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Gun violence in K-12 schools in the United States: Moving towards a preventive (versus reactive) framework

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ABSTRACT

Intentional shootings in K-12 schools in the U.S. persist as a public health problem. The number of shootings in K-12 schools has increased precipitously since 2017. And with approximately 100,000 K-12 public schools nationally serving 51 million children, investing in a comprehensive gun violence prevention strategy is critical. Unfortunately, our current school gun violence prevention approach almost exclusively centers reactive strategies that are in place to respond to acts of gun violence in the moment, rather than preventive strategies that would prevent them from occurring at all. Reliance on these strategies alone, however, is not sufficient. In line with the core tenets of public health prevention and the Whole School, Whole Child, Whole Community model, we present a more expansive school gun violence prevention framework that broadens the spectrum of what constitutes "school gun violence prevention." Our work highlights how enhancing basic neighborhood and school structures—including investments in public libraries, affordable housing, and universal school-based violence prevention programs—are key to both preventing gun violence and promoting well–being. We also highlight the role of stricter gun laws, reasonable school security efforts, bystander interventions, building awareness within school communities, and meaningful investments in early interventions and mental health services. Children, who have been tragically exposed to any number of adverse experiences in the wake of the COVID–19 pandemic, deserve more reasoned choices and large-scale investments in understanding and cutting off the root causes of school gun violence; not just a reliance on strategies that focus on what to do in the moment of a violent act. As gun violence in K–12 schools persists, we must reframe the discourse about school gun violence around prevention, not reaction.

1. Introduction

1.1. Problem statement

School gun violence persists, and in fact is growing, as a public health problem in the United States (U·S). Since 2015 there have been approximately 275 intentional shootings (shootings where there was intent to harm someone else) in K-12 schools across the nation.(Federal Emergency Management Agency: Center for Homeland Defense and Security, 2021) And while schools are not the only place where children are exposed to gun violence (it is estimated that 8030 children are shot in the U.S. each year),(Brady, 2022) preventing this type of school-based violence remains extremely important, given how much time children physically spend at school and also the importance of a school environment in shaping children's health, learning, and development. Indeed, recent data estimate that over 311,000 children have been exposed to gun violence in K-12 schools since the Columbine High School shooting in 1999.(Cox et al., 2019) And these indirect forms of gun violence exposure (e.g. witnessing gunfire or hearing gunshots) have serious implications for children.(Rajan et al., 2019a; Bancalari et al., 2022a) Moreover, gun violence has only increased since the onset of the COVID-19 pandemic.(Thebault and Rindler, 2021) Although school buildings were closed for a period in 2020, shootings quickly and tragically resumed once buildings reopened.(Keierleber, 2021; Gun Violence Archive, 2022) Gun violence is now the leading cause of death among children and teens in the U.S. and gun deaths reached their

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highest level in 2021.(Gun Violence Archive, 2022; Goldstick et al., 2022) Recent work estimates that between March 2020 – March 2021, over 11 million children were exposed to at least one firearm fatality, compared with an estimated nine million children in the year prior to the onset of the COVID-19 pandemic.(Martin et al., 2022) And this exposure to gun violence continues to disproportionately impact Black, Native American, Asian Pacific Islander, Hispanic, and multiracial children in comparison to their White peers.(Martin et al., 2022)

With nearly 100,000 K-12 public schools nationally serving an estimated 51 million children,(National Center for Education Statistics, 2022) a comprehensive school gun violence prevention strategy to address this growing public health problem is, therefore, critical. Unfortunately, our current school gun violence prevention approach almost exclusively centers reactive strategies that are in place to respond to acts of gun violence in the moment of (for example, via active shooter drills and armed teachers). Reliance on these reactive strategies alone, however, is not sufficient. As has been seen with successful solutions to other public health issues,(Mozaffarian et al., 2013) responses to the ongoing school gun violence problem need to be far more strategic, multifaceted in nature, and address its upstream causes(Kim, 2019) well before a possible shooting is a threat to a school community.

In this work, we draw on the scientific evidence to present a school gun violence prevention framework that shifts the emphasis away from a primary reliance on strategies intended to react to school shootings in the moment of a violent act. Instead, our framework broadens the spectrum of what currently constitutes "school gun violence prevention." And in doing so, reimagines the prevention of school gun violence as an opportunity to meaningfully invest in schools, its surrounding communities, and by extension its children.

1.2. Conceptual models

Currently, most K-12 schools consider the prevention of gun violence to be a part of their "emergency preparedness" efforts.(Everytown for Gun Safety, 2022) While a coordinated emergency preparedness plan plays an important role in reacting to a school shooting, such efforts alone are not sufficient. If we consider the purpose of schools and their contribution to shaping the healthy development of children,(Hoglund et al., 2015; Lewallen et al., 2015; Tyack and Cuban, 1995) it's not enough for schools to be free from acts of intentional gun violence. Rather, schools must also be spaces where children can thrive, where their potential is cultivated, where they are motivated to learn, where school staff are fully supported, and where the safety of the entire school community is assured.(Hoglund et al., 2015; Lewallen et al., 2015; Tyack and Cuban, 1995; Basch, 2011) In 1995, Tyack and Cuban referred to schools as having the possibility to be "visionary spaces," shaped by the experiences of children.(Tyack and Cuban, 1995) However, more than 25 years later–alongside the rise of a multi–billion dollar school security industry(Cox and Rich, 2018)–it is the persistence of intentional gun violence that overwhelmingly shapes many aspects of a school; including its safety policies, disciplinary strategies, physical layout, and budget. We propose that there is a far better way to prevent intentional gun violence in schools, that thoughtfully attends to the well-being of children and the broader school community in the process.

We have drawn predominantly on two conceptual models to inform our proposed approach. First, public health as a field is predicated on three levels of prevention: primary, secondary, and tertiary prevention and with the understanding that most of our public health resources should be devoted to primary prevention efforts intended to reduce the likelihood of violence occurring in the first place.(Centers for Disease Control and Prevention, 2022; Price and Khubchandani, 2019) These types of investments–coupled with secondary and tertiary preventive efforts intended to contend with the short and long-term impacts of school gun violence exposure–can together inform a more effectual strategy. Second, and in line with previous work,(Rajan et al., 2017) we look to the Whole School, Whole Community, Whole Child (WSCC) model, which recognizes the inherent relationship between health and learning and underscores the important relationship between schools and communities.(Lewallen et al., 2015) The WSCC calls for the implementation of evidence-based policies and practices that together contribute to a safe physical school environment, a positive and nurturing social and emotional climate, and increased access to psychological supports, among other needed health programming and social services.(Lewallen et al., 2015) And the WSCC model also prioritizes the well-being of children by underscoring that all students who come to school should be healthy, safe, engaged, challenged, and supported. (Lewallen et al., 2015) These core tenets of the WSCC have directly informed the school gun violence prevention framework we are presenting here.

While these conceptual models focus primarily on social determinants of health and center investments, policies, and practices that would fundamentally shape the environments in which children live and learn, the existing research on school shooting perpetrators as individuals – while limited – also provides some additional insight into how we might approach the prevention of intentional school shootings. It is important to underscore that the available research in this area consists mostly of case-studies of the lives and motivations of the perpetrators and as such, there is no accepted "profile" of a school shooter. (Bonanno and Levenson Jr., 2015) Indeed, the National Association of School Psychologists (NASP) specifically states that schools should avoid profiling students in this manner.(National Association of School Psychologists, 2022) We do know, however, via an analysis of 343 school shootings in the U.S., that among the instances where a firearm could be identified, a handgun was used in 75% of the shootings.(Paradice, 2017) This same study found that, among the school shooting scenarios where at least four individuals were injured, the shooter died by suicide over half (55%) of the time.(Paradice, 2017) Moreover, this work also found that in only two cases did law enforcement kill the school shooter. (Paradice, 2017)

Other work has also explored patterns among school shooters, which support the need for concerted preventive investments in the school environment over more reactive approaches to school violence. For example, in a recent case-study examining the lives of twenty perpetrators and the presence or absence of both negative (depression, violent obsessions, family conflict, threats, school problems) and positive psychosocial characteristics (goals related to athletics and academics, participations in school, community, religious groups, and others), the authors found that none of the school shooters had any of the positive psychosocial characteristics.(Vitz and Faria, 2020) They went on to suggest that creating more positive, pro-social meaning for these school shooters may have helped to prevent these shootings.(Vitz and Faria, 2020) Similarly, the "Five-Stage Sequential Model" recently proposed by Levin and Madfis has sought to explain why individuals may perpetrate violence at their schools. Indeed, in this work the authors argue that long term frustration and stress in early life (termed "chronic strain"), results in a lack of pro-social support systems ("uncontrolled strain").(Levin and Madfis, 2009) Then, if a real or imagined negative event occurs (termed "acute strain"), this may lead to fantasizing and planning of a mass murder in order to reclaim control.(Levin and Madfis, 2009) Importantly, the authors also note that if the individual is able to obtain firearms and has firearm proficiency, then in rare cases they may commit a school shooting.(Levin and Madfis, 2009) This research, therefore, also suggests that reducing chronic and uncontrolled strain, increasing pro-social support systems in school and the community, and reducing youth access to firearms, may together be helpful in preventing these types of violent incidents.(Levin and Madfis, 2009)

Encouragingly, there is recent work on school shootings that has detailed a more expansive preventive approach.(Everytown for Gun Safety, 2022; Rajan et al., 2017; Rajan, 2021; Interdisciplinary Group on Preventing School and Community Violence, 2022; Price and Khubchandani, 2019) However, these efforts have stopped short of drawing clear connections between a school and its surrounding neighborhoods.

In addition, and although much of this work recognizes the known negative health implications associated with childhood gun violence exposure,(Rajan et al., 2019b; Bancalari et al., 2022b) most school gun violence prevention efforts do not address how crucial it is for schools to attend to the lingering trauma often experienced by members of a school community who have been exposed to gun violence. This is particularly important as harms associated with this kind of trauma can propagate more violence.(Rajan et al., 2019b; Bancalari et al., 2022b)

2. A preventive framework

In line with these models and drawing on an extensive review of the existing literature, we therefore present a framework for preventing intentional gun violence in K-12 schools.

2.1. Primary prevention

As noted earlier, primary prevention involves coordinated efforts that address upstream drivers of intentional school gun violence, fundamentally improve conditions in schools and communities, and seek to intervene before such violence occurs.

(1) *Community investments.* There is a significant body of research that has demonstrated the enormous value of investing in community structures and resources as ways in which to effectively reduce gun violence, while also improving a myriad of other health outcomes(Culyba et al., 2016; Branas et al., 2021) While this body of research has largely focused on community–level gun violence, there are important connections to school gun violence prevention as well. Attention to these connections is particularly salient since it is well established that experiences with violence beget more violence.(Brendtro and Long, 1994) As has been discussed in the context of other social phenomena, the boundaries between a school and the neighborhoods that surround a school are "porous".(Leahy et al., 2016) In other words, gun violence is not always geographically isolated to a school building or to its surrounding community. And, in fact, as firearms may travel back and forth between places, so too does the threat and experience of gun violence. This understanding is reflected in the WSCC model and other recent research, which highlights that what a child experiences in their community naturally influences their school experience.(Lewallen et al., 2015; Rajan et al., 2017; Rajan et al., 2019b) As such, a comprehensive school gun violence prevention framework must consider the neighborhoods within which a given school is situated and the experiences with gun violence that a child might experience outside of school. And data support this; for example, previous research has shown that adolescents who choose to carry a firearm are significantly more likely to feel unsafe–not just at school, but also on their way to and from school.(Ruggles and Rajan, 2014)

Community–level interventions that have specifically been shown to meaningfully reduce rates of gun violence include improving housing conditions(Branas et al., 2021; Kondo et al., 2018) and enhancing street lighting.(Culyba et al., 2016; Branas et al., 2021) Increasing access to affordable housing in urban areas in particular (e.g. via rent subsidies) is consistently associated with reductions in violent crime within that community or neighborhood.(Kondo et al., 2018) And research confirms that access to affordable housing and these corresponding connections to improved community outcomes is important in non-urban areas as well.(Massey et al., 2013) Similarly, street lighting and improved exterior lighting on school grounds have also been embedded into design suggestions for improving school safety in urban and non-urban areas alike.(Erwine, 2006) Perhaps unsurprisingly, these place-based solutions have also demonstrated significant and sustained benefits in several other ways that go beyond reductions in gun violence. For example, children with access to stable affordable housing are significantly less likely to experience food insecurity, developmental delays, and other poor health outcomes.(Fenelon et al., 2018; Hatem et al., 2020)

Research also confirms that equitable access to early childhood education during a child's preschool years (which includes support for caregivers and access to needed health services)(Branas et al., 2021; Reynolds et al., 2001) and access to community–based programming that engages youth during later adolescence (such as programs that incorporate job and educational training)(Branas et al., 2021; Chicago Sun Times, 2022) should serve as fundamental components of a gun violence prevention strategy. Our review of the literature also highlights the value of investments in public libraries, which have been shown to not only improve population health, but to also reduce disparities in community health outcomes and specifically mitigate rates of crime. (Philbin et al., 2019; Neto et al., 2021)

Taken together, investments in these evidence–informed primary prevention strategies focused on reducing community gun violence and improving community well-being would significantly contribute to disrupting cycles of violence and disenfranchisement that are known drivers of gun violence. They would simultaneously improve upon the poor health and economic outcomes that typically stem from gun violence exposure. And these fundamental neighborhood changes would also considerably reduce the level of gun violence that children and their families are exposed to. This, in turn, would improve well–being and ultimately foster more positive connections between K–12 schools and their surrounding communities. Given the disproportionate burden of community gun violence exposure placed on children of color,(Goldstick et al., 2022; Martin et al., 2022) the benefits of investing in communities as part of a broader school violence prevention plan are significant. And as children are exposed to gun violence outside of school (and for some, this occurs on their way to and from school),(Rajan et al., 2019a; Goldstick et al., 2022; Martin et al., 2022; Ruggles and Rajan, 2014) a prevention strategy that considers investments in the neighborhoods surrounding schools is needed.

(2) *Investments in the school environment.* At the same time, there is considerable research on the role of the school environment itself and its relationship to school violence. As underscored in recent research,(Kolbe, 2020) we can–and should–draw on the efforts we know effectively prevent other forms of school violence to help understand the best ways to address school gun violence. And we suggest that primary prevention efforts in this context means prioritizing policies and practices that will impact students well before there is motivation to bring a firearm to school with the intent of causing harm. Indeed, if we extrapolate from the school violence literature and also draw on core WSCC principles, (Lewallen et al., 2015) there is extensive research that supports the benefits of centering a primary prevention approach to gun violence by investing in a school's environment to ensure all children feel safe, secure, and valued.(Rajan et al., 2017; Reeping et al., 2021; Johnson, 2009) This involves the implementation of programs and practices that cultivate a sense of belonging, foster positive connections between children, their peers, and teachers, and encourage greater agency in children.(Rajan et al., 2017; Reeping et al., 2021; Johnson, 2009; Leurent et al., 2021; Lesko, 2012) For example, one review of school-based practices associated with violence reduction has emphasized the importance of positive school climate indicators, including positive teacher–-student relationships, an orderly classroom environment, establishment of clear rules that are perceived to be fair by students, and school–wide efforts (through extracurriculars and student organizations) that promote positive peer interactions.(Johnson, 2009) More recent work has also established the relationship between school disorder, a lack of school connectedness, and

displays of more aggressive behavior among students.(Hurd et al., 2018)

Universal school–based violence prevention programming has demonstrated effectiveness as well.(Hahn et al., 2007) Though not specific to gun violence, several existing programs have been shown to reduce levels of school violence outcomes, with noted positive benefit–to–cost ratios. Specifically, the most effective school–based programming efforts have been those that promote prosocial skill development (such as anger management, empathy, problem-solving, and decision-making) alongside the promotion of social norms for non–violence.(Gavine et al., 2016) Evidence also suggests that school–based restorative justice efforts may hold some promise in the context of violence prevention, as school administrators seek alternative ways to more compassionately address issues of conflict and violence that arise during the school day.(Fronius et al., 2016; Payne and Welch, 2015; Payne and Welch, 2018) In moments of a dispute, restorative justice practices may include encouraging students to work together with adult support and guidance to resolve conflicts (for example, via peer mediation). And while models of restorative practices in schools do vary, they maintain a focus on bringing together all parties involved in a particular altercation to collaboratively problem–solve as members of a shared community.(Payne and Welch, 2015; Payne and Welch, 2018) Compare this to current zero–tolerance policies that have been grossly ineffective at deterring violence nor promoting positive student outcomes.(American Psychological Association, 2008) Schools with a restorative justice focus have also typically sought to dismantle disciplinary policies that tend to be oppressive or criminalizing in nature and that are known to undermine perceptions of safety among its school community.(Long et al., 2022)

In sum, the prioritizing of positive school climate indicators, the implementation of universal school–based violence prevention programming focused on prosocial skill development, the use of restorative justice–oriented conflict resolution practices, and the removal of punitive disciplinary policies together serve as critical components of an evidence–informed school gun violence prevention framework.

(3) *Reducing access to firearms for proscribed users*. There are currently over 400 million firearms in circulation in the U.S; a figure that increased considerably during the COVID-19 pandemic.(Schleimer et al., 2021; Ssentongo et al., 2021) And the existing research is very clear that an increased presence of firearms leads to an increased risk of firearm violence. However, strengthening gun laws has long been politically divisive and often difficult to expediently advance.(Branas et al., 2021) Nonetheless, and given the existing evidence that has rigorously evaluated the effectiveness of specific laws, our proposed school gun violence prevention framework recognizes the critical need for the coordinated implementation of policies that together are known to reduce access to firearms and, by extension, the likelihood of gun violence in K-12 schools.(Reeping et al., 2022) Research has discussed the ways in which firearm availability places youth at heightened risk.(Chavez et al., 2022) Recent work evaluated the association between the permissiveness of state firearm laws, gun ownership rates, and school shootings. And these results illustrated that after accounting for key confounders, more permissive state firearm laws and higher rates of gun ownership are associated with higher rates of school shootings.(Reeping et al., 2022) These include laws that are relevant specifically to school buildings (for example, under what circumstances might a firearm be allowed on school property), laws that may make it easier for a school-aged child to access a firearm, and laws that impact the lethality of an intentional shooting.(Reeping et al., 2022) Together such policies impact school shootings(Reeping et al., 2022) and therefore ought to be a part of a meaningful school gun violence prevention framework. More specifically, such policies include the following: bans on assault weapons,(Post et al., 2021) large capacity magazine bans,(Klarevas et al., 2019) "red flag laws" (also known as extreme risk laws),(Wintemute et al., 2019) permit requirements to purchase a firearm,(Webster et al., 2020) ensuring all states raise the minimum age to purchase semi-automatic firearms to 21 years (this is especially important as most perpetrators of school gun violence are school–aged),(Reeping et al., 2022) child access laws,(RAND Corporation, 2020) and background checks.(Wintemute, 2018) The Biden Administration announced earlier this year that they will begin regulating "ghost guns" like they do other firearms,(The White House, 2022) which may also play a role in contributing to reductions in gun violence. Lastly, given the high rates of community gun ownership and its known relationship to intentional shootings in K–12 schools,(Reeping et al., 2022) we should do all we can to promote safe firearm storage practices (that is, storing guns in homes locked, unloaded, and separately from ammunition).(Be Smart for Kids, 2021) This is especially important, because research has confirmed that firearms used in school shootings were taken from the perpetrator's home or from a close relative more than 70% of the time, and in half of those cases the firearm was not securely stored.(United States Department of Homeland Security, 2019) Promising research has highlighted how pediatricians, school nurses, and other stakeholders can play an active role in educating families about safe firearm storage.(Fuzzell et al., 2022)

2.2. Secondary prevention

The next component of our proposed framework involves the implementation of evidence-informed secondary prevention strategies. These are largely needed when comprehensive primary prevention efforts are not in place, but also because no single preventive strategy is sufficient on its own. The secondary efforts presented here are in line with certain current school safety approaches and tend to consider the more immediate threat of gun violence in K-12 schools.

(1) *School security*. Following a school shooting, we often hear about the need for more security, police, and surveillance as ways to prevent such incidents from happening in the future. However, despite their widespread use in thousands of K–12 schools across the U.S., there is extremely limited evidence as to the effectiveness of these approaches. Of the few existing strategies that have been studied, several of them (including arming teachers and/or school resource officers with firearms, utilizing metal detectors, implementing zero–tolerance policies, and using anonymous reporting systems) currently have no demonstrable evidence as to their effectiveness(American Psychological Association, 2008; Rajan and Branas, 2018; Messman et al., 2022) They are also expensive and may have unintended negative impacts on children's perceptions of safety at school. Moreover, the effectiveness of many other strategies (for example, the presence of indoor bulletproof structures and monitored school entryways) have yet to be rigorously studied. However, one current school security practice (behavioral threat assessment) does have a more extensive evidence base on which to draw.

There is considerable evidence on behavioral threat assessment demonstrating that it is a useful risk–management tool that should be readily implemented as part of a school gun violence prevention strategy. Broadly speaking, behavioral threat assessment is a process through which a team of trained school staff are made aware of a threat made by a student. The assessment process then guides the school through how to respond, deescalates the threat itself, and importantly then attends to the needs of the student who made the threat in the first place.(Cornell and Maeng, 2018; Maeng et al., 2020; Burnette et al., 2020) There has

been a significant amount of research conducted on this process and its effectiveness has illustrated that schools who implemented these guidelines, while also using fewer punitive disciplinary approaches, have been able to successfully intervene and prevent the onset of potentially violent incidents.(Cornell and Maeng, 2018; Maeng et al., 2020; Burnette et al., 2020)

(2) *Bystander responses and interventions.* There is considerable research on the role of bystanders in influencing bullying and other aggressive behaviors during the school day and from which we can draw on to better understand risks for violence perpetration as well. For example, some work has described how even passive bystander behavior – in other words, a lack of intervention in the moment – can inadvertently enable contentious interactions between peers to escalate into more serious forms of violence.(Wilson-Simmons et al., 2006) Conversely, research has highlighted the connections between a positive bystander (one who discourages the contentious interaction and/or redirects the situation), a positive school climate, and decreases in aggressive behaviors at school.(Children's Hospital of Philadelphia, 2020; Storer et al., 2017) It is worth noting here that previous work utilizing data on school shooting perpetrators found that the majority of perpetrators exhibited concerning behavior prior to a school shooting attempt.(United States Department of Homeland Security, 2019) This too highlights the importance of building awareness, communication, and promoting positive bystander behavior among students and other members of a school community. Though the nature of "concerning behaviors" do vary considerably, there are warning signs that some school violence prevention programs are using to encourage students and school staff alike to pay attention to.(Sandy Hook Promise, 2022) These signs include withdrawing from friends or school activities, making statements about self-harm, engaging in bullying behaviors, and/or making direct and violent threats towards others. (Sandy Hook Promise, 2022) School psychologists consistently reiterate that there is no "typical" profile of a school shooter and that profiling students can in and of itself be problematic.(National Association of School Psychologists, 2022) However, as part of a larger prevention framework, the existing research suggests that it is important to encourage students to confidentially share any concerns or observations they may have with a trusted adult.(Kowalski, 2022) This also speaks more broadly to the importance of students having access to and connections with adults whom they feel are supportive, caring, and can be comfortable speaking with; an important component of a positive school climate.(Lewallen et al., 2015)

(3) *School environments and disparities in student outcomes.* As we discuss school security and consider the best ways to reduce school gun violence, it is important to recognize the ways in which many existing security features also exacerbate disparities in school discipline outcomes and worsen overall experiences for children, particularly children of color. This is particularly concerning as one of the core principles of the WSCC emphasizes that a positive social and emotional school climate is foundational for student learning and development.(Lewallen et al., 2015) Perpetrators of intentional school gun violence are typically in their teens and are middle-class, White males, who live in suburbs or rural neighborhoods and with parents that own firearms.(United States Government Accountability Office, 2020) Despite these known demographics, "hardening" of K–12 schools via several of the security strategies described above is more likely to occur in schools that are primarily non–White and in urban areas of lower socioeconomic status, even after accounting for neighborhood violent crime rates.(Farmer, 2010; Gastic and Johnson, 2015) Thus, schools appear to differentially employ security interventions and disciplinary action based on sociodemographic factors unrelated to school safety.(Gastic and Johnson, 2015; Prins and Kajeepeta, 2019) Critics have argued that this criminalizes students for minor misbehaviors, possibly provoking pathways into the criminal justice system, a phenomenon often described as the school-to-prison pipeline.(Gastic and Johnson, 2015; Prins and Kajeepeta, 2019; Prins et al., 2022)

Some patterns of school security usage are associated with increased exposure to crime and violence at school and misusage of security may have detrimental effects on academic outcomes, especially heavily surveilled high schools serving predominantly low socioeconomic students. (Gastic and Johnson, 2015; Prins and Kajeepeta, 2019; Prins et al., 2022; Zimmerman and Astor, 2021) In this way, school securitization is often part of a broader, misunderstood policy trend to merely manage, rather than repair, consequences of disinvestment, economic austerity, and unprecedented social inequality. In fact, it is important to note that under the Elementary and Secondary Education Act and in every state across the U.S., a child who brings a gun to school must be expelled for at least one year.(Office of Juvenile Justice and Delinquency Prevention, 2022) This type of punitive response–while it temporarily "solves" the problem by removing the student from the physical school building–is hardly an effective solution on its own. In line with the tenets of the WSCC, a meaningful gun violence prevention approach should aim to also understand–and more importantly address–why a child might be driven to carry a firearm in the first place. And given the established importance of children maintaining positive connections in their schools,(Hurd et al., 2018) schools often serving as the source of critical support and needed resources,(Lewallen et al., 2015; Basch, 2011) and also given the research on zero-tolerance policies that has underscored their lack of effectiveness,(American Psychological Association, 2008) it certainly seems reasonable to rework our current response to firearm possession in such a way that it is not solely punitive in nature. One immediate and feasible alternative could be for schools to instead employ the aforementioned behavioral threat assessment process(Cornell and Maeng, 2018; Maeng et al., 2020; Burnette et al., 2020) in this situation as a more effective response. Data support that there are numerous factors (including a lack of perceived safety at school and youth feeling unsafe as they walk to and from school) directly associated with youth firearm possession.(Ruggles and Rajan, 2014) Thus, attention to those underlying causes remains critical to preventing school gun violence and underscores the value of emphasizing primary prevention efforts.

2.3. Tertiary prevention

The last component of our proposed framework recognizes the need for tertiary prevention strategies, intended to mitigate harm when an intentional school shooting occurs alongside efforts intended to respond to the short– and long–term consequences of exposure to gun violence.

(1) *Lockdown drills.* Lockdown drills are currently implemented in over 95% of K–12 public schools across the U.S,(Wang et al., 2020) although there is currently mixed evidence and the nature of these drills vary considerably from school to school. There is no evidence that lockdowns themselves are effective at deterring intentional gun violence, rather, it is a strategy framed by experts as an emergency response tool.(Schildkraut et al., 2019) Research has suggested that indicators of poor mental health among students (including symptoms of anxiety and stress) increase considerably following participation in these drills.(ElSherief et al., 2021) However, when implemented in developmentally appropriate ways that are aligned with best practices put forth by NASP, research has shown that lockdown drills can significantly improve perceptions of safety and increase students' preparedness for a gun violence emergency.(Schildkraut et al., 2019) The

existing research specifically suggests that to be the most effective in terms of emergency preparedness, while also minimizing any potential trauma to members of the school community, (Schildkraut et al., 2019; Schildkraut and Nickerson, 2022) the lockdown drill process should utilize clear and simple language, (Schildkraut et al., 2019; Schildkraut and Nickerson, 2022; I love u guys Foundation, 2022) be planned and overseen by an interdisciplinary team of school staff that include teachers, mental health professionals, school leaders, and facilities personnel, (Schildkraut et al., 2019; Schildkraut and Nickerson, 2022; I love u guys Foundation, 2022) be explicitly presented as a drill, (Schildkraut et al., 2019; Schildkraut and Nickerson, 2022; I love u guys Foundation, 2022) and should incorporate time immediately afterwards for students to ask questions and process as needed.(Schildkraut et al., 2019; Schildkraut and Nickerson, 2022; I love u guys Foundation, 2022) Taken together and given the available evidence, it seems reasonable to consider the use of lockdown drills–when informed by these existing best practices–as a tool that may mitigate harm when a shooting occurs.

(2) *Mental health and early interventions.* Because gun violence is so ubiquitous and its exposure places children at heightened risk for poor physical and mental health outcomes,(Keierleber, 2021) the third component of our proposed school gun violence prevention framework calls for an investment in efforts that support school communities in the aftermath of gun violence exposure. Though some perpetrators of gun violence may experience symptoms of mental illness, most individuals who have a mental illness are not violent; and in fact, are far more likely to be victims of violence. (Thornicroft, 2006) However, attention to mental health in the context of supporting children following exposure to gun violence remains extremely important, and again reflects one of the core tenets of the WSCC.(Lewallen et al., 2015) Research on the impact of childhood exposure to adverse experiences has identified specific pathways that can place children at significantly heightened risk for numerous long–term poor health outcomes (including an increased likelihood for violence perpetration, substance misuse, and poor chronic health).(Rajan et al., 2019a) But these serious outcomes typically only manifest if there are limited protective factors in place and no early intervention efforts made available in the aftermath of exposure. That is, if a child experiences this kind of trauma without any meaningful intervention or support.(Asmussen et al., 2019)

Therefore, a gun violence prevention strategy must ensure that schools have the resources and infrastructure in place to attend to the lingering trauma often experienced by members of a school community who have either been directly or indirectly exposed to gun violence both during and outside of the school day.(Bancalari et al., 2022a) And this reasonably includes consistent and equitable access to comprehensive mental health care. There is an extensive body of work that has discussed specific ways in which to increase access to mental health services in school and communities: expanding the capacity of child mental health services in schools by hiring more school counselors, school psychologists, and other qualified and trained school–based mental health professionals, training teachers, parents, and even siblings so they are collectively able to provide support to students who are at particular risk for poor mental health outcomes during and outside of the school day, increasing the number of state and local grants made available directly to school districts to increase the availability of mental health services, and connecting K-12 schools directly with local community–based–organizations already providing needed services to broaden the range of options available to children (for example, via grief counseling or family therapy).(Everytown for Gun Safety, 2022; Brueck, 2016) Sufficient and ready access to these resources have always been hard to come by (particularly in communities where gun violence is the most prevalent). And the COVID-19 pandemic has further exacerbated disparities in access, thus making it even more critical to urgently invest in these resources.

There are also school–wide interventions that have been shown to be both feasible to implement and effective at specifically reducing post-traumatic stress disorder (PTSD). This is especially important in the context of school gun violence, as PTSD harms propagates more violence if not effectively treated. Specific programmatic examples include the Cognitive Behavioral Intervention for Trauma in Schools (CBITS) program (which has been used with children from late elementary school through high school)(Cognitive Behavioral Intervention for Trauma in Schools, 2022) and Multimodality Trauma Treatment (MMTT), developed for use among children ranging in age from 6 through 18 years. (The National Child Traumatic Stress Network, 2012) Research in this area has highlighted how this specific type of programming should be implemented alongside practical approaches in the classroom, such as the use of the "Listen, Protect, Connect" method,(Schreiber et al., 2006) which is currently considered best practice for psychological first aid among teachers and students in the aftermath of a crisis.

(3) *Commitment to trauma-informed schools.* In addition to increased access to mental health care and school–wide efforts to respond specifically to PTSD, data have indicated that a commitment to trauma–informed schools can also collectively help mitigate additional individual harms associated with school gun violence exposure. The National Child Traumatic Stress Network and others have identified key elements that comprise a trauma-informed school, such as actively assessing symptoms of traumatic stress, working closely with families to best meet the individualized needs of students, revising school discipline policies to be less punitive in nature, and collaborating with local community resources to ensure that children and their families are supported outside of school hours.(The National Child Traumatic Stress Network, 2022) All of this assumes, however, that schools are well–supported with a sufficient number of staff, that school staff have regular access to and are engaged in relevant professional development, that school staff who may also be experiencing trauma or secondary trauma are supported with resources of their own, and that these kinds of trauma–informed efforts are not being countered by the presence of tactics or policies that criminalize children in the name of safety.

3. An observation on funding

What we have proposed here is a more expansive and effective framework for preventing intentional gun violence in K-12 schools across the U.S. By drawing on the existing evidence and actively centering the needs of children in the process, our approach substantially broadens the concept of "school gun violence prevention." Instead of relying solely on tactics intended to respond to intentional gun violence in the moment, we propose specific investments, mostly at the school– and neighborhood–levels, that disrupt upstream drivers of gun violence. We propose that these efforts should be coupled with specific gun laws, reasonable and evidence–informed school security efforts, a dismantling of punitive disciplinary strategies, and the provision of consistent mental health and early intervention support for children and their communities in the aftermath of gun violence. Together, these elements inform a framework which would not only reduce intentional gun violence in K–12 schools, but would almost certainly result in improved health, developmental, and learning outcomes for children across disparate communities.

To pursue this kind of fundamental shift is not easy. Doing so requires bold, forward–thinking, evidence–driven leadership. For years, the solutions to school gun violence have been fairly myopic in nature. Therefore, to accomplish what is proposed here, we need our federal,

state, and local governments, in partnership with K–12 school districts, to be willing to reallocate existing resources in a more strategic manner. K–12 public schools across the U.S. have relatively limited resources to begin with. And many existing gun violence prevention tools are quite expensive. For example, some have estimated that the cost of arming one school resource officer with a firearm in every school across the U.S. would account for almost 30% of the current federal education budget. (Rajan and Branas, 2018) And just one metal detector costs several thousand dollars. In New York City Public Schools, over $400 million dollars per year are devoted towards "school safety", the majority of which goes to hiring police.(Children's Defense Fund New York, 2020) Imagine if even some of these funds went instead towards evidence-informed gun violence prevention measures? Encouragingly, the existing scientific literature provides insight into the ways in which preventing gun violence in K–12 schools is possible. Far too many school communities have had to contend with the tragedy of intentional gun violence for us to not consider a more effective and sustainable alternative.

4. Conclusions

A more expansive and evidence–informed strategy to prevent intentional shootings in K-12 schools should include the enhancement of basic neighborhood and school structures–including investments in affordable housing, public libraries, and universal school-based violence prevention programs. These should occur alongside new gun laws, evidence–informed school security efforts, and meaningful investments in early interventions and mental health services. Policymakers and school districts often set these fundamentals aside when they are most needed (like in the aftermath of a school shooting), and instead often double down on punitive, yet unproven, school discipline strategies, and relying predominantly on reactive school security tactics and greater police presence. Children, who have also been tragically exposed to any number of adverse experiences in the wake of the COVID-19 pandemic, deserve reasoned choices and large-scale investments in understanding and cutting off the root causes of school gun violence–not just a reliance on strategies that focus on what to do in the moment of a violent act. As intentional gun violence in K–12 schools persists as a public health problem in the U.S., we must reframe the discourse about school gun violence around prevention, not reaction.

CRediT authorship contribution statement

Sonali Rajan: Conceptualization, Investigation, Writing – original draft, Writing – review & editing, Supervision. **Paul M. Reeping:** Investigation, Writing – original draft, Writing – review & editing. **Zahra Ladhani:** Investigation, Writing – original draft, Writing – review & editing. **Lalitha M. Vasudevan:** Writing – review & editing, Supervision. **Charles C. Branas:** Conceptualization, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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