white victims and Table A4 shows results for our larger set of cities of over 50,000 residents. Models I - III first show the effect of the proportion of Black officers on the number of police-caused deaths, the rate per population and the rate per arrest. The point estimates for the proportion of Black officers are negative and substantial, indicating that the number and rate of officer-involved killings of blacks might be lower in cities with a higher share of black officers in the police force. However, the coefficient estimates are not statistically significant, so that we cannot draw clear conclusions about the relation between the rate of police killings and the representation of African-Americans in the police force. Still, this finding is in line with previous research showing mixed evidence for the effect of minority representation in police departments (Hickman and Piquero 2009; Smith 2003; Smith and Holmes 2014). Accordingly, the finding about an overall effect of Black officer representation on the number and rate of officer-involved killings of blacks is inconclusive.

[Table 4 about here]

Models IV – VI extend the regressions with an additional interaction term between the proportion of black officers and the black-on-white homicide rate as our measure of group threat. The interaction term is negative and substantial across the different models for the number and rate of officer-involved killings. It indicates that the proportion of black officers decreases the effect of crime threat. The incidence-rate ratio for the black-on-white homicide rate is 1.26 when the proportion of black officers is at the mean of 11%.

At this level, a one standard deviation change in the black-on-white homicide rate corresponds to a 26% higher number of officer-involved killings of blacks. In cities with a higher level of African-American officers in the police department, however, the strength of the relation is lower or, correspondingly, higher at lower representation levels. This pattern is consistent across the three models with diverse outcome measures: the number of police-caused deaths, the rate per population and the rate per arrest.

Accordingly, the proportion of black officers and the black-on-white homicide rate is not only related to the number of police killings of African-Americans but also the rate per population and the rate per arrest. Figure 3 illustrates this pattern for the black-on-white homicide rate. It shows the incidence-rate ratio for a one standard deviation change in the black-on-white homicide rate as a function of the proportion of black officers. The marginal distribution of the proportion of black officers across the police departments in our sample is shown on the x-axis. In cities with no African-American police officers, the conditional marginal effect is large with a 40.6% increase in the number of officer-involved killings of blacks for a one standard deviation change in the black-on-white homicide rate. Similarly, the rate of officer-involved killings per arrests is 83.7% higher when the black-on-white homicide rate changes by one standard deviation. As the representation of African-Americans in the police improves, however, the effect of a one standard deviation change in the black-on-white homicide rate decreases substantially. In departments at the extreme with about half of African-American police officers (3.0% of departments), the conditional marginal effect is around zero for the number and rate of officer-involved killings.

[Figure 3 about here]

A central concern is that other police reforms confound the coefficient estimates for the proportion of African-American officers. Indeed, hiring minority officers might be

part of a series of police reforms that are designed to increase legitimacy and reduce excessive force. The regression results presented above, however, control for prominent police reforms including an index of community policing, two indicator variables for the presence of a civilian complaint review board and a performance monitoring system, and the proportion of female police officers. The findings remain consistent and are in line with earlier research showing that officer representation is important independent of other police reforms (Smith and Holmes 2014; Willits and Nowacki 2014). Moreover, the effects of officer racial composition are not racially symmetrical. Table A2 presents the same results for non-Hispanic whites. They show that the representation of African-Americans is unrelated to the number and rate of white police shootings. This finding supports the argument that racial dynamics rather than other organizational factors are the key mechanism explaining the observed pattern.

Overall, it remains unclear whether the representation of African-American in the police is related to the number and rate of officer-involved killings itself. But the interaction term indicates that inclusive police departments with a high proportion of African-American officers are less sensitive to minority threat. A diverse police force mitigates group threat and thereby reduces the number and rate of officer-involved killings.

Conclusion

Understanding the structural determinants of officer involved killings across the United States is a nascent research area (Hirschfield 2015; Klinger 2012; Zimring forthcoming). Aided by a comprehensive and unique data collection effort, this study makes important progress towards understanding the structural factors that drive police killings. But the implications are broader. Officer-involved killings represent the end of a continuum of force, so that the findings inform a much larger universe of police behaviors.

Accordingly, the contributions of our analyses are manifold. First, our results revisit and improve previous research on group threat. They indicate that police-caused killings of African-Americans are not simply driven by population shares, as suggested by previous studies. Instead, they reveal a race-specific pattern in the ways in which the police respond to crime. Indeed, the *black-on-white* homicide rate is a significant predictor of officer-involved killings whereas *black-on-black* homicides and measures for political and economic threat are unrelated to police killings. Similar to recent research focused on arrest rates and the size of the police force (Eitle et al. 2002; Stults and Baumer 2007), these results provide support for the threat of black crime hypothesis. The finding that police killings of African-Americans increase as a function of the black-on-white homicide rate is consistent with a body of social science evidence of police discrimination toward minority citizens observed by social scientists under a wide variety of sampling and measurement conditions (Epp, Maynard-Moody, and Haider-Markel 2014; Gelman, Fagan, and Kiss 2007; Kochel, Wilson, and Mastrofski 2011; Legewie 2016; see, generally O'Flaherty 2015). Several studies find that when blacks victimize whites, the high value attached to a white victim and the racial fears of authorities engender severe treatment (Baldus, Woodworth, and Pulaski 1990; Paternoster, Brame, and Bacon 2007).

Second, minority representation in the police might not reduce the number of officer-involved killings itself, but their presence mitigates group threat. Indeed, our findings indicate that the relation between black-on-white homicide rate and the number of officer-involved killings is weaker in settings with increasing representation of African-Americans in the police force. These findings make new and substantial contributions to our understanding of a highly contentious social, cultural and political issue. They indicate that group threat continues to be an important driver of officer-involved killings.

These findings have implications for a decades old push to diversify the nation's police-forces. Prior research on the benefits of a diverse police force reached no conclusion. Other than a normative argument, there was no reliable evidence that a diverse

police force was either more effective in responding to crime, or able to bridge the racial breach in trust in the police. Our results provide evidence that a high proportion of black officers might not necessarily reduce the number of officer-involved killings directly, but mitigates the role of group threat and thereby eases tensions between the police and African-American communities.

Third, our study has broader implications for group-threat theories and minority representation in state agencies and bureaucracies. Previous research on group threat has generally emphasized the interest of the dominant group as a driving factor for minority threat (for an exception see Holmes 2000; Smith and Holmes 2014). From this perspective, police use of (deadly) force is driven by structural factors that create pressure to maintain racial hierarchies and inequalities. Our argument, however, highlights the importance of considering the police as a distinct social group that contributes to the ways in which group threat plays out. From this perspective, the police, both through behavior and their social identity, can aggravate or alleviate intergroup conflict, such as through the diversity of police officers. This argument extends previous research on inter-group conflict and group threat that has largely focused on population dynamics without considering the mediating role of state agencies. It also points to the importance of minority representation in bureaucracies as a social good. Indeed, a diverse workforce is an important issue in nearly every sector of society. While previous research has largely focused on the role of descriptive representation in parliament or public office for substantive representation on policy issues (e.g. Lloren 2015) or on minority and women representatives as role models (e.g. Beaman et al. 2012), our research shows that minority representation in government bureaucracies or the police can mitigate conflict and group threat.

Finally, we compile a comprehensive database of police-caused killings between January 2013 and June 2016 that can aid further inquiry into the determinants of police killings. Previous research largely relied on data about "justifiable homicides of felons" irregularly reported to the Federal Bureau of Investigation (FBI) by a non-representative

subset of police agencies. While it is impossible to determine whether our database is complete, the information is far more comprehensive than government sources, unaffected by reporting bias, representative of the entire United States, and based on a clear definition of officer-involved killings. The 2004 National Research Council Committee to Review Police Policy and Practices asserted that "there is no more important piece of data regarding police behavior than that on the exercise of lethal force" (Skogan and Frydl 2004:157). We make our database available to other researchers to advance research on officer-involved killings.

While our dataset on police killings overcomes important data limitations from previous research and the analyses control for important covariates, the findings are limited by the observational nature of the data (Legewie 2012; Morgan and Winship 2014). Future research should use experimental or quasi-experimental designs to examine the role of a diverse police force for the police use of (deadly) force and other outcomes.

References

Allison, Paul. 2012. *Logistic Regression Using SAS: Theory and Application*. Cary, N.C: SAS Institute.

Allport, Gordon W. 1954. *The Nature Of Prejudice*. Cambridge: Perseus Books.

Antonovics, Kate and Brian G. Knight. 2009. "A New Look at Racial Profiling: Evidence from the Boston Police Department." *Review of Economics and Statistics* 91(1):163–77.

Anwar, Shamena and Hanming Fang. 2006. "An Alternative Test of Racial Prejudice in Motor Vehicle Searches: Theory and Evidence." *American Economic Review* 96(1):127–51.

Baldus, David C., George Woodworth, and Charles A. Pulaski. 1990. *Equal Justice and the Death Penalty: A Legal and Empirical Analysis*. Boston: Northeastern University Press.

Banducci, Susan A., Todd Donovan, and Jeffrey A. Karp. 2004. "Minority Representation, Empowerment, and Participation." *Journal of Politics* 66(2):534–556.

Barber, Catherine et al. 2016. "Homicides by Police: Comparing Counts From the National Violent Death Reporting System, Vital Statistics, and Supplementary Homicide Reports." *American Journal of Public Health* 106(5):922–27.

Baumer, Eric P., Steven F. Messner, and Richard Rosenfeld. 2003. "Explaining Spatial Variation in Support for Capital Punishment: A Multilevel Analysis." *American Journal of Sociology* 108(4):844–875.

Beaman, Lori, Esther Duflo, Rohini Pande, and Petia Topalova. 2012. "Female Leadership Raises Aspirations and Educational Attainment for Girls: A Policy Experiment in India." *Science* 335(6068):582–86.

Bell, Jeannine. 2002. *Policing Hatred: Law Enforcement, Civil Rights, and Hate Crime*. NYU Press.

Blalock, Hubert M. 1967. *Toward a Theory of Minority-Group Relations*. New York: Capricorn Books.

Blumer, Herbert. 1958. "Race Prejudice as a Sense of Group Position." *The Pacific Sociological Review* 1(1):3–7.

Bohannon, John. 2016. "Mechanical Turk Upends Social Sciences." *Science* 352(6291):1263–64.

Bolton, Kenneth and Joe Feagin. 2004. *Black in Blue: African-American Police Officers and Racism*. Routledge.

Burch, Andrea M. 2011. "Arrest-Related Deaths, 2003-2009 - Statistical Tables."

Burghart, Brian. 2016. "Fatal Encounters: A Step toward Creating an Impartial, Comprehensive and Searchable National Database of People Killed during Interactions with Law Enforcement."

Chambliss, William J. 2001. *Power, Politics, and Crime*. Boulder, Colo: Westview Press.

Close, Billy R. and Patrick Leon Mason. 2007. "Searching for Efficient Enforcement: Officer Characteristics and Racially Biased Policing." *Review of Law & Economics* 3(2):263–321.

Dawson, Michael C. 1994. *Behind the Mule: Race and Class in African-American Politics*. Princeton University Press.

Dubber, Markus D. 2015. *An Introduction to the Model Penal Code*. New York: Oxford University Press.

Eitle, D., S. J. D'Alessio, and L. Stolzenberg. 2002. "Racial Threat and Social Control: A Test of The Political, Economic, and Threat of Black Crime Hypotheses." *Social Forces* 81(2):557–76.

Enos, Ryan D. 2016. "What the Demolition of Public Housing Teaches Us about the Impact of Racial Threat on Political Behavior." *American Journal of Political Science* 60(1):123–42.

Epp, Charles R., Steven Maynard-Moody, and Donald P. Haider-Markel. 2014. *Pulled Over: How Police Stops Define Race and Citizenship*. University of Chicago Press.

Fagan, Jeffrey, Anthony A. Braga, Rod K. Brunson, and April Pattavina. 2016. "Stops and Stares: Street Stops, Surveillance, and Race in the New Policing." *Fordham Urban Law Journal* 43.

Fagan, Jeffrey and Amanda Geller. 2010. *Profiling and Consent: Stops, Searches and Seizures after Soto*. Rochester, NY: Social Science Research Network.

Flanders, Chad and Joseph C. Welling. 2016. "Police Use of Deadly Force: State Statues 30 Years after Garner." *St. Louis University Public Law Review, Forthcoming*.

Fryer, Roland G. 2016. *An Empirical Analysis of Racial Differences in Police Use of Force*. National Bureau of Economic Research.

Fyfe, James J. 1980. "Geographic Correlates of Police Shooting: A Microanalysis." *Journal of Research in Crime and Delinquency* 17(1):101–13.

Gay, Claudine. 2002. "Spirals of Trust? The Effect of Descriptive Representation on the Relationship between Citizens and Their Government." *American Journal of Political Science* 46(4):717–32.

Gelman, Andrew, Jeffrey Fagan, and Alex Kiss. 2007. "An Analysis of the New York City Police Department's 'Stop-and-Frisk' Policy in the Context of Claims of Racial Bias." *Journal of the American Statistical Association* 102(479):813–23.

Gelman, Andrew and Jennifer Hill. 2007. *Data Analysis Using Regression and Multilevel/Hierarchical Models*. Cambridge: Cambridge University Press.

Goff, Phillip Atiba, Tracey Lloyd, Amanda Geller, Steven Raphael, and Jack Glaser. 2016. *The Science of Justice: Race, Arrests, and Police Use of Force*. Center for Polcing Equity.

Goldstein, Herman. 1977. "Policing a Free Society." *Policing a Free Society Cambridge, Mass: Ballinger Pub. Co*.

Hickman, Matthew J. and Alex R. Piquero. 2009. "Organizational, Administrative, and Environmental Correlates of Complaints About Police Use of Force Does Minority Representation Matter?" *Crime & Delinquency* 55(1):3–27.

Hilbe, Joseph M. 2011. *Negative Binomial Regression*. Cambridge University Press.

Hipp, John R., George E. Tita, and Lyndsay N. Boggess. 2011. "A New Twist on an Old Approach: A Random-Interaction Approach for Estimating Rates of Inter-Group Interaction." *Journal of Quantitative Criminology* 27(1):27–51.

Hirschfield, Paul J. 2015. "Lethal Policing: Making Sense of American Exceptionalism." *Sociological Forum* 30(4):1109–17.

Holmes, Malcolm D. 2000. "Minority Threat and Police Brutality: Determinants of Civil Rights Criminal Complaints in U.S. Municipalities." *Criminology* 38(2):343–368.

Jackson, Pamela I. and Leo Carroll. 1981. "Race and the War on Crime: The Sociopolitical Determinants of Municipal Police Expenditures in 90 Non-Southern US Cities." *American Sociological Review* 46(3):290–305.

Jacobs, David and Jason T. Carmichael. 2002. "The Political Sociology of the Death Penalty: A Pooled Time-Series Analysis." *American Sociological Review* 67(1):109–31.

Jacobs, David, Jason T. Carmichael, and Stephanie L. Kent. 2005. "Vigilantism, Current Racial Threat, and Death Sentences." *American Sociological Review* 70(4):656–77.

Jacobs, David and Robert M. O'Brien. 1998. "The Determinants of Deadly Force: A Structural Analysis of Police Violence." *American Journal of Sociology* 103(4):837–62.

King, Ryan D. and Darren Wheelock. 2007. "Group Threat and Social Control: Race, Perceptions of Minorities and the Desire to Punish." *Social Forces* 85(3):1255–80.

Kleiber, Christian and Achim Zeileis. 2016. "Visualizing Count Data Regressions Using Rootograms." *The American Statistician* 70(3):296–303.

Klinger, David A. 2008. "On the Importance of Sound Measures of Forceful Police Actions." *Criminology & Public Policy* 7(4):605–17.

Klinger, David A. 2012. "On the Problems and Promise of Research on Lethal Police Violence A Research Note." *Homicide Studies* 16(1):78–96.

Klinger, David, Richard Rosenfeld, Daniel Isom, and Michael Deckard. 2016. "Race, Crime, and the Micro-Ecology of Deadly Force: Micro-Ecology of Deadly Force." *Criminology & Public Policy* 15(1):193–222.

Kochel, Tammy Rinehart, David B. Wilson, and Stephen D. Mastrofski. 2011. "Effect of Suspect Race on Officers' Arrest Decisions." *Criminology* 49(2):473–512.

LaVeist, Thomas A. 1992. "The Political Empowerment and Health Status of African-Americans: Mapping a New Territory." *American Journal of Sociology* 1080–1095.

Legewie, Joscha. 2012. "Die Schätzung von Kausalen Effekten: Überlegungen Zu Methoden Der Kausalanalyse Anhand von Kontexteffekten in Der Schule." *Kölner Zeitschrift Für Soziologie Und Sozialpsychologie* 64(1):123–53.

Legewie, Joscha. 2016. "Racial Profiling and Use of Force in Police Stops: How Local Events Trigger Periods of Increased Discrimination." *American Journal of Sociology* 122(2):379–424.

Lewis, William G. 1989. "Toward Representative Bureaucracy: Blacks in City Police Organizations, 1975-1985." *Public Administration Review* 49(3):257.

Liska, Allen E. 1992. *Social Threat and Social Control*. Albany: SUNY Press.

Liska, Allen E. and Mitchell B. Chamlin. 1984. "Social Structure and Crime Control among Macrosocial Units." *American Journal of Sociology* 383–395.

Liska, Allen E. and Jiang Yu. 1992. "Specifying and Testing the Threat Hypothesis: Police Use of Deadly Force." P. 53- in *Social Threat and Social Control*, edited by A. E. Liska. SUNY Press.

Lloren, Anouk. 2015. "Women's Substantive Representation: Defending Feminist Interests or Women's Electoral Preferences?" *The Journal of Legislative Studies* 21(2):144–67.

Loftin, Colin, Brian Wiersema, David McDowall, and Adam Dobrin. 2003. "Underreporting of Justifiable Homicides Committed by Police Officers in the United States, 1976-1998." *American Journal of Public Health* 93(7):1117–1121.

Long, J.Scott and Jeremy Freese. 2005. *Regression Models for Categorical Dependent Variables Using Stata*. 2nd ed. College Station, Texas: Stata Press.

Maltz, Michael D. 1999. *Bridging Gaps in Police Crime Data*. Washington, D.C.: Bureau of Justice Statistics.

Mansbridge, Jane. 1999. "Should Blacks Represent Blacks and Women Represent Women? A Contingent 'Yes.'" *The Journal of Politics* 61(03):628–657.

Miller, Ted R. et al. 2016. "Perils of Police Action: A Cautionary Tale from US Data Sets." *Injury Prevention* injuryprev-2016-042023.

Morgan, Stephen L. and Christopher Winship. 2014. *Counterfactuals and Causal Inference: Methods and Principles for Social Research*. Cambridge: Cambridge University Press.

Mullainathan, Sendhil. 2015. "Police Killings of Blacks: Here Is What the Data Say - NYTimes.com."

O'Flaherty, Brendan. 2015. *The Economics of Race in the United States*. Cambridge, MA: Harvard University Press.

Osgood, D.Wayne. 2000. "Poisson-Based Regression Analysis of Aggregate Crime Rates." *Journal of Quantitative Criminology* 16(1):21–43.

Ozkan, Turgut, John L. Worrall, and Alex R. Piquero. 2016. "Does Minority Representation in Police Agencies Reduce Assaults on the Police?" *American Journal of Criminal Justice* 41(3):402–23.

Paternoster, Raymond, Robert Brame, and Sarah Bacon. 2007. *The Death Penalty: America's Experience with Capital Punishment*. New York: Oxford University Press.

Pettigrew, Thomas F. 1998. "Reactions Toward the New Minorities of Western Europe." *Annual Review of Sociology* 24(1):77–103.

Planty, Michael et al. 2015. *Arrest-Related Deaths Program: Data Quality Profile*. U.S. Department of Justice.

Portes, Alejandro and Julia Sensenbrenner. 1993. "Embeddedness and Immigration: Notes on the Social Determinants of Economic Action." *American Journal of Sociology* 98(6):1320–1350.

Quillian, Lincoln. 1995. "Prejudice as a Response to Perceived Group Threat: Population Composition and Anti-Immigrant and Racial Prejudice in Europe." *American Sociological Review* 60(4):586–611.

Ross, Cody T. 2015a. "A Multi-Level Bayesian Analysis of Racial Bias in Police Shootings at the County-Level in the United States, 2011–2014." *PLoS ONE* 10(11):e0141854.

Ross, Cody T. 2015b. "Identifying the Drivers of the Exceptionally-High Rates of Lethal and Racially-Biased Violence by Police in the United States Requires Geographically-Resolved Data and Analysis." *Sociological Forum*.

Rubin, Donald B. 2004. *Multiple Imputation for Nonresponse in Surveys*. John Wiley & Sons.

Sampson, Robert J. and W.Byron Groves. 1989. "Community Structure and Crime: Testing Social-Disorganization Theory." *American Journal of Sociology* 94(4):774–802.

Scherer, Nancy and Brett Curry. 2010. "Does Descriptive Race Representation Enhance Institutional Legitimacy? The Case of the U.S. Courts." *The Journal of Politics* 72(01):90–104.

Shihadeh, Edward S. and Nicole Flynn. 1996. "Segregation and Crime: The Effect of Black Social Isolation on the Rates of Black Urban Violence." *Social Forces* 74(4):1325–52.

Simien, Evelyn M. 2005. "Race, Gender, and Linked Fate." *Journal of Black Studies* 35(5):529–50.

Skogan, Wesley and Kathleen Frydl. 2004. *Fairness and Effectiveness in Policing: The Evidence*. Washington, DC: National Academies Press.

Smith, Brad and Malcolm D. Holmes. 2014. "Police Use of Excessive Force in Minority Communities: A Test of the Minority Threat, Place, and Community Accountability Hypotheses." *Social Problems* 61(1):83–104.

Smith, Brad W. 2003. "The Impact of Police Officer Diversity on Police-Caused Homicides." *Policy Studies Journal* 31(2):147–62.

Sorensen, Jonathan R., James W. Marquart, and Deon E. Brock. 1993. "Factors Related to Killings of Felons by Police Officers: A Test of the Community Violence and Conflict Hypotheses." *Justice Quarterly* 10(3):417–440.

Stokes, L. D. 1997. "Minority Groups in Law Enforcement." in *Contemporary policing: Personnel, issues and trends*, edited by M. L. Dantzker. Boston: Butterworth Heineman.

Stults, Brian J. and Eric P. Baumer. 2007. "Racial Context and Police Force Size: Evaluating the Empirical Validity of the Minority Threat Perspective." *American Journal of Sociology* 113(2):507–46.

Sun, Ivan Y. and Brian K. Payne. 2004. "Racial Differences in Resolving Conflicts: A Comparison between Black and White Police Officers." *Crime & Delinquency* 50(4):516–41.

Taylor, Ralph B. and Jeanette Covington. 1988. "Neighborhood Changes in Ecology and Violence." *Criminology* 26(4):553–90.

Theobald, N. A. and D. P. Haider-Markel. 2008. "Race, Bureaucracy, and Symbolic Representation: Interactions between Citizens and Police." *Journal of Public Administration Research and Theory* 19(2):409–26.

Turk, Austin T. 1966. "Conflict and Criminality." *American Sociological Review* 31(3):338–352.

Van Buuren, Stef and Karin Groothuis-Oudshoorn. 2011. "Mice: Multivariate Imputation by Chained Equations in R." *Journal of Statistical Software* 45(3).

Walker, Samuel. 1985. "Racial Minority and Female Employment in Policing: The Implications of 'glacial' Change." *Crime & Delinquency* 31(4):555–572.

Walker, Samuel and Charles M. Katz. 2011. *The Police in America: An Introduction*. Dubuque, Iowa: McGraw-Hill.

Walker, Samuel, Cassia Spohn, and Miriam DeLone. 2012. *The Color of Justice: Race, Ethnicity, and Crime in America*. Cengage Learning.

Weitzer, Ronald. 2000. "Racialized Policing: Residents' Perceptions in Three Neighborhoods." *Law & Society Review* 34(1):129–55.

Willits, Dale W. and Jeffrey S. Nowacki. 2014. "Police Organisation and Deadly Force: An Examination of Variation across Large and Small Cities." *Policing and Society* 24(1):63–80.

Zimring, Franklin E. forthcoming. *When Police Kill: The Character and Control of Violence in Uniform*. Cambridge MA: Harvard University Press (forthcoming).

Zimring, Franklin E. and Brittany Arsiniega. 2015. "Trends in Killing of and by Police: A Preliminary Analysis." *Ohio State Journal of Criminal Law* 13(1):247–64.

Appendix A - Construction of Database on Police Killings

The construction of our dataset is based on five steps. First, we use information from four crowd-sourced and newspaper initiated data collection efforts. Most importantly, this includes information from "Fatal Encounters" (Burghart 2016) from January 2013 to June 2016. The goal of Fatal Encounters is to "create a comprehensive national database of people who are killed through interactions with police" from 2000 to today (Burghart 2016). It is the most comprehensive data collection project that tracks officer-involved killings over multiple years (for a comparison of different data sources see Table A1 and subsection "Data Quality"). The project relies on paid researchers, public records requests and crowd-sourced data. As of September 2016, the archive considers the information complete from January 2013 to June 2016. Fatal Encounters includes information on any interaction with police that results in death. This definition is broader compared to our own definition and includes accidents and deadly domestic violence involving police officers as perpetrators. We supplement information from Fatal Encounters with three additional data collection projects that only cover part of the entire period: "Mapping Police Violence" from 2013 to 2015,[26] "The Counted" from January 2015 to June 2016 compiled by the Guardian,[27] and data collected by the Washington Post from January 2015 to June 2016.[28] These three data sources contain a small number of additional cases and allow us to cross-validate information on race. From all four data sources, we identify 4,802 unique cases.

Second, we use the coding scheme detailed in Box 1 to categorize all 4,802 unique cases identified in the first step. The coding is done by two independent coders from

[26] http://mappingpoliceviolence.org/ (accessed on August 17, 2016).

[27] https://www.theguardian.com/us-news/ng-interactive/2015/jun/01/about-the-counted (accessed on July 22, 2016).

[28] https://github.com/washingtonpost/data-police-shootings (accessed on July 22, 2016).

Amazon Mechanical Turk.[29] Each coder received a short description of the incident and was instructed to categorize the case into one of the four categories outlined in Box 1 with the additional options for "other" and "unknown". All cases with ambiguous coding were examined by the authors (3.4% of all cases). 3,512 cases were classified as "Intentional or purposeful", 321 as "Unintentional but result of extremely reckless, reckless or negligent use of force", 135 as "Accidental unrelated to the use of force", and 688 as "Self-inflicted death or accident caused by suspect". The following analysis focuses on the 3,833 cases in the first two categories excluding accidental and self-inflicted deaths. Accordingly, many cases from Fatal Encounters were excluded considering that they do not fit into our own definition of officer-involved killings.

Third, we verified and completed missing information for each of the 3,833 records. While the database is comprehensive and well-maintained, there are occasional errors and cases with missing information. Most important, information on victim race is missing for about 30% of all cases and considered unreliable for others. To address this problem, we use two independent coders from Amazon Mechanical Turk to verify and complete the information for all 3,833 cases. We gave each coder the victim's name, date of the incident and the state in which it occurred. They were asked to collect information on the race of the victim, the involved police agencies and the city in which the incident occurred from newspaper sources. We personally cross-validated all cases for which the information from Fatal Encounters, the first and second coders were not identical. This cross-validation and the comparison between the two independent coders ensures the

[29] Amazon Mechanical Turk (https://www.mturk.com/mturk) is an online platform or marketplace that allows researchers (known as Requesters) to post jobs (usually small data collection or coding tasks and surveys) (Bohannon 2016). Workers can select existing jobs and complete them for a monetary payment. The platform provides access to over 500,000 workers and thereby makes it possible to complete data collection and coding task within hours instead of months. A common critique of the platform is that it often involves sub-minimum wage labor. To ensure a fair compensation of workers, we coded 100 cases ourselves and used the time estimate to calculate an hourly wage of $13.

quality and accuracy of the data verification process. Aside from verifying key information, the procedure completes information on the race of the victim for 74% of the cases with missing information on victim's race.

Fourth, we use name and place-based imputation for the remaining cases with missing information on race. Our procedure largely resembles Enos' approach (2016). It uses information from the racial demographics of the census block where the victim lived together with the likelihood that a victim's surname is linked to a racial or ethnic group based on the U.S. Census Bureau counts of names by race. For example, Smith as the most common name in the United States is 73.4% white, 22.2% black, 0.4% Asian and Pacific Islander, 0.9% American Indian, 1.6% mixed race, and 1.6% Hispanic. Following Enos (2016), we combine the frequencies for each victim's surname and the racial demographics of the census block using Bayes' rule (see Enos 2016 for details on the approach). Based on this approach, we obtain the probability that each victim is white, black, Hispanic, Asian and Pacific Islander, American Indian, or mixed race.[30]

Finally, we link our database with population data from the U.S. Census, crime data from the F.B.I. Uniform Crime Reports, and information on police agencies from the Law Enforcement Management and Administrative Statistics (LEMAS) data series collected by the Bureau of Justice Statistics. Linking each record to these different data

[30] To account for the uncertainty inherent in these probabilities and the overall imputation procedure, we obtain ten plausible race/ethnicities for each case with missing information based on random draws from a multinomial distribution using the name and place-based probabilities as parameters for the distribution. A victim that is 80% white and 20% black based on their name and address, for example, might receive eight plausible race values "white" and two plausible race "black" (note that for most cases the probability for one of the different racial/ethnic groups is above 80%). Similar to multiple imputation, we repeat all of our analyses for each of the different plausible values and combine the result using Rubin's (2004) repeated imputation summary statistics (for a similar approach to measurement error see Blackwell, Honaker, and King 2015; or Legewie and Schaeffer 2016 for an application to a different area). As a result, the final analyses account for the uncertainty from the imputation procedure.

sources requires matching keys for police agencies and census designated places (or counties if the incident does not fall in a census designated place). In both cases, we use name-based matching with manual corrections for cases without exact matches. As a result, we obtain the Originating Agency Identifier (ORI) code from the "Law Enforcement Agency Identifiers Crosswalk" database created by the Bureau of Justice Statistics[31] and the census designated place 5-digit code. These matching keys allow us to link each case to various data-sources including population data from the U.S. Census, crime data from the F.B.I. Uniform Crime Reports, and information on police agencies from the Law Enforcement Management and Administrative Statistics (LEMAS) data series.

The result of this procedure is a comprehensive database on officer-involved killings between January 2013 and June 2016. The database not only includes verified information on all officer-involved killings but also links this information to other data sources. Linking these different data sources is a key part of understanding the determinants of police.

[Table A1 about here]

Data Quality

Table A1 compares our final database to Fatal Encounters (FE), The Counted from The Guardian and The Washington Post's list of police killings in 2015 (a comparison for 2013 and 2014 is not possible because the Counted and the Washington Post datasets only focus on 2015 and beyond). The table shows the number of cases in 2015 ("Cases"), the number of cases that fit our definition of officer-involved killings ("Cases fitting our

[31] The crosswalk includes over 36,000 law enforcement agencies in the United States and assigns each agency the Originating Agency Identifier (ORI) code, which makes it possible to merge various data sources that have no common match keys.

Def."), the unique cases that were only found in this data source ("Unique Cases"), the missing cases that are not part of this dataset ("Missing Cases"), and the proportion of cases with missing information on race ("% Race Missing"). Of the three data sources, FE is the most complete source. It includes 37 unique cases in 2015. We exclude many other cases from FE because they do not fit our definition of officer-involved killings. However, our dataset also includes 33 cases that are missing from FE in 2015. The Counted and the Washington Post include less unique and substantially more missing cases (note that Washington Post only focuses on shooting deaths). However, the quality of information on victim's race is substantially lower in the original FE database. Our coding procedure described above substantially improves on that and is closely aligned with The Counted and The Washington Post estimates. For 2015, there are just 14 cases or 1.2% for which the race coding is not the same so that the error rate is very small.

Most importantly, there is substantial overlap between the different sources, which increases our confidence in the completeness of our dataset. Overall, the comparison with the two alternative data sources indicates that (a) FE is the most complete enumeration of officer-involved shootings in 2015; (b) it is the only collection effort that covers multiple years, and (c) the quality of the information on victim's race is low in the original database but substantially improved through our own data collection. The fact that FE covers multiple year is important considering that our analyses of officer-involved killings can aggregate data across years and thereby avoid scarcity by city due to the low number of cases for many jurisdictions.

In sum, it is impossible to ascertain whether there are police killings that eluded our data collection process. Indeed, extrapolating from our comparison based on data from 2015 suggests that we might miss 66 cases in 2013 and 2014 or about 1.7% of our entire enumeration. This estimate is even smaller for major cities (0.8%), which are the focus of our analysis. But the database is far more complete than SHR or other commonly used sources. In the two years with overlapping data (2013-2014), SHR contains 40.3%

fewer cases compared to our own data. This underreporting is partly based on selective reporting of agencies (19.5% of the agencies in our sample do not report to SHR) and partly based on underreporting by agencies that are part of SHR (in the cities that are part of our sample and part of SHR, our database contains 29.5% more incidents).

Box 1 - Categorization of Officer-involved Killings

5. **Intentional or purposeful police killing**
   Police officer takes a life with the conscious objective to cause death, whether lawful or unlawful. Intentional killings also include cases in which an officer acts with the awareness that as a result of his/her conduct, it is nearly certain that the conduct will cause death.
   Examples: (1) After battering a police officer, a person is fatally shot by the officer. (2) After being stopped by an officer, a person flees and is fatally shot in the back.
6. **Unintentional police killing but result of extremely reckless, reckless or negligent use of force**
   A police officer uses force with disregard or ignorance to a (substantial) risk that death will result from his/her conduct.
   Examples: (1) An officer is engaged in a shootout with a suspect and hits a bystander who dies. (2) During an encounter with a suspect, an officer repeatedly either uses a Taser, forcefully restrains a suspect using a mechanical restraint, uses a chokehold or another type of physical force. As a result, the suspect suffocates or suffers cardiac arrest and dies. (3) An officer intentionally rams a suspect during a car chase and pushes him/her of the road, which results in a deadly car crash. (4) An officer mistakes a firearm for a taser and shoots a suspect who dies. (5) An officer pushes a suspect into oncoming traffic during a violent struggle and the suspect is killed by a vehicle.

(Category 3 and 4 are excluded from our definition)

7. **Accidental policing killing unrelated to the use of force**
   A police officer accidentally kills a suspect in an incident that is unrelated to the use of police force.
   Examples: An officer is involved in a deadly car crash during normal traffic conditions.
8. **Self-inflicted death or accident caused by suspect**
   The death is self-inflicted such as a suicide or an accident caused by the suspect that kills the suspect or bystanders.
   Examples: (1) A suspect shoots himself after a confrontation with the police. (2) A suspect hits a tree during a car chase and dies. (3) Suspect hits another car during a car chase and kills the driver in the other vehicle.

Table 1 - Description and Summary Statistics of Variables by Source

Variable	Description	Mean	SD
Pol. Killings of Blacks	Number of Officer-involved killings of blacks	1.78	3.91
Pol. Killings of Whites	Number of Officer-involved killings of whites	1.71	2.82
Census and American Community Survey			
Population (Black)	Black city population in 100,000s (offset)	0.58	1.48
Population (White)	White city population in 100,000s (offset)	1.29	2.05
Population Density	Population density per square mile	4266.5	3341.2
Prop. Black	Proportion black residents	0.17	0.17
Prop. Unemployment Black	Proportion unemployed among blacks	0.16	0.05
Prop. Unemployment White	Proportion unemployed among whites	0.09	0.03
Black-White Segregation	Dissimilarity index for Black-White Segregation	0.42	0.16
Uniform Crime Reports, Various Data Series			
Arrests Black (log)	Number of black arrests for homicides, violent or property crimes, and weapon charges in 100,000s (offset)	0.06	0.11
Arrests White (log)	Number of white arrests for homicides, violent or property crimes, and weapon charges in 100,000s (offset)	0.08	0.10
Violent Crime Rate	Number of violent crimes per 100,000 residents	560.05	381.86
Homicide Rate: Black on Black	Number of black on black homicides over five-year period (2009-2013) per 100,000 residents	10.65	17.13
Homicide Rate: Black on White	Number of black on white homicides over five-year period (2009-2013) per 100,000 residents	1.86	1.95
Law Enforcement Management and Administrative Statistics (LEMAS)			
Officers per 100,000	Number of police officers per 100,000 residents	187.26	85.03
Prop. Black Officers	Proportion of black police officers	0.11	0.12
Prop. Female Officers	Proportion of female police officers	0.12	0.04
Community Policing Index	Index based on six indicators (see text)	5.34	1.59
Officer Monitoring System	Personnel performance monitoring or assessment system for officers	0.54	0.50
Civ. Complaint Review Board	Civilian complaint review board or agency for use of force complaints	0.27	0.44
Other Sources			
Black Mayor	Binary indicator for black city mayor	0.10	0.30
Prop. Black Council Members	Proportion of black members in city council	0.17	0.21
Region	Binary indicator for North, Midwest, South, Southwest, and Northwest (reference North)	-	-

Note: Descriptive variables based on (imputed) sample of 266 cities with more than 100,000 residents. All continuous variables except Prop. Black Officers are standardized for the analysis.

Figure 4 - Officer-Involved Killings across the United States, January 2013- June 2016

Table 2 - Officer-Involved Killings across major U.S. cities, January 2013 – June 2016

			Killings of Blacks			Killings of Whites			Risk Ratio (Black/White)	
City	Pop.	Prop. Black	Count	Rate per Pop.	Rate per Arrests	Count	Rate per Pop.	Rate per Arrests	Rate per Pop.	Rate per Arrests
Chicago, IL	27.06	0.32	36	4.17	43.12	2	0.23	6.99	18.17	6.17
New York, NY	82.69	0.23	25	1.33	166.15†	6	0.22	21.49†	6.07	7.73†
Los Angeles, CA	38.27	0.09	19	5.49	58.49	12	1.10	14.99	5.00	3.90
Houston, TX	21.35	0.23	19	3.86	30.72	6	1.09	11.26	3.54	2.73
Columbus, OH	8.01	0.27	18	8.20	228.60	4	0.85	58.60	9.70	3.90
Oklahoma City, OK	5.91	0.14	14	16.55	143.77	10	3.02	62.59	5.49	2.30
Baltimore, MD	6.21	0.63	13	3.34	18.70	2	1.15	16.83	2.91	1.11
Washington, DC	6.19	0.49	12	3.92	111.40†	0	0.00	0.00†	-	-
Philadelphia, PA	15.37	0.42	12	1.86	14.82	2	0.36	5.19	5.22	2.86
Memphis, TN	6.51	0.63	9	2.20	17.63	4	2.24	54.90	0.98	0.32
Dallas, TX	12.22	0.24	9	3.04	30.76	9	2.52	32.24	1.21	0.95
Milwaukee, WI	5.96	0.39	7	3.02	19.41	1	0.45	9.92	6.65	1.96
Boston, MA	6.29	0.23	6	4.17	64.94	0	0.00	0.00	-	-
San Antonio, TX	13.59	0.06	6	6.88	48.85	6	1.66	8.28	4.14	5.90
Fort Worth, TX	7.61	0.19	5	3.51	33.23	6	1.91	24.85	1.84	1.34
Phoenix, AZ	14.74	0.06	4	4.22	27.85	26	3.79	41.66	1.11	0.67
Jacksonville, FL	8.30	0.30	4	1.61	29.94†	1	0.22	92.25†	7.29	0.32†
Las Vegas, NV	5.91	0.11	4	6.23	12.58	16	5.77	28.06	1.08	0.45
San Francisco, CA	8.18	0.06	3	6.53	33.75	3	0.88	28.32	7.43	1.19
Seattle, WA	6.25	0.07	3	6.64	49.16	9	2.16	104.32	3.07	0.47
Tucson, AZ	5.23	0.05	2	8.27	41.12	5	2.05	14.61	4.04	2.81
Fresno, CA	5.01	0.08	2	5.27	27.55	4	2.70	12.67	1.95	2.17
Detroit, MI	7.07	0.81	2	0.35	11.12	0	0.00	0.00	-	-
Albuquerque, NM	5.50	0.03	2	12.48	94.12	8	3.47	31.75	3.60	2.96
Austin, TX	8.37	0.08	2	3.10	16.64	14	3.41	40.86	0.91	0.41
El Paso, TX	6.61	0.03	2	10.28	96.29	3	3.10	11.61	3.32	8.29
San Diego, CA	13.23	0.06	1	1.18	7.72	9	1.54	22.81	0.77	0.34
San Jose, CA	9.69	0.03	1	3.67	37.85	4	1.48	19.90	2.48	1.90
Denver, CO	6.19	0.10	0	0.00	0.00	7	2.15	35.14	0.00	0.00
Portland, OR	5.95	0.06	0	0.00	0.00†	6	1.40	56.67†	0.00	0.00†
Cities 500k+ residents	379.5	0.21	242	3.03	36.16	185	1.35	23.23	2.25	1.56
Cities 100k+ residents	807.6	0.19	473	3.05	31.38	456	1.33	21.69	2.30	1.45
Cities 50k+ residents	1064	0.17	536	2.89	27.8	601	1.22	19.88	2.37	1.4

Note: 30 U.S. cities with over 500,000 residents sorted by number of black police killings. Population and arrests are in 100,000s.

† *imputed black and white arrests.*

Table 3 - Group Threat and Killings by Police Officers across U.S. Cities

	Killings of Blacks			Killings of Whites		
	Model I (Count)	Model II (Rate per Pop.)	Mode III (Rate per Arrests)	Model IV (Count)	Mode V (Rate per Pop.)	Model VI (Rate per Arrests)
Prop. Black	-0.213	-0.258	-0.147	-0.425*	-0.383	0.263
	(0.169)	(0.168)	(0.226)	(0.201)	(0.199)	(0.228)
Prop. Black Council Members	0.184	0.183	0.328	-0.091	-0.079	-0.157
	(0.115)	(0.115)	(0.167)	(0.139)	(0.139)	(0.158)
Prop. Unemployment White	-0.103	-0.096	-0.123	0.161*	0.158*	-0.075
	(0.085)	(0.083)	(0.132)	(0.079)	(0.079)	(0.106)
Homicide Rate: Black on White	0.249**	0.252**	0.416**	0.124	0.128	0.159
	(0.089)	(0.086)	(0.138)	(0.087)	(0.087)	(0.119)
Homicide Rate: Black on Black	-0.025	-0.023	-0.239	0.038	0.040	-0.182
	(0.086)	(0.086)	(0.129)	(0.128)	(0.129)	(0.154)
Control Variables						
Pop. Black or White (log)	1.026***			0.913***		
	(0.079)			(0.091)		
Population Density	-0.060	-0.054	0.276	-0.183*	-0.178*	-0.064
	(0.061)	(0.060)	(0.135)	(0.077)	(0.077)	(0.097)
Prop. Unemployment Black	0.223*	0.215*	0.194	-0.091	-0.079	-0.071
	(0.107)	(0.104)	(0.151)	(0.082)	(0.081)	(0.095)
Violent Crime Rate	0.004	0.005	-0.039	0.204*	0.209*	0.041
	(0.078)	(0.078)	(0.124)	(0.083)	(0.083)	(0.111)
Black-White Segregation	0.015	0.037	0.004	0.272**	0.225*	0.190
	(0.123)	(0.103)	(0.172)	(0.104)	(0.091)	(0.127)
Black Mayor	0.290	0.291	0.350	0.006	-0.027	0.059
	(0.178)	(0.178)	(0.288)	(0.252)	(0.250)	(0.299)
Officers per 100,000 Pop.	0.092	0.095	-0.152	0.020	-0.006	-0.146
	(0.072)	(0.071)	(0.124)	(0.093)	(0.089)	(0.112)
Prop. Female Officers	-0.029	-0.028	0.068	-0.101	-0.114	-0.021
	(0.077)	(0.077)	(0.104)	(0.072)	(0.071)	(0.082)
Community Policing Index	-0.046	-0.047	-0.114	0.022	0.027	-0.019
	(0.075)	(0.074)	(0.129)	(0.077)	(0.079)	(0.073)
Officer Monitoring System	-0.072	-0.064	0.134	-0.141	-0.165	-0.070
	(0.138)	(0.136)	(0.185)	(0.129)	(0.127)	(0.154)
Civ. Complaint Review Board	0.072	0.077	0.145	0.186	0.156	0.318
	(0.154)	(0.154)	(0.232)	(0.143)	(0.139)	(0.165)
Region	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.291***	1.262***	3.290***	-0.032	0.021	3.164***
	(0.188)	(0.167)	(0.167)	(0.258)	(0.154)	(0.181)

*Note: N=266; Estimates based on negative-binomial regressions. Rate models include offset defined as the logged Black/White population or arrests in 100,000s. All continuous variables are standardized. $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; std. errors in parenthesis.*

Figure 5 - The Race Gap in Police Agencies across the United States, 2013

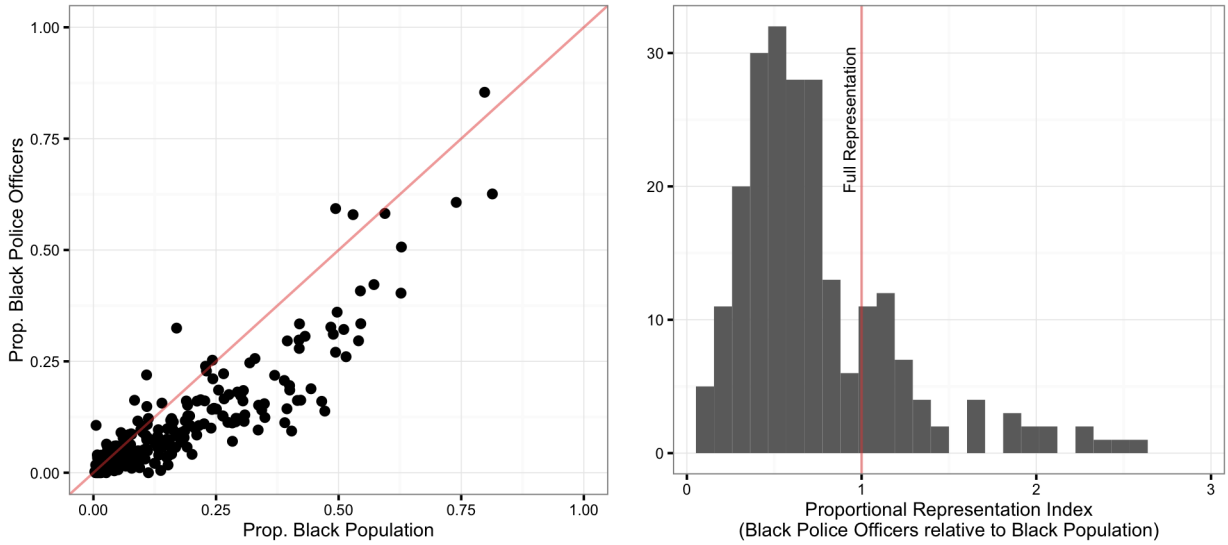

Table 4 - Representation of Black Police Officers and Police Killings of Blacks

	Model I (Count)	Model II (Rate per Pop.)	Mode III (Rate per Arrests)	Model IV (Count)	Mode V (Rate per Pop.)	Model VI (Rate per Arrests)
Prop. Black	-0.442*	-0.438*	-0.276	-0.482**	-0.481**	-0.378
	(0.187)	(0.186)	(0.272)	(0.178)	(0.178)	(0.273)
Prop. Black Council Members	0.180	0.179	0.327	0.158	0.157	0.311
	(0.118)	(0.118)	(0.163)	(0.110)	(0.109)	(0.161)
Prop. Unemployment White	-0.214*	-0.212*	-0.126	-0.157	-0.159	-0.084
	(0.085)	(0.083)	(0.137)	(0.086)	(0.084)	(0.134)
Homicide Rate: Black on White	0.189*	0.187*	0.413**	0.341***	.343***	0.608***
	(0.082)	(0.080)	(0.134)	(0.096)	(0.095)	(0.146)
Homicide Rate: Black on Black	-0.023	-0.022	-0.239	0.133	0.131	-0.018
	(0.086)	(0.086)	(0.129)	(0.098)	(0.098)	(0.168)
Prop. Black Officers (PBO)	-0.124	-0.126	-0.017	0.021	0.021	0.188
	(0.090)	(0.089)	(0.157)	(0.102)	(0.102)	(0.173)
PBO x Homicide Rate: Black on White				-0.100**	-0.100**	-0.139*
				(0.037)	(0.037)	(0.060)
Control Variables						
Population Black	1.012***			0.992***		
	(0.079)			(0.077)		
Population Density	-0.063	-0.061	0.276	-0.038	-0.039	0.298*
	(0.061)	(0.059)	(0.135)	(0.059)	(0.058)	(0.136)
Prop. Unemployment Black	0.028	0.025	0.099	0.017	0.020	0.078
	(0.107)	(0.103)	(0.157)	(0.104)	(0.101)	(0.153)
Violent Crime Rate	0.028	0.028	-0.035	-0.049	-0.049	-0.122
	(0.079)	(0.079)	(0.122)	(0.082)	(0.082)	(0.122)
Black-White Segregation	0.040	0.050	0.005	0.014	0.007	-0.044
	(0.123)	(0.102)	(0.168)	(0.120)	(0.099)	(0.165)
Black Mayor	0.308	0.309	0.398	0.246	0.245	0.277
	(0.177)	(0.177)	(0.301)	(0.173)	(0.173)	(0.304)
Officers per 100,000 Pop.	0.115	0.117	-0.150	0.043	0.042	-0.260*
	(0.073)	(0.072)	(0.123)	(0.076)	(0.075)	(0.126)
Prop. Female Officers	0.003	0.004	0.071	0.001	0.000	0.066
	(0.079)	(0.079)	(0.110)	(0.076)	(0.076)	(0.107)
Community Policing Index	-0.035	-0.036	-0.112	-0.064	-0.063	-0.144
	(0.075)	(0.075)	(0.134)	(0.073)	(0.073)	(0.147)
Officer Monitoring System	-0.076	-0.073	0.132	-0.020	-0.023	0.222
	(0.137)	(0.135)	(0.191)	(0.131)	(0.131)	(0.196)
Civ. Complaint Review Board	0.075	0.077	0.143	0.175	0.174	0.252
	(0.155)	(0.154)	(0.230)	(0.152)	(0.151)	(0.221)
Region	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.328***	1.316***	3.298***	1.155***	1.164***	3.093***
	(0.189)	(0.171)	(0.259)	(0.194)	(0.178)	(0.265)

*Note: N=266; Estimates based on negative-binomial regressions. Rate models include offset defined as the logged Black population or arrests in 100,000s. All continuous variables are standardized except "Prop. Black Officers" for which one-unit refers to a 10% change. $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; std. errors in parenthesis.*

Figure 6 - Effect of Black-on-White Homicide Rate on Police Killings

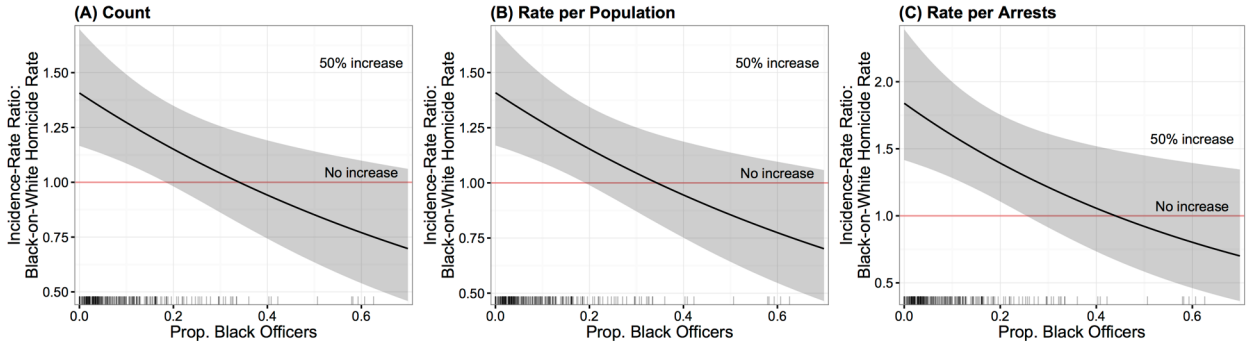

Table A1 - Comparison of Data Sources on Police Killings, 2015

Source	Method and Definition	Cases	Cases fitting our Def.	Unique Cases	Missing Cases	% Race Missing
Fatal Encounters	Crowd-sourced information, police reports, monitoring of news outlets, freedom of information requests. Definition: All interactions with the police that result in death (including off-duty officers).	1,351	1,114	37	33	18.4%
The Counted (The Guardian)	Police reports, witness statements, monitoring regional news outlets, research groups and open-source reporting projects. Definition: Any deaths arising directly from encounters with law enforcement.	1,146	1,098	13	49	2.0%
Washington Post	News reports, public records, Internet databases and original reporting. Definition: All shooting deaths from on-duty police officers.	990	963	0	184	2.8%
Our Data	See description in text.	1,147	1,147	-	-	0.9%

Note: Our definition of officer-involved killings is outlined in Box 1 (category 1 and 2). The columns "Unique Cases" and "Missing Cases" are in reference to our data. For example, 13 unique cases in The Counted refers to the number of cases in our data that were only found in The Counted but not in Fatal Encounters or the Washington Post database. The data from all three sources was downloaded on August 22, 2016.

Table A2 - Representation of Black Police Officers and Police Killings of Whites

	Model I (Count)	Model II (Rate per Pop.)	Mode III (Rate per Arrests)	Model IV (Count)	Mode V (Rate per Pop.)	Model VI (Rate per Arrests)
Prop. Black	-0.290	-0.249	0.391	-0.300	-0.254	0.353
	(0.228)	(0.227)	(0.286)	(0.230)	(0.228)	(0.291)
Prop. Black Council Members	-0.091	-0.079	-0.166	-0.093	-0.080	-0.164
	(0.139)	(0.139)	(0.161)	(0.140)	(0.140)	(0.159)
Prop. Unemployment White	0.152	0.150	-0.083	0.156	0.152	-0.081
	(0.079)	(0.079)	(0.108)	(0.080)	(0.080)	(0.109)
Homicide Rate: Black on White	0.096	0.101	0.235	0.120	0.116	0.305*
	(0.090)	(0.091)	(0.124)	(0.105)	(0.105)	(0.131)
Homicide Rate: Black on Black	0.058	0.060	-0.161	0.085	0.078	-0.082
	(0.130)	(0.131)	(0.159)	(0.144)	(0.144)	(0.204)
Prop. Black Officers (PBO)	-0.168	-0.162	-0.173	-0.147	-0.148	-0.103
	(0.140)	(0.142)	(0.177)	(0.148)	(0.150)	(0.192)
PBO x Homicide Rate: Black on White				-0.024	-0.016	-0.065
				(0.056)	(0.055)	(0.082)
Control Variables						
Population White	0.907***			0.901***		
	(0.092)			(0.093)		
Population Density	-0.171*	-0.167*	-0.049	-0.170*	-0.166*	-0.044
	(0.078)	(0.078)	(0.099)	(0.078)	(0.078)	(0.098)
Prop. Unemployment Black	-0.083	-0.070	-0.061	-0.088	-0.073	-0.070
	(0.082)	(0.082)	(0.097)	(0.083)	(0.082)	(0.097)
Violent Crime Rate	0.220**	0.224**	0.059	0.215*	0.221**	0.042
	(0.084)	(0.084)	(0.116)	(0.085)	(0.085)	(0.112)
Black-White Segregation	0.281**	0.231*	0.203	0.278**	0.227*	0.181
	(0.103)	(0.091)	(0.125)	(0.103)	(0.092)	(0.133)
Black Mayor	0.041	0.003	0.098	0.040	0.001	0.078
	(0.252)	(0.250)	(0.291)	(0.252)	(0.250)	(0.289)
Officers per 100,000 Pop.	0.039	0.011	-0.121	0.031	0.004	-0.150
	(0.095)	(0.091)	(0.114)	(0.097)	(0.094)	(0.115)
Prop. Female Officers	-0.081	-0.096	0.001	-0.081	-0.096	-0.004
	(0.074)	(0.073)	(0.087)	(0.074)	(0.073)	(0.087)
Community Policing Index	0.033	0.038	-0.009	0.031	0.037	-0.016
	(0.077)	(0.079)	(0.074)	(0.077)	(0.079)	(0.076)
Officer Monitoring System	-0.152	-0.178	-0.087	-0.146	-0.175	-0.072
	(0.129)	(0.127)	(0.154)	(0.131)	(0.128)	(0.158)
Civ. Complaint Review Board	0.182	0.150	0.303	0.188	0.153	0.320
	(0.143)	(0.139)	(0.167)	(0.145)	(0.140)	(0.164)
Region	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.102	0.109	3.300***	0.091	0.102	3.259***
	(0.191)	(0.191)	(0.218)	(0.193)	(0.193)	(0.225)

*Note: N=266; Estimates based on negative-binomial regressions. Rate models include offset defined as the logged White population or arrests in 100,000s. All continuous variables are standardized except "Prop. Black Officers" for which one-unit refers to a 10% change. $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; std. errors in parenthesis.*

Table A3 - Group Threat and Killings by Police Officers across U.S. Cities (50,000+ population)

	Killings of Blacks			Killings of Whites		
	Model I (Count)	Model II (Rate per Pop.)	Mode III (Rate per Arrests)	Model IV (Count)	Mode V (Rate per Pop.)	Model VI (Rate per Arrests)
Prop. Black	-0.551**	-0.527***	-0.241	-0.380*	-0.399*	0.095
	(0.133)	(0.135)	(0.173)	(0.159)	(0.157)	(0.160)
Prop. Black Council Members	0.171	0.171	0.222	0.005	0.002	-0.036
	(0.109)	(0.114)	(0.161)	(0.126)	(0.124)	(0.129)
Prop. Unemployment White	-0.114	-0.104	0.020	0.122*	0.119*	-0.030
	(0.077)	(0.075)	(0.091)	(0.060)	(0.060)	(0.069)
Homicide Rate: Black on White	0.186**	0.166*	0.266**	0.072	0.069	0.143
	(0.069)	(0.068)	(0.084)	(0.067)	(0.067)	(0.076)
Homicide Rate: Black on Black	-0.028	-0.016	-0.142	0.034	0.035	-0.072
	(0.067)	(0.066)	(0.088)	(0.092)	(0.092)	(0.105)
Control Variables (see Table 3)	Yes	Yes	Yes	Yes	Yes	Yes

*Note: N=635; Replication of findings from Table 3 with sample of cities with a population of over 50,000. p < 0.05, ** p < 0.01, *** p < 0.001; std. errors in parenthesis.*

Table A4 - Representation of Black Police Officers and Police Killings (50,000+ population)

	Killings of Blacks			Killings of Whites		
	Model I (Count)	Model II (Rate per Pop.)	Mode III (Rate per Arrests)	Model IV (Count)	Mode V (Rate per Pop.)	Model VI (Rate per Arrests)
Prop. Black	-0.527**	-0.512***	-0.266	-0.303*	-0.322	0.069
	(0.102)	(0.105)	(0.194)	(0.172)	(0.168)	(0.182)
Prop. Black Council Members	0.181	0.183	0.233	0.009	0.007	-0.036
	(0.102)	(0.105)	(0.158)	(0.126)	(0.125)	(0.136)
Prop. Unemployment White	-0.088	-0.080	0.038	0.119*	0.116	-0.026
	(0.077)	(0.076)	(0.093)	(0.060)	(0.060)	(0.069)
Homicide Rate: Black on White	0.299***	0.289***	0.386***	0.075	0.076	0.193*
	(0.081)	(0.079)	(0.100)	(0.081)	(0.081)	(0.092)
Homicide Rate: Black on Black	0.099	0.114	-0.008	0.071	0.077	-0.012
	(0.082)	(0.080)	(0.108)	(0.108)	(0.107)	(0.120)
Prop. Black Officers (PBO)	0.012	0.005	-0.021	-0.109	-0.105	-0.031
	(0.088)	(0.087)	(0.102)	(0.120)	(0.118)	(0.127)
PBO x Homicide Rate: Black on White	-0.093**	-0.098**	-0.101*	-0.021	-0.026	-0.058
	(0.035)	(0.035)	(0.043)	(0.051)	(0.050)	(0.054)
Control Variables (see Table 4)	Yes	Yes	Yes	Yes	Yes	Yes

*Note: N=635; Replication of findings from Table 4 (Model IV-VI) and A2 (Model IV-VI) with sample of cities with a population of over 50,000. p < 0.05, ** p < 0.01, *** p < 0.001; std. errors in parenthesis.*