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Youth Violence: What We Know and What We Need to Know

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School shootings tear the fabric of society. In the wake of a school shooting, parents, pediatricians, policymakers, politicians, and the public search for "the" cause of the shooting. But there is no single cause. The causes of school shootings are extremely complex. After the Sandy Hook Elementary School rampage shooting in Newtown, Connecticut, we wrote a report for the National Science Foundation on what is known and not known about youth violence. This article summarizes and updates that report. After distinguishing violent behavior from aggressive behavior, we describe the prevalence of gun violence in the United States and age-related risks for violence. We delineate important differences between violence in the context of rare rampage school shootings, and much more common urban street violence. Acts of violence are influenced by multiple factors, often acting together. We summarize evidence on some major risk factors and protective factors for youth violence, highlighting individual and contextual factors, which often interact. We consider new quantitative "data mining" procedures that can be used to predict youth violence perpetrated by groups and individuals, recognizing critical issues of privacy and ethical concerns that arise in the prediction of violence. We also discuss implications of the current evidence for reducing youth violence, and we offer suggestions for future research. We conclude by arguing that the prevention of youth violence should be a national priority.

Keywords: aggression, violence, rampage shooting, school shooting, street shooting

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> We cannot tolerate this anymore. These tragedies must end. And to end them, we must change. We will be told that the causes of such violence are complex, and that is true. No single law—no set of laws can eliminate evil from the world, or prevent every senseless act of violence in our society. But that cannot be an excuse for inaction. Surely, we can do better than this. If there is even one step we can take to save another child, or another parent, or another town . . . then surely we have an obligation to try.
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> —President Barack Obama, Interfaith Prayer Vigil, Newtown High School, Newtown, Connecticut, December 16, 2012

President Obama made these remarks 2 days following the Newtown, Connecticut, shooting, in which a 20-year-old man first killed his mother and then went to a nearby elementary school in Newtown and killed 20 children and six staff members before killing himself. In the wake of the Newtown shooting, the National Science Foundation (NSF), at the request of Representative Frank Wolf (Republican-Virginia), assembled an advisory committee to the NSF Social, Behavioral, and Economic Sciences Division to summarize key evidence on youth violence, focusing particularly on school rampage shootings, but also on other forms of youth violence. The first two authors of this article assembled a team of experts to write an advisory report on what we know and what we need to know about youth violence. The 12 authors of this article met and completed that report early in 2013 (Bushman et al., 2013). This article is based on our conclusions, augmented by additional evidence. We also discuss the implications of the findings on youth violence for prevention, public policy, and future research.

Defining Violence

In contrast to aggression, usually defined as any behavior intended to harm another person who does not want to be harmed, violence is usually defined as aggression with the goal of extreme physical harm, such as injury or death (Bushman & Huesmann, 2010). For example, one youth spreading rumors about a peer is an act of aggression but is not an act of violence. One youth hitting, kicking, shooting, or stabbing a peer is an act of violence. Thus, all violent acts are aggressive, but not all aggressive acts are violent—only those designed to cause extreme physical harm are violent.

Why Focus on Youth Violence?

Youth violence includes violent acts committed by young people who are not viewed as fully mature. "Youth" often includes young people who are legally adults. For example, the 2014 report by the Center for Disease Control and Prevention (CDC, 2014) titled "Preventing Youth Violence: Opportunities for Action" includes data on 10- to 24-year-olds (David-Ferdon & Simon, 2014). We use the same age range for this article, but concentrate on 15- to 24-year-olds.

Incidents of violence increase in frequency during adolescence and early adulthood for a subset of individuals, and then rapidly and continuously decrease throughout life (Loeber & Farrington, 2012). A disproportionate amount of violent crime in the United States is committed by 15- to 24-year-olds (Federal Bureau of Investigation, 2013). More U.S. youth die from homicide each year than from cancer, heart disease, birth defects, flu and pneumonia, respiratory diseases, stroke, and diabetes combined (David-Ferdon & Simon, 2014).

U.S. youth perpetrate and experience very high rates of violence compared to youth from many other developed nations (David-Ferdon & Simon, 2014). For example, youth homicide rates are 3 to 40 times higher than rates in similarly high-income countries (David-Ferdon & Simon, 2014, p. 8). Youth violence disproportionately affects males and youth from ethnic/racial minority groups, although rates vary for different kinds of violence.

Two Distinct Types of Youth Gun Violence

Violent rampage shootings in schools differ in dramatic ways from street shootings (or "street violence") commonly associated with U.S. inner cities. Table 1 summarizes major descriptive differences between these two types of youth violence, which will be discussed further.

School Rampage Shootings

The Newtown school tragedy joined a small but growing list of rampage shootings committed by youth in schools, but also in other public places (e.g., movie theaters, shopping malls, supermarkets). The scale of the loss when these events happen is so devastating and apparently random that the public and the nation's legislators are seeking answers to questions about causes and potential prevention measures. Yet because these events are rare, most of the evidence on the features of rampage shooters is based on intensive case history studies as well as analyses of databases such as the School-Associated Violent Deaths maintained by the CDC (2014) on school-related homicides. This review relies primarily upon an in-depth study of all school shootings from 1974 through 2001 (Newman, Fox, Harding, Mehta, & Roth, 2004), and a review of research on school shootings through 2011 (Rocque, 2012).

Newman and her colleagues (2004) interviewed 163 people in two sites that experienced extensive injury and deaths in school mass shootings: Heath, Kentucky, and Westside, Arkansas. The team also analyzed all newspaper accounts of every rampage school shooting in the United States from 1974 to 2002, which amounted to 25 incidents involving 27

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attackers. Based on these materials, they developed a framework for characterizing shooting rampages. They then assessed this framework against the CDC database (CDC, 2014; annual reports of school homicides and suicides that included 12 incidents with 19 attackers from 1994 to 1999), the Secret Service's Safe School Initiative (Vossekuil, Fein, Reddy, Borum, & Modzeleski, 2002; 37 incidents with 41 attackers from 1974 to 2000), case studies from the National Academy of Sciences report *Deadly Lessons: Understanding Lethal School Violence* (Moore, Petrie, Braga, & McLaughlin, 2003; 45 incidents from 1974 to 2001), and the *Columbine Review Commission Report* (Erickson, 2001). We also use a review of additional evidence on the prevalence and nature of school rampage shootings based on 22 incidents with 24 attackers and data extending to the 2008–2009 school year (Rocque, 2012). These cases represented a total of 85 incidents from 1974 to 2008. Based on these sources, some common factors emerge.

School shootings typically occur in stable, close-knit, low-crime, small rural towns or suburbs (92% of the incidents in Newman et al., 2004, study). The school shooter generally is a White adolescent male (85% in the Newman et al., 2004, study and 76% in the Secret Service study, Vossekuil et al., 2002), with little history of disciplinary problems (63% never in trouble in the Secret Service study). Perpetrators often have average or better than average intelligence and academic achievement (41% mostly *A*s and *B*s, only 2% failing in the Secret Service study). School shooters are commonly assumed to be loners, but ethnographic and archival research indicates otherwise (e.g., only 34% were classified as "loners" in the Secret Service study). Usually, school shooters are boys with a history of trying to join peer groups, but find themselves socially marginalized. In their analysis of media reports of school shootings, Newman and her colleagues found that 78% of school shooters were socially marginalized. In the CDC database, 84% of school shooters were described by principals or law enforcement officials as "wannabees," "gothic," "geeks," and so forth. The Secret Service (Vossekuil et al., 2002) found that 27% of the school shooters "socialized with peers who were either disliked by mainstream students or were "considered part of a 'fringe' group" (p. 20).

Individual vulnerabilities that accentuate the difficulties of coping with social marginalization often are evident. Although school shooters often have no documented history of medical treatment for mental disorders, both media accounts and other studies indicate a variety of signs of early stage onset of mental illness, including depression and suicidality (see also Langman, 2009). For example, in the Secret Service study (Vossekuil et al., 2002), 61% of the perpetrators experienced feelings of severe depression and 78% considered or attempted suicide prior to the shooting. It is important to note, however, that millions of adolescents who feel depressed or consider or attempt suicide never become school shooters.

In almost half of the 37 school shooting incidents studied by the Secret Service, "attackers were influenced or encouraged by others" (Vossekuil et al., 2002, p. 64), and police sometimes considered charging these "bystanders" as co-conspirators. But this rarely transpires because the evidence of actual collaboration is weak, and bystanders say they thought the killer was only engaging in "fantasy talk." Newman et al. (2004) were only able to identify one case in which a bystander was charged.

Many high school shooters manifest intense interest in guns prior to the shooting incident. In the Secret Service study (Vossekuil et al., 2002), 63% of the shooters had a known history of weapons use. These youth often get guns from their parents. The percent of guns obtained from home or a relative was 68% in the Secret Service study, 67% in the Newman et al. (2004) study, and 53% in the CDC study. High school shooters growing up in rural small towns had experience with the use of guns because they lived in communities where hunting has been part of local culture (Newman et al., 2004, p. 69). Older rampage shooters, such as college students, typically turn to the Internet, gun shows, and other means of legal acquisition of guns (Newman & Fox, 2009).

Rampage shooters also often kill themselves after killing as many victims as they can (Vossekuil et al., 2002; Everytown for Gun Safety, 2014; Fast, 2008). In a study of recent mass shootings, 43% of perpetrators committed suicide during the incident (Everytown for Gun Safety, 2014). In comparison, less than 0.001% of all homicides also involve suicides (Eliason, 2009). What distinguishes perpetrators of murder-suicide, an extremely rare event, from those who

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commit suicide is suicidal ideation co-occurring with hostile ideation reflecting long-standing resentments toward others (e.g., Vossekuil et al., 2002). This combination likely helps explain why people who commit homicide followed by suicide tend to leave more homicide victims than those who only commit homicide (CDC, 2012). Some of the case studies of rampage shooters suggest that killing multiple victims prior to suicide may be a way of achieving fame and notoriety as their final statement (Newman et al., 2004). Moreover, the intense media coverage surrounding rampage shootings may provide scripts for youth with suicidal-homicidal ideation. Based on an analysis of suicides following reports of suicides in the news, Romer, Jamieson, and Jamieson (2006) concluded that approximately 10% of suicides among individuals aged 15 to 24 years were attributable to press coverage of public acts of suicide. Coverage of murder-suicides may be especially likely to elicit contagion (Stack, 1989).

The evidence we summarize points to the conclusion that a school shooting itself may be a symbolic event directed at the school as an institution rather than specific individuals and is, as one writer described, "theatrical, tragic, and pointless" (Fast, 2008, p. 11). School shooters generally do not personally know anyone who has killed before, and they are not imitating individuals they know, but may be imitating other rampage shooters or media characters.

Street Shootings

The database for street violence comes from decades of social science research. In contrast to school shooters, "street shooters" more commonly live in densely populated areas with high crime levels, low social trust levels, and poverty rates reaching beyond 40% (Harding, 2010; Sampson, 2012). In one study, for example, a Boston, Massachusetts, neighborhood with these characteristics accounted for 10% of the city's homicides over a 2-year period, even though it only contained 2% of the city's population (Harding, 2010, p. 28).

Although structural factors are important for predicting the incidence of urban street shootings, researchers note that even in the most violent of neighborhoods, a small minority of youth commit the vast majority of violent acts (Harding, 2010; Jones, 2010). These youth often have inordinately strong loyalties to their neighborhood "turfs," and are engaged in contests of will with known antagonists. Street shootings are rarely random acts of violence, but instead aim to hurt or kill individuals they know, often because they perceive themselves or their group to be in danger and in need of protection (Fagan & Wilkinson, 1998; Rios, 2011).

Another difference between school shooters and street shooters is where they obtain weapons. Data from a nationally representative sample of people in state prison indicate that individuals incarcerated for crimes committed when they were younger than 18 years old most commonly obtain them from "street or black market" sources (47%) or receive them from a friend or family members (38%). Because transferring a handgun to a juvenile is illegal in almost all contexts, and only 13% of youth reported theft as their means of gun acquisition, the vast majority of street shooters are armed via illegal transactions (Webster, Freed, Frattaroli, & Wilson, 2002; Webster, Meyers, & Buggs, 2014). In addition, street shooters rarely commit suicide after shooting others (Harding, 2010).

Risk and Protective Factors for Youth Violence

When youth use guns to kill others, it is only natural for citizens and policymakers to seek to identify "the" cause. However, as President Obama noted, violent behavior is very complex. Evidence, as well as theories about the causes of youth violence, implicate multiple influences occurring in complex combinations over differing time scales (from distal to immediate) that lead to acts of violence (e.g., David-Ferdon & Simon, 2014). Notwithstanding this complexity, there is considerable interest in identifying key risk and protective factors for youth violence, and particularly those influences that may be malleable.

Following the Newtown shooting, Congress and the media focused on three risk factors for school shootings: (a) access to guns, (b) exposure to violent media, and (c) mental health. However, these are only three of a host of possible risk factors for youth violence. The Report of the Office of the Child Advocate for the State of Connecticut (2014) of the Sandy Hook shooting also focused on mental health and access to guns, but additionally underscored numerous other

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risks, misunderstandings, and inadequate supports in the life of the shooter leading up to the Sandy Hook killings. The 2014 CDC youth violence report also summarized numerous risk and protective factors, noting that there has been more attention to risk than protective influences, although both are important in determining violent behavior (David-Ferdon & Simon, 2014).

In this article, we consider multiple risk and protective factors implicated by the literature on youth violence, drawing on those that appear early in development (e.g., family abuse and neglect) and those that are more relevant during adolescence (e.g., access to guns). Our list is certainly not exhaustive. We assume that whether a violent act occurs results from interactions among many individual and contextual factors. Although many characteristics associated with youth violence apply to both school and street shooters, some may not. We note wherever possible how individual and contextual risk factors may differ for school and street shooters.

Longitudinal studies of youth development have identified an early and stable trajectory of youth antisocial behavior, including tendencies toward the use of violence. These studies indicate that characteristics of the parents, their child, and the social environment play a substantial role in the development and course of this trajectory (e.g., Moffitt et al., 2011; Odgers et al., 2008; Zheng & Cleveland, 2013). It is also noteworthy that this stable trajectory typically includes less than 15% of youth, and that even within this group violence is not a universal behavior. Indeed, most youth do not engage in antisocial or more extreme violent behaviors. A second frequently observed antisocial trajectory arises later in adolescence, but tends to be less prone to violence (e.g., Odgers et al., 2008).

Family Influences

Families appear to play multiple roles that may increase or decrease the risk of youth violence. Many of the best-established risk factors for youth violence are based in the family, including harsh and rejecting parents, interparental violence, child abuse and neglect, chaotic family life, inconsistent discipline, and poor monitoring by parents of children showing early signs of aggression (Dodge, Greenberg, & Malone, 2008; Loeber & Farrington, 1998, 2012; Lösel & Farrington, 2012; Stoddard et al., 2013). Risk factors for youth violence often co-occur and also predict multiple negative outcomes in addition to violence, including related antisocial behaviors, substance abuse, mental health problems, and health-risk behaviors. Evidence on factors associated with *lower* risk for youth violence often implicate similar factors, including close attachment bonds with consistently supportive caregivers, effective and developmentally sensitive parenting (including consistent disciplinary practices and monitoring), and families operating in ways that children experience as safe, stable, well-managed, and well-regulated (e.g., David-Ferdon & Simon, 2014; Loeber & Farrington, 1998, 2012).

Neurobiological Factors

Neurobiological risk factors have long been implicated in youth violence. These include neurocognitive deficits, perinatal complications, genetic risks, and psychophysiological differences (e.g., low resting heart rate), among others (Glenn & Raine, 2014). There is now a greater understanding about how chronic and traumatic stress resulting from adverse childhood experiences (e.g., family violence and conflict, child physical abuse and neglect, sexual abuse, traumatic separation from caretakers) can shape the development and functioning of the hypothalamic-pituitary-adrenocortical axis in ways that compromise adaptive responses to stress (Lupien, McEwen, Gunnar, & Heim, 2009). Research using animal models is shedding light on how the development of the hypothalamic-pituitary-adrenocortical axis is associated with aggression and impulsiveness in humans (Veenema, 2009). There is also emerging evidence of gene-environment interaction effects in humans that alter the developing brain in ways that moderate the risk of antisocial outcomes, including violence (Caspi et al., 2002; Dodge, 2009).

Academic Achievement

Data from multiple longitudinal studies suggest that school readiness and academic achievement during the school years, along with school engagement, predict *lower*

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rates of urban youth violence (e.g., Herrenkohl, Lee, & Hawkins, 2012; Resnick, Ireland, & Borowsky, 2004). For example, in the National Longitudinal Study of Adolescent Health (Resnick et al., 2004), boys with a grade point average (GPA) in the top quartile (high GPA) at Time 1 (students in Grades 7 to 11) had a 26.6% probability (15.2% for girls) of reporting any Time 2 violent behavior (about 11 months later) compared to 43.9% of the boys (27.9% of the girls) in the bottom quartile (low GPA). Among boys in this study with multiple risk factors for violence, those with higher GPAs had a predicted probability of 52.6% (38.8% for girls) for falling in the top quintile of violent behavior compared to a probability of 70.5% (60.8% for girls) for those with lower GPAs. Such findings may reflect a variety of cognitive and emotional self-control skills associated with school readiness and success, as well as the effectiveness of schools in engaging children and preventing dropout (Herrenkohl et al., 2012; Lösel & Farrington, 2012). Poor academic achievement does not appear to be a predictor of rampage shootings. If anything, rampage shooters often have average or better than average academic achievement levels (e.g., Vossekuil et al., 2002).

Personality Traits and Individual Differences

One of the best predictors of future behavior is past behavior. Thus, it is not surprising that individuals who are characteristically aggressive or impulsive with difficulties in self-control are more likely to engage in later acts of aggression, violence, delinquency, and crime (e.g., Loeber & Farrington, 1998). Individual differences in self-control (the inverse of impulsivity) are among the strongest and most consistent observed individual correlates of crime, delinquency, violence, and other problem behaviors (Gottfredson, 2005; Loeber & Farrington, 2012; Moffitt et al., 2011). For example, a study of a large birth cohort of males in New Zealand found that persons convicted of violent crimes scored significantly lower on measures of self-control than did those not convicted of violent crimes (d's ranged from 0.5 to more than 1.0; Caspi et al., 1994). Another study found that low self-control was correlated with both psychological (r = .47) and physical (r = .38) bullying among adolescents (Moon & Alarid, 2015). Violent behavior often is short-sighted, producing little longer-term gain at the risk of considerable long-term cost for the perpetrator. Many acts of violence among urban youth erupt so suddenly that they seem to be nearly spontaneous (even to the offender, in hindsight). In contrast, rampage shootings tend to be planned and deliberate (Cornell et al., 2013; Newman et al., 2004).

Three other personality traits are broadly related to aggression and violence, the so-called Dark Triad of Personality— psychopathy, narcissism, and Machiavellianism (Paulhus & Williams, 2002). Psychopaths show a pervasive disregard for, and violation of, the rights of others. They are callous and unemotional individuals who mainly focus on obtaining their own goals, regardless of whether they hurt others in the process. A meta-analysis indicates that "callous-unemotional" traits that are the antithesis of empathy in youth are associated with more severe antisocial and aggressive behavior (r = .33; Frick, Ray, Thornton, & Kahn, 2014). People high in narcissism have a grandiose sense of who they are and of the recognition and status to which they are entitled. When narcissists do not get the special treatment they think they deserve, they may lash out aggressively against others (e.g., Bushman & Baumeister, 1998). It is a common myth that violent people have low self-esteem (Baumeister, Smart, & Boden, 1996). One meta-analysis found that violent criminals had much higher levels of narcissism than other young men (d = 1.63; Bushman & Baumeister, 2002), but their self-esteem scores did not differ (d = 0.0002; Bushman & Baumeister, 2002). "Machiavellianism" refers to using any means necessary to get power, including manipulation, aggression and violence. Machiavellianism is positively related to bullying in school (e.g., r = .33 in a study by Andreou, 2004). Taken together, these three dispositional qualities embody the lack of empathy, sense of entitlement, and motivation to gain power that appear to facilitate involvement in violence. However, whether they are specific risk factors for either rampage shooting or street violence has yet to be established.

Exposure to Media Violence

Public debate on the link between violent media and youth violence can become especially contentious in the

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wake of a shooting rampage. In many rampage shootings, the perpetrator puts on a uniform (e.g., hockey mask, trench coat, movie costume, military uniform), as if following a media script. The perpetrator then collects several guns and ammunition, goes to a public place, kills as many people as possible, and then often kills himself (or is killed by the police). It is tempting for some to conclude that violent media caused the shooting rampage. However, it is not possible to make causal inferences about the link between exposure to violent media and violent criminal behavior because it is unethical to conduct experimental studies in which research participants can commit violent crimes.

One can, however, draw causal inferences about the link between exposure to media violence and aggression. Hundreds of studies have shown that exposure to media violence is a significant risk factor for aggressive behavior in youth (e.g., for a meta-analytic review, see Bushman & Huesmann, 2006; $d = 0.39$ for aggressive behavior across all studies), and experimental studies indicate that the link is causal. Studies also have shown that parents who set limits on the amount and content of children's media use provide a powerful protective factor against aggression. For example, one 1-year longitudinal study of 430 children 7- to 11-year-old children found that parental involvement in children's media consumption reduced the likelihood of getting into a fight from 44% to 35% (Gentile & Bushman, 2012).

Exposure to media violence is significantly related to violent criminal behavior, although the effects are smaller than for aggressive behavior. One meta-analysis included a violent outcome variable called "criminal violence against a person (e.g., homicide, suicide, stabbing, etc.)" (Paik & Comstock, 1994). Across 58 studies (of all types), there was a significant effect of exposure to TV violence on criminal violence ($d = 0.20$; see also Savage & Yancey, 2008, who found a similar effect of $d = 0.21$). Across 271 studies, there was a significant effect of TV violence exposure on "physical violence against a person (non-illegal behavior)" ($d = 0.47$; Paik & Comstock, 1994). Several longitudinal studies have shown that early repeated exposure to violent media predicts later aggressive and violent behavior, after controlling for early aggressive and violent behavior as well as other predictors, such as intelligence, poverty, and parenting style (e.g., Huesmann, Moise-Titus, Podolski, & Eron, 2003). However, it must be noted that millions of young Americans consume violent media and do not commit violent crimes.

There is a downward spiral between aggression, rejection, and consumption of violent media (Slater, Henry, Swaim, & Anderson, 2003). Specifically, aggressive youth tend to be rejected by nonaggressive peers, and therefore spend more time consuming violent media and associating with other aggressive youth (who have also been rejected by others), which, in turn, is associated with even more aggressive behavior.

According to psychoanalytic theory, exposure to media violence can act as a safety valve by releasing violent impulses into harmless channels through catharsis. However, scientific evidence contradicts the catharsis hypothesis (e.g., Bushman, 2002; Bushman, Baumeister, & Stack, 1999; Geen & Quanty, 1977). Another theory proposes that media violence may reduce violent crime by keeping young men off the street (Dahl & DellaVigna, 2009), but more evidence is needed before firm conclusions can be drawn.

Access to Guns

In the United States in 2011, 84% of homicide victims ages 15–24 were killed with guns (National Center for Injury Prevention and Control, 2011). The frequent involvement of guns in lethal youth violence, and the ability of guns to inflict more lethal wounds than other personal weapons, suggest that gun availability is an important cause of youth homicides. There are methodological challenges to making causal inferences about the positive association between gun availability and homicide risks (National Research Council, 2005); nonetheless, three types of evidence point in the direction of causation.

First, high levels of gun ownership and much more lax gun control laws in the United States likely make unsupervised access to handguns more available to youth within the United States compared with other high-income countries (Richardson & Hemenway, 2011). Second, a study comparing homicide rates across U.S. states, which controlled for other risk factors for lethal violence (e.g., economic and social resource deprivation, racial composition, alcohol use,

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rates of nonlethal violent crime), found that for every 1% increase in household gun ownership youth homicides committed with guns increased by 2.4% (Miller, Hemenway, & Azrael, 2007). It can be difficult to discern the independent effects of gun ownership from those of lax gun laws that make it easier for youth to access guns, because states with the highest prevalence of gun ownership typically have the most lax gun laws (Fleegler, Lee, Monuteaux, Hemenway, & Mannix, 2013). Both likely play a role in youth's unsupervised access to guns and associated risks for lethal violence (Webster, Vernick, & Bulzacchelli, 2009). Third, temporal changes in illegal gun availability to youth coincide with temporal changes in youth homicide. The extraordinary increase in youth homicides of young African American males that were committed with guns during the late 1980s and early 1990s mirrored trends in arrests for illegally carrying guns and deaths due to gun suicides and accidental shootings (Blumstein & Cork, 1996). Similarly, the dramatic reduction in juvenile-involved murders between 1994 and 1999 and leveling off since then has closely mirrored trends for juvenile arrests for weapons violations, almost all of which are for illegal possession of a gun (Snyder, 2011).

Young men may be particularly sensitive to cultural influences on masculinity in adolescence when they are physically maturing, particularly in the context of popular media that glorify violence and domination of others (Kimmel & Mahler, 2003). The least physically developed young boys may lose out in pecking orders that value height, big muscles, athletic prowess, and mature looks (Newman et al., 2004). Guns could become a great equalizer in this tournament of recognition (Harcourt, 2006). Whereas street sources and peers are common sources of guns for street shooters, rampage school shooters who are ages 18 and younger tend to gain access to guns that are in their own households by stealing legal guns from their parents or other relatives (CDC, 2014; Newman et al., 2004; Vossekuil et al., 2002).

Alcohol and Other Drugs of Abuse

Alcohol and substance abuse have long been associated with risk for youth violence (e.g., Herrenkohl, Lee, & Hawkins, 2012; Loeber & Farrington, 2012; Whiteside et al., 2013). It has been a practice for centuries to issue soldiers alcohol before they go into battle, both to increase aggression and to decrease fear (Keegan, 1993). Recent accounts of child soldiers also describe the role of drugs in desensitizing children to extreme violence (Betancourt, Agnew-Blais, Gilman, Williams, & Ellis, 2010). Nevertheless, available data do not suggest a connection between rampage shootings and either intoxication or a history of substance abuse. There is little evidence that rampage shooters are on alcohol or drugs at the time they commit their acts (Cornell et al., 2013; Newman et al., 2004), an important difference from youth involved in street violence (see Table 1).

Social Rejection and Peer Hierarchies

Status anxieties, a history of social rejection, and peer hierarchies also can create conditions that increase the risk of youth violence. Some evidence suggests that rampage shooters have a history of rejection from relatively small and cohesive peer networks into which they have sought entry through behaviors intended to curry favor, but which peers perceive as socially inept (Newman et al., 2004). With regard to street violence, rejection in the form of disrespect of one's group can lead to collective violence (Fagan & Wilkinson, 1998). Youth may join neighborhood gangs for protection from such violence only to become involved in dynamics that alternate among protection, predation, and victimization (Rios, 2011).

Under most conditions, however, rejection in various forms—exclusion, devaluation, disrespect, bullying—can lead to aggression but rarely to lethal violence. When rejection occurs in adverse family, community, and peer circumstances, it can lead individuals to develop a heightened sensitivity for future threats of rejection, which has been shown to lead to a small but significant increase in the likelihood of aggression and violence (Downey, Lebolt, Rincón, & Freitas, 1998). Rejection from peer groups may have a stronger impact on males than rejection from best friends or romantic partners, with the opposite pattern occurring for females (Baumeister & Sommer, 1997). Among adolescent males, rejection in forms that convey powerlessness and devaluation of one's masculinity may be especially threatening (Bourgois, 1996).

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Rejection and disrespect may have a more profound effect on youth than older adults. During adolescence, when passion and peer influence are rising but brain systems that support self-control and planning are not fully mature, the typical youth is more likely to engage in risky behaviors, especially in emotionally charged social circumstances (Steinberg, 2008). However, the vast majority do not exhibit violence as a result of extreme reactivity and risky decision making (Frick & Viding, 2009). Moreover, violence could emerge at any time in the life course in reaction to identity-challenging stress and factors that compromise self-control such as substance abuse.

Intense reactions to rejection are especially likely for rejection sensitive individuals with low self-control (Mischel & Ayduk, 2004). One such impulsive reaction may be to use a lethal weapon that happens to be accessible. Youth with a history of being bullied and bullying others are 5 times more likely to report carrying weapons than peers with no bullying history (Bradshaw, Waasdorp, Goldweber, & Johnson, 2013; van Geel, Vedder, & Tanilon, 2014). A second reaction is to ruminate about a plan for revenge, which may increase the probability of its implementation (Gollwitzer, 1999). This outcome may be particularly likely in the case of school shooters, especially if the shooter has released warnings about his intentions in order to gain attention, and fears another episode of rejection if he "backs down" (Newman et al., 2004).

Poverty and Social Distrust

In urban areas of concentrated poverty, youth violence can become a form of rough street justice in response to failures by the formal justice system to secure neighborhoods, increasing social distrust of the police by youth of color (especially African American youth), and limited opportunities for youth to generate respect and dignity among peers (Harding, 2010). Under these conditions, how youth see themselves and are seen by peers can become linked to "campaigns for respect" organized around the capacity to repel or commit violence (Anderson, 1999; Jones, 2010). Strong neighborhood identities can lodge such campaigns in the defense of "turf" by youth groups and gangs, which escalates violence collectively, leaving urban spaces as "danger zones" of zealously protected territories (Harding, 2010, p. 44).

In these contexts, parents still can play important roles, but youth (especially those of color) have to navigate a street reality that often models and supports violence, and a broader society where they must contend with racialized stereotypes of criminality (Eberhardt, Goff, Purdie, & Davies, 2004). As a consequence, parenting youth who are embedded in a violent street context can be particularly challenging, and even the type of parenting that typically promotes healthy development might not be sufficient to protect against youth violence (De Coster, Heimer, & Wittrock, 2006).

Mental Illness

When school shootings occur, the shooters are often portrayed in the media as having some form of severe mental illness. Indeed the available evidence suggests that some are at the onset of what may become a serious disorder if they survive (Newman et al., 2004; Rocque, 2012; Moore et al., 2003). Although severe mental illness is linked with somewhat higher risk of violent acts, only 4% of violent acts are attributable to severe mental illness (Appelbaum, 2013). Of these acts, few involve guns (Appelbaum & Swanson, 2010). In fact, a lifetime diagnosis of a severe mental illness may add little additional risk of violence, especially if the individual is in remission or is receiving treatment (Appelbaum & Swanson, 2010). The factors predictive of future violence among the severely mentally ill are similar to those that predict violence in the general population (e.g., Van Dorn, Volavka, & Johnson, 2012).

Despite these caveats regarding mental illness as a cause of violence, some forms of mental illness that characterize either rampage or street shooters could be targeted for prevention purposes. Early identification of suicidal youth in schools and other settings could be a target of intervention for school shooters (Cooper, Clements, & Holt, 2011). This is especially true if suicidal thoughts are expressed in conjunction with intense hostility toward others. For street shooters, heavy exposure to violence in the home and neighborhood predisposes youth to post-traumatic stress disorder (PTSD) and substance use disorder, both of which could be

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targeted especially among youth already involved in the criminal justice system (Schubert & Mulvey, 2014).

Preventing Youth Violence

The evidence suggests that a variety of intervention programs can reduce some forms of youth violence (David-Ferdon & Simon, 2014; Lösel & Farrington, 2012). However, careful evaluations are needed to identify what programs work, and for whom (Mihalic, Fagan, Irwin, Ballard, & Elliott, 2004; Piquero, Farrington, Welsh, Tremblay, & Jennings, 2009).

Self-Control Skills

Although some early risk factors related to youth violence are difficult to alter, others are more amenable to change. Evidence is growing that self-regulation skills are malleable in children, beginning in early childhood (e.g., Diamond & Lee, 2011). Self-control training delivered directly to children can increase self-control and decrease delinquency. For example, a meta-analytic review of 34 studies involving randomized controlled experimental designs with participants up to age 10 and with posttest measures of self-control and child behavior problems for both experimental and control groups, found that the majority of effect sizes were positive, with small to moderate increases in self-control (d = 0.28 to 0.61), and small to moderate improvement (d = 0.09 to 0.30) in self-control on delinquency reduction (Piquero, Jennings, & Farrington, 2010).

Social Competence Skills

The likelihood of violence also may be reduced by interventions focused on developing social–cognitive and behavioral skills intended to increase empathy, social problem-solving, perspective taking, the effective management of interpersonal conflict, anger management, and alternative ways of interpreting social cues and coping with rejection and disappointment. Schools have successfully implemented universal preventive classroom interventions that improve conduct and reduce risks for violence, such as the Good Behavior Game (e.g., Kellam et al., 2011). Programs that start in first grade and continue into adolescence, that intervene with parents and schools, and that target social competence skills and other risk factors, can reduce the risk for youth violence (e.g., Conduct Problems Prevention Research Group, 2011). Effective preschool programs for disadvantaged children that engage parents and promote school readiness can also reduce later repeated involvement with the criminal justice system by as much as 75% (Heckman, 2013).

Strengthen Effective Parenting and Family-Based Protective Factors

Prevention studies targeting risk and protective factors among children at high risk for antisocial behavior provide corroborative evidence that improving parenting and family management can reduce aggression and violence in youth (Piquero et al., 2009; Welsh et al., 2012). One meta-analysis reviewed randomized, controlled experiments that included pre–post evaluations of family programs (excluding qualitative studies), with families that had children under age 5, for which child behavioral delinquency outcomes were obtained and parent training was part of the program studied (including, but not limited to home visitation programs) and for which sufficient data were available to calculate effect sizes. Among the 55 studies meeting these criteria, they calculated a weighted mean effect size of d = 0.35 on postprogram measures of childhood delinquency and/or antisocial problems (Piquero et al., 2009). The Child–Parent Center Preschool Program in Chicago, Illinois, for example, implemented in early childhood, reduced risk for violent arrests by 40% by age 18 (Reynolds, Temple, Robertson, & Mann, 2001). However, it is not yet clear how effective even well-validated prevention programs may be for preventing specific and contrasting forms of youth violence, including street violence, school shootings, and violent forms of bullying.

Minimizing Violent Media Effects

With regards to violent media, "the train has left the station," so to speak, as children invest considerable amounts of time with media (e.g., Common Sense Media, 2013). However, parents can reduce the negative impact of violent media on their children. Typically, parental interventions are placed in one of three groups: (a) instructive

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mediation, (b) restrictive mediation, and (c) social coviewing (Valkenburg, Krcmar, Peeters, & Marseille, 1999). Instructive mediation, which involves parents talking to their children about violent media content (e.g., alternative means of solving conflict besides aggression, why it is unrealistic, why guns are dangerous), can reduce the harmful effect of violent media on children (e.g., Nathanson, 2004). Restrictive mediation involves restricting access to violent media (Valkenburg et al., 1999). Parents can use filtering devices to restrict violent content on TV sets and computers. Parents can also restrict the sheer amount of media exposure. The American Academy of Pediatrics recommends that parents limit their children's overall screen time for entertainment purposes and establish "screen-free" zones at home by making sure that there are no televisions, computers, or video games in children's bedrooms (Committee on Public Education, 2001, Council on Communications and Media, 2011). Social coviewing involves parents consuming violent media with their children without discussing it; this approach can backfire because children may assume that violent media must not be harmful if their parents watch it with them and do not say anything bad about it (Nathanson, 1999).

We recommend establishing an easy-to-understand universal ratings system for all forms of media, with ratings assigned by child development experts rather than the industry. In the United States, however, the rating system is like alphabet soup, with different forms of media using different letters (e.g., TV-MA for TV, R for movies, Ao for video games), and different content codes (e.g., FV, V, S, L, D, AC, AL, GL, MV, V, GV, BN, N, SSC, RP). Parents do not always understand these ratings. For example, only 3% of parents surveyed knew that FV meant "fantasy violence," and some even thought it meant "family viewing" (Kaiser Family Foundation, 1999). In addition, ratings are assigned by the industry. The Netherlands uses age-based ratings (e.g., 12+ for children 12 and older) and easy to understand symbols for content-based ratings (e.g., a fist for violence) for TV programs, movies, and video games, with ratings assigned by child development experts rather than the industry—called *Kijkwijzer* ("viewing guidelines" in English; for a review, see Valkenburg, Beentjes, Nikken, & Tan, 2002). In 2006, a version of *Kijkwijzer* was also introduced in Turkey. Media literacy programs can also help children become more intelligent and critical media consumers (e.g., Bickham & Slaby, 2012), and can even help reduce aggression and violence in youth. In one study, for example, middle school students who were randomly assigned to participate in a violent media literacy program were 2.16 less likely to push or shove another student and were 2.32 times less likely to threaten to hit or hurt someone in comparison to control students (Fingar & Jolls, 2014).

Reduce Youth Access to Guns

Approximately two thirds of U.S. homicides are committed with guns (Federal Bureau of Investigation, 2013). Although one can certainly kill people with other weapons (e.g., knives), one can kill more people much faster with guns than with other weapons. For example, the same day of the lethal Newtown shootings, a man stabbed 22 children in China, but none of them died (Associated Press, 2012). Guns also increase the physical and psychological distance between the killer and the victims, which makes killing easier (e.g., Baumeister, 1997).

A broader body of research suggests that high standards for legal gun ownership and certain policies to deter transfers of guns to prohibited persons (e.g., universal background checks, permit-to-purchase laws) reduce gun availability to criminals and reduce violence (Webster & Wintemute, 2015). However, few studies have examined the effects of these policies or of youth-focused firearm restrictions on juvenile's access and criminal misuse of guns. Reducing firearm access to youth by legally requiring or encouraging gun owners to lock up guns to keep them from underage youth reduces suicides and unintentional shootings (Webster, Vernick, Zeoli, & Manganello, 2004; Hepburn, Azrael, Miller, & Hemenway, 2006; Grossman et al., 2012). However, the impact such laws have on rampage or street shootings is unknown.

Policing strategies designed to detect and deter illegal gun carrying in high-risk settings have consistently been shown to reduce gun violence (Koper & Mayo-Wilson, 2006). Youth report that their awareness of these police practices curtail their gun carrying (Freed, Webster, Longwell, Carrese, & Wilson, 2001). Targeted initiatives with relatively

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small and well-trained police units have proven to be effective in reducing gun violence and often have community support (Shaw, 1995; McGarrell, Chermak, Wilson, & Corsaro, 2006). Broader initiatives such as "stop and frisk" in New York City, New York, have proven to be very contentious because they are vulnerable to racial bias in their application (e.g., Gelman, Fagan, & Kiss, 2007). If these approaches lead to harassment and racial profiling, they could decrease community trust of police officers.

College age rampage shooters who are at least age 21 are often able to acquire guns from licensed gun dealers or from unlicensed private sellers who they find online or at gun shows (Newman & Fox, 2009). Federal gun laws and the laws in most U.S. states prohibit a relatively small number of individuals with mental illnesses (i.e., those who, through a legal proceeding, were found to represent a serious threat to themselves or others as a result of a mental illness) from possessing guns. The records for these mental health disqualifications often are not made available to law enforcement agencies conducting pre-gun-sale background checks. As a result, in the case of college shooters, individuals who were known on campus to have significant mental and emotional problems can access guns from licensed gun dealers, usually legally (Newman & Fox, 2009).

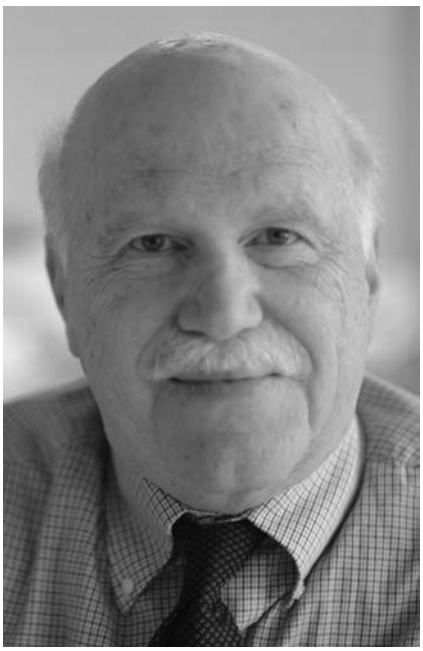
Although gun safety is an important part of prevention, it is critical not to place too much confidence in this strategy. Some rampage school shooters took blowtorches to safes or found cable cutters to slice through security devices to gain access to guns (Newman et al., 2004). A very dedicated killer can be difficult to deter via gun control alone. However, many people are not quite that dedicated. They are ambivalent, and anything that raises the stakes and makes it harder for them to access guns can be an effective part of prevention strategies. In sum, gun laws are helpful but not sufficient for deterring gun violence in youth.

Reduce Alcohol and Substance Abuse in Youth

Findings discussed above linking alcohol and substance abuse to aggression and violence among youth suggest that interventions to reduce substance use by youth would also lower risk for violence in subgroups of high-risk youth (David-Ferdon & Simon, 2014). Findings from the Pittsburgh Youth Study suggest that it may also be important to simultaneously address contextual influences, because they found that increases in alcohol use within individuals were more strongly linked to increases in aggression among boys with attitudes favoring violence and living in high-crime neighborhoods (White, Fite, Pardini, Mun, & Loeber, 2013). Changing alcohol-related polices can also help reduce youth violence rates. For example, surveillance data analyzed by researchers at the Clark-Hill Institute for Positive Youth Development found that single-serve alcohol beverages were associated with increased violence rates. Local policymakers used these data to develop a new alcohol licensing policy, and found that violence-related ambulance pick-ups in the community where the intervention took place decreased from 19.6 per 1,000 youth 15–24 years, in the 18 months prior to the intervention to 0 per 1,000 in the 18 months after the intervention. The study included an 18-month baseline period, a 6-month intervention period, and an 18-month postintervention period. Another study found that reducing the density of alcohol outlets and sales significantly reduced violence rates (e.g., Elder et al., 2010).

Improving School Climates

General efforts in schools should focus on creating climates where students feel engaged and feel a sense of belonging. Of particular importance is the development of mechanisms that can build social trust between youth and adults, both in schools and in communities, for social trust has been demonstrated to be an important aspect of school climates that leads away from peer violence (Williams & Guerra, 2011). On campuses, ensuring that culturally diverse students have access to all academic and extracurricular opportunities can break down negative stereotypes among groups and create trust among peers (Carter, 2012). There is also a need to recognize and cultivate informal practices of peer conflict management that youth use to solve problems in nonaggressive ways that are supported and reinforced by an inclusive and trusting climate (Morrill & Musheno, in press). School police forces emphasizing suspension and expulsion of



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youth exhibiting behavioral difficulties (e.g., "zero tolerance" or some forms of "safe schools" policies) can undermine positive school climates, marginalizing already challenged children, even propelling them on a trajectory toward prison (Bahena, Cooc, Currie-Rubin, Kuttner, & Ng, 2012). Moreover, a Department of Education report based on statistics from 72,000 schools in 7,000 school districts across the country found that although African American students accounted for 35% of those suspended once and 39% of all expulsions, they made up only 18% of those enrolled (Gregory, Skiba, & Noguera, 2010; Koon, 2013).

Restorative justice programs represent one increasingly popular movement intended to improve school climates, thereby reducing peer violence and aggression (Morrison, 2007). Restorative justice generally refers to processes through which "stakeholders affected by an injustice have an opportunity to discuss how they have been affected . . . and what should be done to repair harm" (Braithwaite, 2004, p. 28). This approach has been translated into schools via a number of practices, including peer juries, problem solving, peer discussion circles, family group conferencing, and victim–offender, peer mediation. Advocates suggest that school-based restorative justice programs signal a caring and safe climate organized around forgiveness, respectful dialogue, responsibility, and community participation (Braithwaite, 1999). Although there is some evidence that restorative justice can reduce serious assaults and other forms of violence in individuals already involved in the criminal justice system (Strang, Sherman, Mayo-Wilson, Woods, & Ariel, 2013; Bergseth & Bouffard, 2007), the type of randomized trials needed to establish the effectiveness of this approach in reducing school based-violence has not yet been undertaken.

Data Mining: Can It Predict Youth Violence?

The advent of tools that make it possible to search large quantities of online data through computer algorithms has raised new possibilities for predicting youth violence. In particular, because social media data such as Facebook and Twitter are often publicly available, data mining algorithms provide a means for sifting through these data to predict events and identify user characteristics (Han, Kamber, & Pei, 2011). For example, recent approaches using Twitter data can provide advance prediction of civil unrest events (Chen & Neill, 2014), and can identify users with PTSD and other mental conditions (Coppersmith, Harman & Dredze, 2014). Data mining techniques have multiple potential uses for providing early warnings of youth violence. However, some of these uses create not only technical challenges, but also raise privacy concerns and other serious ethical issues.

Predicting Street Violence

Researchers have successfully developed techniques for predicting geographic "hotspots" of violent crime in U.S. cities such as Chicago; Los Angeles, California; and New York City (Cohen, Gorr, & Olligschlaeger, 2007; Eck, Chainey, Cameron, Leitner, & Wilson, 2005; Mohler, Short, Brantingham, Schoenberg, & Tita, 2011; Neill & Gorr, 2007). Most of these techniques rely on data that is often publicly available, such as aggregate counts of crimes, de-identified crime offense reports, and 911 emergency telephone calls. These techniques can achieve high predictive accuracy because urban crime often follows regular patterns (e.g., escalating conflicts between street gangs), and place-based interventions such as targeted police patrols can reduce the overall level of street violence. For example, a meta-analysis of 19 studies found that hot spots policing produced significant, positive effect sizes for reductions in drug offenses ($d = 0.25$), violent crimes ($d = 0.18$), and disorder offenses ($d = 0.15$; Braga, Papachristos, & Hureau, 2014).

A complementary approach to prediction of street violence analyzes social network ties, using social media or other data sources (e.g., co-offending data) to identify individuals at high risk of being victims or perpetrators of street violence (Papachristos & Wildeman, 2014). For example, the Chicago Police Department uses social media data (e.g., Facebook profiles) to map the relationships between Chicago's most active gang members. The police use the inferred social network for prediction of homicides and development of interventions targeted at the individuals at highest risk for involvement in a homicide. Another example of individual-based crime prediction is the software used in Baltimore,

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Maryland; Philadelphia, Pennsylvania; and Washington, DC, to predict those individuals on probation or parole most likely to murder or commit other crimes (Berk, Sherman, Barnes, Kurtz, & Ahlman, 2009). This approach relies on detailed information collected about each offender's life history and criminal record, and thus will not help predict first-time offenders.

Predicting Rampage Shootings

Individual-based surveillance to predict rampage shootings is inherently much more difficult than place-based surveillance, for three reasons. First, rampage shootings are extremely rare. Even if features are identified that increase an individual's probability of committing violence by several orders of magnitude, huge numbers of individuals displaying these factors will never perpetrate violence. Second, there may be wide discrepancies in the amount and types of data available for each individual (e.g., some potentially dangerous individuals may not use online communication or may not reveal anything predictive). Third, there are large risks to individual privacy that are difficult to mitigate, which raise both moral and legal concerns. Because of these concerns and the likelihood of an unacceptably high false positive rate, mining of social network data should be used to provide secondary rather than primary evidence for deciding whether and how to intervene in the event of received threats or warnings related to a specific individual.

Social network data may also identify hostile social environments that can lead to violent behavior (Spivak & Prothrow-Stith, 2001), including carrying a weapon and physical fighting (Nansel, Overpeck, Haynie, Ruan, & Scheidt, 2003). For example, network data may track messages involving *cyberbullying*, which refers to the use of digital media to bully others, such as "flaming" (i.e., hostile and insulting interaction between people online), online gossip or rumors, teasing, reputation destruction, and cyberostracism (Hinduja & Patchin, 2009). The use of social

Table 1
Some Major Descriptive Differences Between Street Shootings and School Shootings

Street shootings	School shootings
Less rare	Extremely rare
Concentrated in inner cities	Concentrated in rural towns and suburbs
Non-White offenders overrepresented	Mostly White offenders
Guns usually obtained from illegal gun market	Guns often obtained from family members who purchased them legally
Preferred weapon is a handgun	Often multiple guns used, including semiautomatic rifles with high capacity magazines
Many recidivist violent offenders	Uncommon recidivist violent offenders
History of discipline problems common	History of discipline problems uncommon
Co-offending typical	Solo offending typical
Prior criminal victimization common	Prior criminal victimization uncommon
Suicide combined with homicide uncommon	Suicide and homicide very common
Victims mostly of same sex and race (often African American males)	Mixed-sex male and female but same race
Victimization of family members highly unusual	Victimization of family members can occur prior to the school shooting
Mostly from low income families	Mostly from middle class families
Substance use common	Substance use uncommon
Treatment of mental illness uncommon	Treatment of mental illness uncommon, but some symptoms of mental illness may be present
Generally below average in academic achievement	Generally average, or above, in intellectual functioning and academic achievement
Generally personally know someone who has killed or been killed before	Generally do not personally know anyone who has killed before
Avoid media attention for shootings because they don't want to be caught and prosecuted	Seek media attention for shootings

media for cyberbullying creates opportunities to study online transcripts of bullying events called "bullying traces" (Xu, Jun, Zhu, & Bellmore, 2012). Bullying traces may also reveal when youth resist cyberbullying or even intervene to stop it (Marwick & Boyd, 2011).

Preventing Shootings in Schools and Communities

Rampage shootings. Programs and strategies to prevent rampage shootings are not well developed. The most efficacious form of prevention lies in ensuring that information that "something terrible is about to happen" is brought to trusted adults who have the knowledge to respond effectively. This requires encouraging the recipients of warnings, threats, and other forms of advanced notice to come forward (Newman et al., 2004). Media attention to shootings provokes a spike in reporting threats, which can lead to an increase in the interceptions of shooters before they carry out their plans (Newman et al., 2004).

Efforts to alert schools to the potential for hostile action by students have been implemented in some U.S. states and other countries (e.g., Cornell, Sheras, Gregory, & Fan, 2009; Endrass et al., 2011). Although school shooters often "leak" their intentions to others in the community (Fein et al., 2002), these messages are typically not taken seriously by their peers. However, the establishment of tip lines and other mechanisms for reporting such threats appear to uncover potential threats and avert threats to school safety (Cornell et al., 2009). These programs are similar in intent to efforts to identify youth at risk for suicide in schools (Cooper et al., 2011). Students, parents, and school staff are educated about the warning signs of suicidal behavior and encouraged to help potential victims to get treatment.

Encouraging youth to come forward must be tempered by the understanding that the vast majority of the time they will be reporting false positives. The language of threat is simply too common to assume it always means something. But when threats become more specific (in terms of targets, timing, preparation, etc.), the only real protection is to foster the conditions of trust and confidentiality that will signal to members of the social cliques where they hear threats to come forward and report the threats (Newman et al., 2004).

Zero tolerance policies need to be reconsidered, at least for speech (though weapon possession should never be tolerated). When school systems react to verbal comments with automatic sanctions, the practice can dissuade students who hear threats from coming forward to report their concerns out of fear of overreaction in a climate of a high level of false positives (Newman et al., 2004). Shutting down this information pipeline leaves us in a very vulnerable position because interruption of plots is essential to prevention (Newman et al., 2004).

Although trying to predict which specific students will turn into shooters is futile, schools should focus attention on students who show signs of disturbance or broadcast an intention to do harm (Newman et al., 2004). More generally, schools should ensure that informal and formal control systems operate in tandem to respond robustly to both actual and potential bullying and physical violence (Morrill & Musheno, in press).

Postvention for school shootings. School shootings are devastating, especially to the communities in which they occur. Based on the available evidence, scholars have offered general suggestions about what to do in the aftermath of a school shooting (Newman et al., 2004). Media attention often creates a major problem for school authorities. Schools should insist that news organizations pool their resources and send one representative, rather than multiple reporters to cover rampage school shootings. Media also provide a stage for antisocial youth to become a "star" through extreme acts of violence, such as rampage shootings. Their access to attention through media should be minimized.

Communities should develop postshooting crisis plans that provide mental health services on a widespread basis. Educators need to be both well informed about the symptoms of trauma and open with parents about the importance of counseling. Special attention should also be paid to the needs of teachers and staff in the wake of a school shooting. They are often expected to step into the role of counselor or comforter when they are also suffering from trauma and in need of support. Mental health resources should be available in schools at all times, not just in the aftermath of a school shooting (see Newman et al., 2004).

Schools have a legitimate need to reassure the public that security has been restored in the wake of a school shooting. Different schools have taken different approaches, such as searching student bags for weapons, adding locks and security personnel at the school entrance, and building fences around the school property. Although such measures can reassure students and parents in the short-term, they can also undermine social trust in the long-term and must be accompanied with other efforts to rebuild trust and meaningful relational ties on school campuses (see Newman et al., 2004).

Prevention of street shootings. Street shootings involve an extremely difficult set of both individual and contextual influences that require a complex set of multilevel interventions (e.g., Ingoldsby, Shelleby, Lane, & Shaw, 2012; Tolan, Gorman-Smith, & Henry, 2003). One scholar, for example, points toward the importance of a "rich" organizational life of on-the-ground community organizations as mechanisms for increasing social trust in

neighborhoods, which is associated with lower rates of youth violence (Sampson, 2012, p. 312). But how these abstract ideas translate into specific interventions is unclear. There is recent evidence that high-quality (i.e., low-conflict, high-emotional-closeness) relationships between children and care givers can reduce conduct problems, including peer violence, years later even holding constant family income, children's earlier conduct problems, and parenting styles (Ingoldsby, Shelleby, Lane, & Shaw, 2012). Summer employment mentoring programs may have the same effects prior to serious offending (Heller, 2014). Nevertheless, reducing the forces that encourage youth violence will require concerted efforts by police, parents, and other adults to avoid the debilitating effects of involvement with the juvenile justice system that treats poor and minority youth harshly and ensnares them (Rios, 2011). The effort currently underway to reform the juvenile justice system by engaging youth through education and treatment (rather than punishment) is a strategy that could bear fruit (Models for Change, 2014). Similarly, support for successful reentry of incarcerated youth and young adults into their communities has the potential to reduce future violence. Of particular importance is the removal of unnecessary obstacles to gaining employment and returning to school.

Research conducted with serious youth offenders in urban centers such as Chicago indicates that youth with substance use problems are more than 50% more likely to experience recidivism after release into the community than other offenders (Schubert & Mulvey, 2014). Other research (also in Chicago) indicates that nearly all youth detained in the juvenile justice system have experienced traumatic events often leading to PTSD and comorbid disorders (Abram et al., 2013). Such conditions are treatable, but current practice in juvenile detention does not deliver these treatments in a consistent manner, leaving many youth at risk for further offending (Schubert & Mulvey, 2014), and high risk for gun violence upon return to their communities (Teplin et al., 2014).

A novel approach to prevention of violence in high-risk school-age male youth in Chicago employs a combination of strategies both during and after school (Heller, Pollack, Ander, & Ludwig, 2013). The program, called Becoming a Man, employs community organizations that train various forms of impulse control and strategies to negotiate interpersonal conflicts. It also encourages greater attachment to school and the value of persisting toward graduation. Results from a large randomized trial indicate a 44% reduction in arrests for violent behavior during the program year and subsequent increases in school performance ($d = 0.19$). Improvements in school attendance and graduation appear to make the program cost effective.

Directions for Future Research

In our charge from the NSF to write about what we know and do not know about youth violence, it immediately became apparent that although there is a developed literature on the topic, there is much that we still do not know. In this section, we describe some of the most urgent directions for future research.

Guns

More research is needed on youths' perceptions and behaviors as potential consumers of handguns, and how those perceptions and behaviors are affected by contextual factors such as state regulations over gun sales, law enforcement practices directed at deterring youth acquisition and carrying of guns, and street outreach prevention programs. A huge challenge to initiatives is that many youth are willing to loan their guns to friends and family members. More research is needed on how to discourage gun sharing practices. There are many gaps in gun policy research (Webster & Wintemute, 2015). For example, there has been little research on the effects of minimum age restrictions on handgun purchases, and if those effects depend on regulations to prevent illegal diversion (e.g., comprehensive background check).

Media Violence

Previous research has shown that when exposed to movie characters that smoke, many youth are more likely to start smoking themselves (e.g., Dal Cin, Stoolmiller, & Sargent, 2012); the same is true for characters that drink (e.g., Wills, Sargent, Gibbons, Gerrard, & Stoolmiller, 2009). Future research should test whether youth are more interested in acquiring and using guns after exposure to movie characters that use guns. Research could also examine the extent to which media can decrease the perceived desirability of guns, in an environment when media tend to glorify them. Future research should examine what types of individuals are most susceptible to violent media effects, such as youth with certain mental illnesses, youth with poor self-control, youth who possess guns, and youth who do not understand the morals of plots and the motives of characters that contain violent content. Future research should also investigate what types of settings facilitate violent media effects (e.g., cooperative vs. competitive vs. alone gameplay; immersive technologies).

The rampage shootings in Newtown and, more recently, in Santa Barbara, California, have drawn attention to online communities that youth may join to communicate with others who share and support their violent interests and hostile ideologies (e.g., Report of the Office of the Child Advocate for the State of Connecticut, 2014). Research is needed to understand how involvement with online social

groups facilitates the translation of hostile grudges into violent action. Prior research suggests that online communities operate like other social groups in ways that influence real-life behavior (McKenna & Bargh, 1998).

Mental Health, Suicide, and Homicide Ideation

Future research could examine the intersection of hostile and suicidal ideation in youth as a marker for youth who are at risk for murder-suicide, a common characteristic of rampage shootings (Everytown for Gun Safety, 2014; Vossekuil et al., 2002). Considerable research has been conducted to understand suicidal ideation in youth (Evans, Hawton, & Rodham, 2004). More should be done to learn about risk factors for homicidal and suicidal ideation and to understand the circumstances under which such co-occurring ideation becomes linked to plans to use violence to gain the status and recognition that is perceived to be lacking.

Because existing studies of youth who engage in rampage shootings have focused mainly on middle and high school students (e.g., Newman et al., 2004), it is important to establish whether college-age rampage shooting show any distinctive pattern of mental health or social adjustment difficulties. In particular, the transition to independent living, or even its possibility, might exacerbate serious social and emotional difficulties of the sort that characterize some of the college-age rampage shooters and potentially trigger in them extreme reactions. This possibility is suggested in the Report of the Office of the Child Advocate for the State of Connecticut (2014) on the Newtown shooter, but needs to be examined in other cases. More generally, research is needed to establish how mental health services can be effectively harnessed to support youth experiencing these difficulties, with special attention to those making the transition to independent living.

Family Environment

Family function appears to play a multitude of roles in generating or mitigating risk for youth violence, yet there are numerous gaps in the literature. More knowledge is needed on differential predictors of specific forms of violence, particularly given that family backgrounds of rampage shooters often do not fit the typical markers of street shooters. For rampage shooters, interactions of individual vulnerabilities and contextual influences arising in peer groups, schools, and communities may play critical roles.

In the case of street shootings that are heavily concentrated in high-poverty neighborhoods, parents may have little trust in the police, and peer influences are often driven by gang membership and other turf identities (Goffman, 2014; Harding, 2010). Nevertheless, parents and schools may have some effect in reducing involvement in violence (Fauth, Roth, & Brooks-Gunn, 2007; Ingoldsby et al., 2012; Tolan et al., 2003). Expanded research is needed on effective interventions to reduce youth violence in this context.

Research also is needed on the role of early childhood experiences in the family and caregiving environment on risk for youth violence, including the prenatal environment. There is a need to identify best practices to support healthy development of children in vulnerable families. In addition, it is important for communities, policymakers, and scientists to join together and identify the resources needed for family members with a child or youth who demonstrates signs of preoccupation with violence. Research is needed on the best strategies and developmental timing for helping parents to teach and monitor children effectively in regard to promoting positive child uses of media, good self-control skills, safe behavior around guns, healthy peer relationships, and other potential protective factors against violence. It is also important to improve child welfare systems intended to promote positive child development, such as foster care and juvenile justice systems, that may inadvertently function as "violence feeder systems."

Whereas our focus has been on the formative role of early family experiences on later violence, it is also important to consider the role of families during adolescence and, perhaps especially, early adulthood in the lives of youth with serious social and emotional difficulties of the sort that characterize some of the school shooters. These difficulties may hinder parents' ability to engage in constructive ways, prompting them to give up or give in. Yet, for these youth, the transition (or even its possibility) from the family home to independent living may be deeply threatening and destabilizing and prompt extreme reactions because it removes invisible supports on which they depend (e.g., Report of the Office of the Child Advocate for the State of Connecticut, 2014). Research is needed to establish how to access mental health services that can support families of youth experiencing these difficulties.

School and Community Climate

Research is needed to understand how the ways in which schools deal with challenging behavior may contribute to the risk of violence. For example, a suspension may result in a child being left without any adult supervision if the parent is working. Greater insight is needed about interpersonal peer conflict in school, especially the roles played by social trust, interpersonal relationships, and peer hierarchies in creating the conditions that lead youth away from or toward peer aggression (Morrill & Musheno, in press). Efforts along these lines could be devoted to basic research and assessing the efficacy of school-level approaches, such as restorative justice programs, that seek to facilitate alternative ways of resolving peer conflict without exclusion or violence.

A growing body of theory and evidence implicates the role of neighborhood-level factors for youth violence in urban areas characterized by persistent and concentrated poverty, gang violence, and low levels of social trust among residents (e.g., Sampson, 2012). However, neighborhood-level strategies to reduce youth violence and promote youth success have produced conflicting results, pointing to the need to distinguish how different aspects as adolescents' social environment influence their ongoing development (Sampson, 2012).

Conclusions

Rampage school shootings are rare. Schools remain the safest place for children—far safer than crossing the street. Even so, the shock that follows from the murders of innocent children is so threatening to our sense of social order that it calls out for explanation and intervention so that it does not happen again. It is unlikely that we will ever understand the depth of alienation or desires for social status motivating an individual shooter, nor will we be able to restore peace of mind to the families and communities that have experienced these tragedies.

Street shootings take the lives of far more people in 1 year than all the school rampage shootings put together. While addressing the critical need to understand rampage school shootings, we must not lose sight of the fact that in terms of the sheer social cost, the violence that bedevils the nation's poorest neighborhoods is far more costly in terms of human life, family disruption, and the destabilization of communities engendered by chronic fear and trauma.

Whether we focus on rare or ubiquitous forms of violence, it is crucial to recognize that gun violence in the United States is far higher than in any other high-income country. It is also important to recognize that the causes of violence are complex. Evidence on the risk and protective processes for youth violence is increasing. However, it is clear that additional and more nuanced knowledge is needed on both causes and effective solutions for different forms of youth violence in different contexts. In the aftermath of Newtown and the many other tragedies in schools and streets that preceded and followed this tragic event, it is also clear that understanding and preventing youth violence should be a national priority.

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