National Trends in Emergency Department Visits for Child Maltreatment, 2007–2014

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Abstract

Objective: To understand the prevalence of child maltreatment-related ED visits in the U.S, we examined data from the 2007–2014 Nationwide Emergency Department Sample (NEDS).

Methods: Based on existing literature, ICD-9 CM ED discharge codes for children less than 10 years of age were characterized as specified child maltreatment, defined as visits with an explicit maltreatment ICD-9 or E-code. The prevalence of child maltreatment visits per 100,000 children in the United States (based on CDC WONDER estimates) overall and by socio-demographic factors was examined, and tests for trends over time were evaluated with Cochrane-Armitage tests. Analyses were conducted in 2019.

Results: The prevalence of child maltreatment based in ICD-9 discharge codes ED visits dropped from 69.2 visits per 100,000 in 2007 to 65.9 visits per 100,000 in 2014; this trend was statistically significant. The prevalence was lowest in 2010 (60.1 visits per 100,000 children). There were increases observed for some demographic groups in this time period. Throughout the eight-year period examined, the prevalence of child maltreatment visits was highest for physical abuse compared to other forms of maltreatment, higher for boys compared to girls; highest for children less than one year old, and higher for children living in neighborhoods with the lowest median income compared to children in higher income neighborhoods.

Conclusion: The NEDS dataset is a valuable surveillance tool for examining trends in child maltreatment. Future studies should explore what factors may explain variations in child maltreatment over time to best develop prevention strategies.

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Introduction

Children use health services for diverse purposes such as emergency treatment for injuries and assessment and treatment of illness. Vulnerable children, such as those experiencing maltreatment, may utilize health services, particularly emergency care frequently(Suglia et al., 2016). Patterns of health service utilization by these highly vulnerable children may provide insights into the prevalence of maltreatment nationally as well as factors that may impact that prevalence which could inform efforts to prevent child maltreatment and its associated consequences.

Emergency department (ED) visits are used to inform surveillance efforts for outcomes such as suicide attempts and self-injurious behavior (Canner, Giuliano, Selvarajah, Hammond, & Schneider, 2018), intimate partner violence (Davidov, Larrabee, & Davis, 2015), and elder abuse (Evans, Hunold, Rosen, & Platts-Mills, 2017) where, similar to child maltreatment, ascertainment presents many challenges. For these outcomes, multiple data sources, including those derived from ED visits, are important for capturing their full population burden. While the prevalence of ED visits indicating maltreatment is low, childhood maltreatment ED visits offer a potential way to survey childhood maltreatment trends over time. Moreover, due to the nature of injuries and illnesses seen in the ED, it may be more likely to capture physical abuse, as opposed to other forms of maltreatment such as neglect that account for the majority of maltreatment cases in other data sources such as National Child Abuse and Neglect Data System (NCANDS)(Leventhal, Martin, & Gaither, 2012). They also offer an opportunity to explore trends according to socio-demographic factors that may inform overall prevention efforts.

Data estimating child maltreatment trends over time often rely on cases reported to Child Protective Service (CPS). For example, NCANDS relies solely on reports to CPS that are screened for inclusion in follow-up investigations. NCANDS shows that confirmed maltreatment has declined nationwide since 1990, with the largest decreases for sexual and physical abuse(Finkelhor, Saito, & L., 2017). Using NCANDS data it is estimated that 12.5% of children will be confirmed victims of maltreatment by age 18 (Wildeman et al., 2014), but this is believed to underestimate the true prevalence of child maltreatment in the US given its reliance on substantiated cases which some studies suggest may be biased by race, socioeconomic status (SES), and receipt of social services (Chaffin & Bard, 2006; Font, Berger, & Slack, 2012). Other nationally representative surveillance systems, like the National Incidence Study of Child Abuse and Neglect (NIS; HHS), do not rely on substantiated case as NCANDS, rather it relies on community professionals for reports of child maltreatment; however, this survey is only conducted once per decade and therefore cannot be used to examine recent trends. Thus, there is a need to utilize additional data sources beyond NCANDS and NIS to understand trends in reporting of child maltreatment.

Use of ED visits to inform surveillance of child maltreatment allows for the examination of trends over time of ED visits reported as child maltreatment. We aim to examine the Nationwide Emergency Department Sample data system (2007–2014) to examine correlates of ED related maltreatment visits and trends over time. We focus on differences by socio-demographic factors (child's gender, SES) previously shown to be associated with maltreatment and determine variations in maltreatment ED visits over time and explore variations by socio-demographic factors.

Methods

Study Data and Population

Data came from the Nationwide Emergency Department Sample (NEDS) which is part of the Healthcare Cost and Utilization Project (HCUP), sponsored by the Agency for Healthcare Research and Quality (AHRQ). The NEDS is the largest all-payer ED database that is publicly available in the United States, containing information from ED visits at 950 hospitals that approximate a 20-percent stratified sample of U.S. hospital-based EDs. Weights are provided to calculate national estimates pertaining to the approximately 134 million ED visits per year. Not every year reported contains all the same states, however, the sample is regionally and nationally representative ("Overview of the Nationwide Emergency Department Sample (NEDS)"). NEDS data is available up to 2018, however, visits prior to 2015 use the International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9 CM), visits during 2015 use a mix of ICD-9CM and International Classification of Disease, Tenth Revision, Clinical Modification (ICD-10 CM), visits during 2016 and after use ICD-10CM. Given the previously documented effects on trend analyses during this coding transition, (Slavova et al., 2018) we utilized ED visit data from 2007 to 2014 for our analyses. The sample was restricted to children younger than 10 years of age; with this restriction, we are less likely to include cases that may reflect peer perpetrated violence rather than child maltreatment.

Definition of maltreatment

We used International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9 CM) codes and External causes of injury codes (E-codes) to identify children receiving an explicit diagnosis of maltreatment based on definitions previously described (King, Farst, Jaeger, Onukwube, & Robbins, 2015; Kuang, Aratani, & Li, 2018) (Supplemental Table 1). These visits were defined as *specified* cases of maltreatment based on previous validation studies (Leventhal et al., 2012; Schnitzer, Slusher, Kruse, & Tarleton, 2011), and on confirmation from child abuse experts as described in previous studies(King et al., 2015). In previous work these visits are defined as specified maltreatment given the explicit diagnosis given to these visits as opposed to suggestive maltreatment where no explicit maltreatment ICD-9 or E-code is used. In these analyses given our sole use of specified maltreatment we refer to these cases herein as maltreatment.

Demographic characteristics

ED patient's sex and age as well as median household income based on residential zip code, and hospital region (North, South, Midwest, West) were examined. In the NEDS dataset,

yearly median household incomes are divided into quartiles from residential ZIP Code-demographic data obtained from Claritas (https://www.hcup-us.ahrq.gov/db/vars/zipinc_qrtl/nedsnote.jsp).

Statistical Analysis

We calculated the prevalence of ED visits for maltreatment. For the numerator, we calculated the weighted number of maltreatment ED visits in each demographic category to obtain national estimates, accounting for the complex sample design of NEDS. For the denominator, we utilized CDC WONDER estimates created by the National Center for Health Statistics and Census Bureau (https://wonder.cdc.gov/bridged-race-population.html) to obtain the number of children in the United States less than age 10 in each demographic category. All prevalences are expressed as per 100,000 children. All statistical analyses were performed using SAS callable SUDAAN, version 9.4 (SAS Version 9.4 and SUDAAN Version 11.0.3). We also tested for trends over time using Cochrane-Armitage tests, setting statistical significance at p<.05.

Results

The prevalence of child maltreatment related visits among children younger than 10 years of age, over the eight-year period, decreased over time (Cochrane-Armitage trend p<.05), going from 69.2 ED visits per 100,000 children in 2007 to 65.9 ED visits per 100,000 children in 2014 (Figure 1). We note the highest prevalence of maltreatment related ED visits was in 2007 and the lowest in 2010 (60.1 visits per 100,000 children), however from 2010 to 2014 we note an increase in prevalence. When examining visits by type of abuse (Table 1), physical abuse was most prevalent in 2007 and declined from 2007 to 2014, in contrast maltreatment visits related to sexual abuse or poly-maltreatment increased from 2007–2014 (Cochrane-Armitage p<.05).

For any given year, the prevalence of maltreatment visits was higher for boys compared to girls (Supplemental table S2). Among boys, there was a decrease in the prevalence of maltreatment from 2007 to 2014 (75.3 visits per 100,000 boys vs 69.5 visits per 100,000 boys). However, among girls, while there was a decrease in the prevalence from 2007 to 2010, there was an overall increase in prevalence from 2007 (59.5 visits per 100,000 girls) to 2014 (61.9 visits per 100,000 girls in 2014) (p for trend <.05).

As the risk of child maltreatment varies with age, analyses were conducted to examine variations by age groups, 0–.99, 1–3.99, 4–6.99 and 7–9.99 (Figure 2). Children less than one year of age had the highest prevalence of maltreatment for all years (103.8 visits per 100,000 children in 2007 and 90.1 visits per 100,000 children in 2014, p for trend <.05). Children ages 1–3.99 and 7–9.99 showed significant decreases in the prevalence of maltreatment from 2007 to 2014. However, in children ages 4–6.99, although there was a decrease in the prevalence of maltreatment after 2008, the prevalence in 2014 was greater than in 2007.

Upon examining trends by SES, characterized as neighborhood median income we note that, children living in neighborhoods with the lowest quartile (first quartile) of median income

have the highest prevalence of maltreatment visits for any given year (Figure 3). Over the eight-year period there was a decrease in prevalence among this SES group (prevalence in 2007 123.4 visits per 100,000 children versus 111.1 visits per 100,000 children in 2014, p for trend <.05). By contrast, there was an increase in the prevalence of maltreatment for children living in the second lowest income quartile (2nd quartile (p<.05).

There was variation in the prevalence of maltreatment across US regions (Supplemental Figure S1). In 2007, the Midwest had the highest prevalence of maltreatment (87.5 visits per 100,000 children), but this number substantially decreased to 67.9 visits per 100,000 children in 2014 (Cochrane-Armitage p<.05). Maltreatment was least prevalent in the West, where it decreased from 2007 (55.5 visits per 100,000 children) to 2014 (41.9 visits per 100,000) (Cochrane-Armitage p<.05). Unlike the other regions, the South experienced an increase in the prevalence of maltreatment from 2007 (61.3 visits per 100,000 children) to 2014 (68.1 visits per 100,000 children) (p <.05).

Conclusions

Using the NEDS, we note a decrease in ED visits classified as child maltreatment among children less than 10 years of age between 2007–2014, albeit this trend varied among demographic groups. We note the highest prevalence of maltreatment related ED visits in 2007 and the lowest prevalence in 2010, and an increase in prevalence from 2010–2014. Our findings are consistent to those of the NCANDS survey which based on statistics from state child protection agencies, has noted decreases in the prevalence of child maltreatment since the early 1990's. In contrast, NCANDS has a high prevalence of neglect cases while we find the highest prevalence of physical abuse. It's likely differences in findings could be related to type of injuries that may warrant ED visit, suggesting surveillance of child maltreatment trends through ED may capture a different type of maltreatment. Our findings also differ from a recent analyses using NEDS data which noted no significant changes on the prevalence of physical abuse related ED visits over time. However, those analyses relied on both suggestive and specified physical abuse cases potentially obscuring trends in specified abuse cases.(Zins et al., 2019)

Overall we note a higher prevalence of ED maltreatment visits among lower SES neighborhoods, consistent with findings from the National Incidence Study of Child Abuse and Neglect which utilizes CPS reports as well as reports from community professionals (daycares, schools, police officers, etc.).(Sedlak et al., 2010) While the overall prevalence of maltreatment ED visits is higher among lower SES families, the largest decreases over the 8-year period in the prevalence of ED maltreatment visits occurred among those in the lowest SES strata. By contrast, we note increases in the prevalence of maltreatment ED visits among the second lowest SES group. Declines in specific socio-demographic groups could reflect targeted efforts to promote safe and nurturing environments to children in the most socially disadvantage situations, such as nursing partnership programs. Alternatively, it could reflect a declining trend for seeking health services among the most vulnerable populations. For example, several communities have access to Child Advocacy Centers where children are directly evaluated after a CPS report by a child abuse clinicians without the need to visit a ED. In relation to region, we note decreases in child maltreatment ED

visits among all regions examined except for the South. Based on child characteristics, the prevalence of maltreatment decreases among boys but increases among girls over the 8-year period and is highest among the youngest children (< 1 year of age). This is consistent with NCANDS which has noted the highest prevalence of maltreatment among the youngest children (12 months and younger).(Wildeman et al., 2014) NCANDS has a high prevalence of neglect cases while we find the highest prevalence of physical abuse. As noted, differences in findings could be related to type of injuries that may warrant ED visit, which differ by age, higher likelihood of missed cases among younger children(Berger & Lindberg, 2019) or the likelihood of older children being able to disclose the maltreatment sustained in the ED. Systems that rely on CPS reports and those that rely in hospital-ED related visits may be monitoring different types of maltreatment cases and thus may both be necessary to survey maltreatment in the US and inform the allocation of resources to the most vulnerable children.

There are several limitations worth noting. We rely on ICD-9 codes for specified maltreatment, however indication of maltreatment is difficult and a number of ED visits that may be suspected maltreatment cases may not receive a ICD-9 code for specified maltreatment, thus we are likely under estimating maltreatment cases. We do not have detailed information on individual level income and rely on neighborhood level income as a marker of SES. We recognize the importance of diversity in research, however available data limited our availability to describe the population sample as we do not have access to additional sociodemographic information, such as race/ethnicity, that may help us further understand trends over time. Trends are for visits not participants, so that children who repeatedly come to the ED are not tracked. Despite these limitations, these data provide a snapshot of trends over time in child maltreatment in the US that can inform national efforts to prevent maltreatment.

The NEDS dataset is a valuable surveillance tool for examining trends in child maltreatment. ED and hospital discharge data can be used to monitor trends over time on maltreatment related visits as well as geographic variations and examine whether particular socio-demographic groups are being affected. Future studies should explore what factors may explain the noted sociodemographic and regional variations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgement:

Abbreviations:

AHRQ   Agency for Healthcare Research and Quality

NCANDS   Child Abuse and Neglect Data System

CPS	Child Protective Service
ED	Emergency Department
ICD-9 CM	International Classification of Disease, Ninth Revision, Clinical Modification
NIS	National Incidence Study of Child Abuse and Neglect
NEDS	Nationwide Emergency Department Sample
SES	socioeconomic status

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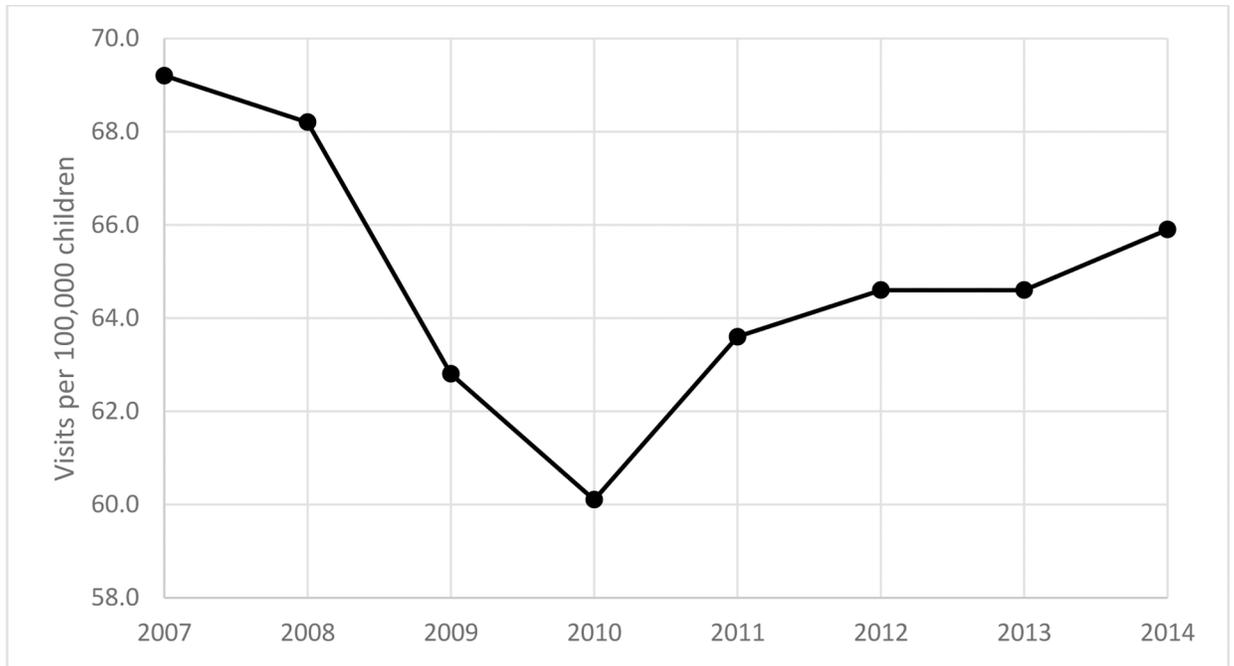
Figure 1.
Prevalence of child maltreatment related ED visits per 100,000 children (0–9 years). NEDS 2007–2014
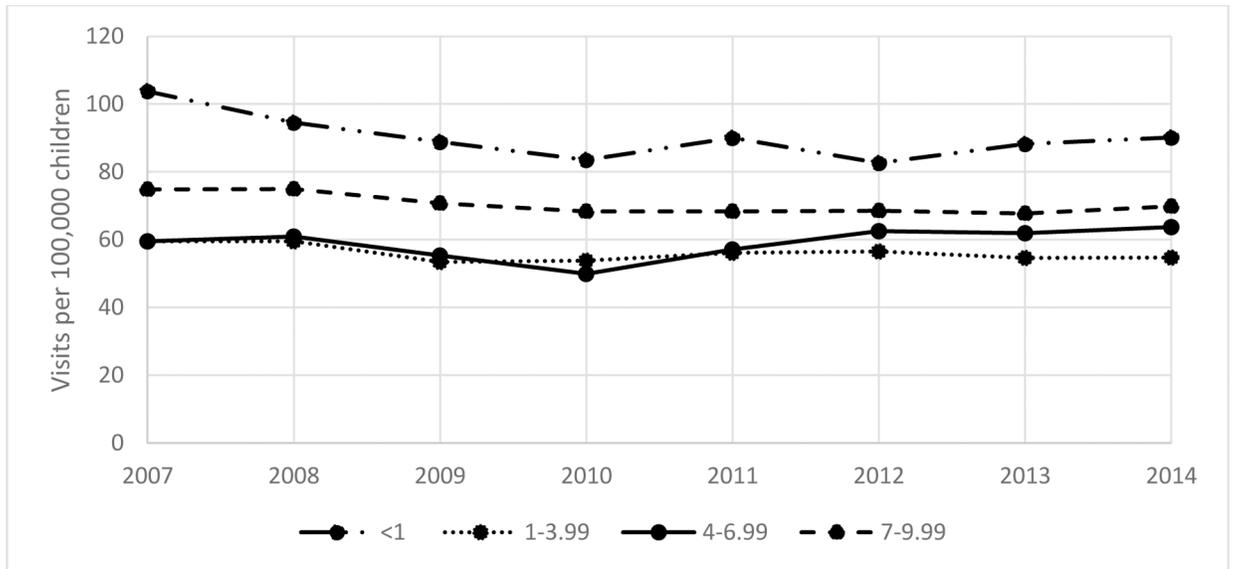
Figure 2.
Prevalence of child maltreatment related ED visits by age per 100,000 children (0–9 years).
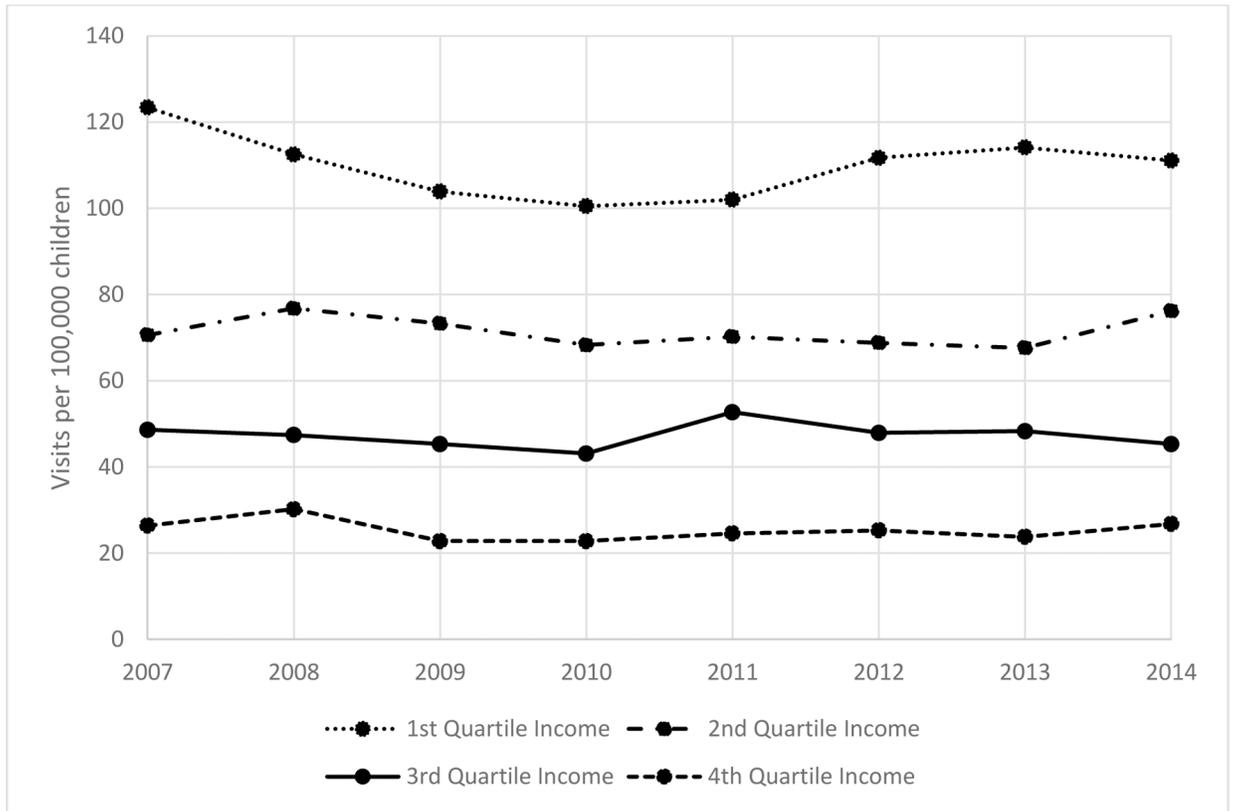NEDS 2007–2014

Figure 3.
Prevalence of maltreatment related ED visis by Neighborhood Median Income, per 100,000 chidlren (0–9 years). NEDS 2007–2014

Table 1.

Prevalence of maltreatment related ED visis by maltreatment type, per 100,000 chidlren (0–9 years of age). NEDS 2007–2014

Year	Physical Abuse	Sexual Abuse	Neglect	Poly Maltreatment
2007	57.2	2.7	2.7	6.6
2008	55.3	2.9	2.7	7.3
2009	51.1	2.6	2.3	6.7
2010	49.4	2	2.3	6.4
2011	52.2	1.9	2.4	7.1
2012	51.7	2.6	2.9	7.3
2013	50.9	3.2	2.8	7.8
2014	50.4	3	2.6	9.8