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The prevalence of fatal police shootings by U.S. police, 2015–2016: Patterns and answers from a new data set

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ABSTRACT

Purpose: Previous studies on police use of fatal force in the United States are limited to specific cities or rely on aggregate data. This is the first analysis of its type to rely on incident-level national data and to establish base rates for police shooting fatalities.

Methods: Publicly available data from the *Washington Post* were used to model the data, which cover the period from January 2, 2015 to December 29, 2016 (n = 1948).

Results: Although the data are limited, the patterns are not consistent with the national rhetoric that the police are killing Blacks, particularly unarmed Black men, more than others because of their race and that officer-involved shooting fatalities are increasing; fatalities are generally stable across both years. The data help establish national base rates for fatal police shootings, which has yet to be done.

Conclusions: The United States government should develop a nationwide use of force database to assist police executives, elected leaders and researchers in understanding police use of force. Future research should rely on the situational context of the shooting and the micro-level factors the courts consider when analyzing the legal aspects of use of force instead of sociodemographic factors.

1. Introduction

Police use of force is arguably the most severe form of government intrusion into personal liberty and has been a source of a political, social and academic interest for several decades (Harding & Fahey, 1973; Jacobs & Britt, 1979; Kobler, 1975; Robin, 1963). When a police officer decides to use force it must be both proportional and immediately necessary. This assessment is idiosyncratic to the time, place, officer, and all of the situational conditions that inform the totality of the circumstances test (Illinois v. Gates, 1983), which ultimately determines reasonableness (Graham v. Connor, 1989) and reasonableness, in turn, establishes what is lawful. When a police officer confronts a situation that requires force, they are guided by three principles: 1) substantive law (statutory law on use of force in policing); 2) agency policy (e.g., use of force continuum); and 3) procedural law (case law on applying force). These principles converge with situational circumstances that include the offender and the environment and dictate the type and amount of force permitted. For example, among the many nuances courts will consider in its assessment is the degree of threat an offender poses to the officer or the public in terms of relative numbers or perceived strength. If the officer is outnumbered, is confronted by an unusually strong offender or adroit fighter (e.g., martial artist), then what constitutes necessary force is different from a relatively evenly-matched confrontation (Sharrar v. Felsing, 1997). Even when the confrontation is evenly matched a police officer is under no obligation to retreat or desist; indeed, the officer may press forward to achieve their lawful objective, which includes using force to overcome the offender's actual or threatened resistance.

In any use of force incident we expect the officer will use the necessary means to effect an arrest and protect themselves and other citizens. It is not the officer's responsibility to drop their gun belt and provide the offender with a “fair fight;” not only is that folly, but a police officer is not expected to delay taking action or to take action that could make a situation even more dangerous to themselves or others around them. This is true whether the offender is armed or unarmed. The offender's history of mental illness or level of impairment from alcohol or drugs also contributes to the court's assessment of the threat the offender poses (Krueger v. Fuhr, 1993; Hunt v. County of Whitman, 2006).

One factor that does not figure into the threat assessment is race. Race does not imply the need to use force, behavior does. The public has reacted harshly to portrayals that Blacks are killed by police in epidemic proportions compared to other racial groups, or that young, unarmed males are killed because of their race and without justification

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(Chamberlain, 2017; Howard, 2016; Kang, 2015; Lee, 2016; Poltermann and Ljunc, 2017; Younoussi & Pollock, 2017). The Black Lives Matter movement views the world as one where "…Black lives are systematically and intentionally targeted for demise."[1] While the perceived need for this declaration is not specifically placed on the police, a number of high profile deadly force incidents across the United States have resulted in protests which specifically have. The Malcolm X Grassroots Movement declared "In 2012, police summarily executed more than 313 Black people—one every 28 hours. The use of deadly force against Black people is standard practice in the US—woven into the very fabric of society."[2] The rhetoric is just as vociferous today as it was in the 1960s during the tumultuous civil rights era (Kerner Commission, 1968; Reiss, 1968); however, subsequent research dispelled some of the allegations of police use of force during that period (Friedrich, 1980).

Similarly today, there is empirical evidence that police shootings did not increase after the shooting of Michael Brown that prompted the riots in Ferguson, MO in August 2014 (Campbell, Nix, & Maguire, 2017), despite some reports of just the opposite (Perez-Pena, 2015). These reports skew public perception about the police in a negative direction (Nix & Wolfe, 2017; Pickett, Mancini, Mears, & Gertz, 2015; Weitzer, Tuch, & Skogan, 2008) and may be responsible for "de-policing" (a withdrawal from proactive police work) in certain places across the country, although the evidence is mixed (Morgan & Pally, 2016; Oliver, 2015; Shjarback, Pyrooz, Wolfe, & Decker, 2017). Some of this is perpetuated by studies that suggest African-Americans are "dehumanized" in the criminal justice system (Goff, Eberhardt, Williams, & Jackson, 2008; Owusu-Bempah, 2016), that Whites are implicitly favored in the criminal justice system (Smith, Levinson, & Robinson, 2014), that police officers tend to hold more implicitly biased views than others in society (Sidanius, Van Laar, Levin, & Sinclair, 2003), or that disproportionality indicates implicit bias (Nix, Campbell, Byers, & Alpert, 2017). Disproportionality is thought to be an indicator of implicit bias, which is when subconscious mental processes between race and crime are thought to explain the differences in treatment between African-Americans and others (Eberhardt, Goff, Purdie, & Davies, 2004; Greenwald, Nosek, & Banaji, 2003). Under this theory, even well-meaning police officers are supposedly acting on subconscious biases that "everyone" in the general public holds, which manifest in differential treatment of people of color. The validity of implicit bias tests has been questioned for quite some time and recent research strongly suggests "…the statistical evidence is simply too lacking for the [implicit bias] test to be used to predict individual behavior" (Singal, 2017, p. 8; see also Blanton & Jaccard, 2015; Blanton, Jaccard, & Burrows, 2015; James, Klinger, & Vila, 2014; Oswald, Mitchell, Blanton, Jaccard, & Tetlock, 2013, 2015).

Police shooting data has been sporadic, localized and incomplete, which has led to some fragmentation in the literature and public misperceptions about police shooting fatalities (Fyfe, 2002; Shane, 2016). Public discussions on police use of force tend to lack a great deal of context, except for race, sex, signs of mental illness, and unarmed status. Race in particular is socially inflammatory, unqualified and cannot be the full story. In this vacuum, an appeal to emotion arises; logic and reasoning grounded in facts are cast aside in favor of a few anecdotes and isolated incidents that signal a "crisis" to political and social pundits. Although appealing to emotion often carries more force than reason, it is still fallacious.

Unfortunately, there is no standardized incident-level national data collection effort on police use of force in the U.S. U.S. government sources including the FBI Uniform Crime Report, Justifiable Homicide and the Centers for Disease Control, National Violent Death Reporting System are incomplete and rely on aggregate data. A new dataset has emerged, collected by the *Washington Post*, which reveals some interesting patterns that are not consistent with these perceptions of police use of deadly force. The data covers 2015 and 2016 for the entire country, not just individual cities. This paper examines the patterns that have emerged and tests a series of questions for significant differences. Although the data are limited and there is much room for improvement, they do provide some insight into this important social and political issue and the results are reassuring that fatal police shootings do not show an increasing trend. The data also help establish base rates, which are essential for future comparisons and for making informed policy decisions.

2. Literature review

Egon Bittner (1970) suggested that a defining characteristic of the police is the capacity and authority to use force in pursuit of their duties. While it is understood that the actual use of force is a relatively rare event, with estimates ranging from 0.1% to 31.8% (Hickman, Piquero, & Garner, 2008), these incidents are often high-profile, and because of their severity, garner an inordinate amount of attention as compared to the duties and responsibilities of the police. It comes as no surprise then that these relatively rare events have been studied so diligently.

Understanding the discretionary power of the police and their capacity to use force has been weighed in the courts (Graham v. Connor, 1989; Tennessee v. Garner, 1985), allowing the judiciary to clarify factors of police citizen interactions where force is permitted, and identifying factors of interactions where it is not. Building off of this, criminologists have sought to understand and delineate the characteristics associated with use of force incidents. These characteristics often fit broadly into categories of incident (situational) factors and community (ecological) factors.

2.1. Situational factors

There is a large body of research surrounding situational factors of police use of force. Race of the citizen has repeatedly been examined for evidence of implicit bias (Nix et al., 2017), heightened risk (Jacobs & O'Brien, 1998), greater force (Schuck, 2004), and support of force (Johnson & Kuhns, 2009), to name only a few. However, other research findings have failed to find support for the impact of race (Lawton, 2007) and suggest that non-situational factors may account for variation observed. Race of the officer has also been examined for its relationship to the force used during a police citizen encounter, again with mixed findings. Alpert and Dunham (2004) found support for the relationship between officer race and level of force, while other research has failed to find a similar relation (Garner, Buchanan, Schade, & Hepburn, 1996).

2.2. Ecological factors

One limiting factor of much research in the area of police use of force is the lack of availability of data across agencies. The inability to compare across different agencies has highlighted the importance of considering use of force within an agency by examining ecological factors related to the use of force. Klinger (1997) in particular highlights the importance of considering the context of use of force incidents with his development of an Ecological Theory. Other theories such as the Racial Threat Theory (Blalock, 1967) highlight the importance of community characteristics on an officer's discretion. The importance of the context is not a new idea, with early work (Fyfe, 1980) using large geographic regions for comparison and more recent work examining use of force trends at the city (Jacobs & O'Brien, 1998; Sorensen,

[1] Retrieved on February 10, 2017 from http://blacklivesmatter.com/guiding-principles/.

[2] Retrieved on February 10, 2017 from https://mxgm.org/wp-content/uploads/2013/05/we-charge-genocide-FINAL.pdf.

Marquart, & Brock, 1993; Willits & Nowacki, 2014), neighborhood (Bayley & Mendelsohn, 1969; Terrill & Reisig, 2003; Lawton, 2007; Klinger, Rosenfeld, Isom, & Deckard, 2016) and micro levels (Lee, Vaughn, & Lim, 2014).

The literature described above is not intended to bear any semblance to an exhaustive list of research on police use of force, but instead represents articles selected to demonstrate broader themes of research in the area. For an excellent summary of research surrounding non-lethal use of police force, refer to Hickman et al. (2008).

2.3. A national estimate of police use of force

Like any scientific endeavor, the research is limited by the availability of the data. The current study relies on data collected and archived by the *Washington Post* because there is no active requirement that this information be recorded, reported and studied. In light of a series of recent high profile shootings, there has been a renewed interest, and public support for developing a national data collection of police use of force to develop estimates on its incidence and prevalence.

Recently, Alpert (2015) highlighted that the media has become the source of the best available data on officer involved shootings, and iterates the importance of good data and the need to develop a system that would collect information relevant to both an administrative and academic audience. In this same issue, Klinger et al. (2016) provide a series of policy recommendations including, at a minimum, what data would need to be systematically collected to augment our knowledge of police use of deadly force. Interestingly, Hickman et al. (2008) demonstrate the wide variation in reported use of force incidents across 36 studies. They utilize the Police-Public Contact Survey (PPCS) in conjunction with the Survey of Inmates in Local Jails (SILJ) to weight a sample of almost 7000 interviews to provide a nationally representative sample.

These calls and innovations aside, it should be clear that this focus on a national reporting system is not new. Prior researchers (Alpert & Fridell, 1992; Fyfe, 1988; Sherman & Langworthy, 1979) have all called for increased transparency in the count, rate and details of police use of force incidents.

3. Methods

The data are publicly available and were obtained freely from the *Washington Post* ("Fatal Force Database," 2015–2016).[3] The *Post* data project is intended to collect publicly available reports on police use of force incidents that result in death from news reports, law enforcement websites, social media, and independent databases such as Killed by Police and Fatal Encounters to get a better sense of the number of police fatalities in the United States. The database is rolling, which means that it is updated periodically as fatalities occur; the data for this study are from January 2, 2015 to December 29, 2016 (n = 1948). The data are collected at the incident level; however, given that police shootings are rare events, the data were aggregated to the state level to ensure sufficient variability for the analyses. The unit of analysis is the shooting incident. The dependent variable is the mean fatality rate per 100,000 population (based on 2016 U.S. Census Bureau state populations) to eliminate the effects of any gross influences. Early adulthood offenders were measured as those between 20 and 39, which was conceptualized by Erikson's (1963, 1980) psychosocial development scale and is consistent with similar studies involving young adults (Whitbourne, Zuschlag, Elliot, & Waterman, 1992). The independent variables are nominal and were dichotomized for analysis, except for age and year, which are scale level; age, race, flight status, weapon type, and region of the country were also grouped for additional analysis. The research questions are:

1. Which U.S. cities present the greatest risk of a police shooting fatality?
2. Is the mean rate of police shooting fatalities significantly different between various situational indices?
3. To what extent do age, race, sex and signs of mental illness predict the mean rate of police shooting fatalities while controlling for other factors?

The data do suffer from some issues raised by Jacob (1984) concerning published data, which may lead to problems drawing accurate conclusions (Williams, Bowman, & Jung, 2016). Other limitations include: 1) all of the cases involve fatalities, so comparing nonfatal shootings is not possible; 2) there is no data on the officers' characteristics, which limits demographic comparisons; 3) there is no data on environmental characteristics, which limits controlling for the tactics, approach, crime type, offender resistance, and the immediate situation; 4) the data on offenders and the incident are very limited and do not thoroughly describe the situation facing the officers; and 5) the data do not differentiate intentional and unintentional shootings. Despite these limitations, the data are suitable for generalizing about patterns of police shooting fatalities since there is excellent geographical distribution (all of the states and Washington, D.C. are captured), the data represent the population of interest, not a sample, and there is a relatively high degree of similarity between the data for both years.

4. Analysis

The prevalence of police shooting fatalities has remained relatively stable between 2015 (M = 0.752; n = 991) and 2016 (M = 0.743; n = 957). Fatalities declined 3.4% with monthly averages at 81.2, ± 3.4 (Fig. 1), and there is no significant difference between years, $t(1946) = 0.551$, $p = 0.581$. Despite some spikes in the data, there is no difference in the fatality rate across months, $F(11, 1936) = 0.920$, $p = 0.520$, or days of the week, $F(6, 1941) = 0.643$, $p = 0.696$.

Table 1 is the state ranking per 100,000 population. All fifty states and D.C. are represented with California (16.8%), Texas (9.2%) and Florida (6.0%) comprising 32.0% of the fatalities (n = 624). New Mexico has the highest mean rate (1.97) followed by Alaska (1.48) and Oklahoma (1.48); Connecticut (0.17), New York (0.18) and Rhode Island (0.19) are lowest. The national mean fatality rate is 0.75 with a standard deviation of 0.35 and a range of 1.80. Although the base rate shows wide variability across states, those with the highest gross number of fatalities do not emerge as leaders when the data are normalized per population.

An important principle of risk analysis is that outcomes are highly concentrated among particular people, places and situations. This implies that focusing efforts where police shooting fatalities are concentrated will yield the greatest preventive benefits. To examine risk further, the Pareto principle (also known as the 80/20 rule) was applied at the city level (Table 2) to answer the first research question: *Which U.S. cities present the greatest risk of a police shooting fatality?* The 80/20 rule describes the phenomenon that 80% of outcomes (in this case police shooting fatalities) are attributable to 20% of the input (in this case locations) (Clarke & Eck, 2005, pp. 48–49). There are 1211 cities represented, where the top 20 cities (n = 278), 1.7%, account for 14.3% of the fatalities. As expected, major U.S. cities present the greatest risk of a fatality, which is likely correlated with crime rate and neighborhood context (MacDonald, Kaminski, Alpert, & Tennenbaum, 2001; Terrill & Reisig, 2003). In theory, focusing preventive action such as policy development, training and education on these 20 cities, rather than on all 1211 cities, could be an efficient strategy for reducing police fatalities nationwide. Although risk presents itself at the aggregate

[3] https://www.washingtonpost.com/graphics/national/police-shootings/. Retrieved on January 20, 2017.

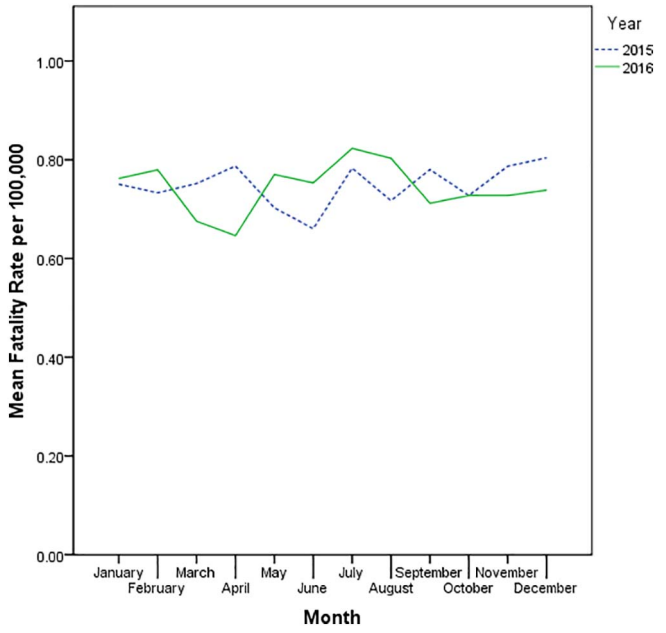

Fig. 1. Police shooting fatality comparison, 2015–2016.

(city) level, greater analysis is required at the incident level to determine the context and situational nuances of each individual shooting to determine how and why each shooting occurred. Unknown and hidden vulnerabilities can increase risk, so it is important to tease out those nuances that are susceptible to training and policy provisions in each city. That analysis is beyond the *Post* data.

Table 3 presents the descriptive statistics. The offender's mean age is 36.6 with a wide standard deviation of 12.9 years; the most common offender was 31 years old. Early adulthood offenders (ages 20–39) account for 58.8% of the fatalities. Offenders are overwhelmingly male (95.8%), and Whites comprise the largest group (51.5%); when racial groups are dichotomized, nonwhites are slightly more than half (50.9%). The majority of offenders did not display any signs of mental illness (74.6%). Almost two-thirds of offenders (64.9%) were attacking the officer when killed, and the overwhelming majority (92.3%) were armed when they were killed. The majority of fatalities occurred during weekdays (72.1%); most offenders were not fleeing (69.8%); and most officers were not wearing a body camera (89.2%). As for weapons, 59 different types of weapons were used in 1700 incidents; weapons were undetermined ($n = 90$), or unknown ($n = 12$) in 5.3% of the incidents, and offenders were unarmed ($n = 141$) in 7.3% of incidents. Guns were most prevalent over all other weapons (63.1%); six types of weapons (10.2%)—gun, knife, vehicle, toy weapon, machete, and sword—accounted for 93.5% of the fatalities. Most of the fatalities occurred in the South region[4] (41.2%), followed by the West (35.5%); the Northeast region was well below the other regions (7.3%). Fatalities were almost evenly split between 2015 (50.9%) and 2016 (49.1%).

Table 4 is a comparison of means for the police shooting fatality rate, which is intended to examine differences between various situational indices. Most of the comparisons are not significant, which indicates the relative stability of fatalities. Early adulthood offenders, those believed to be in greatest contact with the police (see Eith & Durose, 2011), was not significant ($t(1908) = -0.969$, $p = 0.333$), except when controlling for race. The mean rate for Hispanics was higher than for Whites, Blacks and others ($p < 0.000$), but was not different for Asians ($p = 0.339$) or Native Americans ($p = 0.529$). The mean rate for Blacks was lower than for Whites, Hispanics ($p < 0.000$) and Native Americans ($p < 0.002$), but was not different for Asians and others. The rate for Native Americans was higher than for Whites ($p = 0.030$), Blacks ($p = 0.002$) and others ($p = 0.001$), but not different for Asians and Hispanics. When race is dichotomized into Black and all others, the mean rate for Blacks ($M = 0.633$) was significantly lower than all others ($M = 0.783$), $t(1857) = 8.385$, $p = 0.000$. The same analysis when controlling for sex also showed differences. The mean rate for White males was lower than for Hispanics ($p < 0.000$) and higher than for Blacks ($p < 0.000$) and others ($p < 0.000$). The mean rate for Black males was lower than for Whites, Hispanics ($p < 0.000$) and Native Americans ($p = 0.013$).

The next set of differences is among those who were unarmed by region of the country. The rate of unarmed fatalities in the Northeast was significantly lower than all other regions ($M = 0.278$). The South was higher ($M = 0.720$) than the Northeast and the Midwest ($M = 0.504$; $p < 0.000$), but was lower than the West ($M = 0.935$; $p < 0.001$). The rate of fatalities in the West region is also significantly higher than all other regions ($M = 0.986$; $p < 0.000$), regardless of

Table 1
State ranking of police shooting fatalities per 100,000 population, 2015–2016.

Rank	State	N	M
1	NM	41	1.97
2	AK	11	1.48
	OK	58	1.48
3	WY	8	1.37
4	DC	9	1.32
5	AZ	91	1.31
6	WV	22	1.20
7	NV	33	1.12
8	CO	60	1.08
9	LA	46	0.98
10	AL	42	0.86
	MT	9	0.86
11	CA	327	0.83
12	SD	7	0.81
13	NE	15	0.79
14	ID	13	0.77
	KY	34	0.77
15	OR	30	0.73
	SC	36	0.73
16	MO	42	0.69
17	AR	20	0.67
18	KS	19	0.65
	TX	180	0.65
19	TN	42	0.63
20	UT	18	0.59
21	WA	42	0.58
22	FL	117	0.57
23	HI	8	0.56
24	NC	56	0.55
25	MS	16	0.54
26	GA	55	0.53
27	MD	30	0.50
	IN	33	0.50
28	WI	28	0.48
	VT	3	0.48
29	OH	55	0.47
30	MN	25	0.45
31	DE	4	0.42
	VA	35	0.42
32	NH	5	0.37
	IL	47	0.37
33	IA	10	0.32
34	MA	21	0.31
	PA	39	0.31
35	NJ	27	0.30
	ME	4	0.30
36	MI	29	0.29
37	ND	2	0.26
38	RI	2	0.19
39	NY	36	0.18
40	CT	6	0.17

[4] U.S. regions according to the FBI Uniform Crime Report: Northeast: ME, NH, VT, MA, CT, RI, NY, PA, NJ; South: TX, OK, AR, LA, AL, GA, KY, TN, WV, VA, DE, MD, DC, NC, SC, FL, MS; Midwest: ND, SD, NB, KS, MN, IA, MO, MI, WI, IL, IN, OH; West: WA, OR, CA, HI, AK, ID, NV, MT, WY, CO, AZ, UT, NM.

Table 2
Top 20 riskiest U.S. cities for police shooting fatalities, 2015–2016

City	Fatalities	% of fatalities	Cumulative % of fatalities	Cumulative % of cities
Los Angeles	29	1.5%	1.5%	0.1%
Phoenix	22	1.1%	2.6%	0.2%
Houston	21	1.1%	3.7%	0.2%
Chicago	20	1.0%	4.7%	0.3%
Las Vegas	16	0.8%	5.5%	0.4%
San Antonio	15	0.8%	6.3%	0.5%
New York	14	0.7%	7.0%	0.6%
Columbus (OH)	13	0.7%	7.7%	0.7%
Indianapolis	13	0.7%	8.4%	0.7%
Miami	13	0.7%	9.0%	0.8%
Austin	12	0.6%	9.7%	0.9%
Tucson	12	0.6%	10.3%	1.0%
Albuquerque	11	0.6%	10.8%	1.1%
Oklahoma City	11	0.6%	11.4%	1.2%
Bakersfield	10	0.5%	11.9%	1.2%
Denver	10	0.5%	12.4%	1.3%
Charlotte	9	0.5%	12.9%	1.4%
San Bernardino	9	0.5%	13.3%	1.5%
San Francisco	9	0.5%	13.8%	1.6%
Washington, D.C.	9	0.5%	14.3%	1.7%
7 cities, 8 incidents	56	2.9%	17.1%	2.2%
10 cities, 7 incidents	70	3.6%	20.7%	3.1%
7 cities, 6 incidents	42	2.2%	22.9%	3.6%
11 cites, 5 incidents	55	2.8%	25.7%	4.5%
13 cities, 4 incidents	52	2.7%	28.4%	5.6%
51 cities, 3 incidents	153	7.9%	36.2%	9.8%
150 cities, 2 incidents	300	15.4%	51.6%	22.2%
942 cities, 1 incident	942	48.4%	100.0%	100.0%
1211 cities	1948	100.0%		

armed status. The offender's flight status also emerged as significantly different. The rate of fatalities is higher for those who were fleeing in a car ($M = 0.813$) compared to those who were not fleeing ($M = 0.737$; $p < 0.004$), or those who were fleeing on foot ($M = 0.728$; $p < 0.033$). The presence of body-worn cameras (BWC) is also significantly different. The mean rate of fatalities is higher for officers wearing a body camera ($M = 0.829$) compared to those who were not wearing a camera ($M = 0.738$; $p < 0.000$). This may be a function of the increasing proliferation of that technology resulting from a moral panic about police shootings (Shane, 2016; Wasserman, 2014). Research on body cameras used during police shootings suggests that citizens prefer officers use them and that when BWC video is coupled with audio, perceptions of an unjustified shooting were lowest (Culhane, Boman, & Schweitzer, 2016).

Lastly, differences among racial groups also emerged. The mean rate of fatalities for Whites ($M = 0.741$) is significantly lower than for Hispanics ($M = 0.897$; $p < 0.000$) and Native Americans ($M = 1.106$; $p < 0.005$), but is higher than for Blacks ($M = 0.633$; $p < 0.000$). The rate for Asians ($M = 0.707$) is significantly lower than Hispanics ($M = 0.897$; $p < 0.002$) and Native Americans ($M = 1.106$; $p < 0.003$), but there were no differences between Whites ($M = 0.741$; $p < 0.1.000$) and Blacks ($p < 0.748$). The rate for Blacks is significantly lower than for Whites, Hispanics and Native Americans ($p < 0.000$), but was not different from Asians ($M = 0.707$; $p < 0.748$) and others ($M = 0.624$; $p < 1.000$).

Looking further at the data, ordinary least squares regression was used to determine the amount of variance in the rate of police shootings (Table 5) and help answer the last research question: *To what extent do age, race, sex, and signs of mental illness predict the mean rate of police shooting fatalities, controlling for other factors?* The demographic variables largely thought to predict the rate of police shootings are not

Table 3
Descriptive statistics in the Washington post use of force data 2015–2016 ($n = 1948$)

Variables and metrics	N	%	Mean fatality base rate	S.D.
Dependent variable				
Police shooting fatalities per 100,000	1948	–	0.75	0.35
Grouping variables				
Offender's age (scale)	1910	100.0	36.6	12.9
Offender's age (grouped)	1910	100.0	–	–
< 18 (1)	34	1.8	0.674	0.238
18–27 (2)	495	25.9	0.739	0.352
28–37 (3)	610	31.9	0.754	0.356
38–47 (4)	368	19.3	0.762	0.347
48–57 (5)	259	13.6	0.739	0.329
58–67 (6)	109	5.7	0.708	0.338
68–77 (7)	29	1.5	0.736	0.345
78–87 (8)	6	0.3	0.834	0.455
Offender's median age (binary)	1910	100.0	–	–
< 35	955	50.0	0.745	0.352
> 35	955	50.0	0.746	0.342
Early adulthood offenders	1910	100.0	–	–
20–39	1124	58.8	0.752	0.352
All others	786	41.2	0.736	0.339
Offender's sex	1948	100.0	–	–
Male (1)	1866	95.8	0.745	0.347
Female (0)	82	4.2	0.766	0.332
Offender's race	1859	100.0	–	–
White (2)	957	51.5	0.741	0.338
Black (4)	490	26.4	0.633	0.282
Hispanic (3)	332	17.9	0.897	0.390
Asian (1)	29	1.6	0.707	0.217
Other (6)	26	1.4	0.624	0.148
Native American (5)	25	1.3	1.106	0.432
Offender's signs of mental illness	1948	100.0	–	–
No signs of mental illness (0)	1454	74.6	0.756	0.344
Signs of mental illness (1)	494	25.4	0.722	0.352
Offender's attack status	1948	100.0	–	–
Under attack (1)	1265	64.9	0.750	0.356
Not under attack (0)	683	35.1	0.743	0.326
Offender's armed status	1841	100.0	–	–
Armed (1)	1700	92.3	0.750	0.352
Unarmed (0)	141	7.7	0.724	0.320
Weekend/weekday	1948	100.0	–	–
Weekday (0)	1405	72.1	0.743	0.341
Weekend (1)	543	27.9	0.758	0.359
Offender's flight status	1921	100.0	–	–
Not fleeing (1)	1340	69.8	0.737	0.340
Car (2)	285	14.8	0.813	0.360
Foot (3)	227	11.8	0.728	0.364
Other (4)	69	3.6	0.727	0.307
Officer wearing body camera	1948	100.0	–	–
Officer not wearing body camera (0)	1737	89.2	0.738	0.342
Officer wearing body camera (1)	211	10.8	0.829	0.373
Weapon type (grouped)	1700	100.0	–	–
Guns (1)	1080	63.5	0.756	0.367
Cutting instruments (2)	343	20.2	0.721	0.317
Blunt instruments (3)	45	2.6	0.739	0.334
Other weapons (4)	112	6.6	0.726	0.327
Vehicles (5)	120	7.1	0.802	0.338
Weapon type (binary)	1700	100.0	–	–
Gun (1)	1080	63.5	0.756	0.367
Other weapon (0)	620	36.5	0.739	0.324
Region	1948	100.0	–	–
South (2)	802	41.2	0.724	0.271
West (4)	691	35.5	0.986	0.332
Midwest (3)	312	16.0	0.499	0.144
Northeast (1)	143	7.3	0.273	0.068
Year	1948	100.0	–	–
2015	991	50.9	0.752	0.342
2016	957	49.1	0.743	0.350

Table 4
Differences in the rate of police fatalities, 2015–2016.

Variables	Questions Is the rate of fatalities significantly different between…	Finding	n	*t*-test *t*	ANOVA *F*	*p*
Age						
Age (grouped, see Table 3)	… the offenders' age groups?	No	1909	–	0.657	0.709
Age (< 35, > 35) (median)	… offenders under and over 35?	No	1910	− 0.050	–	0.960
Early adulthood (20–39, others)	…early adulthood offenders (20–39) and others?	No	1910	− 0.969	–	0.333
Sex						
Sex (male, female)	… offenders who are male or female?	No	1948	− 0.495	–	0.621
Time						
Year	… 2015 and 2016?	No	1948	0.551	–	0.581
Day of week (1–7)	…days of the week?	No	1948	–	0.643	0.696
Weekend (yes, no)	… weekend and weekday?	No	1948	0.852	–	0.394
Week of year (1–53[a])	…each week of the year?	No	1948	–	1.051	0.376
Mental illness						
Signs of mental illness (yes, no)	… offenders exhibiting and not exhibiting signs mental illness?	No	1948	− 1.862	–	0.063
Attack status						
Attacking (yes, no)	… offenders who were attacking or not attacking the officer?	No	1948	0.460	–	0.646
Weapon type						
Guns and other weapons	…guns and other weapons?	No	1700	− 0.964	–	0.335
Armed status						
Armed (yes, no)	… offenders who were armed or unarmed?	No	1841	0.854	–	0.393
Unarmed status						
Unarmed × early adulthood	…unarmed early adulthood offenders and others?	No	140	− 0.526	–	0.600
Unarmed × race	…unarmed offenders based on race?	No	141	–	1.657	0.164
Unarmed × race × sex	…unarmed White and nonwhites males?	No	135	− 0.611	–	0.542
Unarmed status × region	…unarmed offenders based on regions of the country?	Yes	141	–	23.415	0.000
Flight status						
Fleeing (grouped, see Table 3)	… offenders' flight status?	Yes	1921	–	4.223	0.006
Officer wearing body camera						
Body camera (yes, no)	… officers with and without a body camera?	Yes	1948	− 3.649	–	0.000
Region of the country						
Region (grouped, see Table 3)	… different regions of the country?	Yes	1948	–	415.411	0.000
Racial category						
Race (grouped, see Table 3)	… offenders' racial groups?	Yes	1859	–	31.776	0.000

[a] 2015 had one extra week.

Table 5
Multiple regression analysis predicting rate of police shootings per 100,000 population (n = 1727)[a].

Variables	B	SE	β
Independent			
Age	0.000	0.001	0.007
Sex	− 0.046	0.041	− 0.027
Race (white; nonwhite)	− 0.004	0.018	− 0.006
Mental Illness	− 0.036	0.020	− 0.045
Control			
Armed	0.024	0.032	0.018
Fleeing	0.037	0.020	0.047
Attacking	0.005	0.018	0.007
Weekend	0.021	0.019	0.027
(Constant)	0.754	0.056	

Note: R = 0.081; Adj. R^2 = 0.002; $F(8, 1718) = 1.414$, p = 0.186.
[a] Listwise deletion of cases.

significant; even after controlling for other conditions the model has no explanatory power.[5] This suggests that other situational factors and contextual details are likely driving the variability in police shooting fatalities such as the circumstances that led the officer to fear for his or her life, or that of a third person (see some examples in note # 8). That analysis is beyond the *Post* data, but is critical to understanding how police shootings are occurring so tactics can be developed to reduce or avoid them insofar as possible.

A second set of analyses replicated the test presented in Table 5 using a clustered regression technique. Due to the fact that the dependent variable (police shooting rate per 100,000 population) was calculated by state, concerns about the independence of the observations were raised. The cluster command in Stata 12.0 was used to determine if accounting for this impacted the results. None of the results in the clustered approach reached a measure of statistical significance ($p < 0.05$), however mental health was close ($p = 0.053$) but, as seen in table 5, has a negative association.

5. Discussion

It is reassuring that fatal police shootings do not show an increasing trend and the results are inconsistent with beliefs espoused in popular culture. The findings suggest that the public likely has a misconception about police use of fatal force. Some social and media sources suggest that unarmed Black males are being killed by police at higher rates due to police officer racial bias, and those exhibiting signs of mental illness are more likely to be killed than those without such signs. There is no evidence to support this narrative. Specifically, there is no significant difference in the rate of fatalities between early adulthood Whites and non-whites. Contrary to popular opinion, Whites who were not attacking the officer were more likely to be shot than Blacks who were not attacking the officer. The non-significant difference between the mean fatality rates of Black offenders who were unarmed compared to White offenders who were unarmed, when controlling for sex, contradicts the notion that unarmed Black males are killed at disproportionate rates compared to other groups. The same holds true for fatality rates involving those who do and do not exhibit signs of mental illness. One interesting finding is the differences in geographical region. One possibility for these differences may be policies, training and/or culture of the police agencies in those regions, as well as gun laws. Although there is some uniformity in police use of deadly force across the country

[5] A correlation matrix, not shown in this paper, reveals there are no significant relationships between the dependent and predictor variables except for flight; the fatality rate per 100,000 increases for those who are fleeing with a very weak effect (r = 0.050, p = 0.031).

based on U.S. Supreme Court decisions (Graham v. Connor, 1989; Tennessee v. Garner, 1985), police agencies retain a great deal of discretion and autonomy in hiring, training and policy development, which influences how laws and policies are implemented at the line level. Police are also subject to wide variation in guns laws (e.g., stand your ground, self-defense or castle doctrines; open or concealed carry; possession of assault weapons; peaceable journey) that may expose officers to more actual or perceived threats, or at least place them in a heightened state of caution during citizen encounters.

The findings suggest that some of the trope conveyed by news outlets and social media sources based on age, race, sex, and signs of mental illness are not grounded in evidence, yet they have had a profound effect on police policy. For example, adopting body-worn cameras has proliferated throughout U.S. police departments to enhance transparency, with the objective of reducing the number of incidents of unjustified use of force and preventing another Ferguson-type riot. While body-worn cameras do have their benefits, they are not a panacea; in fact, the rate of shooting fatalities is higher for those with a body-worn camera than without one, which demonstrates the limits of this new technology. Although the fatality rates are higher for some groups and in some regions of the country, the data stop short of answering how and why this is occurring. Previous research does show a correlation between age, race and sex with local crime rates and neighborhood composition, which may be a factor. However, that same research relies on data that is localized and does not account for the situational and contextual circumstances the officer was facing when the shooting occurred.

For an officer's use of force to be deemed “objectively reasonable” and consistent with current procedural law (Graham v. Connor, 1989), his or her response (“what” and “how”) must be reasonably balanced with the governmental interests at stake (“why”). The officer's quantum of force can be measured by evaluating “what” force option was used, and “how” it was used. The level of force an officer applies will vary based on the situation. Because of this variation, policies for applying force are based on many factors, including the officer's assignment (patrol vs. detective vs. SWAT), level of training and experience, along with the environmental context the officer is facing. Most, if not all, past and present research on use of force is not undertaken within this framework and, as such, does not accurately tell the story of police shootings. This shortcoming severely restricts policing's ability to evolve tactics in response to a changing environment and potentially avoid a fatal encounter. Consequently, policing fails to learn from past experiences and cannot rule out chance alone as the reason for a justifiable or unjustifiable shooting. Unfortunately, the *Post* data do not enable such analysis since many of the variables needed to evaluate the encounter are not captured.

The *Post* data also help establish statistical base rates for lethal use of force incidents by police, which has yet to be done on a national level. Base rates are a statistic, usually depicted as a proportion or a percentage of a population that exhibits some characteristic or outcome (in this case fatality from a police shooting) and which indicate probability based on the absence of controls or other information. When judging the probability of an event (e.g., dying in a police shooting), there are two types of information that are typically available: 1) generic information about the prevalence of events of that type; and 2) specific information about a given case (e.g., Michael Brown, Ferguson, MO). Knowledge about the number of police shooting fatalities in the general population is termed distributional or base rate information. Knowledge about a single fatal police shooting is termed individuating or case-based information. When given information about a single fatality and information about the fatality base rate, people tend to base their judgments on case-based information and either underutilize or ignore base-rate evidence (Bar-Hillel, 1980; Tversky & Kahneman, 1974).

Underutilizing or ignoring base rate evidence when reaching a decision is known as the base rate fallacy and helps explain why people are fearful or overly concerned about rare events (dying in a plane crash; dying from a police shooting). It also helps explain why people too often make hasty judgements based on stereotypes and preexisting beliefs about a limited number of category attributes (e.g., age, race, sex, mental illness, unarmed status). Although these attributes can sometimes be useful, they often lead to severe systematic errors (Funder, 1996). Since the outcome of many police shooting fatalities end in a courtroom, whether criminal or civil, base rates that are closely linked to the particulars of a specific case are more likely to be admitted as relevant evidence (Koehler, 2002).

To overcome the stereotypes about dying from a police shooting, a much stronger social message is needed about base rate fatalities instead of anecdotes (e.g., case-based information) because perception often becomes reality (Malmin, 2015). Overcoming emotional arguments with reason means not vilifying and dismissing critics as illegitimate and listening to the “other side's” point of view. This does not mean compromising on principles, but it does mean expressing empathy, which goes a long way toward shared public safety responsibility.

6. Limitations

The *Post* data have not been independently verified for their validity, although they purport to capture more fatalities than government sources such as the FBI Uniform Crime Report, Supplemental Homicide Report and the Centers for Disease Control and Prevention, National Violent Death Reporting System. The U.S. Bureau of Justice Statistics readily acknowledges the incomplete structure of the FBI's data, where some records at the state level are completely missing and other instances where there are too many records (Brown & Langan, 2001; see also Maxfield, 1989). The FBI data have been criticized because they are derived from voluntary reports from law enforcement agencies, 20–30% of which do not report the information in a given year. However, the majority of these agencies are small and do not frequently experience violent crime (Johnson, 2016). The Center of Disease Control Mortality Reports are derived from a supplemental federal form completed by physicians and coroners when they complete a death certificate. As it takes time to determine the cause of death and analyze the data received, the FBI and CDC reports may lag by as much as two years (Johnson, 2016). If, for example, data were captured on non-fatal police shootings, then it would be possible to calculate the number of shots fired by officers and the number of officers that discharged their weapons in relation to the situational context. This would provide trainers and policymakers with a better understanding of how deadly force is applied (Klinger et al., 2016), which is the best preventative.

Also, the data were collected by journalists who are not likely trained in research methods; as such, there is some conceptual ambiguity with key variables. The terms “fleeing” and “unarmed” lack context. At best they are crude definitions that are not informed by science, police practices or law. For example, was the offender fleeing: 1) recklessly in a vehicle that endangered the officers or the public? 2) while armed? or 3) taking a hostage? Was the unarmed offender: 1) reaching for a weapon? 2) trying to disarm the officer? 3) attacking the officer? 4) did less-lethal options fail against the offender who continued to attack the officer or resist arrest? 5) failing to follow verbal commands while making threatening gestures with concealed hands during the commission of a crime or flight therefrom? 6) assisted by an accomplice as both attacked the officer when the officer shot and killed one of them? 7) attacking a third person? 8) winning a physical fight against the officer? The conceptual definitions for fleeing and unarmed are not specified in the methodology provided by the *Post* and they do not indicate whether the offender posed a threat, was harmful, or was surrendering or regrouping. The armed-unarmed dichotomy offered by the *Post* is not the correct triggering condition for police use of force. Police officers can use force when they perceive an imminent

threat of serious bodily injury[6] to themselves or a third person, notwithstanding whether a physical weapon is present. Any one of the aforementioned conditions could justifiably merit deadly force against an offender who is fleeing or unarmed depending on the totality of the circumstances, which could render the plain meaning of those terms meaningless.[7]

Although risk of a shooting fatality presents itself at the aggregate (city) level, greater analysis is required at the incident level to determine the context and situational nuances of each individual shooting to determine how and why the shootings occurred. Aggregate data and the statistics that flow from them summarize a set of observations that communicate the largest amount of information as simply as possible, but they do not measure the fine details. Aggregate data may mask incident-level details that are necessary to identify trends and patterns, as well as the factors that may be correlated with use of force across similar cities and various contexts, such as level of offender resistance, offender's crime (felony, misdemeanor, traffic), officer assignment (patrol, investigative), type of contact (reactive, self-initiated), years of service, neighborhood composition, type of incident and organizational composition, among the many. It is distinctly possible that multivariate analysis involving situational variables will yield results similar to Friedrich (1980) who found that "police use of force depends primarily on two types of factors: how the offender behaves and whether or not other citizens and police are present…The manner of the offender toward the police has the greatest impact…" (p. 95).

7. Policy implications

The Pareto analysis shows how ripe this topic is for industry advocates (e.g., Police Executive Research Forum; International Association of Chief of Police; National Sheriff's Association; Fraternal Order of Police) and policing researchers (e.g., American Society of Criminology, Division of Policing; Academy of Criminal Justice Sciences, Police Section; Police Foundation) to convene a national summit of the top 20 cities to explore incident-level characteristics of fatal police shooting in those cities. These groups have a long history of working with practitioners to generate research and to assist in translating research into practice. As part of policing's "new professionalism" (Stone & Travis, 2011), a summit of this sort could yield evidence-based solutions (such as less-lethal force options, de-escalation techniques and problem-oriented policing) that help mitigate the risks and harms associated with police use of force. This would add a measure of coherence to the national discussion of police use of force (Shane, 2016).

Without hard data, police departments and policymakers absorb a great deal of uncertainty and there is some degree of plausible deniability for senior police and elected officials about the nature and extent of the problem and no way to call them on it. By withholding accurate and timely information from the public by failing to collect the data (an act of omission rather than commission), police leaders and policymakers can shape and massage the account of police shooting fatalities that may serve political ends instead of rational discourse. As such, policing researchers should also lend their expertise toward developing a comprehensive national government database of incident-level use of force data to support pending federal legislation (H.R. 306, National Statistics on Deadly Force Transparency Act of 2015).[8] A data source of this type would be consistent with the core mission of the: 1) National Police Research Platform, funded by the National Institute of Justice; 2) National Data Collection Committee of the Division of Policing at the American Society of Criminology; 3) findings from a joint report issued by the National Sheriffs' Association and Treatment Advocacy Center (2013) on justifiable homicides by law enforcement officers involving the mentally ill; 4) findings from the Police Executive Research Forum (2012) on being proactive about preventing use of force situations; 5) Police Foundation's report titled "5 Things You Need to Know About Open Data in Policing;" and 6) the President's "Police Data Initiative." An incident-based system is inherently flexible and can unmask relationships between victims, offenders, locations, and other micro-level details similar to the FBI's National Incident-based Reporting System (NIBRS). Incident-level data are superior to aggregate data for inferential purposes and can help explain the sequence of events that lead to police use of force, which will inform better tactics, better policies and a greater understanding of how a shooting occurs.

8. Directions for future research

Courts define the permissible scope of police action through decisions and statutory interpretation, and police policy becomes more or less restrictive based on the outcome of those decisions. Research can—and should—inform those decisions.[9] Most of the past and present use of force research focuses on sociodemographic factors—age, race, sex, concentrated disadvantage—to explain the phenomenon in the same way it is used to explain crime (e.g., Cullen & Agnew, 2006). While interesting, they do little if anything to help understand the dynamics of a police shooting, or to help reduce use of force encounters, which should be the overriding goal of use of force research. To improve police use of force—and by improve we mean reducing the type and amount—policing researchers should turn to the factors courts consider when analyzing the legal aspects of a use of force episode (City of Canton v. Harris, 1989; Graham v. Connor, 1989; Monell v. New York City Department of Social Services, 1978; Tennessee v. Garner, 1985).

To exact accountability courts examine the micro actions of the offender and the officer, in relation to their environment,[10] as set within the prevailing legal framework. This helps establish reasonableness, the

[6] "Serious bodily injury" generally means bodily injury that creates a substantial risk of death or which causes serious, permanent disfigurement, or protracted loss or impairment of the function of any bodily member or organ (e.g., New Jersey Criminal Code, *N.J.S.A.* 2C:11–1, Definitions).

[7] Examples of an imminent threat of serious bodily injury facing a police officer from an unarmed offender when deadly force was used include: Vicent (2015) when an offender "…tried to hold the officer's head underwater and that [the officer] was able to fight his way above water and shoot [the offender];" Robinson (2015) when an offender "Suddenly, and without warning…hit the officer at least once and the two began struggling. A witness said [the offender] was pushing the officer against the railing and was afraid he was going to push the officer over the rail off the second floor balcony;" Winne (2017) when a fleeing offender was trying to "drive away with another detective hanging on to his car" when he was shot and killed by a second officer; Perry (2016) when an unarmed offender assumed a shooting stance and pointed a "metallic, cylindrical object at one of the officers," which turned out to be a "vaping device;" Medina (2014) when an unarmed offender with "mental problems" struggled with responding officers and "spun around, tucked his head toward the officer's gun and basically tackled him to the ground, trying to grab at the weapon;" Spielman (2016) when an unarmed offender "…who was under the influence of PCP attacked a female officer [and] viciously pounded her head into the street as her partner was trying to get him off of her. This attack went on for several minutes;" Associated Press (2015) when an unarmed offender "…knocked one officer to the ground and was grappling for the officer's holstered weapon when the second officer fired two shots. The first officer pulled out a backup gun and shot [the offender] in the back…". Also see MacDonald (2016) for a discussion of the limitations of the *Post's* unarmed status classification and police shootings.

[8] Pending as of April 2017. Retrieved from https://www.congress.gov/bill/114th-congress/house-bill/306/actions, on April 1, 2017.

[9] Prominent criminologist, the late Dr. James Fyfe testified before the U.S. Supreme Court during the Tennessee v. Garner (1985) decision, which profoundly changed U.S. police policy relating to the fleeing felon rule. Also see Sherman and Cohn (1989) for sweeping changes in domestic violence policy.

[10] To illustrate the complexity of a police shooting, author Shane conceptualized the interaction between the officer's ($n=37$) and the offender's ($n=24$) actions, in relation to their environment ($n=9$). Shane conservatively estimates there are 54,740 unique combinations of conditions that could arise. A combination, not a permutation, is the number of ways to choose a sample of r elements from a set of n distinct objects, where the order does not matter and replacements are not permitted.

$$C(n,r) = C(70,3)$$
$$\frac{70!}{(3!\,(70-3)!)}$$
$$= 54,740$$

cornerstone of the Fourth Amendment's seizure analysis. Reasonableness encompasses, but is not limited to: 1) the severity of the crime(s) at issue; 2) whether the offender poses an immediate threat to the safety of the officer(s) or others; 3) whether the offender is actively resisting arrest or attempting to evade arrest by flight; 4) the influence of drugs/alcohol or the mental capacity of the offender; 5) the time available to an officer to make a decision; 6) the availability of more officers, or resources to de-escalate the situation; 7) the proximity or access of weapons to the offender; and 8) any other imminent or exigent circumstances (e.g., Blair et al., 2011). Most currently available data sources do not enable this type of analysis, but are very easily captured by the police agencies where they occur.

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