

The Economic Burden of Hospitalizations Associated With Child Abuse and Neglect

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In 1999, an estimated 826 000 children were abused or neglected nationally.¹ This represents a victimization rate of 11.8 per 1000 children. It was further estimated that 1100 children died as a result of abuse and neglect. Such estimates are surely conservative because victims of abuse and neglect are often not identified, and even if suspected, abuse and neglect are underreported.²⁻⁷ Although the personal costs in pain and suffering to victims and their families cannot be calculated, in this study we assess the burden of hospitalizations associated with child abuse and neglect. By demonstrating the substantial costs of tertiary care for victims of child abuse and neglect, we can justify increased support for primary prevention.^{8,9}

Several studies have demonstrated that hospitalized children who are identified as abused or neglected have longer hospital stays, more severe injuries, worse medical outcomes, and higher hospital charges, and such children are more likely to die during the current hospitalization compared with other hospitalized children.⁸⁻¹² Most of this research is based on reviews of medical records conducted in pediatric tertiary care hospitals with trauma centers. One study found significant differences of more than \$2000 in daily hospital charges for child abuse patients compared with other children admitted to a pediatric intensive care unit, with mean charges for hospitalized victims of \$30 684.⁸ Another study conducted at a regional pediatric trauma center reported an average hospital charge of \$20 359 for victims of child abuse, and this was significantly higher than the hospital charges for other injured children except those for burn victims.¹² To better understand the scope of the problem, we should look at nationally representative data. However, we know of only 2 studies that relied on national data, and neither reported on the costs of hospitalization.^{2,10}

Objectives. This study assessed the economic burden of child abuse–related hospitalizations.

Methods. We compared inpatient stays coded with a diagnosis of child abuse or neglect with stays of other hospitalized children using the 1999 National Inpatient Sample of the Healthcare Costs and Utilization Project.

Results. Children whose hospital stays were coded with a diagnosis of abuse or neglect were significantly more likely to have died during hospitalization (4.0% vs 0.5%), have longer stays (8.2 vs 4.0 days), twice the number of diagnoses (6.3 vs 2.8), and double the total charges (\$19 266 vs \$9513) than were other hospitalized children. Furthermore, the primary payer was typically Medicaid (66.5% vs 37.0%).

Conclusion. Earlier identification of children at risk for child abuse and neglect might reduce the individual, medical, and societal costs. (*Am J Public Health.* 2004;94:586–590)

Our research objective was to determine 1 aspect of the economic burden of child abuse and neglect on the health care system using a national probability sample of US community hospitals. Specifically, we compared children hospitalized with a diagnostic code of abuse or neglect with other hospitalized children in terms of mean hospital charges, length of hospital stay, and the numbers of diagnoses and deaths during hospitalizations. Although research has demonstrated that diagnostic codes for child and adult abuse are likely underutilized,^{13,14} analyses based on these codes can provide valuable information on the medical response to victims of abuse and neglect. Thus, for hospitalizations coded with a diagnosis of abuse or neglect, we expect higher hospital charges, longer hospital stays, and more comorbidities compared with other hospitalized children, as well as more deaths during hospitalization.

METHODS

We conducted secondary data analyses of the 1999 Nationwide Inpatient Sample of the Healthcare Costs and Utilization Project (NIS-HCUP).¹⁵ The sampling design for the NIS-HCUP was a stratified random sample of hospitals with all discharges included from each selected hospital. The 1999 NIS-HCUP

provides data on 7 198 929 hospital inpatient stays at 984 hospitals in 24 states, thereby approximating a 20% stratified sample of US community hospitals. Sample weights are provided in the NIS-HCUP to enable data users to produce national estimates.

Identification of Cases

All inpatient hospital stays of children aged 18 years and younger were selected ($n=1\,371\,835$). Of these, two thirds (64.8%) had neonatal/maternal diagnoses/procedures. Because these patients were less likely to have diagnoses of abuse or neglect, all new mothers and neonates aged less than 1 day were omitted, thereby resulting in 636 802 inpatient hospital stays for these analyses. Among the excluded cases, there were 19 coded with child abuse or neglect: 15 were neonatal/maternal, and 4 were 0 days old.

To identify cases of child abuse and neglect, we used diagnostic codes from the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)*.¹⁶ In 1996, the single code for child maltreatment syndrome was expanded to better specify the forms of abuse: physical, sexual, emotional/psychological, neglect, and shaken infant syndrome (see the list of codes presented in Table 1).¹⁷ The NIS-HCUP provides a primary diagnosis and up to 14 secondary diagnoses

TABLE 1—Estimated 1999 US Hospital Inpatient Stays Coded With a Diagnosis of Child Abuse or Neglect

ICD-9 Code	Types of Abuse	Percentage With Diagnosis of Abuse	Weighted n ^a
99550	Child abuse, unspecified	4.6	217
99551	Child emotional/psychological abuse	0.5	25
99552	Child neglect (nutritional)	16.0	761
99553	Child sexual abuse	8.9	426
99554	Child physical abuse	38.8	1849
99555	Shaken infant syndrome	21.1	1008
99559	Other child abuse and neglect	6.5	311
	Two or more types of abuse coded	3.6	173
Totals		100	4771

Note. ICD-9 = The International Classification of Diseases, Ninth Revision, Clinical Modification.

^aRepresents population estimates based on weighted data for n = 966.

for each inpatient stay. We selected inpatient stays with any of the *ICD-9-CM* diagnostic codes of child abuse or neglect as the subset of cases of abuse-related hospitalizations. Five cases coded as adult abuse but involving patients younger than 18 years were recoded to child abuse. Remaining hospitalizations constituted our comparison group.

Demographic Variables

Age at the time of admission, gender, race, and income are presented for both groups (see Table 2 for breakdown of variables). Age was provided in years, with zero indicating infants younger than 1 year. For race, Hispanic, Asian/Pacific Islander, Native American, and other were collapsed into 1 category called Other, and because race was not provided for nearly 20% of patients, we created a separate category labeled Unknown for inclusion in analyses. Income is based on 4 categories representing the median income for the patient's zip code. Despite caveats about the use of zip codes as proxies for income,¹⁸ this variable is the best approximation available in these data. Another proxy for income is the expected primary payer for the hospitalization, which is also reported.

Medical Discharge Variables

Admission source (e.g., emergency vs routine), whether or not the patient died during hospitalization, the length of hospital stay in days, the number of diagnoses and proce-

dures, and total charges are compared and reported for both groups.

Hospital Variables

The location of the hospital (i.e., urban or rural), whether or not it was a teaching hospital, and region of the country are also reported for both groups.

Analysis

Using sample weights provided in the NIS-HCUP data, we produced national estimates of hospitalizations coded with a diagnosis of abuse or neglect. Analyses were done with SAS (SAS Institute Inc, Cary, NC), and SUDAAN (Research Triangle Institute, Research Triangle Park, NC) was used for calculating variance and assessing statistical significance that takes into account the sampling design. Unless otherwise specified, only weighted data are reported. We estimated the overall percentage of US hospitalizations coded with a diagnosis of child abuse or neglect, along with a breakdown of the types of abuse. Statistical comparisons between child abuse-related and other hospitalizations are presented; we used χ^2 tests for categorical variables and *t* tests for means. Significance tests of total charges and length of stay were based on analyses that used log transformations to adjust for skew. Odds ratios with confidence intervals are reported when appropriate. One-way analysis of variance was used to compare total charges between groups and among the types of abuse.

RESULTS

In the 1999 NIS-HCUP, there were 966 cases of children hospitalized with 1 of the diagnostic codes for abuse or neglect, providing a national estimate of 4771, or 0.15% of US hospitalizations of children aged 18 years and younger, after neonatal or maternal diagnoses/procedures and neonates younger than 1 day were omitted. Physical abuse was coded most often (38.8%), followed by shaken infant syndrome (21.1%), child neglect (16.0%), sexual abuse (8.9%), child abuse unspecified (4.6%), and emotional/psychological abuse (0.5%) (Table 1). Two or more diagnoses of abuse were coded in 3.6% of cases. Abuse or neglect was the primary diagnosis 40.2% of the time.

Overall, we found significant differences between hospital stays coded with a diagnosis of abuse or neglect and other hospital stays in the demographics of the child/parent, medical utilization, and hospitals sampled.

Demographically, children whose hospital stays were coded with a diagnosis of abuse or neglect tended to be younger on average (2.7 vs 5.2 years; $P < .0001$) (Table 2). In analyses not shown, 49.2% of those coded with abuse or neglect were younger than 1 year compared with 40.8% of those not coded as such. Nearly one half of hospitalized children were White, but they represented less than one third of the group coded as abused or neglected ($P < .0001$). Hospitalizations of Black children and those hospitalized without a racial classification were proportionally more likely to be coded as abused or neglected. The median income based on the patient's zip code indicates that those coded as abused or neglected were significantly more likely to be in the lower income categories ($P = .0027$). Race continued to discriminate between the abused and not-abused groups even after we controlled for income categories. Medicaid was the expected primary payer for two thirds (66.5%) of the hospitalizations of the abused or neglected group compared with almost one third (37.0%) of the hospitalizations of other groups, and the opposite tendency was observed for private payers (24.0% vs 54.5%; $P < .0001$). The gender of the hospitalized children did not differ between the 2 groups.

TABLE 2—Estimated 1999 US Hospital Inpatient Stays Coded With a Diagnosis of Abuse or Neglect Compared With Those Not Coded With Abuse or Neglect

Variables	Abuse/Neglect Coded	No Abuse/Neglect Coded	P Value
Patient/Family Demographic Characteristics			
Mean age, y (SE)	2.7 (0.18)	5.2 (0.13)	<.0001
Gender (% male)	54.5	54.4	.9375
Race, %			<.0001
Black	20.1	16.0	
White	30.9	46.6	
Other (Hispanic, Asian/Pacific Islander, Native American, and other)	14.3	17.6	
Unknown	33.9	19.9	
Median income for patient's zip code, %			.0027
\$1–\$24 999	10.6	8.4	
\$25 000–\$34 999	38.3	32.9	
\$35 000–\$44 999	30.5	30.9	
≥\$45 000	20.6	27.9	
Expected primary payer, %			<.0001
Medicaid	66.5	37.0	
Private including HMO	24.0	54.5	
Other	9.5	8.5	
Medical/Hospital Stay Characteristics			
Admission source, %			<.0001
Emergency room	58.5	37.6	
Routine/birth/other	27.3	56.9	
Another hospital or facility	14.2	5.3	
Court/law enforcement	0.11	0.22	
In-hospital deaths (% died) (OR=8.82, 95% CI=6.19, 12.60)	4.0	0.47	<.0001
Mean length of stay, d (SE)	8.2 (0.59)	4.0 (0.08)	<.0001
Mean number of diagnoses (SE)	6.3 (0.19)	2.8 (0.05)	<.0001
Mean number of procedures (SE)	1.3 (0.092)	0.8 (0.04)	<.0001
Mean total charges, \$ (SE)	19 266 (16 466)	9 513 (4 588)	<.0001
Hospital Characteristics			
Region, %			.0004
Northeast	17.5	18.9	
Midwest	28.7	17.2	
South	33.9	46.7	
West	19.9	17.4	
Location of hospital (% urban) (OR=1.63; 95% CI=1.13, 2.34)	91.2	86.4	.0029
Status of hospital (% teaching) (OR=2.94; 95% CI=2.33, 3.71)	81.8	60.5	<.0001

Notes. HMO = health maintenance organization; OR = odds ratio; CI = confidence interval. Analyses are based on weighted data: population estimate = 3 123 626.

Hospitalized children whose stays were coded with a diagnosis of abuse or neglect were significantly more likely to be admitted through the emergency room than routinely ($P < .0001$) compared with children not coded as abused or neglected; and they were nearly 9 times more likely to die during hospitaliza-

tion (odds ratio [OR] = 8.82, 95% confidence interval [CI] = 6.19, 12.60), resulting in an estimated 190 deaths. On average, those coded with abuse or neglect compared with those not coded as abused or neglected spent twice the number of days (8.2 vs 4.0), had twice the number of diagnoses (6.3 vs 2.8), had

more procedures (1.3 vs 0.8), and had double the total charges (\$19 266 vs \$9 513).

A higher percentage of hospitalizations with a diagnosis of child abuse and neglect were coded in the Midwest (28.7% vs 17.2%) and a lower percentage in the South (33.9% vs 46.7%). Medical staff at hospitals located in urban areas were significantly more likely to have coded abuse or neglect compared with hospitals located in rural areas ($P = .0029$); and teaching hospitals were nearly 3 times more likely to have coded abuse or neglect compared with nonteaching hospitals (OR = 2.94, 95% CI = 2.33, 3.71).

Comparisons of the mean total charges for each type of abuse or neglect and when no abuse was coded are presented in Table 3 and show that the abused or neglected children, *regardless of type of abuse*, had significantly higher average charges. Compared with the mean total charges for hospital stays in which no abuse or neglect was coded (\$9 513), the highest mean charges were for shaken infant syndrome (\$30 311), followed by children who had experienced multiple types of abuse or neglect (\$22 070), and then "other child abuse and neglect," which includes multiple forms (\$20 267). Because costs at teaching hospitals are known to be higher,¹⁹ we reanalyzed the mean total charges for abuse-related hospitalizations compared with those without abuse or neglect while controlling for teaching status, and the significant differences in average total charges, *regardless of type of abuse*, remained.

DISCUSSION

Our analyses demonstrate that the financial costs for children hospitalized with a diagnosis of child abuse or neglect are considerable compared with those for other hospitalized children. The average total charges were nearly \$10 000 more per hospitalization for the abused or neglected group, with an estimated total 1999 cost of nearly \$92 million for fewer than 5000 children. In addition to the diagnosis of abuse or neglect, they had twice the number of diagnoses/comorbidities. Sadly, these children were also nearly 9 times more likely to die during hospitalization.

Possible explanations for higher charges for children hospitalized with a diagnosis of abuse

TABLE 3—Mean Total Charges for 1999 US Hospitalizations Coded With an Abuse/Neglect Diagnosis Compared With Those Not Coded With Abuse or Neglect

Types of Abuse	Mean Total Charges, \$	SE	n
Not coded as abused: comparison group	9 513	458	3 024 581
99550: Child abuse unspecified	12 163	1 774	207
99551 Child emotional/psychological abuse	9 875	2 509	25
99552: Child neglect	14 292	2 664	729
99553: Child sexual abuse	11 285	2 420	421
99554: Child physical abuse	17 593	2 003	1 719
99555: Shaken infant syndrome	30 311	2 928	979
99559: Other child abuse and neglect	20 267	4 747	301
≥ 2 types of abuse coded	22 070	4 743	163

Note. Analysis of variance between each type of abuse or neglect and the comparison group is significant at $P < .05$ ($F = 59.56$, $df = 8$).

or neglect include the following: (1) Those so coded may represent the most severe cases, and certain types of abuse may get coded more than other types (e.g., physical abuse and shaken infant syndrome).^{2,6} (2) Children with preexisting disabilities may be overrepresented among the abused and neglected^{20,21} and also more likely to have higher charges associated with their hospitalizations. (3) Children identified as abused may need to stay in the hospital longer for additional diagnostic evaluations/investigations of the circumstances of the injuries or neglect.⁸ None of these explanations, however, negate the fact that child abuse and neglect are costly for both victims and society. Moreover, by excluding hospital stays with neonatal/maternal diagnoses or procedures and neonates aged less than 1 day, which we argued would be less likely to be coded with a diagnosis of abuse or neglect, a bias may have been introduced. But in fact, when these cases were included in the analyses, the difference in mean total charges between the 2 groups was even greater, lowering the mean total charges for the group with no abuse or neglect diagnostic codes to \$6879.

We also found children hospitalized with a diagnosis of child abuse or neglect to be more likely to be younger, to be Black, to live in lower-income areas, and to be insured by Medicaid. Other studies support findings of differences in the recognition and identification of abuse according to racial/socioeconomic status.^{2-4,22,23} It remains unclear whether some

social groups may be at greater risk for abuse or neglect or whether they may be more likely identified/coded as abused because of social conceptions about abuse and about reporting it. National incidence studies of child abuse and neglect have found no racial differences in the incidence of maltreatment, but lower incomes are related to higher incidence rates.²⁴ Actual demographics of abuse and neglect require additional study to assist in identification of at-risk children.

The limitations of these analyses include the fact that these data reflect only hospitalizations coded with a diagnosis of child abuse or neglect, and therefore these analyses most likely underestimate the numbers of hospitalized children who experienced abuse or neglect. Unfortunately, it is very unlikely that fewer than 5000 children nationally were admitted to community hospitals for medical care associated with child maltreatment.^{2,24} These data only provide the total charges incurred for the hospitalization and do not include other costs related to services, medical and otherwise, that victims or their families may incur after discharge—and as such reflect an underestimate of the overall financial burden. The charges also do not include physician services. One study estimates an additional 25% for inpatient physician services,²⁵ thus increasing the total estimated charges for these hospitalizations in 1999 to nearly \$115 million. Additionally, we know that abused and neglected children often experience a lifetime of poorer mental and

physical health, requiring more medical and social services.^{8,10-11} Therefore, our estimate of the charges for 1 hospitalized victim of abuse or neglect does not reflect the lifetime of health care costs that can result in such cases. Despite these limitations, our research demonstrates the substantial medical bill for the maltreatment of children and sheds light on the social costs of such maltreatment. Furthermore, these analyses provide unique descriptions of the current use of the diagnostic codes for child maltreatment and may provide important information for future efforts to develop guidelines for the appropriate use of these codes.²⁶

Child abuse and neglect are underidentified, underdiagnosed, and undercoded. Targeting interventions for those already being abused or neglected as well as medical education for health care providers and interventions for children at risk of abuse and neglect can reduce the individual, medical, and social costs. Notably, teaching hospitals were thrice as likely to code abuse, thereby confirming the importance of medical training for addressing the problem of child abuse and neglect. Future analyses of the diagnoses or comorbidities associated with inpatient stays coded with a diagnosis of abuse or neglect may help prevent future harm to children by providing potential indicators or red flags of present abuse. Our findings provide the economic rationale for policies and programs to prevent child abuse and neglect. ■

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Contributors

S. Rovi and M.S. Johnson conceived of the study. S. Rovi and P.-H. Chen conducted data analyses. All authors interpreted findings and reviewed drafts of the article.

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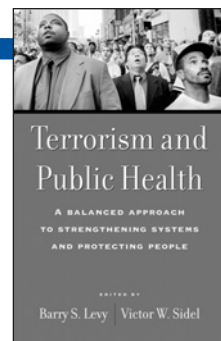
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Human Participant Protection

The University of Medicine and Dentistry of New Jersey's institutional review board approved this research as exempt from review.

References

1. *Child Maltreatment 1999*. Washington, DC: US Department of Health and Human Services, Administration on Children, Youth and Families; 2001.
2. Hampton RL, Newberger EH. Child abuse incidence and reporting by hospitals: significance of severity, class, and race. *Am J Public Health*. 1985;75:56–60.
3. Herman-Giddens ME, Brown G, Verbiest S, et al. Underascertainment of child abuse mortality in the United States. *JAMA*. 1999;282:463–467.
4. Jenny C, Hymel KP, Ritzen A, Reinert SE, Hay TC. Analysis of missed cases of abusive head trauma. *JAMA*. 1999;291:621–626.
5. Kempe CH, Silverman FN, Steele BF, Droegemueller W, Silver HK. The battered-child syndrome. *JAMA*. 1962;181:105–112.
6. Saulsbury FT, Campbell RE. Evaluation of child abuse reporting by physicians. *Am J Dis Child*. 1985;139:393–395.
7. Warner JE, Hansen DJ. The identification and reporting of physical abuse by physicians: a review and implications for research. *Child Abuse Negl*. 1994;18:11–25.
8. Irazuzta JE, McJunkin JE, Danadian K, Arnold F, Zhang J. Outcome and cost of child abuse. *Child Abuse Negl*. 1997;21:751–757.
9. Wright MS, Litaker D. Childhood victims of violence: hospital utilization by children with intentional injuries. *Arch Pediatr Adolesc Med*. 1996;150:415–420.
10. DiScala C, Sege R, Li G, Reece RM. Child abuse and unintentional injuries: a 10-year retrospective. *Arch Pediatr Adolesc Med*. 2000;154:16–22.
11. Rivera FP, Kamitsuka MD, Quan L. Injuries to children younger than 1 year of age. *Pediatrics*. 1988;81:93–97.
12. Peclet MH, Newman KD, Eichelberger MR, et al. Patterns of injury in children. *J Pediatr Surg*. 1990;25:85–91.
13. Rovi S, Johnson MS. Physician use of diagnostic codes for child/adult abuse. *J Am Med Womens Assoc*. 1999;54:211–214.
14. Runyan WJ, Davey D. Identifying domestic violence within inpatient hospital admissions using medical records. *Women Health*. 2000;30:1–14.
15. *Healthcare Cost and Utilization Project. 1999 National Inpatient Sample*. Rockville, Md: Agency for Healthcare Research and Quality; 2001.
16. Public Health Service and Health Care Financing Administration. *The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)*. Los Angeles, Calif: Practice Management Information Corp; 1996.
17. American Hospital Association. Child/adult abuse. *Coding Clinic ICD-9-CM*. 1996;13(4):38–45.
18. Krieger N, Waterman P, Chen JT, Soobader M, Subramanian SV, Carson R. Zip code caveat: bias due to spatiotemporal mismatches between zip codes and US census-defined geographic areas—the public health disparities geocoding project. *Am J Public Health*. 2002;92:1100–1102.
19. Mechanic R, Coleman K, Dobson A. Teaching hospital costs: implications for academic missions in a competitive market. *JAMA*. 1998;280:1015–1019.
20. Sullivan PM, Knutson JF. Maltreatment and disabilities: a population-based epidemiological study. *Child Abuse Neglect*. 2000;24:1257–1273.
21. Crosse SB, Kaye E, Ratnofsky AC. A report on the maltreatment of children with disabilities. Washington, DC: US Department of Health and Human Services.
22. Lane WG, Rubin DM, Monteith R, Christian CW. Racial differences in the evaluation of pediatric fractures for physical abuse. *JAMA*. 2002;288:1603–1609.
23. Flaherty EG, Sege R, Mattson CL, Binns HJ. Assessment of suspicion of abuse in the primary care setting. *Ambulatory Pediatr*. 2002; 2:120–126.
24. Sedlak AJ, Broadhurst DD. Executive summary of the third national incidence study of child abuse and neglect. US Department of Health and Human Services, Administration for Children and Families. Available at: <http://www.calib.com/nccanch/pubs/statinfo/nis3.cfm>. Accessed November 4, 2002.
25. Quinlan KP, Sacks JJ. Hospitalizations for dog bite injuries. *JAMA*. 1999;281:232–233.
26. Rovi S, Johnson MS. More harm than good? The use of diagnostic codes for child and adult abuse. *Violence Victims*. 2003; 18:491–502.



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