Health Care Costs Associated With Child Maltreatment: Impact on Medicaid

WHAT'S KNOWN ON THIS SUBJECT: Child maltreatment is a serious and prevalent public health problem in the United States. Responsible for substantial morbidity and mortality, maltreatment affects children's physical and mental health.

WHAT THIS STUDY ADDS: Although many health impacts of child maltreatment have been documented, no claims-based study has quantified the impact of maltreatment on health service utilization and costs. This study presents systematic claims-based estimates of maltreatment impacts on utilization and costs for the Medicaid population.

AUTHORS: Curtis Florence, PhD,[a] Derek S. Brown, PhD,[b] Xiangming Fang, PhD,[c] and Hope F. Thompson, BA[d]

[a]*Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Division of Analysis, Research and Practice Integration, Atlanta, Georgia;* [b]*Brown School, Washington University in St Louis, St Louis, Missouri;* [c]*International Center for Applied Economics and Policy, College of Economics and Management, China Agricultural University, and* [d]*Ford School and Department of Economics, University of Michigan, Ann Arbor, Michigan*

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abstract

OBJECTIVE: To estimate the increased Medicaid expenditures associated with child maltreatment.

METHODS: Data on child maltreatment were collected from the National Survey of Child and Adolescent Well-Being, a nationally representative sample of cases investigated or assessed by local Child Protective Services agencies between October 1999 and December 2000. Medicaid claims data for 2000 to 2003 were obtained from the Medicaid Analytic Extract (MAX). Children from the National Survey of Child and Adolescent Well-Being who had Medicaid were matched to the MAX data by Social Security number or birthdate, gender, and zip code. Propensity score matching was used to select a comparison group from the MAX data. Two-part regression models were used to estimate the impact of child maltreatment on expenditures. Data with individual identifiers were obtained under confidentiality agreements with the collecting agencies.

RESULTS: Children who were identified as maltreated or as being at risk of maltreatment incurred, on average, Medicaid expenditures that were >$2600 higher per year compared with children not so identified. This finding accounted for ~9% of all Medicaid expenditures for children.

CONCLUSIONS: Child maltreatment imposes a substantial financial burden on the Medicaid system. These expenses could be partially offset by increased investment in child maltreatment prevention. *Pediatrics* 2013;132:312–318

Federal and state governments are under intense pressure to control spending, particularly for health care. Often, prevention is offered as a potential method of controlling health care costs. Prevention of events that contribute to increased demand for health care services are particularly likely to result in reductions in health care spending. One such area that could potentially reduce health care costs is the prevention of child maltreatment (CM).

CM has been shown to have adverse effects on health,[1–3] resulting in an increased demand for health services. CM is a serious and prevalent public health problem in the United States, responsible for substantial morbidity and mortality. The 4 major types of CM are physical abuse, sexual abuse, emotional abuse, and neglect. In fiscal year 2008, US state and local Child Protective Services (CPS) agencies investigated reports of ~3.7 million children being abused or neglected. Among them, an estimated 772 000 children were classified by CPS authorities as being maltreated.[4] Programs have recently been evaluated and been shown to have a significant effect on preventing CM.[5,6]

Whereas several prevention programs for child maltreatment have been evaluated, no study to date has developed a systematic estimate of the overall impact of CM on health care spending. A review of medical costs identified many limitations with existing studies and a wide variance in costs, from $0 to $24 000 per case of CM.[7] This lack of information represents an important gap in the literature, because prevention of CM could lead to reductions in health care spending.

In this article, the first systematic estimates of the effect of CM on health care spending are presented. Health care cost differences were estimated between a population of children who were the subject of a CPS investigation and the general population of children.

These estimates were made for children who were enrolled in Medicaid, which covers low-income children. Low income is a significant risk factor for maltreatment.[8]

By estimating the cost impact of CM in the Medicaid system, we also focus on a system that is costly to states. Approximately 17% of the mean state budget in 2007 was for Medicaid.[9] Most of the cost of CM law enforcement and services is borne by state and local governments. Because these governments will likely fund programs and policies to prevent CM, a better understanding of potential savings from Medicaid spending could help inform their decisions.

METHODS

A survey of children who were subjects of a CM investigation was used, and those who were enrolled in Medicaid were matched to their Medicaid claims records. The National Survey of Child and Adolescent Well-Being (NSCAW) is a nationally representative sample of 5501 children who were investigated or assessed by local CPS agencies between October 1999 and December 2000. A separate NSCAW sample of 727 children in foster care for at least 1 year was not included in this study, because these children's needs, characteristics, and sampling frame are significantly different from those of the NSCAW CPS sample.

Any child surveyed in the NSCAW data was considered to be "maltreated or at risk for maltreatment" regardless of whether maltreatment was substantiated in the investigation. This assumption is based on several studies comparing children with unsubstantiated cases with those with substantiated cases, which found no significant differences between these 2 groups on several developmental and mental health outcomes that are associated with maltreatment.[10] The NSCAW sample

used in this study will be referred to as "maltreated" in the remainder of the article, regardless of the disposition of their CPS case.

The original NSCAW sample was drawn from 36 states with the use of a stratified design.[11,12] NSCAW contains up to 5 waves of survey data. However, only select variables at baseline were used in this study because our analysis compared NSCAW with non-NSCAW children, and survey data were unavailable for the comparison group.

The analytic data file reflects a unique linkage of NSCAW and Medicaid claims (Medicaid Analytic Extract [MAX]) data. NSCAW data were used to identify a sample of maltreated or at-risk children, some of whom were in foster care. MAX data were used to construct a comparison sample of non-NSCAW children and to identify health care expenditures and types of service for both populations.

MAX

MAX data served 2 roles in this study. First, a propensity score–matched sample of children from state MAX files provided a comparison group for statistical analysis. Second, MAX payment and utilization data were used to construct the dependent variables for both NSCAW and the matched samples. Institutional review board protocols and resource constraints limited the MAX data to 14 states and 4 years (2000–2003). We selected the states to maximize the potential linked and usable sample on the basis of NSCAW sampling data and rates of Medicaid managed-care penetration in each state. Full state files for all Medicaid-eligible children were obtained.

Section 2.02 NSCAW-MAX Linkage

Attaching MAX-derived dependent variables to the NSCAW sample required linking the 2 data sources where permitted. Of n = 5501 from the NSCAW CPS

sample, the parents or guardians of 3791 children consented to matching. The number of potential matches was reduced to 2873 when restricted to the 14 states examined here. Although linkage is impossible if an NSCAW child was never enrolled in Medicaid, a majority of the NSCAW CPS sample was eligible for Medicaid or the CHIP (Children's Health Insurance Program) at wave 1 due to low household income. Of the full 5501, 3939 reported that the child had Medicaid insurance at wave 1. Children may gain or lose Medicaid coverage over time, so the feasible linkage sample for any given year of MAX data varies slightly.

Child Social Security numbers facilitated an exact link for 1318 cases. An additional 1132 cases, most of whom did not provide Social Security numbers, were linked after finding all unique date of birth, gender, and zip code combinations that matched between NSCAW and MAX; multiple matches were excluded from this study. The total linked sample consisted of 2450 children, although expenditure analysis can only be conducted on the NSCAW sample enrolled in Medicaid fee-for-service (FFS) or primary care case management (PCCM) plans because many states make widespread use of Medicaid health maintenance organizations, which receive fixed, capitated payments per child per month. Observations were discarded if their MAX data showed <12 months of enrollment in either Medicaid FFS or PCCM insurance in a calendar year. After this reduction, 972 NSCAW sample members ($n \times T = 2465$ child-years, where n is the number of sample members and T is the number of years the sample member is observed in the claims data) remained for propensity score matching.

Because not all NSCAW cases could be linked to MAX, the nationally representative survey design from the original

NSCAW data was lost. The original NSCAW sample weights and survey design variables were statistically invalid after our MAX linkage. All analyses in this study were therefore conducted without using the weights.

Dependent Variables and Sample Selection

The primary dependent variable was the annual Medicaid payment amount. MAX files provided up to 4 years of data per child, and analysis was conducted at the child-year level. For each sample member, the total annual Medicaid payments for several mutually exclusive groups based on Medicaid type-of-service (TOS) codes were also identified. We report totals for total Medicaid expenditures, psychiatric care (TOS 4 and 53), inpatient hospital (TOS 1), outpatient/physician/clinic care (TOS 8, 11, and 12), prescription drugs (TOS 16), targeted case management (TOS 31), and home health and rehabilitation (TOS 13 and 33). Data were adjusted to 2009 dollars following guidelines from the Agency for Healthcare Research and Quality and the Centers for Medicare and Medicaid Services Office of the Actuary.[13,14]

Section 2.04 Propensity Score Matching

The NSCAW data do not contain a low-risk or nonmaltreated comparison group. To address this situation, propensity scoring was used to construct a matched control group of children who were similar to NSCAW children. To reduce the impact of unobserved CM in the matched group, before matching, all non-NSCAW MAX children who were categorically eligible for Medicaid as a result of foster care placement were excluded. Some maltreated children likely remained in our comparison sample, given the prevalence rate of maltreatment in the general population.[15] However, any bias introduced

in our estimates would be toward zero if maltreated children in our comparison group had higher expenditures on average compared with nonmaltreated children. In this sense, our estimates can be viewed as a lower bound of the true effect of CM on health care expenditures. A total of $n \times T = 2\,388\,180$ non-NSCAW MAX observations were available for matching.

Propensity score matching was implemented by using Stata 12.1 statistical software (StataCorp, College Station, TX).[16] Propensity score matching was accomplished by estimating a probit regression model where the dependent variable equals 1 for children in the NSCAW sample and 0 for children in the comparison group from the MAX data. The predicted probability from this model estimates the likelihood of being in the maltreated group for all children in both samples. The children in the NSCAW data were then matched to a non-NSCAW child in the MAX data who had a predicted probability of maltreatment closest to that of the NASCAW child.[17] This regression was estimated on the following indicator variables: male, integer age indicators, race/ethnicity (black, Hispanic, other/unknown [white omitted]), year of data, state of residence, zip code, and FFS and PCCM insurance.

Statistical Analysis

Both unadjusted and adjusted methods were used to examine the difference in total Medicaid payments and payments for various TOS categories between NSCAW and non-NSCAW samples. Simple means provided unadjusted results, and the null hypothesis of no difference in payments between NSCAW and non-NSCAW was assessed with t tests. Although propensity score matching eliminates the observable differences between NSCAW and non-NSCAW samples, health care expenditure data tends to be highly skewed. Comparison

of simple means with highly skewed data can sometimes be misleading because the mean and median can differ substantially. For this reason, we also estimated regression adjusted means for each group and compared those as well.

Our adjusted analysis used current standards for regression models of medical expenditures.[18] The following indicator variables were used for the adjusted models: NSCAW sample, male, age groups (3–5, 6–10, 11–14, and ≥15 years; 0–2 years as the reference), race/ethnicity (black, Hispanic, and other/unknown; white as the reference), year of data, state of residence, and FFS-only and PCCM-only insurance. Separate models were estimated for total Medicaid payments and for each TOS.

RESULTS

Descriptive statistics for NSCAW children are shown in Table 1 for both the overall NSCAW sample and for the subsample of children who were matched to records in MAX. The 2 groups were quite similar, although the matched sample consisted of slightly more African Americans and fewer Hispanics than the full NSCAW sample. The differences were small enough so that we were confident that the matched samples were demographically similar to the overall NSCAW sample.

The characteristics of our NSCAW linked sample and the records matched by propensity scores from the Medicaid MAX files are presented in Table 2. The propensity score methodology matches records from the NSCAW and MAX files based on observable characteristics, so it was expected that the 2 groups would appear very similar, which was indeed the case. Results showed that the rate of each characteristic was very similar between the 2 groups, with no characteristics significantly different at $P \le .10$. It therefore appears that the NSCAW children were successfully matched to similar children in the MAX file.

Comparisons of Medicaid spending for NSCAW children and matched counterparts in MAX are presented in Table 3. NSCAW children had considerably higher costs overall than did observationally similar children in Medicaid. The difference in mean costs was >$2600 per child per year. Much of this cost difference was reflected in higher psychiatric and inpatient hospitalization costs. Ambulatory care (outpatient, physician, and clinic), prescription drugs, and targeted case management also accounted for a considerable amount of the cost difference.

Although the propensity score matching controls for the effect of the observational characteristics on health care spending, it cannot account for the skewed distribution of health care expenditures. Health care expenditure data tends to have a small number of extremely large values relative to the median value. This feature of health care costs data was potentially problematic for the comparisons of means presented here, because estimates of the mean are sensitive to extreme values. To confirm that the comparison of means was valid in this analysis, a standard regression technique for adjusting the skewed distribution of expenditures (the "2-part" expenditure model) was estimated for overall expenditures and for each expenditure category. These results are shown in column 4 of Table 3. These regression-based estimates were very similar to the comparison of means calculation in sign and magnitude.

Finally, the differences in the rate of use of each type of care were examined (Table 4). Both samples had high overall rates of using Medicaid services, but the NSCAW sample was significantly higher. Relative to the comparison group, NSCAW children were almost twice as likely to have used psychiatric services and were almost 3 times as likely to have been provided targeted case management. This result is not surprising, because CM is associated with higher rates of depression, substance use, and violent behavior.[5]

The percentage of children receiving any care in the other categories was also significantly higher for NSCAW children. This finding implies that the cost differences shown in Table 3 not only reflect a higher cost per case when accessing care but also a higher rate of care for maltreated children.

TABLE 1 Distribution of NSCAW and Linked Samples by Select Characteristics at Wave 1

Variable	Full NSCAW CPS Sample (Unweighted) (n = 5501)	NSCAW CPS Sample Linked to MAX (Unweighted) (n = 972)
Gender		
Male	49	49
Female	51	51
Age (wave 1)		
0–2 years	36	35
3–5 years	15	15
6–10 years	27	25
11–14 years	21	23
≥15 years	2	2
Race/ethnicity		
White	42	47
Black	31	36
Hispanic	19	11
Other	8	6

Data are presented as percentages.

DISCUSSION

Our study found substantially higher Medicaid expenditures for children who were subjects of a CM investigation than for children drawn from the general Medicaid enrollment. This finding raises the question of how large the impact of CM is on Medicaid. Weighted analysis of the full NSCAW CPS sample (n = 5501) revealed that 61% had Medicaid coverage. If we apply this rate to the total number of investigated cases of CM (the population from which NSCAW is drawn), the number covered by Medicaid would be ~2 257 000 of the 3.7 million children with investigated cases, implying an estimated cost to Medicaid of $5.9 billion per year. Overall Medicaid spending for children was $68.4 billion in 2009.[19] Our estimates imply that the excess cost to Medicaid associated with CM are ~9% of all Medicaid expenditures for children ($5.9/$68.4).

In addition, additional social costs of CM, including juvenile detention, lost productivity, quality of life, special education, and case management, were not included in these estimates. For example, 1 study estimated that preventing a case of CM could, on average, save $141 285 in productivity losses, $7564 in child welfare costs, $6604 in criminal justice costs, and $7829 in special education costs.[20]

The substantial impact of CM on the Medicaid system raises the question of what can be done to prevent maltreatment and to avoid the additional expenditures identified in this study. Several programs have been developed that have demonstrated reduced rates of CM. These programs, such as the Chicago Child-Parent Centers or Nurse Family Partnerships, usually focus on parent training and child development[21]. Given the association between CM and health

TABLE 2 Summary Statistics of Demographic Variables for the NSCAW-MAX Matched Samples

Variable	NSCAW Linked (n × T = 2465)	Propensity Score 1:1 Matched MAX Sample (Control Group) (n × T = 2465)	Test of Difference in Means (P)
Gender			
Male	49	49	.820
Female	51	51	.820
Age			
0–2 years	16	16	.969
3–5 years	23	23	.893
6–10 years	27	27	.724
11–14 years	21	22	.468
≥15 years	12	12	.827
Race			
White	56	57	.434
Black	31	32	.603
Hispanic	8	6	.104
Other	6	5	.345
Year of data			
2000	21	22	.512
2001	27	27	.949
2002	26	26	.650
2003	26	26	.820
Insurance type			
FFS for all 12 months in a year	64	64	.678
PCCM for all 12 months in a year	20	20	.887
Some FFS, some PCCM during calendar year	16	16	.483
States			
Key state 1	15	14	.903
Key state 2	10	11	.852
Key state 3	9	10	.846
Key state 4	8	8	.246
Key state 5	4	4	1.000
Other states (9)	55	54	.440

Data are presented as percentages or P values. n, sample size, T, number of years in claims data.

TABLE 3 Differences in Annual Medicaid Payments

Variable	Mean Payments		Difference in Mean Payments (NSCAW − Matched)	NSCAW-Matched Difference (From 2-Part GLM Model)
	NSCAW Linked (n × T = 2465)	Matched MAX (n × T = 2465)		
All Medicaid payments				
Total annual payments	$6426	$3791	$2635	$2835***
Payments by type of service				
Psychiatric	$1265	$384	$881***	$954***
Inpatient hospital	$837	$478	$359**	$274**
Outpatient, physician, clinic	$1012	$599	$413***	$286***
Prescription drugs	$813	$550	$263**	$265***
Targeted case management	$327	$58	$269***	$281***
Home health and rehabilitation	$740	$565	$175	$85
Other	$1432	$1340	$92	$152

GLM generalized linear model. n, sample size, T, number of years in claims data, . **P < .05, ***P < .01.

TABLE 4 Differences in Annual Medicaid Utilization

Variable	Utilization Rates		Difference in Utilization Rates (NSCAW − Matched)
	NSCAW Linked (n*T = 2465)	Matched MAX (n*T = 2465)	
All Medicaid utilization			
Total annual payments >$0	96.4	94.2	2.2***
Utilization by type of service			
Psychiatric	35.7	18.5	17.2***
Inpatient hospital	7.9	5.1	2.8***
Outpatient, physician, clinic	89.1	85.3	3.8***
Prescription drugs	83.7	77.4	6.3***
Targeted case management	13.1	5.0	8.1***
Home health and rehabilitation	8.8	5.8	3.0***
Other	83.2	79.4	3.8***

Data are presented as percentages. ***$P < .01$.

care costs revealed here, future studies of preventive interventions could expand the set of studied outcomes to include differences in health care costs associated with CM programs.

A recently evaluated program, the Triple P Positive Parenting Program, is a multilevel program that uses a mass media campaign combined with training for service providers to promote positive parenting based on the need level of parents and is usually accessed in a health care setting. This program reduced the number of CM cases in a trial conducted in South Carolina.[6] Because the costs of implementing the full multilevel Triple P program have recently been published,[22] this program offers a convenient example of how our estimates can be used to demonstrate the reduction in Medicaid costs that may result from the implementation of preventive interventions.

Based on the treatment effects estimated for the Triple P program, ∼306 substantiated cases of CM would be prevented per year for a hypothetical population of 100 000 children aged ≤8 years. The 1-year startup cost of the program is estimated at $1.2 million for a population of this size. If 61% of the prevented cases of maltreatment are Medicaid children, Triple P would be expected to prevent 187 cases of maltreatment in this population, which we estimate would reduce Medicaid costs by slightly more than $0.5 million

per year. Savings from reduced Medicaid expenditures could therefore fund a substantial amount of the resources needed to implement this preventative intervention, even though health care costs account for a relatively small fraction of the economic burden of CM.

Several limitations of the study should be noted. First, our sample of maltreated children contained children with investigated cases of CM, whether or not there was an official finding of substantiated maltreatment. However, current research suggests that health outcomes between these groups are not significantly different.[10] Second, it was not possible to identify CM in our comparison sample from the Medicaid MAX data. If children in our matched comparison sample were maltreated and had resulting increased expenditures, this means that our estimates of expenditure differences are too low. Similarly, if some of the children in the NSCAW data were not maltreated, this would cause our estimates to be smaller than the actual impact of CM. We were also limited to estimating expenditure differences for children in FFS and PCCM Medicaid states.

If states with capitated Medicaid payments are able to reduce expenses for high-expenditure cases, such as maltreated children, our estimates may be too high to apply to those states. Finally, there were a limited number of individual characteristics to perform the

matching. All variations in socioeconomic characteristics were only controlled for by matching maltreated children to children of similar demographics who resided in the same state and zip code. If there were remaining systematic differences between these 2 groups, such as differences in health status not associated with maltreatment, this could have biased our results.

CONCLUSIONS

Medicaid-enrolled children with investigated or substantiated cases of CM have substantially higher health care utilization and cost than nonmaltreated children. This higher utilization and cost crosses a wide range of types of care, including inpatient and outpatient settings. The large impact of CM on the health of victims and on the health care system demonstrates the benefit that could be derived from prevention. Although this study has been able to quantify these impacts for the population of children enrolled in non–health maintenance organization Medicaid, there is still little that is known about the impact of maltreatment on health care costs among privately insured and uninsured children. In addition, there is a need to better understand the impact of different types of maltreatment (eg, physical abuse, sexual abuse, neglect, etc) on health care expenditures.

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Curtis Florence, Derek S. Brown, Xiangming Fang and Hope F. Thompson

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