



K–12 School Shootings

Implications for Policy, Prevention, and Child Well-Being

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KEYWORDS

- School shootings • School safety • School violence • Gun violence
- Active shootings • Mass shootings

KEY POINTS

- All children in K–12 schools have a right to a safe and secure learning environment, which allows for their healthy development.
- When a school shooting occurs, the harm goes beyond those who were directly injured or killed and has mental health consequences for all who are directly or indirectly affiliated with the tragedy.
- Many existing interventions—including physical security measures, active shooter drills, arming teachers, behavioral interventions, and federal or local laws—have been proposed and/or subsequently implemented without consideration for how such interventions may have an impact on the well-being of children.

INTRODUCTION

On December 14, 2012, a 20-year-old man, not yet legally old enough to carry a handgun, would go on to commit the deadliest K–12 school shooting in US history.¹ Earlier in the morning, he first murdered his mother, a firearms enthusiast, and stole her Bushmaster XM15-E2S rifle, Izhmash Canta-12 12-gauge shotgun, SIG Sauer P226, and Glock 20SF handgun, all of which were bought legally.² He then drove 10 minutes away to Sandy Hook Elementary School in Newtown, Connecticut, a kindergarten through fourth grade elementary school, where more than 400 were students enrolled. The school had security measures in place; for example, visitors needed to be

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identified and buzzed into the building, which was locked once the school day began.¹ Using the Bushmaster rifle, the perpetrator bypassed this system by shooting through plate glass in the front of the school. After killing the principal and school psychologist and wounding a teacher who tried to stop the attack, he opened fire on 2 first-grade classrooms.¹ In 1 of the classrooms, he shot and killed a teacher and behavioral specialist who had attempted to shelter the students in the bathroom. He then murdered all the students except a 6-year-old girl; she survived by hiding in the corner of the bathroom and playing dead, likely underneath her murdered classmates. Fifteen children perished in this classroom.¹ In the second classroom, the teacher and special needs teacher put themselves between the perpetrator and the children, and several students were able to escape the room when the shooter reloaded his firearm. Tragically, 5 students still were killed, including both teachers. Within approximately 6 minutes, 20 children (only 6–7 years old) and 6 adults were killed before the gunman committed suicide using the handgun.¹ This tragedy relaunched a national conversation about the occurrence of mass shootings, specifically the physical, psychological, and educational harm inflicted on children. Despite being touted as the “tipping point” in gun violence prevention,³ only individual states have been successful in passing legislation in hopes of reducing mass shootings. To this day, there has not been significant legislation passed at the federal level to prevent these incidents from occurring in the future.⁴

Using the most commonly used definition of a mass shooting—an incident where 4 or more individuals are killed by a single (or sometimes pair) of perpetrators⁵—studies have found that children and teens (individuals under the age of 18) make up a surprisingly high percentage of the victims killed in these tragedies. In 2019, children comprised 22% of the population in the United States⁶ and accounted for approximately 25% of victims in all mass shootings.⁷ Children are even more likely to be victimized with a gun if the event occurs in the home. Between 2009 and 2016, there were 102 mass shootings, of which 71 occurred in the home and 31 in public. Children under the age of 18 accounted for nearly half (44%) of the deaths in domestic mass shootings and 10% of the victims in public mass shootings.⁸

Although children and teens usually are not targeted in public mass shootings,⁸ school shootings in K–12 schools—which include mass shootings—remain an unfortunate exception. These tragedies have an impact primarily on children and teens and are especially concerning given the age of the victims. The definition of a school shooting, like mass shootings, can vary widely, ranging from an accidental discharge of a gun at school, to the injury or death of a student by a firearm, and to a school mass shooting.⁹ Using the definition of any incident of interpersonal gunfire in a K–12 school, the *Washington Post* created a data set that details any school shooting since the Columbine School shooting, in 1999.¹⁰ Using these data, the number of school shootings per year, with some of the most infamous school shootings labeled, is presented in **Fig. 1**. Regardless of how a school shooting is defined, all of these events can have detrimental effects on a child’s well-being, development, and critical learning outcomes. This is evident particularly if considering that school shootings have an impact not only on those children who are physically injured and killed but also on those who witness the shooting, hear gunshots, or know a friend or family member who was killed, among other levels of exposure.¹¹ Indeed, the short-term and long-term implications of school shootings on communities across the United States can be devastating.^{12,13}

K–12 school shootings are of particular interest given the expectation of safety within a school’s walls and the right of every child to learn and thrive in a safe school environment. An apt comparison can be made between school shootings and plane crashes. Deaths due to both are rare,^{14,15} and planes and classrooms also are presumed to be safe places. Due to the presumption of safety, however, if something

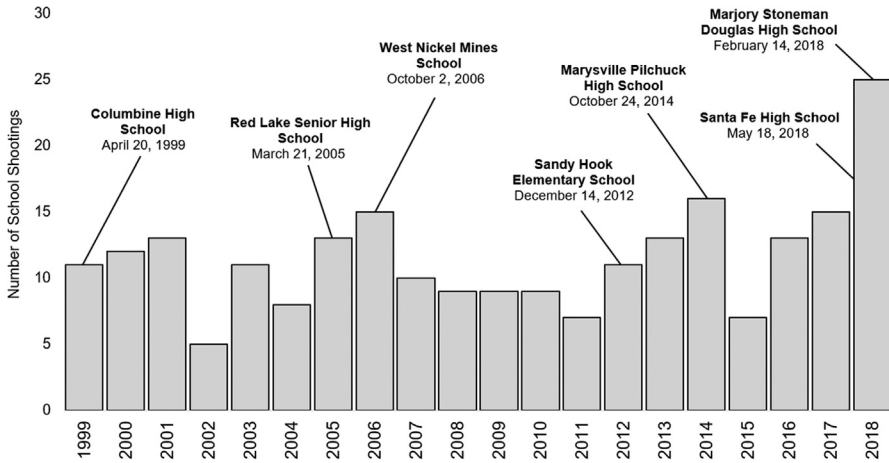


Fig. 1. Number of school shootings in the United States since the Columbine High School shooting.

goes wrong, the event rightfully is seen not only as tragic but also as preventable. As a result, both are more likely to make international news than more frequent tragedies, such as car crashes or domestic shootings.^{16,17} This heightened media response may be a reason why many are terrified of these events; in 2018, Americans rated mass shootings, including school shootings, as the second most important event of the year (with the first being the economy).¹⁸ And the impact of a school shooting may feel particularly devastating, because schools are intended to be safe spaces within which children should be able to thrive and foster their physical, social, and emotional development. The notion that schools could be the site of such violence is counter to understanding—and expectations of—what schools can and should be. At the same time, an argument can be made that the fear associated with the anticipation of gun violence in schools also is due to a loss of control by the victims.¹⁹ Just as a passenger on a plane has no way of preventing a mechanical dysfunction or error by the pilot, a parent has little ability to stop a school shooting in the moment. Importantly, however, the 2 scenarios differ in the way society responds to them. Despite how rare plane crashes prove to be, if one occurs, there is an immediate investigation and steps are made to prevent a future occurrence with significant investments of money and research. The airline industry continues to produce safer airplanes, stricter safety regulations, and a commitment to bringing the number of the accidents to zero. This same mentality should exist with shootings in schools—they are tragedies that should not exist in modern society. Yet, the number of school mass shootings, which had been relatively consistent year-to-year since the 1999 Columbine High School mass shooting, has started to increase in incidence since 2015.⁹ Data indicate that more mass school shootings occurred in K–12 schools in 2017 than any other year.⁹ Furthermore, the solutions to preventing a school shooting are not as straightforward as preventing a mechanical failure in a machine, because they need to consider the mental and educational well-being of children.

HARM BEYOND INJURY AND DEATH

Research has confirmed that the implications of youth being exposed to gun violence—in particular, a school shooting—can occur even if no one is killed or

injured.¹¹ For example, a significant body of work has demonstrated that the anticipation of violence more generally can lead to heightened anxiety, fear, and depression across a range of populations.^{20–22} According to the *Washington Post*, well over 200 instances of gunfire in K–12 schools have occurred in the United States in the 20 years since the Columbine shooting in Colorado,¹⁰ the most publicly notable being mass shooting tragedies at schools like Sandy Hook Elementary School and Marjory Stoneman Douglas High School. Although approximately 150 students and educators have been killed and 300 injured by mass shootings in schools, more than 236,000 students have been exposed to gun violence at their K–12 school since Columbine.¹⁰ The number of students exposed to interpersonal gunfire in their schools per year is presented in Fig. 2.¹⁰ This number, however, is still an underestimate of the total harm created by these events because the reactions and responses to the school mass shootings also could have negative mental health outcomes for children across the United States through anxiety of the anticipation that a shooting might take place at their school in the future.

For example, the hundreds of thousands of students who may have avoided being physically injured by a firearm during these attacks still may experience long-term mental health consequences. Any sense of security or safety in their schools—an essential component of learning²³—can be disrupted with insecurity after these tragedies. A review by Lowe and Galea,²⁴ published in 2017, examined 49 articles covering 15 mass shootings, 4 of which were in K–12 settings. Among these articles, the most common psychological outcomes that were assessed and found elevated among this population were posttraumatic stress disorder and major depression, although evidence of generalized anxiety disorder, acute stress disorder, alcohol-related conditions, drug use disorder, panic disorder, adjustment disorder, and antisocial personality disorder also were found to be significant in individuals' lives who had been affected by a mass shooting.²⁴ Although psychological conditions were found

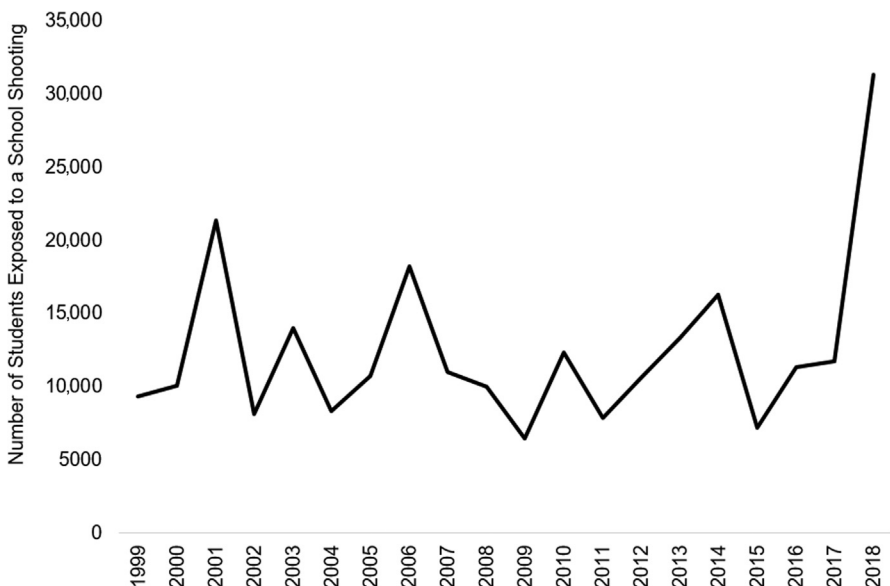


Fig. 2. Number of students exposed to interpersonal gun violence in the United States since the Columbine High School shooting.

more severe for those who had greater exposure (ie, witnessing the attack or knowing a victim), those with little direct exposure to the shooting still had at least short-term mental distress of some kind following the incident.²⁴ Furthermore, although this review included both adults and minors, children and teens who were exposed to these events often experienced higher rates of psychological disorders, including posttraumatic stress disorder, in comparison to their adult counterparts. In another study, depending on the way in which they are exposed, approximately 30% to 40% of children who are exposed to a life-threatening event develop symptoms of posttraumatic stress disorder.²⁵ In some cases, mental anguish, often fueled by survivor's guilt and trauma,²⁶ can result in deaths years after the incident. For example, 2 Marjory Stoneman Douglas High School students committed suicide a little over a year after the school mass shooting, and a father of a Sandy Hook Elementary School victim committed suicide in 2019.^{27,28}

Gun violence in K–12 schools persists, with potentially devastating and traumatic implications for communities around the United States. The following sections present evidence in support of several solutions at multiple levels for this endemic, while also evaluating the lack of evidence that exists for other solutions that currently are in place.

SOLUTIONS AND GAPS IN EVIDENCE

Like all public health crises, the solution to the persistence of gun violence in K–12 schools will require a multifaceted and coordinated effort that draws on a wide range of evidence-informed strategies and involves multiple stakeholders. Importantly, these solutions also must consider the well-being of children in their approach. This section identifies examples of current approaches to gun violence prevention in schools and speaks to their strengths and limitations.

School Level

Physical security measures

The image of a school has changed since the 1999 Columbine shooting in Littleton, Colorado, with the implementation of security measures, such as metal detectors, armed guards, and zero-tolerance policies.²⁹ In 1999, less than 20% of schools had security cameras; now, more than 80% do.²⁹ These policies also disproportionately affect schools in communities with a lower socioeconomic status and where the primary population are students of color—regardless of crime rates—and are 1 facet of the school-to-prison pipeline.^{30,31} Unfortunately, evidence surrounding these policies is limited and, when available, conflicting. Some researchers have found that more security measures in school, such as metal detectors and armed guards, resulted in students feeling less safe compared with schools without these measures.^{32–34} Other researchers have reported the opposite: students felt more safe with these policies³⁵ or that these security measures have little effect on academic performance.³⁶ Furthermore, although there is evidence in support of some behavior interventions in preventing school violence, such as counseling, mentoring, and peer mediation,^{37–39} most studies evaluating physical security policies have been inconclusive.⁴⁰ This dilemma proposes a problem: school districts not only are implementing policies that have not been proved effective in reducing violence but also are doing so without knowing the mental health consequences of these measures. The lives significantly influenced by school shootings are vast and uncountable; therefore, research on the best ways to reduce harm related to these tragedies, both mental and physical, is critical.

Lockdowns and active shooter drills

In the weeks before the school shooting at Sandy Hook Elementary School, the school had practiced lockdown and safety procedures; it is thought that the shooter bypassed one of the first-grade classrooms because the teacher had forgotten to remove black construction paper from the window of the classroom door.¹ In the years following, lockdown and active shooting drills have increased in American schools: according to the National Center for Education Statistics, approximately 95% of schools now conduct these drills.⁴¹ These drills are meant to help students and teachers practice quickly locking the door and windows/blinds, finding cover in a classroom, and remaining quiet and, in some instances, include multioptional responses, such as teaching students and educators how to create barricades, evacuate the school, and actively resist a shooter.⁴² Simulation studies have shown that lockdowns, in particular, multioptional ones, may save lives.⁴² But the implementation of these drills is not without controversy, because there is fear that they might be harmful for a child's emotional and mental well-being,⁴³ can be used to the shooter's advantage,⁴⁴ or may numb students' reactions if a real shooting were to occur.⁴⁵ One survey among students between the ages of 14 and 24 found that although 56% reported that they do help to teach students what to do in case of an attack, 60% of the 815 respondents reported that the drill made them feel "scared and hopeless."⁴⁶ It, therefore, is important that these drills are implemented appropriately. For example, if the drills are well planned and the students are warned about the drill before it happens (as opposed to being surprised), some of the harm from these practices could be avoided.⁴⁷ Even so, school psychologists should be included in both the planning and aftermath of active shooter drills to prevent trauma from occurring, especially with students of younger ages.⁴⁸

Arming teachers

The shooting at Marjory Stoneman Douglas High School in Parkland, Florida, reignited a national conversation around arming teachers with firearms. Although not a new idea, it brought this concept to the forefront of the national discourse. Unfortunately, and as recent work has illustrated, little is known about the effectiveness of arming teachers in deterring gun violence in schools,⁴⁹ including how its implementation would work. For example, many law enforcement officers receive more than 800 hours of basic training, which includes 168 hours of training specifically on weapon use, self-defense tactics, and the use of force.⁵⁰ States that have laws, however, aimed at arming school personnel offer significantly less training—if any—to their school staff.⁴⁹ Research also suggests that arming teachers could heighten levels of anxiety and negatively affect a school's climate as opposed to serving as an effective deterrence of gun violence.⁵¹ A large majority of teachers and parents are opposed to the idea as well. A recent survey of 500 US teachers found that 73% opposed proposals to arm school staff,⁵² and a survey of parents of elementary, middle, and high school students found that 63% oppose arming teachers.⁵³ Arming teachers also would require a contingency plan in place for all possible firearm-related scenarios (whether intentional or accidental), an understanding about the implications of this proposed effort on teacher burden and burnout, a clear sense of how this would resonate or possibly conflict with existing school policies, and an exorbitant cost investment.^{49,54}

Efforts to address early antecedents of violent behavior

The prevention of engagement in violence behavior among children—in particular, adolescents—has a long and complicated history. As a health crisis, gun violence in schools and its related behavioral antecedents should be addressed, not solely or

primarily with punitive measures. In today's school environment, children often are viewed either as perpetrators to be punished or as victims to be protected without building on their agency.⁵⁵ Investing in evidence-based preventive efforts that are intended to promote critical skill development, however, and doing so in ways that recognize the resources and agency that children and adolescents bring to the issue, likely are far more effective ways both to address the perceived threat of gun violence and prevent the onset of violent tendencies among youth, while also promoting well-being more broadly. For example, skill-oriented initiatives with a social-emotional learning focus have been shown to help youth develop healthier coping mechanisms and improve capabilities to address and manage social anxieties, interpersonal conflict with peers and sexual partners, feelings of anger or frustration, challenges with emotion regulation, and engagement in aggressive behaviors.⁵⁶ Investing in such efforts early on in the developmental trajectory has the potential to be effective, because research demonstrates that experiences with violence beget more violence.⁵⁷ In line with work in developmental epidemiology,^{58,59} the authors anticipate that prevention strategies that reduce the onset of more minor incidents of violence among youth (hypothesized to be early antecedents of gun violence), in turn may prevent incidents of gun violence. Other school-based and classroom-based initiatives focused on the school climate^{60–62} and engaging parents in the school community⁶³ also have been shown to have an impact on reducing aggressive and violent behaviors more broadly. At the same time, work on positive youth development programs have identified short-term impacts on reducing violent outcomes, but the long-term efficacy of such efforts is not clear.⁶⁴ Much of this work also has elucidated that more research is needed to better understand the efficacy of such preventive efforts on reducing gun violence in schools.⁶³ But these efforts can and should be considered part of a broader menu of strategies that schools pursue as they consider how best to keep their communities safe.

Bullying and warning signs

A majority of K–12 school mass shootings are perpetrated by minors,⁹ and, in many incidences, research has found that bullying—both being the target of or committing the bullying—is a major risk factor for committing school based violence.⁶⁵ An evaluation of 15 mass shootings found that 13 of the perpetrators had experienced acute or chronic rejection.⁶⁶ For example, in a case of the Sandy Hook mass shooting, the gunman had been described as “very withdrawn emotionally” and “quiet and socially awkward.”⁶⁷ In response to these commonalities between the perpetrators, Sandy Hook Promise, an organization with a mission to “create a culture engaged in preventing shootings, violence, and other harmful acts in schools,” developed the Start With Hello program and curriculum.⁶⁸ The goal of this program is to teach students to be more socially inclusive of one another, with hope that this will reduce bullying and rejection that some students might experience.

In many cases of school violence, there often also are warning signs preceding the event. A study conducted by the US Secret Service and the US Department of Education reviewed all targeted school violence incidents from 1974 to June 2000 and identified behavioral warning signs in 93% of the cases.⁶⁹ In 81% of the incidents, other people, often the shooter's peers, had some knowledge of the plans.⁶⁹ In a follow-up study conducted from 2008 to 2017, researchers found that 100% of the perpetrators showed concerning behaviors, and in 77% of school shooting incidents at least 1 person knew about the attackers plan.⁷⁰ These numbers represent an important place for an intervention, and the Start With Hello campaign could be a first step in getting individuals the support that they need. The age level–appropriate curriculum may be effective in helping students

identify possible warning signs of potential future attacks and encourage students to feel comfortable telling an adult or mentor about these warning signs without fear of retribution for themselves or the person they are concerned for.⁶⁸

State and Federal Levels

Red flag laws and extreme risk protection orders

In circumstances where the perpetrator is old enough to own a firearm, data on behavioral warning signs also suggest risk-based firearm removal laws could be an effective tool for prevention. Based on the presumption that a person's risk for violence can fluctuate over time, these laws may prevent a firearm associated tragedy by temporarily removing the firearm from the individual. These laws, often referred to as *red flag laws* or *extreme risk protection orders*, are in effect in 19 states and the District of Columbia as of July 2020.⁷¹ The law is specific to each state, but, in most cases, law enforcement or family members may petition a court to temporarily suspend an individual's right to possess or purchase a firearm. Current research is limited but shows promising evidence of the effectiveness of these state-level risk-based firearm removal policies. Two studies evaluated these laws in Connecticut and Indiana.^{72,73} The results were inconclusive for violence prevention but promising for suicide prevention. It is important, however, to recognize that this law would not have prevented the mass shooting at Sandy Hook and other school shootings like Sandy Hook. Most school shootings are perpetrated by minors who often already are unable to legally possess a firearm. As long as firearms are as widely accessible as they are in the United States, the effectiveness of this strategy against preventing school shootings still is unknown. Further research is needed in order to adequately assess the realities of both implementing these orders and their resulting effectiveness in addressing violence prevention.

Gun-free zones

In 1990, one of the most well-known instances of a federal law intended to prevent shootings in schools, the Gun-Free School Zones Act of 1990,⁷⁴ was passed. The bill outlawed any individual from knowingly possessing a firearm within 1000 ft from school (public or private) grounds, with some exceptions.⁷⁴ According to the National Criminal Justice Reference Service, the penalty for breaking this law is a fine up to \$5000 or imprisonment of up to 5 years.⁷⁵ This policy has become highly politicized in recent years. Just 3 days after the 2012 school shooting at Sandy Hook Elementary School, editorials began to appear online blaming the shooting on the fact Sandy Hook Elementary School was a gun-free zone.⁷⁶ Although proponents of the law believe this helps to keep guns away from schools, opponents of gun-free zones believe that perpetrators may target these areas due to the belief that the victims would not be able to defend themselves because they are unarmed. Despite the controversy, there currently is no peer-reviewed evidence to the effectiveness of gun-free zones.⁷⁷

Child access prevention laws

Given that a majority of school shootings are perpetrated by a minor,⁹ Child access prevention (CAP) laws could be an effective policy to prevent school shootings. CAP laws require that a firearm is stored and locked properly so that a child would not be able to access it. In most cases, some tragedy with a child must occur for these policies to be invoked.

The RAND Corporation has determined that there is substantial evidence that CAP laws prevent accidental shootings and suicides (the only policy to achieve a "supportive" rating), and there is some evidence that CAP laws also prevent violent crime.⁷⁸ In 2020, 29 states and the District of Columbia have implemented some form of CAP law, although the details can vary greatly by jurisdiction. With variation, 14 states and the

District of Columbia require only that the individual was negligent in storing and locking the firearm.⁷⁹ In the other 14 states, however, there is an additional requirement that the individual recklessly endangered their child by not properly locking and storing a firearm in order to be charged. In these states, it must be proved that the individual was aware of the risks but disregarded these dangers in their failure to secure their firearm.⁷⁹ The punishments for improper storage (either negligent or reckless) also can vary in these states from a misdemeanor to a felony.⁷⁹ Therefore, the effectiveness of these laws depends on the specific state.⁸⁰

Other gun safety laws

The authors choose to focus this discussion on the 3 policies discussed previously—red flag/extreme risk protection orders, gun-free zones, and CAP laws—because they have specific qualities to them that suggest they could directly decrease the frequency of K–12 school shootings. Other gun laws, however, such as limits on magazine size, licensing laws, universal background checks, and a ban on assault weapons, also might be effective in reducing these shootings. Research has suggested that conglomerate measures on the permissiveness of gun laws in a state show that more restrictive gun laws are associated with lower mass shootings,⁸¹ for example. Other research has found that specific policies, such as handgun purchaser licensing laws and bans of large-capacity magazines, are associated with fewer mass shootings.⁸² More research is needed, however, to determine if these results would be generalizable to K–12 school shootings.

SUMMARY

K–12 school shootings are exceedingly rare events in the United States, but even a single occurrence that places children and their well-being at-risk is 1 too many. Schools should be spaces where students are safe, supported, and able to engage, thrive, and learn. When a school shooting occurs, the harm extends far beyond those who have been physically injured or killed and can have significant effects that have an impact on the mental health, learning, and emotional well-being of children within the school community. There are several current practices and policies in place with the goal of preventing K–12 school shootings; however, these solutions must account for the well-being and developmental needs of children and ensure they are not harmful in their own ways. For example, research has illustrated that metal detectors in schools have the potential to make students feel less safe,^{32–34} and arming teachers could increase anxiety of students and teachers alike.⁴⁹ At the same time, there are other school safety efforts (for example, behavioral threat assessments, notification technologies, and emergency preparedness drills and programs, among others), which may be effective in deterring school gun violence. Rigorous research, however, is needed to evaluate the effectiveness of these kinds of tactics independently and, perhaps more importantly, in tandem and as part of a school's larger safety plan.

Additionally, some evidence suggests that investing in the implementation of positive youth development programs, increased access to comprehensive mental health care for children, and/or implementing antibullying and inclusion programs ought to be part of a broader and long-term vision for gun violence prevention. Given the critical role schools play in shaping a child's development, schools have the potential to address early antecedents of violence behavior, and investing in this kind of evidence-based programming for students could be an important component without waiting for new laws to be passed.⁸³ Lastly, and from a policy perspective, the evidence is clear that the passing of specific laws intended to prevent school shootings and other types of gun violence should be a goal—CAP laws, for example, have been

shown to be effective at preventing children from accessing firearms.⁷⁸ When taken together, this multilevel approach has enormous potential to effectively prevent school shootings and foster the long-term well-being of children.

CLINICAL CARE POINTS

- Gun violence in K–12 schools is a public health crisis that has an impact not only on the children and school staff who are directly injured and killed in these tragic events but also on all members of the school community who were indirectly exposed to this violence.
- It is estimated that more than 240,000 children have been exposed to gun violence in schools over the past 2 decades, with black children impacted at disproportionately high rates.
- K–12 schools ought to be safe spaces where children can thrive. There are limited data quantifying the short-term and long-term impacts of school shootings on child health and learning outcomes.
- Solutions to the persistence of gun violence in K–12 schools must require a multifaceted and coordinated effort that draws on a wide range of evidence-informed strategies that also consider the well-being of children in their approach.
- There is limited evidence regarding the effectiveness of physical security measures; however, school-wide efforts to address early antecedents of aggressive behaviors in youth and policies that make it harder for youth to have access to guns and promote safe firearm practices collectively could help reduce K–12 school shootings.

DISCLOSURES

The authors have nothing to disclose.

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