



# Reviewing the Literature on the Impact of Gun Violence on Early Childhood Development

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## Abstract

**Purpose of Review** To examine the impacts of gun violence on early childhood development including early childhood mental health, cognitive development, and the assessment and treatment of survivors.

**Recent Findings** The literature reflects that gun violence exposure is often associated with significant mental health outcomes including anxiety, post-traumatic stress, and depression in older youth. Historically, studies have focused on adolescents and their exposures to gun violence through proximity to gun violence within their communities, neighborhoods, and schools. However, the impacts of gun violence on young children are less known.

**Summary** Gun violence has significant impacts on mental health outcomes of youth aged 0–18. Few studies focus specifically on how gun violence impacts early childhood development. In light of the increase in youth gun violence over the past three decades with a significant uptick since the onset of the COVID-19 pandemic, continued efforts are needed to better understand how gun violence impacts early childhood development.

**Keywords** Gun violence · Trauma · Mental health outcomes · Early childhood development

## Introduction

Many children and adolescents are directly and indirectly exposed to gun violence each year through their communities, home, school, and the media. Exposure to gun violence can have devastating impacts on children associated with later psychiatric and physical health problems extending into adulthood [1]. One common finding for increased risks for adverse outcomes includes being in close proximity to violence as a child or adolescent. The traumatic implications of gun violence

extend beyond the immediate survivor, with consequences impacting the surrounding communities, neighborhoods, and support systems [2]. While the effects of gun violence are most commonly associated with older youth and adults, increased incidents involving young children have made it impossible to ignore how pervasive its effects are within this population [3••].

Even with increasing exposures, a dearth of information known on precisely how gun violence impacts very young child development or how to mitigate the development outcomes caused by experiencing gun violence raises cause for concern. The aim of this review is twofold. The first aim is to assess and summarize the current literature on the impacts of gun violence on early childhood development. And the second is to highlight commonalities and trends across the extant literature around risk factors of early childhood gun violence exposure. Importantly, for the purposes of this review, early childhood development broadly refers to mental health and cognitive development.

## Trends in the Literature

The literature reviewed, focused primarily on work published from 2020 to 2023, though highly relevant literature from previous years has been included to provide a

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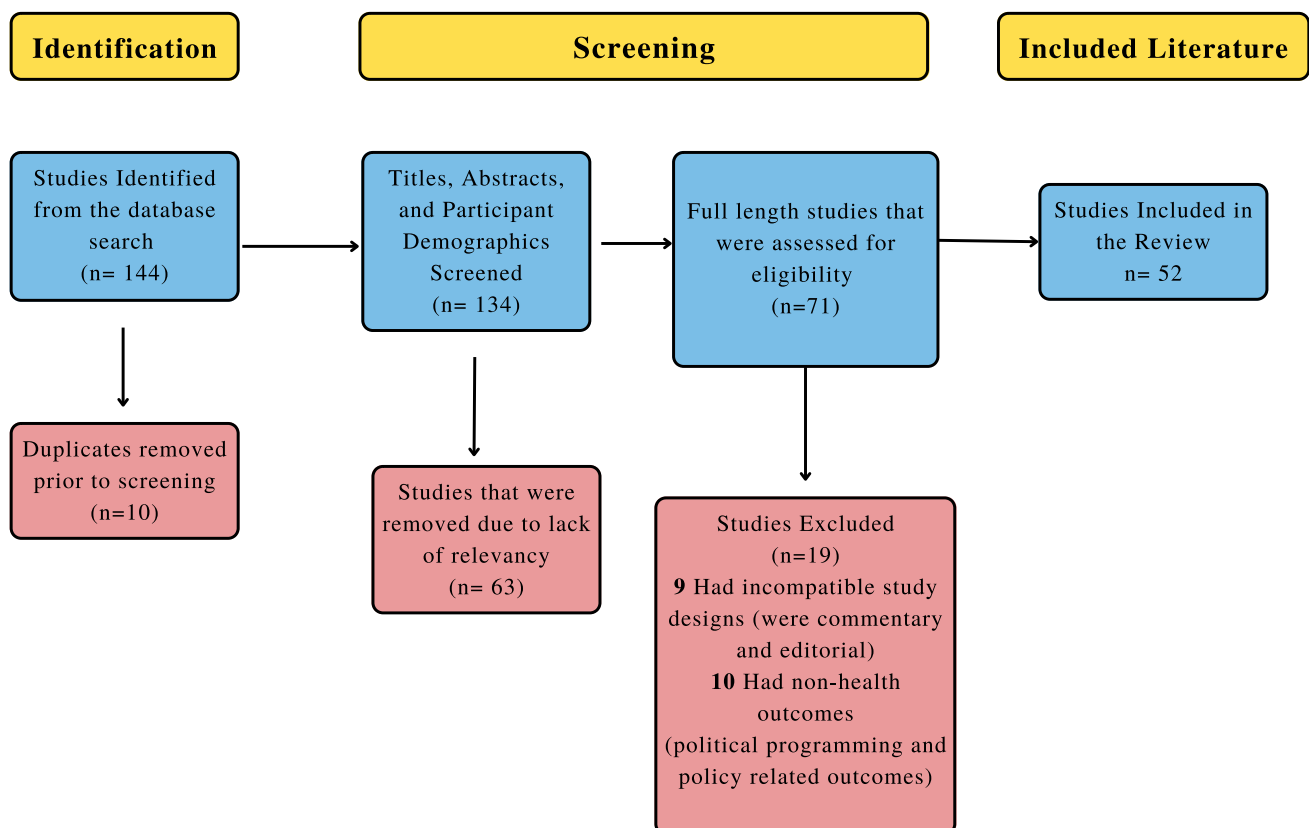
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more comprehensive understanding of gun violence and its impact on early childhood (see Fig. 1). In the past several years, the prominent trends in gun violence research including young children have identified associations between gun violence and race, gender, socioeconomic status, and community environment [2, 4–7]. Extant literature supports the associations between neighborhood conditions, community level factors, and the influence that these contexts have on a child’s cognitive, emotional, and social health. Taken in culmination, these findings illustrate potential associations between various factors that may increase a young child’s exposure to gun violence.

Studies aimed at identifying the racial associations for gun violence prevalence among young children include Rajan and Branas’ study on pre and post pandemic gun violence exposures and Kwon and Iverson’s study on pediatric gun violence injuries. Rajan et al. study [6] on the racial disparities in childhood exposure to gun violence before and after the pandemic was the most prominent study that assessed the association between race and gun violence and included young children, aged 5 to 8, in their participant sample. Rajan and Branas identified that children under 17, including young children who live in more socially vulnerable communities, are disproportionately

impacted by violence, such as gun violence. They further found that Black children were more likely than non-Latinx white children to be exposed to neighborhood firearm violence and that children in the South experienced higher baseline levels of violence exposure than children in the Northeast and Midwest [6]. Similarly, Kwon et al. study on the exposure of pediatric patients to violence, which included children aged 0 to 8, found that Black children were more likely to experience firearm-related injuries and that children living in socially vulnerable communities were disproportionately impacted by violence, including gun violence [8].

In the same way that race is associated with heightened exposure to gun violence among young children in these studies, community environment has also been found to have a prominent association with gun violence exposure. Tracy and Miller’s study on how community environment is associated with gun violence found that community socioeconomic distress significantly predicts pediatric exposure to gun violence [9]. This finding highlights that children in under resourced communities have an increased risk of being exposed to gun violence. Relatedly, Beardslee and Dorchery’s research on childhood socioeconomic disadvantage and its association found that childhood disadvantage



**Fig. 1** PRISMA flow chart demonstrating the literature search, screening process, and the results of the review

shown as early as 7 was strongly associated with adolescent gun violence exposure [10]. Both of these studies highlight that socioeconomic status and community environment have relevant, and often overlapping, associations with the exposure of young children to gun violence.

## Trends in Gun Violence Incidence

Until 2020, motor vehicle crashes (both traffic-related and non-traffic-related) were the leading cause of death among children and adolescents [11]. However, in 2020, firearm-related injuries passed motor vehicle crashes as the leading cause of death in this group [11]. While the majority of firearm-related fatalities are among adolescents, there is still a substantial amount among young children [11]. Kalesan and colleagues found increasing trends in the number of school shootings between 2013 and 2015, with 154 during this time period (35, 55, and 64, respectively, per year) [12]. Despite this, school shootings still make up less than 1% of all firearm deaths in school-aged children and adolescents. However, children are still increasingly involved in firearm deaths, with the number of 0–4 year olds killed by firearms increasing from 87 in 2019 to 135 in 2020. In 2020, 63% of these deaths were due to homicide and 30% were unintentional [11, 13].

The public health crisis of gun violence escalated even more during the COVID-19 pandemic with multiple studies reporting increased gun violence [3••, 14–16]. The literature attributes this increase to several potential factors including an increase in firearm purchases during the pandemic, children staying at home during the pandemic where they might be in close proximity to guns, and increases in firearm-related urban and interpersonal violence [3••, 11]. Khubchandani and Price also found that people living with children at home were more likely to purchase firearms during the pandemic [17]. In a cross-sectional study conducted by Peña and Jena analyzing gun-related deaths of children (17 and under) between 2014 and 2022, the 28 day moving averages for the number of children killed during this timeframe has a clear upward trend [14]. Notably, the number of deaths increased from March 16th 2020 onwards with an estimated 1.12 additional children killed each day [14]. In a similar study conducted by Donnelly et al. that also evaluated firearm violence before and after the pandemic, it was found that not only did shooting incidents involving children (< 18 years old) drastically increase in 2020 during the COVID-19 pandemic, but that states with stronger gun laws had a decrease in the number of child-involved gun violence [7, 16]. During the pandemic, it was also shown that gun-related deaths increased in areas with low median income or a high percentage of Black or Hispanic population, which corresponds with other literature on the impact of the pandemic on historically marginalized communities [14, 15].

In sum, the number of children impacted by gun violence drastically increased during the pandemic and this disproportionately impacted Black and Hispanic communities.

Major disparities in gun violence fatality also exist by gender and race. Male children and adolescents overall died at higher rates for all major causes of death when compared to their female counterparts, and this was most noticeable for firearm deaths. Firearm deaths among male children and adolescents were 5.1 times the rate for female children and adolescents [11]. Byrnes et al. found that boys are more likely to engage in risk-taking behavior, which could be contributing to this difference [18]. Additionally, the disparities in firearm fatalities with respect to race and ethnic group are also very striking. Firearm fatalities in Black children and adolescents are 3.7 times as high as the rate for non-Latinx white children and adolescents [11].

## Exposure to Gun Violence

Turner and Jones conducted a multivariable study on gun violence exposure among children aged 2 to 18 and found that for all children the most common form of gun exposure was hearing shots in a public place, and that there was a demographic pattern with respect to age, socioeconomic status, race, and sex, that emerged when analyzing the youth impacted by this exposure. The demographic pattern demonstrated that lower income children, Black and Hispanic children, and male children had increased risk of being exposed to gun violence. Other literature demonstrates the most prominent predictors for youth exposure to gun violence are socioeconomic class, community environment, age, gender, and race [2, 4, 7]. For very young children, literature reflects the most common route of exposure was through their immediate community surroundings, such as neighborhoods or schools [8]. This same literature reflects that the increasing exposure experienced by children and adolescents has noted widespread consequences ranging from impaired cognitive development to increased mental health morbidity [1]. Common findings for young children who have been exposed to gun violence include demonstrating post-traumatic stress symptoms, anxiety, and depression [19••]. The traumatic implications of gun violence extend beyond the immediate survivor, with consequences impacting the surrounding communities, neighborhoods, and support systems [2].

## Childhood Development

The early years of a child's life are crucial for brain development, as the brain is growing rapidly and has high plasticity making it extremely sensitive to environmental influences

[20]. Exposure to chronic stressors such as lack of home stability and poverty has been shown to negatively impair early brain development [21, 22]. Additionally, several studies have discussed the impacts that toxic stress and early adversity can have on learning, behavior, and physical and mental health [22, 23]. Toxic stress is defined by the magnitude and duration of the biological response to the stressor and is the result of strong, frequent, or prolonged activation of stress response systems in the absence of a buffer [23, 24]. A buffer in this context refers to supportive elements, such as protective caregiving or a supportive environment, that can curtail the effects of stressors [23, 24]. When experiencing adversity or prolonged stressors in the prenatal stage, both human and animal studies have shown that this leaves the brain and body more at risk to the impacts of additional physiological and psychosocial factors that occur later in age [25–27]. Occasionally, the body is unable to recover after a stressor occurs leaving the body in a hyper stimulated state, which can be associated with later development of a depressive or anxiety disorder [26]. In addition, toxic stress has been associated with persistent inflammation, elevated blood pressure, and obesity [28–30]. In a detailed analysis conducted by Janusek et al. that investigated the impacts of childhood trauma on two key inflammatory markers in adults (IL-6 and TNF- $\alpha$ ), it was found that there is a significant association with experiencing childhood trauma and these biomarkers, which indicates that exposure to childhood adversity increases the adult proinflammatory response to stress. The literature did not directly distinguish a difference between IL-6 and TNF- $\alpha$  in reference to childhood adversity; however, increased amounts of the IL-6 biomarker in adults was found to be associated with increased exposure to neighborhood violence as a child. The majority of participants in this study also reported being victims of or witnesses to community violence (both directly and indirectly), which includes witnessing a suicide or homicide [30]. This suggests that childhood exposure to gun violence both directly and indirectly can increase inflammation in the body [25]. Thus, with increasing awareness that environmental stressors such as gun violence can negatively impair childhood brain development, it is essential to reduce children's exposure to these devastating events.

## Mental Health Outcomes from Gun Violence

The literature surrounding the mental health outcomes of children and adolescents who have experienced gun violence is limited and most focused on older youth [33]. The few studies from the last 3 years that have focused on the mental health outcomes of young children aged 0 to 8 who have been exposed to gun violence provide little detail on the psychopathology of young children.

In the only original study that analyzed mental health outcomes in young children who have been exposed to gun

violence, Vasan and HK conducted a study on the association of neighborhood violence with mental health–related utilization of the pediatric emergency department [31]. Study population included 54,341 pediatric patients aged 1 to 11 who lived near individuals who were shot, and the primary measure was Emergency Department encounters for mental health–related complaints in children. This study suggests that exposure to gun violence was associated with an increase in acute mental health symptoms within young children [31]. The symptoms observed included increased stress, harmful psychologic disturbances, and promotion of maladaptive coping behaviors [9]. Vasan and HK do note that while their findings are not robust enough to prove a causal relationship between gun violence exposure and children's mental health, it does aid in elucidating several mechanisms that may underlie the association that they observed.

Literature reviews related to mental health outcomes have provided more context into mental health outcomes in young children. In a review on the effects of mass shootings on the mental health of children, Cimolai et al. found that the majority of young survivors will experience acute stress reactions and a subset of these survivors will go on to develop long-term outcomes that can impact their function. The primary child mental health outcomes that they identified across literature from past 10 years included anxiety, depression, post-traumatic stress disorder (PTSD), and other internalizing symptoms [19••]. Their review included a discussion on the dearth of literature on specific mental health outcomes caused by gun violence in young children, and in response to this highlighted how PTSD can present in young children, aged 0 to 6, as a result of traumatic experiences in general. In younger children, PTSD presents through the persistence of behavioral interactions which include, sadness, lack of interest, development of new fears, aggression, and increased anxiety [32].

Much of the current literature including young children also focuses on analyzing the effects of school shootings on development. Reeping's study on school shootings among youth aged K–12 found that these events have significant effects on mental health and the emotional well-being of impacted students within the school community [1]. These impacts included increased depression, PTSD, and anxiety in young children [33]. Shonfield and Domeria's study on supporting children after school shootings found that these events can also cause trauma symptoms within effected individuals [34]. As mass shootings are considered to be traumatic experiences, Cimolai and Schmitz discussed ways that these mental health outcomes from young children who have experienced generally traumatic events could apply to young children who have specifically experienced mass shooting events. In a scoping review about the long-term consequences of

**Table 1** Recent literature reviews that highlight the effects of gun violence on young children

Name	Author	Study overview	Notable findings
Effects of Mass Shootings on the Mental Health of Children and Adolescents	Cimolai and Schmitz	Many youths are exposed to gun violence, with a smaller subset exposed to mass shootings. While youth have varying responses to mass shootings, possibly due to risk and protective factors as well as level of exposure, the mental health outcomes are significant and include post-traumatic stress, suicide, depression, substance abuse, and anxiety. Efforts at developing effective prevention and treatment programs are still underway but generally take a tiered public health approach	School shootings occur in environments that mainly impact children and adolescents. These events cause significant psychological impacts on survivors which include internalizing symptoms like depression, anxiety, and PTSD. Some survivors will experience acute stress reactions but only a subset will develop long-term impacts that will impact functioning
Youth exposure to violence involving a gun: evidence for adverse childhood experience classification	Rajan and Myers et al	Our findings provide evidence that youth gun violence exposure should be classified as an ACE	(1) The importance of including gun violence exposure as an ACE in future screening tools; (2) the importance of broadening the definition of gun violence exposure to include exposure to violence involving a gun (injury from, witnessing, hearing gunshots, and/or knowing a friend or family member who was shot), and (3) the importance of expanding the notion of who should conduct such screenings to increase the reach of existing screening efforts
Risk and protective factors related to youth firearm violence: a scoping review and directions for future research	Schmidt, Rupp, Pizarro et al	Among the 28 included studies, 15 explored risk/protective factors for victimization, five focused on perpetration, five did not differentiate between victimization and perpetration, and five focused on suicide. Most studies examined individual-level risk factors	Protective factors for youth firearm outcomes were understudied. We need more research on youth firearm violence using longitudinal data and robust statistical methods. Future research is needed to understand the underlying mechanisms by which risk/protective factors influence firearm violence

Table 1 (continued)

Name	Author	Study overview	Notable findings
What are the long-term consequences of youth exposure to firearm injury, and how do we prevent them? A scoping review	Ranney and Ehrlich	The long-term consequences of exposure to firearm injury—including suicide, assault, and mass shootings—on children's mental and physical health is unknown. A scoping review was conducted to learn more about this topic	In general, among youth directly exposed to a mass shooting, rates of post-traumatic stress assessed using standardized assessments were consistently significantly higher compared to control populations. The rate of post-traumatic stress ranged from 11 to 62%, depending on the type of assessment used, nature of the exposure, and the time from the traumatic event (Bugge et al., 2015; Hafstad et al., 2014; Haravuori et al., 2011, 2016; Schwarz & Kowalski, 1991; Suomalainen et al., 2011). Physical proximity to the shooting correlated with severity of post-traumatic stress at 1 month and 1 year following the event (Nader et al., 1990; Pynoos et al., 1987a, b). Media exposure to an event did not correlate with severity of post-traumatic stress symptoms (Haravuori et al., 2011). Only one manuscript that evaluated an intervention to specifically prevent consequences of firearm injury among youth. This gap in the youth literature is particularly glaring, given that an extensive literature describes effective interventions and preventative interventions for other types of trauma and youth violence (David-Ferdon et al., 2016; Schneider, Grilli, & Schneider, 2013); additionally, a growing body of literature provides preliminary evidence on hospital-based post-injury intervention programs to reduce consequences of firearm injury and other types of injuries among adults (Affinati et al., 2016; Zatzick et al., 2013)

**Table 1** (continued)

Name	Author	Study overview	Notable findings
Annual Research Review: Youth firearm violence disparities in the United States and implications for prevention	Bottani and Camacho	Research has identified the United States (U.S.) as a global outlier in its firearm ownership rates, with a correspondingly higher risk of youth firearm violence compared to other countries. The relative extent of disparities in youth firearm violence within the U.S. has been less clear. Little is known about factors in the social ecology driving these disparities and whether current firearm violence prevention approaches sufficiently address them	The burden of firearm violence varied markedly at intersections of gender, race, place, developmental stage, and homicidal or suicidal intent. Firearm homicide among Black boys and young men (ages 15–24) was at outlier levels—many times greater than the rates of any other demographic group, developmental stage, or violence intent, particularly in urban settings. Recent research has operationalized structural racism and implicated historically racialized spaces as a root cause of this disparity. In contrast, elevated firearm suicide rates were found among Native and White boys and young men in rural settings; firearm-related cultural attitudes and gender socialization were points of consideration to explain these disparities. We highlighted research-based youth firearm violence preventive interventions and emphasized gaps in efforts focused on structural and sociocultural factors
Youth Exposure to Endemic Community Gun Violence: A Systematic Review	Bancalari and Rajan	Aimed to synthesize and critically assess the state of evidence on indirect exposure to community gun violence among low-income urban youth in the U.S. Of the 143 studies identified and screened, 13 studies were ultimately included	The broad themes emerging include (1) a lack of consensus regarding the range of experiences that constitute community gun violence, (2) exposure to violence involving a firearm as distinct from that with other weapons, (3) a need to conceptualize multiple dimensions of gun violence exposure, (4) differential impacts of exposure to community gun violence across developmental stages, and (5) how indirect gun violence exposure uniquely contributes to cycles of community violence. Exposure to community gun violence has been linked to distress, anxiety, depression, anger, withdrawal, post-traumatic stress, substance use, desensitization to violence, and academic difficulties, yet the particular risk factors and pathways underlying these associations are not well-explained. Research suggests that youth exposed to gun violence during early childhood (birth through age 8) may be placed at risk for the most severe developmental consequences. Early childhood trauma is known to disrupt neurodevelopment via physiological dysregulation and learned maladaptive coping (Cooley-Strickland et al., 2009)



youth exposure to firearm injury, Ranney and Ehrlich proposed a similar connection between how young children respond to traumatic events and children exposed to mass shootings. In their review, Ranney and Ehrlich found that children exposed to mass shootings have higher rates of post-traumatic stress than control populations [35].

Prominent literature reviews related to mental health outcomes in young children are shown in Table 1.

## Conclusions

The current literature on the impacts of gun violence on child development heavily focuses on older adolescents, with those focused on the impacts of such exposure on early childhood presented in this review. Young children have different cognitive and developmental markers than other demographics and it is necessary to understand the impact of gun violence on this cohort of children [9]. As Bancalari and Sommer found in their 2021 literature review, it is imperative that more research is done into the impacts of gun violence exposure across different developmental stages [5]. The steadily increasing exposure of young children to gun violence reflected in the current trends and statistics demonstrates the need for more research to be conducted into how gun violence exposure impacts early childhood development.

The literature presently suggests that exposure to gun violence is associated with an increase in children's mental health distress, with young children experiencing increased post-traumatic stress symptoms and anxiety [36••]. Based on this, a potential future direction for the field could be further investigating the associations between gun violence as a traumatic experience with mental health outcomes in young children aged 0 to 8. Additional research is needed to assess the treatment of young children exposed to gun violence and identify effective methods for working with this young population to mitigate negative mental health outcomes for those exposed.

Potential future research directions include analyzing how young children respond to media pertaining to gun violence, school-based discussions pertaining to gun violence, and non-school-based communal discussions to gun violence. More research is also needed to assess the psychobiological outcomes, such as neuroinflammation and physiological stress indicators, of gun violence on young children. Additionally, future literature directions could include investigating the psychopathology associated with how young children respond to other forms of gun violence exposure, such as hearing gunshots or being around a survivor of gun violence. Lastly, future directions could include implementing protective factors that can aid in reducing childhood exposure to gun violence. In sum, gun violence is ubiquitous with very young children increasingly exposed. With increased and

targeted research efforts addressing this specific population, clinicians can better help parents and caregivers navigate the various exposures, with the intended outcome of ensuring young children's optimal development in the face of unremitting stressors and exposures.

## Compliance with Ethical Standards

**Conflict of Interest** The authors declare no competing interests.

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Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

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