

COST^o AND COMPENSATION OF INJURIES IN MEDICAL MALPRACTICE

FRANK A. SLOAN* AND STEPHEN S. VAN WERT**

I

INTRODUCTION

The primary functions of the tort system in resolving medical malpractice claims are to deter injuries and to compensate victims.¹ One reason for the high overhead of the tort system is the separation of liability and loss determinations. Calculations of damages are expected to follow general rules.² All injury classification schemes yield categories with some intracategory variation in actual loss. The advantage of individualized loss determinations is their presumed elimination of such heterogeneity.

Individualized estimates also have potential disadvantages. The rules controlling awards for damages must be sufficiently general to cover a broad spectrum of situations. This necessity, coupled with the fact that numerous assumptions underlie almost any calculation of loss, allows attorneys and expert witnesses considerable discretion to cast the loss in the most favorable light for their clients—high losses for plaintiffs and low losses for defendants. The tort system implicitly expects that the settlement process and the jury system can avoid over- and underestimates of loss. This faith, however, has not been documented empirically.

Courts have no memory of awards paid for damages in similar cases;³ they maintain no data banks on past awards. Such data are available from jury

Copyright © 1991 by Law and Contemporary Problems

* Centennial Professor of Economics and Director, Health Policy Center, Institute for Public Policy Studies, Vanderbilt University.

** Formerly, Research Associate, Health Policy Center, Institute for Public Policy Studies, Vanderbilt University. Currently, student at Duke University School of Law.

The authors wish to thank Penny Githens, Lars Runquist, Sharon Stanley, Teresa Waters, and Mingliang Zhang for their help on this study. This research was supported in part by a grant from The Robert Wood Johnson Foundation, "Resolution of Malpractice Claims: Birth- and Emergency Room-Injuries" (Grant No. 14045).

1. The tort system has other goals as well, but deterrence and compensation are at the top of most lists. On other goals, see The 78th American Assembly (Tort and Insurance Practice Section, ABA), *Tort Law and the Public Interest: Competition, Innovation and the Consumer Welfare* 6-7 (W. W. Norton, 1990).

2. See generally Michael L. Brookshire, *Economic Damages: The Handbook for Plaintiff and Defense Attorneys* (Anderson, 1987); Dan B. Dobbs, *Handbook on the Law of Remedies: Damages, Equity, Restitution* (West, 1982) ("Remedies"); Stuart M. Speiser, *Recovery for Wrongful Death: Economic Handbook* (Lawyers Co-Op, 1979).

3. See Randall R. Bovbjerg, Frank A. Sloan & James F. Blumstein, *Valuing Life and Limb in Tort: Scheduling Pain and Suffering*, 83 *Nw U L Rev* 908, 916, 960-61 (1989); James F. Blumstein, Randall R. Bovbjerg & Frank A. Sloan, *Beyond Tort Reform: Developing Better Tools for Assessing Damages for Personal Injuries*, 8 *Yale J Reg* 149, 153-55 (1991).

verdict reporters,⁴ but these data have seldom been analyzed sufficiently to provide a benchmark for a particular case. Although estimates of medical costs and wage losses are often reported along with compensation paid to plaintiffs, little or no indication is provided as to how such costs and losses are computed. A thorough verdict analysis would need to know, for example, what assumptions were made about future inflation, future medical care, or the possibility of the injured party returning to work. Other relevant questions would include which life tables were used, whether losses were discounted to present value, and, if so, which discount rate was used?⁵

Another problem with compensation analysis is the paucity of studies that quantify the cost of particular types of injuries.⁶ Empirical studies, if done well, would provide a point of reference for evaluating alleged damages in a particular case. The lack of such studies provides an important reason for undertaking the present research about the costs of medical malpractice-related injuries.

Because of the lack of detailed information to guide expert testimony, the outcome in a given medical malpractice case may be unpredictable; results can be extremely varied across comparable cases. This variability impedes the settlement process.⁷ In particular, the extent that such variability leads plaintiffs to be overly optimistic about their chances for obtaining a high

4. Jury verdict reporters are not fully reliable. In addition to problems in their text, some jury verdict reporters appear to be selective in the cases they report. One study found that mean compensation from the reporters was appreciably higher than mean compensation obtained for comparable cases in the same state (Florida) and time period that were resolved at verdict from a closed claim file. See Frank A. Sloan & Chee Ruey Hsieh, *Variability in Medical Malpractice Payments: Is the Compensation System Fair?*, 24 L & Soc Rev 601 (1990).

5. Similar problems exist when economic loss data are provided from closed liability insurance claim files, such as on the Insurance Services Office Product Liability Closed Claim Survey, conducted in 1977, or a study of medical malpractice closed claims conducted by the National Association of Insurance Commissioners ("NAIC") during 1975 through 1978. See Insurance Services Office, *Product Liability Closed Claims Survey: A Technical Analysis of Survey Results* (1977); M. Patricia Sowka, ed, *Malpractice Claims: Final Compilation* (NAIC, 1980). Even if the data collection forms provide for components of loss to be reported, as on the NAIC form, such data are typically unavailable for settled cases. Also, there is no indication how such components of loss were calculated.

6. The studies reported in the medical literature tend to cover the cost of injuries over a limited time period or for a single component of cost. Studies related to the injuries discussed in this article include: Michael H. Boyle, et al, *Economic Evaluation of Neonatal Intensive Care of Very-Low-Birth-Weight Infants*, 308 New Eng J Med 1330 (1983); John T. McCarthy, et al, *Who Pays the Bill for Neonatal Intensive Care?*, 95 J Pediatrics 755 (1979); Marie C. McCormick, Sam Shapiro & Barbara H. Starfield, *Rehospitalization in the First Year of Life for High-Risk Survivors*, 66 Pediatrics 991 (1980); Ciaran S. Phibbs, Ronald L. Williams & Roderic H. Phibbs, *Newborn Risk Factors and Costs of Neonatal Intensive Care*, 68 Pediatrics 313 (1981); Jeffrey J. Pomerance, *Cost of Living for Infants Weighing 1,000 Grams or Less at Birth*, 61 Pediatrics 908 (1978); Jeffrey J. Pomerance, Barry S. Schiffrin & Janet L. Meredith, *Womb Rent*, 137 Am J Ob Gyn 486 (1982); Donna-Jean B. Walker, et al, *Cost-Benefit Analysis of Neonatal Intensive Care for Infants Less than 1,000 Grams at Birth*, 74 Pediatrics 20 (1984); Ellen J. MacKenzie, Sam Shapiro & John H. Siegel, *The Economic Impact of Traumatic Injuries: One-Year Treatment-Related Expenditures*, 260 J Am Med Ass'n 3290 (1988).

7. The conceptual basis for the notion that variability in damages impedes settlements is quite strong. See Robert D. Cooter & Daniel L. Rubinfeld, *Economic Analysis of Legal Disputes*, 27 J Econ Lit 1067, 1075-76 (1989); Donald Wittman, *Dispute Resolution, Bargaining, and the Selection of Cases for Trial: A Study of the Generation of Biased and Unbiased Data*, 17 J Legal Stud 313 (1988). Direct empirical support, however, is lacking.

verdict award will be reflected in high compensation demands prior to trial. Defendants also may be optimistic, reasoning that their potential losses at trial are minor. This would be reflected in low settlement offers. Such variability also introduces inequities in compensation. It may encourage nuisance suits, and potential tortfeasors have a less certain signal of the consequences of failing to exercise due care.⁸

Lack of adequate information about the costs of various injuries has been a problem in the policy arena as well. Several states have enacted legislation placing dollar limits on payment for noneconomic loss or, alternatively, for total loss.⁹ The underlying rationale for limiting such payments is the belief that many claimants are overcompensated by the tort system. This conclusory determination is puzzling given the paucity of empirical evidence about claimants' losses. The only basis for this conclusion is anecdotal evidence from individual cases.

Several studies based on regression analysis have found that, while compensation rises with economic loss, a percentage point increase in loss raises compensation by far less than a percentage point, implying that large losses are undercompensated relative to smaller ones.¹⁰ A single dollar limit on loss applies most directly to larger losses; it may not affect smaller losses at all. The regression studies are not conclusive because they are based on reported estimates of loss from jury verdicts and insurance claims data that may be subject to substantial errors in measurement. Such errors may cause the estimated effect of loss on compensation to be understated. The magnitude of such errors cannot be measured because the method used to compute loss in the data bases is not given.

States have enacted statutory changes that reflect at least implicit assumptions about the relationship of compensation to cost. Changes in the collateral source rule are designed to make it more likely that funds available to a claimant from collateral sources will be subtracted from awards, which

8. Errors in valuation of damages may cause overdeterrence; that is, taking too many precautions if, as is plausible, potential defendants are risk averse. One might argue that an unclear law will lead to underdeterrence. Richard Posner argued that if the law (or its application) is unclear, prospective violators will discount the possibility of being caught and convicted. However, this line of reasoning appears to apply to enforcement and liability determination rather than to damages once a finding of liability has been made. See Richard A. Posner, *Economic Analysis of Law* 513-14 (Little, Brown, 3d ed 1986).

9. See generally Randall R. Bovbjerg, *Legislation on Medical Malpractice: Future Developments and a Preliminary Report Card*, 22 UC Davis L Rev 499 (1989).

10. In economic jargon, the elasticity is less than one. The following studies reported elasticities of compensation with respect to economic loss of much less than one: Randall R. Bovbjerg, et al, *Juries and Justice: Are Malpractice and Other Personal Injuries Created Equal?*, 54 L & Contemp Probs 5 (Winter 1991); Lee A. Lillard & W. Kip Viscusi, *The Bargaining Structure of the Litigation Process* (unpublished, January 1990); Sloan & Hsieh, 24 L & Soc Rev 601 (cited in note 4); W. Kip Viscusi, *The Determinants of the Disposition of Product Liability Claims and Compensation for Bodily Injury*, 15 J Legal Stud 321 (1986).

An exception is a recent study by Viscusi that found that the elasticity of payment with respect to economic loss was not significantly different from one. The author, however, noted that the difference may have been due to the mix of claims picked up in the sample. W. Kip Viscusi, *The Interaction between Product Liability and Workers' Compensation as Ex Post Remedies for Workplace Injuries*, 5 J L Econ & Org 185, 206 (1989).

suggests that claimants were believed to be overcompensated.¹¹ On the other hand, other policy reforms, such as limits on plaintiffs' attorneys' fees, are often justified in part on the basis that claimants should receive more rather than less.¹²

Several no-fault or no-fault-like plans have been proposed as alternatives to the present fault-based system of compensating injured persons.¹³ A fundamental objective of such plans is to compensate such persons both inexpensively and quickly. It would be very useful to have reliable information about losses incurred for developing predictions of program cost, or, as an alternative to individualized payments, for scheduling damages.¹⁴

The importance of having reliable information about losses for designing no-fault plans is illustrated by a recent article by Andrew and John Freeman, who proposed no-fault cerebral palsy insurance.¹⁵ The authors proposed to pay 80 percent of all handicap-related expenses not covered by other insurance or government assistance, up to a maximum of \$250,000 per child

11. See, for example, the position taken in Tort Policy Working Group, *An Update on the Liability Crisis* 84-86 (March 1987) ("Update"). The Working Group saw

no reason why plaintiffs should be permitted to receive double compensation, particularly where part of the compensation is paid by the government. It simply makes no sense to require consumers of goods and services to pay higher prices to compensate plaintiffs through tort settlements or judgments, and then to pay higher taxes to compensate plaintiffs a second time through government benefits for the same injury.

Id at 85. Implicit in the quotation is the assumption that the consumer, not the tortfeasor, pays for negligence. Empirical evidence to support this assumption is lacking. In the medical malpractice area, there is some evidence that malpractice premiums are shifted forward to patients by more than the premium increase. For a review of this evidence, see Frank A. Sloan & Randall R. Bovbjerg, *Medical Malpractice: Crises, Responses and Effects*, in Health Ins Ass'n Am Res Bull 31 (May 1989). The quotation raises important, larger, normative questions of both equity and efficiency. Why should the tortfeasor not be asked to pay for the harm he or she inflicts?

12. See, for example, the discussion in Tort Policy Working Group, *Update* at 86-87 (cited in note 11).

13. Given that we study birth-related injuries resulting in medical malpractice claims in this article, the most pertinent plans are the Virginia Birth-Related Neurological Injury Compensation Act, Va Code Ann §§ 38.2-5000 to 38.2-5021 (Supp 1988), and the Florida Birth-Related Neurological Injury Compensation Plan, Florida Chapter 88-1, §§ 60-75. The Florida law, which was to take effect on January 1, 1989, has never been implemented, and experience with the Virginia law has not yet been evaluated. On the Virginia law, see James A. Henderson, Jr., *The Virginia Birth-Related Injury Compensation Act: Limited No-Fault Statutes as Solutions to the "Medical Malpractice Crisis"* and Richard A. Epstein, *Market and Regulatory Approaches to Medical Malpractice: The Virginia Obstetrical No-Fault Statute*, both in Victoria P. Rostow & Roger J. Bulger, eds, 2 *Medical Professional Liability and the Delivery of Obstetrical Care* at 194 & 115 respectively (Nat'l Acad Press, 1989). Both laws are essentially identical. The Virginia law compensates for loss of earnings from the age of eighteen to the age of sixty-five in an amount equal to half the average weekly wage in Virginia for workers in the private, nonfarm sector (§ 38.2-5009(3)). It also provides for collateral source offset (§§ 38.2-5009(1)(a)-(d)) and for payment of reasonable attorneys' fees (§ 38.2-5009(4)).

14. An advantage of scheduled damages is that claimants in a category are paid a fixed amount rather than an amount dependent on claimants' decisions. Paying the latter way may cause rewards and overutilization of various therapeutic services, and withdrawal from the labor force. On the other hand, if there is appreciable variation in loss within categories and a fixed payment for persons in each category, scheduling damages could introduce major inequities in payment. Bovbjerg, Sloan & Blumstein, 83 Nw U L Rev at 964-66 (cited in note 3) (discussing the pros and cons of scheduling, but mainly in the context of payment for noneconomic rather than economic loss).

15. Andrew D. Freeman & John M. Freeman, *No-Fault Cerebral Palsy Insurance: An Alternative to the Obstetrical Malpractice Lottery*, 14 J Health Pol, Pol'y & L 707 (1989).

(indexed for inflation). They justified the limit by referring to a North Carolina survey that found that out-of-pocket expenses for the care of a child with cerebral palsy were \$6,000 per year until age four, under \$3,000 per year from ages four to eighteen, and well under \$1,000 per year thereafter. The proposal did not cover lost wages because the authors assumed that most children with cerebral palsy who live to adulthood are employable.¹⁶ Freeman and Freeman estimated the cost of buying an annuity to cover the average claimant with cerebral palsy to be \$50,000.

Settlements and jury awards paid families with birth-injured children amounts considerably higher than \$50,000.¹⁷ Under the no-fault plan, health insurers and public agencies would still have the burden of paying for the expenses they currently cover. The price of the annuity in the no-fault plan depends critically on true out-of-pocket loss, however, and the evidence used to support the above estimates should, at a minimum, stand the test of replication.

This article has two major purposes—first, to quantify the cost of permanent injuries in birth-related and emergency room cases that lead to medical malpractice claims, and, second, to compare estimated cost with compensation received. Some of the intricacies of cost estimation are described, as are some of the major policy issues in deciding which costs are and are not covered. We devote substantial attention to our costing methodology. The accuracy of the cost estimates crucially depends on the underlying methodology. Also, it is easy to be misled into thinking that liability determination is complex, especially in fields such as medical malpractice, while loss determination is reasonably straightforward. Our description of our costing methodology shows that the latter premise is false. Issues of defendant liability and claimant comparative negligence are not discussed in this article; the entire focus is on damages.

Section II discusses our data and the methods we used to compute past and future damages for birth-injury and emergency room cases in the state of Florida. The estimates are for expenses for personal health care services, wage loss, and nonmarket loss (lost household production). There are no guidelines for quantifying pain and suffering and other kinds of noneconomic loss, and we made no attempt to develop estimates of such loss. Section III presents our findings about cost and compensation for particular types of injuries. Finally, Section IV discusses the implications of the findings as well as some conceptual issues in compensation policy.

16. Freeman and Freeman cited a personal communication with Jim Everest, executive director, United Cerebral Palsy of North Carolina, as the source of information about the survey results. *Id.* at 711. Frank Sloan called Mr. Everest to learn more about the survey. He was told that the sample was very small and the families surveyed tended to have relatively high incomes. Mr. Everest did not place much confidence in the survey findings.

17. See Table 3 at the end of this article.

II

METHODOLOGY FOR QUANTIFYING COST OF INJURIES

A. Sources and Nature of Survey Data

The data used in this article came from a larger study of the dispute resolution process in medical malpractice.¹⁸ As part of the study, 187 families with closed medical malpractice claims were surveyed in Florida during late 1989 and early 1990, based upon incidents mostly occurring in the early to mid-1980s.¹⁹ The survey provided much new information on the genesis and resolution of disputes heretofore not available from any other source.

The interviews involved two types of cases: birth-related injuries and injuries to adults that occurred in hospital emergency rooms. Both types of injuries, especially the former, have attracted considerable attention.²⁰ Birth-related injuries tend to involve substantial losses and compensation.²¹ In response to the threat of claims, obstetricians supposedly have altered their practice styles; some even have quit delivering babies altogether.²² The vast majority of birth-injured claimants in our sample had cerebral palsy, mental retardation (or both), other impairments; others died at birth. One of the crises in emergency room care is the rising frequency of medical malpractice claims.²³ The emergency room claimants had a wide variety of injuries; slightly over half survived.

Florida was selected primarily because substantial information is publicly available in the state about medical malpractice claims. There is a requirement that a form be filed on each defendant in all completed medical malpractice cases.²⁴ These closed-claim forms provided a sampling frame; we sought to locate and interview all birth-related claimants and all emergency room claimants within the ages of twenty-five and fifty-four who suffered permanent injuries. Florida has one of the highest, if not the highest, medical

18. The larger study is entitled *Resolution of Malpractice Claims: Birth- and Emergency Room-Related Injuries*, and was sponsored by The Robert Wood Johnson Foundation. The study analyzes reasons for claiming, lawyer-client relationships, defendant liability, determinants of the stage of resolution of the dispute, and demands, offers, and counteroffers, as well as cost and compensation of injuries.

19. The entire survey instrument is available from the authors upon request (Health Policy Center, Station B, Box 1503, Vanderbilt University, Nashville, TN 37235).

20. See, for example, Committee to Study Medical Professional Liability and Delivery of Obstetrical Care, Institute of Medicine, *Summary of Conclusions and Recommendations*, in 1 *Medical Professional Liability and the Delivery of Obstetrical Care* 4-13 (Nat'l Acad Press); Brown, Dolan & Painton, *Do You Want to Die? The Crisis in Emergency Care is Taking its Toll on Doctors, Nurses—and Patients*, *Time* 58 (May 28, 1990); David Karp, *The ER: New Hot Spot for Malpractice Claims*, *Medical Econ* 37 (November 9, 1981).

21. Stephen Daniels & Lori Andrews, *The Shadow of the Law: Jury Decisions in Obstetrics and Gynecology Cases*, in Victoria P. Rostow & Roger J. Bulger, eds, 2 *Medical Professional Liability and the Delivery of Obstetrical Care* (Nat'l Acad Press, 1989).

22. See, for example, Opinion Research Corporation, *Professional Liability and its Effects: Report of a 1987 Survey of ACOG's Membership* (especially Table 36) (prepared for the American College of Obstetricians and Gynecologists, March 1988).

23. See sources cited in note 20.

24. Fla Stat Ann § 627.912 (West, 1990).

malpractice premiums in the United States,²⁵ which makes it in that sense atypical. However, there is no reason to believe that the birth-related and emergency room injuries that lead to claims in Florida are unrepresentative of such claims in other states. The costs associated with such injuries especially should be similar, since malpractice premiums do not affect such costs.

Each interview lasted about one and one-half hours on average and elicited information about the claimant's clinical history, events leading to the claimant's decision to file a claim, details about the claimant's lawyer-client relationship, demands for and offers of settlement, information needed to compute the cost of the injury, compensation received by the claimant, and general background information on the claimant, such as educational attainment. The information collected for the cost of injury calculations also was extensive. The cost section of the survey contained a number of questions on health care utilization during several time periods: (1) in the year of the injury, (2) during the twelve months prior to the survey,²⁶ (3) anticipated during the twelve months after the survey, and (4) other types of utilization anticipated beyond the twelve months following the survey, such as future surgeries, hospitalizations, and use of long-term care facilities or private-duty nursing. Although many of the same kinds of questions were asked for claimants with birth-related and emergency room injuries, there were naturally some differences in the survey format.

For the birth-related injury sample, a set of questions was developed concerning (1) hospital use at the time of the delivery, (2) where the baby went after being discharged, (3) the number of days the baby spent in a hospital from date of first discharge to survey, (4) the number of physician visits in each of three periods (first, last, and next year), and (5) the number of annual visits by other health care personnel, including nurses, speech pathologists, psychologists, social workers, and physical, respiratory and occupational therapists. Also included in the survey were questions about expenditures for (1) medical supplies (such as drugs, crutches, wheelchairs, ventilators, or other health aides), (2) extra or special formulas and diets, (3) alterations in the home (for example, extra heat or air conditioning, bathroom aids, and ramps), (4) special vehicles and/or alterations of standard vehicles, and (5) special schools. The survey also asked questions about employment of personnel in the family's home to assist with the needs of the child and care administered to parents as a result of the injury (such as counseling, medication, or physician visits), and about loss of earnings by the child's parents that was attributable to the injury. To determine whether expenses were incurred out-of-pocket by the households, parallel questions were

25. Harvard Medical Malpractice Study, *Patients, Doctors, and Lawyers: Medical Injury, Malpractice Litigation and Patient Compensation in New York* 1-3 (1990) ("Harvard Medical Malpractice Study").

26. As we surveyed families with closed claims, and because medical malpractice claims take years to resolve, the year of the injury and the year preceding the survey were always several years apart. On the lag between dates of incidents, filing, and claim resolution in medical malpractice cases, see, for example, Frank A. Sloan, Randall R. Bovbjerg & Penny B. Githens, *Insuring Medical Malpractice* ch 6 (Oxford U Press, 1991).

included about whether the expense was covered by insurance or a public agency. A total of 127 families with birth-related injuries who filed a claim against a health care provider responded to the survey.²⁷

The questions asked of emergency room claimants mostly followed the birth-related injury version of the questionnaire. One major difference was that, because it was appropriate in this context, we asked the earnings loss of the injured person.²⁸ A large part of the medical section of the questionnaire dealt with any chronic conditions the individual may have had prior to the emergency room visit. Other information requested related to each injured person's work and earnings history before the visit and the extent to which the family attributed the person's failure to return to work to the injury. Sixty responses were obtained from emergency room claimant families.²⁹ The single most frequent allegation in the emergency room sample was a missed diagnosis or a misdiagnosis, such as failure to diagnose a heart attack that led to a death soon after the visit. Mistakes in the administration and choice of treatment were also alleged.

B. Methodology for Estimating Costs of Injuries

Estimates of medical, wage, and nonmarket losses, both past and future, were computed.³⁰ In this study, "future" refers to the period after the survey date.

The loss calculations are based on information documented either from data provided by respondents or from a review of the literature and conversations with experts. Since the birth-related injuries encompassed only a few medical conditions, the literature review of these injuries was much more fruitful than the one we conducted for hospital emergency room injuries. Because of the wide differences in diagnoses in the emergency room sample, only costs that could be documented by the survey were included. For the birth-related injuries, by contrast, we included some expenses that the literature and expert opinions predicted are likely to be incurred by claimants in the future. Computations of loss were based on economic principles. For

27. We could not obtain compensation information about one of the 127 cases. See Table 3 at the end of this article. See also note 29.

28. None of the surviving birth-injured persons were of working age. The earliest birth injury in our survey occurred seventeen years before the survey date; the mean difference between the birth date and date of survey was six years. All of the emergency room-injured claimants were adults (age twenty-five or older) at the time of the subject emergency room visit.

29. We encountered problems locating verifiable addresses and telephone numbers for our survey. Mothers and emergency room visitors are a mobile group, especially in a state with a highly transient population such as Florida. Seventy-three percent of persons located completed the interview. In all, about one-third of the original sample was included. Since we had extensive information on families we could not interview from the closed claim forms filed with Florida's Department of Insurance, we could make extensive comparisons between respondents and nonrespondents. No response bias was detected.

30. Production outside the workplace ("nonmarket production") is an important component of national output but is not counted in the Gross National Product. Family members "produce" meals, transportation, child care, and home tutoring, for example. Units on "home production" are now routinely taught in labor economics courses. See, for example, Ronald G. Ehrenberg, *Modern Labor Economics: Theory & Public Policy* 220-30 (Scott, Foresman, 3d ed 1987).

some types of loss, legal rules have evolved that tend to differ from economists' opinions. Losses were computed irrespective of whether they were covered by collateral sources or were incurred out-of-pocket by claimant families. The former type of losses receive more attention in this article.

1. *Birth-Related Injuries: Past Loss.* Estimation of past loss largely involved calculating actual bills, much as experts employed in individual cases do. Information was obtained on the use of most types of personal health care services for the year following the birth and the year immediately preceding the survey. For some items, however, the survey asked for all use since birth. These items included: (1) hospitalizations since the first discharge, (2) the amount spent on medical supplies, prescriptions, crutches, wheelchairs, ventilators, and other health equipment since the first discharge from the hospital, (3) special alterations on the home or vehicle, and/or the purchase of a special vehicle, and (4) special education expenses, of which the survey only asked for use since the birth. We assumed that utilization of these items occurred uniformly over the interval from the birth to the survey. Thus, for example, if a child was hospitalized for a total of forty days since the first discharge, and he was five years old at the time of the survey, we assumed that eight days of hospitalization occurred in the year following the first discharge and eight days occurred during the year before the survey.

The survey also questioned the employment of non-health care personnel in the home as a result of the injury. Since it was likely that the problems of caring for the child at home had grown worse over time, a greater proportion of such expense was allocated to the years immediately preceding the survey.

Some types of care, especially some hospital care at delivery and physicians' services throughout childhood, are routine. For these, we counted only use in excess of specific amounts in the loss estimates. Other services, such as use of neonatal intensive care, private-duty nursing, physical and occupational therapy, and stays in institutions, are relatively unusual.³¹ Costs of such services were fully attributed to the injury in our survey.

For most elements of cost, the survey requested only information about amounts of services, rather than expenditures. To derive expenditures, price information about services in Florida was obtained directly from several sources, including Florida's Hospital Cost Containment Board,³² the Florida

31. Only fragmentary information on use and cost of neonatal care is available. There is even less "hard" evidence on the other types of cost. For a summary, see Institute of Medicine, *Preventing Low Birthweight* 221-24 (Nat'l Acad Press, 1985).

32. For data on gross operating revenue per adjusted patient day for acute care hospitals and per diem charges for neonatal intensive care and newborn nursery units, see Letter from Mel Chang, State of Florida Health Care Cost Containment Board (June 21, 1990) ("Chang Letter"). We supplemented these data with revenue data on Florida hospitals obtained from annual issues of American Hospital Association's *Hospital Statistics*. To convert the Florida data on per diem charges for neonatal intensive care and newborn nursery to total per day charges, we used data on the ratio of per diem charges to total charges from US Congress, Office of Technology Assessment, *Intensive Care Units, Clinical Outcomes, Costs, and Decisionmaking* 22 (Gov't Printing Office, Study 28, November 1984). Total charges include hospital charges other than the basic room and board charge.

Hospital Research and Education Foundation,³³ Developmental Services of the Florida Department of Health and Rehabilitative Services,³⁴ and Hope Haven Clinic in Jacksonville.³⁵ We obtained physician fee data for pediatricians from *Medical Economics*.³⁶ Some amount for expenditures on physicians' services while the patient was hospitalized had to be included (for surgeons, anesthesiologists, and in-hospital visits by physicians as well as visits prior and subsequent to the hospitalization). No direct information is available to document charges associated with hospital stays that do not appear on hospital bills. A uniform 50 percent markup over the hospital charge for such services was assumed.³⁷

For some items, only out-of-pocket expenses data, rather than units of service, were obtained. Here, we treated the out-of-pocket expenses as total expenses. There is no insurance or public assistance for alterations to a home or vehicle or the purchase of a special vehicle.³⁸ Estimates of out-of-pocket expenses thus should be reasonably appropriate measures of total expenses. However, for other expenses, such as schooling, substantial public support is available;³⁹ therefore the estimates for the cost of special education for

33. For data on hourly charges for temporary staff nurses in Florida, see Florida Hospital Research & Education Foundation, Inc., *Temporary Staffing Agencies: Solution or Problem?, A Resource Manual for Hospitals* 19 (January 1989). The data were for charges by temporary staffing agencies to their customers (such as hospitals and nursing homes). The value used was \$27.74.

34. For data about average cost per person served by type of residential setting from 1989 to 1990, see Florida Department of Health and Rehabilitative Services, *Extending the Comprehensive Services Plan for People with Developmental Difficulties: 1990-2000, Creating New Opportunities: Technical Appendix 3* (January 1990) ("*Extending the Comprehensive Services Plan*").

35. We obtained information about charges for occupational therapy, physical therapy, respiratory therapy, speech therapy, and social work from Dr. Joseph Pesek, Hope Haven Clinic, Jacksonville, Florida on June 25, 1990 by telephone. We tried to obtain such information from other sources in Florida as well, but clinics were reluctant to release such information over the telephone. The stated reason was that it is difficult to quote a fee without knowing the patient's condition. We applied the charges obtained from the Hope Haven Clinic to the state as a whole.

36. The survey did not ask for the specialty of the physicians that the claimants visited. We assumed the birth-injured children visited pediatricians. *Medical Economics* publishes physician fee data annually. We used fee estimates for the United States as a whole for the appropriate years. Price data for other variables were specific to Florida and the year in which the injury occurred.

37. Calculations for 1980 implied that the physician charge for hospital work averaged 18% of the hospital charge. Frank A. Sloan, *Physicians and Hospitals: Implications of an Expanding Physician Supply* in Eli Ginzberg & Miriam Ostow, eds, *The Coming Physician Surplus: In Search of a Policy* 99 (Rowman & Allanheld, 1984). An 18% markup for nonhospital charges associated with a hospital stay is too low to be used for computing losses in this study. A high proportion of cases in our sample involved surgical admissions for which surgical fees were charged. Also, many stays required a lengthy post-hospital convalescence period during which the patient typically received therapeutic services from allied health personnel.

38. The Education for All Handicapped Children Act, Pub L No 94-142 (1976), makes free education and certain related services available, when indicated, to handicapped persons between the ages of three and twenty-one. A practical description of available services under the act is provided in Jay Schleichkorn, *Coping with Cerebral Palsy: Answers to Questions Parents Often Ask* 109-34 (PRO-ED, 1983). Under the Act, "handicapped children" includes persons evaluated as being mentally retarded, hard of hearing, deaf, seriously emotionally disturbed, orthopedically impaired, otherwise health-impaired, deaf-blind, multi-handicapped, or as having specific learning disabilities. Id at 109. The act provides for a comprehensive list of therapeutic services to be provided at no cost to recipients. However, alterations to the home and special vehicles are not subsidized. Since vehicles plausibly have other uses, we only counted half of the cost of a special vehicle as a loss.

39. Schleichkorn, *Coping with Cerebral Palsy* at 109 (cited in note 38).

severely handicapped children obtained from the survey should substantially understate the total of such expenses to society. When the parent indicated that the child was enrolled in a special school and had cerebral palsy, mental retardation, or both, the annual difference in public education cost for children with these specific impairments versus unimpaired students was computed using data provided by Florida's Department of Education.⁴⁰ The family's out-of-pocket expense for special education was then added to the difference in public expense. Using the United States Consumer Price Index, we converted all monetarily-expressed variables in the study into 1989 dollars.

The birth-related injuries affected a parent's employment status in some families. If a mother said that her child's injury was "fairly important," "very important," or "extremely important" in her decision not to return to work, information obtained about her prior annual earnings was used to develop estimates of her earnings loss.⁴¹

Loss estimates and out-of-pocket losses were computed for the two years (year of injury, year before the survey) for which underlying loss information was requested.⁴² We derived past losses (losses from birth to survey date) in a three-step process for the families with children who lived to the year before the survey. First, since the ages of the birth-injured children at the time of the survey varied, an equation was estimated to gauge the time pattern of past losses by age of the child. Second, parameter estimates from this regression were used with estimates of first and previous year losses from the survey to estimate values of past loss for all individual years. Once we estimated each year's past loss in real terms, we took account of foregone interest by computing future values on losses accruing before the year the case closed, using a real interest rate of 2.75 percent. For children who survived the first year but not to the year before the survey, we simply multiplied the first year cost by the number of years they lived.⁴³ The values then were summed to compute an estimate of total past loss in 1989 dollars.

2. *Birth-Related Injuries: Future Loss.* Computing future loss involves projections that necessarily are uncertain, especially the projections for the

40. During 1988-89, Florida's Department of Education paid \$6,100 per educable mentally retarded child, \$5,400 per trainable mentally handicapped person, and \$12,500 per profoundly mentally handicapped person, excluding physical, occupational, and speech therapy, which are also provided by the state. Letter to Frank Sloan from Dr. Landis Stetler, Department of Education, Bureau of Education for Exceptional Students, Florida (July 25, 1990). We used these estimates net of the mean annual educational cost incurred by the state in the same year in our calculations.

41. We did not compute estimates of nonmarket loss of parents of birth-injured children or of relatives of adults injured in hospital emergency rooms.

42. The survey asked whether various health services were reimbursed from some source other than the claimant's family. If the health services were reimbursed, we assumed the service was completely covered. All earnings loss was included as out-of-pocket loss.

43. We made this simplifying assumption in the absence of better information. The survey obtained cost and utilization data for the twelve months prior to the survey; all children who died had done so by this time. All children who survived their first year, but had died by their fifth year, were not alive at the time of the survey. Very few of these children lived for four years or more.

outlying years. We estimated the claimant's future loss in two steps—first, we projected the loss up to the claimant's twentieth birthday, and then we projected the loss for the rest of his or her life.⁴⁴ Computations of losses up to age twenty were based on estimates of use of services and expected out-of-pocket costs for respondents the year following the survey and an extensive literature review of studies from a variety of disciplines about utilization of services for children with the types of injuries in our sample, especially cerebral palsy. We did not compute future medical loss or parents' lost earnings for children who died by the survey date.⁴⁵ However, future wage loss beyond age twenty was calculated for children who would have otherwise entered the labor force.⁴⁶

a. *Group assignments.* To develop estimates of future loss incurred by families with children who survived, we first assigned the living children to one of four groups, according to their functional status. Children were classified independently of their use of therapeutic or custodial services, except when the utilization of particular services provided a direct indication of functional status, such as current institutionalization, use of wheelchairs, or tube feeding.

Group I contained children with relatively minor impairments. Based on survey responses, the interviewer's written comments, and the severity-of-injury index value assigned by the defendant's medical malpractice insurer on the closed-claim forms,⁴⁷ these children should have a normal life expectancy and be able to work at a regular job even though their physical disabilities may somewhat limit their choice of occupation. None of these children were

44. The vast majority of surviving children were under ten years old at the time of the survey. A number of books describe only developmental problems that the children in our study experienced. For these reasons, it seemed inadvisable to project medical expense beyond the twentieth year with the exception of institutionalization cost, which we could document.

Among the better books we consulted are: Schleichkorn, *Coping with Cerebral Palsy* (cited in note 38); Eugene Bleck, *Orthopedic Management of Cerebral Palsy* (Saunders, 1979); Eugene McDonald, *Treating Cerebral Palsy: For Clinicians by Clinicians* (PRO-ED, 1987); and George H. Thompson, Isadore L. Rubin & Robert M. Bilenker, eds, *Comprehensive Management of Cerebral Palsy* (Grune & Stratton, 1983). In our sample, 44% of the surviving children had cerebral palsy or Erb's palsy. This was the primary group of children with long-term needs for comprehensive therapeutic (as opposed to custodial) services.

45. If, according to a sequence of questions, the parents of surviving children reported lost earnings due to the birth-related injury, we forecasted parents' lost earnings to the child's twentieth birthday. We assumed that the parents did not lose earnings after this time. While several parents indicated that they planned to keep the child in their homes until they could no longer provide adequate care, these attitudes toward taking care of adult children may change. So, to the extent that children with severe disabilities stay in their parents' homes after age twenty, we have understated parents' lost earnings.

46. The labor force participation rate increases markedly at age 20. In 1986, male labor force participation rates at ages sixteen to nineteen were 56.4% versus 85.8% for those ages twenty to twenty-four, and for females 53.0% at ages sixteen to nineteen versus 72.4% for those ages twenty to twenty-four. US Dep't of Commerce, *Statistical Abstract of the United States 1988*, 366 (Gov't Printing Office, 1988) ("1988 Statistical Abstract"). By not considering the potential earnings of unimpaired persons under age twenty, we have somewhat understated future earnings loss.

47. An entry on the closed-claim form used by the State of Florida asks for the severity of the claimant's injury. The same information has been requested on closed-claim forms used by others such as the National Association of Insurance Commissioners. See note 5. The index values are:

retarded, most did not have cerebral palsy, and the few who did suffered only minor permanent impairments.⁴⁸

Children at the other end of the spectrum were assigned to Groups III and IV. These groups included all children classified by the insurers as having the most serious injuries.⁴⁹ In some cases, the parent indicated that the child would be institutionalized when the parent dies or otherwise becomes unable to care for the child. Almost all children in these groups were retarded; most also had cerebral palsy or other major physical dysfunctions. We assumed that these children will be unable to find employment and that they will have an appreciably reduced life expectancy. Group IV contained children who were mentally retarded, nonambulatory, or had poor feeding ability at the time of the survey. Group III contained the other children with the most serious injuries. We used the same data and assumptions in computing future losses incurred by children in Groups III and IV, except that for Group IV, we used a life table forecasting a much shorter life span.⁵⁰

<i>Severity of Injury</i>	<i>Examples</i>
1. Emotional only	Fright, no physical damage.
2. Temporary insignificant	Lacerations, contusions, minor scars, rash. No delay in recovery.
3. Temporary minor	Infections, missed fracture, fall in hospital. Recovery delayed.
4. Temporary major	Burns, surgical material left, drug side effect, brain damage. Recovery delayed.
5. Permanent minor	Loss of fingers, loss or damage to organs. Include non-disabling injuries.
6. Permanent significant	Deafness, loss of limb, loss of eye, loss of one kidney or lung.
7. Permanent major	Paraplegia, blindness, loss of two limbs, brain damage.
8. Permanent grave	Quadriplegia, severe brain damage, lifelong care or fatal prognosis.
9. Death	

One criterion used in selecting claimant families to be interviewed for this study was that the severity of the claimant's injury be rated at five or greater.

48. Almost all children classified in Group I had been given severity codes of five or six by the medical malpractice insurer which completed the form on the case. We included a few severity seven cases in Group I because we had additional information from the survey to suggest a favorable long-term outcome. We assumed a normal life expectancy for children in this group. Gender-specific life tables came from United States Department of Health and Human Services, *Vital Statistics of the United States*, 1986, 6 (DHHS Pub No 88-1147, October 1988). We based this assumption on a review of the literature on mortality of children with cerebral palsy and mental retardation. Early studies of mortality of children with cerebral palsy showed an appreciably elevated risk of death, especially when combined with mental retardation. Peter Cohen & Piero Mustacchi, *Survival in Cerebral Palsy*, 195 *J Am Med Ass'n* 642 (1966), for example, found substantial variation in mortality according to the degree of severity of cerebral palsy; overall, the probability of survival was more closely related to the degree of intellectual impairment than to the degree of motor deficit. See generally Edward Schlesinger, Norman Allaway & Seymour Peltin, *Survivorship in Cerebral Palsy*, 49 *Am J Pub Health* 343 (1959); and Richard B. Singer & Lewis Levinson, eds, 68 *Medical Risks: Patterns of Mortality and Survival Reference* (Lexington Books, 1976). At a given level of motor deficit, the non-ambulatory mentally retarded have higher mortality rates since they are more likely to have respiratory diseases. C. Miller and Richard K. Eyman, *Hospital and Community Mortality Rates Among the Retarded*, 22 *J Mental Deficiency Res* 137 (1978). Unfortunately, there are no reliable and detailed estimates of the effects of specific physical dysfunctions on mortality in either the earlier or later literature. Many of the more recent studies are based on Canadian or European data. See notes 49, 50.

49. The vast majority of cases assigned to Groups III and IV had been assigned severity codes of seven and eight. These groups contained all the children assigned a severity code of eight.

50. For Group III, we used information about life expectancies of mentally retarded persons in Canadian institutions from Lucille C. Wolf & R. E. Wright, *Changes in Life Expectancy of Mentally Retarded Persons in Canadian Institutions: A 12-Year Comparison*, 31 *J Mental Deficiency Res* 41 (1987).

Children whose health and functional status fell in the middle of Groups I and III-IV were placed in Group II. Group II children tended to have injuries classified by the insurer as "permanent major partial disability."⁵¹ Many of the children were retarded or had other mental problems. They also tended to have several physical impairments, such as various forms of cerebral palsy, blindness/vision problems, deafness/hearing problems, kidney problems, loss of a foot, total paralysis of an arm, and asthma or other lung problems. We assumed that these children suffered a slight loss of life expectancy and faced some loss of earnings capacity.⁵²

The authors presented separate life tables for persons with profound, moderate-severe, and borderline-mild mental retardation starting from age five. They reported that, at age five, persons with profound mental retardation could expect to reach age forty, those with moderate-severe retardation age forty-eight, and those with borderline-mild mental retardation age fifty-eight. Even the least severe category had higher death rates than those reported for cerebral palsy patients in California for an earlier period by Cohen and Mustacci, 195 J Am Med Ass'n at 642 (cited in note 48). Wolf and Wright's mortality rates may be somewhat high for children in our sample with "average" impairments for two reasons, but, nevertheless, lacking better data, these estimates are acceptably close. First, their data must contain persons with Down's syndrome, and the life expectancy of such persons is considerably lower than those in our sample. S. Simil L. von Wendt & Paula Rantakallio, *Mortality of Mentally Retarded Children to 17 Years of Age Assessed in a Prospective One-Year Birth Cohort*, 30 J Mental Deficiency Research 401 (1986); Patricia A. Baird & Adele D. Sadovnick, *Life Expectancy in Down's Syndrome*, 110 J Peds 849 (1987). Second, the authors based their estimates on an institutionalized population, and such persons face a higher risk of dying. Only two of the children in our sample were in institutions at the date of the survey.

For Group IV, we used life expectancy data on profoundly mentally handicapped persons computed from the California Department of Developmental Services data reported by Richard K. Eyman, et al, *The Life Expectancy of Profoundly Handicapped People with Mental Retardation*, 323 New Eng J Med 584 (1990). The authors found that immobile subjects had a much lower life expectancy than mobile subjects. They classified patients into three groups: (1) those who required tube feeding; (2) those who could eat if fed by others; and (3) those who were mobile but not ambulatory. The groups had life expectancies at age five of 4.8, 8.3, and 21.4 years, respectively, far lower than even the most pessimistic life table presented by Wolf and Wright. Id at 48. We used the life table for the middle group for our Group IV calculations. All persons in our Group IV closely matched Eyman's criteria.

51. See note 47 for definition of the severity index. Cases classified as "grave" permanent total disability were always placed in Groups III and IV.

52. For Group II, we used a life table for mildly mentally retarded persons in Denmark from Annalise Dupont, Michael Vaeth & Paul Videbech, *Mortality, Life Expectancy and Causes of Death of Mildly Mentally Retarded in Denmark*, 44 Upsala J Med Sci Supp 76, 78 (1987). Life expectancies from this table are only slightly below the general population. For example, at age five, the mildly mentally retarded can expect to live 62.5 additional years.

Our literature review concentrated on cerebral palsy and mental retardation. Experts in these areas would argue that with early therapeutic interventions, vocational training, technological improvements (such as computers), family support, and recently enacted legislation protecting handicapped workers, children born handicapped during the 1980s have more favorable prospects than handicapped children born a few decades previously. See, for example, Mark L. Hill, et al, *Benefit-Cost Analysis of Supported Competitive Employment for Persons with Mental Retardation*, 8 Res Developmental Disabilities 71 (1987); Michael S. Shafer, et al, *Competitive Employment and Workers with Mental Retardation: Analysis of Employers' Perceptions and Experiences*, 92 Am J Mental Retardation 304 (1987) (vocational training); see also Jane M. Everson & Roberta Goodwyn, *A Comparison of the Use of Adaptive Microswitches by Students with Cerebral Palsy*, 41 Am J Occupational Therapy 739 (1987) (technological improvements); and Roberta O'Grady, et al, *Vocational Predictions Compared with Present Vocational Status of 60 Young Adults with Cerebral Palsy*, 27 Developmental Med & Child Neurology 775 (1985) (family support). But considering the litigation cost needed to obtain recoveries via the tort system, it is likely that the children in a sample of closed medical malpractice claims would have more serious impairments than the "average" child with the same conditions.

Future employment prospects depend on the individual's mental and physical capacities. James E. Martin, et al, *Comparison Between Nonhandicapped and Mentally Retarded Workers: Why They Lose Their*

b. *Calculation of loss to age twenty.* The calculations of loss up to age twenty were performed separately for each child in the sample. We took account of the probability of the child surviving to that age. The child's group classification affected which life table was used. We included the same elements of cost as we did in making the corresponding calculation of past losses, but we had to make more assumptions. The projections were based on three types of data: (1) responses to questions about projected use of specific services during the twelve months following the survey; (2) answers to general questions about the use of some specific services in the future, but with no indication when the services would be utilized; and (3) pertinent literature.⁵³ For example, if the survey indicated that a child with cerebral palsy will need

Jobs, 7 Applied Research in Mental Retardation 467 (1986); Robert L. Schalock & Mary Ann Lilley, *Placement From Community-Based Mental Retardation Programs: How Well Do Clients Do After 8 to 10 Years?*, 90 Am J Mental Deficiency 669 (1986). Of the two, intellectual capacity tends to be more important, although multiplicity of physical handicaps affects future employment prospects as well. For example, see G. A. Pollock & Gordon Stark, *Long-Term Results in the Management of 67 Children with Cerebral Palsy*, 11 Developmental Med & Child Neurology 17 (1969); O'Grady, et al, 27 Developmental Med & Child Neurology at 775 (cited above).

Several studies have emphasized the importance of intelligence as a predictor of future employment. For example, in a Canadian study of young adults with cerebral palsy, 58% with IQs of 90 or above were employed or were employable in a nonsheltered environment; by contrast, only 8% of those with IQs under 70 were considered eligible for such employment. J. K. Martin, *Follow-up Studies in Cerebral Palsy*, 94 Canadian Med Ass'n J 996 (1966). A U.S. study reported that in their sample no child with cerebral palsy with an IQ under 50 had a useful job in later years. Zelda S. Klapper & Robert G. Birch, *The Relation of Childhood Characteristics to Outcome in Young Adults with Cerebral Palsy*, 8 Developmental Med & Child Neurology 645 (1966). Those with IQs of 110 and over completed high school and went to college. A chapter in a textbook gave as its best estimate a 40% probability that a person with cerebral palsy will acquire gainful employment, with a range around this estimate of 0.07 to 0.60. Bruce K. Shapiro, et al, *Associated Dysfunctions*, in George H. Thompson, Isadore L. Rubin & Robert M. Bilenker, eds, *Comprehensive Management of Cerebral Palsy* 87 (Grune & Stratton, 1983) ("*Associated Dysfunctions*"). Focusing on the mentally retarded, Richardson, Koller, and Katz reported that, with vocational training, half of the mentally retarded persons in their sample with IQs of 50 or more were able to find work in nonsheltered settings. See Stephan A. Richardson, Helen Koller & Mindy Katz, *Job Histories in Open Employment of a Population of Young Adults with Mental Retardation*, 92 Am J Mental Retardation 483 (1988).

Our survey did not obtain information about the child's IQ. Judging from the information provided on the survey, we judge that the Group I children were not retarded. We were persuaded by the Klapper-Birch study that these children will find jobs as adults. The Group IV children were so impaired that most will not live to adulthood. Predicting future employment and earnings for the Group II and III children was more difficult. Most of the Group II children appeared to have IQs ranging from 50 to 90, with some accompanying physical impairments. For this group, we assumed labor force participation rates of 0.75 of normal rates and employment in low-wage jobs. The Group III children had much more severe physical impairments, which would seem to preclude them from working in other than sheltered settings.

53. Although the parents of some of the children in our sample did not indicate that their child had cerebral palsy, many children had similar impairments. Cerebral palsy is a term applied to a number of disabilities resulting from injury to the central nervous system. Although children with cerebral palsy often receive treatment from birth, the actual start of programmed activities often begins at age two or three. Schleichkorn, *Coping with Cerebral Palsy* at 66 (cited in note 38). Treatment must deal with problems such as cognitive dysfunction (30% to 70% of such children), hearing loss (6% to 16%), language disorders, behavioral disturbances, visual defects (strabismus is the most common disorder and constitutes about half of all visual problems), seizures (14% to 40%), and orthopedic problems involving upper and/or lower limbs. Shapiro, et al, *Associated Dysfunctions* at 88-92 (cited in note 52); Janet Yost & Pamela McMillan, *Communication Disorders*, in George H. Thompson, Isadore L. Rubin & Robert M. Bilenker, eds, *Comprehensive Management of Cerebral Palsy* 157, 160-65 (Grune & Stratton, 1983); Bleck, *Orthopedic Management of Cerebral Palsy* (cited in note 44).

surgery to correct curvature of the spine, we consulted the literature to find out the typical age at which individuals with this condition have such operations.⁵⁴ Based on the literature and conversations with experts, we assumed that patients would utilize various therapists' services up to age sixteen, and thereafter at one-fourth the previous rate to age twenty.⁵⁵

We used a 2.75 percent real discount rate to discount future losses to the year the case closed and to compute the future value of past losses up to the year of closing.⁵⁶ Earnings were assumed to grow at a steady rate of 1.90 percent per year.⁵⁷ Medical care prices historically have risen faster than the overall inflation rate.⁵⁸ We assumed that relative prices of medical services

54. Two of the more frequently performed procedures are heel cord lengthenings, which improve the child's ability to walk, give better balance, and keep the child from walking on his or her toes, and adductor tenotomy, which involves the cutting of muscles that bring the legs together. Either operation may have to be repeated once or twice, starting between ages four and eight. Bleck, *Orthopedic Management of Cerebral Palsy* at 137 (cited in note 44). The operations involve immobilization in a plaster cast followed by physical therapy. Two other problems are curvature of the spine, which affects 35% of nonambulatory children, and hip dislocation, which is especially common in nonambulatory patients. Hip dislocation requires total hip replacement and is done to relieve pain rather than to achieve mobility. Shapiro, et al, *Associated Dysfunctions* at 87, 92 (cited in note 52); P. Cooke, W. G. Cole & R. P. L. Carey, *Dislocation of the Hip in Cerebral Palsy: Natural History and Predictability*, 71-B J Bone & Joint Surg 441 (1989). Curvature of the spine is corrected surgically in the child's early teenage years. Clyde L. Nash, *Spinal Deformities* in George H. Thompson, Isadore L. Rubin & Robert M. Bilenker, eds, *Comprehensive Management of Cerebral Palsy* 257-58, 266 (Grune & Stratton, 1983). Eye surgery to correct strabismus appears to be more successful if performed after the child is at least age eight. Paul R. Mitchell, *Ophthalmologic Problems*, in George H. Thompson, Isadore L. Rubin & Robert M. Bilenker, eds, *Comprehensive Management of Cerebral Palsy* 139, 147 (Grune & Stratton, 1983).

55. Various services of allied health professionals are covered under Pub L No 94-142 through age twenty-one. However, by the junior high and high school years, many handicapped children have reached the highest levels of independence and motor skills that they are capable of achieving. Thus, physical therapy services are utilized on a less frequent basis, often for monitoring and consultation. Mary Cassidy-Conway & Richard M. Zawacki, *Physical Therapy*, in George H. Thompson, Isadore L. Rubin & Robert M. Bilenker, eds, *Comprehensive Management of Cerebral Palsy* 195-97, 199 (Grune & Stratton, 1983). During infancy and early childhood, occupational therapy stresses attainment of communication skills, developing independence in activities of daily living, and gaining mobility. Subsequently, through adolescence, the focus of therapy shifts to time and life-skills management, increased socialization, and community survival skills. Alice Kibele, *Occupational Therapy's Role in Improving the Quality of Life for Persons with Cerebral Palsy*, 43 Am J Occupational Therapy 371 (1989).

56. This rate was estimated for the period 1954-76 by Martin Feldstein and Lawrence Summers in *Inflation, Tax Rules, and the Long-Term Interest Rate*, 1 Brookings Papers on Econ Activity 61, 87 (1978). Rates from real after-tax returns during the last two decades have been even lower. Barbara Donnelly, *How Taxes and Costs Prey on Nest Eggs*, 71 Wall St J C1, C23 (September 25, 1990). The same rate was used in a study of losses from deaths resulting from aviation crashes. Elizabeth M. King & James P. Smith, *Computing Economic Loss in Cases of Wrongful Death* 95 (RAND, The Institute for Civil Justice, 1988). There is some argument in the literature about the appropriate discount rate for computing the present value of losses. Jennings and Phillips argued for higher rates than the one we used on grounds that the discount rate should reflect the riskiness of future income. We accounted for the possibility of not receiving earnings by including the probability of working at various ages prior to discounting. See William P. Jennings & G. Michael Phillips, *Risk as a Discount Rate Determinant in Wrongful Death and Injury Cases*, 56 J Risk & Ins 122 (1989). On the other hand, Anderson and Roberts argued for a rate similar to the one we used. Gary A. Anderson & David L. Roberts, *Stability in the Present Value Assessment of Lost Earnings*, 56 J Risk & Ins 50 (1989).

57. We took the earnings growth rate from King & Smith, *Computing Economic Loss in Cases of Wrongful Death* at 34-36 (cited in note 56).

58. Between 1970 and 1986, the professional services part of the medical component of Consumer Price Index ("CPI") went up by 227%, and the price of a hospital room, also recorded as

will rise at 2.75 per year, which is consistent with historical trends. With the discount rate equal to the relative inflation of such services, it makes no difference to the results of the calculation when the services will be utilized. Prices of other goods, such as vehicles and wheelchairs, and services, such as alterations of homes and education, were assumed to grow at the general inflation rate.⁵⁹

c. *Calculation of losses beyond age twenty.* Next, for children alive at the survey date, we computed the losses that would accrue past the child's age of twenty. These calculations included the major components of loss at this stage, future wage losses, and the cost of living arrangements other than independent living. Since we lacked accurate data, we excluded the cost of various items which were included in the calculations of loss for earlier years, such as hospitalizations and visits to physicians and other health care personnel. These exclusions may have led to appreciable underestimates of future loss, especially for the more impaired children with fairly lengthy life expectancies.

Based on data about individual clients obtained from the Client Information System of Developmental Services of the Florida Department of Health and Rehabilitative Services,⁶⁰ we computed the probabilities of being in three alternative living arrangements over the life cycle—*independent living or family home, group home, or institution (nursing home or long-stay hospital)*. These computations were performed separately for Groups II and III-IV combined and for six age groups. The probability of incurring a group home or institutionalization expense reflects both the probability of living to a particular year and, if alive, the probability of a particular arrangement. Estimates of the former probabilities came from the life tables and the latter from the Client Information System. We assumed that Group I patients will

part of the CPI, went up by 418%. During the same period, the overall CPI increased by 183%, compared to a 259% increase for the medical component of the CPI. US Dep't Commerce, *1988 Statistical Abstract* at 91, 450 (cited in note 46).

59. The medical care commodities part of the medical component of the CPI increased by 164% between 1970 and 1986, slightly less than the increase in the CPI overall. *Id.*

60. We received data about individual clients of the state's Developmental Services Office (with identifications concealed) from the State of Florida in machine-readable form. The data base is described in Florida Dep't Health and Rehabilitative Services, Client Information System/Developmental Services, HRS Manual No 50-3 (July 1988). These data were used to compute the probabilities of birth-injured persons being in various living arrangements at different ages.

live independently,⁶¹ and we assumed that all institutionalizations will be in nursing homes.⁶²

Future wage loss must be computed relative to the wage income the individual could anticipate in the absence of the injury. To calculate this opportunity cost, we assumed that the injured children would have had mean earnings for their gender,⁶³ adjusted for the probability of working. We discounted this earnings stream starting from age twenty and going back to the year the claim was closed, using the same discount rate and earnings growth rate as in the previous calculations.

We assumed that Group I children would have normal lifetime earnings. We assumed that Group II children would be three-quarters as likely to work as their unimpaired counterparts in the same age-gender group. When they work, they would earn \$4.00 per hour, increasing annually at 1.9 percent. We assumed that Groups III and IV children would be unable to work.⁶⁴

Unfortunately, there is virtually no reliable information about the work histories of children with the types of impairments of the children in our sample.⁶⁵ Also, the propensity and ability of impaired persons to work appears to be changing. Thus, although the ordinal ranking of wage loss is

61. Information about clients' conditions in the Developmental Services Office data base is not nearly as detailed as the descriptions available from our survey. We had some information on the severity of conditions from our survey, but not from the client data base. We suspect that the errors in predicting probabilities of various living arrangements were particularly great for the least and the most impaired. For this reason, we did not use estimated probabilities from the client data base for Group I at all, and we did not compute separate probabilities for Groups III and IV. We assumed that all Group I patients will live independently, an assumption consistent with our assumptions that they will suffer no labor market or household production losses.

There has been a strong trend away from institutionalization, but it is not clear that the trend will continue. For this reason, we did not adjust the probabilities obtained from the client data base for trends.

Few of the parents responding to our survey expected their children to be institutionalized in the future, at least not until the parents died or became incapacitated. In most cases, however, the children were still young, and the parents had not yet faced the reality of living with an adult dependent. Some evidence suggests that adults with major disabilities, such as those associated with cerebral palsy, prefer independent living. See, for example, McDonald, *Treating Cerebral Palsy* at 17 (cited in note 44). By contrast, parents and professionals place less value on independent living. Kibele, 43 *Am J Occupational Therapy* at 371 (cited in note 55).

62. In 1989-90, the annual cost per person for service from Florida's Developmental Services Office in major state hospitals and "clusters" (facilities providing around-the-clock nursing care) was \$57,000. Care in an intermediate care facility (nursing home) was \$46,000.

Foster care involves placement in a home; in Florida, one to three persons may be placed in a single home. Group homes generally have from four to six residents, but some contain as many as seventeen residents. In 1988-89, the state spent almost \$13,000 per year per person placed in foster and group homes. Florida Dep't Health and Rehabilitative Services, *Extending the Comprehensive Services Plan* at 3 (cited in note 34). For purposes of our calculations, we used costs of foster care and nursing home care independent of the cost of independent living provided in the same source at 3.

63. The earnings data by gender came from US Dep't Commerce, *Employment & Earnings* 233 (January 1990). We added a factor for fringe benefits from US Dep't Commerce, *Statistical Abstract of the United States*, 1990, 413 (1990) ("1990 Statistical Abstract"). Data on probabilities of working at various ages, also by gender, came from US Dep't Commerce, *Employment & Earnings* 17 (January 1990).

64. See note 52.

65. *Id.*

clearly plausible, there is room for differences of opinion about specific assumptions.

Although decedents suffered earnings losses, we had to account for the cost of rearing a child to adulthood and the offsetting savings to households in consumption during adulthood.⁶⁶ We therefore calculated the ratio of mean household expenditures for a family of three to the expenditures of a family of four.⁶⁷ We then multiplied the wage loss by this ratio. Finally, we computed nonmarket loss (lost household production, such as cooking, cleaning, child care, and purchasing) for the decedents and survivors with major impairments (Groups II through IV).⁶⁸ For Group II, we measured nonmarket loss by taking the difference between the market wage of an unimpaired person and the reduced wage assigned to this group. We assumed survivors in the other groups, like decedents, would not be able to work in the household at all. For children not alive on the survey date, we computed earnings loss as the present value of expected earnings for an average person of the same gender.⁶⁹

3. *Emergency Room Injuries: Past Losses.* Rather than encompassing a few types of impairments affecting persons of roughly the same ages, like the birth-related injuries, the emergency room injuries ranged from alleged

66. Estimates of the cost of rearing a child to adulthood, evaluated at the child's birth year, came from Thomas J. Espenshade, *Investing in Children: New Estimates of Parental Expenditures* (Urban Institute Press, 1984). We updated the estimate to 1989 dollars using the CPI for all items. This offset amounted to \$205,019 and applied only to decedents. This consumption offset also applied only to decedents, not impaired survivors. For a discussion of consumption offsets in computing damages in wrongful death actions, see King & Smith, *Computing Economic Loss in Cases of Wrongful Death* at 69-77 (cited in note 56).

67. The data on household expenditure by family size and mean family size came from the US Dep't Commerce, *1988 Statistical Abstract* at 43, 420 (cited in note 46).

68. Individuals engage in many useful activities outside of the labor market, such as caring for children, fixing meals, and shopping, and they may participate in various activities in the community. Since women spend more time at such activities than men, failure to count nonmarket losses would result in an overstatement of losses of males relative to females. It is clear that one would want to count nonmarket losses incurred by adult victims. Counting such losses for child victims (the losses pertain to these persons as adults) is more controversial, since a child decedent would have no family (that is, spouse and children) and a survivor probably would not have a family if seriously impaired. On the other hand, it is logical to count such lost output to the extent that the injury keeps the person from being a productive member of society.

King and Smith, in *Computing Economic Loss in Cases of Wrongful Death* at 58-68 (cited in note 56), used microdata from the 1975-1976 University of Michigan Time Allocation Study to compute the number of nonmarket hours by gender, age, and family size/composition. We used the summary tables on nonmarket hours provided by King and Smith for our calculations of nonmarket loss. For "home wages," we used mean market wages by gender. For Group I, there was no nonmarket loss; for Group II, we assumed a loss in household productivity in proportion to the difference between the \$4.00 market wage assumed for such individuals and the mean wage of workers. We assumed that Groups III and IV will not be able to do nonmarket work as adults.

In the law, nonmarket loss, if it is to be considered at all, is a noneconomic loss. Many court decisions permit recovery of the "pecuniary value" of services or advice, or companionship that a decedent would have provided. Some court decisions exclude elements of such loss. Many states, including Florida, at Fla Stat Ann § 768.22 (West, 1990), do not award such a loss when a minor child is the decedent. See Dobbs, *Remedies* at 558-59 (cited in note 2). The chances of collecting for nonmarket loss are even more limited when the injured party survives.

69. See note 62.

misdiagnosed heart attacks to mistreatment of various kinds of trauma, and the age at the time of injury varied appreciably. To a greater extent than the birth-related injuries, in the emergency room injury cases, it was often difficult to know if the loss was actually caused by the injury. More specifically, the wage loss that the claimants attributed to the injury in fact could have been "malingering." For example, one claimant reported being unable to work because of an injury to his finger. With the limited information provided to us, we had to accept this reason for not working. Birth-injured claimants did not present this problem; the children were not old enough to work and the children's injuries were typically sufficiently severe to have plausibly caused some parents to incur earnings losses. Also, the emergency room injury sample had more missing values, because a greater proportion of persons had died by the time of our study. Their surviving relatives were less familiar with costs incurred than were the parents of the birth-injured children.

The methodology was similar to that for birth-injured claimants, with some notable exceptions. In many cases, the claimant was admitted to the hospital through the emergency room or very soon after the emergency room visit. The hospitalization would have occurred even if there had been no problem with the care rendered during the emergency room visit. Inadequate care in the emergency room may have prolonged the hospital stay, however. To be conservative, we counted only the cost of hospital days of the stay immediately following the emergency room visit that Medicare considers to be "outlier" days for the diagnosis-related group ("DRG"). The outlier number of days is far above the mean length of stay for a DRG. In addition, the vast majority of adults visit physicians during the course of a year. We adjusted for this by counting only the cost of visits in excess of the mean for a person in the same age category.

Some of those surveyed might not have lived long after the event that brought them to the emergency room even if the alleged medical error had not occurred. So, rather than using standard life tables, which would not reflect the likelihood that many claimants already had reduced life expectancies, we computed a table for each emergency room claimant using a hazard model developed by Idler and Angel.⁷⁰ The tables we computed

70. Ellen L. Idler & Ronald J. Angel, *Self-Rated Health in the NHANES-1 Epidemiologic Follow-up Study*, 80 *Am J Pub Health* 446 (1990). Idler and Angel estimated a hazard model using data from the National Health and Examination Survey Epidemiologic Follow-up Survey, which was conducted from 1971-84. Using the parameter estimates from a hazard model permits one to obtain relative risks of dying for a person with a given set of characteristics. We used the parameter estimates from the article with the values of variables from our survey to compute the relative risk of dying for emergency room injury decedents and survivors. No one in the follow-up survey was followed for more than twelve years. We had to assume that the relative risk based on a twelve-year time interval is representative of the person's risk of dying over the remainder of his or her lifetime.

The hazard model's explanatory variables were: measures of various conditions on a one to three severity scale; self-rated health; sociodemographic variables (age, race, educational attainment, marital status, family income, and work status); and health behaviors (smoking, alcohol use, obesity, and inactivity). Our survey questions perfectly matched the Follow-up Survey on self-rated health, the sociodemographics, and some of the health behaviors. Based on the descriptions provided by our survey, we classified each case on a one to three severity scale by condition. Clearly life-

reflected the life-threatening conditions that many of the claimants had. Fortunately, we had data from our survey on almost all the explanatory variables used by Idler and Angel to predict survival, including types of chronic conditions, self-rated health, sociodemographic variables, and some health behaviors.

We computed the earnings loss of claimants who had worked at least eight months during the year preceding the emergency room visit and for whom the injury was at least a "fairly important" factor in their decision not to return to work. This included decedents who satisfied the pre-injury work criterion. We assumed that the claimant normally would have retired at age sixty-two.⁷¹

Earnings at each age were predicted from an earnings equation we estimated with data from the emergency room claimants.⁷² We used a predicted earnings variable for three reasons. First, earnings data were missing in about half of the emergency room cases. Second, mean earnings data from the population that typically visits emergency rooms may not be representative of United States or Florida's adult population.⁷³ Third, we wanted to account for age-related changes in earnings.

threatening diagnoses received a three; diagnoses that rarely if ever lead to death received a one; and a score of two was given to the remaining cases. For example, a misdiagnosed heart attack was coded a "three" on "circulatory" chronic condition. Unfortunately, the emergency room version of our questionnaire requested only indirect indicators of smoking and alcohol use. For example, we asked whether the claimant had ever been advised by a physician to quit smoking.

71. Persons are eligible for early retirement benefits from Social Security at age sixty-two. In 1981, 75% of men and 84% of women were less than sixty-five when they began collecting Social Security benefits. Lawrence H. Thompson, *The Social Security Debate*, 21 J Econ Lit 1425, 1429 (1983). Our assumption that earnings stop at age sixty-two may have led to a slight understatement of future earnings loss.

72. The estimated earnings regression used in the analysis was:

$$\begin{aligned} \text{EARN} = & -82,914^a + 3,747^b \text{AGE} - 44^b \text{AGE}^2 + 1,926^b \text{EDU} - 10,737^b \text{FEMALE} + 10,738 \text{WHITE} \\ & (28,739) \quad (1,378) \quad (17) \quad (899) \quad (4,800) \quad (6,542) \\ R^2 = & 0.49 \quad \bar{R}^2 = 0.37 \quad F(5,21) = 4.1, \end{aligned}$$

where EARN = earnings of injured person in year preceding the survey; AGE = age at survey; EDU = years of schooling; FEMALE = 1 if claimant female; and WHITE = 1 if claimant white. Variable *a* = statistically significant at 1% level, two-tail test; *b* = statistically significant at 5% level, two-tail test.

The top number of each pair shows the effect of the variable on earnings. For example, each year of schooling (EDU) increased the injured person's earnings by \$1,926 per year. The numbers in parentheses are standard errors of the top numbers and are needed to determine whether the top number is statistically significant from zero. The R^2 gives the proportion of the variation in the dependent variable (in this application, earnings) explained by the equation. \bar{R}^2 is the R^2 adjusted for degrees of freedom. The R^2 approaches 1.0 as the number of observations in the sample (degrees of freedom) decreases. Thus, with many variables and few observations, it might appear from the R^2 that the equation has greater explanatory power than it actually has. The sample on which this regression is based contained only twenty-six observations. Thus, the \bar{R}^2 is a much better indicator of explanatory power in this sample than is the R^2 .

73. There were 2.47 persons per household in Florida in 1986 and mean per capita income in the state in 1985 was \$11,271, yielding a mean family income of \$27,839. Around the same time, mean family income of the emergency room claimants was \$26,515. To compute the income estimate from our claimant file, we assumed the open-ended \$40,000 plus category had a mean income of \$60,000. For the estimates for Florida as a whole, see *1988 Statistical Abstract* at 46.431 (cited in note 46). Compared to United States workers generally, the emergency room claimants had somewhat higher earnings, \$21,616 versus \$17,150 for the United States in 1985. See *id* at 394 for

To estimate nonmarket loss, we first classified claimants into four groups based on their ability to function in the household at the time of the survey. Group I consisted of claimants who appeared to be completely functional in the household in spite of a permanent injury (such as loss of a finger). At the other end of the spectrum, Group IV claimants could not perform any work at home; this group included all decedents. Groups II and III consisted of claimants having disabilities that interfered with household work. Claimants in Group III had much more serious disabilities than Group II. We assumed a one-third loss of potential nonmarket output for Group II and two-thirds loss for Group III. Tables 4-6 below, which show cost and compensation estimates for emergency room claimants, only distinguish among the survivors and decedents of Groups I and II-IV. The sample size was insufficient to permit a finer breakdown. Data on nonmarket hours came from the same source as the corresponding analysis for birth injuries.⁷⁴ We used an hourly wage rate based on the predicted earnings variable for the household wage.⁷⁵

The next step was to compute estimates of total past losses. Because of the small number of survivors of emergency room incidents in our sample (34) and the variety of types of injuries, it did not make sense to measure the phasing of past loss by the age of the injured party. Instead, based on descriptions of the injury and the length of time between the incident and the survey, we judged whether linear interpolation between the first and previous year's estimate of loss was appropriate on a case by case basis. When it appeared that much of the loss would have occurred soon after the injury or that the gap between the two dates was large, we assumed that the difference between the two years' losses was made up in the first half of the time interval. We then linearly interpolated to obtain values for the first half and assumed a constant past annual loss at the level determined from the year before the survey date. We then summed the values for individual years to obtain an estimate of total past loss.

4. *Emergency Room Injuries: Future Losses.* The survey did not capture much information needed for computing the future medical losses of survivors. We obtained utilization forecasted by the respondent for the twelve months following the survey as well as respondents' expectations about future surgical operations and stays in institutions at any time during the survivor's remaining lifetime. Since the expected number of surgical operations is plausibly a substantial underestimate of future actual utilization, we assumed that the expected utilization would occur with certainty, as would the services projected for the year following the survey. However, we adjusted future

the national earnings estimate. To derive the annual amount, we multiplied the weekly estimate given in the table by 50.

74. King & Smith, *Computing Economic Loss in Cases of Wrongful Death* at 58-68 (cited in note 56).

75. For employed persons, the market wage equals the household wage. For nonemployed persons, however, the household wage exceeds the net market wage less other costs associated with working, such as transportation cost (net market wage). We did not adjust for this.

institutionalizations for survival probabilities using the survival probabilities computed from the hazard model. Added to the future costs of various services were estimated earnings and nonmarket losses.

III

RESULTS

A. Birth-Related Injury Cases

1. *Past Annual Loss: Injury Severity, Timing, Share Incurred Out-of-Pocket.* Past losses both in the year following the birth and in the year preceding the survey are plausibly related to the severity of the injury (Table 1⁷⁶). For surviving children, the mean first year loss varied from \$15,500 for Group I children to \$58,200 for children in Group IV. For children who died by the time of the survey, first year cost was \$118,900 for decedents who left the hospital and \$18,700 for those who died too soon after birth to be discharged from the hospital. Mean loss incurred by families with surviving children during the year before the survey (also in 1989 dollars) was slightly higher; the loss also rose monotonically with severity of injury.

Median losses in Table 1 are consistently below the means. This suggests that a few relatively high losses influenced the means. Losses at the lowest quartile of the distribution for the first year were \$4,900 for survivors and \$900 for decedents. For the year before the survey, the corresponding value of \$19,800 for survivors was higher. Losses at the upper quartile were substantial for Group IV survivors (\$95,200 for the birth and \$113,700 for the year before the survey) and decedents who left the hospital (\$202,900 for the birth year), but were much lower for the other groups. Although the categories have value in predicting losses, there remains considerable intracategory variation in losses, which suggests that case-specific estimation of losses has some benefit. Frequency distributions of losses tended to be tighter in the year preceding the survey than in the first year, implying a convergence in losses over time.

Overall, families with surviving children incurred expenses not covered by collateral sources of \$10,300 in the first year and \$9,500 in the year before the survey.⁷⁷ Families with children who died incurred \$7,300 in such costs in the year following the birth. Thus, for the families with survivors, about three out of four dollars of loss was covered by funds from various collateral sources (slightly less was covered in the twelve months before the survey). For the decedent families, 82 percent of the loss was covered. Although both estimates imply substantial protection against the risk of injury, a loss of \$10,000 is high relative to (although less than) the median income of the

76. All tables are included at the end of this article.

77. We assumed that none of the earnings losses were covered by private insurance, public insurance, or public assistance. Our survey did not collect information on this.

families⁷⁸ and is appreciably higher than the estimates of loss in cerebral palsy cases provided by Freeman and Freeman, who estimated out-of-pocket losses in the \$1,000 to \$6,000 range.⁷⁹ Even though the injuries typically occurred several years earlier, the out-of-pocket expenses had not declined much by the year preceding the survey.⁸⁰

2. *Magnitude of Total Loss.* Sums of past and future losses also tended to rise with severity of injury (Table 2). Except for Group I survivors, who incurred a mean total loss of \$123,500, mean past and future losses exceeded \$1,000,000. Such losses were higher for families with surviving children (\$1.6 million) than for those with decedents (\$1.4 million), and future losses are projected to be far higher than past losses. Overall, only 13 percent of losses actually had been incurred as of the survey date. The largest elements of future losses are future net earnings and nonmarket losses. The present value of these losses alone exceeds \$1,000,000 (\$633,700 and \$494,800).

Losses to age twenty were computed independently of the grouping scheme developed for the surviving children, except that group-specific life tables were used in these calculations. Such losses are much higher for Groups II-IV than for Group I. The estimate for Group IV, \$110,200, is below those of Groups II and III, which are \$134,800 and \$140,000, respectively, because Group IV children have a much shorter life expectancy.

The net earnings loss and the household production loss beyond age twenty reflect assumptions made about the future market and household productivity of persons in the various groups. Unlike past losses and losses to age twenty, there are no intragroup differences in these losses, given the way they were calculated. Differences in the relative magnitudes of foregone earnings and nonmarket losses reflect the composition of the group by gender. Males have higher earnings losses because of high rates of participation in the labor force and higher wage rates, while females have more anticipated nonmarket losses because of a greater number of nonmarket work hours.⁸¹

We estimated the cost of future nursing home and foster care at \$285,800 for surviving children in Group II, \$331,700 for those in Group III, but only \$22,400 for Group IV children. The Group IV estimate is low because it is unlikely that these children will survive to an age at which they are likely to need such care. In general, poor life expectancy reduces medical and other care expenses, but increases lost earnings and nonmarket losses because the earnings and nonmarket output of an unimpaired person are subtracted from the victim's expected earnings output in calculating the loss. In Table 2,

78. Mean income of families with birth-related injuries in our sample was \$25,915 for the year before the injury and \$33,050 at the time of the survey.

79. Freeman & Freeman, 14 J Health Pol, Pol'y & L at 707, 710-11 (cited in note 15).

80. Mean ages of children who survived at the time of the survey were: 6.5 for Group I; 5.6 for Group II; 7.7 for Group III; and 6.5 for Group IV.

81. The differences in nonmarket losses between the two decedent groups fully reflect differences in the gender composition of the two samples.

virtually all of the losses incurred by families with Group I children was medical (past loss also includes some lost parental earnings). By contrast, less than 2 percent of the losses incurred by families whose children died in the hospital was medical.

3. *Compensation Versus Cost.* About 30 percent of the claimants did not receive any compensation from their claims, with a somewhat higher percentage for those families whose child died (Table 3). The mean payment was \$620,100 for the sample as a whole and \$877,900 for those receiving compensation, which is substantially above the mean for all claims closed in Florida.⁸² This latter category of mean compensation is more meaningful in a comparison of compensation and cost because it is likely that defendants were not negligent in a greater percentage of noncompensation claims.

Overall, cost was appreciably higher than compensation, \$1.5 million for cost (Table 2) versus \$0.62 million for compensation (Table 3). For claimants who received money, compensation equalled only 57 percent of total cost. (The cost incurred by claimants who received money is not shown in the tables, but was used to compute the ratio of compensation to cost. Their cost was similar to cost incurred by all claimants.) The discrepancy between compensation and cost was especially great when the child had died; payment in that case was only 24 percent of cost. Families with surviving children received much more, with compensation at 71 percent of cost.

As in past studies, the least serious injuries were comparatively well compensated.⁸³ Compensation of claimants with Group I child survivors were paid more than three times the estimated cost. By contrast, for Groups II, III and IV, payment was 37, 80, and 77 percent of cost, respectively. Claimants in Group II were clearly the least well-compensated of the claimants in the survivors' categories.⁸⁴ Compensation for the first three survivors' groups rose with severity of injury. That is, families with Group III children were paid more than those with Group I or Group II children. By contrast, families of Group IV survivors received less compensation than those from Group III, probably because Group IV's survival probabilities were far lower.

Although widely accepted by economists, the concept of nonmarket losses is not yet used in law as an element of damages. However, even dropping nonmarket losses does not essentially reverse the conclusion that, if anything, birth-related injuries were undercompensated. For compensated cases, cost was still slightly less than compensation for all groups, with nonmarket losses eliminated.

82. The mean value of claims paid in Florida between October 1985 and March 1988 was \$236,000 (1987 dollars). This estimate was derived from Sloan & Hsieh, 24 L & Soc Rev Table 2 (cited in note 4).

83. See note 10.

84. Projected earnings and nonmarket losses depend on the assumptions we made, but future losses to age twenty largely reflect information about anticipated expense provided by the respondents. Predicted loss to age twenty is almost as high for Group II as for Group III (\$134,800 versus \$140,000, Table 2).

B. Emergency Room Injury Cases

1. *Past Annual Losses: Injury Severity, Timing, Share Incurred Out-of-Pocket.* Emergency room claimants incurred losses of \$38,000 in the year following the injury if they survived and \$20,800 if they died (Table 4). Losses were slightly lower in the year preceding the survey (12 percent lower for the emergency room sample as a whole).⁸⁵ As with the birth-related injuries, losses rose appreciably with the severity of the injury.⁸⁶ Emergency room claimants incurred out-of-pocket losses of \$13,800 in the year following the injury and \$11,900 in the year immediately preceding the survey. We excluded nonmarket loss from the calculations of first and preceding years' losses to make the table more closely comparable to the corresponding table for birth-related injuries (Table 1). We assumed that the children would not incur nonmarket losses until adulthood, and we did not compute parents' nonmarket losses.

2. *Magnitude of Total Loss.* Total loss, both past and future, was \$111,000 for Group I survivors, \$1.3 million for Groups II-IV survivors, and \$0.52 million for decedents (Table 5). The estimate of future loss is incomplete in that we were able to compute only medical and related loss anticipated in the year following the survey and major expenses that, at the time of the survey, were expected to occur at any time in the future.⁸⁷ Such major expenses include future surgical operations and a need for continuous nursing care.⁸⁸ Missing from the estimate are such expenses as the cost of physicians (other than for anticipated surgery) in years other than the first year, future hospitalizations other than for anticipated operations, and nursing care other

85. Table 4 shows decedents' losses in the year following the injury and in the year before the survey. By contrast, Table 1 only shows the former for decedents. Emergency room decedents incurred earnings loss in the year before the survey. Birth-injured children who died would not have begun to work if they had not experienced the injury.

86. Because we had only sixteen observations in emergency room survivor Groups II-IV, Table 4 does not show a breakdown of means by each of the three groups. Means for the individual groups rise monotonically with injury severity.

87. Items of expense anticipated to be incurred in the next year excluded physicians' services and hospitalizations, but included services of allied health personnel, medical supplies, nursing care, special education, care by nonhealth professionals, and alterations to the home.

88. Nine of the thirty-four survivors said that they would receive one or more surgical operations in the future. We assigned a length of stay to each procedure using Bernard L. Kasten, Jr., ed, *The Physician's DRG Handbook* (Mosby/Lexi Co, 1987). We used hospital prices per day from Florida's Health Care Cost Containment Board. Chang Letter (cited in note 32). We multiplied the resulting estimate by 1.5. See discussion in note 37 and accompanying text. We accepted the respondent's answer that the care will be needed. Although accepting such predictions as valid should have led us to overestimate future losses, our failure to include certain important elements of future losses probably led to more serious biases in the opposite direction. The omissions are identified in the next sentence of the text.

One respondent said that the injured party will need around-the-clock nursing for life. The resulting loss exceeded \$10 million. Rather than use this estimate, we assumed that the person will be institutionalized in a nursing home for the remainder of his life. In two cases, it was anticipated that the person will be institutionalized for life. A third individual will remain in a mental hospital. The claimant gave the name of the hospital, and we obtained the annual charge at the hospital from Mr. Andrew Reid, Florida Mental Health Institute, Florida Dep't Health and Rehabilitative Services (September 3, 1990).

than that provided to institutionalized persons. This information was not obtained by our survey.

As anticipated, medical and related expenses were minor for decedents, with the major expense being lost earnings. By contrast, medical and related expenses were the single most costly items for survivors, especially for the more seriously impaired. Past and future foregone earnings for survivors were \$42,700 and \$76,100, respectively.

3. *Compensation Versus Cost.* The mean payment of the sixty emergency room claimants was \$354,100 (Table 6), slightly over half the mean payment to claimants with birth-related injuries (Table 3). Considering only those who received some compensation, the mean payment was \$505,900, versus a mean loss of \$636,200 (latter estimate not shown in tables). For the latter group, payment was 80 percent of loss, as contrasted with 57 percent for birth-related injuries (from Tables 2 and 3). Group I survivors who obtained some compensation recovered more than twice their loss; for Groups II-IV survivors and decedents, the corresponding percentages were 83 and 70, respectively. Tables 5 and 6 support the earlier findings that injuries tend to be undercompensated. In addition, similar to the birth injuries, the less serious emergency room injuries (among those who survived the injury) were better compensated.

Although the losses associated with deaths attributed to an emergency room injury were far less than for birth-related deaths (\$0.5 million versus \$1.4 million), emergency room decedents received more compensation on average—\$350,400 versus \$336,500. The difference probably reflects legal rules that especially restrict payment to survivors of child decedents.⁸⁹

It is interesting that the vast majority of emergency room claims involving deaths received some payment (85 percent), but the same was true for only slightly more than half of those claimants who survived. Thus, relative to cost, the twenty-six families with decedents fared much better on average than did the thirty-four families with survivors.

IV

DISCUSSION

A. Major Findings

The empirical evidence supports several conclusions. First, at least for the injuries studied, compensation tends to fall short of the cost of injuries, and, indeed, substantially so for some groups. From the perspective of deterrence, therefore, compensation is inadequate on average. Our evidence suggests that such "tort reforms" as limits on payment for total loss or noneconomic loss are inappropriate, since overcompensation is more nearly the exception than the rule. Only about one-fifth of the claimants in our study were paid

89. See discussion in note 68.

more than *economic* loss. Punitive damages were not paid, at least explicitly, in any of the 187 cases in our sample. The sample contained a few cases in which compensation ran in the millions of dollars and compensation was many times the economic loss we computed. These are the types of cases that attract publicity and probably have had undue influence on the public's thinking about medical malpractice, the tort system in general, and state legislation in this field.

Second, the cost of an injury, like compensation, is systematically related to the severity of the impairment. We made several assumptions about future labor force participation and ability to function in the household that depended on the category of injury severity. However, the relationship between loss and severity holds for elements of loss that did not depend on these assumptions, in particular medical and related expenses.

Third, undercompensation is more apparent for certain groups than for others. Based on previous research, we anticipated that claims involving more severe injuries and death would be less well-compensated relative to the underlying loss than would claims involving less severe injuries.⁹⁰ This disparity in fact proved to be true of both the birth-related and emergency room injuries. In addition, it is likely that we seriously underestimated future medical and related expenses of survivors of emergency room incidents, especially in cases involving severe injuries.

Undercounting future medical and related losses is not a problem in the case of the decedents in our survey. Our estimates of mean total loss incurred of \$1.4 million for births and \$0.5 million for emergency room decedents are below values of (a lost) life obtained using a willingness-to-pay methodology.⁹¹ A recent study of deaths resulting from aviation crashes also found that decedents' beneficiaries recovered amounts far less than economic

90. See note 10.

91. Ted R. Miller, *Willingness to Pay Comes of Age: Will the System Survive?*, 83 Nw U L Rev 876 (1989). Miller derived a \$1.95 million per lost life figure by taking the mean of values provided in twenty-nine studies he considered to be of reasonably good quality. Values of lost lives in the studies ranged from \$1 million to \$3.1 million. Miller compared these values to the range of \$240,000 to \$425,000 losses obtained from studies of loss using a traditional human capital costing methodology. In a study that appeared after Miller's, Moore and Viscusi reported value of life estimates in the \$5.34 to \$5.70 million range. See Michael J. Moore & W. Kip Viscusi, *Compensation Mechanisms for Job Risks: Wages, Workers' Compensation and Product Liability* 80 (Princeton, 1990).

losses from the tort system.⁹² An earlier study of seriously-injured automobile accident victims reached the same conclusion.⁹³

B. Why Losses Are Undercompensated

There are several possible reasons for the tort system's undercompensation of some types of injuries. First, payments may have been discounted for comparative negligence and/or questionable liability. Empirical evidence from analysis of medical malpractice and other tort cases involving personal injuries has linked reductions in payment at verdict to the percent of the plaintiff's comparative negligence.⁹⁴ To our knowledge, the liability discount in settlements has not been accurately documented. In another part of our Florida claimant study, we are relating liability assessments conducted by physician panels to compensation resulting from settlements of the cases in our sample.

Second, tort based compensation is not taxable. By contrast, earnings that would have accrued to claimant families in the absence of the injury are taxable. We did not incorporate taxes in our analysis, but perhaps courts and private parties whose settlements are guided by potential awards at verdict do reduce payments in anticipation of the fact that the payments will not be taxed. To the extent that awards are to serve as deterrent signals to potential tortfeasors, it is inappropriate to adjust for taxes.⁹⁵ From the standpoint of compensation, however, it generally would be appropriate to adjust for taxes. But if the objective is to determine a loss for compensation purposes, we have not systematically adjusted for the attorneys' fees either. The fees much more than offset any potential savings from the tax exemption.⁹⁶

92. Elizabeth King and James Smith found that the ratio of compensation received to loss to survivors was only 49%. This compares to ratios of 24% (birth-related injuries) and 67% (emergency room injuries) in our study. They used a methodology similar to ours. The authors gave five reasons to partially explain the low recovery rates. First, for whatever reason, the tort system tends to undercompensate large losses. (Unlike our study, their study was limited to decedents.) Second, limitations on awards, especially those imposed by the Warsaw Convention and the Montreal Agreement, were binding. Third, decedents' beneficiaries, who on balance were probably risk averse, were willing to settle for a certain lower payment rather than take their chances at trial. Fourth, the authors used a broader definition of loss than the courts often accept, in particular, the inclusion of nonmarket loss. But they excluded, as we did, noneconomic loss. Fifth, experts used methods to compute loss that were often analytically incorrect and on balance served to reduce payment size. Elizabeth M. King & James P. Smith, *Economic Loss and Compensation in Aviation Accidents* xviii-xix (RAND, 1988).

93. Robert L. Bombaugh, *The Department of Transportation's Auto Insurance Study and Auto Accident Compensation Reform*, 71 Colum L Rev 207 (1971). See especially discussion id at 213-16.

94. Sloan & Hsieh, 24 L & Soc Rev 632-33, Table 4 (cited in note 4); James K. Hammit, Stephen J. Carrol & Daniel A. Relles, *Tort Standards and Jury Decisions*, 14 J Legal Stud 751, 756-58 (1985).

95. See, for example, Steven Shavell, *Economic Analysis of Accident Law* 143 (Harv U Press, 1987).

96. The vast majority of respondents to our survey paid contingent fees of 33 and 40%. In 1986, families with adjusted gross incomes ("AGI") of \$13,000-\$14,999 paid federal personal income taxes of 7.7% of AGI. Families with an AGI of \$50,000-\$74,999 paid 16.4% of AGI in federal personal income taxes. The rates were slightly lower in 1987 after the 1986 tax cut. US Dep't Commerce, *1990 Statistical Abstract* at 320 (cited in note 63). Florida has no personal income tax. The claimants probably paid less than these amounts because medical expenses above a threshold are tax deductible.

Third, legal rules, such as those limiting compensation in death cases, should lead to undercompensation.⁹⁷ In death cases, state legislatures have faced a clear conflict between the deterrence and compensation objectives of the tort system. From the viewpoint of deterrence, tortfeasors should have to pay the full economic loss to the survivors. However, if the survivors were not dependent on the deceased person for financial support, or if they were likely to be independent of the decedent in the future (as is typical of child decedents vis-à-vis their parents), the tortfeasor paying full economic loss may constitute a windfall for the survivors. Legislatures have tended to place greater weight on the compensation objective, and, as a consequence, have not permitted payment for lost wages to persons not likely to be dependent on such earnings. Payment for lost household production falls in the same category, unless it can be shown that the survivors would have benefitted from such housework. As a deterrence signal, it appears from the tort system's current incentives that tortfeasors should prefer their victims to be dead than alive. From the standpoint of society, such lost output is as real with the victim dead as it is with the victim alive and totally disabled.

Fourth, claimants may elect to settle for less than the potential award at verdict because of risk aversion and/or the substantial cost and delay incurred in bringing a case to trial. An indication that plaintiffs' risk aversion may be important is that plaintiffs in our sample whose cases were resolved by pretrial settlements recovered about three-fifths of their economic loss on average. (All such cases resulted in payment to plaintiffs by our definition.) By contrast, plaintiffs whose cases were resolved by trial settlements or verdict awards received amounts slightly higher than their economic losses. We admittedly cannot disentangle the influence of plaintiff risk aversion from (1) plaintiff litigation cost and (2) discounts for liability considerations, but from the information available to us, it is doubtful that litigation cost alone could explain much of the gap between the pretrial settlement payments and those obtained at a later stage in the dispute resolution process.⁹⁸

Fifth, although inclusion of nonmarket loss is fully accepted by economists, participants in the dispute resolution process probably have not reached this point yet. Sixth, perhaps some plaintiffs may not be well represented by their attorneys. Either these attorneys may not fully anticipate the magnitude of future losses or, because of inexperience or their own personal interests, they may not push their clients' cases to their full potential.⁹⁹ A seventh related factor is the "worthiness" of the plaintiff; certain traits can result in the jury or insurer viewing the plaintiff as less deserving of full compensation. These factors suggest that full compensation more likely is received if the plaintiff is a "good guy" and has a good lawyer.

97. See, for example, W. Page Keeton, et al, *Prosser and Keeton on Torts* 943 (West, 1984).

98. For a discussion of awards by stage of resolution, see King & Smith, *Economic Loss and Compensation* at 38-39 (cited in note 92); Sloan & Hsieh, 24 L & Soc Rev 601 (cited in note 4); Bovbjerg, et al, 54 L & Contemp Probs at 9-12 (cited in note 10).

99. Thomas B. Metzloff, *Resolving Malpractice Disputes: Imaging the Jury's Shadow*, 54 L & Contemp Probs 43, 75-76 (Winter 1991).

C. Noneconomic Loss

We did not attempt to quantify noneconomic loss, such as for pain and suffering, loss of enjoyment of life, or loss of consortium.¹⁰⁰ Payment for such losses has been controversial in part because there are no available objective standards for quantifying them. One possible standard would be juries' willingness to pay for such losses in past cases. Although the vast majority of cases reach settlement before a final verdict is rendered, settlements rarely distinguish between payment for economic versus noneconomic loss. One recent study of jury verdicts in Florida and Kansas City reported that the median award for noneconomic loss was \$21,000, but the mean was \$301,000, which indicates sizable payments in a few cases.¹⁰¹ Both mean and median awards for noneconomic losses for the types of injuries heavily represented in our sample (major permanent injuries and deaths) were well over \$500,000.¹⁰² In some of the death cases, juries may have tried to offset statutory constraints against paying for economic losses by making larger payments for noneconomic losses. Because of the high variability in awards and the possibility that payments for noneconomic losses are sometimes disguised payments for economic losses, it seems unwise to attempt to gain information about societal valuations of noneconomic losses from jury verdict data. Clearly, however, without considering such losses, our estimates underestimate true loss.

D. Limitations of This Study and Implications for Future Research

The importance of these findings from a public policy standpoint depends on a number of issues related to the accuracy of the estimates. How well do the loss estimates reflect actual expenses currently incurred by, or on behalf of, claimants? Does the actual experience of the claimants involved in this study generalize to a larger class of victims of injuries?

Several normative issues are closely related to the above empirical issues. Should documentable losses be taken as givens? Should one adjust for various types of moral hazards that may account for some losses, such as overuse of remedial services because they are covered, or withdrawal from the workforce because this action may trigger a subsidy? Should the costs of services with undocumented effectiveness to injured persons be compensated?

100. One might argue that our noneconomic losses are closely related to nonmarket losses, as the concept has been applied in this article. Our calculations, for example, include loss of a deceased husband's services in the household. As noted above, however, courts may not be willing to pay for this as they would for the replacement homemaker services of a mother with children. Yet they may pay for loss of consortium. For additional discussion of nonmarket losses, see note 68.

101. Bovbjerg, Sloan & Blumstein, 83 Nw U L Rev at 937 (cited in note 14). Payment for noneconomic losses was computed as the difference between the total payment and economic losses, as reported. W. Kip Viscusi, *Pain and Suffering in Product Liability Cases: Systematic Compensation or Capricious Awards?*, 8 Int'l Rev L & Econ 203 (1988).

102. These were losses for injuries in severity of injury categories seven, eight, and nine. Bovbjerg, Sloan & Blumstein, 83 Nw U L Rev at 937 (cited in note 3). The severity of injury scale is discussed in note 47.

This study has focused on a subset of injuries that lead to medical malpractice claims. This raises the question of how well these subsets of claimants generalize to all claimants, and, alternatively, to all families with members who incur similar injuries. As absolute values of loss, the estimates presented here do not generalize to all medical malpractice cases. This study dealt with permanent injuries, mostly severe ones; loss in birth-related injuries tends to be comparatively great in large part because victims often survive for many years and continually receive extensive therapeutic and custodial services. However, the relationship of compensation to cost documented here is plausibly typical of medical malpractice and other personal injury tort claims.

Because obtaining compensation through the tort system is costly, it is very likely that injuries resulting in claims involve more damage than do injuries overall.¹⁰³ Also, if a lack of funds from collateral sources to cover cost is a determinant in filing a lawsuit,¹⁰⁴ then the out-of-pocket costs documented here should be higher than those incurred by families with similar injuries who do not claim.

If one were designing a no-fault plan, one would want to know the total and out-of-pocket costs of the entire injured population that satisfies the eligibility criteria of the plan. For this purpose, our estimates only represent a first cut. However, it would still be important to know the losses of the potential losers under no-fault, namely the injured parties who obtain compensation under the present, fault-based tort system. Such persons would realistically secure much less money under a no-fault system, especially a system with a collateral source offset.

Courts typically rely on expert opinion to make judgments about the elements that underlie a calculation of loss, such as life and worklife expectancies, future prices, utilization of various services to be consumed, and wage rates for persons expected to work. The judgments are made about particular individuals about whom the expert may have direct knowledge. Input from clinicians typically reflects the clinicians' practical experience with seemingly similar patients. Economic experts are guided by general rules that, if they wish to withstand the rigors of cross examination, should be applied consistently across the cases in which they testify.

We obtained considerable information about the claimants, but we had less information about individual claimants than typically would be available to an expert testifying about damages. Thus, we were forced to examine the existing literature for empirical evidence about average effects so that our assumptions could at least be correct on average for groups of individuals. This literature ranged from texts about the treatment of children with

103. Evidence from two studies suggests that only a small proportion of cases in which health care provider negligence occurred actually result in claims. See *Harvard Medical Practice Study* at 7-1 (cited in note 25); Don Harper Mills, ed, *California Medical Association and California Hospital Report on the Medical Insurance Feasibility Study* (Sutter, 1977).

104. To our knowledge, there is no empirical evidence on this.

cerebral palsy to journal articles on life expectancies of adults with particular chronic conditions.

However, in one sense, we probably had more information than experts who base testimony primarily on their own professional experiences. How, for example, could an expert accurately predict the probability that a 5-year-old child with cerebral palsy will work at age fifty without reference to pertinent epidemiological information, or accurately assess the probability of institutionalization, based on one's own professional experience alone? Even to the extent that such predictions convey useful information, there is no existing mechanism for pooling expert opinion across cases.

In reviewing the literature, we were struck by the paucity of empirical evidence about utilization of specific services, work histories, living arrangements, and life expectancies of persons with particular conditions. Much of the more reliable information either has been published only quite recently, or has not been published but is available in unpublished, but (thankfully) computer-readable form. Loss estimates could be made much more precise if they could be based on a better empirical foundation.

Even if we had a better static picture of the world of injury victims as it currently exists, there would be a problem in predicting change. The long-term effects of the increasing use of specific treatment interventions on children with severe impairments have not been documented. Recently enacted statutory changes have probably improved the job prospects of the handicapped, but there is as yet no documentation concerning how much improvement has been made.¹⁰⁵ Technological changes may improve the ability of persons with serious disabilities to function at home and in the workplace, but these changes probably will come at considerable cost.¹⁰⁶ Future policy changes, such as the enactment of long-term care insurance, may dramatically affect probabilities of institutionalization. Life expectancies of the general population have increased markedly in recent years.¹⁰⁷ Changes in mortality of impaired persons are not well documented, however. If the life expectancy of an unimpaired person rises relative to that of an impaired person, total loss increases, assuming other factors hold constant. Conversely, if there are relative improvements in the longevity of the impaired, loss may go down—if, on balance, the impaired group is a burden on society—or up, if the impaired produce more than they consume.

The appropriate measure of loss would represent the cost when victims make efficient decisions about the use of services and work. If victims are provided with full coverage of certain services, one may expect that the services will be consumed to the point at which the marginal benefit of these services to the victims is far less than the cost of production at the margin.

105. An important example of such legislation is the Americans with Disabilities Act of 1990, Pub L No 101-336, 104 Stat 327, to be codified at 42 USC § 12101.

106. See, for example, Everson & Goodwyn, 41 Am J Occupational Therapy 739 (cited in note 52).

107. See 2 *Vital Statistics of the United States, 1986, Mortality Part A* at 2-3 (cited in note 48).

Also, if the injured person can obtain disability benefits or higher compensation from the tort system by not working, the work/leisure choice is distorted. Although, in principle, one would want to set compensation at economically efficient levels of loss, in practice it is difficult to identify additional loss due to inefficiency. More research on behavioral responses to incentives is needed. For some care that victims receive, such as intensive physical therapy given to young children with cerebral palsy, no one, including the professionals, really knows the marginal long-term benefits. Only careful in-depth evaluations can determine the long-term benefits of such therapy.

V

CONCLUSION

There are substantial losses associated with the types of medical malpractice claims analyzed in our research. For birth-related and emergency room cases of permanent injury in Florida, a claimant receiving much more than economic loss in compensation more nearly appears to be the exception than the norm. Admittedly, generalizing conclusions from a detailed analysis of 187 closed claims from one state to the nation as a whole, and for a subset of medical malpractice case types to medical malpractice cases more generally, may be subject to criticism. Empirical evidence from earlier studies is consistent with our research, however.¹⁰⁸

We have devoted considerable space in this article to our methodology for computing losses. One reason for this emphasis is that the results can be no more reliable than the underlying methods. The description of methods also identifies complexities inherent in loss estimation. Even alternative approaches to the current fault-based tort system will require careful quantification of losses if compensation is to be at all accurate.

108. Miller, 83 Nw U L Rev 876 (cited in note 91); King & Smith, *Economic Loss and Compensation* (cited in note 92); Bombaugh, 71 Colum L Rev 207 (cited in note 93).

TABLE 1
LOSS AND OUT-OF-POCKET LOSSES INCURRED IN BIRTH YEAR AND
YEAR BEFORE THE SURVEY: BIRTH-RELATED INJURIES*

Group	Loss				Out-of-Pocket Loss				
	Mean	Median	Lower Quartile	Upper Quartile	Mean	Median	Lower Quartile	Upper Quartile	
<u>Birth Year</u>									
<u>Survivors**</u>									
I (14)	15.5	4.7	1.4	47.9	4.9	1.3	0.0	5.8	
II (20)	30.2	23.3	5.8	34.3	18.0	4.3	0.8	19.7	
III (27)	43.4	19.0	2.3	68.1	8.6	2.3	1.0	11.5	
IV (22)	58.2	35.6	9.5	95.2	8.9	4.2	0.3	9.4	
All (83)	39.4	22.0	4.9	63.7	10.3	3.1	0.6	12.0	
<u>Decedents</u>									
Left hospital	(10)	118.9	73.0	3.8	202.9	13.8	4.5	0.0	34.9
Died in									
hospital	(34)	18.7	1.4	0.0	31.6	5.4	0.0	0.0	2.5
All	(44)	41.5	14.7	0.9	70.6	7.3	1.0	0.0	9.9
All (127)		40.1	15.2	2.3	47.9	9.3	1.9	0.0	6.1
<u>Year Before Survey</u>									
<u>Survivors</u>									
I (14)		15.7	13.8	9.8	21.9	1.9	0.1	0.0	1.3
II (20)		26.5	25.4	18.2	33.2	5.2	1.5	0.2	6.3
III (27)		42.5	31.9	21.8	45.7	10.8	3.8	0.2	15.3
IV (22)		69.5	33.5	25.1	113.7	16.9	3.7	0.8	19.1
All (83)		41.3	27.7	19.8	56.7	9.5	1.7	0.1	8.0

* In thousands of 1989 dollars. Estimates include medical and related expense and earnings loss of parents.

** Numbers of observations in parentheses.

TABLE 2
PAST AND FUTURE LOSSES INCURRED: BIRTH-RELATED INJURIES*

Group	Future Loss					Total	Total
	Past Loss	Predicated Loss To Age 20	Foregone Earnings	Foster/ Nursing Home	Nonmarket Loss		
<u>Survivors**</u>							
I (14)	80.7	42.8	0.0	0.0	0.0	42.8	123.5
II (20)	128.4	134.8	595.6	285.8	433.0	1,449.2	1,577.6
III (27)	288.4	140.0	806.0	331.7	565.7	1,843.4	2,131.8
IV (22)	367.8	110.2	775.6	22.4	588.9	1,497.1	1,865.0
All (83)	235.8	114.4	611.3	182.7	444.4	1,352.8	1,588.6
<u>Decedents</u>							
Left hospital (10)	438.3	0.0	546.4	0.0	702.8	1,249.2	1,687.5
Died in hospital (34)	21.4	0.0	714.2	0.0	556.6	1,270.8	1,292.2
All (44)	116.1	0.0	676.0	0.0	589.9	1,265.9	1,382.0
<u>All (127)</u>	194.4	74.8	633.7	119.4	494.8	1,322.7	1,517.1

* In thousands of 1989 dollars.

** Numbers in parentheses are numbers of observations in category.

TABLE 3
COMPENSATION RECEIVED: BIRTH-RELATED INJURIES*

Group	Percent of Claimants Receiving Compensation	Mean Compensation	
		All Claimants	Claimants Who Received Compensation
<u>Survivors**</u>			
I (14)	64.3	208.7	324.6
II (20)	75.0	436.4	581.9
III (26)	69.2	1,196.0	1,727.5
IV (22)	81.8	1,165.1	1,424.1
All (82)	73.2	833.9	1,139.6
<u>Decedents</u>			
Left hospital (10)	60.0	545.8	909.7
Died in hospital (34)	67.6	126.5	187.0
All (44)	65.9	221.8	336.5
<u>All (126)***</u>	70.6	620.1	877.9

* In thousands of 1989 dollars.

** Number of observations in parentheses.

*** One observation was dropped from the computations underlying this table because data on compensation were unavailable. The settlement was sealed and the compensation obtained could not be revealed. We could not use compensation information for this claimant from the closed claim forms submitted to the Florida Department of Insurance because we did not have all the forms for the case. The case involved a Group III child survivor. We were told that the family received some compensation.

TABLE 4
LOSS AND OUT-OF-POCKET LOSSES INCURRED IN YEAR FOLLOWING
THE INJURY AND IN YEAR BEFORE THE SURVEY:
EMERGENCY ROOM INJURIES*

Group	Loss				Out-of-Pocket Loss			
	Mean	Median	Lower Quartile	Upper Quartile	Mean	Median	Lower Quartile	Upper Quartile
<u>Year Following Injury</u>								
<u>Survivors</u>								
I (18)	10.3	7.6	1.9	21.1	4.2	0.4	0.0	8.1
II-IV (16)	69.1	15.1	1.0	88.5	17.0	6.1	0.1	18.5
All (34)	38.0	9.1	1.2	25.1	10.2	1.3	0.0	11.9
<u>Decedents (26)</u>	20.8	19.1	0.0	31.5	18.4	16.7	0.0	31.5
<u>All (60)</u>	30.5	13.5	0.7	27.9	13.8	0.1	0.0	5.1
<u>Year Before Survey</u>								
<u>Survivors</u>								
I (18)	8.0	4.5	1.1	15.1	3.4	0.2	0.0	3.5
II-IV (16)	58.2	24.2	1.0	66.2	16.7	4.7	0.5	13.9
All (34)	31.6	13.7	1.0	39.2	9.7	1.0	0.0	8.4
<u>Decedents (26)</u>	20.5	19.1	0.0	35.3	14.9	13.9	0.0	25.8
<u>All (60)</u>	26.8	16.1	0.6	37.5	11.9	3.1	0.0	17.6

* In thousands of 1989 dollars. Estimates exclude nonmarket loss.

** Numbers of observations in parentheses.

TABLE 5
PAST AND FUTURE LOSSES INCURRED: EMERGENCY ROOM INJURIES*

Group	Past Loss				Future Loss					
	Medical and Related	Foregone Earnings	Non-market	Total	Medical and Related		Foregone Earnings	Non-market	Total	Total
					1st Year	Other				
<u>Survivors**</u>										
I (18)	60.6	28.1	0.0	88.7	0.3	3.4	18.6	0.0	22.3	111.0
II-IV (16)	409.3	59.1	51.8	520.2	22.1	396.6	140.8	220.3	779.8	1,300.0
All (34)	224.7	42.7	24.4	291.8	10.5	188.5	76.1	103.7	378.8	670.6
<u>Decedents (26)</u>	9.6	93.4	65.8	168.8	0.0	0.0	222.4	129.2	351.6	520.4
<u>All (60)</u>	131.5	64.7	42.3	238.5	6.0	106.8	139.5	114.7	367.0	605.5

* In thousands of 1989 dollars.

** Numbers of observations in parentheses.

TABLE 6
 COMPENSATION RECEIVED: EMERGENCY ROOM INJURIES*

<u>Group</u>	<u>Percent of Claimants Receiving Compensation</u>	<u>Mean Compensation</u>	
		<u>All Claimants</u>	<u>Claimants Who Received Compensation</u>
<u>Survivors**</u>			
I (18)	55.6	47.8	86.0
II-IV (16)	62.5	792.3	1,267.7
All (34)	58.8	398.2	676.9
<u>Decedents (26)</u>			
All (60)	70.0	354.1	505.9

* In thousands of 1989 dollars

** Numbers of observations in parentheses.