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Reducing Fatal Police Shootings as System Crashes: Research, Theory, and Practice

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Abstract

Can fatal shootings by American police be reduced? If so, what theoretical framework would be most useful in saving more lives? What research agenda would that framework suggest? The purpose of this review is to answer those three questions. It applies the system-accident framework (Perrow 1984) as a pathway to help police agencies reduce fatal police shootings, adapting it as system-crash prevention to encompass a wider range of systemic causes of catastrophic events. In contrast to deterrence, the dominant policy perspective on reducing fatal shootings, a system-crash prevention approach applies lateral thinking (Johnson 2010) from lessons learned about airplane crashes, surgical errors, nuclear power plant meltdowns, and other rare events in complex systems. This framework spotlights the rare combinations of risk factors and errors that can produce fatal shootings, the prevention of which may need to vary widely between large and small communities. Of the 986 fatal police shootings reported nationally in 2015 (Wash. Post 2016), an estimated half occurred in cities with fewer than 50,000 residents; only a third occurred in cities over 250,000 residents (Sherman 2015), where the majority of all research on police shootings has been done. The system designs for fewer police killings in very large versus very small police agencies require a general framework for policy-relevant criminology. The framework suggested by Sampson et al. (2013) requires research to identify



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(a) causal mechanisms that may generally help to reduce fatal police shootings but may also have (b) heterogeneous effects that may work differently on different subpopulations or when their application is (c) contextualized in different social settings. Future research must therefore include very small communities in order to understand and help prevent the majority of all fatal police shootings.

INTRODUCTION

On September 16, 2016, in Tulsa, Oklahoma, Police Officer Betty Shelby fatally shot Terence Crutcher, an unarmed 40-year-old black man, who was standing near his vehicle in the middle of a street. Several videos of the event (e.g., <https://www.youtube.com/watch?v=Kopdb1c2b1M>) show that Shelby shot Crutcher while he was reaching into his vehicle and that after the shooting a group of police officers left Crutcher bleeding as he lay on the road for at least several minutes. Within one week, the local prosecutor charged Officer Shelby with first-degree manslaughter. On May 17, 2017, a jury found her not guilty. Her defense was that she had acted consistent with her training. The jury said that they could not conclude that she had acted in violation of her training. Much the same might have been said about the failure to render first aid immediately, let alone the apparent absence from standard police equipment of the new hemostatic bandages that are known to stop bleeding by soldiers wounded on the battlefield (Rhee et al. 2008).

For many critics, this case was a tragic failure to hold an individual police officer accountable. However, for those looking to reduce the annual gun death toll of and by US police officers, this case was a failure to hold organizational systems accountable, and it is not an exception. As this review shows, there is far greater evidence that fatal police shootings can be reduced by re-engineering police systems than by trying (with little chance of success) to change the legal immunity of police officers or the behavior of juries.

Five facts support the conclusion that a conceptual framework based primarily on punishment will fail to reduce the killings of either citizens or police. The first fact is the widespread social construction of punishing police as a zero-sum political battle, with winners and losers. The second fact is the repeated failure of jurors in 2016–17 to reach guilty verdicts against police for their fatal shootings, even in the face of powerful video evidence, of such black men as Samuel DuBose in Cincinnati, OH, Walter Scott in North Charleston, SC, Terence Crutcher in Tulsa, OK, and Philando Castile in suburban St. Paul, MN (Blinder 2017, Bosman et al. 2017). A third fact is the continued high approval ratings of local police by white citizens since Michael Brown's death, even as nonwhites, Democrats, and big-city residents give their police consistently lower levels of approval (Gallup 2016). Fourth, fatal police shootings in the United States have many causal pathways in which it seems probable that a minority would offer any evidence of criminal intent or administrative rule-breaking. Finally, the historical evidence from other complex systems suggests that their collateral death rates decline more substantially by re-engineering their social and technical systems than by increasing the certainty, speed, or severity of punishment (Perrow 1984).

These five facts do not suggest that the debate over punishing police for unnecessary fatal shootings can or should be abandoned. The facts merely pose a strong challenge to using deterrence as the primary or exclusive strategy for reducing fatal police shootings. Although there is research evidence that such punishment has been and can be effective, it is difficult to achieve and has rarely worked without other strategies to support it. The great importance of achieving justice for its own sake does not make punishment the only or best way to save lives. As this review concludes, more

police shootings may be prevented by undertaking field research on organizational innovations than by any other strategy.

National police leaders who criticized President Trump's 2017 comments on police use of force (Manger 2017, New York Times Edit. Board 2017) showed that these leaders can offer an independent source of power to save lives, even while they may disagree among themselves or with some of the officers they lead. Given the complexity of the problems at stake, the criminology of fatal police shootings may be of greatest value in helping police leaders, as well as state and local legislators, to redesign organizational systems for policing in the United States. These organizational systems are central to what the Tulsa jury said in its statement about their acquittal of the Tulsa officer who killed Terence Crutcher: "The jury could not, beyond a reasonable doubt, conclude that she did anything outside of her duties and training as a police officer in that situation" (Ellis 2017). The Tulsa jury offers a clear challenge to both criminology and police leadership to design the kind of recruitment, training, promotions, supervision, dispatching, tracking, decision-making, and organizational culture that can make shooting an unarmed man behaving like Terence Crutcher unthinkable, and the failure to render first aid to him after the shooting even more so.

This review explores how the twentieth-century success of a deterrence framework in reducing fatal police shootings may be surpassed by developing a system-crash prevention framework in our current century. The first section, *Criminology and Fatal Police Shootings, 1963–2000*, reviews how research helped to reduce fatal shootings by restricting the organizational and legal powers to kill fleeing felons, followed by the failure of criminology to detect and confront the high death toll associated with defense-of-life shootings since 1990. The second section, *Recent Criminology of Police Shootings*, shows how, with the major exceptions of Klinger (2005) and Zimring (2017), recent research has generally been too explanatory (rather than policy-oriented) in focus to promote the major changes needed to reduce the almost 1,000 fatal shootings reported annually (Wash. Post 2016). The third section, *System-Crash Prevention and Fatal Police Shootings*, develops an organizational perspective to guide future research on reducing police shootings. Adapted from Perrow's (1984) system-accident framework, the new framework this review presents is best defined as system-crash prevention (Badger 2015, Richtel 2016). By applying Perrow's key concepts of interactive complexity, tight coupling, and production pressures to police shootings, the review suggests that these tragedies are not inevitable, normal accidents caused by too much complexity but rather might be prevented by rigorously tested innovations in organizational systems. The fourth section, *A Tale of Two Policing Systems: Cleveland Versus Camden*, applies the framework of system-crash prevention to illustrate the life-and-death difference between the crash-prone and crash-preventive police organizational systems in Cleveland, OH, and Camden, NJ, respectively. The final section, *A Research Agenda for Preventing Police Shootings*, offers recommendations for advancing empirical research on two different approaches to system-crash prevention: reengineering core police functions, such as dispatch management, and introducing new features specifically focused on saving lives, such as first aid equipment and immediate police transport of the people they shoot to the nearest hospital.

The key to the success of a system-crash prevention framework is to make it adaptable to a wide range of contingencies and contexts. Space permits only limited attention to these variations, but the review attempts to deploy a more general framework for policy-relevant criminology as suggested by Sampson et al. (2013): Research should identify (*a*) causal mechanisms that may generally help to reduce fatal police shootings but may also have (*b*) heterogeneous effects that may work differently on different subpopulations when their application is (*c*) contextualized in different social settings. That framework is especially relevant to this review because of the recently established fact that half of all fatal police shootings occur in cities with fewer than 50,000 residents and 31% occur in cities of more than 250,000 (Sherman 2015). Whether and how various

system-crash prevention designs may prevent police shootings in the different contexts of very large versus very small police agencies are central to the research agenda proposed below.

CRIMINOLOGY AND FATAL POLICE SHOOTINGS, 1963–2000

Two Great Awakenings of Protest and Scholarship

America has reduced fatal police shootings once before, with criminology playing a key role in what can be called the First Great Awakening¹ of both public and scholarly sentiment against avoidable police shootings. From 1970 through 1985, 50 cities of more than 250,000 residents each took actions that cut in half the annual total count of citizens killed by police in those cities from 353 to 172 per year (Sherman & Cohn 1986). The major change during this period was a growing ban on shooting nonviolent fleeing suspects. This now-forgotten change in police-citizen violence saw both killings by and killings of police fall dramatically, by 51% and 65%, respectively. The denouement of this First Great Awakening was the 1985 US Supreme Court decision of *Tennessee v. Garner* (471 US 1) that declared the law of almost half of US states unconstitutional in permitting police to kill nonviolent suspects. Coming at the end of a long gradual spread of this ban across big cities, the Garner ruling seemed to push down the FBI's national count of voluntarily reported justifiable homicides by police still further (Tennenbaum 1994), perhaps largely in the smaller cities that had not already adopted the ban.

The First Great Awakening faded with the crack epidemic of the late 1980s. As big-city homicide rates spiked, criminologists and national news media seemed unaware that police killings of citizens went back up in the early 1990s (Zimring 2017), when many police agencies shifted from revolvers to semiautomatic pistols with large ammunition clips. The influence of the US Supreme Court decision in *Graham v. Connor* (1989) is also blamed for reversing the benefits of *Garner* because in *Graham* the Court ruled that police could justify killing people if they reasonably believed that the person shot was putting a life in danger (Terrill 2009). Although many leaders of black communities in cities both large and small seemed well aware of the continuing police killings they faced, by the mid-1990s the national good news of declining general homicide rates became the dominant long-term crime story. Not until police officer Darren Wilson killed Michael Brown in Ferguson, MO, on August 9, 2014, did Americans witness a Second Great Awakening of concern and debate over police-citizen violence.

Unlike the First Great Awakening, the Second has been fed by widespread smartphone ownership (Smith 2017) providing a steady stream of online videos of police shootings, many of them criminal, and many more avoidable. Although this Second Great Awakening saw an initial post-Ferguson decline in public approval of their local police in 2015 (the lowest in 22 years), it was also followed by a substantial increase in killings of police (Officer Down Meml. Page 2017) in 2016 over 2015 (63 over 41), which may have prompted a subsequent half-century high in Gallup poll ratings of police approval (Gallup 2016). Even that volatility, however, may suggest the increased intensity of public feelings about police since 2014.

So far, this Second Great Awakening has not been accompanied by any substantial drop in killings by police, but it has seen other important changes. Most important is a major change in the national measurement of fatal police shootings—not by government, as recommended by the Presidential Task Force on 21st Century Policing (2015), but independently by two newspapers, the *Washington Post* and *The Guardian* (Zimring 2017). Both of these counts of online news reports

¹A social movement producing major change in moral or spiritual consensus; see Ahlstrom 1972.

of police killings in the United States showed more than twice as many deaths caused by police as counted by the voluntary federal data. Both newspapers reached fairly similar counts of the number of people shot to death by police in 2015 and 2016, converging just under 1,000 in both years. Using the 50% drop in big-city killings by police in 1970–84 as a benchmark, a comparable success by the Second Great Awakening could save 500 lives a year.

The Second Great Awakening has also seen some change on other fronts. There has been legislative action by 16 states on police training in de-escalation tactics (Am. Public Media 2017), a rapid spread of police wearing (if not always activating) body-worn video cameras, and other new practices, some of them consistent with the recommendations of the Obama panel (Pres. Task Force 2015). It has produced fascinating new initiatives by police chiefs to slow down police decisions to shoot people, such as the new Hippocratic Ethos of Policing in Camden, NJ (Goldstein 2017). And there is a small but growing body of new research published by policy-oriented criminologists, led by Zimring (2017).

What the Second Great Awakening has not yet seen is a growing body of the kind of criminological impact evaluations of the First Great Awakening. One prime example is the innovation of de-escalation training. Despite the spreading state legislation requiring police to receive such training (Am. Public Media 2017), it appears that not one impact evaluation of training by that name has been conducted or published (Engel et al. 2017). An ongoing systematic review of 99 databases using 16 search terms has identified more than 40,000 potentially relevant titles but only 62 evaluations of de-escalation training in any field (including schools and mental hospitals); of those, only one was done with police (in Switzerland, $N = 29$), but no behavioral measures were employed (Berking et al. 2010; as cited in Engel 2017). Similarly, a wide range of field research has been done on body-worn video cameras, but there is apparently no research on the effect of such cameras in altering shooting behavior. Thus, two of the most rapidly spreading innovations in police reform may have gone completely unevaluated with respect to police use of guns.

Criminology of Fatal Police Shootings in the First Great Awakening

The criminology of fatal police shootings began with descriptive studies that quickly led on to policy evaluations, ultimately helping to make case law with empirical evidence. Robin's (1963) finding of huge variations in rates of citizens killed across major cities suggested vast discretion that might be restricted based on the voluntary reporting of justifiable homicide by police to the FBI. Milton et al. (1977) produced the first comparative analysis of police shooting deaths based on the review of police agency files on each case, followed by other agencies allowing in-depth descriptions, such as Meyer's (1980) on the LAPD, and by analyses of other agencies (see Geller & Scott 1992).

This descriptive research on shootings built on the American Bar Foundation's massive field studies of policing in the 1950s, which documented extensive discretion in all aspects of enforcement (e.g., LaFave 1965). This research led to publications on how to regulate legally permissible police discretion through organizational policy-making (Goldstein 1967, Pres. Comm. Law Enforc. Adm. Justice 1967, Remington 1965). One participant in these discussions was New York Police Commissioner Patrick V. Murphy, who (with other police chiefs) spent two weeks at a University of Wisconsin Law School seminar sponsored by the Police Foundation in 1971 (Herman Goldstein, pers. commun.). Shortly after that, Murphy launched a major initiative to restrict police shootings in New York City. This initiative inspired many other police agencies to follow Murphy's lead, but they were helped along by the pioneering work of James Fyfe (1978) in documenting the impact of Murphy's changes in extensive detail.

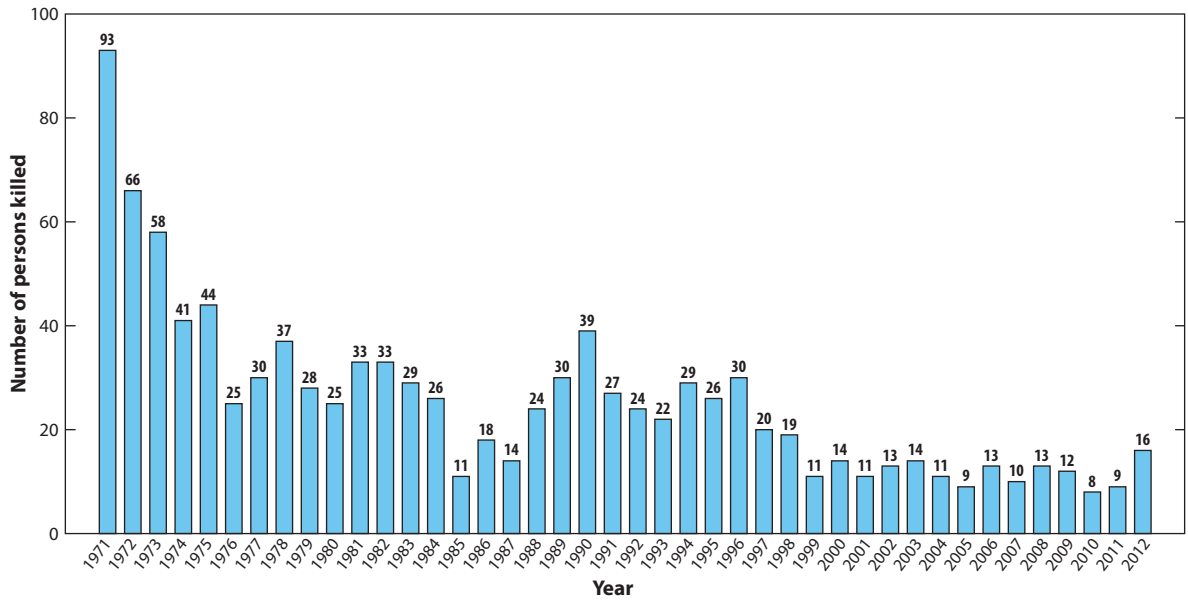


Figure 1

Persons fatally shot by New York City Police, 1971–2012. Source: NYPD.

This convergence of academic criminology with pioneering police leadership must be understood in the context of police shootings as one of the major civil rights issues of the era. In 1968, as head of the Washington, DC, police, Patrick V. Murphy had already challenged Chicago’s Mayor Daley during the riots after Dr. Martin Luther King’s murder in 1968. Daley had ordered Chicago police to shoot the looters. Murphy told his police not to shoot the looters. This prompted a national debate over deadly force that Murphy continued in New York in 1972, when he put to good use the Goldstein-Remington-LaFave framework for structured discretion in reengineering the policies, training, supervision, review, discipline, and organizational learning systems for police shootings in the NYPD (Fyfe 1978). This decision launched a process leading not only to Fyfe’s series of publications but eventually to a 91% drop in New York’s police killings by 2010—from 93 citizen deaths in 1971 to 8 in 2010 (**Figure 1**).

Other police leaders then followed Murphy’s initiative, including Kansas City Police Chief Joseph McNamara in 1973–75 and Atlanta’s Lee Brown in 1978–82, and were also evaluated by criminologists (Geller & Scott 1992, Sherman 1983). The primary audience for this research was the US Supreme Court, to which an alliance of big-city chiefs and criminologists submitted a joint amicus curiae brief in the case of *Tennessee v. Garner* (1985). The key research findings for constitutional law were the answers to the 6th US Circuit Court of Appeals hypotheses in *Wiley v. Memphis Police Dept.* (1977), which were central to the *Garner* case and claimed that if police shoot less crime will go up and police will get hurt more. The *Garner* court cited Fyfe’s (1978, 1981) and Sherman’s (1980b, 1983) research showing that restrictions led to no adverse effects on police officer safety and crime, but that, after restrictive rules were imposed, large reductions in police shootings did follow.

In the same general time period, other case studies of often controversial restrictions on shooting nonviolent suspects, as well as restrictions on shooting at cars or shooting warning shots, showed that restrictions worked in every case. Geller & Scott (1992) reported reductions in

shootings by police in the immediate aftermath of such policy restrictions in the 1970s and 1980s in Oakland, Los Angeles, Dallas, Omaha, and Memphis without any evidence of increased injury to police or of any overall increases in the severity of crime.

Yet Fyfe (1982) and Sherman (1983) both concluded, independently, that merely changing policies was not enough. Other elements of organizational change seemed to be essential, including external demands and internal leadership, both ensuring that policies are implemented and enforced. Their conclusion received further support from White's (2001) late contribution of data (the analysis of 982 Philadelphia police shootings from 1970 through 1992) relating to two major policy changes: one loosening restrictions on situations in which police were allowed to shoot (1974) and one tightening those restrictions again (1980). The evidence suggested that although policy restrictions made some difference, the rhetorical messages from the Mayor and Police Commissioner produced effects that overrode the policy content.

Although these detailed insights came from just four cities, they reflected a general trend sweeping across at least 50 of the 59 cities with more than 250,000 residents in 1970. Sherman & Cohn (1986) reported from a mail and telephone survey that total citizens killed across those cities dropped from 353 in 1970 to 172 in 1984 (the year before the *Garner* decision). The death rate per 100,000 residents went down in twice as many cities (32) as those where the rate increased (16) (Sherman & Cohn 1986). Equally important, the number of police killed feloniously in total across those cities in those years dropped from a peak of 28 to a low of 13, with an average of 29 per year in 1970–75, finally dropping to 14 per year in 1976–80 and 17 in 1981–84. Although the decline in murders of police may have occurred for reasons independent of the decline in killing citizens (e.g., more bullet-proof vests), it appears that shooting fewer citizens caused no increase in any death rates.

The most striking finding in research of that era was never published but bears a full display here as **Figure 2**. The National Urban League obtained race-of-decedent data from the FBI's compilation of police agency voluntary reporting of justifiable homicides by police for the period 1970 through 1979 in 57 of the cities with more 250,000 residents (Mendez 1983). Their finding

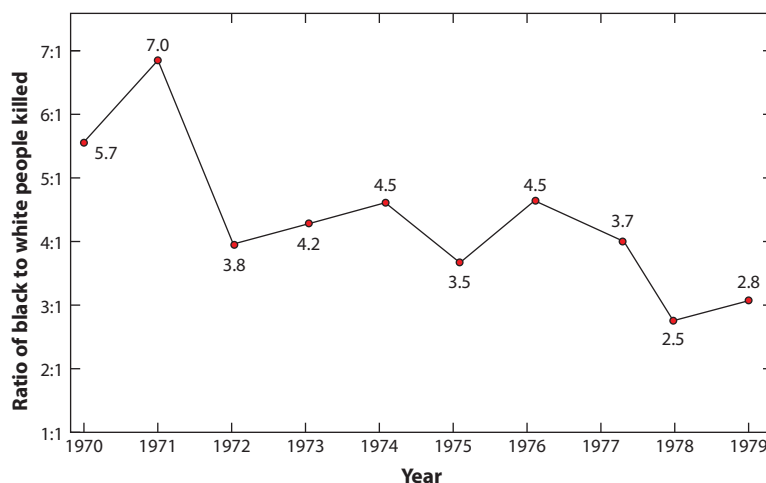


Figure 2

Ratio of rates of legal police killings per 100,000 of black to whites in 57 US cities with over 250,000 residents, 1970–79. Source: Secondary analysis of FBI Justifiable Homicide by Police data (Mendez 1983, table 2).

was a striking reduction in racial disparity. Although there were still almost 3 blacks killed for every white person killed by police in those cities at the end of the decade, the low of 2.5 to 1 was still a two-thirds reduction in disparity from the peak of 7 to 1. Moreover, since the absolute rate of blacks killed declined, this finding also shows a substantial saving of lives—perhaps the majority of lives saved in the overall drop of big city, police-citizen violence.

Whatever the causes of the drop in police killings in big cities, it seems unlikely that they were limited to formal organizational policies or programs. This point has recently been made in the context of a large Australian city (Melbourne), where restrictive laws were held constant while fatal shootings spiked and then fell in response to two organizational changes—both internal responses to external conditions (Saligari & Evans 2015). After a series of murders of city police in the 1980s, a new training emphasis on danger to police apparently encouraged more preemptive use of force, with a sharp increase in fatal shootings of citizens. That led, in turn, to a public outcry—including the State Coroner’s criticism of a culture of bravery leading to rapid confrontations rather than delay and negotiation. The new response in the early 1990s was to launch Project Beacon:

A new 5-day training project for all operational officers, underpinned by a “safety-first” philosophy: safety for officers, safety for the community and safety for the suspect. . . . The immediate impact of this training was remarkable and a culture of safety first had effectively permeated through all levels of Victoria Police (Saligari & Evans 2015, p. S82).

Fatal police shootings statewide by police in Victoria dropped by 50% in the short run after Project Beacon. By a few years later, however, the numbers began to climb again, with mentally ill suspects comprising almost half of persons killed. This echoes the conclusion from US case studies: that there is no single intervention that is likely to have a lasting effect on fatal shootings. Nonetheless, the first wave of US research featured substantial attention to policy interventions. That is more than can be said of most recent research.

RECENT CRIMINOLOGY OF POLICE SHOOTINGS

It is clearly premature to compare three years of post-Ferguson criminology of police shootings to 30 years of work done in the First Great Awakening. However, with the exception of the important theoretical discussions by Klinger (2005) and his colleagues (Pickering & Klinger 2016), little recent criminology is focused on identifying specific system changes that could prevent police shootings. The major exception is Zimring’s (2017) invaluable analysis of a wide range of accessible statistical data, notably *The Guardian* (2017) website for people killed by US police in a sample comprising all 551 (of a total of 1,146 deaths for 2015) listed deaths in the first six months of 2015. Similarly, Sherman (2015) examined all 620 listed deaths in the first 7.5 months (through August 17) of the 2015 cases included in the *Washington Post* (2017) database of fatal shootings by police (of the total of 991 deaths listed in those data by the end of 2015).²

Although Zimring’s book addresses a range of questions, its diagnostics and policy recommendations offer the most comprehensive contemporary treatment of the problem. A selection of his most important diagnostic observations, based solely on the news media accounts compiled by *The Guardian*, can be presented most clearly in a list [with page numbers in Zimring (2017) for reference]:

²This review focuses on fatal shootings, rather than all deaths, to reduce the heterogeneity of the phenomena to be understood and prevented, which requires excluding deaths in custody and those from choke-holds and TASERs as well as other situations with different causal processes from shootings.

1. Most people killed by police responding to calls are white non-Hispanics (52%), with African Americans at 26% and Hispanics at 17% (p. 45).
2. Proportionate to the national population, African Americans are 2.3 times more likely to be killed than whites, and Native Americans are twice as likely; there is no elevated rate of death for Hispanic over non-Hispanic whites (p. 46).
3. Unlike the declining rates of arrest among men over age 20, the rate of killing by police remains steady well past age 40; the age curve for fatal police shootings appears independent of the age curve of arrests for criminal activity (p. 47).
4. The most common situations in which police killed people were disturbances (23%), of which approximately half were domestic. Criminal investigations made up 15% of fatal encounters, arrest and crime in progress combined accounted for 14%, traffic stops made up 9%, while armed and dangerous and shots fired combined summed to 7% (p. 54).
5. Deaths of African Americans were twice the proportion of arrest-related cases (41%) as of noncriminal justice cases (20%) (p. 54).
6. There was no firearm present in 44% of fatal police shootings (p. 57).
7. A firearm or knife was in the decedent's possession in 72% of deaths (p. 57).
8. More than one officer is present in most police killings (65%), but 37% of killings by officers who are alone kill suspects who have no guns, compared to 11% of deaths occurring with multiple officers present (pp. 60–61).
9. The precipitating suspect conduct for police killings was pointing a gun or shooting at police in 40% of cases, brandishing a gun in 24% of cases, charging at police in 13% of cases, driving a car at police in 4% of cases, running away from police (which is generally unlawful under *Garner*) in 3.4% of cases, and officers stabbed or cut in 1% of cases (p. 62).
10. In the limited portion of cases reporting the number of bullets fired, police fired four or more bullets at the suspect in 32% of cases, thus increasing the risk of death (pp. 64–69).

Zimring (2017) provides excellent interpretations of these findings on a number of levels. Yet what his diagnosis strikingly omits is the widely varying organizational and community context of these events. Although he does note that there are substantial regional differences with respect to population-based rates, he largely ignores the elephant in the room of American policing: the huge differences between large and small communities (and the corollary size of the police agencies). For this, we must report Sherman's (2015) findings that the majority (51%) of fatal police shootings in a 7-month sample of all events reported by the *Washington Post* (2017) in 2015 occurred in communities of fewer than 50,000 people, and almost 70% occurred outside of the major cities (250,000 people or more), where shootings had already declined during the First Great Awakening. Although the largest cities still accounted for 30% of fatal police shootings in 2015, their rates per 100 homicides were only one-sixth of the rates of the smallest communities, those under 10,000 residents (**Figure 3**). Homicide rates by size of community are arguably appropriate to use as a benchmark of risk, especially because in most analyses across communities, homicide rates are positively (and strongly) correlated with fatal police shootings (Klinger et al. 2015, Liska & Yu 1992, Sherman & Langworthy 1979). The near-linear, monotonic-negative relationship in **Figure 3** between city population size and fatal police shootings is striking.

Explanatory Research

Neither Sherman nor any other criminologist has done much to understand or explain the apparently large role of community size in relation to fatal police shootings. The best recent use of any kind of contextual analysis is reported in Klinger et al.'s (2015) study of 230 police shootings in St. Louis, but their very nuanced study was necessarily limited to neighborhood differences within

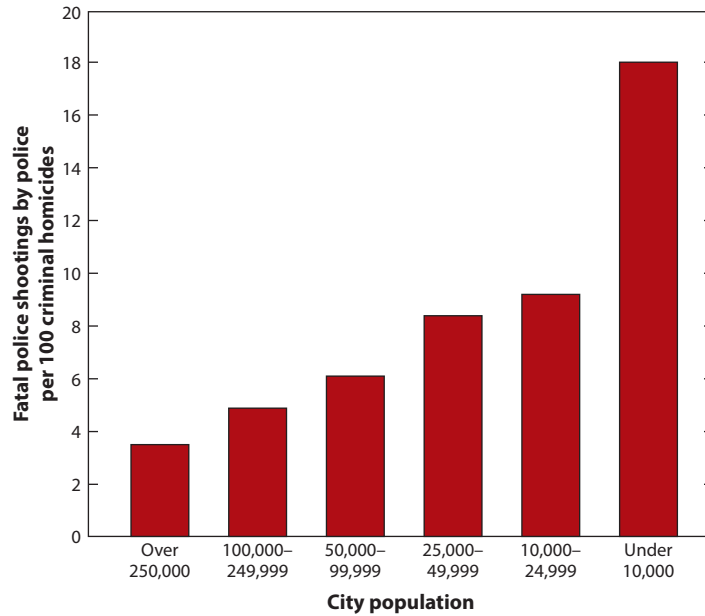


Figure 3

Rates of US fatal police shootings per 100 criminal homicides by city population size, January 1 through August 17, 2015. Sources: Secondary analysis of all 468 deaths identified by city out of 621 *Washington Post* (2015) reports, with 25% missing data on city where reported death occurred; rates of criminal homicides per 100,000 and total population size in each category of city size calculated from FBI Uniform Crime Reports for 2013, latest year available, in Sherman (2015).

one large city. Moreover, they rightly challenge the many cross-city analyses based on what we now know to have been the grossly under-reported FBI data on justifiable homicides by police officers (Jacobs & O'Brien 1998, Liska & Yu 1992, Sherman & Langworthy 1979, Sorensen et al. 1993). Ironically, what Klinger et al. (2015) studied turns out to be the dregs of the problem America faces: relatively small variations in the low rates per 100 homicides found within a big city rather than the very large variations across cities of vastly different sizes. Yet their finding of a curvilinear relationship between police shootings (both lethal and nonlethal) and block-level firearms violence is an important discovery: Police shootings become less likely at the highest levels of overall firearms violence than at the levels just below the top, where police shootings peak. Do police generally shoot less if they perceive a very high rate of violence than when they do not? If further research shows this St. Louis finding to have consilience with studies comparing cities (rather than neighborhoods) with higher and lower rates of violence, it could be an important way to inform contextually appropriate policies (Sampson et al. 2013). The benefit of contextual studies like Klinger et al. (2015) is thus to draw attention to organizational and environmental differences in the potential causal mechanisms or their policy applications for reducing shootings.

Few other recent studies yield such insights into the causal power of contextual differences. Rather than explaining differences in fatal police shootings across or within organizations, most post-Ferguson criminology focuses on differences in police likelihood of shooting across suspects and officers. In the former category are simulation studies showing greater and lesser likelihood of officers (or laboratory subjects) shooting white versus black suspects (see Fridell 2016, James et al. 2016). In the latter category is a cohort-based analysis of almost 2,000 Philadelphia police

officers tested for self-control levels upon hiring, 5% of whom went on to shoot at someone in the first years of their careers (Donner et al. 2017).

The Philadelphia study found significantly, but not substantially, higher levels of likelihood to shoot among officers with less self-control, as measured by a range of noncompliant behavior such as traffic violations. For every additional point on a scale of poor self-control from 1 to 7, there was a 21% increase in the odds of officers shooting their guns (Donner et al. 2017). Yet that finding is less impressive than the huge swing in total police shootings by Philadelphia police that Zimring (2017) reports (but does not relate to the organizational hypothesis of a leadership change): The 62 shootings in the year before Charles Ramsey became police commissioner (in January 2008) were reduced to 42 in his first year and (with fluctuations) down to 23 in 2015, his last year as head of Philadelphia police.

As Zimring (2017, p. 237) suggests, this 63% reduction did not require “significant changes in either police personnel or functions.” Changes in the proportions of shooting-prone officers (Donner et al. 2017) are unlikely to have happened that fast. Yet such a rapid downward trend seems unlikely to have been due to random fluctuation, despite high year-to-year variance in the annual Philadelphia shootings. As a matter of context (Sampson et al. 2013), the continuing effects of change in leadership, such as the appointment of Commissioner Ramsey, are important to consider to understand how to implement any systemic changes in the causal pathways to police shooting practices.

One good model for how to study the administrative regulation of practices affecting deadly force can be found in recent research on non-deadly force. The massive Terrill et al. (2012) study of the regulation of less-than-lethal force examined eight cities, comprising five large cities (over 250,000) and three next-largest cities (150,000–249,999). Although Terrill & Paoline (2016) conclude from examining 3,340 use-of-force incidents in three of the large agencies that more restrictive policies appeared to reduce the use of force, their larger study found many nuances and contextual differences. Their multimethod approach of interviewing officers as well as reviewing citizen complaints and officer reports may also help to study fatal force. Most important, the heterogeneity of outcomes on different criteria serves to remind us that reducing fatal shootings raises questions about other outcomes, such as police officers killed or injured or general crime rates (Sherman 1983).

Perhaps a more direct approach to testing the effects of use-of-force policies is the Bishopp et al. (2015) study of TASER deployment by 275 Dallas, TX, police officers who were already using TASERs. By coding 4,400 officer months, they found that the raw percentage of arrests in which these officers used their TASERs on the suspect dropped from a peak of 20% under a permissive policy to a trough of 4% after a restrictive policy was introduced. By testing the effect on weapon users of restrictions on weapon use, they identified a causal mechanism for that subset of officers. In the context of shootings, the approach could compare new shooting regulations on both officers with and without prior histories of gun use. Yet the problems of eliminating rival hypotheses, such as regression to the mean, were limitations clearly identified by the authors (Bishopp et al. 2015).

Perhaps the greatest gap in post-Ferguson criminology is what might be called preventative imagination. It is one thing to say that policies should be more restrictive. It is quite another to say exactly what should be restricted and how compliance with those restrictions should be achieved. In this arena, the President’s Task Force on 21st Century Policing (2015) summarized the statements and hypotheses of many criminologists and is a rich source of ideas. But most proposals were broad visions for policing in general, not ideas aimed at police shootings in particular. The specific shopping list for less-lethal policing proposed by Zimring (2017) is by far the most focused. His four ways to save lives is a clear starting point: fewer shooting incidents, fewer bullets fired, immediate medical attention, immediate transportation to a trauma center. Yet what would bring

these together is a more integrative theoretical perspective. Just having more rules and threats of punishment may not be enough to reduce deaths.

Missing in Action: Organization Theory and its Levers

Modern police research has long been plagued by an absence of evidence-based theory of police organizational behavior. Understanding how to change police agencies can only come from studying when they do or don't change, and the many factors affecting such changes. Sherman's (1978) attempt to discern how systematic police corruption largely disappeared from Oakland (CA) in the 1950s and the NYPD in the 1970s (but not in two other agencies) is a possible starting point. By identifying the internal and external actors in major decision-making, the study pointed to the major levers that leaders could pull to change organizational behavior. Yet most of those levers were connected to threats and punishments—a focus continued by post-Ferguson criminology. The theory of deterrence on which those levers were constructed may have worked for controlling police corruption and even less-than-lethal force. Given the risks officers face of losing their lives (not just illicit income) in relation to deadly force, a broader theory may be needed—especially one that can cause lasting change rather than short-term responses to temporary crackdowns (Sherman 1990). Klinger's (2005) discussion of social theory and the street cop opened the door to such a broader theory for police use of deadly force, using the lateral thinking that has been central to many realms of invention (Johnson 2010). Klinger's initial foray into Perrow's (1984) *Normal Accidents* offered clear tactical demonstrations of Perrow's relevance to situations in which shootings may occur or be averted. The remainder of this review builds on those tactical insights to adapt Perrow's concepts for a broader framework that guides research questions on specific ways to change police systems.

SYSTEM-CRASH PREVENTION AND FATAL POLICE SHOOTINGS

System Catastrophes: Accidents or Crashes?

Perhaps the best theory that criminology can apply to reducing police shootings is not inherently criminological but organizational: one that helps to provide change in operational systems rather than hold more individuals blameworthy. That is exactly the tension identified by Perrow (1984) in observing how a wide range of organizations struggle with rare but catastrophic events, such as nuclear power plant meltdowns, that he describes as the inevitable (or what he calls normal, as in predictable) result of too much complexity in organizational systems. The broader term of art he chose for these events is system accidents, emphasizing complexity rather than individual fault or blame as the root cause of the catastrophes.

Yet in recent years there has been a further tension in even using the word accident to describe car crashes or fatal high-rise fires (Richtel 2016), let alone fatal police shootings. Hence, this review proposes to adapt, modify, and rename the original concept of system accidents as system crashes. This evolution in both content and label is consistent with recent histories of the word accident as one developed by factory owners to avoid blame for injuries to workers caused by unsafe factory systems (Badger 2015). The trend in nomenclature suggests that the term crash is one that is more neutral as to a cause than the term accident, which implies that what happened is an act of God and not preventable by human agency.

So what does it mean to call police shootings system crashes and why does it matter? It matters because it signals a shift from a blame culture to a learning culture (Braithwaite 2005). It means that we can study not only who, if anyone, was at fault but also what processes went wrong and how

we can fix them. To call police shootings system crashes helps to insulate the search for solutions from being consumed entirely by the urge to identify enemies. That insulation may open the door to calm reflection on the problem by all parties concerned.

The word crash also announces a substantive departure from Perrow's (1984) central (and very important) concern with extreme complexity making catastrophes normal, and hence accidental (with no single person to blame). Perrow's (2012) definition of system accidents excluded catastrophes that occurred when everyone did not play safe—such as the Fukushima 2011 nuclear disaster that occurred after management ignored warnings that the facility was vulnerable to earthquakes. That reckless conduct by managers, Perrow (2012) said, meant that the nuclear meltdown in Fukushima was not a normal accident resulting (inevitably) from the inherent complexity of the system. For the purposes of our new framework applying Perrow's concepts, however, the Fukushima meltdown could be considered a preventable, rather than inevitable, systems crash—one from which much can be learned to prevent future disasters.

Our crash prevention framework uses the same concepts Perrow developed to trace forward a category of causal patterns of the specific type of catastrophes he called normal (or system) accidents: events that he defines by the specific causal pathway of system complexity with tight coupling of operating parts of the system. Using the same concepts, we can trace backward not only to crashes caused solely by systemic complexity but to crashes in which complexity is only one of several causes. Perrow's concepts can guide us backward from any fatal police shooting to encompass almost any link in a chain of causation that can be cut to prevent future deaths by that causal chain.

Even when no one person is responsible for unnecessary or even mistaken police shootings, the organization as a whole can be considered culpable and hence in need of reform. That is how, as a matter of law, the UK's Metropolitan Police Commissioner's Office (but not the Commissioner) was found guilty by a jury (BBC 2007) for endangering the safety of the public in shooting Brazilian Jean Charles de Menezes by mistaken identity on an underground train after terrorist attacks on London trains and buses in July 2005. The Commissioner at that time, Ian Blair (2009), later reported that the systemic cause of the mistaken identity had been the unexpected need to combine the work of two different surveillance units, with different rules and procedures. This causal pathway for the fatal shooting was something he was able to help prevent in the future by a system change in procedures.

As Braithwaite (1989, 2005) suggests, it is important to confront individuals and organizations with the harm that their conduct causes. But it is equally important to do it in a way that allows them to express remorse and seek redemption by launching a new course of action. Braithwaite's (2005, p. 283) graphic model is

Confrontation \Rightarrow Truth \Rightarrow Prevention.

But the success of such confrontations depends on the emotional content of the language the confronters employ. Makkai & Braithwaite (1994), for example, show that the language regulators use to confront nursing home administrators with their organizational failures is a strong predictor of whether harm caused to resident patients declines by the next inspection. Any confrontation with a person being held accountable for harm can easily come across as a statement that “you are a bad person” rather than that “we know you are a good person, but your actions are harmful and we must learn together how to stop them” (Collins 2004, Rossner 2013). The bad person narrative only seemed to worsen organizational performance of the nursing homes, whereas the learn-together narrative predicted improvements in performance. That is why it is worth trying to shift national and local dialog on police shootings from blame to learning.

The central point Perrow (1984) made in defining the concept of system accidents is that the urge to blame individuals often obstructs the search for organizational solutions. If a system-crash perspective can help build a consensus that many dimensions of police systems need to be changed to reduce unnecessary deaths (not just but certainly including firing or prosecuting culpable shooting officers), police and their constituencies might start a dialog over the details of which system changes to make. That dialog could begin by describing Perrow's central hypothesis that the interactive complexity of modern systems is the main target for reform. From the 1979 nuclear power plant near-meltdown at Three Mile Island in Pennsylvania to airplane and shipping accidents, Perrow shows how the post-incident reviews rarely identify the true culprit: It is the complexity of the high-risk systems that causes extreme harm. Similarly, fatal police shootings shine the spotlight on the shooter rather than on the complex organizational processes that recruited, hired, trained, supervised, disciplined, assigned, and dispatched the shooter before anyone faced a split-second decision to shoot.

Deviance, System Complexity, Organizational Change

Perrow (2012) defines system, or normal, accidents as events that happen while “everyone tries very hard to play safe, but unexpected interaction of two or more failures (because of interactive complexity) causes a cascade of failures (because of tight coupling). These failures may often be harmless, alone or even in combination. But they can become catastrophic if they occur in a context that cannot be isolated from other ongoing processes.” Perrow labels that context as tight coupling, a system in a state of little slack created by production pressures to keep the system running constantly at top speed.

Such pressures are certainly familiar to police. Recall the Coroner of Victoria complaining about undue police haste as a cause of needless shootings (Saligari & Evans 2015). The question of whether police organizations that tolerate such haste are deviant may be central to achieving organizational change. Just as Klinger (2005) cites the Challenger shuttle-launch disaster (Vaughan 1997) as caused by a deviant organizational decision to take an unacceptable risk, the tight coupling of police to rapid response times may be labeled as immorally reckless as building a nuclear power plant near a tsunami-prone shoreline (Perrow 2012).

Perrow suggests that any system that is complexly interactive and tightly coupled will inevitably produce some regular occurrence of system accidents, which then makes them normal for that system. Missile launches, for example, engage systems with interactive complexity and tight coupling. The long-term rate of missile launch failures is 5% or greater (Masunaga 2016). Yet Perrow focuses on system accidents with much lower frequency rates and even more catastrophic consequences.

One key example of interactive complexity Perrow (1984) offers is a 1981 airway accident at Orange County Airport in California. At 1,500 takeoffs and landings per day, it was the fourth busiest airport in the country in 1980; it also mixed private planes with the much faster commercial aircraft. One day while an air traffic controller was juggling three private and three commercial planes, he cleared plane Y for takeoff and plane X for landing. When he noticed the distance between the two planes was too close, he told plane X to abort the landing and Y to abort the takeoff. Both were too slow to comply. Plane X's pilot raised his landing gear but could not pull the plane up, so the pilot decided to land anyway. But he failed to lock the wheels. The wheels of plane X tore off on impact, taking the wings and engines with them. The plane skidded, stopped, and burst into flames. Four people were seriously injured, but all were evacuated before the plane exploded.

The multiple failures of interactive complexity in this airport case were (a) the controller clearing two planes to use the same airspace with much less separation than the recommended

6,000 feet; (b) pilot X acting too slowly to pull up and go around; (c) pilot Y acting too slowly to get off the runway; and (d) pilot X deciding he had to land but not locking the landing gear. The tight coupling was the proximity of six planes all competing for airspace and dependent on a perfect juggling act by the controller. There was no slack in the system that could buy more time or patience for the planes to go elsewhere.

The extensive details of the event documented by the National Transportation Safety Board led it to place most of the blame on pilot X, with some for the controller and pilot Y. But Perrow (1984, p. 151–52) concluded that

There is blame enough for everybody, suggesting that the system is at fault. . . . We could also fault the Orange County supervisors. . . . They allowed an airport of this small size to be used to handle all of the private planes of their wealthy county residents and also to provide commercial flights. . . . Most importantly, we can fault a complexly interactive and quite tightly coupled system that attempts to work at the maximum limits of safety.

The good news in Perrow's analysis is that some kinds of systems (like air travel) begin with high rates of accidents, but accident rates are lowered by redesigning the systems to reduce their interactive complexity. Airway safety is a particular success story, in which "experience, better designs, equipment, and procedures appeared. . . .the unsuspected interactions were avoided and the tight coupling reduced" (Perrow 1984, p. 5). The bad news is that for some other kinds of systems, attempts to fix these problems either fail or make things worse. Perrow (1984) defines those systems as having organizational structures that have major contradictions, using technological solutions that only increase interactive complexity and tighten the coupling.

Which type of system is policing? Reformers quoted by Kennedy (2017) suggest that policing has failed to build a culture of safety comparable to that found in commercial passenger airlines, from which not one passenger died in a US plane crash in either 2015 or 2016, despite almost 912 million passenger journeys in 2016 (FAA 2017). Yet in the long run, whether policing can become as safe as air travel may depend on how well police innovators can apply Perrow's concepts. What follows is a first attempt to suggest detailed systemic applications of Perrow's framework.

Interactive Complexity

Interactive complexity in policing arises in many kinds of interactions, such as those between police and citizens face to face, among officers dealing with the same citizen, among officers dealing with each other, and between organizational practices and individual officers. Crucially, complexity arises whenever police face citizens who do not comply with police orders (Klinger 2005; Terrill 2003, 2005)—just as when the pilots in California failed to comply with the Air Traffic Controller's orders. There are myriad ways in which people can fail to obey police orders, which makes the next steps of those people unexpected—or at least difficult to predict with certainty. The diverse ways people can defy police authority vary on a continuum of conduct that may appear more or less threatening to the safety of police and bystanders. What also varies, as generations of systematic observation have shown (Sherman 1980a), is the conduct of police officers in response to noncompliance: their discretion to use force, make arrests, call for backup, and let suspects run away to catch them on another day. A graphic model might look like this:

Citizen Noncompliance \Rightarrow Police Response \Rightarrow Citizen Threatens Police \Rightarrow Force?

The two variables of citizen noncompliance and officer discretion are central to the (still untested) idea of de-escalation training, giving police skills in how to calm people down when

they are upset. Using such skills may be a kind of emergency brake against police anger (or fear) escalating in response to citizen anger—a dynamic many observers see in events leading up to police shootings that may have been avoidable.

Theoretically, the idea of de-escalation of interactions between police and citizens may be the wrong target. What may be far more important are interactions among police officers and their formal organizations, especially those that create production pressures that make tight coupling even tighter when police encounter noncompliant individuals. These production pressures take away what Perrow (1984) calls slack in the system and do not allow officers the time to practice any form of de-escalation.

Tight Coupling and Production Pressures

Two kinds of production pressures are familiar to policing, both of which cause tight coupling. One is the pressure to move on: any production pressure to finish the present task to attend to the next task. The other is the pressure to contain risk: to ensure that the present situation is limited to the initial participants and does not spill over to affect more people or escalate to an injury to police themselves. Both forms of pressure create a sense of urgency in police work and work against a strategy of patient de-escalation.

Pressure to move on. The pressure to move on makes police work not unlike landing airplanes on an aircraft carrier: There is usually another plane waiting its turn to land after this landing is finished. Police dealing with any kind of incident are highly conscious of the need to complete their task so that another task can be addressed very soon thereafter. The pressure to keep up production, if only to be available for a new dispatch, can create an organizational contradiction between doing the present task well and getting it over with as soon as possible. Every time police officers arrive at a location where there has been a request for police service, they hear a cry for help ringing in their ears—but not necessarily from the people at the present location. They hear their own counterfactual question of what else should I be doing now that could be more important than this petty job? This nagging worry may feed their impatience with the case at hand. It puts police in a constant state of triaging their time, always wondering whether they should be helping colleagues at another location, or whether their peers will think them lazy if they take too long at any one job. The result is a dominant occupational culture theme of police work best described as urgency: a strong sense of duty to (a) finish each task in order to (b) resume readiness to provide immediate assistance elsewhere to those who need it most, wherever they may be. Whether this is equally true in small and large communities, however, is a central issue of context (Sampson et al. 2013).

Pressure to contain risk. A different kind of time pressure may be unique to police encounters with citizens who appear dangerous. This pressure, as a logical extension of Perrow's concept of tight coupling and production pressures, may be called pressure to contain risk. This time pressure arises from the tight coupling between the behavior of noncompliant people and the potential for that behavior to harm police or others. If police do not terminate the behavior immediately, then that behavior may spill over from its current nonthreatening state to cause actual damage. That is the reason given for the many cases in which police shoot people who brandish knives when they fail to drop the knives immediately on command. Yet that is exactly what Camden Police addressed in the incident described below (Goldstein 2017) when they formed a cordon around a knife-wielding man: their tactic uncoupled the behavior of the man from its potential for hurting bystanders as well as from hurting police. More precisely, police loosened the coupling between

his behavior and its possible impact by imposing themselves as a human shield that bought time for further negotiation.

Unless tight coupling is diagnosed and addressed, it can be just as dangerous in policing as in aircraft landings. When citizens are noncompliant, police may rightly say they do not have all day. Shooting people certainly takes less time than arresting them without injury. Yet given the potentially catastrophic costs of speed, a safer system would make it possible for police to do just that: wait all day, if that is what it takes to avoid a lethal confrontation.

Police officers are also tightly coupled to other officers who are present in any citizen encounter (Klinger 2005). This increases complexity, given their differences of opinions about patience versus urgency. When, for example, a homeless man chased a police officer around Lafayette Park in front of the White House in 1994, he had a knife taped to his hand. The officer called for backup, and five officers formed a semicircle with guns pointed at the man. While he refused orders to drop the knife, he stood still looking at police. Other police cleared bystanders away, and the standoff continued for several minutes. Then a siren was heard as another police car drove up near the scene. A US Park Police officer emerged, ran over to the other officers already dealing with the man and immediately shot the homeless man twice. The man died in hospital (Scull 1994). The shooting police officer was not prosecuted, but most of the other officers present had not deemed it necessary to kill the man. This difference suggests not only production pressures but also a further system problem of excessive decentralization, in which no one is in command at the scene of a life-or-death standoff (Reiss 1980). The paradox Reiss observed is that the lack of hierarchical authority made each officer more tightly coupled to all others because not one but many officers had the power of deciding whether to shoot. Reiss's suggestion to impose hierarchical authority on such situations was perhaps the first example of a system design that could reduce unnecessary shootings.

How Rare and Catastrophic Are Fatal Police Shootings?

One objection Perrow could make to applying his framework to police shootings is that they are neither rare enough nor sufficiently catastrophic. For any single police department, however—especially in small communities—a fatal police shooting is likely to be extremely rare on an annual basis. It is certain to be catastrophic for the persons shot and their families, not to mention the police officers involved. Some readers, however, may challenge the claim that police shootings are rare, so let us consider whether they are rare enough for system-accident theory.

Using the *Washington Post* estimate of just under 1,000 fatal police shootings in the United States per year in 2015, 2016, and 2017, we can estimate a rate in several ways. On a per capita basis, 320 million people have a 1 in 320,000 chance of being fatally shot by police each year. Since most people never have any direct contact with police, however, it seems more relevant to base a shooting rate on the number of police encounters. Arrests may seem more relevant, but there are many cases of people being killed in situations in which there was no probable cause to make an arrest: Amadou Diallo, for example, was shot (by mistake) on his doorstep.

Estimating total encounters from both reactive and proactive contacts is not easy, but one estimate comes from the US Bureau of Justice Statistics. That agency conducts the annual National Criminal Victimization Survey of US residents and supplements the survey every three years with a Police-Public Contacts Survey (PPCS) limited to face-to-face contacts, excluding telephone and other contacts. The 2008 PPCS (Eith & Durose 2011) is the latest detailed report to provide information on the number of contacts each respondent has. Using the percent of respondents who had one versus two or more contacts leading to a mean of 1.7 contacts per person who had a police contact (Eith & Durose 2011, table 7), we can conservatively estimate the number

of contacts by multiplying 1.7 times the 40 million who had any contact at all, which results in 68 million contacts. On that basis, we can estimate the risk of any resident being fatally shot in a police encounter is 1 in 68,000. By contrast to air passenger safety, where 912 million (M) people flew every day without any fatalities in 2015 or 2016 (FAA 2017), encountering a police officer is at least 26,000 times more dangerous than boarding an aircraft. [Assuming even one aviation death in two years (just to avoid a zero in order to do a rough calculation), one death in 912-M flight-trips \times 2 years = 1 in 1,824-M trips/68-M police encounters = 26,000 \times higher odds of death with police encounters than flight-trips].

In terms of the number of police officers, the Presidential Task Force (2015) estimated the number of US police at 1.13 million. Thus, the rate at which police shoot people fatally each year is 1 in 1,130 police officers. Put another way, the average officer would have to work 1,130 years to be expected, on average, to shoot someone fatally. From the standpoint of 18,000 police agencies, the mean would be one fatal shooting every 18 years, with many if not most agencies having never killed anyone in living memory.

So how rare is rare, in terms of Perrow's system-accident theory? It is clear from Perrow (1984) that different systems have different rates of failure, from missile-launching (high) to plane-landing (low). The estimates we have for fatal police shootings are certainly within those ranges.

As for the catastrophic character of a fatal police shooting for a police agency, Zimring's (2017) analysis suggests that big police agencies can shrug these cases off, with one estimate of civil litigation costs at a mean of \$38,750 per case in Los Angeles. Yet many police shootings are likely to generate intense public criticism over who should be blamed. For officers who experience the aftermath of a fatal shooting, the qualitative evidence suggests it is a highly traumatic experience (Van Maanen 1980). Certainly, those who are charged with murder manifest high levels of impact, even if they are acquitted (Furber & Smith 2017). The consequences for public trust in the police agency can also be devastating; Skogan (2006) demonstrates with survey data that one bad event can outweigh many good deeds. Even bad publicity about police conduct in another city may depress crime reporting to police in African-American neighborhoods in cities around the country, with good evidence of that effect seen in Milwaukee (Desmond et al. 2016).

Seen from a broad perspective on police organizations in relation to their environments, fatal police shootings seem appropriate for analysis with a theory of rare organizational catastrophes. But other considerations remain: whether it is ever correct to call them accidents (probably not) and whether they can be better prevented by focusing on failures of complex systems rather than just on individual actions (probably). One illustration of how much difference police system characteristics can make is found in a comparison of two police agencies, each of them dispatching officers to deal with a reportedly armed suspect. In the following comparison, police in Cleveland killed an unarmed boy, suffering international notoriety and criticism. Police in Camden, however, averted killing a man with a knife. One of these police agencies, Camden, had adopted a well-developed system-crash prevention strategy. The other, Cleveland, had not.

A TALE OF TWO POLICING SYSTEMS: CLEVELAND VERSUS CAMDEN

The key concepts of Perrow's system-accident framework can be illustrated in the contrast between two incidents. One is the tragic killing of Tamir Rice, a 12-year-old boy in Cleveland, OH. The other is an averted shooting of a man with a knife in Camden NJ, whose life was saved by the construction of a system that reduced the hurry-up production pressures on front-line police officers.

Cleveland

On November 22, 2014, a 12-year-old African-American boy playing with a toy gun in a local park named Tamir Rice was shot to death in Cleveland by a 26-year-old white police officer named Timothy Loehmann. At the time of the shooting, Loehmann's only information was that a male black had been sitting on a swing and pointing a pistol at people in a city park. A CCTV video shows a police car driving quickly right up to Rice (within two feet), Loehmann jumping out and shooting Rice once in the torso, then running around to the back of the police car as if to take cover.

The shooting may not have happened had any one of the following facts not been true:

1. The caller who notified police told the police call-taker that Rice's pistol was "probably fake," but the dispatcher did not tell the police officers assigned to respond to the scene.
2. The caller told the dispatcher the male with the gun was "probably a juvenile," but the dispatcher did not tell the police of that statement; Rice was wearing a thick parka coat and weighed 195 pounds, so may have appeared to be an adult.
3. The police officer who shot Rice had been asked to resign from the first police agency he had worked for, only a month out of the police academy; the Independence Ohio (population 7,000) Police Department had deemed Loehmann too emotionally unstable for police work, a fact he did not disclose on the application form for employment in the Cleveland Ohio (population 390,000) Police Department.
4. The Cleveland Police did not contact the Independence Police to obtain details about Loehmann's previous performance.
5. The pellet gun Rice was holding was manufactured with an orange marker to indicate that it was not a real gun; the orange marker was missing at the time Rice was holding it.
6. Neither police officer administered first aid to Rice after he was shot.
7. The officers did not drive Rice to a hospital.

Both the dispatcher and Officer Loehmann were fired from their jobs: the dispatcher for not relaying crucial information to the officers, and Loehmann for not fully disclosing the reason he had left the Independence Police Department. No one was prosecuted.

As the county prosecutor described this case, it was a perfect storm of "human error, mistakes and communications by all involved that day" (Fantz et al. 2015). In other words, it was a system crash.

Camden

The multiple system factors connected to the killing of Tamir Rice can be contrasted with the multiple factors that restrained Camden, NJ, police from killing an unidentified man in late 2015, when Camden police responded to a report of a man with a knife in a restaurant (Goldstein 2017). More than 15 officers did exactly what Chief J. Scott Thomson had trained them to do under what the *New York Times* called his "Hippocratic ethos of policing: minimize harm, and try to save lives" (Goldstein 2017):

Officers are trained to hold their fire when possible, especially when confronting people wielding knives and showing signs of mental illness, and to engage them in conversation when commands of "drop the knife" don't work. This sometimes requires backing up to a safer distance or relying on patience rather than anything on an officer's gun belt.

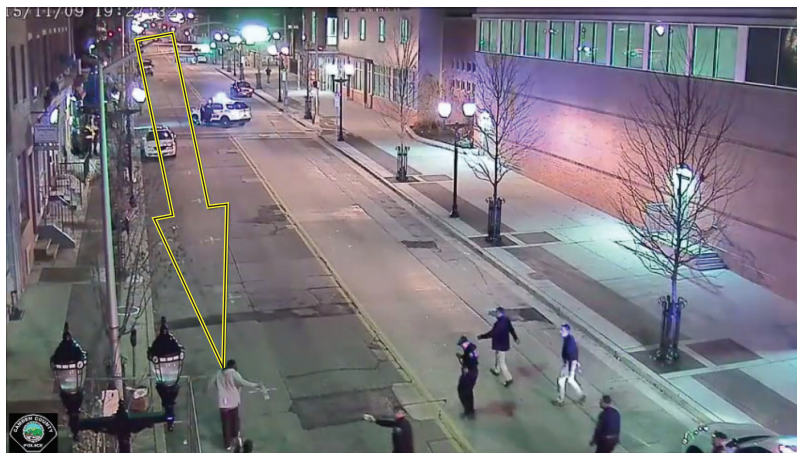


Figure 4

Camden police cordon off a man with a knife for more than seven minutes before they use a TASER electric stun gun on him to disarm and arrest him without injury (2015). Source: <https://www.youtube.com/watch?v=YtVUMT9P8iw&feature=youtu.be>.

In the Camden restaurant incident, the *New York Times* reported that

A 48-year-old man walked into a Crown Fried Chicken, behaved menacingly toward customers and employees, brandished a steak knife and left. Outside, officers ordered him to drop the knife, according to video from police body cameras. But the man began walking away, slashing the knife through the air as he went.

For several minutes, the officers formed a cordon around the man and walked with him for a few blocks, trying to clear traffic ahead and periodically instructing him to drop the knife. The crisis ended when the man did just that. (Goldstein 2017).

The stunning video the *Times* described shows a more complex story (Camden Cty. Police 2015): For at least seven minutes, up to 15 police officers and two police cars created a ring around the man while he continued to slash the air with his knife and walk at a rapid pace (see **Figure 4**). At least one officer had a TASER but could not use it because the man with the knife was walking too fast for the stun gun's electrified darts to penetrate his clothing. The police officers continued to walk with the man for up to six minutes until the officer with the TASER could get close enough to fire the nonlethal darts, which knocked the man to the ground. He was immediately handcuffed and apparently uninjured.

The *Times* also reported that

Had the episode taken place a year before, “we would more than likely have deployed deadly force and moved on,” Chief Thomson said. The chief said he had stressed to his officers that the department “does not treat repositioning as retreating,” and that backing up to put a car between a suspect and an officer “is not an act of cowardice” (Goldstein 2017).

Note that this case does not require the reengineering of an entire police agency. All it required was a focus on patience. What Camden did can arguably be attempted in any police agency of

any size in the United States, until research falsifies that hypothesis. It should work anywhere because, theoretically, the tactic illustrates the linkage between dealing with a knife-wielding man and everything else that is going on in Camden at the same time. The clear directive to give priority to containing this risk without deadly force made that connection for the officers, so they did not have to do it by themselves. As Sampson et al. (2013, p. 610) observed,

A key strength of our recommended approach is that to understand whether a particular causal effect is identified, *we do not need to estimate the whole system*. What we do need to do is to draw on theory to gain an understanding of how parts of the system are stitched together.

Chief Scott stitched the parts together.

A RESEARCH AGENDA FOR PREVENTING POLICE SHOOTINGS

Any research agenda for saving lives must start with the question of whether police systems were even designed to save the lives of people who police shoot. The evidence suggests the systems were not so designed. Unlike commercial airline passengers, whose safety has been steadily increased by better systems designs, people who are noncompliant with police authority have not generally been seen as customers to be protected—at least in the prevailing view of police and many elected officials. Although some police leaders as far back as August Vollmer in 1913 have proclaimed the need to protect defiant citizens from collateral damage by policing (Oliver 2017, Sherman 2017), the cultural battle to treat lawbreakers as Vollmer wished is still in progress. Policing so that all lives actually matter therefore requires that police, scholars, and the public go back to the drawing board to design a system specifically aimed at placing preservation of life on an equal (and often higher) level with swift enforcement of the law.

As Zimring (2017) points out, the number of people who die from police shootings is proximately determined by at least four successive decision points, all occurring closely in time:

1. Whether police will shoot at all.
2. When to stop shooting (and after how many bullets shot).
3. What medical care police themselves will render immediately to all persons they shoot.
4. Whether police cars will immediately transport to a hospital persons shot by police rather than waiting for an ambulance or emergency medical technician to arrive.

The fact that most of the 18,000 US police agencies appear to have no clear policies on decision points 2, 3, and 4 speaks volumes about the lack of design for the organizational behavior affecting the fatality rate outcomes of police shootings. At minimum, it suggests that system designs for saving lives are incomplete. Most shootings do not result in death (Meyer 1980). The fastest way to reduce fatal shootings may be to increase life-saving first aid after each shooting occurs.

The evidence is clearest in relation to missing policies on first aid for the people police shoot. Many lives can be saved by applying battlefield-grade hemostatic bandages to people who have just been shot (Rhee et al. 2008), but officers cannot be expected to apply those bandages if the department does not issue them along with police weapons. Officers can save lives of severely injured gunshot-wound victims if they place wounded persons in their police cars for immediate transport to the hospital (Band et al. 2014), but they may be barred from doing so unless they have been trained and authorized by a local system designed to save lives.

Officers are also unlikely to know how to decide when enough bullets have been fired unless they are trained to make that decision on clear principles. Blaming individual officers for failing to make the right split-second decisions on such policies would clearly be wrong. Yet many deaths might

never occur if police organizations had better policies on all four decision points Zimring raises. Those policies, in turn, must be designed not in isolation from other dimensions of a policing system but rather in full light of the coupling and interactions with all relevant dimensions—from training and supervision to dispatchers and health-care systems.

A research agenda informed by system-accident theory might well distinguish between innovations that (a) adjust core functions of policing to reduce the risk of lethal confrontations occurring at any time and innovations that (b) add new features designed specifically to save lives when lethal confrontations occur, such as medical care or cease-fire protocols.

Redesigning Core Functions to Generate Fewer Confrontations

Starting with the core-functions issues, criminologists could address the following questions:

1. Can production pressures on police to act quickly be reduced to slow down decision-making in every citizen encounter—thus leaving time to avoid split-second decisions (Fyfe 1986)?

This question could be addressed in many ways, including attempting to replicate the Camden system in a series of Level 2 impact evaluations (Sherman 1997) comparable to those used by Fyfe (1978), Sherman (1983), Geller & Scott (1992), and White (2001).

2. What do many officers or police chiefs do to avoid shooting people despite legally sufficient provocation and justification (averted shootings), and how can we find links to other parts of the system that may inhibit their success?

This question could be addressed by reviewing police arrest reports to identify officers who were directly threatened but did not shoot, along the lines of research by C. Winship (pers. commun.).

3. Do police records show some police officers to be predictably more at risk than others to shoot illegally or unnecessarily, such that evidence-based decisions could be made to remove them from street encounters with civilians?

No prediction studies appear to have been done based on the prior performance histories of police officers using the methods pioneered by Berk et al. (2009). Such studies can be done easily in large police agencies with modern information technology, but it is more difficult in smaller agencies absent a statewide database. Related research could look at the prevalence of shooting by officers who have been dismissed from other police agencies, a key issue in whether a license to practice policing (as is required in Florida) could reduce shootings by banning officers who lose their license from re-employment as police officers.

4. Do certain kinds of training raise the risk of avoidable shootings so that such training can be discontinued in favor of other training tools that save more lives?

This question can be addressed with natural experiments comparing trainee cohorts receiving different kinds of police training. The shooting behavior of officers trained by an explicitly designed and new life-saving-for-all training program, for example, could be compared to that of police officers trained by previous programs.

5. Can on-the-scene protocols safely divert authority to shoot civilians from officers to supervisors (as in high-speed chases)?

One feature of system-accident theory is an extensive review of centralization versus decentralization of authority relevant to crises (Perrow 1984). In a world in which supervisors could not monitor police actions from afar, it was very difficult to insert supervisors into situations as soon as police pull out their guns. Yet technology has progressed rapidly since 1984, and now such insertion is possible. As more police go to work each day wearing body-worn video cameras, it is becoming

possible to consider electronic on-site supervision from afar that can be switched on in a few seconds. Even without such technology, there is a long precedent in control-room supervision by radio for another high-risk-of-system-crash scenario: the high-speed chase. As Reiss (1980) suggested long before body cameras, there is every reason to include the concept of centralized decision-making as a tool for trying to increase the avoidability of shoot/don't shoot confrontations.

6. Can organizational incentives offered to encourage delay and de-escalation (bring-them-back-alive medals) help to reduce avoidable shootings?

A comprehensive documentary by Am. Public Media (2017) reports that medals for “de-escalation are now given to Los Angeles and Philadelphia Police.” A national study of shooting rates before and after these medals are introduced (or discontinued) could shed some light on the possible causal mechanisms they may create.

Designing Innovations to Reduce Deaths when Confrontations Occur

Once police engage in a lethal confrontation, Zimring's decision points show that there are still many opportunities to save lives. Criminologists could therefore work with police agencies to answer such questions as these:

1. Can cease-fire protocols limit the number of bullets fired by police under clear circumstances?

This recommendation from Zimring (2017) may be the most difficult to develop. At minimum, it would likely require a committee of field and training officers to agree on certain principles regarding cease-fire protocols.

2. How many lives can be saved by police applying hemostatic bandages to civilians immediately after a shooting by police?

A Cambridge University study in Trinidad is in progress on this question. The major result so far is that officers do not want to apply bandages to people they shoot. The research may need to start with a discussion about what it will take to implement this policy.

3. How many lives can be saved by requiring police to drive wounded civilians in police cars to hospitals as soon as they have received first aid?

The evidence from Philadelphia (Band et al. 2014), which launched this policy in the 1990s, is that among 4,121 trauma patients with 27% mortality rate, gunshot-wound victims transported immediately to the hospital by police had a 30% lower mortality rate than those whose transportation was by ambulance with emergency medical services staff. This suggestive finding could be tested in a controlled experiment among a randomly selected group of patrol officers in high-gunshot areas, comparing mortality rates to patients who did not encounter the experimental group officers.

4. Should every accidental or intentional gunshot wound caused by a police officer be subject to a peer review process located outside of the shooter's organizational unit?

Of all the systemic reforms for reducing fatal police shootings, an expert peer review of every shooting is the idea closest to the strategy used for increasing airline safety (Kennedy 2017): the National Transportation Safety Board. There is also good evidence from New York that it can work, at least if it is implemented in a large organizational context. Fyfe (1978) offered a detailed implementation analysis of the new Firearms Discharge Review Board (FDRB) in New York, which required police officers who fire their guns to meet in person with a committee of senior officers to discuss each decision to shoot. The FDRB created a new learning process for the entire

department, focused on training officers, changing training systems, adapting general policies, improving supervision, and increasing a deterrent threat of dismissal for violating restrictive rules on police using firearms. Because the context of creating an FDRB would be vastly different in a police agency of 30 officers than in the 30,000 or more of the NYPD, this strategy could be tested at a statewide level in states that have many small police agencies.

5. Can police leaders build more community trust after shootings by various statements of regret or efforts at reconciliation?

One possible research project would be to recruit police chiefs to invite families of shooting victims to meet privately with them—but not with the shooting officers—in face-to-face restorative justice conferences (RJCs). The chiefs would accept responsibility for the police agency having caused harm and talk with the families about how they might try to prevent or minimize harm in future. James Bueermann (pers. commun.) notes that his own attempts to do this as a California Chief of Police encountered objections from the Redlands city attorney because the conversations could increase the risk of legal liability of police agencies to pay civil damages to survivors of shootings. A model for facilitating such dialogue, independent of civil litigation concerns, can be found in the medical malpractice laws of some states. Those statutes encourage doctors to apologize to survivors of people who died during medical operations (including those with mistakes) by excluding any such conversations from being used as evidence in lawsuits against doctors or hospitals. The same may be possible with police shootings—another possible benefit of discussing them as system crashes.³

CONCLUSION

This review offers two frameworks for future research but with unequal coverage: system-crash prevention (adapted from Perrow 1984) and contextual policy development (Sampson et al. 2013). The system-crash prevention framework (adapted from Perrow 1984, 2012) is presented in greater depth because it changes the nature of the discussion about developing police systems to save lives. Yet the contextual policy development framework (Sampson et al. 2013) is equally important because it must be deployed to include the small communities where most fatal shootings occur.

From all the research discussed in this review, the most surprising and important conclusion is that the places where police kill the most people have been subjects of the least research. Although the icon of the Second Great Awakening remains Ferguson, MO (2010 population, 21,000 people), research efficiencies still attract criminologists (including the author) to the biggest cities. The death of Michael Brown set off a North Atlantic effort to count every fatal police shooting reported online, which revealed that small is dangerous and much more dangerous per police encounter than the big cities. That conclusion, drawn from the new data, appears not to be intuitively plausible to scholars and media alike. Yet there is no doubt that state-level reform of police organizations, including communities both small and large, is the most rational target for research, based on both mortality and political science.

The central obstacle to research and development for the majority of fatal police shootings is a key state-level policy: the vast decentralization of US police agencies. Any attempt to reduce

³The idea of RJCs about fatal police shootings has a relevant precedent in Montgomery, AL, where police failed to protect a Freedom Rider civil rights group from beatings by a white mob in 1961. Five decades later, Montgomery Police Department Chief Kevin Murphy took an opportunity to apologize for this harm on behalf of his police agency (Giammona 2013). The apology was something Chief Murphy had planned to do since his first days as a Montgomery police officer decades after the mob attack. The apology was delivered on camera (YouTube 2013) to Congressman John Lewis of Atlanta, who had marched with the Rev. Dr. Martin Luther King in Montgomery.

fatal police shootings would be better targeted on the agencies in smaller communities, where the majority of all fatal shootings occur and where the rates of shootings are highest. Any attempt to introduce innovations in those communities will likely require the support of state legislatures and the police training boards that most states have created (IADLEST 2017).

Foremost among the ideas that could be developed is interagency cooperation within states, i.e., ways in which smaller agencies can share in specialist expertise for life-saving tactics and strategies—with or without cooperation from state police or even nearby cities over 100,000. These strategies could include first-aid and psychological training for police in treating gunshot wounds they have effected themselves, protocols for equipping police cars to transport shot persons to hospitals, and in hostage negotiations or siege situations—all of them introduced with careful impact evaluation research. In the small cities, towns, and villages around Cambridge, England, for example, a joint team of firearms specialists from three police agencies (Bedfordshire, Cambridgeshire, and Hertfordshire) responds quickly to every siege situation, using specialist skills for which they train together many days a year (Davies 2017). Unlike a weapons-focused team, the UK approach is focused on contact avoidance with armed suspects, much like the approach of Camden Police Department (Davies 2017). The same specialist firearms skills are used across the 43 police forces in England, with all qualified officers undergoing the same specialist training and receiving an annual certification as to a high level of skill. The National Police Chiefs' Council of England and Wales make every effort to promote what they call interoperability of police in different forces performing the same tasks with the same protocols. For some US states, and some US police agencies, this might be a feasible approach to support with state legislation and funding.

Yet there is no question that some states in the United States would be far more receptive to this approach than others. This lesson of the contextual differences framework (Sampson et al. 2013) is that what works in some contexts, e.g., communities, states, kinds of people, or organizations, may not work in others. Rather than seeking a single solution to a manifestly complex issue, the next generation of criminology for fatal shootings might have better success with a wide variety of solutions for a variety of contexts.

The similarities of big cities have long attracted criminologists to the common causes of crime and justice problems in those cities. Yet the concentration of fatal police shootings in smaller communities requires criminologists to pay more attention to small cities and towns. Foundations and federal funders should recognize the challenge this poses and provide extra incentives for research and development aimed at contextual diversity rather than highly generalizable policies.

This approach, although difficult, is consistent with a great tradition in American criminology: its long history of studying life and death. From Sellin's early studies of the death penalty to the outpouring of modern homicide studies, mortality is rightly a major concern for criminologists. Yet even since Ferguson and the advent of crowd-sourced death counts, these extra-judicial police shootings (Zimring 2017) have not been central to criminology. As this review shows, there is no reason to keep fatal police shootings on the periphery of criminology, let alone to keep criminology peripheral to police shooting issues. The need for this issue to be addressed by a new generation of police scholars has never been greater. There is much work to do, in both theory and research, on reducing the collateral deaths from the state's monopoly on the legitimate use of force. Perhaps future volumes of the *Annual Review of Criminology* will be able to record the progress of that work.

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The author does not presently have any affiliations, memberships, or financial holdings that might be perceived as affecting the objectivity of this review. From 1977 through 2012, the author occasionally and intermittently served as a paid and unpaid advisor to attorneys on all sides of

court cases concerning misuse of deadly force, including those prosecuting police officers, litigating claims against police agencies, and defending police officers or agencies, but decided in 2012 to permanently end his offering of paid advice.

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