

# A War on Cops? The Effects of Ferguson on the Number of U.S. Police Officers Murdered in the Line of Duty

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Police agencies in the U.S. are currently facing a major legitimacy crisis resulting from a spate of high-profile use of force incidents, many involving minority citizens. Recent headlines emphasize that there is now a “war on cops” and that police officers are facing increasing levels of hostility and violence fueled by a growing anti-police sentiment. In the aftermath of events in Ferguson, Missouri in August 2014, some commentators claim that the number of police officers feloniously assaulted and killed in the line of duty has increased sharply. Using time series analysis of data from the Officer Down Memorial Page, we test whether events in Ferguson were associated with an increase in the number of police officers murdered in the line of duty. Our results provide no evidence for a “Ferguson Effect” on the number of U.S. police officers murdered in the line of duty as of March 2016.

**Keywords** line of duty death; police; Ferguson Effect; time series; murder

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## Introduction

Police agencies in the U.S. are currently facing a major legitimacy crisis stemming from a rash of high-profile use of force incidents, many of which involved minority citizens. The death of Michael Brown in Ferguson, Missouri in August 2014 led to a wave of protests throughout the U.S. and helped to fuel the growth of the Black Lives Matter (BLM) movement.<sup>1</sup> One U.S. Department of Justice official noted that the protests and other events that occurred in and around Ferguson after the shooting of Michael Brown helped to launch “a new civil rights movement” in the U.S. (Davis, 2015). In response to some of these incidents, President Barack Obama established the President’s Task Force on 21st Century Policing in December 2014. When the Task Force released its final report in the summer of 2015, it recommended that law enforcement agencies should “acknowledge the role of policing in past and present injustice and discrimination” and take steps to restore public trust and confidence (President’s Task Force on 21st Century Policing’s, 2015, p. 12).

While many police leaders acknowledge the need for reform, some commentators have argued that the national conversation about racial discrimination and use of force in policing has gone too far, resulting in widespread anti-police sentiment. Some have suggested that placing police under heightened levels of scrutiny has resulted in the emergence of a “Ferguson Effect” in which officers are now less willing to engage in proactive enforcement activities because they are afraid to get in trouble (Mac Donald, 2015). There is now a vibrant debate among journalists, scholars, politicians, and others about whether crime in U.S. cities is increasing as dramatically as claimed by some observers, and if so, whether the Ferguson Effect is responsible for the increase (Mac Donald, 2016a, 2016b; Pyrooz, Decker, Wolfe, & Shjarback, 2016; Rosenfeld, 2015).

Some have taken the idea of a Ferguson Effect one step further and argued that fear of being disciplined, losing their jobs or their pensions, or being prosecuted or sued is leading police officers to hesitate in dangerous situations, thus potentially endangering them. For instance, one police chief noted that “more police officers are being killed, because they’re hesitating more before pulling the trigger to defend themselves” (Reese, 2014). Recent headlines emphasize that police officers are now facing increasing levels of hostility and violence fueled by a growing anti-police sentiment (DeMarche, 2015). As a result, some commentators claim that the number of police officers being feloniously assaulted and killed in the line of duty is increasing sharply (Hattem, 2015). Former NYPD Commissioner Howard Safir noted that there is “a war on police” and laid part of the blame on Attorney General Eric Holder for turning

1. Other prominent incidents included the deaths of Eric Garner in New York City in July 2014; Tamir Rice in Cleveland, Ohio in November 2014; Walter Scott in North Charleston, South Carolina in April 2015; and Freddie Gray in Baltimore, Maryland in April 2015.

people against the police (Safir, 2015). In a letter to President Obama, Chuck Canterbury, president of the National Fraternal Order of Police, wrote:

It is not just talk; it is not just rhetoric. Those spewing this hatred and those calling for violence are having an impact. They have been given a platform by the media to convey the message that police officers are their enemy and it is time to attack that enemy ... There is a very real and very deliberate campaign to terrorize our nation's law enforcement officers. (Canterbury, 2016)

Given the important role of police in society and the prospect that they may be facing greater danger, these are vital public policy issues that deserve serious attention from scholars. It is unclear to what extent the Ferguson Effect is real or imagined, and if it is real, whether it has had an influence on the number of police officers murdered in the line of duty. Using open-source data from the *Officer Down Memorial Page* (ODMP), a website that tracks law enforcement line of duty deaths, we carry out a series of analyses to test whether the post-Ferguson police legitimacy crisis in the U.S. is associated with an increase in the number of police officers murdered in the line of duty.

### Literature Review

Extant research has found that murders of police officers are relatively rare, and long-term trends in police homicides are somewhat stable over time (Kaminski & Marvell, 2002). In their analysis of police homicide trends between 1850 and 1998, Kaminski and Marvell (2002) found that there were two “extreme peaks” (p. 171) “from 1918 to 1934 and 1969 to 1981” (p. 173). During these time periods, the number of police officers murdered totaled more than 100 per year. The authors assumed that the first spike resulted from Prohibition, while the second spike seems to have corresponded with the rise in the total number of general homicides per year during this time period. Collectively, police killings have been trending downward. The rate of police killings in the 1930s was higher (11.4 officers per 10,000 persons) than any period since that time. Additionally, after the second spike in 1973 (7.3 officers per 10,000 persons), the rate of police homicides has steadily trended downward (Kaminski & Marvell, 2002). Kaminski and Marvell found that economic growth, reductions in inflation, the growing number of incarcerated citizens, and World War II were significantly associated with reductions in the number of officers killed by citizens. Additionally, the authors suggest that the steady decline in deaths after 1973 could be a result of the adoption of police body armor, which has helped prevent a substantial number of felonious assaults against police officers from resulting in fatalities.

Scholars have explored the underlying causes of police homicides using theoretical frameworks typically used to explain correlates of general homicides. Specifically, researchers have used theory to provide *post hoc* explanations of how city-level variables impact hostility and violence toward the police.

For example, some scholars have tested the impact of economic deprivation on police killings, suggesting that because economic conditions (e.g. poverty and unemployment) are correlated with elevated violent crime rates, these conditions may contribute to heightened hostility and aggression toward law enforcement (Bailey & Peterson, 1987; Batton & Wilson, 2006; Chamlin, 1989). Findings from this research suggest that higher rates of poverty and unemployment may increase the number of homicides of police officers (Bailey & Peterson, 1987; Batton & Wilson, 2006; Kaminski, 2004, 2008). Conversely, other studies have failed to find a relationship between unemployment and the rate at which police officers are murdered in the line of duty (Kaminski & Marvell, 2002). In short, research evidence on the influence of macro-level economic factors on the number of police officers feloniously assaulted and killed is mixed. However, two other theoretical frameworks—*conflict* and *defiance* theory—may be useful for explaining fluctuations in deadly violence toward police officers.

Conflict theory provides a classic sociological perspective that is useful for understanding violence both by the police and against the police (Blalock, 1967; Quinney, 1970; Turk, 1969). According to this perspective, when the dominant or powerful groups in society perceive racial and economic minorities as a threat, they use their influence to enact public policies that can control these populations and suppress the perceived threat. For example, several studies have demonstrated that racial heterogeneity (e.g. percent of the population that is minority) is positively associated with crime control variables such as police size or budget (Greenberg, Kessler, & Loftin, 1985; Jacobs, 1979; Jackson, 1986; Jackson & Carroll, 1981; Liska, Lawrence, & Benson, 1981). Other studies suggest a link between racial heterogeneity and police use of deadly force (Jacobs & Britt, 1979; Liska & Yu, 1992). Given findings such as these, Chamlin (1989, p. 356) observed:

To the extent that civilians view the police as being inclined to protect the interests of the elites rather than the entire community in areas of greater economic deprivation or racial heterogeneity, it is likely that they may become more violent in their encounters with law enforcement officials.

That is, as the size of the perceived threatening population (in this case, minority citizens) increases, so too does the level of antagonism and conflict between the police and those who comprise the threatening population. Police interactions with minority citizens may, in turn, become more volatile, which can result in increased violence directed against officers. Indeed, empirical findings are supportive of a significant positive relationship between racial heterogeneity and police homicides (Chamlin, 1989; Jacobs & Carmichael, 2002; Kaminski & Stucky, 2009). The rise of the BLM movement can easily be viewed, from the conflict perspective, as the growth of a threatening population in the eyes of influential elites and the authorities who are thought to protect their interests (i.e. the police). If this is valid, the rise of BLM after the

shooting of Michael Brown in Ferguson is likely to be associated with increased hostility between police and (particularly minority) citizens.<sup>2</sup> Such hostility may result in a greater number of police officers being feloniously assaulted and killed in the line of duty.

Another useful framework for understanding violence directed at police officers is defiance theory (Sherman, 1993). It posits that punishments perceived as excessive or unfair may result in *defiance*—either by specific individuals or collective groups—rather than *deterrence*. Four considerations factor into the response to a punishment: legitimacy (Tyler, 1990), social bonds (Hirschi, 1969; Scheff & Retzinger, 1991), shame (Braithwaite, 1989), and pride (Henley, 1954):

Sanctions provoke future *defiance* of the law (persistence, more frequent or more serious violations) to the extent that 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. (Sherman, 1993, p. 448)

Defiance theory further suggests that sanctions (e.g. police use of deadly force) are more likely to be viewed as unfair when they are perceived as discriminatory, excessive, or undeserved. Many of the most heavily publicized deadly force incidents in recent history involved white police officers and unarmed black citizens. In fact, a recent examination of all citizens killed by police gunfire in 2015 demonstrated that black citizens were more than twice as likely as white citizens to have been unarmed, yet no more or less likely to have been actively attacking the officer(s) or other citizens before their demise (Nix, Campbell, Byers, & Alpert, *in press*). As a result of these perceived injustices, BLM has stated on its website that “Black lives are systematically and intentionally targeted for demise” and “Every 28 hours a Black man, woman, or child is murdered by police or vigilante law enforcement” (BLM: Freedom & Justice for all Black Lives, *n.d.*). Indeed, BLM has been at the forefront of an unprecedented challenge to the legitimacy of U.S. police, a topic to which we turn next.

U.S. police are currently in the midst of a legitimacy crisis following a string of highly publicized deadly force incidents involving white officers and unarmed black citizens (Pyrooz et al., 2016; Wolfe & Nix, 2016). Several of these incidents were captured on video and went viral on the Internet, fueling public discontent with law enforcement. Michael Brown’s death and subsequent events in and around Ferguson served as a potent catalyst for the growth of the BLM movement, which had originally been formed in response to Trayvon Martin’s death in Florida two years earlier (BLM: Freedom & Justice for all Black Lives, *n.d.*). Some have suggested that continued criticism directed at the police—along with the growth of BLM—will ultimately result in a national

2. Though importantly, BLM has numerous white supporters as well.

crime wave (Mac Donald, 2015). However, a recent empirical analysis of crime trends before and after Ferguson suggests this is not the case (Pyrooz et al., 2016). Nevertheless, recent studies offer reason to believe that the Ferguson controversy has adversely impacted both citizens and the police. Culhane, Boman, and Schweitzer (2016), for example, demonstrated with a pre/post experimental design that citizens were less likely to view police shootings as justified in the post-Ferguson era. With respect to the police, Nix and Wolfe (2015) found that reduced motivation as a result of negative publicity in the six months after Ferguson was associated with lower levels of officer self-legitimacy (i.e., the confidence they have in the authority vested in them; see Bottoms & Tankebe, 2012). Similarly, Wolfe and Nix (2016) showed that negative publicity was associated with reduced willingness to engage in community partnerships among a sample of sheriff's deputies. Finally, Morgan and Pally (2016) found evidence of de-policing within the Baltimore Police Department (i.e. fewer arrests and citations) in the months following Michael Brown's death in Ferguson. Similar findings have been reported in North Charleston and Chicago following the deaths of Walter Scott and Laquan McDonald, respectively (Arthur & Asher, 2016; Knapp, 2016). In sum, while Ferguson does not appear to have produced a national crime wave, it certainly appears to have impacted police-community relations in other ways.

Might this post-Ferguson legitimacy crisis have other detrimental effects on the police? Some writers have suggested that all of the negative publicity surrounding law enforcement, coupled with the growth of BLM, has resulted in a war on cops. That is, in response to all of the criticism aimed at them, the police have become more reluctant to use force in instances that require it, for fear of being labeled a racist cop, or perhaps even worse, becoming the villain in the next viral video. Two recent experimental studies conducted *prior to* Brown's death in Ferguson provide support for a "reverse racism" effect whereby officers participating in a shooter simulation were slower to shoot black suspects than white suspects (James, James, & Vila, 2016; James, Klinger, & Vila, 2014). The authors argue the most likely explanation for their findings is that officers are concerned about "the social and legal consequences of shooting a member of a historically oppressed racial group" (James et al., 2016, p. 16). Qualitative research on this topic also suggests police officers are more hesitant to use force—even when the situation calls for it—when the suspect is a minority (Klinger, 2004). Bearing in mind that these studies were all conducted *before* Ferguson; it seems plausible that these sentiments have only become more salient among the police in the post-Ferguson era. At the same time, the growth of BLM and all of the criticism being directed at the police may have led offenders to feel more emboldened and, in some cases, more likely to violently resist police orders. If this is true, it could certainly be a deadly recipe for the police. Yet, to date, the idea that there is a "war on cops" has only been supported by speculation and anecdotal evidence.

## Data and Methods

This study seeks to determine whether there has been a “Ferguson Effect” on the level of violence against police officers in the U.S. If there is such an effect, we would expect to observe an increase in the level of violence against police after the shooting death of Michael Brown on August 9th, 2014 in Ferguson, Missouri. To determine whether events in Ferguson were associated with a change in the number of U.S. police officers murdered in the line of duty, we constructed a time series data-set based on information extracted from the ODMP website. The ODMP is a non-profit organization founded in 1996 by a police officer in Virginia. According to the website:

In the early stages of development, the ODMP honored only law enforcement officers who had been killed or wounded in 1996, but quickly expanded to include officers killed in the line of duty dating back to 1990. Then, with the help of the National Law Enforcement Officer’s Memorial Fund, Inc., the site gained access to information about thousands of heroes who had given their lives in the line of duty since the 1790s. (see <https://www.odmp.org/info/about-odmp>)

Data from the ODMP have been used in several other studies of police officer fatalities (e.g. Eliason, 2011; Johnson, 2013; Varvarigou et al., 2014). Using the ODMP data-set, we examined trends in the number of murders for the 324-week period between January 2, 2010 and March 18, 2016. Thus we have 240 weeks of data before the shooting of Michael Brown, and 84 weeks of data afterwards. During the time covered by the study, 351 U.S. police officers were murdered in incidents that met our selection criteria.<sup>3</sup>

A cursory review of the data suggests that the mean number of officers murdered per week decreased slightly during the study period. The weekly time series of police officers murdered in the line of duty has a significant, negative, linear slope ( $b = -.017$ ,  $p = .006$ ). To the extent that a linear trend accurately summarizes the time series, these findings reveal that the number of officers murdered in the line of duty decreased by .017 officers per week during the study period. Put differently, the downward slope suggests that the number of officers murdered in the line of duty has dropped by about .88

3. We filtered out certain incidents from the data we downloaded from ODMP. First, we excluded any incidents that occurred in U.S. territories, including American Samoa, Guam, Puerto Rico, and the U.S. Virgin Islands. Second, since our interest is in violence against people, we excluded any incidents in which the victim was a police K-9. Third, since the primary focus of the debate over the Ferguson Effect is on state and local law enforcement agencies, we excluded incidents in which the victim was a military or federal law enforcement officer. Fourth, since ODMP tracks all line of duty deaths regardless of cause (including illnesses, accidents, and assaults), we excluded deaths due to illnesses and accidents. We retained only those cases in which the cause of death was listed as assault, bomb, gunfire, stabbing, or vehicular assault.



officers ( $.017 \times 52 = .88$ ) per year since 2010. This finding runs counter to the hypothesis that more police officers are being murdered post-Ferguson. However, this simplistic analysis fails to account for a number of complex issues associated with the analysis of time series data (McDowall, McCleary, Meidinger, & Hay Jr., 1980). Moreover, since we are specifically interested in determining whether the shooting of Michael Brown and subsequent events in Ferguson in August 2014 are associated with the number of police officers murdered in the line of duty, we rely on interrupted time series analysis to answer two primary research questions. First, were events in Ferguson associated with an abrupt, permanent change in the mean number of police officers murdered in the line of duty? Second, and perhaps more realistically, were events in Ferguson associated with a gradual, permanent change in the mean number of officers murdered in the line of duty? In the next section, we provide answers to these questions.<sup>4</sup>

## Findings

### Did a “Ferguson Effect” Contribute to an Abrupt Change in the Number of Police Officers Murdered in the Line of Duty?

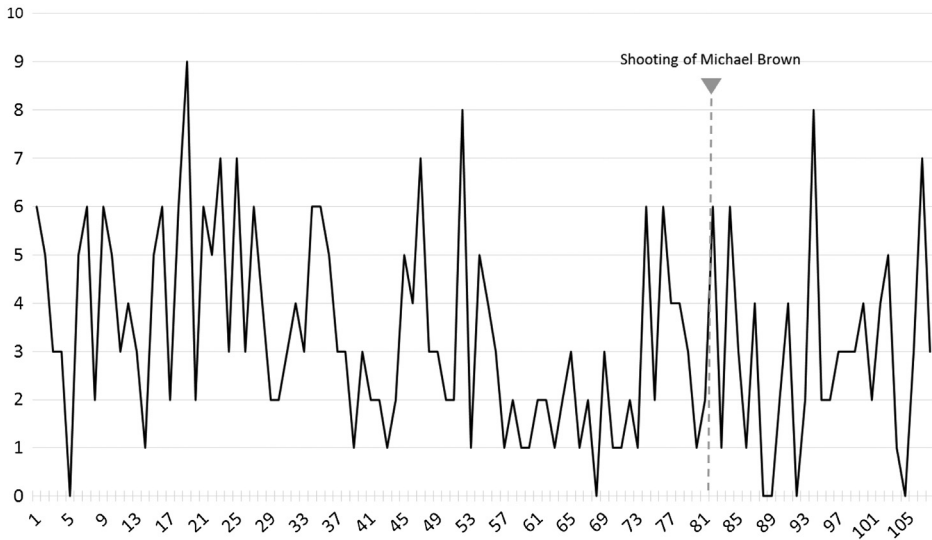
Because murders of police officers are somewhat infrequent (from a statistical perspective) when measured weekly, we selected three-week periods as our unit of analysis rather than one-week periods.<sup>5</sup> As a result, we have 80 three-week periods before Michael Brown’s shooting and 28 three-week periods afterwards. We calibrated the three-week periods so the 81st period begins on the day Michael Brown was killed. Though we view three-week periods as the most appropriate temporal unit of analysis for this study, we also conducted supplemental analyses using one and two-week periods to test the robustness of our findings.

Figure 1 shows the number of officers murdered per three-week period from January 2, 2010 to March 18, 2016. During the pre-Ferguson portion of the time series that includes periods 1–80, the mean number of officers murdered

4. The terminology used to describe changes in the time series as “abrupt permanent” or “gradual permanent” is derived from McDowall et al. (1980). The use of the word “permanent” in this context is not meant to suggest that an effect lasts forever. Instead it refers to an effect that lasts from its inception until the end of the time series.

5. The number of officers murdered per week during the time period covered by this study ranged from 0 to 5, with a mean of 1.08, a median of 1, and a mode of 0. These low frequencies present certain challenges for statistical modeling, therefore we chose to use three-week periods instead. The number of officers murdered per three-week period ranged from 0 to 9, with a mean of 3.25, a median of 3, and a mode of 2. We could have chosen four-week periods as well, but this would have reduced the number of post-Ferguson data points from 28 to 21. Our decision about the most appropriate unit of temporal aggregation was based on balancing two factors: ensuring that the outcome variable had sufficient frequencies, and maximizing the number of post-Ferguson observations.





**Figure 1** Police officers murdered per three-week period, January 2, 2010–March 18, 2016.

*Note.* The vertical dashed line indicates the shooting death of Michael Brown in Ferguson, Missouri on August 9, 2014.

during each period equaled 3.38 (with a median of 3.00 and a standard deviation of 2.02). During the post-Ferguson portion of the time series that includes periods 81–108, the mean number of fatal shootings equaled 2.89 (with a median of 3.00 and a standard deviation of 2.11).<sup>6</sup> This represents a 14.5% decrease in the mean number of officers murdered and a 0% change in the median number of officers murdered (see Table 1). A *t*-test comparing the mean number of officers murdered before and after the shooting of Michael Brown was not statistically significant ( $t = 1.07$ ,  $df = 106$ ,  $p = .285$ ). This preliminary analysis suggests that the shooting of Michael Brown and subsequent events in Ferguson did not increase the frequency with which police officers in the U.S. are murdered in the line of duty. However, this preliminary analysis does not account for the possibility of serially correlated errors and other issues in the time-series, and therefore may be biased. Thus, we performed time series analyses on the data using a variety of model specifications and estimation methods.

In regression analysis with time series data, the residuals are often correlated with those of adjacent observations, which violates the assumption that the residuals are independent of one another. To account for this serial correlation in the residuals, we rely on interrupted time series analysis using the

6. The full series ranges from 0 to 9, with a mean of 3.25, a median of 3, a standard deviation of 2.05, and a variance of 4.19.

**Table 1** Preliminary analysis of changes in the number of police officers murdered in the line of duty

Statistics	Pre-Ferguson Period (n=80)	Post-Ferguson Period (n=28)	Percent Change
Mean # officers murdered per 3-week period <sup>a</sup>	3.38	2.89	−14.5%
Median # officers murdered per 3-week period	3.00	3.00	0.0%

<sup>a</sup>*t* = 1.07, *df* = 106, *p* = .285.

Box–Jenkins approach, which involves the use of autoregressive integrated moving average (ARIMA) models (Box & Jenkins, 1976; Glass, Willson, & Gottman, 2008; McDowall et al., 1980). As defined by McDowall and McCleary (2014, p. 2654), the interrupted time series model is a quasi-experimental design that:

... breaks a long series of observations into pre-intervention and post-intervention segments, and a data analysis then compares the segment means. A rejection of the null hypothesis of equality between the means supports a conclusion that the intervention produced a change in the outcome variable.

The interrupted time series model is now commonly used in criminology and criminal justice to evaluate the effects of interventions, though some scholars have urged caution in using these models to draw causal inferences (Britt, Kleck, & Bordua, 1996). McDowall and McCleary (2014) argue that the careful use of ARIMA modeling can help to overcome several threats to internal validity when evaluating the effects of interventions using an interrupted time series approach.

Selecting the most appropriate ARIMA model involves specifying its three components: *p* refers to the autoregressive component of the model, *d* refers to the integration or trend component, and *q* refers to the moving average component. Non-seasonal ARIMA model specifications are often depicted using the convention: *ARIMA* (*p*, *d*, *q*). Numerous diagnostics are available to enable the researcher to identify the most appropriate ARIMA model specification. We carried out most diagnostics and model estimation using time series analysis methods in *EViews* 9, with one supplemental analysis carried out using *R* (version 3.3.1).

Earlier we noted a slight downward linear trend in the data series. However, visual inspection of the data series as well as the autocorrelation plots suggested that the series is stationary. Based on an augmented Dickey–Fuller test (*t* = −9.54, *p* < .001) and a Phillips-Perron test (*t* = −9.79, *p* < .001), we rejected the null hypothesis that there is a unit root and concluded that the series is stationary (Dickey & Fuller, 1981; Phillips & Perron, 1988). As a result,

**Table 2** Interrupted time series results, abrupt change model

Variable	Coefficient	Std. error	<i>t</i> -Statistic	Prob.
Constant	3.38	.23	14.76	.000
Pre-post	−.48	.45	−1.07	.286
Log likelihood	−229.52	$R^2$		.01
<i>F</i> -statistic	1.15	Durbin–Watson		1.85
Prob. ( <i>F</i> -statistic)	.285			

we did not include a trend component in the ARIMA model. Our initial diagnoses revealed no evidence of significant serial correlation in the residuals. This finding was based on visual inspection of the autocorrelation plots and the Ljung–Box *Q*-statistics as well as findings from the Durbin–Watson and Breusch–Godfrey LM tests (Breusch, 1978; Durbin & Watson, 1950; Godfrey, 1978; Ljung & Box, 1978). Finally, the autocorrelation plots also revealed no need for a moving average component. In the absence of the serial correlation, trend, and moving average components in an ARIMA specification, the resulting model is equivalent to an ordinary-least squares (OLS) regression.

Table 2 presents the findings from this analysis. In short, we found that the pre-post variable (coded 0 before the shooting of Michael Brown and 1 afterwards) did not exert a statistically significant effect on the mean number of police officers murdered in the line of duty ( $b = -.48$ ,  $SE = .45$ ,  $p = .286$ ). Because the number of murders is a count variable, we also estimated the effect of the pre-post variable using a negative binomial regression model. The results confirm the findings from the OLS model ( $b = -.15$ ,  $SE = .14$ ,  $p = .278$ ).<sup>7</sup> These findings suggest that the shooting of Michael Brown and subsequent events in Ferguson did not have an abrupt, permanent effect on the number of U.S. police officers murdered in the line of duty.

These findings were robust across a variety of model specifications and estimation procedures. As part of our model identification and selection process, we estimated four ARIMA model specifications associated with an abrupt, permanent change. Based on the diagnostics presented earlier, we believe the ARIMA (0, 0, 0) specification is the most appropriate model (the results are shown in Table 2). However, the substantive findings did not differ when we tested the following three specifications: ARIMA (1, 0, 0), (1, 0, 1), and (0, 0, 1). The coefficients for the pre-post variable ranged from  $-.28$  to  $-.48$

7. To test the robustness of these findings, we carried out a supplemental analysis in *R* using an autoregressive Poisson model developed for time series analyses of event counts (for details, see Brandt & Williams, 2001). The results confirm the findings already reported here, with the pre-post variable exerting a negative but non-significant influence ( $B = -.11$ ,  $SE = .29$ ,  $z = -.39$ ) on the number of police officers murdered in the line of duty.

across these three alternative models and none were statistically significant. Thus the results were consistent across different specifications of the ARIMA model. In an effort to determine whether the findings were sensitive to different choices about temporal aggregation, we also estimated OLS and negative binomial models using time series databases constructed of one-week periods ( $n = 324$ ) and two-week periods ( $n = 162$ ). In every instance, the coefficient for the pre-post variable was negative and non-significant.<sup>8</sup> We conclude from these supplemental analyses that our original findings are robust and that the shooting of Michael Brown and subsequent events in Ferguson did not have an abrupt, permanent effect on the number of U.S. police officers murdered in the line of duty.

### Did a "Ferguson Effect" Contribute to a Gradual Change in the Number of Police Officers Murdered in the Line of Duty?

The first research question focused on whether the shooting of Michael Brown and subsequent events in Ferguson in August 2014 had an instantaneous and lasting effect on the number of murders of U.S. police officers. However, it may be more realistic to expect that if there was a "Ferguson Effect" on murders of police officers, it might have occurred more gradually. To investigate the possibility of such an effect, we relied on methods recommended by McDowall et al. (1980) for detecting a "gradual, permanent" impact on the time series. Table 3 presents the findings from this analysis. Consistent with our previous results, we found that events in Ferguson did not exert a statistically significant effect on the mean number of police officers murdered in the line of duty ( $b = -.41$ ,  $SE = .45$ ,  $p = .369$ ). Once again, because the number of murders is a count variable, we also estimated the effect of the pre-post variable using a negative binomial regression model. The results confirm the findings from the OLS model ( $b = -.13$ ,  $SE = .14$ ,  $p = .364$ ). These findings suggest that the shooting of Michael Brown and subsequent events in Ferguson did not have a gradual, permanent effect on the number of U.S. police officers murdered in the line of duty.

As with our earlier findings on the abrupt impact of events in Ferguson, our findings with regard to gradual impact are robust across a variety of model specifications and estimation methods. As part of our initial model identification and selection process, we estimated four ARIMA model specifications associated with a gradual, permanent change. Based on the diagnostics, we believe the ARIMA (0, 0, 0) specification is the most appropriate model (the results are shown in Table 3). However, the substantive findings did not differ when we

8. For one-week periods, we obtained the following results: OLS ( $b = -.16$ ,  $SE = .14$ ,  $p = .241$ ) and negative binomial ( $b = -.15$ ,  $SE = .13$ ,  $p = .240$ ). For two-week periods, we obtained the following results: OLS ( $b = -.27$ ,  $SE = .29$ ,  $p = .353$ ) and negative binomial ( $b = -.13$ ,  $SE = .14$ ,  $p = .348$ ).

**Table 3** Interrupted time series results, gradual change model

Variable	Coefficient	Std. error	<i>t</i> -Statistic	Prob.
Constant	3.11	.40	7.70	.000
Pre-post	-.41	.45	-.90	.369
Murders <sub><i>t</i>-1</sub>	.07	.10	.71	.479
Log likelihood	-226.78	<i>R</i> <sup>2</sup>		.01
<i>F</i> -statistic	.75	Durbin-Watson		2.03
Prob. ( <i>F</i> -statistic)	.474			

tested the following three alternative specifications: ARIMA (1, 0, 0), (1, 0, 1), and (0, 0, 1). The coefficients for the pre-post variable ranged from  $-.23$  to  $.04$  across these three alternative specifications and none were statistically significant. Thus, once again, our findings are robust across multiple specifications of the ARIMA model. In an effort to determine whether the findings were sensitive to different choices about temporal aggregation, we also estimated OLS and negative binomial models using time series databases constructed using one-week periods ( $n = 324$ ) and two-week periods ( $n = 162$ ). The results are consistent with the findings from models estimated using three-week periods.<sup>9</sup> We conclude from these various supplementary analyses that our original findings were robust and that the shooting of Michael Brown and subsequent events in Ferguson did not have a gradual, permanent effect on the number of U.S. police officers murdered in the line of duty.

## Discussion

The shooting of Michael Brown in Ferguson, Missouri in August 2014 fueled the growth of what some have called a new civil rights movement in the United States. The extent to which American police agencies use their coercive authority in a fair and neutral manner has been called into question, thus undermining the legitimacy or rightful authority of the police for some people. Much of this legitimacy crisis can be attributed to incidents in which police have used deadly force, often against minorities, under questionable circumstances. Several of these incidents have been captured on video and quickly went viral through the ubiquitous use of social media. Many cities have experienced impassioned protests against police, often led by BLM activists. In some instances the protests have turned riotous, resulting in looting and violence.

9. For one-week periods, we obtained the following results: OLS ( $b = -.15$ ,  $SE = .14$ ,  $p = .291$ ) and negative binomial ( $b = -.14$ ,  $SE = .13$ ,  $p = .282$ ). For two-week periods, we obtained the following results: OLS ( $b = -.23$ ,  $SE = .29$ ,  $p = .440$ ) and negative binomial ( $b = -.11$ ,  $SE = .14$ ,  $p = .435$ ).

Police find themselves not only the object of protests and riots, but they are also responsible for ensuring public order and public safety during such events.

Two opposing narratives have emerged in the aftermath of Ferguson and other recent high profile events focusing on the police. One is that police do not behave in a fair and neutral manner and that minorities are subjected to a disproportionate share of the coercive authority granted to police by the state. This is one of the central premises of the BLM movement. BLM activists recently launched a national campaign to end police violence, noting that “we can live in a world where the police don’t kill people by limiting police interventions, improving community interactions, and ensuring accountability” (Lopez, 2015). The second narrative is that there is now a war on cops, with more and more people feeling empowered to challenge police authority (Canterbury, 2016; DeMarche, 2015; Safir, 2015). As a result, police officers are disengaging from proactive police work out of fear of getting in trouble, getting sued, or losing their job. Moreover, police officers are hesitating during potentially violent situations, which places them at greater risk (Reese, 2014). According to this narrative, violence against police is on the rise because BLM and other influential groups and individuals are either tacitly or explicitly encouraging it. The debate over these two narratives has spilled over into academia, with researchers now seeking to examine the validity of both perspectives.

The research questions examined in this study focus on illuminating just one part of the second narrative. We sought to determine whether the post-Ferguson legitimacy crisis in American policing was associated with an increase in the extent to which U.S. police officers are murdered in the line of duty. We found no evidence of such an increase as of the end of our study period in March 2016.<sup>10</sup> Across multiple model specifications and estimation methods, our findings support the conclusion that the shooting of Michael Brown and subsequent events in Ferguson in August 2014 were not associated with an increase in the number of police officers murdered in the line of duty. The results remained consistent whether we relied on linear regression or negative binomial models; autoregressive Poisson models; a temporal aggregation of one, two, or three weeks; an assumption of abrupt or gradual effects; or the inclusion of autoregressive or moving average terms in the ARIMA models. In every case, the coefficient representing the effect of Ferguson was non-significant, and in all but one case, the coefficient was negative. A recent debate over another analysis of the Ferguson Effect called into question the use of p-values, noting that they represent an arbitrary threshold (Mac Donald, 2016b). Even if one were to discount the use of p-values to make such an argument here, the fact that the signs of the

10. Our study period ended several months before a particularly tragic month for U.S. police agencies. On July 7, 2016, five police officers were shot and killed by a sniper in Dallas, Texas. Shortly after that, on July 17, 2016, three police officers were shot and killed in Baton Rouge, Louisiana. By the time these well-known incidents occurred, our analysis had already been completed and this paper had already been written.

coefficients were consistently negative would still constitute evidence against a Ferguson Effect on the number of U.S. police officers murdered in the line of duty.

While we make no claim to have explicitly *tested* conflict or defiance theory, our findings do not support the conclusion that these theories explain recent trends in police homicides. The logic underlying conflict theory is consistent with the idea that the growth of the BLM movement could lead police-citizen interactions to become more volatile, and in turn, deadly for the police (and for citizens). And according to defiance theory, minority citizens in particular may become more defiant and aggressive toward officers in response to perceived injustices committed by the police in recent years. Yet, our analyses provide strong evidence that the police legitimacy crisis stemming from Ferguson has not resulted in a greater number of officers being killed in the line of duty. In fact, police homicides appear to be trending slightly downward. It is unknown to what extent de-policing may have influenced this trend. If in fact police officers are making fewer proactive stops, this would reduce the frequency with which officers find themselves in volatile situations involving defiant citizens. It is therefore crucial for researchers to continue exploring the de-policing hypothesis. Thus, while our findings did not provide explicit support for conflict or defiance theory in the context of police homicides, it would be naïve to dismiss these theories as possible explanations for other measures of resistance toward the police, whether violent or nonviolent. Future research should continue to explore violence and other forms of resistance against the police using these frameworks—particularly in cities that have experienced protests against the police, including those led by BLM.

Although the evidence presented here makes a noteworthy contribution to the debate over the validity of the Ferguson Effect, it has some limitations. First, it is unable to draw on a comprehensive national database on the use of violence against police officers in the United States. The FBI has attempted to track such data for many years with its *Law Enforcement Officers Killed and Assaulted* data series, but as other scholars have noted, the data series is flawed in many ways that limit its utility for research like this (e.g. Kuhns, Dolliver, Bent, & Maguire, 2016). The LEOKA data are released too slowly to allow for timely analyses of recent trends (the data sets are usually archived about 16–18 months after the end of each year). For instance, as of August 2016, the 2015 LEOKA data were still not yet available in a publicly accessible archive. Furthermore, under-reporting is endemic even among large agencies (Kuhns et al., 2016). As a result, the data sets have serious missing data problems, particularly when used for longitudinal analyses. For instance, we found that only 302 of the 521 (58%) line of duty deaths reported in the annual LEOKA reports from 2010 to 2014 were listed in the LEOKA databases. One useful aspect of the LEOKA data is that they contain measures of officers injured in the line of duty (in addition to officers killed). However, given the issues we have just outlined, the data are not well-suited for answering questions about whether the post-Ferguson legitimacy crisis in American policing has increased



the overall level of violence against police, whether measured in terms of injuries or deaths.

Similarly, to the extent that the police legitimacy crisis in the U.S. may be associated with an increase in disrespect toward police or a decrease in people's willingness to comply with lawful police orders, the analysis in this paper would be unable to detect such effects. Our only focus in this paper is on the most extreme instances of violence in which officers were fatally assaulted.<sup>11</sup> Our results cannot be used to draw inferences about whether other phenomena such as nonfatal violence, disrespect, or disobedience toward police have increased post-Ferguson. Finally, while the data source we used appears to be comprehensive, it has not (to our knowledge) been previously validated.<sup>12</sup> While it is significantly more complete than the FBI's data, we are not familiar with any evidence on its data quality.

## Conclusion

Every instance in which a police officer is killed in the line of duty constitutes a tragedy. However, despite popular rhetoric to the contrary, we find no evidence that the number of such instances is increasing post-Ferguson. To the extent that the number of police officers killed in the line of duty has changed at all, it has decreased slightly. Additional research is needed before definitive conclusions can be reached about whether the "war on cops" is myth or reality. Unfortunately, current data on the number of non-fatal attacks against the police make it difficult to draw clear inferences about national trends. Similarly, there are no national data on the extent to which police in the U.S. are facing increased levels of disrespect or unwillingness to cooperate with lawful police orders among members of the public. Some police officers believe that law enforcement has become more dangerous post-Ferguson and express reluctance to use force even in situations that call for it (see Nix & Wolfe, 2016). This is troublesome not only for the police but also for the communities they serve. Ultimately, a war on cops could result in an insecure, unsafe society—and indeed, a growing body of evidence suggests that de-policing has occurred in select cities following highly criticized deadly force incidents (e.g. Baltimore, Chicago, North Charleston). Yet, as of the end of our study period in

11. However, it is worth noting that in some instances, the difference between a non-fatal and fatal assault may simply be the proximity of a level-one trauma center and the quality of emergency care (Giacopassi, Sparger, & Stein, 1992; Hanke & Gundlach, 1995; MacKenzie et al., 2006), or small differences in where a bullet strikes an officer.

12. We identified one error in which the cause of death for a police officer mistakenly shot by a fellow officer during a shootout with suspects who had ambushed them was listed as "Gunfire (Accidental)." Since the officer's death resulted indirectly from a felonious assault, and since the ambush suspects have been charged with first-degree murder in the officer's death, the cause of death should arguably not be coded as accidental. Unfortunately, we do not know how often such issues occur in the ODMP database.

March 2016, we find no evidence to support the conclusion that police officers were killed feloniously in greater numbers post-Ferguson.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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