Pediatric Firearm-Related Hospital Encounters During the SARS-CoV-2 Pandemic

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In the United States, 4.6 million children live in a home with an unsecured firearm, increasing their risk for firearm-related injuries, which are the second leading cause of death in US children.1–2 In 2020, the United States witnessed unprecedented rise in firearm sales as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic strained communities with additional psychosocial and economic stressors.3 Current literature evaluating firearm injuries and the SARS-CoV-2 pandemic includes only single-center data, adult populations, or young children, excluding pediatric suicide.4–5 We aimed to quantify pediatric firearm-related and total encounters during the initial 2020 SARS-CoV-2 pandemic period, as compared to these periods in the previous 3 years.

METHODS

We used International Classification of Diseases, 10th Revision (ICD-10) discharge diagnosis codes to conduct a cross-sectional comparison of pediatric (age 0–18 years) firearm-related and total emergency department (ED) and hospital encounters between calendar weeks 9 and 36 (corresponding to approximately March to August) 2020 and 2017–2019 at 44 US children’s hospitals participating in the Pediatric Health Information System (PHIS) database. The primary outcome was firearm-related encounters, defined as an initial encounter for a penetrating injury from a powder-charged weapon identified by ICD-10 discharge code (see Supplemental Information).6 The median weekly volumes in 4-week blocks for 2017–2019 were compared to the median in 2020 by using the Wilcoxon rank test. Differences in medians were estimated by using quantile regression. Similarly, weekly volumes in 2020 were compared to the 25th and 75th percentiles for 2017–2019.

RESULTS

There were 2510 firearm-related encounters during the 4-year study period, of which 798 (32%) occurred in 2020. Of these, 45.6% included adolescents aged 15 to 18 years, 78.8% were boys, 61.7% were non-Hispanic Black children, 62.7% lived in the South census region, and 48.9% resided in a very low Child Opportunity Index neighborhood (Table 1). There were no differences in cohort characteristics in 2020 vs 2017–2019 (Table 1).

Compared to 2017–2019, total encounters in 2020 decreased in each 4-week block and by 42.3% overall (Fig 1A). In contrast, firearm-related encounters increased by 38.8% from a median of 575 encounters in 2017–2019 to 798


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encounters in 2020, increasing in each 4-week block with a range of +16.9% to +67.9% (Fig 1B). An observed increase in overall firearm-related encounters in 2020 remained when using 25th percentile (+57.7%) or 75th percentile (+26.5%) volumes for 2017–2019. The overall difference in medians was statistically significant (+9.0 encounters per week; \( P < .001 \)).

**DISCUSSION**

Firearm-related encounters at US children’s hospitals increased significantly in March to August 2020 compared to 2017–2019, whereas total encounters decreased substantially.

The combination of unparalleled firearm sales, heightened social and economic distress, and children atypically home from school created a uniquely risky environment for firearm injury. Consistent with previous literature, we found higher rates of firearm injuries in older non-Hispanic Black adolescent boys from Southern regions. In addition, we found no significant changes in demographics, rurality, or region comparing firearm-related encounters in 2020 to 2017–2019, suggesting the SARS-CoV-2 pandemic was associated with an increase in pediatric firearm injuries.
without a shift in the population most at risk. Additionally, nearly half of our firearm cohort resided in a very low Child Opportunity Index neighborhood. This highlights socioeconomic inequities, many of which overlap with risk factors associated with violence, including poverty, inadequate housing, and lower economic opportunity.⁸,⁹ Although in recent studies, researchers also found that firearm injuries among adults and very young children increased during the SARS-CoV-2 pandemic, this is the first report highlighting the significant increase in pediatric firearm encounters for all ages during the pandemic despite unprecedented declines in total encounters.

Limitations include retrospective design, restricted time frame of available data, and reduced generalizability to community hospitals and rural settings. Despite likely underrepresenting older adolescents managed in adult trauma centers, we demonstrated a significant increase in firearm encounters, highlighting the impact firearm injuries have on children of all ages. Although we recognize database limitations, we chose PHIS given its nationally representative sample, inclusion of inpatient and ED encounters, relatively even representation of injury intents, and up-to-date data. Lastly, we did not make inferences on the basis of coded injury intent because of known discordance between codes and injury description.¹⁰ Different trends may emerge as extended time lines and additional data sets are used.

These findings underscore the critical importance of preventing firearm injuries, intensified in the context of a global pandemic, by applying effective tools such as counseling on safe firearm storage, promoting crisis support and violence intervention resources, supporting responsible firearm legislation, and advocating for firearm safety research.¹¹

ABBREVIATIONS
ED: emergency department
ICD-10: International Classification of Diseases, 10th Revision
PHIS: Pediatric Health Information System
SARS-CoV-2: severe acute respiratory syndrome coronavirus 2

REFERENCES
Supplemental Materials

Methods

Firearm encounters were identified by using ICD-10 discharge diagnosis codes W32-34, X72-X74, X93-X95, Y22-Y24, Y35.0, and Y38.4, excluding blunt trauma, nonpowder gun injuries, and subsequent or sequala encounters. The March to August timeline was chosen because this correlated best with the SARS-CoV-2 pandemic and the most complete PHIS data. We excluded hospitals with incomplete data or data quality concerns during the study period. Descriptive characteristics of the firearm-related encounter cohort were summarized for 2020 and 2017–2019 and compared by using Pearson’s $\chi^2$ tests. The Child Opportunity Index is a composite metric based on 29 neighborhood indicators collected from public and proprietary sources at the census-tract level, assigned to 5 ordered levels of opportunity (very low, low, moderate, high, and very high) to describe the level of neighborhood opportunity. The Institutional Review Board at Vanderbilt University Medical Center approved this study.
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*Pediatrics* 2021;148; DOI: 10.1542/peds.2021-050223 originally published online May 12, 2021;
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