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Child maltreatment-related children’s emergency department visits before and during the COVID-19 pandemic in Connecticut

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ABSTRACT

Background: Previous studies of national emergency department (ED) data demonstrate a decrease in visits coded for physical abuse during the pandemic period. However, no study to date has examined the incidence of multiple child maltreatment types (physical abuse, sexual abuse, and neglect), within a single state while considering state-specific closure policies. Furthermore, no similar study has utilized detailed chart review to identify cases, nor compared hospital data to Child Protective Services (CPS) reports.

Objective: To determine the incidence of child maltreatment-related ED visits before and during the COVID-19 pandemic, including characterizing the type of maltreatment, severity, and CPS reporting.

Participants and setting: Children younger than 18 years old at two tertiary-care, academic children’s hospitals in X state.

Methods: Maltreatment-related ED visits were identified by ICD-10-CM codes and keywords in chief concerns and provider notes. We conducted a cross-sectional retrospective review of ED visits and child abuse consultations during the pre-COVID (1/1/2019–3/15/2020) and COVID (3/16/2020–8/31/2020) periods, as well as state-level CPS reports for suspected maltreatment.

Results: Maltreatment-related ED visits decreased from 15.7/week in the matched pre-COVID period (n = 380 total) to 12.3/week (n = 296 total) in the COVID period (P < .01). However, ED visits (P < .05) and CPS reports (P < .001) for child neglect increased during this period. Provider notes identified 62.4% of child maltreatment ED visits, while ICD-10 codes identified only-CM captured 46.8%.

Conclusion: ED visits for physical and sexual abuse declined, but neglect cases increased during the COVID-19 pandemic in X state.

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1. Introduction

Major life events, such as economic hardships and natural disasters, are known to create disruption of the family unit through factors such as increased parental stress, lack of social support, unemployment, and poverty. For example, the 2008 US economic recession and Hurricane Floyd highlighted the negative impact of societal disruption on rates of child maltreatment (Keenan, Marshall, Nocera, & Runyan, 2004a; Schneider, Waldfogel, & Brooks-Gunn, 2017; Wood et al., 2016). Specifically, the incidence of abusive head trauma, the most fatal form of child physical abuse, was shown to increase under these tumultuous circumstances (Barlow & Minns, 2000; Ellingson, Leventhal, & Weiss, 2008; Keenan, Runyan, Marshall, Nocera, & Merten, 2004b). These historical lessons emphasize the risk of child maltreatment during periods of societal destabilization, such as the Coronavirus Disease-2019 (COVID-19) pandemic.

The COVID-19 pandemic created multi-layer (Phelps & Sperry, 2020) contextual (Coyne et al., 2020) stressors for families. Anxiety, depressive symptoms, and other COVID-19-related stressors were linked to greater parental stress, which is an established risk factor for child abuse (Brown, Doom, Lechuga-Peña, Watamura, & Koppels, 2020). Furthermore, the economic consequences of COVID-19 were profound, with unemployment rates reaching levels higher than those experienced in the 2008 economic recession across every state (Falk, Romero, Nicchitta, & Nyhof, 2021). Such factors led to widespread concern about the increased risk of child maltreatment and the need to protect children during the COVID-19 pandemic.

At a healthcare level, the onset of the pandemic reduced emergency department (ED) utilization (Hartnett, Kite-Powell, DeVies, et al., 2020), with fear of COVID-19 exposure compounding traditional barriers to ED care, such as cost, wait time, and lack of transportation (Niforatos, Chaitoff, Zheutlin, Feinstein, & Raja, 2020). Public messaging to “stay at home” and closure of certain healthcare settings also likely shifted healthcare-seeking behavior during the pandemic. It is logical to assume that the complex interplay of these factors reduced child safety and access to care (Bram et al., 2020; Macy, Smith, Cartland, Golbeck, & Davis, 2021). Furthermore, social distancing measures reduced the visibility of children to mandated reporters of child abuse and neglect, including less interface with teachers, daycare providers, and primary care clinicians. Given our knowledge of previous natural disasters and conflicts, the combination of these factors in the context of the COVID-19 pandemic may similarly increase risk for child maltreatment (Albutt, Kelly, Kabanga, & VanRooyen, 2017; Seddighi, Salmani, Javadi, & Seddighi, 2019).

Recent studies on the COVID-19 pandemic did not demonstrate an increase in child maltreatment-related ED visits on a national basis. However, these studies were limited to one source of national administrative data and the use of only ICD-10-CM codes for case detection (Kaiser et al., 2021; Swedo, 2020). As acknowledged by the authors of these studies, the use of only ICD codes for detection likely underestimates the rate of maltreatment-related ED visits, given that ICD codes for child maltreatment are more specific than sensitive. (Hughes Garza, Piper, Barczyk, Pérez, & Lawson, 2021) Furthermore, wide variability in state policies during the pandemic limits the ability of national data sets to describe the relationship between state policies and healthcare utilization. Lastly, these studies only examined physical abuse rates and did not assess whether rates of ED visits for sexual abuse and neglect were similarly affected by policies implemented at the state level.

Unlike previous research, our study aimed to utilize a more comprehensive approach for case detection by including ICD-10-CM codes, chief complaints, keywords in provider notes, and a detailed review of provider notes. Furthermore, we aimed to investigate rates of multiple maltreatment types (physical abuse, sexual abuse, and neglect) in the context of state-specific reopening phases. To accurately describe a single statewide experience, we used data from the two level-1 pediatric trauma center EDs in X state to describe the association of the COVID-19 pandemic with: (1) the number of the child maltreatment-related ED visits, (2) the types of maltreatment (physical abuse, sexual abuse, and neglect) and (3) the severity of maltreatment. We obtained two additional perspectives on trends in the state: data from the child abuse evaluation programs at each children’s hospital and summary data on reports to Child Protective Services (CPS). Our hypothesis was that the rate of ED visits related to child maltreatment would increase due to the social and economic ramifications of the COVID-19 pandemic. Furthermore, we hypothesized that ED utilization patterns may underrepresent true rates of child maltreatment given pandemic-associated barriers to care, with severe presentations comprising a higher proportion of the study sample.

2. Methods

2.1. Study setting and population

This study was conducted at Site 1 and Site 2 Hospitals in X state and was approved by each hospital’s Institutional Review Boards. A chart review was performed at each site to identify ED visits related to confirmed or suspected child maltreatment from January 1, 2019, to August 31, 2020, for children and adolescents younger than 18 years old.

2.2. Time periods

We compared the pre-COVID period to the COVID period to determine if the number of maltreatment-related ED visits changed. The COVID period was divided into three phases: (1) Initial shutdown/schools closed: March 16 – May 17, 2020, (2) Phase 1 reopening: May 18 – June 16, 2020 (e.g., resumption of outdoor dining, non-essential retail; Lamont, 2020a) and (3) Phase 2

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1 Names removed for blinded review.
### Table 1
Chief concerns, provider note keywords, and ICD-10 codes to identify cases in study.

| Source | Terms |
|--------|-------|
| Chief concern | Abuse/neglect concern, Alleged child abuse, Alleged sexual assault, Assault victim, Concerns for physical abuse, DCF involvement, Failure to thrive, Growth failure, Medical problem, Medical screening, Physical screening, Sibling screening, Signal 5288 |
| **Provider note keywords** | Abuse, Abusive, Assault, DART, DARRT, Exploit, Maltreatment, NAT, Nonaccidental trauma, Physical abuse, Physical assault, Rape, SCAN, Seduction, Sexual abuse, Sexual assault, Social worker |
| **ICD-10-CM codes** | **Descriptor** | **ICD-10-CM codes** | **Age range** | **Exclusions** |
| **Sexual abuse** | Child sexual abuse confirmed | T74.22 | 0–17 | Alleged child rape or sexual assault ruled out Z04.42 |
| | Sexual assault | T74.2 | 0–17 | Alleged child rape or sexual assault ruled out Z04.42 |
| | Sexual assault by bodily force | Y05 | 0–17 | Alleged child rape or sexual assault ruled out Z04.42 |
| | Child sexual abuse suspected | T76.22 | 0–17 | Alleged child rape or sexual assault ruled out Z04.42 |
| | Observation after alleged rape | Z04.4 | 0–17 | Alleged child rape or sexual assault ruled out Z04.42 |
| | Forced sexual exploitation | Z04.81 | 0–17 | Alleged child rape or sexual assault ruled out Z04.42 |
| | Gonococcal infection, genital, rectum, throat, vulva | A54.00, A54.6, A54.5, A54.02 | 0–12 | Eye newborn A54.31, (P39.8; P39.9; P35.2): other congenital infections specific to neonatal period; perinatal period; |
| | Child sexual abuse, anus, rectum, throat, vulva | A56.00, A56.01, A56.02, A56.09, A56.2, A56.3 | 0–12 | (P39.8; P39.9; P35.2): other congenital infections specific to neonatal period; perinatal period; |
| | Trichomonas Vaginalis, urethritis, vaginitis | A59.00, A59.01, A59.03 | 0–12 | (P39.8; P39.9; P35.2): other congenital infections specific to neonatal period; perinatal period; |
| | Syphilis carrier suspected, exposure to HIV sexually transmitted disease | Z22.4, Z20.2 | 0–12 | Congenital A50.42; (P39.8; P39.9; P35.2): other congenital infections specific to neonatal period; perinatal period; |
| | HIV sexually transmitted, exposure to HIV sexually transmitted disease | Z11.4, Z20.6 | 0–12 | Maternal 098.72 |
| | Unspecified sexually transmitted disease | A64 | 0–12 | Alleged child rape or sexual assault ruled out Z04.42, Alleged child rape or sexual assault ruled out Z04.42, (P39.8; P39.9; P35.2): other congenital infections specific to neonatal period; perinatal period |
| | Injury to genital organs, external | S39.94 | 0–10 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9, pathological fracture with osteoporosis M80, pathological fracture M84.4; Falls (manual review) |
| | Physical abuse | Child physical abuse confirmed | T74.12 | 0–17 | Z04.72 Physical child abuse ruled out |
| | Child physical abuse suspected | T74.12 | 0–17 | Z04.72 Physical child abuse ruled out |
| | Shaken infant syndrome | T74.4 | 0–17 | Manual review |
| | Assault by bodily force | Y04 | 0–17 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9 |
| | Retinal hemorrhage | H35.9 | 0–3 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9 |
| | Subconjunctival hemorrhage | H11.3 | 0–23 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9 |
| | Rib fracture, single, multiple | S22.3, S22.4 | 0–23 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9, pathological fracture with osteoporosis M80, pathological fracture M84.4 |
| | Femur, humerus, radius, ulna, tibia, fibula fracture | S72.9, S42.3, S52.9, S52.2, S82.2, S82.4 | 0–11 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9, pathological fracture with osteoporosis M80, pathological fracture M84.4 |
| | Skull fracture | S02.0 | 0–6 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9, pathological fracture with osteoporosis M80, pathological fracture M84.4, Z04.72 Physical child abuse ruled out |
| | Intracranial injury traumatic, SAH traumatic, SDH traumatic | T14.9, S06.6x, S06.5x | 0–23 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9, pathological fracture with osteoporosis M80, pathological fracture M84.4, plus non-traumatic hemorrhage I62.1, I62.9, I60.9, I62.00, Z04.72 Physical child abuse ruled out |
| | Intra-abdominal injury | S36.90 | 0–4 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9, pathological fracture with osteoporosis M80, pathological fracture M84.4, Z04.72 Physical child abuse ruled out |
| | Intrathoracic injury | S27 | 0–4 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9, pathological fracture with osteoporosis M80, pathological fracture M84.4, Z04.72 Physical child abuse ruled out |
| | Burns | T30.0 | 0–6 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9, pathological fracture with osteoporosis M80, pathological fracture M84.4, Z04.72 Physical child abuse ruled out |
| | Contusion | T14.8 | 0–6 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9, pathological fracture with osteoporosis M80, pathological fracture M84.4, Z04.72 Physical child abuse ruled out |
| | Mouth injury | S00.502, S00.552, S01.502, T14.9, T14.8, S09.93 | 0–6 | Transport accidents V01-V99, birth trauma P10-P15, coagulation disorder D68.9, pathological fracture with osteoporosis M80, pathological fracture M84.4, plus non-traumatic hemorrhage I62.1, I62.9, I60.9, I62.00, Z04.72 Physical child abuse ruled out |
| | Poisoning | T36-T50 | 0–10 | (continued on next page) |
reopening: June 17 – August 31, 2020 (e.g., resumption of limited indoor dining, gatherings, gyms; Lamont, 2020b). To adjust for seasonal effects, we used matched comparison time periods of the same calendar dates in 2019. In addition, we used the full pre-COVID period (January 1, 2019 – March 15, 2020) for interrupted time series analyses.

2.3. Case identification procedure

Relevant cases were identified by a pre-determined set of inclusion/exclusion criteria, developed from previous literature (Hunter et al., 2020; Lindberg, Beaty, Juarez-Colunga, Wood, & Runyan, 2015; Schnitzer, Slusher, Kruse, & Tarleton, 2011) and based on: (1) chief concerns, (2) keywords in ED provider notes, and (3) ICD-10-CM codes (Table 1). Cases meeting at least one of these three criteria were included in the study sample for chart review. The initial automated search criteria were set broadly to include as many suspected cases of maltreatment as possible.

Clinical teams at each site (consisting of an attending physician with clinical expertise in child abuse in the ED and a medical student) performed independent review of ED provider note(s) from each encounter of interest. At each site, cases were initially categorized into three groups: (1) maltreatment-related, (2) possibly maltreatment-related, and (3) not maltreatment-related. Cases categorized as possibly maltreatment-related and those for which there was disagreement were then jointly reviewed by the study investigators at each site to determine whether to include these cases as maltreatment-related. Frequent discussions between the sites throughout the process ensured consistency in categorization through discussion. Cases whose final categorization were maltreatment-related were then subcategorized by type of concern (physical abuse, sexual abuse, and/or neglect). Cases could be categorized as more than one type of abuse/neglect. Because our focus is on describing healthcare utilization patterns, multiple visits by the same child were included. We confirmed interrater reliability using Cohen’s kappa for 2 raters.

2.4. Measures

Our primary outcomes were (1) the number of child maltreatment-related ED visits and (2) the distribution of maltreatment presenting to the ED by type (physical abuse, sexual abuse, neglect) and severity. We also obtained the total pediatric census for each ED for each week during the study period to determine the proportion of total ED visits that were related to child maltreatment.

We examined demographic variables of age, sex, race/ethnicity, and insurance type. We categorized any indication of public insurance as “public,” private insurance with no indication of public insurance as “private,” and no insurance or missing data as missing. Insurance type was included as a proxy for socioeconomic status, which may differ between sites and impact healthcare utilization. Although no insurance is different from missing, there were too few cases of no insurance (2.1%) to analyze separately. We used ZIP code from the medical record, the American Community Survey data, and ArcGIS to estimate the neighborhood-level poverty for each child, defined as the percentage of households at or below the federal poverty level in the child’s ZIP code of residence (Bureau, 2019).

Table 1 (continued)

| Source | Terms |
|--------|-------|
| Chief concern | Abuse/neglect concern, Alleged child abuse, Alleged sexual assault, Assault victim, Concerns for physical abuse, DCF involvement, Failure to thrive, Growth failure, Medical problem, Medical screening, Physical screening, Sibling screening, Signal 5288 |
| Provider note keywords | Abuse, Abusive, Assault, DART, DARRT, Exploit, Maltreatment, NAT, Nonaccidental trauma, Physical abuse, Physical assault, Rape, SCAN, Seduction, Sexual abuse, Sexual assault, Social worker |
| ICD-10-CM codes | Descriptor | ICD-10-CM codes | Age range | Exclusions |
| | Drowning/near drowning | T75.1 | 0–10 | Y40-Y88; T88.9; Suspected ruled out drug poisoning or medical adverse event Z03.6, Z04.72 Physical child abuse ruled out |
| | Child Neglect or Abandonment confirmed | T74.02 | 0–17 | Water transport accident (V90-V94), Z04.72 Physical child abuse ruled out |
| | Neglect and abandonment | Y06 | 0–17 | |
| | Suspected child neglect or abandonment | T76.02 | 0–17 | |
| | Child Psychological abuse confirmed | T74.32 | 0–17 | |
| | Child psychological abuse suspected | T76.32 | 0–17 | |
| | Other maltreatment syndromes | T74.8 | 0–17 | |
| | Other maltreatment | Y07 | 0–17 | |
| | Maltreatment syndrome, unspecified | T74.9 | 0–17 | |

a A Site 2-specific code related to child maltreatment.

b “DARRT” was determined to be a frequent misspelling of “DART” (Site 1 child abuse team) in the provider notes and, therefore, included as a search term.

c “SCAN” is the acronym for the child abuse team at Site 2.
As a measure of severity, we examined discharge disposition, which was taken from the medical record and categorized as discharged from facility or three categories of hospital admission: medical, psychiatric, or pediatric intensive care unit.

2.5. Analysis

We compared the child’s demographic characteristics, maltreatment concern types (physical abuse, sexual abuse, and/or neglect), rates of hospital admission, and percentage of ED visits that were maltreatment related between the COVID period (March 16 – August 31, 2020) and the matched pre-COVID period (March 16 – August 31, 2019). We also compared these characteristics by site. For types of concern, we examined both the number of visits for each type and the percentage of visits related to each type, in order to distinguish between overall reduced healthcare utilization and a change in the distribution of maltreatment type. For continuous variables of age and neighborhood poverty, we used Wilcoxon rank-sum tests, as these variables had skewed distributions. For categorical variables, chi-square tests were used.

We used two methods to evaluate the association between COVID and maltreatment-related ED visits. First, we used a t-test to compare the mean number of visits per week between the two matched periods. Second, to examine changes over time more closely, we used an interrupted time series analysis (Linden, 2015) with weeks as our primary unit of time; we used a 52-week lag to account for seasonal effects. We tested for evidence of autocorrelation in each model and adjusted as necessary. To test for site differences in the number of visits per week over time, we used month as the primary unit of time due to small cell sizes; a 12-month lag was used. For all analyses, the level of significance was set at 0.05 and Stata/SE 15 was used (StataCorp LLC). No methods for managing missing data were required because the only variable with missing data was descriptive (insurance status missing or uninsured: 4.9%).

2.6. Supplemental data sources

We obtained two additional perspectives on trends in the region: summary data on reports to Child Protective Services (CPS) for the entire state and data from the child abuse programs at each hospital. Monthly summarized CPS data were obtained from the state’s Department of Children and Families, including reports (accepted and non-accepted) and the type of alleged maltreatment. Encounter data from the child abuse programs at each site included consultations by medical providers with child abuse expertise in both inpatient and outpatient settings. The consultations included telephone calls with other providers and in-person or telehealth examinations of children. Consultation data reflect a smaller number of cases, some of which were included in our primary dataset and some of which were from other facilities, for which child maltreatment was a sufficient concern to involve these experts. Due to the different levels of detail available in these records, we did not include them in our primary analyses and provided separate descriptive statistics only. The CPS and child abuse team data were included to provide context and determine whether CPS reports of maltreatment and child abuse expert consultations followed the trend observed in maltreatment-related ED visits.

3. Results

3.1. Patient characteristics

The automated search identified 8739 possible cases. Through manual chart review, we verified 1248 maltreatment-related ED visits, 952 during the full pre-COVID period (January 1, 2019 – March 15, 2020). A subset of the pre-COVID cases (n = 380, March 16, 2019 – August 31, 2019) were matched with cases occurring during COVID in 2020 (n = 296, March 16, 2020 – August 31, 2020) (Table 2). Interrater reliability prior to discussion to reach consensus on which cases were maltreatment related was substantial (Site 1:

| Factor                     | Missing (%) | Matched pre-COVID N (%) or median (IQR) | COVID N (%) or median (IQR) | p-Value |
|----------------------------|-------------|----------------------------------------|-----------------------------|---------|
| N                          | 380         | 296                                    |                             |         |
| Gender                     |             |                                        |                             |         |
| Female                     |             | 212 (55.8%)                            | 158 (53.4%)                 | 0.53    |
| Male                       |             | 168 (44.2%)                            | 138 (46.6%)                 |         |
| Race/ethnicity             | 0           |                                        |                             |         |
| White, Non-Hispanic        |             | 114 (30.0%)                            | 81 (27.4%)                  | 0.21    |
| Black, Non-Hispanic        |             | 90 (23.7%)                             | 75 (25.3%)                  |         |
| Hispanic                   |             | 154 (40.5%)                            | 111 (37.5%)                 |         |
| Other                      | 22 (5.8%)   | 29 (9.8%)                              |                             |         |
| Age (years), median (IQR)  | 0           | 5.0 (2.0, 12.0)                        | 4.0 (1.0, 12.0)             | 0.03    |
| Median percent poverty in ZIP code (IQR) |           | 8.7 (4.9, 20.2)                       | 8.9 (4.5, 20.2)             | 0.55    |
| Insurance typea            | 4.9%        |                                        |                             | 0.48    |
| Public                     |             | 312 (86.0%)                            | 235 (83.9%)                 |         |
| Private                    |             | 51 (14.0%)                             | 45 (14.9%)                  |         |

a The COVID period was March 16, 2020 – Aug 31, 2020 and the matched pre-COVID period was March 16, 2019 – August 31, 2019.
b Any indication of public insurance was categorized as public (i.e., having both commercial insurance coverage and Medicaid was categorized as public).
Maltreatment-related visits by COVID-pandemic phase and type of maltreatment.

Table 3

| characteristics for the full pre-COVID period. A difference in the distribution of race and ethnicity between sites was detected ($\chi^2(3,n = 676) = 26.9; P < .001$); a higher percentage of children seen at Site 2 were Hispanic (42.6% vs. 32.4%) and fewer were non-Hispanic Black (19.1% vs. 35.1%). More children at Site 2 were covered by public insurance (87.0% vs. 80.8%; $\chi^2(1,n = 643) = 4.28; P < .04$). More visits at Site 2 were related to maltreatment (1.13% vs. 0.89%; $\chi^2(1,n = 65,066) = 8.43; P < .004$) and more resulted in admission to the hospital (32.4% vs. 23.1%; $\chi^2(1,n = 676) = 6.22; P < .01$). See Supplemental Table 2 for additional detail on characteristics for each site separately.

Of the 1248 identified maltreatment-related ED cases, 55.0% (686) were identified through chief concerns, 63.4% (791) through keywords in provider notes, and 46.8% (584) through ICD-10-CM codes. Only 17.1% of cases (214) were identified by all three methods.

3.2. Comparison between pre-COVID and COVID periods

The number of maltreatment-related ED visits decreased from 15.7 during the matched pre-COVID period to 12.3 per week during the COVID period ($b = 3.67; 95\% CI: -5.96; -1.37; P = .002$; Table 3). Interrupted time series analysis showed a significant decrease at the start of the COVID period ($-4.6$ visits/week; 95\% CI: $-6.56; -2.71; P < .001$). As illustrated in Fig. 1 Panel A with the dashed line from January 1, 2019, to March 16, 2020, there was no substantial change in maltreatment-related visits per week before the pandemic (change $= 0.002; 95\% CI: -0.05, 0.06; P < .95$). During the pandemic period (solid line), there was a gradual increase ($0.13; 95\% CI: 0.08, 0.18; P < .001$), approaching the pre-COVID level of maltreatment-related visits, but no distinct changes at the start of the reopening phases. Similar results were found when months and days were used as the unit of time.

To determine if there were site differences, we repeated the interrupted time series analysis stratified by site. The two sites had equivalent decreases in visits in March 2020 (difference between sites $b = 0.08, 0.18; P < .001$), approaching the pre-COVID level of maltreatment-related visits, but no distinct changes at the start of the COVID period ($b = 4.6; 95\% CI: 2.85, 7.51; P < .001$). Interrupted time series analysis also showed a sharp decrease ($519; 95\% CI: 285.5, 751.9; P < .001$) during the pandemic period, approaching the pre-COVID level of maltreatment-related visits, but no distinct changes at the start of the COVID period ($b = 4.6; 95\% CI: 2.85, 7.51; P < .001$).

The overall ED census decreased from 1796 visits per week during the matched pre-COVID period to 915 per week during COVID ($t = 13.2; P < .001$). During the pandemic period, there was a gradual increase ($2.62$ visits/month; 95\% CI: $1.34, 3.89; P < .001$), approaching the pre-COVID level of maltreatment-related visits, but no distinct changes at the start of the reopening phases. Similar results were found when months and days were used as the unit of time.

Table 3

| Matched Pre-COVID | | COVID | Total pre-COVID vs. total COVID p-value$^a$ |
|-------------------|-------------------|-------------------|-------------------|
|                   | Phase 1: 3/16-5/17 | Phase 2: 5/18-6/16 | Phase 3: 6/17-8/31 | Total | Phase 1: 3/16-5/18 | Phase 2: 5/18-6/16 | Phase 3: 6/17-8/31 | Total |
| Total maltreatment-related visits | 116 | 63 | 201 | 380 | 94 | 54 | 148 | 296 |
| Maltreatment-related visits per week | 12.7 | 14.7 | 18.8 | 15.7 | 10.3 | 12.6 | 13.8 | 12.3 |
| Total ED visits per week | 2022 | 1948 | 1554 | 1796 | 731 | 926 | 1061 | 915 |
| % of ED visits maltreatment-related | 0.63% | 0.75% | 1.21% | 0.88% | 1.41% | 1.36% | 1.30% | 1.36% |

| Physical abuse | Percent of maltreatment visits$^c$ per week | 66.4% | 60.3% | 64.2% | 64.2% | 67.0% | 75.9% | 65.5% | 67.9% |
| Sexual abuse | Percent of maltreatment visits per week | 27.6% | 30.2% | 28.4% | 28.6 | 22.3% | 16.7% | 24.3% | 22.3% |
| Neglect | Percent of maltreatment visits per week | 9.6% | 7.9% | 9.0% | 9.0% | 14.9% | 14.8% | 12.8% | 13.9% |
| | ED visits resulting in a hospital admission | 23.3% | 28.6% | 29.9% | 27.6% | 38.3% | 37.0% | 25.0% | 31.4% |

$^a$ P-values calculated by linear or logistic regression, controlling for insurance type and race and ethnicity, except as noted.

$^b$ P-values calculated by $\chi^2$ tests, because only aggregate data were available for non-maltreatment ED visits.

$^c$ The percent of visits by maltreatment sum to more than 100% because each visit could be related to more than one type of maltreatment.
The percentage of visits attributed to maltreatment increased from 0.88% to 1.36% (54.5% increase; \( \chi^2(1, n = 68,999) = 9.00; P < .003; \) Fig. 1 Panel C).

### 3.3. Types of maltreatment

Fig. 2 illustrates changes in visits per week for each type of maltreatment over four time periods for each year, defined by the phases of the pandemic in X state in 2020, with 2019 serving as a comparison. There was no significant change in the distribution of maltreatment types of physical abuse (Panel A) or sexual abuse (Panel B) between the pre-COVID and COVID time periods (Table 3). In contrast, visits for neglect concerns increased from 9.0% in the matched pre-COVID period to 13.9% during the COVID period (Table 3; 54% increase; \( \chi^2(1, n = 676) = 4.06; P < .044; \) illustrated in Panel C). There was no association between neighborhood poverty and type of maltreatment concern or overall maltreatment (\( P > .66 \) to 0.82; Supplemental Table 3). There were no differences in maltreatment types by site (\( P > .05 \) to 0.70).

### 3.4. Severity of maltreatment

There was not a significant difference between matched pre-COVID and COVID periods in the percentage of child maltreatment-related ED visits that resulted in hospital admission (28% vs. 31%; OR: 1.18; 95% CI: 0.84, 1.66; \( P = .34 \)) or by admission type (\( P = .55; \) Supplemental Table 4). Supplemental Fig. 2 Panel A illustrates the number of maltreatment-related visits that resulted in hospital admission, and Panel B illustrates the percentage of maltreatment-related visits that resulted in admission.

### 3.5. Reports to CPS and child maltreatment consultations

Using statewide data from CPS, we found that there were more reports to CPS per week in the matched pre-COVID period (1202) than the COVID period (699; \( t(26) = 7.2; P < .001 \)), and a higher percentage of reports were accepted during pre-COVID (49.5% vs. 39.7%; \( \chi^2(1, n = 40,209) = 147.8; P < .001; \) Supplemental Fig. 3). There were significant associations between the type of maltreatment and time period: during the pre-COVID period there was a lower percentage of visits related to neglect pre-COVID than during COVID (66.7% [7576 of 11,364] vs. 79.1% [4849 of 6133]; \( \chi^2(1, n = 17,497) = 297; P < .001 \)), and a higher percentage of allegations of related to physical abuse pre-COVID than during COVID (17.6% [1997 of 11,364] vs. 11.1% [683 of 6133]; \( \chi^2(1, n = 17,497) = 127; P < .001; \) Supplemental Fig. 4).

The child abuse teams consulted on more cases in the matched pre-COVID period (\( n = 675 \)) compared to the COVID period (\( n = 533 \)). Telehealth was not used before COVID but was used for 44 consultations in the COVID period. There was no significant difference in the distribution of consultation mode (\( \chi^2(1, n = 1208) = 1.46; P = .23; \) in-person + telehealth vs. phone calls; Supplemental Fig. 5 Panel A). Also, there was no difference in the types of maltreatment concern (\( \chi^2(1, n = 1140) = 5.94; P = .051; \) Supplemental Fig. 5 Panel B).

### 4. Discussion

In this study of the only two level-1 trauma-center pediatric EDs in X state, we used a comprehensive search strategy to identify rates of multiple forms of child maltreatment-related ED visits before and during the COVID pandemic. Like previous research, we found that the overall volume of ED visits for child maltreatment declined during the COVID-19 pandemic. Uniquely we found an increase in child maltreatment-related ED visits for neglect. There was also an increase in the percentage of CPS reports that were related to neglect during the pandemic, although the absolute number declined. Both sites demonstrated increases in rates of neglect not aligned with the re-opening phases in the state. In contrast, there was no increase in ED visits for physical abuse or sexual abuse, nor an increase in CPS reports for physical or sexual abuse between the pre-COVID and COVID time periods. Furthermore, there was no increase in injury severity (as determined by hospitalizations).

Consistent with previous national reports (Kaiser et al., 2021; Swedo, 2020), pediatric ED utilization for child physical abuse concerns decreased during the initial months of the COVID-19 pandemic in X state. After the initial decrease, utilization gradually increased towards pre-COVID levels, a trend not examined in earlier studies. Similar to other authors, our study showed a change in healthcare-seeking behaviors that reduced the number of ED visits overall (Swedo, 2020). A study that sought to separate healthcare-seeking behavior from abusive injury by focusing only on abusive head trauma, which is sufficiently severe to result in medical care in most situations, found a significant decrease in abuse cases during the pandemic (Maassel, Asnes, Leventhal, & Solomon, 2021). Other measures of maltreatment incidence in our study – CPS reports and child abuse team consultations – were also lower in the COVID-19 period than the pre-COVID period. In addition, our ED-visit severity results are consistent with other authors who found severity to be
Fig. 2. Emergency department visits per week for three types of child maltreatment

Panel A. Physical Abuse
Panel B. Sexual Abuse
Panel C. Neglect.
similar during COVID-19 compared to previous years (Kaiser et al., 2021). Unlike other times of economic instability and natural disasters (Schneider et al., 2017; Wood et al., 2016), it may be that during the pandemic, due to stay-at-home restrictions imposed on all segments of society, there were more adults within a child’s home to supervise and prevent abusive injury. Maassel et al. hypothesized that this may be the reason for decreased hospital admissions for abusive head trauma in the US during COVID (Maassel et al., 2021).

Looking across the datasets, the consistent pattern of decreased child maltreatment-related ED cases during the COVID period implies that the decrease seen in ED visits is a broader phenomenon and not attributable only to families avoiding healthcare settings due to fears related to COVID infection. This provides support to the hypothesis that there may have been protective factors for children during this time frame, such as more adults being present in the home. It is also possible that there was underreporting due to children not being observed by mandated reporters. The consistent finding of an increased proportion of cases being related to neglect during the COVID period suggests that there was a broader impact that resulted in neglect cases being identified in the ED, as well as through other sources.

There are several implications of this study. First, an increase in child neglect has not been previously reported and may be related to economic stresses due to the stay-at-home orders. This finding underscores the importance of ensuring that adequate services are made available to support families with children in times of need and maintaining ED services to evaluate children for neglect concerns during public health crises. Second, stay-at-home guidelines and closed workplaces may have had a protective effect on the occurrence of physical abuse by reducing the time children were at home with a single caregiver (Maassel et al., 2021); this explanation could also extend to sexual abuse. This scenario is unique compared to other times of economic instability and natural disasters. While the exact mechanisms and impacts of such protective factors are unknown, policies supporting such protections, such as the provision of high-quality daycare and flexible work arrangements, may help to protect children.

4.1. Strengths & limitations

There are several strengths to our study. First, our novel strategy to identify cases by ICD-10-CM codes, chief concerns, and provider notes, as well as examining child protection reports and consultations by child abuse evaluation teams, was more comprehensive than previous studies, which only used ICD-10-CM codes to examine rates of child maltreatment before and during the pandemic (Kaiser et al., 2021; Swedo, 2020). We found that our search strategy approximately doubled our case identification compared to using ICD-10-CM codes alone, similar to previous work (Hughes Garza et al., 2021). By considering state CPS reporting, we were able to demonstrate a corresponding increase in the proportion of in CPS reports related to neglect along with increased ED visits for neglect during the first months of the pandemic. Second, by combining data from two pediatric EDs, we were able to increase the power and examine differences between sites. Third, unlike the previous studies, we evaluated the associations between the pandemic and multiple types of maltreatment (physical and sexual abuse and neglect), rather than just physical abuse (Swedo, 2020). Fourth, we focused on a single state, in which state, business, and school closures did not vary substantially across regions, which enabled an examination of changes in utilization by phases of reopening; we did not detect any substantial changes based on these phases.

Our study has at least five limitations. First, our study design limited the findings to X state. However, our results are consistent with previous national studies (Kaiser et al., 2021; Swedo, 2020). Second, data were coded by two different teams of coders, so there may have been some subjectivity in coding despite the agreed-upon criteria for classification. However, any discrepancies were resolved by consensus of the coders, and frequent cross-site research team meetings reduced variability in case classification (maltreatment-related) and categorization (type). Third, reliance on ED providers’ documentation leads to the potential for missing cases of maltreatment if the provider did not consider the diagnosis. Fourth, the two child abuse teams’ evaluation criteria are not standardized, leading to the limited generalizability of our child maltreatment consultation findings to other child abuse evaluation teams. Finally, our study results cannot be generalized to non-pediatric EDs, where most children receive emergency care (Gausche-Hill et al., 2015); further research to replicate our study in general EDs is needed.

5. Conclusion

We found that overall ED visits for child maltreatment declined during the first months of the COVID-19 pandemic when stay-at-home orders were most stringent. By examining the different maltreatment types, we found increases in ED visits and CPS reports for neglect during the first 5½ months of the COVID-19 pandemic in X state. Reliance on ICD-10-CM codes alone would have identified less than half of our cases. Services to support families and monitor children for maltreatment, especially for neglect, must continue during times of crisis and disruption, and ED providers must remain alert for signs of maltreatment during times of widespread social stress.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chiabu.2022.105619.
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