The Effect of US Children's Access to Care on Medical Attention for Injuries

Mary D. Overpeck, DrPH, and Jonathan B. Kotch, MD, MPH

ABSTRACT

This analysis examined the effect of access to care on nonfatal medically attended injury rates for US children in 1988. Rates of medically attended injury were about the same for children with health insurance and Medicaid, after adjustment for other characteristics. However, lack of medical care coverage (health insurance or Medicaid) had the effect of decreasing the rates of both total and serious medically attended injury compared with the rates for children with coverage. For children without coverage, as many as 30% of total injuries and 40% of serious injuries may not have been attended in 1988. (*Am J Public Health.* 1995;85: 402–404)

Introduction

Most epidemiological studies of non-fatal injuries are based on data from emergency room, trauma center, or inpatient hospitalization sources.[1] The type and severity of injuries studied reflect the injuries most likely to be treated by these care sources. Data obtained from treatment sources are insufficient for assessing the effect of an exposure on injury risks because of the limited availability of data about injury and demographic characteristics of people in poorly defined catchment areas. Clinically based studies can be generalized only to the population that is treated, not to the population at risk of injury. Population-based survey data can be used to describe the characteristics of both the treated and untreated.[2]

US nonfatal injury rate estimates are based on population-based surveys but yield very limited estimates of risk characteristics for children owing to sample size.[3-5] However, differences in proportions of injuries have been shown to occur by child's age and nature of injury for those injuries resulting in medical attention compared with injuries resulting in restricted activity.[6] Differences may be due to access to health services.

Use of health services in the United States may be predicted by usual source of medical care, health insurance coverage, or both.[7-12] Health insurance coverage and usual source of care for children younger than 18 years vary by race, ethnicity, family income and employment source, poverty status, and residence.[13-16]

This analysis determines the extent to which uninsured children are likely to have received treatment for nonfatal injuries, compared with children who have insurance, in a nationally representative sample. Since assessment may vary on how serious symptoms are relative to the need for attention, results are presented for all injuries receiving medical attention and for serious injuries (i.e., those having some functional impact on the injured child).[17,18]

Methods

The National Center for Health Statistics' Health Interview Survey (NHIS) is a multistage probability household sample resulting in a representative sample of the US civilian noninstitutionalized population. In 1988, the Child Health Supplement (CHS) to the NHIS selected one child aged 17 years or younger from each family with children, resulting in a sample of 17 110 children and an overall NHIS–CHS response rate of 91%.[19] Final weights adjusted for nonresponse are applied to all data in the analysis to reflect the experience of 64 million US children aged 17 years or younger.

Linear regression modeling is used to test differences in medically attended injury rates by health insurance or Medicaid coverage status after adjustment for confounding. A backward stepwise approach using rescaled weights to assess significant covariates in the model is based on recommendations for large complex surveys.[20] Final estimates of adjusted injury rates, relative rates, and standard errors are developed by standardizing covariates with appropriate final weights for complex survey designs, rather than rescaled weights.[21] The confidence interval (CI) is appropriate for complex survey variance with asymmetrical cumulative incidence ratios and outcomes based on means of multiple event outcomes.[22,23]

Respondents (usually mothers) reported the nature, cause, and severity of each medically attended injury that had occurred during the previous 12 months. No question was asked about injuries that did not receive attention. Injuries were analyzed according to severity levels (to-

Mary D. Overpeck is with the Epidemiology Branch, National Institute of Child Health and Human Development, Bethesda, Md. Jonathan B. Kotch is with the Department of Maternal and Child Health, University of North Carolina at Chapel Hill.

Requests for reprints should be sent to Mary D. Overpeck, DrPH, Epidemiology Branch, National Institute of Child Health and Human Development, 6100 Executive Blvd, Room 7B03, Bethesda, MD 20892.

tal, serious, minor). Severity was defined according to subsequent impact. An injury was considered serious if the child (1) had to stay in bed for more than half a day; (2) had any limitations or was prevented from doing usual childhood activities; (3) spent one or more nights in the hospital; (4) had surgery, including bone setting or stitches; (5) had pain often or all of the time; or (6) was bothered more than a little. Only total and serious rates are presented. After injuries were coded according to the *International Classification of Diseases*[24] external causes of injury (E-codes), injuries resulting from misadventures to patients during surgical or medical care or from complications due to drugs or biological substances causing adverse effects in therapeutic use (E-codes 870–879 and 929–949) were excluded.

The following variables were assessed as potential model confounders: health insurance, Medicaid, a place for sick or injured care, age, race, sex, maternal education, urban/rural place of residence, and poverty status. Covariates were assessed for interaction separately and with the potential exposure variable(s). Age was stratified in three groupings to avoid interaction effects. Age was then kept as a continuous variable within each age group, because it remained significant in the model after stratification. Since poststratification weights for age, race, and sex were used in the models, the distribution of these and other covariates is the same as in the 1988 US population.

Results

Total and serious medically attended injury rates increased with age. Serious injuries represented about half of total medically attended injuries (Table 1). Seventeen percent of children had no medical care coverage (neither health insurance nor Medicaid). Only 6.5% had no place for sick or injured care, and 2.5% had neither coverage nor a place for care.

Medicaid and health insurance were combined as "medical care coverage" (compared with "no coverage") because relative rates (RRs) of medically attended injuries show no significant difference between them (Table 2). Adjusted relative rates of total medically attended injuries range from 0.70 at ages 12 through 17 years to 0.80 at ages younger than 6 years for those without coverage compared with those who have coverage. Serious injury relative rates for those with

TABLE 1—Rates of Nonfatal Medically Attended Injuries and Percentages of Children with No Insurance, No Medicaid, or No Access to Care: United States, 1988

	Age, y			
	<6 (n = 6209)	6–11 (n = 5092)	12–17 (n = 5809)	Total (n = 17 110)
Total injury rates[a]	12.9	14.9	22.5	16.3
Serious injury rates[a,b]	5.8	7.3	12.7	8.3
Children with no insurance, %	29.3	25.6	24.9	26.7
Children with Medicaid, %	16.1	12.1	10.0	12.8
Children with no insurance or Medicaid, %	17.3	16.1	17.4	16.9
Children with no place for sick or injured care, %	5.1	6.1	8.5	6.5

Note. Rates and percentages are weighted by survey poststratification variables and for nonresponse to be representative of the US civilian noninstitutionalized population.
[a]There were 2782 total injuries. Rates are based on injuries per 100 children.
[b]Serious injuries were those that resulted in restricted activity, bed days, surgery, hospitalization, or substantial pain.

TABLE 2—Adjusted Relative Rates of Medically Attended Childhood Injury: A Comparison of Medicaid, Insurance, and Medical Care Coverage, United States, 1988

	Total Injuries				Serious Injuries			
	Medicaid/Insurance		No Coverage/ Any Coverage[a]		Medicaid/Insurance		No Coverage/ Any Coverage[a]	
Age	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
<6 y	1.23	0.98, 1.54	0.80	0.72, 0.88	1.17	0.88, 1.57	0.57	0.40, 0.82
6–11 y	1.27	0.99, 1.63	0.74	0.68, 0.87	1.24	0.89, 1.72	0.61	0.42, 0.88
12–17 y	1.01	0.79, 1.30	0.70	0.55, 0.88	0.88	0.63, 1.24	0.84	0.61, 1.16
All ages	1.16	1.02, 1.32	0.73	0.64, 0.83	1.10	0.92, 1.32	0.71	0.56, 0.90

Note. Relative rates (RRs) are adjusted for having a place for care, maternal education, age (continuous), race, and sex. Confidence intervals (CIs) are based on standard errors produced by SUDAAN to account for variance and final survey weights from the complex sample design. The multistage complex design of the survey had effects on the standard errors ranging from none to an increase by more than a factor of 2.
[a]"Any coverage" means either Medicaid or health insurance.

no coverage ranged from 0.57 at ages younger than 6 years to 0.84 at ages 12 through 17 years. All relative rates showed that children without medical care coverage were significantly less likely to have either total or serious medically attended injuries than were those with any coverage ($P \leq .001$), except for serious injuries at ages 12 through 17 years (RR = .84, 95% CI = 0.61, 1.16).

Discussion

The results of this analysis show that lack of medical care coverage has the effect of decreasing medically attended injury rates, compared with rates for those with coverage, for both total and serious

injuries after potential confounders are accounted for. Do children without coverage have fewer injuries than those with coverage? In fact, poor children are more likely both to have no coverage[11] and to have more fatal injuries.[25,26] The relative rates show that for those without coverage, between 20% and 30% of total injuries in 1988 may not have been attended, ranging from 30% of injuries in children aged 12 through 17 years to 20% of injuries in children younger than 6 years. At least 40% of serious injuries occurring to children aged 11 years and younger without coverage may not have been attended.

Access to medical care through Medicaid seems to result in the same medically

attended injury rates as access through health insurance, a finding consistent with previous studies.[10,11] Partial coverage during the year, deductibles, and copayments required by health insurance plans may decrease levels at which medical attention is sought for injuries even among children considered insured in this study, resulting in smaller differences in injury rates among all insured children, those with Medicaid, and those with no coverage of any type.[27] The Rand Health Insurance Experiment showed that "poor children in cost-sharing plans were less likely to seek care for diagnoses related to trauma or accidents than were poor children with free care."[28]

Potential bias in the findings due to the 12-month recall period could also have resulted from the possibility that seeking medical attention leads to better recall of events. However, another analysis of these data for effects of recall showed little loss when injury resulted in restricted activity or some other effect on the child analogous to our criteria for serious injuries.[17]

The results are consistent with another analysis showing that estimates from sample surveys (or treatment sources) can be biased estimators of the effects of exposures associated with lack of coverage for medical care.[29] When the analysis is restricted to serious injuries, which should be more likely to receive medical attention than those with no substantive impact, the findings remain. Children without medical care coverage are less likely to have medically attended injuries than are those with coverage. Therefore, survey data or clinically based studies may underestimate nonfatal injury risk by 20% to 40% unless access to medical care coverage is taken into account. □

References

1. National Committee for Injury Prevention and Control. *Injury Prevention: Meeting the Challenge.* New York, NY: Oxford University Press; 1989:35–42.
2. Overpeck MD, Trumble AC, Brenner RA. Population-based surveys as sources of injury data and special methodological problems. In: *Proceedings of the International Collaborative Effort on Injuries, May 18–20, 1994.* Hyattsville, Md: National Center for Health Statistics. In press.
3. *Impairments Due to Injuries: United States, 1985–87.* Hyattsville, Md: National Center for Health Statistics; 1991. DHHS publication PHS 91-1505.
4. *Types of Injuries by Selected Characteristics: United States, 1985–87.* Hyattsville, Md: National Center for Health Statistics; December 1990. DHHS publication PHS 91-1503.
5. McCaig LF. National Hospital Ambulatory Medical Care Survey: 1992 emergency department summary. *Adv Data Vital Health Stat.* March 2, 1994; no. 245. DHHS publication PHS 94-1250.
6. *Persons Injured and Disability Days due to Injuries, United States, 1980–81.* Hyattsville, Md: National Center for Health Statistics; March 1985. DHHS publication PHS 85-1577:16.
7. Andersen R, Anderson OW. *A Decade of Health Services.* Chicago, Ill: University of Chicago Press; 1967.
8. Aday LA, Andersen R. *Development of Indices of Access to Medical Care.* Ann Arbor, Mich: Health Administration Press, 1975.
9. Aday L, Andersen R, Fleming G. *Health Care in the U.S.: Equitable for Whom?* Beverly Hills, Calif: Sage Press; 1980.
10. Butler JA, Winter WD, Singer JD, Wenger M. Medical care use and expenditure among children and youth in the United States: analysis of a probability sample. *Pediatrics.* 1985;76:495–507.
11. St Peter RF, Newacheck PW, Halfon N. Access to care for poor children: separate and unequal? *JAMA.* 1992;267:2760–2764.
12. Newacheck PW, McManus MA. Health insurance status of adolescents in the United States. *Pediatrics.* 1989;84:699–708.
13. Trevino FM, Moyer E, Valdez RB, Stroup-Benham CA. Health insurance coverage and utilization of health services by Mexican Americans, mainland Puerto Ricans, and Cuban Americans. *JAMA.* 1991;265:233–237.
14. National Center for Health Statistics. Health care coverage by sociodemographic and health characteristics, United States, 1984. *Vital Health Stat [10].* 1987; no. 162. DHHS publication PHS 87-1590.
15. Ries P. Characteristics of persons with and without health care coverage: United States, 1989. *Adv Data Vital Health Stat.* June 1991; no. 201. DHHS publication PHS 90-1599.
16. Garfinkel S, Corder L, Dobson A. *Health Services Utilization in the U.S. Population by Health Insurance Coverage.* National Medical Care Utilization and Expenditure Survey. Series B No. 13. Washington, DC: Health Care Financing Administration; December 1986:3–7. DHHS publication 20213.
17. Harel Y, Overpeck MD, Jones DJ, et al. The effects of recall on estimating annual nonfatal injury rates for children and adolescents. *Am J Public Health.* 1994;84:599–605.
18. McDermott W. Medicine: The public good and one's own. *Perspect Biol Med.* 1978;21:167–187.
19. *Current Estimates from the National Health Interview Survey, 1988.* Hyattsville, Md: National Center for Health Statistics; October 1989. DHHS publication PHS 89-1501.
20. Lee ES, Forthofer RN, Lorimor RJ. Analysis of complex sample survey data: problems and strategies. *Social Methods Res.* 1986;15:69–101.
21. Software for Survey Data Analysis (SUDAAN) Version 5.30. Research Triangle Park, NC: Research Triangle Institute; 1991.
22. Katz D, Baptista J, Azen SP, Pike MC. Obtaining confidence intervals for the risk ratio in cohort studies. *Biometrics.* 1978;34:469–474.
23. Kleinbaum DG, Kupper LL, Morgenstern H. *Epidemiologic Research.* Belmont, Calif: Lifetime Learning Publications; 1982:298.
24. *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, Ninth Revision Conference, 1975.* Geneva, Switzerland: World Health Organization; 1977:930–1053.
25. Nersesian WS, Petit MR, Shaper R, Lemieux D, Naor E. Childhood deaths and poverty: a study of all childhood deaths in Maine, 1976–1980. *Pediatrics.* 1985;75:41–50.
26. Nelson MD Jr. Socioeconomic status and childhood mortality in North Carolina. *Am J Public Health.* 1992;82:1131–1133.
27. Valdez RB, Ware JE, Manning WG, et al. Prepaid group practice effects on the utilization of medical services and health outcomes for children: results from a controlled trial. *Pediatrics.* 1989;83:168–180.
28. Lohr KN, Brook RH, Kamberg CJ, et al. Use of medical care in the Rand Health Insurance Experiment: Diagnosis- and service-specific analyses in a randomized controlled trial. *Med Care.* 1986;24(9, suppl):S1–S36.
29. Overpeck MD, Kotch JB, Trumble AC. Effects of maternal education and access to care on analysis of injury risk according to patterns of child care. In: *Proceedings of the 1993 Public Health Conference on Records and Statistics.* Hyattsville, Md: National Center for Health Statistics; 1994. DHHS publication PHS 94-1214.