

- cult blood screening for colorectal cancer: the results of the first 107,349 subjects. *Lancet*. 1989;1:1160-1164.
7. Kronborg O, Fenger C, Olsen J, Bech K, Sondergaard O. Repeated screening for colorectal cancer with fecal occult blood test: a prospective randomized study at Funen, Denmark. *Scand J Gastroenterol*. 1989;24:599-606.
  8. Kewenter J, Bjork S, Haglund E, Smith L, Svanvik J, Ahren C. Screening and re-screening for colorectal cancer: a controlled trial of fecal occult blood testing in 27,700 subjects. *Cancer*. 1988;62:645-651.
  9. Fleisher DE, Goldbert JE, Browning TH, et al. Detection and surveillance of colorectal cancer. *JAMA*. 1989;261:580.
  10. Brendler SJ, Tolle SW. Fecal occult blood screening and evaluation for a positive test. *West J Med*. 1987;146:103-105.
  11. Snedecor GW, Cochran WF. *Statistical Methods*. 7th ed. Ames, Ia: Iowa State University Press; 1980.
  12. Mehta CR, Patel NR. A network algorithm for performing Fisher's exact test in rXc contingency tables. *J Am Stat Assoc*. 1983;78:427-434.
  13. Khubchandani IT, Karamchandani M, Kleckner F, et al. Mass screening for colorectal cancer. *Dis Colon Rectum*. 1989;32:754-758.
  14. Simon J. Occult blood screening for colorectal carcinoma: a critical review. *Gastroenterology*. 1985;88:820.
  15. Winchester DP, Shull J, Scanlon E, et al. A mass screening program for colorectal cancer using chemical testing for occult blood in the stool. *Cancer*. 1980;45:2955-2958.
  16. Bralow SP. Community-based colorectal cancer screening programs: a critique. *Cancer Detect Ser #3*. 1992;XVI:16B-16F.
  17. Devitt JE. False alarms of breast cancer. *Lancet*. 1989;ii:1257-1258.
  18. Edeiken S. Mammography and palpable cancer of the breast. *Cancer*. 1988;61:263-265.
  19. Hall F. Screening mammography: potential problems on the horizon. *N Engl J Med*. 1986;314:53-55. Letter.
  20. Eddy DM. Variations in physician practice: the role of uncertainty. *Health Affairs*. 1984;3:74-89.
  21. Eisenberg JM. *Doctors' Decisions and the Cost of Medical Care*. Ann Arbor, Mich: Health Administration Press; 1986.
  22. Eddy DM, Billings J. The quality of medical evidence: implications for quality of care. *Health Affairs*. 1988;7:19-32.
  23. Mant D, Fitzpatrick R, Hogg A, et al. Experiences of patients with false positive results from colorectal cancer screening. *Br J Gen Pract*. 1990;40:423-425.
  24. Fox RC. Training for uncertainty. In: Merton RK, Reeder G, Kendall P, eds. *The Student-Physician: Introductory Studies in the Sociology of Medical Education*. Cambridge, Mass: Harvard University Press; 1957:207-241.
  25. Baumann AO, Deber RB, Thompson GG. Overconfidence among physicians and nurses: the micro-certainty, macro-uncertainty phenomenon. *Soc Sci Med*. 1991;32:167-174.
  26. Gerrity M, DeVellis R, Earp J. Physicians' reactions to uncertainty in patient care. *Med Care*. 1990;28:724-736.

## The Epidemiology of Child Abuse: Findings from the Second National Incidence and Prevalence Study of Child Abuse and Neglect

Joseph C. Cappelleri, PhD, John Eckenrode, PhD, and Jane L. Powers, PhD

### ABSTRACT

The epidemiology of child abuse was investigated with data from the Second National Incidence and Prevalence Study of Child Abuse and Neglect. A statistical comparison of incidence rates suggested that age, family income, and ethnicity were risk factors for both sexual abuse and physical abuse, but county metrostatus was not. Gender was a risk factor for sexual abuse but not for physical abuse. A logistic regression analysis showed that ethnicity, county metrostatus, and a gender-by-income interaction distinguished sexual abuse from physical abuse. (*Am J Public Health*. 1993;83:1622-1624)

### Introduction

The Second National Incidence and Prevalence Study of Child Abuse and Neglect was mandated by Congress in 1984 (1) to assess the current national incidence and prevalence of child abuse and neglect and (2) to determine how the severity, frequency, and character of child maltreatment had changed since 1980 when the First National Incidence Study was conducted.<sup>1-3</sup> A more extensive analysis of these large-scale, nationally representative studies could provide valuable scientific knowledge on the scope and nature of child maltreatment and its impact on public health issues.<sup>4-7</sup>

Using data from the Second National Incidence Study, we sought to examine the impact of five key demographic factors—age at discovery, gender, income, ethnicity, and county metrostatus—on sexual abuse and physical abuse. In addition, using these variables, we compared the risk of sexual abuse with the risk of physical abuse. The latter anal-

ysis is similar to one previously conducted by Jones and McCurdy.<sup>5</sup> However, these investigators used unweighted data, whereas we used the appropriate sampling weights, which gave the correct estimates of the standard errors associated with the regression coefficients and hence were more reliable for hypothesis tests and confidence interval estimations. Emotional abuse has been excluded from our analyses because it was more difficult to define and measure.<sup>8,9</sup>

Joseph C. Cappelleri is with the Department of Epidemiology, Harvard School of Public Health, Boston, Mass. John Eckenrode and Jane L. Powers are with the Family Life Development Center, Department of Human Development and Family Studies, Cornell University, Ithaca, NY.

Requests for reprints should be sent to John Eckenrode, PhD, Department of Human Development and Family Studies, MVR Hall, Cornell University, Ithaca, NY 14853.

This paper was accepted March 10, 1993.

## Methods

### Study Design

Data for this study were collected between September 7 and December 6, 1986. A weighted multistage cluster probability sample was used.<sup>2,3</sup> A nationally representative sample of counties consisting of 28 county-level primary sampling units located in 19 states was selected. Cases were identified through Child Protective Services, as well as through other community professional agencies (e.g., hospitals, schools, day-care centers, social services, and municipal police).

### Definitions

"Incidence rate" is defined as the number of new cases of maltreated children reported in 1986. Reported cases contain both official reports of abuse known to Child Protective Services and unofficial reports of abuse known to professionals and investigatory agencies other than Child Protective Services. The definition of sexual abuse included intrusion, molestation with genital contact, and other or unknown sexual abuse that was perpetrated or permitted by an adult caretaker, parent, or parent substitute. Unlike sexual abuse, physical abuse was not broken down into more specific forms of maltreatment, but was said to occur when a child suffered a physical injury as a result of actions by a parent or caretaker.

### Statistical Analysis

First, we statistically evaluated each of the five potential risk factors for sexual abuse and physical abuse by comparing two given categories (subgroups) of a potential risk factor. Then, we quantified the odds of a child's being sexually abused relative to the odds of a child's being physically abused as a function of the five risk factors by performing a multivariate logistic regression analysis. The weighted results were generated by the WESVAR program<sup>10</sup> for the descriptive results and the WESLOG program<sup>11</sup> for the logistic regression results. All statistical tests were based on two-tailed tests at the .05 level of significance.

## Results

### Descriptive Analysis

The results showed that an estimated total of 133 619 children were reported as being sexually abused in 1986, which represents an estimated incidence rate of 2.11

TABLE 1—Potential Demographic Risk Factors for Sexual Abuse and Physical Abuse

| Risk Factor                     | Sexual Abuse    |                |                    |       | Physical Abuse  |                |        |       |
|---------------------------------|-----------------|----------------|--------------------|-------|-----------------|----------------|--------|-------|
|                                 | Rate (per 1000) | Standard Error | 95% CI             |       | Rate (per 1000) | Standard Error | 95% CI |       |
|                                 |                 |                | Lower              | Upper |                 |                | Lower  | Upper |
| Age, y                          |                 |                |                    |       |                 |                |        |       |
| 0-2                             | 0.36            | 0.09           | 0.17               | 0.54  | 2.43            | 0.48           | 1.43   | 3.44  |
| 3-5                             | 2.41            | 0.59           | 1.20               | 3.63  | 4.17            | 0.77           | 2.68   | 5.65  |
| 6-8                             | 2.07            | 0.53           | 0.98               | 3.17  | 4.91            | 0.80           | 3.25   | 6.57  |
| 9-11                            | 2.46            | 0.64           | 1.12               | 3.79  | 5.18            | 1.09           | 2.92   | 7.44  |
| 12-14                           | 2.58            | 0.36           | 1.83               | 3.33  | 6.61            | 1.25           | 4.01   | 9.21  |
| 15-17                           | 2.87            | 1.23           | 0.31               | 5.42  | 6.33            | 1.30           | 3.62   | 9.04  |
| Sex                             |                 |                |                    |       |                 |                |        |       |
| Girls                           | 3.28            | 0.43           | 2.39               | 4.17  | 5.55            | 0.77           | 3.96   | 7.13  |
| Boys                            | 1.00            | 0.31           | 0.37               | 1.62  | 4.33            | 0.35           | 3.62   | 5.04  |
| Difference                      |                 |                |                    |       |                 |                |        |       |
| Girls-boys                      | 2.28*           | 0.48           | 1.29               | 3.28  | 1.22            | 0.78           | -0.39  | 2.81  |
| Income                          |                 |                |                    |       |                 |                |        |       |
| <\$15 000                       | 4.49            | 0.92           | 2.60               | 6.39  | 8.73            | 0.90           | 6.87   | 10.60 |
| ≥\$15 000                       | 0.81            | 0.14           | 0.51               | 1.10  | 2.13            | 0.42           | 1.25   | 3.00  |
| Difference                      |                 |                |                    |       |                 |                |        |       |
| Less-more                       | 3.68*           | 0.89           | 1.86               | 5.51  | 6.61*           | 0.81           | 4.92   | 8.28  |
| Ethnicity <sup>a</sup>          |                 |                |                    |       |                 |                |        |       |
| White                           | 1.99            | 0.28           | 1.42               | 2.56  | 4.32            | 0.48           | 3.36   | 5.31  |
| Black                           | 2.02            | 0.53           | 0.92               | 3.12  | 7.68            | 1.44           | 4.71   | 10.66 |
| Other                           | 0.87            | 0.52           | -0.21 <sup>b</sup> | 1.94  | 3.24            | 1.24           | 0.69   | 5.79  |
| Difference                      |                 |                |                    |       |                 |                |        |       |
| Black-White                     | 0.03            | 0.51           | -1.02              | 1.07  | 3.36*           | 1.55           | 0.16   | 6.57  |
| Black-other                     | 1.15            | 0.75           | -0.40              | 2.70  | 4.44*           | 1.84           | 0.65   | 8.22  |
| White-other                     | 1.12*           | 0.48           | 0.13               | 2.12  | 1.08            | 1.41           | -1.83  | 3.99  |
| County metrostatus <sup>c</sup> |                 |                |                    |       |                 |                |        |       |
| Major urban                     | 1.88            | 0.76           | 0.30               | 3.45  | 4.97            | 1.60           | 1.67   | 8.27  |
| Urban                           | 2.40            | 0.71           | 0.93               | 3.86  | 5.10            | 1.36           | 2.29   | 7.90  |
| Rural                           | 1.96            | 0.81           | 0.29               | 3.62  | 4.63            | 1.90           | 0.70   | 8.33  |
| Difference                      |                 |                |                    |       |                 |                |        |       |
| Major urban-urban               | 0.52            | 1.23           | -3.06              | 2.02  | -0.13           | 2.54           | -5.36  | 5.11  |
| Major urban-rural               | -0.08           | 1.12           | -2.39              | 2.23  | 0.34            | 2.62           | -5.07  | 5.75  |
| Urban-rural                     | 0.44            | 1.29           | -2.21              | 3.09  | 0.47            | 2.87           | -5.94  | 6.38  |

Note. CI = confidence interval.

<sup>a</sup>The White category included Whites and Hispanics, the Black category included Blacks not of Hispanic origin, and the other category included all other ethnic groups (including American Indian, Alaskan Native, Asian, Pacific Islander).

<sup>b</sup>Practically speaking, this number can be increased to zero, because a negative incidence rate is not possible.

<sup>c</sup>Major urban counties included the 32 largest metropolitan areas in the country, urban counties included the other metropolitan areas, and rural counties included the remaining areas.

\* $P \leq .05$ .

per 1000 children. An estimated total of 311 524 children were reported as being physically abused in 1986, which represents an estimated incidence rate of 4.95 per 1000.

Table 1 shows that, for both types of abuse, the five oldest age groups had a substantially higher rate of physical abuse than the birth-to-2-year-olds, although the older age groups did not differ statistically among themselves. Girls had a higher rate of sexual abuse than boys; physical abuse did not appear to vary by the child's gender. Family income was a significant risk factor for both physical abuse and sexual abuse. Whites were more likely to be identified as sexually

abused than non-Black minorities. Black children were physically abused at a significantly higher rate than White children and children in "other" ethnic groups. Finally, there were no urban-rural differences in the rates of sexual abuse or physical abuse.

### Logistic Regression Results

Table 2 shows the logistic regression results predicting the odds of sexual abuse relative to physical abuse. Compared with physical abuse, sexual abuse was more likely (1) for Whites than Blacks, (2) for girls than boys regardless of family income, and (3) for children residing in urban areas than for children

TABLE 2—Odds Ratio Estimates and 95% Confidence Intervals for Predicting the Likelihood of Sexual Abuse Relative to Physical Abuse

| Risk Factor                                 | Odds Ratio Estimates<br>(Sexual Abuse Relative<br>to Physical Abuse) | 95% Confidence<br>Interval of True<br>Odds Ratio |
|---|--|--|
| Race (Black to White)                       | 0.33*  | 0.25, 0.44                                       |
| Sex (girls to boys)                         | 3.74*  | 2.67, 5.24                                       |
| Sex × income                                | 0.44*  | 0.31, 0.63                                       |
| Major urban to rural                        | 1.37*  | 1.01, 1.88                                       |
| Urban to rural                              | 1.35*  | 1.01, 1.82                                       |
| Family income (<\$15 000 to ≥\$15 000)      | 1.15   | 0.95, 1.38                                       |
| Race (non-Black minorities to White)        | 0.81   | 0.47, 1.37                                       |
| Age (birth–12 years old to 13–18 years old) | 0.95   | 0.82, 1.10                                       |

Note. Fewer than 2% of the cases involved both sexual abuse and physical abuse. These cases were classified as sexually abused in the reported analysis.  
\*P ≤ .05.

residing in rural areas. In addition, the somewhat higher risk of sexual abuse relative to physical abuse for girls varied by income, with a greater gender difference in risk for lower income families.

## Discussion

In this paper we present data from the Second National Incidence and Prevalence Study of Child Abuse and Neglect regarding rates of physical and sexual abuse. We found that the rates of physical and sexual abuse varied as a function of the sociodemographic characteristics of the child and his or her family and that these characteristics helped distinguish between those children at risk for physical abuse and those at risk for sexual abuse. Some of our findings, such as the fact that low income was a significant risk factor for both forms of maltreatment, serve to confirm data reported in other studies. Other findings, such as the differential effect of gender as a function of income when the risk of sexual vs physical abuse is predicted, have not previously been reported.<sup>8,12,13</sup> Unlike the results of Jones and McCurdy,<sup>5</sup> our logistic regression findings showed that, relative to physical abuse, sexual abuse was more likely for Whites than for Blacks but not more likely for Whites than for other racial groups.

Although the data from the Second National Incidence Study have several

major limitations (see Finkelhor and Hotaling for a critique<sup>14</sup>), they are the best available data from which to derive national estimates for the incidence of child abuse and neglect. These data also have value for advancing basic knowledge about child maltreatment and for informing public policy, particularly with regard to estimating the extent of the problem of child maltreatment beyond what is reported to official sources. The data may also help to dispel certain widely held assumptions about maltreatment, such as the assumption that younger children are at greater risk for abuse than older children. More extensive analyses of the data from both the Second and the First National Incidence Studies not only would help refine our current understanding of child maltreatment, but also would highlight aspects of study design that need improvement for future incidence studies. □

## Acknowledgments

This research was supported by funds awarded to Dr John Eckenrode by the National Center on Child Abuse and Neglect under grant 90-CA1370.

The authors thank Drs Andrea Sedlak and Keith Rust for their support of this project.

## References

1. *Study Findings: Study of the National Incidence and Prevalence of Child Abuse*

and Neglect: 1988. Washington, DC: US Dept of Health and Human Services, Office of Human Development Services, National Center on Child Abuse and Neglect; 1988.

2. *Report on Data Collection: Study of the National Incidence and Prevalence of Child Abuse and Neglect: 1988*. Washington, DC: US Dept of Health and Human Services, Office of Human Development Services, National Center on Child Abuse and Neglect; 1988.
3. *Report on Data Processing and Analysis: Study of the National Incidence and Prevalence of Child Abuse and Neglect: 1988*. Washington, DC: US Dept of Health and Human Services, Office of Human Development Services, National Center on Child Abuse and Neglect; 1988.
4. Sedlak A. National prevalence of child abuse and neglect. Presented at the conference on Child Welfare Reform Experiments. February 1991; Washington, DC. Available from Westat Inc, Rockville, Md.
5. Jones ED, McCurdy K. The links between types of maltreatment and demographic characteristics of children. *Child Abuse Negl*. 1992;16:201–215.
6. Ards S, Harrell A. *Reporting of Child Maltreatment: A Secondary Analysis of the National Surveys of Child Abuse and Neglect*. Washington, DC: Urban Institute; 1991.
7. Cappelleri JC, Eckenrode J, Powers J. *A User's Guide for the Second National Incidence Study*. Ithaca, NY: National Data Archive on Child Abuse and Neglect, Cornell University; 1991.
8. Walker CE, Bonner BL, Kaufman KL. *The Physically and Sexually Abused Child: Evaluation and Treatment*. New York, NY: Pergamon Press; 1988.
9. McGee RA, Wolfe DA. Psychological maltreatment: toward an operational definition. *Dev Psychopathology*. 1991;3:3–18.
10. Flyer P, Mohadjer L. *The WESVAR Procedure*. Rockville, Md: Westat Inc; 1988.
11. Westat Inc. *The WESLOG Procedure*. Rockville, MD: Westat Inc; 1990.
12. Finkelhor D, Baron L. High-risk children. In: Finkelhor D, Araji S, Baron L, Browne A, Peters SD, Wyatt GE, eds. *A Sourcebook on Child Sexual Abuse*. Newbury Park, Calif: Sage Publications; 1986:60–88.
13. Wolfe DA. *Child Abuse: Implications for Child Development and Psychopathology*. Newbury Park, Calif: Sage Publications; 1987.
14. Finkelhor D, Hotaling G. Sexual abuse in the national incidence study of child abuse and neglect. *Child Abuse Negl*. 1984;8:22–32.