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Predictors of Childhood Injury in Children Reported to Child Protective Services

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ABSTRACT

Background: Adverse childhood experiences, such as child maltreatment, have been shown to result in negative health outcomes throughout an individual's life. Previous research has found that children with a prior allegation of maltreatment die due to unintentional injuries at twice the rate of children who were not reported to Child Protective Services, however, death is only one outcome of injury and many unintentional injuries do not result in death.

Methods: This secondary analysis of Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) data examined predictors of injury in children whose family has been reported to CPS utilizing the ecological-developmental framework theoretical domains which guided LONGSCAN: child characteristics, family/caregiver characteristics, parental and family functioning, extrafamilial relationship skills, community ecology, child outcomes, and systems of care factors.

Results: Logistic regression modeling showed that the likelihood of childhood injury significantly increased for those children who did not recognize or appropriately respond to cues of ending a conversation (OR=.37), caregiver reported child always has a good place to play in their neighborhood (OR=1.57), and child utilized educational services (OR=2.06).

Conclusion: Understanding the predictors of injury is necessary to implement injury prevention interventions targeting the unique needs of this vulnerable population and increase awareness of prevention strategies to reduce childhood injuries.

Key Words

Child maltreatment, Injury prevention, Longitudinal research

Unintentional injury is the leading cause of death for children and adolescents 1–18 years of age (National Center for Health Statistics, 2017). The most common causes of injury deaths include suffocation, motor vehicle collisions, poisoning, drowning, and fire and burn-related injuries. Suffocation is the most likely injury death among infants younger than 1 year, drowning is the most common for children 1–4 years of age, and motor vehicle collisions are the leading cause of injury death for children and adolescents 5–18 years of age (Centers for Disease Control and Prevention, 2015). Although death can be the result of an unintentional injury, a large number of unintentional injuries do not result in death. Over 6.9 million children in 2010 were treated for a nonfatal injury in an emergency department (Dube et al., 2001). Among U.S. children, falls and being struck by or against an object or person were the leading causes of nonfatal unintentional injuries (Centers for Disease Control and Prevention, 2015).

Research has found a variety of risk factors that lead to children and adolescents being at an increased risk for unintentional injury, including caregiver characteristics, parental and family functioning factors, and extrafamilial relationship skills. Parental characteristics have shown to be risk factors for childhood injury including unemployment (Harris & Kotch, 1994), low socioeconomic status, younger mothers, mothers who have lower education levels, and being raised by single parents (Centers for Disease Control and Prevention & National Center for Injury Prevention and Control, 2012). Parental and family functioning factors have also shown to predict child and adolescent injuries including parental alcohol use (Berger, 2005; Bijur, Kurzon, Overpeck, & Scheidt, 1992; Chaffin, Kelleher, & Hollenberg, 1996; Crandall, Chiu, & Sheehan, 2006; Damashek, Williams, Sher, & Peterson, 2009; Dube et al., 2001; Flynn, Cain, O'Mahen, & Davis, 2006; Kelleher, Chaffin, Hollenberg, & Fischer, 1994; Rinehart et al., 2005; Winqvist, Jokelainen, Luukinen, & Hillbom, 2007), multifamily dwelling and overcrowding (Bradbury, Janicke, Riley, & Finney, 1999; Centers for Disease Control and Prevention & National Center for Injury Prevention and Control, 2012), and family

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disorganization and conflict (Harris & Kotch, 1994; Rhodes & Iwashyna, 2007). Evidence has also suggested that extrafamilial relationship skills, including social isolation and lack of social support, predict unintentional injuries in children and adolescents (Rhodes & Iwashyna, 2007).

It is important to note that individuals who have experienced adverse childhood experiences, such as child maltreatment, have been shown to result in negative health outcomes throughout an individual's life including cancer, ischemic heart disease, liver disease, chronic lung disease, and skeletal fractures (Felitti et al., 1998). Previous research has also found that children with a prior allegation of maltreatment die due to unintentional injuries at twice the rate of children who were not reported to Child Protective Services (CPS) (Putnam-Hornstein, 2011). Given this evidence, it is possible that these vulnerable children may be at greater risk for nonfatal injuries.

The mechanisms and circumstances of unintentional injury deaths have also been found to differ between children who have a history of maltreatment and children who do not have a history of maltreatment. Parks, Mirchandani, Rodriguez, and Hellsten (2011) found that the mechanism of injury in children who had a history of child maltreatment were forms of injury such as suffocation, drowning, and poisoning. In addition, when looking at the children who died due to drowning, two times as many children with a history of child maltreatment drowned in a bathtub compared with children who did not have a history of child maltreatment who more typically drowned in a pool, hot tub, or spa. The findings show that more research is needed to uncover the differences between the high-risk populations of children who have been maltreated in an effort to create more focused injury prevention interventions directed toward their specific needs.

Although literature supports an association between a history of child maltreatment and fatal injuries, to the knowledge of these authors, no study has examined childhood injury not resulting in death in this high-risk population previously (Parks et al., 2011; Putnam-Hornstein, 2011). The purpose of this study was to conduct a secondary analysis of Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) data and examine predictors of injury in children whose family has been reported to CPS utilizing the ecological–developmental framework theoretical domains, which guided LONGSCAN: child characteristics, family/caregiver characteristics, parental and family functioning, extrafamilial relationship skills, community ecology, child outcomes, and systems of care factors.

METHODS

Data

A secondary data analysis was conducted utilizing data from the LONGSCAN study. The LONGSCAN study has been described in detail (Runyan et al., 1998), but a brief description has been provided later. LONGSCAN is a consortium of five different sites located across the United States each conducted a study focusing on the etiology and impact of child abuse (Baltimore, Chicago, Seattle, San Diego, and North Carolina). The sites utilized common assessment measures and methodology enabling the combination of the data. LONGSCAN data were collected through multiple sources including interviews with children, their parents, and their teachers at a variety of ages of the children (i.e., 4, 6, 8, 12, 16, and 20 years of age). Records from CPS were also reviewed. Young children identified at risk for maltreatment or with a history of being reported to CPS were included in the LONGSCAN study (Runyan et al., 1998). For this secondary data analysis, only those children who were reported to CPS were included.

The LONGSCAN study was a theory-based research project. The ecological–developmental framework guided the data collection of LONGSCAN and was used to define the theoretical domains of the study: child characteristics, family/caregiver characteristics, parental and family functioning, extrafamilial relationship skills, community ecology, child outcomes, and systems of care factors (Runyan et al., 1998). These domains guided secondary data analysis.

Measures

The outcome variable, childhood injury, was obtained by analyzing data from ages 6–11. All other variables of interest were collected at age 6. Due to the distribution of several variables not being normal, the variables were collapsed and recoded. Details of this are described later for all variables in the following domains: child characteristics, family/caregiver characteristics, parental and family functioning, extrafamilial relationship skills, community ecology, child outcomes, and systems of care factors.

Childhood Injury

The LONGSCAN Child's Life Events Scale was adapted from the Coddington Child Life Events Scales and documents significant events in the child's life over the past year including the question "Did child suffer any kind of accident in the past year" (LONGSCAN Investigators, 1992a). For this study, data from ages 6–11 were examined to determine whether any accidents were suffered over the past year. If the child reported "yes" in at least one time point, the child was considered to have a childhood injury.

Child Characteristics

Demographic information of the child was obtained through an instrument that asked caregivers information including the child's sex (male, female), race (White, Black, Hispanic, other), and first language of the child (English, Spanish, other) (LONGSCAN Investigators,

1991a). To assess whether the child repeated a grade in school (yes, no/do not know), a question was utilized from the Teacher's Report Form, which questioned teachers to obtain a perception of the child's academic performance, adaptive functioning, and problem behaviors (Achenbach, 1991). A question from the LONGSCAN Child Health Assessment, which assessed the child's current health status, was utilized to answer the question of whether the child had an illness or problem, which affected the child's growth and development (yes, no) (LONGSCAN Investigators, 1991b). A question from the LONGSCAN Child's Life Events Scale discussed in detail previously was also utilized to assess whether someone close to the child died during the past year (yes, no/do not know) (LONGSCAN Investigators, 1992a).

Family/Caregiver Characteristics

Demographic information for the caregivers was collected including caregiver education (completed high school or less, completed some college or graduate/professional school), caregiver employment (regularly works full-time, works part-time, unemployed, other), family income ($0–$19,999, $20,000–$39,999, >$40,000) (LONGSCAN Investigators, 1998).

Parent and Family Functioning

To assess for parent and family functioning, two specific questions from the LONGSCAN Child's Life Events Scale were utilized. Respondents were asked, "Was anyone in child's family or household arrested in this past year" (yes, no/do not know). Respondents were also asked, "Was child ever homeless (or did s/he live at a homeless shelter)?" (yes, no/do not know) (LONGSCAN Investigators, 1992a).

Extrafamilial Relationship Skills

Two questions from the Vineland Adaptive Behavior Scale Screener were utilized to assess for extrafamilial relationship skills, including questions about the child's manners and behavior to others and the child's behavior and relationship with others. Specifically, respondents were questioned to assess whether the child recognizes or appropriately responds to cues of ending a conversation (does not, sometimes, usually). Respondents were also asked about the child's interactions with friends to determine their level of interaction with friends (child does not have interactions with friends, child interacts with a group of friends and initiates get-togethers to some extent) (Sparrow, Carter, & Cicchetti, 1993a, 1993b).

Community Ecology

Two questions from the Neighborhood Risk Assessment, which is designed to assess possible risk factors for family stress and/or maltreatment in a neighborhood, were utilized in this analysis. Respondents were asked, "My neighborhood is a good place to live" (never or almost never, sometimes or usually, always true) and "There is a good place (e.g., playground) for children to play in my neighborhood" (never or almost never, sometimes or usually, always true) (LONGSCAN Investigators, 1992b).

Systems of Care Factors

Three questions were utilized from the LONGSCAN Service Utilization instrument, which assess the types and extent of services utilized and needed by the child. The first questioned the caregiver respondent on whether educational services were utilized (yes, no). The second question asked, "During the past year, have you consulted with any one about a behavioral, emotional, or school problem related to the child?" (yes, no). The final question asked, "During the past year, have you taken your child for a well-child visit? (like a visit for a check-up or immunizations)" (yes, no) (LONGSCAN Investigators, 1991c).

Analysis

To determine the differences between children who were injured compared with those who were not, *t* tests and χ^2 analyses were conducted. Bivariate relationships were established between each variable from the domains of the ecological–developmental framework (child characteristics, family/caregiver characteristics, parental and family functioning, extrafamilial relationship skills, community ecology, child outcomes, and systems of care factors), and the dichotomous childhood injury outcome variable. All variables in each domain that were statistically significant at the .05 level in the bivariate analyses were entered into multivariate logistic regression models. The logistic regression model was calculated to examine the effect of indicators of the ecological–developmental framework domains on the likelihood of youth being injured during their childhood or not.

RESULTS

Descriptive Statistics

This analysis utilized a sample of 473 children who had been reported to CPS. The sample characteristics and bivariate analysis are presented in Table 1 and are organized by domains of the ecological–developmental framework. The majority of the sample was English speaking (98.7%), and slightly over half of the sample was female (50.1%). Children were predominantly Black (40.2%) or White (34.0%).

Associations With Injury

The bivariate analysis revealed that children who were injured between the ages of 5 and 11 years, were more

TABLE 1 Sample Characteristics by Injury

Variable	Injured *n* = 297 *n* (%)	Not Injured *n* = 176 *n* (%)	Total *n* = 473 *n* (%)	*p* Value
Child characteristics				
Sex				.11
Male	90 (54.9)	133 (47.0)	223 (49.9)	
Female	74 (45.1)	150 (53.0)	224 (50.1)	
Race[a]				.34
White	69 (39.2)	92 (31.0)	161 (34.0)	
Black	65 (36.9)	125 (42.1)	190 (40.2)	
Hispanic	10 (5.7)	20 (6.7)	30 (6.3)	
Other	32 (18.2)	60 (20.2)	92 (19.5)	
First language of child				.31
English	162 (98.8)	279 (98.6)	441 (98.7)	
Spanish	1 (0.6)	4 (1.4)	5 (1.1)	
Other	1 (0.6)	0 (0.0)	1 (0.2)	
Child repeated a grade in school				.02*
Yes	1 (0.9)	12 (6.4)	13 (4.3)	
No or do not know	116 (99.2)	175 (93.6)	291 (95.7)	
Child has an illness or problem, which affects child's growth and development				.05*
Yes	23 (14.1)	23 (8.2)	46 (10.4)	
No	140 (85.9)	256 (91.8)	396 (89.6)	
Someone close to the child died during the past year				.01*
Yes	36 (20.5)	35 (11.8)	71 (15.0)	
No or Do not know	140 (79.6)	262 (88.2)	402 (85.0)	
Family/caregiver characteristics				
Caregiver education				.02*
Completed high school or less	88 (54.3)	183 (65.4)	271 (61.3)	
Completed some college or graduate/professional school	74 (45.7)	97 (34.6)	171 (38.7)	
Caregiver employment				.23
Regularly works full-time	50 (30.5)	71 (25.4)	121 (27.3)	
Works part-time	27 (16.5)	44 (15.7)	71 (16.0)	
Unemployed	78 (47.6)	157 (56.1)	235 (52.9)	
Other	9 (5.5)	8 (2.9)	17 (3.8)	
Family income				.58
$0–$19,999	86 (55.1)	164 (59.2)	250 (57.7)	
$20,000–$39,999	42 (26.9)	73 (26.4)	115 (26.6)	
≥$40,0000	28 (18.0)	40 (14.4)	68 (15.7)	
Parent and family functioning				
Child ever homeless				.52

(continues)

TABLE 1 Sample Characteristics by Injury (*Continued*)

Variable	Injured *n* = 297 *n* (%)	Not Injured *n* = 176 *n* (%)	Total *n* = 473 *n* (%)	*p* Value
Yes	12 (6.8)	16 (5.4)	28 (5.9)	
No or do not know	164 (93.2)	281 (94.6)	445 (94.1)	
Family or household member jailed or imprisoned				.41
Yes	24 (13.6)	49 (16.5)	73 (15.4)	
No	152 (86.4)	248 (83.5)	400 (84.6)	
Extrafamilial relationship skills				
Child does not recognize or appropriately respond to cues of ending a conversation				.01**
Does not	151 (87.8)	223 (76.9)	374 (81.0)	
Sometimes	14 (8.1)	41 (14.1)	55 (11.9)	
Usually	7 (4.1)	26 (9.0)	33 (7.1)	
Child interactions with friends				.06
Child does not have interactions with friends	55 (31.3)	118 (39.9)	173 (36.7)	
Child interacts with a group of friends and initiates get-togethers to some extent	121 (68.8)	178 (60.1)	299 (63.4)	
Community ecology				
Neighborhood is a good place to live				.29
Never or almost never	20 (12.6)	36 (13.3)	56 (13.0)	
Sometimes or usually	60 (37.7)	121 (44.7)	181 (42.1)	
Always true	79 (49.7)	114 (42.1)	193 (44.9)	
Child has a good place to play in their neighborhood				.002**
Never or almost never	26 (16.3)	85 (31.4)	111 (25.8)	
Sometimes or usually	39 (24.4)	62 (22.9)	101 (23.4)	
Always true	95 (59.4)	124 (45.8)	219 (50.8)	
Systems of care factors				
Child utilized educational service				.05*
Yes	54 (31.2)	67 (23.0)	121 (26.1)	
No	119 (68.8)	224 (77.0)	343 (73.9)	
Child utilized behavioral, emotional, or school-related service				.41
Yes	72 (41.4)	111 (37.5)	183 (38.9)	
No	102 (58.6)	185 (62.5)	287 (61.1)	
Child taken to well-child visit in past year				.10
Yes	149 (85.1)	266 (90.2)	415 (88.3)	
No	26 (14.9)	29 (9.8)	55 (11.7)	

[a]*Other consists of youth reported as Native American, Asian, mixed race, and other.*

*$p \leq .05$.

**$p \leq .01$.

TABLE 2 Logistic Regression to Predict Childhood Injury by Domains of the Ecological–Developmental Framework

Variable	OR [95% CI]	*p* Value
Child characteristics		
Child repeated a grade in school	0.14 [0.02, 1.20]	.07
Child has an illness or problem, which affects child's growth and development	0.97 [0.39, 2.41]	.94
Someone close to the child died during the past year	1.57 [0.69, 3.56]	.28
Family/caregiver characteristics		
Caregiver education	1.63 [0.91, 2.92]	.10
Extrafamilial relationship skills		
Child does not recognize or appropriately respond to cues of ending a conversation	0.37 [0.17, 0.79]	.01**
Community ecology		
Child has a good place to play in their neighborhood	1.57 [1.10, 2.23]	.01**
Systems of care factors		
Child utilized educational service	2.06 [1.10, 3.86]	.03*

Note. CI = confidence interval; OR = odds ratio.
$*p \leq .05$.
$**p \leq .01$.

likely at age 6 to have repeated a grade ($\chi^2 = 6.27$, $p < .05$), have developmental issues ($\chi^2 = 3.80$, $p < .05$), know someone who died in the previous year ($\chi^2 = 7.82$, $p < .05$), had a caregiver with some college or graduate/professional school ($\chi^2 = 5.27$, $p < .05$), not recognize or appropriately respond to cues of ending a conversation ($\chi^2 = 8.47$, $p < .01$), to reportedly always have a good place to play in their neighborhood ($\chi^2 = 12.69$, $p < .01$), and have used educational services ($\chi^2 = 3.78$, $p < .05$) than children who were not injured between the ages of 5 and 11 years.

Predictors of Injury

The logistic regression to predict childhood injury presented in Table 2 is also organized by domains of the ecological–developmental framework. No significant findings were found in the child characteristics domain or the family/caregiver characteristics domain. The extrafamilial relationship skills domain, community ecology domain, and systems of care factors domain each had significant findings.

The logistic regression model for the extrafamilial relationship skills domain showed that the likelihood of childhood injury significantly increased for those who did not recognize or appropriately respond to cues of ending a conversation (odds ratio [OR] = 0.37). For the community ecology domain, the odds of being injured as a child were significantly higher for those children whose parent/caregiver reported that they always have a good place to play in their neighborhood (OR = 1.57). Finally, for the systems of care factors domain, the odds of being injured as a child were significantly higher for those children who utilized educational services (OR = 2.06).

DISCUSSION

This secondary data analysis of the LONGSCAN dataset examined predictors of injury in children whose family has been reported to CPS. The findings support the need for evidence-based trauma-informed care interventions when working with children who have a history of CPS. Incorporating such interventions in trauma centers, and hospital injury prevention efforts in general, may support this high-risk population and reduce the likelihood of unintentional injuries. Understanding the predictors of injury is necessary to implement interventions targeting the unique needs of this vulnerable population and increase awareness of prevention strategies to reduce childhood injuries. This study found that children with prior CPS involvement who did not respond well to cues of ending a conversation, children whose parents reported that they always had good places to play in their neighborhood, and children in families utilizing education services were at high risk for unintentional childhood injury.

Not responding well to cues of ending a conversation can be a communication deficit of children who have attention-deficit/hyperactivity disorder (ADHD) and autism and these children are known to be at higher risk for child maltreatment than the general population (Bruce, Thernlund, & Nettelbladt, 2006; Geurts & Embrechts, 2008; Hadianfard, 2014; McDonnell et al., 2019; Staikova,

Gomes, Tartter, McCabe, & Halperin, 2013; Stern et al., 2018). Communication, language comprehension, and pragmatic language skills have each been found to be poorer in children with ADHD (Bruce et al., 2006; Geurts & Embrechts, 2008; Staikova et al., 2013). Children with ADHD have also been found to have similar communication difficulties to those with autism (Geurts & Embrechts, 2008). Communication deficits are a central feature of autism, as 63% of children with autism meet criteria for a language disorder and even children with strong verbal abilities often struggle to communicate with others (Kerns, Newschaffer, & Berkowitz, 2015; Levy et al., 2010; Lindsay, Ricketts, Peacey, Dockrell, & Charman, 2016).

These results correspond to research findings that children with ADHD and autism have an increased risk of injury. Results of a system review and meta-analysis conducted found that individuals with ADHD are nearly two times more likely to be injured than those without ADHD. Injuries included traffic injuries, motorcycle traffic injuries, fractures, burns, and dental injuries (Amiri, Sadeghi-Bazargani, Nazari, Ranjbar, & Abdi, 2017). Youth with autism have been found to be more likely to experience serious physical injuries, particularly self-inflicted injuries and poisoning (Kerns et al., 2015; Lee, Harrington, Chang, & Connors, 2008; McDermott, Zhou, & Mann, 2008). Children diagnosed with ADHD, autism, and children who have more difficulties communicating may need extra support from parents, caregivers, and other adults to prevent injuries as well as empowerment around building communication skills to advocate for themselves when they are at risk of being injured.

Children in the study being more likely to suffer accidental injury if parents reported having access to good places to play in their neighborhood is likely, not specific, and limited to children who have been abused or neglected. Some research has argued that when playgrounds are safer, for example playgrounds with safety surfacing, children playing in those playgrounds tend to be less careful on equipment because they think they will be safe if they fall. For the same reason parents, caregivers, and other adults supervising children may pay less attention at safer playgrounds because of the perception that children are less likely to get hurt while they are playing (Gill, 2018). It is important to be mindful about unrealistic expectations that playgrounds can be places where injuries can be eliminated and realize accidents may happen. Research has placed an emphasis on the importance of risk, challenge, and uncertainty in children's learning when on playgrounds, so that must be balanced with the safety of children (Gill, 2018).

Children in families who utilized educational services may be more at risk because they are more likely to be children with some type of disability or developmental delay. Families utilize educational services for a variety of reasons, as the Individuals with Disabilities Education Act covers children who have a wide range of different disabilities including intellectual disabilities and hearing, speech, learning, visual, or orthopedic impairment (Lipkin & Okamoto, 2015). A study conducted by Sullivan and Knutson (2000) found that the three most prevalent types of disabilities in the special education system were emotional disorders, specific learning disabilities, and intellectual disability (i.e., mental retardation), which were also the most prevalent disabilities among children who have experienced maltreatment. Given these findings, it is not surprising that these children may be more susceptible to unintentional injuries. Similar to children who have been diagnosed with ADHD and autism, children in families utilizing educational services may need extra support in place from adults to prevent unintentional injuries.

Limitations

As described earlier, the current study only included children from the LONGSCAN dataset who were reported to CPS. It is important to note that not all the children who were reported to CPS may have substantiated the alleged child maltreatment. In addition, there may have been other children in the sample who had a history of child maltreatment that were not included in this study's sample because the maltreatment was never reported to CPS. For these reasons, caution should be taken when extrapolating these findings to all children who have been maltreated, as our sample is not representative of this population.

It should also be noted that this study focused on the high-risk population of children who were reported to CPS; no comparisons were made between children with a CPS history and those without. The goal of this study was to highlight the specific predictors of this high-risk population and theorize mechanisms to prevent injuries. Although comparisons between these children with and without a CPS history can be illuminating, focusing solely on gaining more knowledge on this high-risk population is a critical step to preventing childhood injuries. Future research should compare the differences in predictors of childhood injury between children with a CPS history and those without.

Implications

Despite the limitations, the current study has important implications for ensuring the safety of the high-risk population of children who have been involved with CPS. Providing preventative education on predictors and risk factors associated with unintentional injuries to nurses, injury prevention specialists, parents, and caregivers of children who are more at risk can increase knowledge on potential hazards and decrease unintentional injuries.

The findings of this study also support the need to implement and study the effectiveness of trauma-informed approaches, such as social–emotional learning, as an intervention to reduce the risk of unintentional childhood injuries in trauma centers, and hospital injury prevention efforts in general. Social–emotional learning focuses on teaching self-management, self-awareness, social awareness, relationship skills, and responsible decision-making and has been found to decrease emotional distress and reduce conduct problems (Payton et al., 2008; Taylor, Oberle, Durlak, & Weissberg, 2017). The emphasis placed on social–emotional learning may give children the necessary skills to avoid unintentional injuries. More research is needed to examine whether social–emotional learning can be utilized as an injury prevention strategy.

KEY POINTS

- Literature supports an association between a history of child maltreatment and fatal injuries; however, to the knowledge of these authors, no study has examined childhood injury not resulting in death in this high-risk population.
- Evidence suggests that children with prior CPS involvement who did not respond well to cues of ending a conversation, children whose parents reported that they always had good places to play in their neighborhood, and children in families utilizing education services, were at high risk for unintentional childhood injury.
- Future research must examine the implementation of evidence-based trauma-informed care interventions in trauma centers and hospital injury prevention efforts in general. Incorporating such interventions into current injury prevention efforts may support this high-risk population and reduce the likelihood of unintentional injuries.

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