

# Is the Number of Citizens Fatally Shot by Police Increasing in the Post-Ferguson Era?

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## **Abstract**

This study examines whether the number of citizens fatally shot by police in the United States has changed significantly since the shooting of Michael Brown in Ferguson, Missouri. Using longitudinal data compiled by killedbypolice.net, we use an interrupted time-series design to test the effect of events in Ferguson on fatal shootings by police. Our analyses reveal that the number of citizens killed by police is temporally unstable, exhibiting random short-term fluctuations that are often misinterpreted as evidence of substantively meaningful trends. However, after testing a variety of model specifications, we find no evidence that the number of fatal police shootings either increased or decreased post-Ferguson. Claims to the contrary are based on weak analyses of short-term trends.

## **Keywords**

Ferguson Effect, police shootings, police use of force, interrupted time-series analysis

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Police use of force is once again in the national spotlight in the United States in the wake of several recent controversial fatal police shootings of citizens. Videos documenting some of these incidents have gone viral, generating significant media attention and fueling intense scrutiny and public discontent with the police (Weitzer, 2015). Although there have been many highly publicized police shootings over the last 2 years (e.g., Tamir Rice in Cleveland, Ohio, in November 2014; Walter Scott in North Charleston, South Carolina, in April 2015; and Philando Castile in Falcon Heights, Minnesota, in July 2016, to name a few), arguably the most consequential was the shooting of Michael Brown by a White police officer in Ferguson, Missouri, in August 2014. This incident sparked widespread protests throughout the United States and fueled the growth of citizen groups that seek to raise awareness about police use of force (such as Black Lives Matter [BLM], n.d., and Campaign Zero), which many speculate is on the rise in the post-Ferguson era (see [blacklivesmatter.com](http://blacklivesmatter.com); [mappingpoliceviolence.org](http://mappingpoliceviolence.org); Kindy, Lowery, Rich, Tate, & Jenkins, 2016).

On the basis of crowdsourcing and media data collection efforts (e.g., [mappingpoliceviolence.org](http://mappingpoliceviolence.org) and Kindy et al., 2016), some commentators have suggested that police violence against citizens is increasing significantly (see also Wines & Cohen, 2015). Yet fatal shootings by the police are relatively rare events (from a statistical perspective), and annual totals tend to fluctuate even during periods of long-term stability (Adams et al., 1999; Bayley & Garofalo, 1989; Fyfe, 1988; Zimring & Arsiniega, 2015). Nevertheless, in the aftermath of events in Ferguson, there are compelling reasons to expect that fatal shootings would trend either upward *or* downward. Both possibilities are consistent with competing narratives that have emerged in the post-Ferguson era. The first narrative is that citizens have become more willing to challenge the authority of police and to defy their orders (H. Mac Donald, 2015; Rosenfeld, 2016; Sherman, 1993). The second is that police officers are now less likely to engage in proactive policing because they fear reprisal for their actions, a phenomenon that has come to be known as “depolicing” (H. Mac Donald, 2015; Nix & Wolfe, 2016; Valencia, 2015). If depolicing has indeed occurred post-Ferguson, we might expect the use of deadly force by officers to *decrease*, as there may be fewer confrontations between police officers and those who would resist their authority. However, if citizens have in fact become more willing to defy the police, we might expect the use of deadly force by police to *increase*. Thus, these competing narratives give rise to opposite hypotheses about post-Ferguson trends in the use of deadly force by police.

Unfortunately, we know little about the extent to which citizens are shot and killed by police in the United States due to the lack of reliable

government data on the subject (Bialik, 2016; Nix, Campbell, Byers, & Alpert, 2017; Planty et al., 2015; Williams, Bowman, & Jung, 2016). Although police use of force has always been a contentious issue in the United States, data availability and data quality issues make it difficult to examine long-term national trends in citizens killed by police (Alpert, 2015a, 2015b). Recent studies have shown that extant research using data from the Uniform Crime Report's (UCR) Supplemental Homicide Report (SHR) and the National Vital Statistics System (NVSS) is of limited value, because these data underreport the number of citizens killed by police each year. For example, a study by Williams et al. (2016) found that compared with crowdsourcing data, the SHR and NVSS miss approximately 30% to 45% of deaths caused by police use of force. Certain media outlets, including *The Washington Post* and *The Guardian*, began collecting detailed information about police deadly force incidents in 2015, whereas crowdsourcing websites such as killedbypolice.net (KBP) and fatalencounters.org have collected data going back to 2013 and 2000, respectively.<sup>1</sup> Recent studies concur that these alternative data sources are far more inclusive and reliable than the data collected by the UCR and the NVSS (Legewie & Fagan, 2016; Planty et al., 2015; Williams et al., 2016). Thus, they can provide a useful platform for research on trends in police deadly force incidents.

The availability of these crowdsourcing data makes it possible to test assertions made by the media that the number of fatal shootings of citizens by police has changed significantly in recent years (Kindy et al., 2016). Of particular interest is whether fatal shootings have increased or decreased post-Ferguson. Thus, the purpose of the present study is straightforward: using data compiled by KBP, we use interrupted time-series analysis to test whether the events in Ferguson in August 2014 had a significant effect on the number of people shot and killed by police in the United States post-Ferguson. To be clear, we are not testing whether depolicing has occurred post-Ferguson or the extent to which civilians are more likely to act antagonistically toward the police. Rather, we treat these competing explanations for changes in the police use of deadly force as a background framework for asking the more basic research question motivating this study:

**Research Question:** Has the number of fatal shootings by police in the United States increased or decreased during the post-Ferguson era?

If a significant upward or downward trend is observed, it will then be necessary to explore the potential reasons for such a change.

## Police Deadly Force

Police use of deadly force has long been a provocative topic in the United States (Alpert, 1989; Alpert & Fridell, 1992; Fyfe, 1988; Goldkamp, 1976; Klinger, 2012a, 2012b; Robin, 1963; Sherman & Langworthy, 1979) and has again become a hot button national issue largely due to widespread media coverage of controversial police killings (Culhane, Boman, & Schweitzer, 2016; Pyrooz, Decker, Wolfe, & Shjarback, 2016; Williams et al., 2016; Wolfe & Nix, 2016). The majority of extant research on citizens killed by police has relied on official data, compiled by either the NVSS or the UCR (Sherman & Langworthy, 1979; Smith, 2003, 2004; Zimring & Arsiniega, 2015), and longitudinal analyses of these data have indicated that these incidents are relatively rare and are generally trending downward (Zimring & Arsiniega, 2015). In their examination of SHR data on aggregate trends in citizens killed by police between 1976 and 2012, Zimring and Arsiniega (2015) found that justifiable killings by police have decreased—from 19.6 citizens per 10 million to 13.01 citizens per 10 million—marking a 9% reduction in killings over a 40-year period. The authors suggest that the downward trend in citizens killed by police coincides with (a) changes in police use of force policies aimed at curtailing the use of deadly force (see also Fyfe, 1979; Sherman, 1983) and (b) the establishment of the fleeing felon rule in *Tennessee v. Garner* (1985). Recent data from the UCR and NVSS have shown that police killings of citizens have remained relatively stable over the past 10 years. For example, from 2006 to 2014, UCR data show that an average of 414 persons were killed by police with yearly numbers ranging from a low of 376 in 2006 to a high of 471 in 2013. Similarly, data from the NVSS indicate that between 2006 and 2014 the police killed an average of 453 citizens, with a low of 377 in 2008 and a high of 547 in 2012 (Williams et al., 2016).

Prior studies that have analyzed official data are limited due to underreporting to the UCR and NVSS by police agencies (Fyfe, 2002; Hirschfield, 2015; Legewie & Fagan, 2016; Ross, 2015; Zimring & Arsiniega, 2015). The FBI keeps track of justifiable killings (i.e., the killing of a felon by law enforcement in the line of duty); however, as FBI Director James Comey stated, these data are unreliable because law enforcement agencies are not required to report all police killings (Comey, 2015). In comparison with recent crowdsourcing data collection efforts, the UCR and NVSS miss nearly half of all citizens killed by police each year (Planty et al., 2015; Williams et al., 2016). Indeed, research exploring the difference between official and crowdsourcing data has shown that the SHR and NVSS missed 43% and 53% of police killings in 2014, respectively (Williams et al., 2016).

Despite limitations in available data, several studies have shed light on the causes of killings by police. Specifically, scholars have explored the underlying correlates of citizens killed by police using criminological theories (e.g., social threat, group threat) typically used to explain correlates of general homicides. Studies have applied theory to assess how ecological characteristics (such as city-level, county-level, and state-level variables) impact the number of citizens killed by police. This body of literature has consistently demonstrated that police killings of citizens are correlated with violent crime rates, income inequality, and racial heterogeneity (Jacobs & Britt, 1979; Legewie & Fagan, 2016; J. M. MacDonald, Kaminski, Alpert, & Tennenbaum, 2001; Sherman & Langworthy, 1979; Smith, 2004). For example, Smith's (2003, 2004) analyses of SHR data from 179 large cities found that income inequality, racial threat variables (i.e., proportion of African Americans and Hispanics), and violent crime rate (i.e., murder, rape, robbery, and assault rates) were significantly correlated with higher aggregate levels of police deadly force. Similarly, Jacobs and O'Brien's (1998) examination of SHR data found that economic inequality and community violence were correlated with the number of citizens killed by police in cities with a population greater than 100,000. At the state level, early analyses of NVSS data also found that income inequality, crime, and ethnicity were related to the number of citizens killed by police. Specifically, Jacobs and Britt (1979) found that income inequality and crime were significant predictors of state totals in deadly force used by police, whereas Liska and Yu (1992) demonstrated that jurisdictions with a higher percentage of minority citizens experienced a higher prevalence of citizens killed by police.

In short, findings regarding the impact of crime and socioeconomic factors on the number of citizens killed by police are relatively consistent. Unfortunately, little is known about the impact of sudden changes in the environment of policing on trends in police use of force more generally, and the use of deadly force more specifically. In reflecting on the potential impact of such sudden changes on fatal shootings by police, we draw on the concept of "environmental jolts" from organizational theory. An environmental jolt is "a sudden and unprecedented event" that is difficult to anticipate and whose impacts are "disruptive and potentially inimical" (Meyer, 1982, p. 515; see also Maguire, 2010).<sup>2</sup> Ferguson serves as a classic example of an environmental jolt, in terms of its impact on not only agencies and communities in the Ferguson area but also policing and police-community relations in the United States more generally. We posit that two explanatory frameworks—*defiance theory* and the *depolicing hypothesis*—may prove useful in explaining how an environmental jolt like the killing of Michael Brown in Ferguson,

Missouri, in August 2014 might influence national trends in police use of deadly force.

### Defiance Theory

*Defiance theory* provides a useful framework for anticipating that the number of citizens killed by police may have *increased* in the post-Ferguson period (Sherman, 1993). Several groups (e.g., BLM, Campaign Zero) have argued that recent police shootings—especially those that involved unarmed minority citizens—are unjust, excessive, and discriminatory. Defiance theory suggests that unjust and excessive sanctions by government officials (i.e., the police) may contribute to a sense of *defiance* among citizens rather than exerting a *deterrent* effect (Sherman, 1993). Four factors impact public reaction to sanctions imposed by law enforcement: (a) legitimacy (Tyler, 1990), (b) social bonds, (Hirschi, 1969; Scheff & Retzinger, 1991), (c) shame (Braithwaite, 1989), and (d) pride (Henley, 1954). In line with these factors, Sherman (1993) suggested that

Sanctions provoke future defiance of the law (persistence, more frequent or more serious violations) to the extent offenders experience sanctioning conduct as illegitimate, that offenders have weak bonds to the sanctioning agent and community, and that offenders deny their shame and become proud of their isolation from the sanctioning community. (p. 448)

Indeed, several high-profile deadly force incidents in recent years have involved unarmed Black citizens and White law enforcement officers. A recent analysis of *The Washington Post's* police fatal shootings data found that although Black citizens were not more likely than Whites to have been attacking law enforcement officers or other citizens, they were more than twice as likely to have been unarmed prior to being fatally shot by police (Nix et al., 2017).

The growth of groups like BLM and Mapping Police Violence (MPV) can be viewed as an example of the response to these perceived discriminatory acts. For example, MPV has expressed on their website that “Police are killing Black people at persistently high rates.” Moreover, commentators from these groups and the media have argued that police use of force is uncontrolled and that the number of citizens killed by police has increased over the past 3 years (see [mappingpoliceviolence.org](http://mappingpoliceviolence.org)). Specifically, MPV has stated that police killings are on the rise since Ferguson, whereas *The Washington Post* reported that fatal shootings by police were up 6% in the first 6 months of 2016 compared with the first 6 months of 2015 (Kindy et al., 2016). In

sum, organizations like MPV and BLM are leading the post-Ferguson challenge to police legitimacy in the United States. Widespread public protest—and in some cities, violent riots—may weaken the bond that citizens have with the police (Wolfe & McLean, 2016), which could in turn result in defiance or even violence directed at the police. If so, police–citizen encounters in the post-Ferguson era may be more likely to result in deadly force due to citizens’ increased willingness to defy and violently resist officers. As such, we would expect the number of citizens killed by police to be on the rise post-Ferguson.

### *Depolicing and the “Ferguson Effect”*

At the same time, some commentators argue that there has been a “Ferguson Effect” on policing after several highly publicized killings of unarmed Black citizens by White police officers (H. Mac Donald, 2015; see also Nix & Wolfe, 2015, 2016; Pyrooz et al., 2016; Ross, 2015; Wolfe & Nix, 2016). Many of these events were captured on video and went viral on the Internet, triggering widespread scrutiny of the police. According to some police leaders, analysts, and criminologists, increased scrutiny of the police in the post-Ferguson era has resulted in *depolicing*, or the reduced likelihood that officers will engage in officer-initiated contacts with citizens because they fear reprisal for their actions (Frankel, 2015; H. Mac Donald, 2015; Oliver, 2015; Reese, 2014; Valencia, 2015; cf. Wolfe & Nix, 2016). That is, the Ferguson Effect may have led officers to fear that proactive policing will increase their risk of receiving disciplinary sanctions, losing their job or pension, and/or being charged criminally or sued for using force against citizens (Reese, 2014; Valencia, 2015). Proponents of the Ferguson Effect further allege that this fear exposes officers to increased risk because they have become reluctant to use force even in potentially deadly situations. For example, a Birmingham, Alabama, police officer who was pistol-whipped after a suspect took his firearm was later quoted as saying, “A lot of officers are being too cautious because of what’s going on in the media. I hesitated because I didn’t want to be in the media like I am right now” (Valencia, 2015).

The events in Ferguson sparked an intense national discussion involving journalists, scholars, and politicians about whether crime rates in the United States have increased post-Ferguson, and if so, whether the heightened crime rates are a result of depolicing due to the Ferguson Effect (H. Mac Donald, 2015; Pyrooz et al., 2016; Rosenfeld, 2016). The most extensive study on pre- and post-Ferguson crime levels to date has shown that this is not the case, as crime trends in large U.S. cities *have not* significantly increased (Pyrooz et al., 2016).<sup>3</sup> Researchers and analysts, however, *have*

found evidence of depolicing among police officers. Specifically, anecdotal evidence indicates that depolicing occurs after negative media attention regarding controversial police policies (e.g., stop and frisk, zero-tolerance policing) and use of force incidents (Leo, 2001; H. Mac Donald, 2001, 2005, 2015; Oliver, 2015). In his qualitative analysis of interview data from police officers, Oliver (2015) found that officers indicated they were less proactive when citizen backlash arose after the implementation of controversial police policies and practices.

More rigorous studies have also uncovered evidence of depolicing. Morgan and Pally (2016) examined trends in crime and arrest data in Baltimore from 2010 to 2015—which allowed them to consider whether depolicing occurred after Brown's death in Ferguson and/or Freddie Gray's death in Baltimore. The authors found that shootings, homicides, robberies, carjackings, and motor vehicle thefts all increased in the 3 months following Gray's death. Yet during the same 3-month period, arrests *declined* by 30%. In fact, arrests had been trending downward for 8 months prior to Gray's death—which aligns closely with the death of Brown in Ferguson. Other reports have found evidence of depolicing in North Charleston and Chicago following the police killings of Walter Scott and Laquan McDonald (Arthur & Asher, 2016; Knapp, 2016).

Other studies based on survey data suggest that police officers may be less willing to engage in proactive policing in the post-Ferguson era. For instance, Nix and Wolfe (2015) surveyed a sheriff's department 6 months after Ferguson and found that officers who felt less motivated due to the negative publicity surrounding law enforcement exhibited less self-legitimacy (i.e., confidence in their authority as police officers). In a separate study, Nix and Wolfe (2016) demonstrated that post-Ferguson, many officers reported feeling that (a) they were less motivated to be proactive, (b) they were more apprehensive about using force even in situations that might require it, (c) policing had become more dangerous, (d) their colleagues had been negatively impacted, and (e) citizens' views of the police had worsened. Finally, Wolfe and Nix (2016) found that those officers who believed they had been adversely impacted by negative publicity in the months following Ferguson expressed less willingness to engage in community partnerships.

In sum, although crime trends at the national level may or may not have been impacted by Ferguson, this iconic event (and others like it) has seemingly had a negative impact on police officers' attitudes and behaviors. If police have become less proactive (Morgan & Pally, 2016; Nix & Wolfe, 2016), or more apprehensive about using force post-Ferguson (Nix & Wolfe, 2016), then the number of incidents likely to result in the use of deadly force by police may have decreased. In other words, if police officers are less



willing to stop drivers or pedestrians than they were pre-Ferguson, then the number of police–citizen interactions may have declined post-Ferguson. As a result, the sheer number of *opportunities* for deadly force to occur may have declined as well. For example, *The Texas Tribune* collected data on *all* police shootings (fatal and nonfatal) that occurred in 36 Texas cities from 2010 to 2015. They found that 8% of the shootings occurred as a result of a traffic stop and another 7% as a result of suspicious activity (see <https://apps.texas-tribune.org/unholstered>). If these sorts of stops are on the decline in the wake of Ferguson, then we might expect the number of citizens killed by police to have declined also in the post-Ferguson era.

## The Current Study

The purpose of the current study is to determine whether there has been a significant change in the number of citizens killed by police in the United States since Ferguson. If citizens have in fact become more emboldened and more defiant, then consistent with defiance theory, we might expect the number of police shootings to have increased. Conversely, if depolicing is occurring, and officers are less likely to engage with citizens, we would anticipate a decrease in the number of hostile encounters, and therefore a decrease in the number of citizens killed by police. If the two phenomena are occurring simultaneously, then it is difficult to predict their combined effects. One possibility is that they would cancel each other out to some extent, however this is merely speculation on our part. But to reiterate, we make no claim to explicitly test defiance theory or the depolicing hypothesis. Instead, we use these frameworks as potential explanations for *why* we might observe a significant shift in the number of citizens killed by police. If in fact the number of citizens fatally shot by police has significantly increased or decreased, further research will be necessary to consider the possible reasons why. Here, we rely on interrupted time-series analysis to estimate the impact of the shooting of Michael Brown and subsequent events in Ferguson on the number of citizens killed by police in the United States.

## Data and Methods

As discussed previously, the U.S. government has not compiled reliable data on citizens killed by police, and available data from the SHR and NVSS suffer from underreporting (Alpert, 2015b; Hirschfield, 2015; Legewie & Fagan, 2016; Nix et al., 2017; Zimring & Arsiniega, 2015). Recent crowdsourcing and media efforts have provided far more comprehensive data than the official data sources maintained by the U.S. government. Some of these data

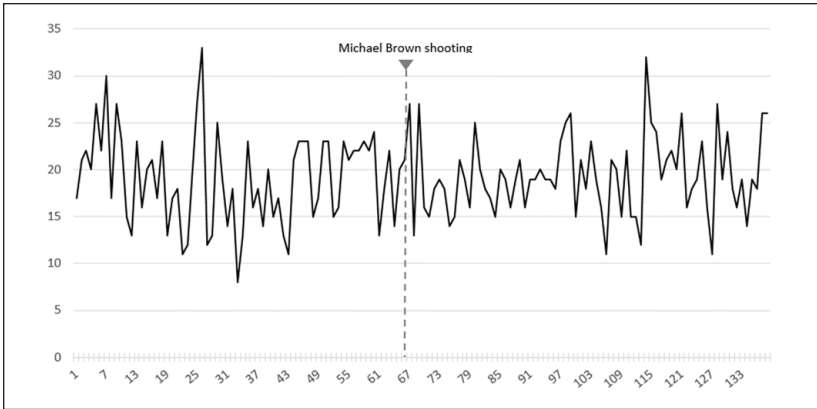
**Table 1.** Database Comparisons of 2015 Police Killings.

Data	Collection method	Total cases	Shootings only
<i>The Washington Post's</i> "Police Shooting Database"	All citizens fatally shot by on-duty police officers—Sources: Internet data sources, news articles, and police records	990	990
<i>The Guardian's</i> "The Counted" Database	All citizens killed by police—Sources: Internet data sources, news articles, police records, and crowdsourcing efforts	1,146	1,019
Mapping Police Violence Database	All citizens killed by police—Sources: Internet data sources, news articles, police records, and crowdsourcing efforts	1,210	1,034
Killed By Police <sup>a</sup>	All citizens killed by police—Sources: news articles and crowdsourcing efforts	1,171	1,007

<sup>a</sup>Killed By Police keeps track of *all* officer involved shootings. For the current study, we examined only cases in which an officer was on-duty and discharged a service weapon.

collection initiatives include *The Washington Post's* Police Shooting Database, *The Guardian's* The Counted, MPV, and KBP. cursory comparisons indicate relative consistency across these four data sets, particularly regarding the number of citizens fatally shot by police (see Table 1). Accordingly, we used the KBP data because their records provided sufficient information from the pre- and post-Ferguson time periods, whereas *The Washington Post* and *The Guardian* only began compiling data as of January 1, 2015.

We obtained data pertaining to 3,055 civilians killed by police between May 4, 2013, and December 25, 2015, from the KBP website, which is a project that compiles web-based crowdsourcing data.<sup>4</sup> Each time a civilian death occurred involving a police officer over this period, KBP documented the following: date; name of the deceased (along with a picture in most instances); the state in which the death occurred; the deceased's age, gender, and race/ethnicity; the manner of death (gunshot, TASER, vehicle, chemical, and/or restraint); and a link to at least one local news source.<sup>5</sup> For the purposes of our study, we elected to include only incidents involving civilians killed by police gunfire ( $N = 2,660$ ; or 87% of the total number of deaths reported by KBP over this timespan). We did so for two reasons. First, restricting our analyses in this manner allows us to be certain about the ultimate cause of death. Many of the deaths involving less lethal force involved multiple types of force (e.g., TASER and restraint) which makes it difficult to



**Figure 1.** Weekly fatal shootings by police in the United States, May 2013 to December 2015.

Note. The dashed vertical line indicates the date of Michael Brown's shooting in Ferguson on August 9, 2014.

determine what actually caused the death. Second, and most importantly, it is in these cases that the involved police officer most likely intended to use deadly force. Although the intent to use deadly force may be possible in cases involving TASERS, vehicles, chemicals, and restraint techniques, these use of force methods do not typically involve intent to kill on the part of police officers. Finally, we also excluded a small number of incidents ( $n = 10$ ) that involved either (a) off-duty police officers not acting in a law enforcement capacity or (b) deaths that occurred in Puerto Rico, Guam, or the Virgin Islands. This left us with 2,650 cases included in our time-series analysis.

## Findings

Our analysis focuses specifically on the impact of the events in and around Ferguson after the shooting of Michael Brown on August 9, 2014. To determine whether Ferguson was associated with a change in fatal shootings by U.S. police, we examined the weekly number of shootings for the 138-week period between May 4, 2013, and December 25, 2015. Thus, we have 66 weeks of data before the shooting of Michael Brown, and 72 weeks of data afterward (we calibrated the week numbers so the 67th week begins on the day Michael Brown was killed).

Figure 1 presents the weekly number of shootings between May 4, 2013, and December 25, 2015. During the preincident period from Weeks 1 to 66,

**Table 2.** Preliminary Analysis of Changes in Fatal Shootings by Police.

Statistics	Preincident period (n = 66)	Postincident period (n = 72)	Percent change
Fatal shootings per week ( <i>M</i> )	19.05	19.35	+1.6%
Fatal shootings per week ( <i>Mdn</i> )	19.5	19.0	-2.6%

the mean weekly number of fatal shootings equaled 19.05 (with a median of 19.5 and a standard deviation of 4.9). During the postincident period from Weeks 67 to 138, the mean number of fatal shootings equaled 19.35 (with a median of 19.0 and a standard deviation of 4.2). This represents a 1.6% increase in mean weekly fatal shootings and a 2.6% decrease in median weekly fatal shootings (see Table 2). A *t* test comparing the number of fatal shootings before and after the shooting of Michael Brown was not statistically significant ( $t = -.39$ ,  $df = 128.3$ ,  $p = .701$ ). This preliminary analysis suggests that the shooting of Michael Brown did not exert a significant influence on the frequency with which police officers in the United States shoot people fatally. However, the simplistic analysis conducted so far ignores the possibility of serially correlated errors in the time series, and therefore may be biased. Thus, we performed formal time-series analyses on the weekly shooting data.

Ordinary linear regression models are often not a good choice for analyzing time-series data due to temporal dependence in the residuals. Thus, social scientists commonly rely on interrupted time-series analysis using the Box–Jenkins approach, which involves the use of autoregressive integrated moving average (ARIMA) models (Box & Jenkins, 1976; Glass, Willson, & Gottman, 1975; McDowall, McCleary, Meidinger, & Hay, 1980). However, our initial diagnoses revealed no evidence of serial correlation in the residuals. The Ljung–Box Q statistics were not significant at any lag, which indicates that there is no significant serial correlation in the residuals (Ljung & Box, 1978). The Breusch–Godfrey Lagrange Multiplier (LM) test also confirmed no significant serial correlation. Thus, our preliminary analysis is based on a basic ordinary least squares (OLS) model that tests the effects of a constant (C) and a dummy variable (PREPOST) coded 0 for weeks before the Michael Brown shooting and 1 for the week of the shooting and afterward. Table 3 presents the findings from this analysis. In short, we found that the shooting of Michael Brown did not exert a statistically significant effect on the weekly number of fatal police shootings in the United States ( $B = 0.30$ ,  $SE = 0.77$ ;  $p = .699$ ). Because the number of shootings is a count variable, we

**Table 3.** Interrupted Time-Series Results.

Variable	Coefficient	SE	t statistic	Probability
Constant	19.05	0.56	33.88	.000
PREPOST	0.30	0.78	0.39	.699
Log likelihood	-404.42		$R^2$	.00
F statistic	0.15	Durbin–Watson		1.85
Probability (F statistic)	.699			

also estimated the model using negative binomial regression. The results confirmed the findings from the OLS regression ( $B = 0.02$ ,  $SE = 0.04$ ,  $p = .696$ ).

Interrupted time-series analysis seeks to determine whether an intervention or incident that takes place at a specific point in time influences a dependent variable that is measured over time. So far, the results of our analysis suggest that the shooting of Michael Brown and other events that occurred in and around Ferguson during the 7-day period starting on August 9, 2014, did not exert a statistically significant effect on the mean weekly number of fatal shootings by police officers in the United States. However, this analysis may have been unable to detect a “Ferguson Effect” on shootings by police if such an effect was delayed. Events in Ferguson unfolded over time, with a number of influential dates including the shooting of Michael Brown on August 9, 2014, President Obama’s decision to dispatch Attorney General Eric Holder to Ferguson on August 18, the announcement of the Grand Jury’s decision on November 24, and the release of the Department of Justice’s civil rights investigation of the incident on March 4, 2015.

To examine the possibility that events other than those that occurred from August 9 to 15, 2014, may have triggered a change in fatal shootings by U.S. police, we tested the time series for the presence of multiple structural breaks using methods developed by Bai and Perron (1998, 2003a, 2003b).<sup>6</sup> The analyses detected no structural breaks in the time series. On the basis of this analysis, we conclude that there were no obvious structural changes in the mean number of weekly fatal shootings by U.S. police during the period included in this study. More specifically, we find no evidence to support the notion that events in and around Ferguson, Missouri, altered the mean number of weekly fatal shootings by U.S. police.

## Discussion and Conclusion

Several high-profile police shootings have brought the topic of deadly force to the forefront of national discussion in the United States once again. Some

commentators and analysts have speculated, based simply on year-to-date comparisons of shootings over the last 3 years, that police use of deadly force is on the rise (Kindy et al., 2016; Sinyangwe, 2016). These overly simplistic comparisons are misleading, however, because killings by police officers are rare events (from a statistical perspective), and the data tend to fluctuate randomly over time even during periods when the overall trend is flat. These temporal fluctuations make it difficult to make valid inferences about trends from overly simplistic comparisons (Adams et al., 1999; Bayley & Garofalo, 1989; Fyfe, 1988; see also Bialik, 2016). To test the hypothesis that the shooting of Michael Brown and the subsequent protests and riots that occurred in Ferguson in August 2014 influenced the frequency of fatal police shootings in the United States, we used an interrupted time-series analysis of roughly 2.5 years of data collected by KBP. Our findings indicated that police killings did not experience significant increases or decreases in the 16 months following the shooting of Michael Brown. Several relevant implications can be derived from our findings.

First, despite increased public scrutiny and publicity surrounding the police in the United States, this study provides evidence that fatal shootings of citizens by police have *not* become more frequent. The daily drumbeat of breaking news about police actions from both conventional media and social media, coupled with the increasing availability of video footage of police actions mean that police live in a fishbowl of sorts, with the public watching their every move. The public appears to have a never-ending thirst for news about the police, especially news that focuses on the police use of deadly force. This focus on high-profile events in the media has been shown to fuel public perceptions about the criminal justice system (Pickett, Mancini, Mears, & Gertz, 2015). Officers truly are in a new era of policing—the “post-Ferguson” era—however, the effects of Ferguson and other major national incidents on police behavior are not yet well understood. Although the best available evidence suggests that the Ferguson Effect has not led to increases in crime (Pyrooz et al., 2016; although see Rosenfeld, 2016) or fatal assaults against police officers (Maguire, Nix, & Campbell, 2016), other studies have suggested that both citizens (Culhane et al., 2016) and the police (Morgan & Pally, 2016; Nix & Wolfe, 2015, 2016; Wolfe & Nix, 2016) have been adversely impacted. In the current study, we discussed two competing causal mechanisms that could explain changes in the number of citizens killed by police: depolicing by law enforcement and/or defiance by citizens. It is possible that both phenomena could be occurring simultaneously: an increase in citizen defiance toward police and a decrease in proactive policing (“depolicing”). Thus, one reason why we may have detected no significant upward or downward trend in fatal shootings by police could be that these two

competing mechanisms may have canceled each other out. Unfortunately, our research design would be unable to detect such an effect. More research on the nature and extent of the Ferguson Effect is certainly needed, but it is reassuring to know that civilian deaths caused by police gunfire are *not* trending upward significantly.

Second, we need better data to examine trends in the number of citizens killed by police in the United States. The recent data collection initiatives undertaken by crowdsourcing websites and news media—such as the Pulitzer Prize–winning efforts by *The Washington Post*—are a giant first step in understanding the nature and extent of police deadly force in the United States. We applaud the media and crowdsourcing websites for their extensive efforts to shed light on this issue; however, we must improve government data collection initiatives to ensure the ongoing availability of valid and reliable information about the police use of deadly force. The U.S. government should spearhead this effort, requiring law enforcement agencies to provide accurate data regarding *all* deadly force incidents. For example, in the KBP data, uncertainty regarding the “race” variable precluded our inclusion of subsequent analyses to examine police killings by suspect race. This is unfortunate because such analyses would be both important and timely, particularly as groups like BLM and MPV have asserted that the police kill minorities disproportionately.

In addition, the U.S. government should also collect information on several other relevant variables, such as suspect demographic information, officer information (e.g., age, race, tenure, past uses of force, history of complaints), level of suspect resistance (as research has consistently shown that this is critical to understanding use of force by police), and the nature of the incident that initiated contact with the police. *The Washington Post* is collecting data on some of these variables, but information regarding officers involved in shootings is extremely difficult to obtain and is not available in current data sets. Moreover, it would be even more beneficial if the U.S. government were able to collect information on nonfatal shootings by police. As research has shown, most police shootings do not result in fatalities (Alpert, 1989; Klinger, Rosenfeld, Isom, & Deckard, 2015); collecting these data would allow researchers to examine all incidents in which officers fire their weapons. The problem is that police agencies have been reluctant to share deadly force data. In December 2015, the FBI announced that it would be developing a system to gather data from police departments in the United States on police shootings. Although the system will still rely on voluntary cooperation from police departments, a senior FBI official noted that the agency would be “relying on peer pressure and financial incentives” to encourage reporting (Davis & Lowery, 2015).

Hopefully, more agencies will feel compelled to forward their data to the FBI moving forward.

Third, our findings emphasize the need to be cautious in drawing inferences from short-term fluctuations in the number of citizens killed by police. Making year-to-date or month-to-month comparisons is irresponsible and misleading to the public (see [mappingpoliceviolence.org/reports](http://mappingpoliceviolence.org/reports); Kindy et al., 2016). For example, according to the SHR, there were 426 citizens killed by police in 2012 and 453 people killed by police in 2014. One might conclude that based on these numbers, police killings were “up” roughly 6%. But this conclusion would be naive, as the NVSS showed that during the same time period, police killings totaled 547 in 2012 and 512 in 2014, marking a 6% decrease in the number of citizens killed by police. Drawing inferences from the two major U.S. government datasets on police killings would thus result in opposite conclusions. Similarly, an analysis of *The Washington Post*’s data showed that police shootings during the first 6 months of 2016 were up 6% in comparison with the first 6 months of 2015. The fact is that these events fluctuate dramatically over the short term, and many of these fluctuations are the result of statistical noise. Careful empirical research has shown that the number of police killings has remained relatively stable over time (see Williams et al., 2016; Zimring & Arsiniega, 2015). Drawing inferences about long-term trends requires the use of time-series methods that account for the many complexities inherent in the analysis of temporal data.

### Limitations

Although our study revealed that fatal shootings have not increased significantly in the post-Ferguson era, our study is not without limitations. First, we were only able to analyze data on *fatal* shootings. As Fyfe (1978) pointed out, deadly force involves more than just civilians killed by police: it includes “physical force *capable* of or *likely* to kill; it does not always kill” (p. 32). Extant research has demonstrated that most incidents involving the use of deadly force by the police do not result in a citizen death (Alpert, 1989; Klinger et al., 2015). As such, although we were able to determine that citizen deaths by police gunfire have not increased post-Ferguson, we were unable to determine whether the police are *using deadly force more often* since August 2014 because these data are simply not available. Importantly, however, several commentators have claimed that police killings of citizens have increased post-Ferguson, which our analysis suggests is not the case. Second, although the data used in this study appear to be comprehensive, the data have not been carefully validated by researchers to our knowledge. Published research provides some confidence in data from recent crowdsourcing and media endeavors (see Legewie



& Fagan, 2016; Williams et al., 2016), and as exhibited in Table 1, the KBP data do line up very closely with other available data sources (e.g., *The Washington Post*, *The Guardian*, MPV). But, to our knowledge, this is the first study that has analyzed KBP data. Finally, we were unable to determine whether depolicing or citizen defiance of police has increased in the post-Ferguson era. Importantly, however, the goal of our study was simply to analyze the available data to determine whether Ferguson represented an environmental jolt that resulted in either a downward or upward trend in fatal shootings by police.

## Conclusion

The results of this study show that the number of citizens killed by police officers has not increased significantly in the 16 months after Ferguson. Police use of deadly force has been and will continue to be an important topic for criminal justice research and reform. We appear to be headed in the right direction with the media's efforts to collect data on these incidents, as well as President Obama's Task Force on 21st Century Policing (President's Task Force on 21st Century Policing, 2015), which have prompted the government to move toward developing more comprehensive data sources on police shootings. In the meantime, we urge caution when drawing inferences based on short-term comparisons from the available data, as the results from such analyses often attribute substantive meaning to random fluctuations in the data. As this analysis has demonstrated, time-series analysis methods provide a useful toolkit for understanding long-term trends in fatal shootings by police.

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## Notes

1. It should be noted that fatalencounters.org is working backward to collect information on deadly force incidents. As such, the quality of the data compiled for the years prior to 2013 is unknown because it is much more difficult to acquire information on these earlier incidents in comparison with more recent events.
2. Pyrooz, Decker, Wolfe, and Shjarback (2016) made a similar argument when they referred to the Ferguson Effect as an "exogenous shock."

3. Rosenfeld (2016) has since concluded that the homicide increase in 56 large cities “was real and nearly unprecedented,” though most of the overall increase was constrained to 10 cities which had experienced, on average, a 33% increase in homicides (p. 2). Although there are several possible explanations for why these cities experienced such drastic increases in homicides, according to Rosenfeld, the Ferguson Effect is the most likely.
4. Zhang, Wagner, and Ross-Degnan (2011) suggested that balanced time series (in which the number of pre- and posttest observations are roughly similar) have a greater statistical power to detect effects. In line with this suggestion, we cut off our data series on December 25, 2015, giving us 66 preintervention observations and 72 postintervention observations. If the time series were extended, we would have made the series more unbalanced and potentially reduced statistical power.
5. In 340 cases, the race of the deceased was unknown, so we were unable to conduct analyses to examine potential differences in the frequency of killings by citizen race.
6. Using the methods developed by Bai and Perron (2003a), we tested for the presence of “abrupt structural changes” in the mean of the time series (p. 16). We allowed for the possibility of up to five structural breaks, setting the trimming percentage at 15 and the significance level at .05.

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