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Background Paper

Medical Malpractice Tort Limits and Health Care Spending

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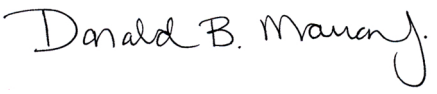
Preface

In recent years, the Congress has considered a number of legislative proposals that would modify the tort litigation system in the United States by imposing limits on medical malpractice claims, as many states have done. In this background paper, the Congressional Budget Office (CBO) reviews existing studies of tort limits and health care spending and presents an empirical analysis of a broader set of spending measures than has been examined previously. The analysis also performs a number of detailed specification tests on the results. In keeping with CBO's mandate to provide objective, nonpartisan analysis, the report makes no recommendations.

Chapin White and Stuart Hagen of CBO's Health and Human Resources Division prepared the report under the supervision of James Baumgardner and Bruce Vavrichek. Alshadye Yemane contributed to the data analysis. The report benefited from comments by Thomas Bradley, Thomas DeLeire, Matthew Goldberg, Robert Murphy, and John Sabelhaus, all of CBO. A number of outside reviewers also provided useful comments, including Michael Chernew of the University of Michigan, Martin Gaynor of Carnegie Mellon University, Sherry Glied of Columbia University, and Michelle Mello of Harvard University. (The assistance of external reviewers implies no responsibility for the final product, which rests solely with CBO.)

Loretta Lettner edited the report, and Christine Bogusz proofread it. Maureen Costantino and Christian Howlett prepared the report for publication, and Lenny Skutnik produced the printed copies. An electronic version of the report is available on CBO's Web site, www.cbo.gov.



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Acting Director

April 2006

Note

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Summary and Introduction

The tort system in the United States—which enables claimants to seek redress for alleged injury to their person, reputation, or property—has been the subject of controversy in recent years. Critics charge that the system, as it is applied to claims of medical malpractice, is subjective and costly and that excessive damage awards have increased health care spending. Many states have implemented restrictions on tort claims for medical malpractice, and the Congress has considered various proposals to establish nationwide tort limits similar to those already imposed by states.

The Congressional Budget Office (CBO) previously considered the effects of limits on tort claims for medical malpractice at the state level and concluded that such limits reduced both malpractice awards and malpractice insurance premiums. Lower malpractice premiums, in turn, would reduce providers' costs and result in somewhat lower private health insurance premiums and costs for federal health programs. This CBO background paper is motivated by the question of whether changes in the malpractice environment could also have an effect on the utilization of health care, perhaps by altering physicians' decisions. The analysis differs from others of its kind in that it looks at a broader set of spending measures than has been examined elsewhere. Although the analysis provides some evidence of links between tort limits and health care spending, the results are inconsistent and depend on the particular relationships and specifications tested. The mixed results also demonstrate the difficulty of disentangling any effects of tort limits from other factors that affect levels of spending for health care. CBO continues to monitor the work of other researchers and conduct its own research on the issue.

Background on Medical Malpractice and Tort Limits

Under common law, individuals may pursue civil claims against physicians or other health care providers for alleged "torts," meaning breaches of duty that result in personal injury. Underpinning the system of tort law is the principle that physicians and other medical providers owe a duty of care to their patients, and that patients may attempt to recover from those providers losses that result from breaches of such duty. The system has twin objectives: deterring negligent behavior on the part of providers and compensating claimants for losses (including medical costs, lost wages, and pain and suffering) they incur as the result of an injury that occurs because of negligence. [1]

Malpractice claims are generally pursued through the state courts, and states have established various rules by which those claims are adjudicated. Some recent proposals that have been considered by the Congress, described in more detail below, include setting caps on awards for noneconomic damages and punitive damages, limiting attorneys' fees, restricting defendants' liability on the basis of the degree of their responsibility for an injury, and allowing evidence of collateral-source benefits to be introduced at trial.

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1. Congressional Budget Office, *The Economics of U.S. Tort Liability: A Primer* (October 2003).

Some analysts argue that new tort limits would reduce overall spending for health care in two ways. First, they would reduce the size of the average award paid by malpractice insurers to claimants and, thus, reduce premiums for malpractice insurance (the "malpractice premium" effect). A reduction in malpractice premiums would tend to reduce the prices that insurers and individuals pay for health care services.[2] Second, those analysts argue that the proposed changes in tort law would reduce health care spending by reducing the intensity and volume of health care services provided (the "utilization" effect). The argument for a utilization effect is built on two premises: first, that fear of litigation drives medical providers to deliver additional medical services ("defensive medicine"), and second, that the proposed tort limits would reduce that perceived threat among physicians and thereby reduce utilization and spending.

Conflicting Estimates

Previously published estimates of the effect of proposed tort limits on federal spending vary widely. The discrepancies among those estimates are attributable primarily to disagreements over the existence and magnitude of possible effects of tort limits on utilization. In a recent cost estimate, CBO concluded that a legislative proposal containing a package of malpractice tort limits—the "Help Efficient, Accessible, Low-Cost, Timely Healthcare (HEALTH) Act of 2003"—would reduce federal direct spending on Medicare, Medicaid, and the Federal Employees Health Benefits program by about $15 billion over 10 years.[3] That reduction in federal spending reflected the estimated reduction in malpractice premiums, which CBO concluded would reduce both private health insurance premiums and payment rates in the Medicare and Medicaid programs.[4] CBO did not, however, assign savings to effects on utilization. By contrast, the Assistant Secretary for Planning and Evaluation (ASPE) of the Department of Health and Human Services, for example, has estimated that a cap on noneconomic damages alone would reduce costs to the federal government by between $25 billion and $44 billion per year, an effect approximately 20 times as large as CBO's estimate of the impact of the HEALTH Act of 2003 (which included a cap

2. A reduction in malpractice premiums represents a reduction in the price of one of the inputs used in the production of medical care. A reduction in medical malpractice premiums has a direct effect on Medicare's payments for hospital and physicians' services, because those prices are set, in part, on the basis of the observed level of medical malpractice premiums. Reductions in medical malpractice premiums would also reduce prices paid by insurers other than Medicare, as reductions in the input costs of providing medical care are passed on to insurers and patients.

3. Congressional Budget Office, *Cost Estimate for H.R. 5: Help Efficient, Accessible, Low-Cost, Timely Healthcare (HEALTH) Act of 2003* (March 10, 2003), available at www.cbo.gov/ftpdocs/40xx/doc4098/hr5ec.pdf.

4. According to CBO's estimates, the HEALTH Act of 2003 would also increase federal revenues by $3 billion over a period of 10 years. That increased revenue reflects the fact that the legislation would reduce medical malpractice premiums and, therefore, health insurance premiums. Because firms are competing for workers in the labor market, lower health insurance premiums would lead to an increase in taxable wages and salaries, which in turn would boost federal revenues.

on noneconomic damages as well as other tort limits).[5] The vast bulk of ASPE's estimated savings was attributable to its estimate of the effects of the proposed rule on utilization.

The analysis presented in this paper considers two sets of health care spending measures at the state level—overall health care spending per capita, and Medicare spending per beneficiary—over the last two and a half decades, and explores the relationship between the level of spending in each year and whether or not a given state had specific types of tort limits in effect in that year. The analysis focuses on the question of whether the implementation of tort limits has an impact on the level of health care spending; it does not examine the extent to which physicians may have adopted certain practice patterns in response to the threat of being sued. This analysis looks at a broader set of spending measures than has been examined elsewhere and performs a more detailed set of specification tests on the results. Those specification tests help assess whether the main regression results reflect the causal impact of tort limits on health care spending or the impact of other factors that are not included in the analysis.

Interpreting the Results

CBO finds that the estimated effects of limits on malpractice torts vary substantially across different measures of health care spending and across different types of tort limits. In some cases, specific tort limits appear to be associated with reductions in health care spending; in other cases, there appears to be no relationship; and in still other cases, tort limits appear to be associated with higher spending. Analysis of overall per capita spending on health care at the state level reveals that eliminating joint-and-several liability is associated with an increase in per capita spending. The estimated effect of implementing a package of previously proposed tort limits is near zero.

More evidence of changes in spending in response to tort limits is found when examining spending for Medicare. Imposing a cap on noneconomic damages is associated with reductions in Medicare spending per beneficiary, although the estimated effect of that tort limit falls and becomes statistically insignificant when controls are added that capture the effects of the implementation of Medicare's prospective payment system (PPS) for hospitals. The Medicare results also show that eliminating joint-and-several liability is associated with statistically significant increases in spending per beneficiary.

A series of specification tests suggests that the associations between some of the tort limits and changes in spending may reflect other factors that are both (1) difficult to measure and (2) correlated with, but not caused by, the passage of malpractice tort limits. The mixed results presented in this analysis demonstrate the difficulty of disen-

5. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, *Confronting the New Health Care Crisis: Improving Health Care Quality and Lowering Costs by Fixing Our Medical Liability System* (July 24, 2002).

tangling any effects of tort limits from other factors that affect levels of health care spending.

Background

In surveys, many physicians report that they alter the way they practice medicine in response to the threat of being sued for malpractice. The measures that physicians take to reduce their risk of liability have been labeled "defensive medicine." Some analysts cite defensive medicine as an important contributor to the high levels of health care spending in the United States. Limits on malpractice torts have been proposed to reduce medical providers' exposure to the threat of being sued with the objective of decreasing the provision of defensive medicine. This section of CBO's analysis describes the types of changes in tort laws that have been considered by the Congress, discusses various definitions of defensive medicine, and examines conceptually the ways in which tort limits might affect health care spending.

Tort Limits Under Consideration by the Congress

The Congress is considering several types of limits to the system that governs tort claims for malpractice:

- *Cap on noneconomic damages*. Imposing such a cap would limit the amount that a claimant could receive for noneconomic damages. Economic damages include medical costs and lost earnings; noneconomic damages include pain and suffering, mental distress, and loss of consortium. Some recent proposals would place a $250,000 ceiling on noneconomic damages.[6]

- *Modification or elimination of joint-and-several liability.* The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any one of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Proposals to eliminate that principle would specify instead that each party be responsible only for the share of damages equal to its degree of responsibility for the injury. Proposals to modify joint-and-several liability might, for example, allow joint-and-several liability to be applied only to any defendant found to be at least 50 percent responsible for an injury.

- *Cap on attorneys' fees*. Some proposals would cap the contingency fees that claimants' attorneys can collect as a percentage of a total damage recovery. The proposed percentage caps could vary on the basis of the dollar amount of the total damage award.

6. Proposals including caps on damages often allow states that have already implemented such caps to retain them, regardless of whether the state caps are lower or higher than those contained in the federal proposal.

- *Establishment of a collateral-source rule*. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance. Some proposals would establish a collateral-source rule that allowed information on a plaintiff's collateral-source benefits to be presented to a jury. Such proposals might also preclude payers of collateral benefits from receiving any portion of an award. Other proposals would impose a collateral-source rule with a mandatory offset, in which an award must be reduced by the amount of any collateral-source benefits received by the claimant. A third type of collateral-source rule—the discretionary offset—would allow the court to adjust the jury award to compensate for collateral-source benefits.

- *Cap on punitive damages*. Punitive damages are not intended to compensate the injured party for damages but instead to punish the defendant for egregious behavior and deter other health care providers from similar behavior. Some proposals would limit the situations in which plaintiffs might receive punitive damages or cap the amount of punitive damages that plaintiffs could receive or do both.

- *Revisions to the statute of limitations*. The statute of limitations specifies the period of time following an injury when the injured party may file a claim for damages. Proposals affecting that statute generally would reduce the period of time available to file. Two types of limits could be applied, the first based on the amount of time that had elapsed since the occurrence of an alleged injury, and the second based on the amount of time that had elapsed since the discovery of an alleged injury. One recent proposal would impose a filing limit of three years after the occurrence of an alleged injury or one year after the discovery of an alleged injury, whichever occurred first.

A number of states have already adopted limits similar or identical to those being considered in the Congress.[7] States have imposed limits on torts in three waves, the first in the late 1980s, the second in the late 1990s, and the third in the last few years (see Figure 1).

Definitions of Defensive Medicine

The term "defensive medicine" has been used in different ways in the literature, with some researchers using the phrase more broadly and others more narrowly. The Office of Technology Assessment (OTA), a former Congressional research agency, used the term defensive medicine as an umbrella term, subdividing it into "positive" and "negative" defensive medicine. OTA defined positive defensive medicine as including "extra tests or procedures [conducted] primarily to reduce malpractice liability," with negative defensive medicine including procedures or patients avoided by physicians out of fear of liability.[8]

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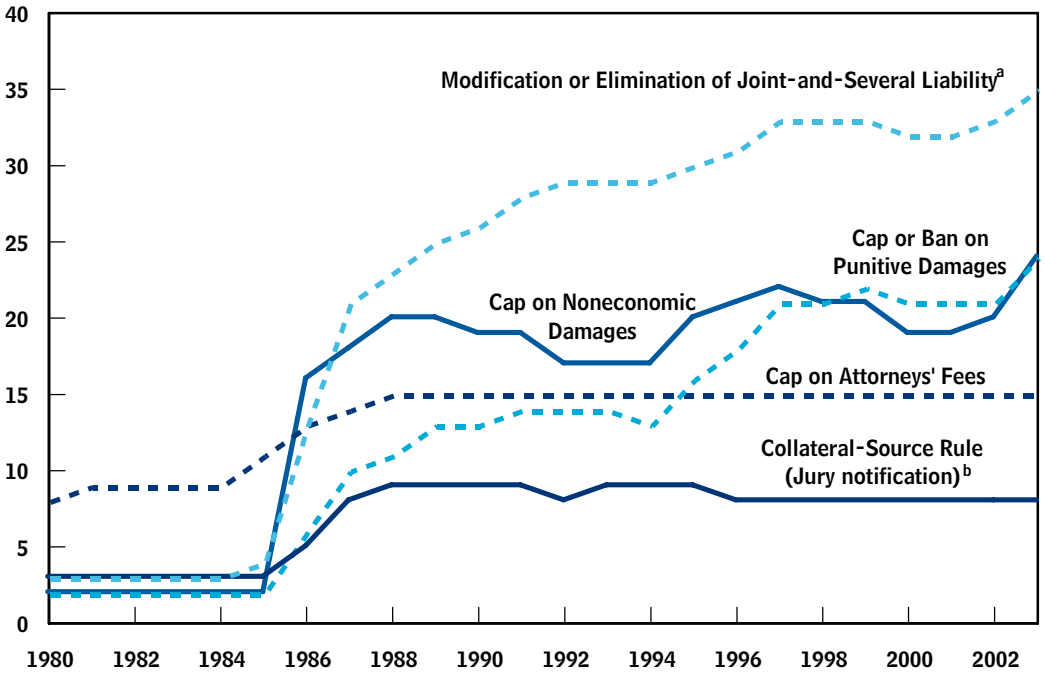
7. Congressional Budget Office, *The Effects of Tort Reform: Evidence from the States* (June 2004).

8. Office of Technology Assessment, *Defensive Medicine and Medical Malpractice*, OTA-H-602 (July 1994).

Figure 1.

Number of States with Tort Limits in Place, by Year, 1980 to 2003



Source: Congressional Budget Office.

Note: Statute of limitations is excluded from the figure because the changes that states made were relatively minor.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

More recent literature generally uses defensive medicine only to refer to those extra tests and procedures undertaken out of fear of liability (what OTA called positive defensive medicine). In previous analyses, CBO used the narrower definition, referring to defensive medicine as "services and procedures that are provided largely or entirely to avoid potential liability."[9] Daniel Kessler and Mark McClellan define defensive medicine even more narrowly, as "precautionary treatments with minimal expected medical benefit [provided] out of fear of legal liability."[10] Lisa Dubay and

9. Congressional Budget Office, *Cost Estimate for H.R. 5*.

10. Daniel Kessler and Mark McClellan, "Do Doctors Practice Defensive Medicine?" *Quarterly Journal of Economics*, vol. 111, no. 2 (May 1996), pp. 353-390.

her colleagues define defensive medicine similarly to Kessler and McClellan, as "the extent to which fear of malpractice liability leads physicians to provide more care than is socially optimal."[11]

Note that the definitions used by Kessler and McClellan and by Dubay and her co-authors limit the concept of defensive medicine to extra tests and procedures they deem socially "wasteful" (in the sense that the costs of providing those treatments exceed the expected clinical benefits). The current analysis does not attempt to assess the clinical or social value of any additional services provided or any services forgone because of a fear of malpractice, nor is it limited to an examination of positive defensive medicine.

Possible Links Between Malpractice Tort Limits and Health Care Spending

The links between limits on malpractice tort claims, the malpractice environment, and levels of health care spending are complex. The malpractice environment, from the point of view of medical providers, includes premiums for malpractice insurance, the likelihood that they will be sued for malpractice (holding constant the quality of medical care provided), and the financial and professional consequences of being sued. Providers often view the premiums they pay for malpractice insurance as a measure of their potential liability—higher premiums may increase their fear of being sued. The types of tort limits listed above are generally believed to help reduce malpractice premiums and make the malpractice environment less favorable to potential claimants and more favorable to medical providers. CBO's analysis focuses on the total effect on health care spending of changes in the malpractice environment.

Proponents of limits on malpractice torts claim that the fear of being sued drives medical providers to deliver services they would otherwise not provide. Among physicians, the fear of being sued is prevalent and well documented.[12] For physicians, the financial costs of being sued are generally limited because most are insured against malpractice claims and premiums for malpractice insurance generally are not adjusted on the basis of an individual physician's claim history although being sued repeatedly may make malpractice coverage difficult to obtain and more expensive.[13] Legal action can also impose other costs on physicians, however, including mental distress, lost time from work, and a damaged reputation.

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11. Lisa Dubay, Robert Kaestner, and Timothy Waidmann, "The Impact of Malpractice Fears on Cesarean Section Rates," *Journal of Health Economics*, vol. 18, no. 4 (August 1999), pp. 491-522.

12. Harris Interactive, Inc., *Most Doctors Report Fear of Malpractice Liability Has Harmed Their Ability to Provide Quality Care: Caused Them to Order Unnecessary Tests, Provide Unnecessary Treatment and Make Unnecessary Referrals*, The Harris Poll, No. 22, May 8, 2002, available at www.harrisinteractive.com/harris_poll/index.asp?PID=300.

13. David M. Studdert, Michelle M. Mello, and Troyen A. Brennan, "Medical Malpractice," *New England Journal of Medicine*, vol. 350, no. 3 (January 15, 2004), pp. 283-292.

The types of tort limits being considered in the Congress would reduce awards to claimants in certain cases and could also reduce the probability that a medical provider would be sued for malpractice. The proposed limits could reduce the probability that claims would be filed if they affected the decisionmaking process of potential plaintiffs and their attorneys. Generally, plaintiffs' attorneys receive payment in the form of a contingency fee, meaning they receive a percentage of any award or settlement. Plaintiffs' attorneys, in choosing which cases to take on and which cases to pursue, assess each case to determine the likelihood of receiving an award and the probable amount of any resulting fee. If caps on awards and on attorneys' fees reduced contingency payments, plaintiffs' attorneys would be less likely to take on certain cases, and in the longer run, fewer attorneys might practice that branch of the law.

There are several possible paths by which medical services utilization could be affected by tort limits. The amount of positive defensive medicine (services provided primarily to avoid being sued for malpractice) might decline. Negative defensive medicine might be reduced as well, meaning that medical providers might be more willing to perform risky procedures; this could increase certain types of utilization. If medical providers were less likely to be sued, they might also feel less compelled to document and justify their clinical decisionmaking processes, which could reduce the amount of time required to provide a given clinical service. If they faced lower medical malpractice premiums, older physicians might choose to retire later, and younger physicians might be more likely to choose specialties, such as obstetrics, that today typically have a high risk of malpractice litigation. Those possible behavioral responses might increase the supply of physicians, which would tend to decrease prices paid for physicians' services and increase the volume of such services, with ambiguous implications for health care utilization and spending. Medical providers might also put less effort into conforming to the standard of care, which could increase the rate of medical injuries resulting from negligence. An increase in the rate of such injuries could increase utilization and spending, if those injuries resulted in costly treatments.

In the analysis presented in this paper, health care spending is modeled as a function of which tort limits are in place as well as other variables commonly included in models of health care spending. Tort limits may affect the prices and quantities of health care services provided through several distinct channels. Some of the potential effects of tort limits would tend to increase utilization and spending, while other potential effects would tend to reduce utilization and spending. The net effect of those tort limits could be in either direction. This analysis attempts to empirically quantify that net effect.

The Effects of the Malpractice Environment on Health Care Utilization and Spending: Existing Evidence

Researchers examining the effects of the malpractice environment on health care utilization and spending have typically used one of two approaches: physician surveys and statistical analyses of observed patterns of health care utilization. Strong evidence sug-

gests that some tort limits reduce the claims paid in malpractice cases and, in the long run, premiums for malpractice insurance (see Box 1). Beyond the effect on malpractice premiums, the literature does not present consistent results, which is not surprising given the diversity of specific research questions and methodologies used.

When asked in surveys whether the fear of malpractice has affected their style of practice, a substantial percentage of physicians tend to agree.[14] For example, a survey sponsored by Common Good in 2002 found that 91 percent of physician respondents reported that the fear of malpractice liability had led them to order "more tests than they would based only on professional judgment of what is medically needed."[15] That finding, if taken in isolation, suggests that the costs of defensive medicine could be substantial.

Other findings suggest that a more nuanced interpretation of the survey results is necessary.

- First, in surveys, a substantial percentage of physicians also report avoiding certain types of procedures or patients because of malpractice pressures.[16] Those survey results suggest that malpractice pressures lead some physicians to provide additional tests and procedures (positive defensive medicine) and lead some physicians to avoid providing other procedures and to avoid caring for certain patients (negative defensive medicine). The net impact of such behavior on health care spending would depend on the magnitudes of the positive and negative defensive medicine effects, and also on whether the reported negative defensive medicine represented a shift in utilization from some physicians (those who avoid risky procedures) to other physicians (those who do not), or a net reduction in utilization (with some risky procedures not being performed at all).

- Second, physician surveys generally are characterized by low response rates.[17] Response bias could undermine the validity of survey findings if physicians chose whether to respond on the basis of the depth of their (presumably negative) feelings about the malpractice system.

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14. Office of Technology Assessment, *Defensive Medicine and Medical Malpractice*; and Harris Interactive, Inc., *Final Report of the Fear of Litigation Study: The Impact on Medicine*, Study No. 15780 prepared for Common Good (April 11, 2002), available at http://cgood.org/assets/attachments/57.pdf.

15. Harris Interactive, Inc., *Fear of Litigation Study.*

16. Office of Technology Assessment, *Defensive Medicine and Medical Malpractice.*

17. Ibid.

Box 1.

The Effects of Tort Limits on Premiums for Medical Malpractice Insurance

In 1993, the Office of Technology Assessment issued a report summarizing the first wave of studies on the experience of states that had set limits on malpractice liability in the 1970s and 1980s. The report concluded that imposing caps on damage awards and allowing collateral-source offsets consistently reduced one or more malpractice cost indicators, which include claim size, claim frequency, and premiums for malpractice insurance. Furthermore, it found weaker evidence that limiting the use of joint-and-several liability and reducing the statute of limitations for filing claims also slowed the growth of premiums for malpractice insurance.[1]

More recent research has concluded that certain types of limits can reduce medical malpractice premiums below what they would be in the absence of the limits. A 2004 study reported that a cap on noneconomic damages would reduce premiums per physician by about 13 percent.[2] It also found that a discretionary offset for collateral-source benefits would reduce loss ratios. A recently released working paper found that the following tort limits were associated with substantial long-term reductions in medical malpractice insurers' developed losses: caps on noneconomic damages, caps on punitive damages, elimination of joint-and-several liability, and changes to rules governing the treatment of collateral sources of damages.[3] Though there is some debate over the strength of the link between losses incurred by medical malpractice insurers and the premiums they charge, it is reasonable to assume that reductions in insurers' losses would, at least over the long term, lead to reductions in medical malpractice premiums.

1. Office of Technology Assessment, *Impact of Legal Reforms on Medical Malpractice Costs*, OTA-BP-H-119 (September 1993).
2. Kenneth E. Thorpe, "The Medical Malpractice 'Crisis': Recent Trends and the Impact of State Tort Reforms," *Health Affairs* (Web Exclusive, January 21, 2004).
3. Developed losses are the actual payments eventually made by malpractice insurers for malpractice claims. See Patricia Born, W. Kip Viscusi, and Tom Baker, *The Effects of Tort Reform on Medical Malpractice Insurers' Ultimate Losses*, Working Paper No. 12086 (Cambridge, Mass.: National Bureau of Economic Research), available at http://papers.nber.org/papers/w12086.pdf.

Box 1.

Continued

On the basis of its own research into the effects of tort restrictions, the Congressional Budget Office (CBO) estimated that the provisions of the Help Efficient, Accessible, Low-Cost, Timely Healthcare (HEALTH) Act of 2003 (H.R. 5) would lower premiums for medical malpractice insurance nationwide by an average of 25 percent to 30 percent from the levels likely to occur under current law.[4] (The savings in a given state would depend in part on the restrictions already in effect there.) CBO found that the following tort limits reduced malpractice insurance premiums: caps on noneconomic damages, caps on punitive damages, and changes to rules governing the treatment of collateral sources of damages.

A reduction of 25 percent to 30 percent in medical malpractice premiums would not, by itself, have a significant impact on total health care costs, however. Malpractice costs amounted to an estimated $24 billion in 2002, less than 2 percent of overall health care spending.[5] Thus, even a reduction of that magnitude in malpractice costs would lower health care costs by only about 0.4 percent to 0.5 percent, and the likely effect on health insurance premiums would be comparably small.

4. Congressional Budget Office, *Cost Estimate for H.R. 5, Help Efficient, Accessible, Low-Cost, Timely Healthcare Act of 2003* (March 10, 2003).

5. According to data from the Office of the Actuary at the Centers for Medicare and Medicaid Services, health care spending in the United States totaled about $1.4 trillion in 2002 (excluding spending on public health and capital improvements).

- Third, the phrasing and framing of questions in the surveys can substantially affect the results. When physicians are asked whether malpractice concerns affect their practice patterns, many say yes. If the survey is structured in a more open-ended way, the results are substantially different. For instance, instead of asking physicians whether malpractice has affected their practice, some surveys have presented clinical scenarios and asked physicians which tests and procedures they would order and why, with malpractice concerns included among many possible rationales. In those more open-ended surveys, malpractice concerns are infrequently cited as the primary reason for ordering particular tests or procedures.[18]

18. Office of Technology Assessment, *Defensive Medicine and Medical Malpractice*.

Because of the difficulties involved in interpreting survey results, most recent research on the potential impacts of malpractice tort limits has been based on analyses of observed patterns of health care utilization. Those analyses use econometric techniques to measure the association between observed levels of malpractice pressure and observed levels of health care utilization and spending. Analyses of this type have a potential advantage over surveys in that they measure actual clinical behavior rather than responses to hypothetical scenarios. The statistical methods and interpretations of those observational analyses are less straightforward than the physician surveys, however, because of the difficulties inherent in attempting to isolate the effects of malpractice pressure from the many other factors that affect patterns of medical practice.

Anecdotal reports have identified obstetric care, and in particular the use of cesarean section, as particularly vulnerable to malpractice pressures.[19] Several research papers have measured the association between malpractice pressures and the percentage of deliveries by cesarean section, with conflicting results.[20] In a paper on cesarean section, Dubay and her colleagues used an approach similar to the one used in this paper.[21] They found some evidence that growth in malpractice pressures over time is associated with an increased probability of delivery by cesarean section. Simulating the impact of imposing a cap on total awards in malpractice cases on obstetrical spending, they concluded that, while such a limit would reduce malpractice premiums substantially, it would decrease the rate of cesarean sections by only about one-half of 1 percentage point, with a corresponding reduction in overall obstetrical spending of about one-quarter of 1 percent.

Kessler and McClellan have written a series of papers examining the association between malpractice pressures and health care utilization and spending.[22] Those studies measured health care spending among a specific population: elderly Medicare fee-for-service (FFS) beneficiaries admitted to an inpatient hospital with a diagnosis of either ischemic heart disease (IHD) or acute myocardial infarction (AMI, or heart attack) between 1984 and 1994.[23] The studies' authors limited the population to

19. Office of Technology Assessment, *Defensive Medicine and Medical Malpractice*.

20. A.Russell Localio and others, "Relationship Between Malpractice Claims and Cesarean Delivery," *Journal of the American Medical Association*, vol. 269, no. 3 (January 20, 1993), pp. 366-373; and Laura-Mae Baldwin and others, "Defensive Medicine and Obstetrics," *Journal of the American Medical Association*, vol. 274, no. 20 (November 22, 1995), pp. 1606-1610.

21. Dubay, Kaestner, and Waidmann, "The Impact of Malpractice Fears on Cesarean Section Rates."

22. Daniel Kessler and Mark McClellan, "Malpractice Law and Health Care Reform: Optimal Liability Policy in an Era of Managed Care," *Journal of Public Economics*, vol. 84, no. 2 (May 2002), pp. 175–197; *How Liability Law Affects Medical Productivity*, Working Paper No. W7533 (Cambridge, Mass.: National Bureau of Economic Research, February 2000); and "Do Doctors Practice Defensive Medicine?"

23. Medicare fee-for-service beneficiaries are those enrolled in the traditional Medicare program (not in a private managed care plan). Most Medicare beneficiaries are enrolled in the fee-for-service program.

AMI/IHD patients in order to increase the homogeneity of the patient population, and they chose to focus on Medicare hospital spending among fee-for-service beneficiaries primarily because of the availability of data. One of the key results from those papers is the finding that so-called direct tort limits—which include caps on damage awards, a ban on punitive damages, no mandatory prejudgment interest, and changes in the treatment of collateral-source benefits—have a large negative association with the growth in Medicare hospital spending among AMI/IHD patients. Those results imply that, over the long run, direct tort limits reduce Medicare hospital spending on AMI/IHD patients by between 4 percent and 9 percent. Those research results have been used as the basis for predicting large potential reductions in health care spending from proposed tort limits.[24]

Although Kessler and McClellan's results have been widely cited, additional research is warranted. As previously stated, their research focused on a narrow patient population—Medicare beneficiaries with AMI/IHD—and used a narrow measure of health care spending—Medicare spending on short-stay hospital care.[25] The approach they used raises questions that this analysis attempts to address. First, do the Kessler/McClellan findings generalize to other populations and other measures of health care spending? Second, do the 1984-1994 results hold when longer time periods are examined? Third, are there important factors excluded from their analysis that could cause a spurious association between the implementation of tort limits and changes in Medicare hospital spending?

CBO's Empirical Analysis

This section describes the methodology and data sources that CBO used and presents the empirical results on the associations between tort limits and health care spending.

Methodology

The analysis uses a panel data approach, with health care spending per capita measured for each state in each year over the span of several decades. The basic specification is:

$$Y_{st} = \alpha_s + \beta_t + X_{st}\gamma + Z_{st}\delta + \varepsilon_{st}$$

where Y_{st} is a measure of the natural logarithm of per capita health care spending at the state-year level, α_{st} is a state-fixed effect, β_t is a year-fixed effect, X_{st} is a set of state-year economic and demographic controls, and Z_{st} represents a vector of tort limits. The state-fixed effects capture state-level differences in spending levels that are constant over the entire period. The year-fixed effects capture national spending

24. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, *Confronting the New Health Care Crisis*.

25. Medicare defines short-stay hospital care as care provided in a typical general hospital. Nearly all Medicare hospital stays take place in short-stay hospitals. Other types of hospitals include long-term care hospitals, psychiatric hospitals, and rehabilitation hospitals.

trends and may be thought of as factors reflecting price inflation as well as other sources of growth. The parameters of interest, δ, reflect the estimated effects of the presence of tort limits on health care spending. Because the dependent variables equal the natural logarithm of spending per capita, the coefficients of interest may be interpreted as percent effects on the level of health care spending per capita (for example, a coefficient of 0.010 implies an effect of 1 percent).[26] The key identifying assumption, which is examined below, is that the imposition of tort limits is not systematically correlated with factors that are not included in the model and that have independent effects on health care spending.[27]

Health care spending per capita, by state and year, is measured among two populations: all individuals living in a given state, and all Medicare FFS beneficiaries living in a given state. The data set includes health care spending per capita for all services, as well as separate measures of hospital spending per capita and physician spending per capita. Thus, the data set contains six separate measures of health care spending at the state-year level. State-year measures of spending per capita are adjusted for demographics to the extent possible, as described in Appendix A.

A significant portion of CBO's analysis focuses on Medicare fee-for-service beneficiaries for three reasons. First, Medicare beneficiaries account for a substantial share of federal spending on health care; analyses of spending among those individuals are, potentially, directly relevant to estimated effects of proposed tort limits on federal outlays. Second, detailed microdata on Medicare FFS spending and beneficiary demographics are available for the last three decades. Third, some of the previous literature on malpractice tort limits has focused on Medicare fee-for-service beneficiaries. Examining that same population in the current analysis facilitates comparisons between the findings presented here and those earlier findings.

Tort limits are coded in two ways. The primary set of regression specifications includes a separate indicator variable for each of a selected package of tort limits—a cap on noneconomic damages, modification or elimination of joint-and-several liability, a cap on attorneys' fees, allowing evidence of collateral-source benefits to be

26. Technically, the percentage effect of an indicator variable in a semilogarithmic specification should be approximated as $100 \times exp(\beta^{hat} - 1/2V^{hat}(\beta^{hat}))$, where β^{hat} is the estimated coefficient for the indicator variable and $V^{hat}(\beta^{hat})$ is the estimated variance of the coefficient estimate. See P.E. Kennedy, "Estimation with Correctly Interpreted Dummy Variables in Semilogarithmic Equations," *American Economic Review,* vol. 71, no. 4 (September 1981) p. 801. However, since all of the estimated coefficients on the tort limits are relatively close to zero, applying Kennedy's correction would produce almost no difference in the reported results. For transparency and simplicity, CBO reports the unadjusted coefficient estimates in the results tables and interprets them as percentage effects.

27. If observable factors could be identified that were correlated with the imposition of tort limits but were not correlated with factors affecting health care spending that are omitted from the analysis, then those factors could be used in an "instrumental variables" analysis. CBO's analysis and discussions with other researchers did not identify a suitable set of instruments.

introduced at trial, and a cap or ban on punitive damages.[28] In a second specification, the tort limits are coded into two variables, "direct" and "indirect," corresponding to the approach used in previous research by Kessler and McClellan. The direct tort limit variable is set equal to one if any of the following limits is in place (and zero otherwise): a cap on noneconomic damages, a cap on total damages, a ban on punitive damages, or a collateral-source rule (mandatory offset). The indirect tort limit variable is set equal to one if either of the following limits is in place (and zero otherwise): a cap on attorneys' fees or modification or elimination of joint-and-several liability.

Standard errors are estimated using the Huber-White correction, with observations clustered at the state level.[29] Clustering at the state level allows error terms to be correlated across years within states. The measures of Medicare spending per beneficiary are generated using a 5 percent sample of beneficiaries, which includes between 1.5 million and 2.2 million beneficiaries each year. [30]

The main analyses (which are presented later in this paper) are weighted by population. For the analyses of overall health care spending per capita, the weight is the population in each state and year. For the analyses of Medicare spending per beneficiary, the weight is the number of fee-for-service Medicare beneficiaries included in the

28. A variable for the statute of limitations was not included in this study because of insufficient variation among the states with respect to a limit of three years from the date of the injury, which has been included in some recent Congressional proposals. Complete elimination of joint-and-several liability is coded as 1.0; weakening the application of joint-and-several liability by, for example, limiting its application to defendants who are responsible for more than a certain share of the injury, is coded as 0.5, implying that modifying the law in this way is equivalent to half the effect of eliminating it altogether. Given that coding scheme, estimated coefficients should be interpreted as the effect of eliminating joint-and-several liability. An indicator variable, also referred to as a dummy variable, takes on values of either zero or one.

29. The analyses were performed in SAS using a routine that produces standard errors equivalent to those generated by the robust cluster(stateID) option in STATA. A recent paper demonstrated that the choice of clustering unit can have important implications for estimated standard errors and Type I error rates. See Marianne Bertrand, Esther Duflo, and Sendhil Mullainathan, "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, vol. 119, no. 1 (February 1, 2004), pp. 249-275. In panel analyses such as this one, with serially correlated laws being used to predict serially correlated outcomes, clustering at the state level is appropriate; clustering instead at the state-year level would probably result in underestimated standard errors and overrejection of the null hypothesis. An alternative set of standard errors was calculated in STATA using bootstrapping methods, again clustering at the state level. Those bootstrapped standard errors (not shown) were quite similar to the parametric standard errors presented in the tables.

30. Despite the highly skewed nature of health care spending, that sample is large enough that standard errors on the estimated sample means are generally small relative to the estimated means. For each state-year, mean Medicare spending per beneficiary is estimated as well as the ratio of estimated standard error to estimated mean. Out of 1,224 state-years (51 states times 24 years), this ratio was below 0.1 for 1,217 state-years, below 0.05 for 1,106 state-years, and below 0.02 for 588 state-years.

sample in each state and year. Appendix B presents alternative specifications, including unweighted analyses.

Health care spending per capita and Medicare spending per beneficiary are measured among all individuals in the relevant population, without limiting the analysis to individuals with a specific medical condition. However, spending measures are adjusted for demographics, and age-adjusted mortality rates are included as a control variable—those methods control to some extent for differential changes across states in health status. In an alternative specification, CBO included state-specific time trends, which provide additional controls for differential changes in health status. The results from that specification are reported in Appendix B.

Restricting the analysis to individuals with a specific medical condition, as other researchers have done, might improve the precision of the estimates but would adversely affect both the generalizability and the internal validity of the findings. [31] The goal of CBO's analysis is to estimate the magnitude of the impact of proposed tort limits on overall health care spending. Results obtained from a sample restricted to a specific medical condition would have limited generalizability because they would not be applicable to all health care spending without making the implausible assumption that tort limits affected all conditions similarly.

Restricting the analysis to patients diagnosed with a particular medical condition might also limit the internal validity of the analysis, because the clinical processes by which patients are identified as having certain medical conditions might reflect malpractice pressures. ("Internal validity" refers to the extent to which an estimated effect reflects the true causal impact of interest.) To use a specific example, the causal effect of interest might be the effect of malpractice pressures on health care spending per capita among individuals with heart disease. An individual who arrives at an emergency room with symptoms of heart disease may or may not be admitted to the hospital, depending to a great extent on the clinician's judgment.[32] If a physician's decision to admit an individual to the hospital is affected by the fear of being sued for malpractice, then the number of individuals who have been admitted to the hospital with chest pain and their average underlying illness severity will be determined in part by malpractice pressures. Estimating the effects of malpractice pressures only among individuals who have been admitted to the hospital with symptoms of heart disease might not, therefore, measure the causal relationship of interest, that is the effect of malpractice pressures on per capita spending.

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31. For example, see Kessler and McClellan, "Do Doctors Practice Defensive Medicine?" and Dubay, Kaestner, and Waidmann, "The Impact of Malpractice Fears on Cesarean Section Rates."

32. David A. Katz and others, "Emergency Physicians' Fear of Malpractice in Evaluating Patients with Possible Acute Cardiac Ischemia," *Annals of Emergency Medicine*, vol. 46, no. 6 (July 2005), pp. 525-533; Office of Technology Assessment, *Defensive Medicine and Medical Malpractice*; and David M. Cutler, Mark B. McClellan, and Joseph P. Newhouse, "How Does Managed Care Do It?" *Rand Journal of Economics*, vol. 31, no. 3 (Autumn 2000), pp. 526–548.

Data Sources and Spending Measures

The data set that CBO used combines yearly state-level data on the tort rules regulating medical malpractice cases with data on overall health care spending per capita and Medicare spending per beneficiary, as well as demographic and macroeconomic controls. The analyses of health care spending per capita are based on the years from 1980 to 2000, and the analyses of Medicare spending per beneficiary are based on the years from 1980 to 2003.

State Tort Laws. Data on state laws were gathered from several sources, with discrepancies resolved by consulting the relevant state statutes.[33] In general, recent Congressional proposals were used as a guide in defining criteria for whether a state had a particular tort limit in place. For example, for changes to the collateral-source rule, states are coded as having imposed a limit if they allow evidence of collateral-source benefits to be presented to the jury in a trial.

Overall Health Care Spending per Capita. The data source for overall health care spending per capita among all individuals is the state health expenditures (SHE) published by the Centers for Medicare and Medicaid Services (CMS).[34] The analysis uses measures of spending per capita on personal health care from the SHE, as well as separate measures of spending per capita on hospital care and spending per capita on physician care.[35] In constructing the SHE, CMS uses as its main data sources the Census Bureau's Economic Census and administrative data from the Medicare and Medicaid programs. The Economic Census is only performed every five years; CMS uses other data sources to estimate trends between those censuses, including wage data from the Bureau of Labor Statistics and data on business receipts from the Internal Revenue Service.

CMS publishes two sets of spending measures: residence-based measures (in which spending is allocated to states on the basis of patients' state of residence) and provider-

33. McCullough, Campbell & Lane, *Summary of Medical Malpractice Law* (last updated August 9, 2005), available at www.mcandl.com/introduction.html; American Tort Reform Association, *State Civil Justice Reforms* (2005), available at www.atra.org/states/; National Conference of State Legislatures, *Medical Malpractice Tort Reform* (updated January 13, 2005), available at www.ncsl.org/standcomm/sclaw/medmaltorttable205.htm; and National Association of Mutual Insurance Companies, *Tort Reform: An Overview of State Legislative Efforts to Improve the Legal System* (updated February 8, 2005), available at www.namic.org/reports/tortReform/overview.asp.

34. See Centers for Medicare and Medicaid Services, State Health Accounts by State of Residence, State of Residence Methodology, State Health Expenditure Accounts, and State Health Accounts (all updated March 1, 2006), available at www.cms.hhs.gov/NationalHealthExpendData/05_NationalHealthAccountsStateHealthAccounts.asp.

35. Personal health care spending equals total spending on health care minus the following: administration of public and private insurance programs, government public health activities, research, and construction of facilities. Physician care includes physician and other professional services, as defined by the Centers for Medicare and Medicaid Services. Hospital care and physician care accounted for about two-thirds of all personal health care spending in 2000.

based measures (in which spending is allocated to states on the basis of a given provider's location). Data for residence-based spending are available only for 1991 through 1998. For those years, CMS's published residence-based data are used. For all other years, residence-based spending is estimated by multiplying provider-based spending by the ratio of residence- to provider-based spending in the closest year for which both sets of data are available (1991 for earlier years and 1998 for later years). Because all of the analyses include state indicator variables, the discrepancy between residence- and provider-based spending only affects the results to the extent that the ratio of residence- to provider-based spending changed differentially across states. An examination of those ratios in the years for which data are available shows that most ratios are near 1 and that those ratios are fairly stable over time.[36] Per capita measures of health care spending equal total spending in each state divided by that state's population. The population for each state-year is calculated from the 2003 Area Resource File (ARF), which includes population counts from the decennial census and estimates for intercensal years.[37]

Medicare Spending per Beneficiary. The Continuous Medicare History Sample (CMHS) is used to calculate Medicare spending per beneficiary. That data set includes annual beneficiary-level demographic, spending, and utilization data for a 5 percent national sample of beneficiaries. That sample is quite large, representing between 1.5 million and 2.2 million beneficiaries per year, depending on the year. The key dependent variables include Medicare fee-for-service outlays per fee-for-service beneficiary, as well as separate measures of per-beneficiary outlays for Part A (hospital) and Part B (physician). Medicare outlays include only the amount reimbursed by Medicare and do not include beneficiaries' cost sharing or third-party payments. Also note that the Medicare spending data differ from the SHE data in how spending

36. In 1998, 41 states had a ratio of residence-based spending to provider-based spending of between 0.95 and 1.05. Wyoming had the highest ratio at 1.16, and the District of Columbia had the lowest at 0.81. See Anne Martin and others, "Health Care Spending During 1991-1998: A Fifty-State Review," *Health Affairs*, vol. 21, no. 4 (July/August 2002), pp. 112-126.

37. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions, "User Documentation for the Area Resource File," February 2003 release. The state-year population for 2003 is not available in the 2003 Area Resource File; population in 2001 and 2002 is used to linearly extrapolate the population in 2003.

is allocated to hospital versus physician spending.[38] Because utilization and spending data are not available for Medicare beneficiaries in private managed care plans, beneficiaries are excluded from the analysis for any year in which they were enrolled in a managed care plan. The measures of Medicare spending per beneficiary equal total Medicare outlays divided by the total person-years of enrollment (both outlays and person-years are limited to beneficiaries not enrolled in a managed care plan). Person-years of enrollment take into account the date of enrollment in Medicare and the date of death, if applicable.[39]

Demographic Adjustments to Health Care Spending. Measures of health care spending from both data sources are adjusted for state-year demographics. For the SHE data, the Integrated Public Use Microdata Series 5 percent census samples are used to estimate the percentage of the population in each age group for 1980, 1990, and 2000. State-specific linear interpolation and extrapolation are used to estimate population by age group in intercensal years. To adjust Medicare spending for demographics, data are used from the CMHS on age, sex, and race. Appendix A provides details on the demographic adjustments to the health care spending measures.

Demographic and Economic Controls. The regression analyses also include state-year measures of the following demographic and economic controls: the percentage of Medicare beneficiaries in managed care (from the CMHS microdata); attorneys per capita (compiled from various publications from the American Bar Association); gross state product per capita (from the Bureau of Economic Analysis); age-adjusted mortality rates (from the National Center for Health Statistics); the percentage of adults without a high school diploma, the percentage of people that are black, and the percentage of people residing in urban areas (all from the Area Resource File); and the

38. State health expenditures are allocated to hospital care versus physicians' services on the basis of the type of establishment providing the service (hospital versus physician's office). Medicare fee-for-service outlays are allocated to Parts A and B on the basis of the type of service being provided. Medicare fee-for-service outlays for Parts A and B add up to total Medicare fee-for-service outlays, whereas state health expenditures for hospital care and physicians' services do not add up to total state health care expenditures (minor spending categories, such as home health care and prescription drugs, make up that difference). Inpatient hospital care constitutes by far the largest component of Medicare Part A spending, but Part A also includes other services such as skilled nursing facility care. Likewise, physicians' services make up the largest component of Medicare Part B spending, but other types of services, such as home health care, are also included in Part B. To illustrate how spending is allocated differently, skilled nursing facility care is included in Medicare Part A spending, whereas skilled nursing facility care is included in the hospital care component of state health expenditures only if the care is provided in a hospital-based facility.

39. CMS has notified CBO that an error in the programs used to construct the CMHS data set affected spending measures for 1998 and some later years. The error incorrectly included in spending for a given year some spending that actually occurred in other years; the result is that the CMHS appears to overstate spending per beneficiary in the affected years by about 15 percent or less. The error tends to decrease the precision of the state-year Medicare spending measures in later years but does not introduce a systematic bias in the results. To test the potential impact of that data processing error, the key regression models using Medicare spending data were rerun excluding 1998 and later years; those results are consistent with the main conclusions of this study.

percentage of the workforce that is unemployed (from the Bureau of Labor Statistics).[40]

Table 1 presents descriptive statistics on state-level measures of tort law, health spending (in nominal dollars), and demographic and economic controls for the years 1980, 2000, and 2003. (The year 1980 is the first year included in the analyses, 2000 is the latest year for which overall health care spending per capita is available, and 2003 is the latest year for which Medicare spending per beneficiary is available.) Of the tort limits listed, a substantial share of states implemented those limits during the period analyzed.

Results

Tables 2 and 3 summarize the results from a series of regression models, where each model uses either a different measure of health care spending as the dependent variable or a different set of tort limit variables. Table 2 presents analyses of state-level overall health care spending per capita, while Table 3 presents analyses of state-level Medicare spending per beneficiary. The regression results from four of the 12 models are also displayed visually in Figure 2. Those four models include indicator variables for each tort limit and use the following dependent variables: overall hospital spending per capita, overall physician care spending per capita, Medicare Part A spending per beneficiary, and Medicare Part B spending per beneficiary.[41] A more complete set of results with alternative specifications is presented in Appendix B.

The results in Tables 2 and 3 and in Figure 2 present a mixed picture. Focusing first on tort limits with statistically significant coefficients in the models of overall health care spending per capita, the analyses show that eliminating the joint-and-several liability rule is associated with increases in health care spending per capita and hospital spending per capita.

Focusing next on tort limits that appear to have some association with spending per capita but do not reach statistical significance at conventional levels, there are several additional findings to note.[42] A cap on noneconomic damages, allowing evidence of collateral-source benefits to be introduced at trial, a cap or ban on punitive damages,

40. The ARF provides information on the percentage of adults without a high school diploma, the percentage of the population that is black, and the percentage of the population residing in urban areas only for the years of the decennial census (1980, 1990, and 2000). Linear interpolation and extrapolation are used to impute those percentages for other years.

41. Figure 2 does not show the results from the analyses of overall health care spending per capita and overall Medicare spending per beneficiary because those spending measures reflect, to a large extent, the combined effects of the other spending measures.

42. Coefficients in this category include those for which the estimated t-statistics are greater than 1 in absolute value but not statistically significant at the 10 percent level.

Table 1.

Descriptive Statistics on Health Care Spending and Tort Limits

	1980	2000	2003
Health Care Spending Measures (Nominal dollars)			
Overall health care spending per capita	950 (140)	4,040 (500)	N.A.
Overall hospital spending per capita	450 (90)	1,470 (240)	N.A.
Overall physician spending per capita	220 (50)	1,170 (170)	N.A.
Medicare spending per beneficiary	1,220 (210)	5,290 (720)	6,150 (730)
Medicare Part A spending per beneficiary	830 (130)	3,070 (440)	3,530 (450)
Medicare Part B spending per beneficiary	390 (90)	2,220 (330)	2,620 (340)
Number of States with Tort Limits			
Cap on noneconomic damages	2	19	24
Modification or elimination of joint-and-several liability[a]	3	32	35
Cap on attorneys' fees	8	15	15
Collateral-source rule (jury notification)[b]	3	8	8
Cap or ban on punitive damages	2	21	24
Statute of limitations (1-3 years from action)	50	50	50
Any "direct" tort limit	10	33	38
Any "indirect" tort limit	10	37	40
Demographic and Economic Controls			
Percentage of Medicare beneficiaries in managed care	1 (2)	19 (12)	14 (11)
Attorneys per 100,000 people	230 (61)	345 (123)	347 (135)
Gross state product per capita (Thousands of dollars)	12 (2)	35 (6)	38 (7)
Age-adjusted mortality rate per 100,000 people	1,040 (60)	870 (70)	840 (80)
Percentage of adults without a high school diploma	34 (6)	20 (4)	18 (4)
Percentage of people that are black	12 (8)	12 (8)	12 (8)
Percentage of people residing in urban areas	74 (13)	79 (13)	80 (13)
Percentage of the workforce that is unemployed	7 (2)	4 (1)	6 (1)

Source: Congressional Budget Office.

Notes: Standard deviations appear in parentheses. Means and standard deviations of the health care spending measures and demographic and economic controls are weighted by state population.

N.A. = not available.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

Table 2.

Summary of Regressions of Overall Health Care Spending per Capita on Tort Limits

	Overall Health Care Spending per Capita		Overall Hospital Care Spending per Capita		Overall Spending on Physician and Clinical Services per Capita	
Tort Limit	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Cap on Noneconomic Damages	-0.014		-0.016		-0.018	
	(0.010)	n.a.	(0.012)	n.a.	(0.017)	n.a.
Elimination of Joint-and-Several Liability[a]	0.040***		0.047***		0.022	
	(0.011)	n.a.	(0.015)	n.a.	(0.021)	n.a.
Cap on Attorneys' Fees	0.007		-0.018		0.001	
	(0.021)	n.a.	(0.023)	n.a.	(0.035)	n.a.
Collateral-Source Rule (Jury notification)[b]	-0.032		-0.037		-0.007	
	(0.024)	n.a.	(0.030)	n.a.	(0.020)	n.a.
Cap or Ban on Punitive Damages	-0.007		-0.019		0.002	
	(0.011)	n.a.	(0.014)	n.a.	(0.014)	n.a.
Sum of Tort Limit Coefficients	-0.005		-0.044		-0.001	
	(0.034)	n.a.	(0.043)	n.a.	(0.031)	n.a.
Any "Direct" Tort Limit	n.a.	-0.008	n.a.	-0.024		-0.003
		(0.011)		(0.014)	n.a.	(0.014)
Any "Indirect" Tort Limit	n.a.	0.020	n.a.	0.023		0.000
		(0.015)		(0.019)	n.a.	(0.019)

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

Each column represents a separate regression model using state-year spending data. The dependent variables equal the natural logarithm of health care spending per capita. Each model includes the 50 states plus the District of Columbia and covers the period from 1980 through 2000. Observations are weighted by state population. The natural logarithm of health care spending per capita is adjusted for demographics as described in the text. All models also include state- and year-fixed effects and economic and demographic controls (coefficients are not shown).

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

Table 3.

Summary of Regressions of Medicare Spending per Beneficiary on Tort Limits

	Medicare Spending per Beneficiary		Part A (Hospital) Spending per Beneficiary		Part B (Physician) Spending per Beneficiary	
Tort Limit	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Cap on Noneconomic Damages	-0.040***	n.a.	-0.052***	n.a.	-0.016	n.a.
	(0.014)		(0.017)		(0.015)	
Elimination of Joint-and-Several Liability[a]	0.053***	n.a.	0.056**	n.a.	0.040**	n.a.
	(0.018)		(0.024)		(0.019)	
Cap on Attorneys' Fees	-0.005	n.a.	-0.011	n.a.	0.002	n.a.
	(0.024)		(0.029)		(0.015)	
Collateral-Source Rule (Jury notification)[b]	-0.043	n.a.	-0.061	n.a.	0.015	n.a.
	(0.036)		(0.042)		(0.026)	
Cap or Ban on Punitive Damages	0.017	n.a.	0.021	n.a.	0.001	n.a.
	(0.015)		(0.018)		(0.015)	
Sum of Tort Limit Coefficients	-0.018	n.a.	-0.047	n.a.	0.043	n.a.
	(0.049)		(0.055)		(0.036)	
Any "Direct" Tort Limit	n.a.	-0.035*	n.a.	-0.046*	n.a.	-0.014
		(0.019)		(0.023)		(0.017)
Any "Indirect" Tort Limit	n.a.	0.028	n.a.	0.023	n.a.	0.037**
		(0.027)		(0.032)		(0.018)

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

Each column represents a separate regression model using state-year spending data. The dependent variables equal the natural logarithm of spending per beneficiary. Each model includes the 50 states plus the District of Columbia and covers the period from 1980 through 2003. Observations are weighted by the number of Medicare fee-for-service beneficiaries in the sample. The natural logarithm of spending per beneficiary is adjusted for demographics as described in the text. All models also include state- and year-fixed effects and economic and demographic controls (coefficients are not shown).

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

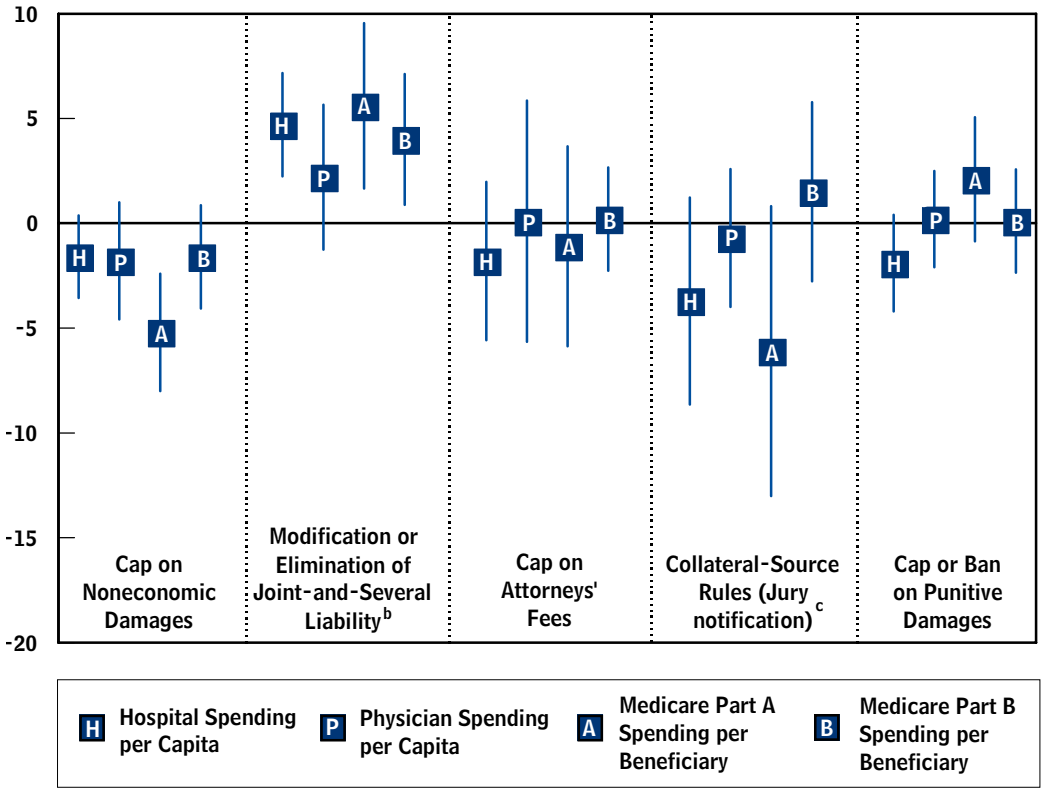
a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

Figure 2.

Summary of Findings on Tort Limits

(Percentage impact of tort limit on per capita spending)[a]



Source: Congressional Budget Office.

Note: The vertical lines indicate a 90 percent confidence interval. A coefficient estimate is statistically significant at the 10 percent level if the 90 percent confidence interval line does not cross the zero line.

a. The percentage impacts are the coefficients from regressions of the natural log of spending per capita.

b. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury

c. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

and any direct tort limit are each associated with reductions in health care spending for at least one of the three categories of spending per capita. Eliminating joint-and-several liability is associated with an increase in spending per capita on physician care, and any indirect tort limit is associated with an increase in hospital spending per capita and overall spending per capita.

The results in Table 2 can be used to estimate the impact on spending of changing from a legal regime in which no tort limits are in place to one in which all five of the selected tort limits are in place. That estimated impact can be calculated by summing the coefficients for the individual tort limits. For health care spending per capita and physician spending per capita, the sum of the coefficients for the individual tort limits is near zero. The sum of the coefficients in the model of hospital spending per capita is -0.044, which has a t-statistic greater than 1 in absolute value but is not statistically significant at conventional levels.

The results in Table 3 using Medicare spending data provide more support for the proposition that tort limits affect health care spending. The cap on noneconomic damages and the direct tort limit variable (which includes a cap on noneconomic damages) both produce statistically significant negative coefficients for the measures of Medicare spending per beneficiary and Medicare Part A (hospital) spending per beneficiary.[43] The coefficients on eliminating joint-and-several liability are statistically significant and positive for all three Medicare spending categories, and in the model of Medicare Part B spending per beneficiary the indirect limit variable (which includes the variable for eliminating joint-and-several liability) has a statistically significant positive coefficient.

Focusing next on coefficients in the Medicare spending models that appear to have some association with health care spending but do not reach statistical significance at conventional levels, noneconomic caps are associated with a reduction in Medicare Part B spending, and allowing evidence of collateral-source benefits to be introduced at trial is associated with reductions in spending in the models of total Medicare

43. Short-stay hospital spending makes up the bulk of Medicare Part A spending. A separate set of analyses was run in which Medicare short-stay hospital spending per beneficiary was regressed on tort limits and the other controls included in the main analysis. In the analyses of Medicare short-stay hospital spending per beneficiary, capping noneconomic damages was associated with a statistically significant 4.3 percent reduction in short-stay hospital spending, while eliminating joint-and-several liability was associated with a statistically significant 5.4 percent increase in short-stay hospital spending. CBO performed further analyses to identify whether the associations between those tort limits and Medicare short-stay hospital spending per beneficiary were driven by changes in hospital stays per beneficiary or changes in payments per hospital stay. For both tort limits (capping noneconomic damages and eliminating joint-and-several liability), the associations with changes in Medicare short-stay hospital spending per beneficiary are attributable primarily to changes in payments per stay, rather than changes in stays per beneficiary, suggesting that most of the observed effect of tort limits on Part A spending is not due to changes in utilization.

spending and Medicare Part A spending. A cap or ban on punitive damages and any indirect tort limit were associated with increases in spending in one or more of the models. Considering the total effect of all of the tort limits together, the sums of the coefficients of the individual limits are not statistically significant for any of the three measures of Medicare spending.[44]

In several of those analyses, two results recur: capping noneconomic damages is associated with reductions in health care spending, and eliminating joint-and-several liability is associated with increases in spending. A simple correlation analysis (weighted by state population) shows that those two tort limits are only weakly positively correlated (they have a correlation coefficient of 0.24).[45] Two additional regressions were run to test for the possibility that the correlation might be producing misleading results in the main analysis, which includes both variables. Each alternative regression included only a single tort limit variable, either a cap on noneconomic damages or the elimination of joint-and-several liability, along with the controls included in the main models. Both of those alternative regressions yielded essentially the same estimates of the tort limit coefficients and with the same level of statistical significance as when the two variables were included together along with the other three tort limit variables.

That eliminating joint-and-several liability would be associated with increases in health care spending seems counterintuitive, although it is consistent with Kessler and McClellan's findings.[46] Eliminating joint-and-several liability would limit each defendant's financial liability to his or her share of responsibility for an alleged injury, which would reduce the awards actually paid in cases where some of the defendants did not have adequate resources to pay their full share of the award. By reducing the expected award payment, eliminating joint-and-several liability would, thus, reduce the attractiveness of filing a malpractice claim. That outcome would be expected to reduce the overall cost to providers of malpractice claims and, therefore, to lessen the pressure on them to practice defensive medicine. W. Kip Viscusi and others (1993) and Patricia Born and others (2006) provide support for that hypothesis: they found that eliminat-

44. In the analysis of Medicare Part B spending per beneficiary, the sum of the coefficients of the individual tort limits equals 0.043; that estimate is not statistically significant at conventional levels but has a t-statistic greater than 1.

45. Technically, the correlation of interest is not the simple correlation between the two tort limits but rather the partial correlation between the two tort limits after adjusting for all the other covariates included in the analysis. To measure that partial correlation, the two tort limits were regressed separately on the control variables included in the main analysis and the residuals were calculated. The correlation between the residuals from those regressions equals only 0.04. That very small correlation is consistent with the subsequent finding that the respective coefficients on a cap on noneconomic damages and elimination of joint-and-several liability are unchanged if either of those two tort limits is dropped from the regression.

46. See Kessler and McClellan, "Do Doctors Practice Defensive Medicine?" The authors find that any "indirect reform," which includes eliminating joint-and-several liability, is associated with an increase in Medicare short-stay hospital spending on heart attack patients of 1.8 percent (AMI patients) to 3.4 percent (IHD patients).

ing joint-and-several liability appeared to reduce medical malpractice insurers' losses and medical malpractice insurance premiums.[47] Other research regarding the effect of eliminating joint-and-several liability on medical malpractice premiums has been inconclusive.[48]

There is an alternative hypothesis that is consistent with a positive relationship between eliminating joint-and-several liability and increases in health care spending. Although eliminating joint-and-several liability might reduce overall malpractice premiums as described above, it could increase malpractice premiums for at least some physicians. That could occur if the elimination of joint-and-several liability made physicians responsible for paying a larger share of damage awards (and made hospitals responsible for paying a smaller share of damage awards), and if from the physician's point of view, paying a larger share of damage awards more than offset any reduction in the number of claims filed. Given that physicians could see their malpractice premiums increase as a result of the elimination of joint-and-several liability, it is conceivable that eliminating joint-and-several liability might increase both the practice of defensive medicine and health care costs in general. CBO has not found any direct empirical evidence to support that hypothesis, however.

The fact that results found using the Medicare data differ from those found using the broader measures of state health care spending could call into question the quality of the broader state data. Indeed, as noted earlier, those data are based in part on the Economic Census, which is conducted only once every five years. Substantial interpolation is required for between-census years. To test the influence of the between-census-year observations on the results of the analyses of overall health care spending, a separate analysis was conducted that included only the years in which the Economic Census was performed. The results of that analysis, although it included less than one-fifth of the data available, are very similar to the main results presented in Table 2. The only systematic difference is that the standard errors are slightly larger in the models that include only the census years. Moreover, when the models of Medicare spending are reestimated using only data for every fifth year, the results are very similar to those originally displayed in Table 3 for Medicare. Thus, that further analysis indicates that lower-quality data do not appear to explain the weaker results found using the SHE data versus the Medicare data.

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47. See W. Kip Viscusi and others, "The Effect of 1980s Tort Reform Legislation on General Liability and Medical Malpractice Insurance, *Journal of Risk and Uncertainty*, vol. 6, no. 2 (April 1993), pp.165-186; and Patricia Born, W. Kip Viscusi, and Tom Baker, *The Effects of Tort Reform on Medical Malpractice Insurers' Ultimate Losses*, Working Paper No. 12086 (Cambridge, Mass.: National Bureau of Economic Research, March 2006), available at http://papers.nber.org/papers/w12086.pdf.

48. CBO was unable to identify a statistically significant relationship between the joint-and-several liability rule and medical malpractice premiums in previous analyses of legislation imposing malpractice tort limits.

Specification Tests

The key identification assumption in the analyses presented in Tables 2 and 3 is that the imposition of state-level tort limits is not correlated with factors that are not included in the model and that are driving differential spending trends across states. CBO undertook three tests of the validity of that assumption. The first two tests involved comparing spending trends in states that implemented tort limits with states that did not. If, in the period prior to implementation of tort limits, the trends in states that later implemented tort limits differed substantially from trends in states that did not, then that would suggest that there may be important differences between those two groups of states. For example, implementation of tort limits could be part of a broader set of initiatives designed to limit growth in health care spending.

Graphical Comparison

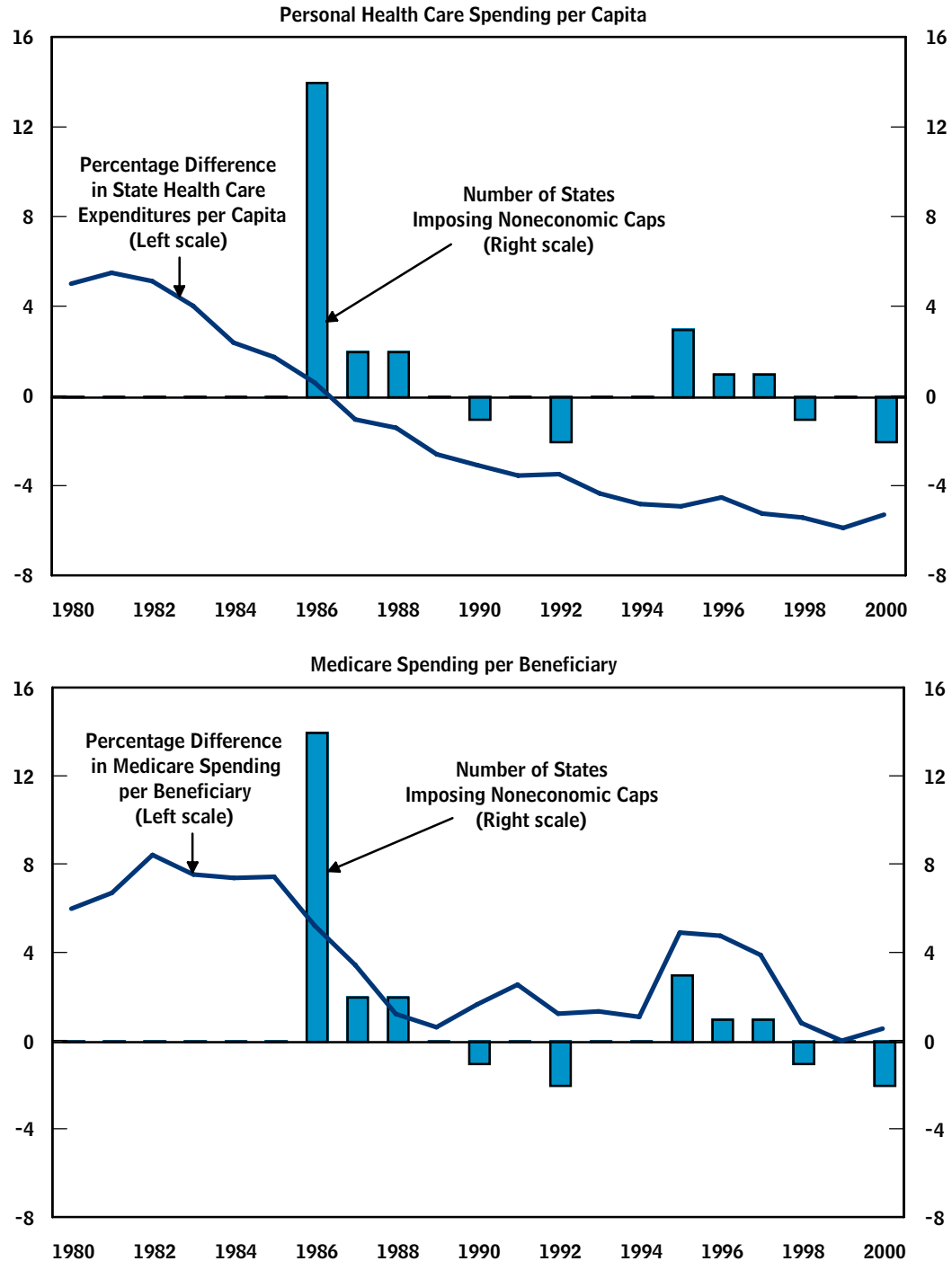
The first specification test is a simple graphical analysis of spending trends in states that passed tort limits versus states that did not. The test consists of analyzing the percentage difference in spending per capita between states that imposed a cap on noneconomic damages at some point versus states that never imposed a noneconomic cap.[49] That analysis focuses on caps on noneconomic damages for two reasons: first, based on the Medicare spending results described earlier, that type of limit appears to have a relatively strong association with reductions in health care spending; and, second, noneconomic caps have been found in earlier CBO research to be strongly associated with reductions in malpractice claims and malpractice insurance premiums. Both overall health care spending per capita and Medicare spending per beneficiary are examined. Each state is assigned to one of three groups: states that had a noneconomic cap in place in 1980 (two states), states that imposed a noneconomic cap at some point between 1981 and 2003 (27 states), and states that had never imposed a noneconomic cap during the period (22 states).

The results, shown in Figure 3, indicate that in 1980 states that later imposed noneconomic caps had higher spending than states that did not impose caps (4.9 percent higher health care spending per capita and 5.9 percent higher Medicare spending per beneficiary). For overall health care spending per capita, that spending gap declined to 0.1 percent by 1986. For Medicare spending per beneficiary, the spending gap widened from 1980 to 1982, then shrank somewhat, and then began to fall dramatically beginning in 1986. It should be noted that the wave of noneconomic caps, and tort limits in general, did not begin until 1986. (The number of states imposing noneconomic caps in each year is indicated in Figure 3 by the vertical bars.)

49. The percentage difference in spending equals the difference in per capita spending (states that imposed caps versus states that did not) divided by spending per capita in states that did not impose caps. All spending measures are adjusted for demographics. Mean spending per capita in each group of states (those that imposed caps and those that did not) equals the population-weighted mean of the state-level measures of spending per capita.

Figure 3.

Percentage Difference in Spending for Health Care Between States with Caps on Noneconomic Damages and States with No Caps, 1980 to 2000



Source: Congressional Budget Office.

The key findings from Figure 3 are that states that later imposed noneconomic caps started the period with higher overall spending per capita, and that between 1982 and 1986 the gap in spending shrank. After the wave of noneconomic caps began in 1986, that differential trend continued, with overall spending per capita in states that imposed noneconomic caps eventually dropping well below spending in states that did not impose caps. For Medicare spending per beneficiary, states that imposed noneconomic caps began the period with higher spending, but the gap did not begin to shrink until 1986. The key questions, which cannot be resolved with the available data, are: 1) whether the observed differential trends in overall health care spending per capita after 1986 in those states that capped noneconomic damages were merely a continuation of a spending reduction process or trend that had already begun in those states or were caused by passage of tort limits; and 2) whether the differential trend in Medicare spending per beneficiary beginning in 1986 in those states that capped noneconomic damages was caused by the implementation of that tort limit or by other factors.

The Addition of "Lead" Variables

To test more specifically for differences in spending trends between states that later imposed caps and states that did not, a second specification test was performed in which a set of "lead" variables was added to the models in Tables 2 and 3. For each tort limit, a variable was created that was set to 1 in a given year if the state imposed that tort limit one to three years in the future and set to zero otherwise. If the coefficients on those lead variables were negative and statistically significant, for example, that would indicate that spending had begun to decline in states that later implemented tort limits *prior to* implementation of the tort limits themselves. That finding would suggest that passage of tort limits occurred after relative spending reductions had begun, calling into question whether tort limits caused the observed relative spending declines.[50] Appendix C illustrates the construction of the lead variables for two selected states—Alaska and Alabama—and provides detailed regression results from models that include the lead variables.[51]

The discussion of the results using the lead variables will focus on those tort limits that had statistically significant coefficients in the main analyses in Tables 2 and 3. In the original models of overall health care spending per capita, the only tort limit with a statistically significant coefficient was the elimination of joint-and-several liability in

50. Relative spending means spending relative to the national trend in health care spending. The tort limit variables are defined on the basis of the date of implementation, which may differ from the date on which the tort limit is passed by the state legislature. Conceivably, physicians might adjust their practice patterns in response to a tort limit prior to the tort limit's date of implementation if physicians either mistakenly assumed that the tort limit would go into effect immediately upon passage, or if they simply adjusted in anticipation of changing conditions.

51. In general, tort limits only affect claims involving injuries that occur after the law goes into effect. Thus, it is unlikely that providers would have any incentive to alter their practice patterns prior to the effective date of the limit.

the models of health care spending per capita and hospital spending per capita. When the lead variables are included in those models, the elimination of joint-and-several liability one to three years in the future is associated with statistically significant increases in current-year spending, which suggests that relative spending in states that eliminated joint-and-several liability began to increase before that tort limit was implemented (see Table C-2).

In the models of total Medicare spending per beneficiary and Medicare Part A spending per beneficiary, the lead variables for caps on noneconomic damages have negative coefficients, though the coefficient on the lead variable in the model of Medicare spending per beneficiary is not statistically significant. The lead variables for any direct reform are near zero (see Tables C-5 and C-6). In the three models of Medicare spending per beneficiary, none of the lead variables on eliminating joint-and-several liability is statistically significant, nor is the lead variable on any indirect reform in the model of Medicare Part B spending per beneficiary (see Table C-7).

The results on the lead variables provide evidence that, in some cases, the relative spending changes associated with certain tort limits began prior to implementation of those limits. That suggests that other factors might have been driving differential trends in states that implemented tort limits. One such factor may have been general concern at the state level with high health care spending, which could have resulted in state or private-sector actions to rein in rising costs, in addition to the imposition of tort limits.

The Addition of Controls for Medicare's Prospective Payment System for Hospitals

The fact that tort limits have stronger associations with changes in Medicare spending than with changes in spending among each state's entire population seems at odds with other evidence that elderly people are less likely to file malpractice claims and are paid smaller amounts in malpractice cases in which they prevail. That raises the question of whether certain policy changes specific to Medicare might have coincided with the implementation of tort limits and been driving Medicare spending trends, confounding the estimates of the effects of tort limits. The most obvious candidate for such a policy change is the implementation, beginning in 1983, of Medicare's new prospective payment system for hospitals. That new payment system, which was phased in over several years, dramatically affected the payments that hospitals received from Medicare. The new PPS compressed payment rates differentially across states, meaning that states with hospitals that previously received high average payments per discharge from Medicare tended to have their average payment rates reduced, and states with hospitals that previously received low average payments per discharge tended to have their average payment rates increased. The fact that states that later implemented noneconomic caps began the 1980s with higher Medicare Part A spending per beneficiary suggests that those states were more likely than states that did not pass tort limits to have their Medicare hospital payment rates negatively impacted by the new PPS.

To test more formally whether the states most heavily impacted by PPS were driving the Medicare Part A spending results, CBO performed a separate set of analyses of Medicare Part A spending in which states were excluded if they were among either the top or bottom 10 in terms of their 1983 average Medicare hospital payment per discharge. States with an unusually high or low hospital payment per discharge were likely to be more strongly impacted by the new Medicare PPS than other states.[52] The results of those analyses were quite similar to the main Medicare Part A results in Table 3, however, suggesting that the estimates reported in Table 3 are probably not driven by a small number of states that were heavily impacted by the new Medicare PPS.

To further test the possibility that the Medicare Part A results in Table 3 were driven by changes in the hospital payment system, two additional variables were added to the Medicare Part A model, representing the degree of cost-reducing pressure imposed on each state's hospitals as a result of the imposition of Medicare's hospital PPS.[53] States were likely to have experienced stronger pressure to reduce hospital spending under the hospital PPS if, prior to the implementation of the PPS, they received higher average payments per discharge from Medicare, or if they had an unusually high number of short-stay hospital beds per capita.[54] When PPS "pressure" variables are included in the Medicare Part A model, the coefficient on the noneconomic cap is less than half as large (-0.023, compared with -0.052 in the Part A model) and is no longer statistically significant at conventional levels, and the coefficient on any direct tort limit is also less than half as large (-0.018, compared with -0.046 in the Part A model) and is no longer statistically significant (see Tables 3 and D-2). The coefficient on eliminating joint-and-several liability remains positive and statistically significant when the PPS controls are included. Those findings suggest that the main results on noneconomic caps in the Medicare models may have been driven in part by the effects of the implementation of Medicare's hospital PPS.

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52. The hospital price for each state was set equal to Medicare payments per discharge in 1983, adjusted for beneficiary demographics and for a state-level aggregation of Medicare's hospital-specific local wage indexes for 1983.

53. The results of these tests are available in Appendix D.

54. Two PPS pressure variables were constructed: the natural logarithm of Medicare short-stay hospital payments per short-stay hospitalization in 1982 (adjusted for demographics and a state-level aggregate of Medicare's hospital wage index for 1983) and the natural logarithm of short-term general hospital beds per capita in 1983 (adjusted for state population density). The year 1982 was used for the payments per stay, rather than 1983, because 1982 was the last year of full cost reimbursement (The Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA), which began the changes to the system of full cost reimbursement, was first implemented in fiscal year 1983, and the prospective payment system was first implemented in fiscal year 1984). Each of those PPS pressure variables was interacted with each of the year indicator variables, and those interactions were included in the alternative specifications. This allows for a flexible time trend that varies with each PPS pressure variable.

The Addition of State-Specific Time Trends

The final specification test of the models presented in Tables 2 and 3 includes state-specific time trends in the regression specifications. Adding state-specific time trends allows for the possibility that states that adopted tort limits had different underlying time trends from states that did not adopt limits. (The detailed results from the regressions that include the time trends are presented in the far right column of the tables in Appendix B.) For all six spending measures, the analyses that include state-specific time trends produce coefficients on eliminating joint-and-several liability that are closer to zero than the coefficients in the main analysis (this comparison is between the coefficients presented in Tables 2 and 3 and the coefficients in the outer right column of Appendix Tables B-1 through B-6). Also, for five of the six spending measures, the coefficients on eliminating joint-and-several liability are less statistically significant (or not statistically significant at all) in the analyses that include state-specific time trends compared with the main analyses. The coefficient estimates on a cap on noneconomic damages were generally similar between the main analyses and the analyses that included state-specific trends. For two spending measures (overall health care spending per capita and hospital spending per capita) the coefficient on a cap on noneconomic damages is not statistically significant in the main analyses but is statistically significant in the analyses that include state-specific time trends. The fact that the coefficient estimates for eliminating joint-and-several liability move toward zero when state-specific time trends are added suggests that states that implemented that tort limit may have had different underlying spending trends than other states, and that those underlying trends may be confounding the results in the main analyses.

Discussion

In previous work, CBO analyzed the effect of limits on tort claims imposed by states and found that those limits reduced premiums for medical malpractice insurance. Lower malpractice premiums would, in turn, reduce providers' costs and therefore result in some lowering of private health insurance premiums and the cost of federal health programs. A remaining question has been whether there is an additional effect of tort limits, a so-called utilization effect—by which changes in the malpractice environment might affect utilization by affecting physicians' behavior.

This empirical analysis examined the question of whether the imposition of state-level tort limits affects health care spending at the state level. The statistical approach is multiple regression with state- and year-level fixed effects. Two sets of tort limit variables were analyzed: the first set included a separate indicator variable for each of five different tort limits—a cap on noneconomic damages, eliminating joint-and-several liability, a cap on attorneys' fees, allowing evidence of collateral-source benefits to be introduced at trial, and a cap or ban on punitive damages; the second included direct and indirect limit variables, similar to the variables used by Kessler and McClellan.[55]

55. See, for example, Kessler and McClellan, "Do Doctors Practice Defensive Medicine?"

The analysis used two sets of data on health care spending for each state in each year since 1980: overall health care spending per capita calculated from CMS's state health expenditures, and Medicare spending per beneficiary calculated from Medicare's administrative files. Each of the two data sets has advantages and disadvantages. The Medicare data, because they are based on administrative claims, are arguably a more accurate measure of spending than the measures of state-level health spending per capita. Medicare spending, however, only accounts for about one-fifth of total health care spending and is not necessarily representative of overall spending. Overall health care spending per capita includes spending for each state's entire population, regardless of age or insurance status. Although data on state health expenditures are a better measure of spending for each state's population as a whole, they are based on a mix of data sources, including primarily the Economic Census, which is conducted only once every five years.

For two of the three measures of Medicare spending per beneficiary considered here (Medicare spending per beneficiary and Medicare Part A spending per beneficiary), a cap on noneconomic damages is associated with a statistically significant reduction in spending. The coefficients on direct tort limits are also negative and statistically significant for those two spending measures, probably reflecting the fact that noneconomic caps are included in the definition of that variable. In contrast, eliminating joint-and-several liability is associated with statistically significant increases in all three measures of Medicare spending, with coefficient estimates that are larger in absolute value than the negative coefficients on the cap on noneconomic damages. Finally, the sum of the coefficients of the individual tort reforms is not statistically different from zero for any of the three measures of Medicare spending that CBO considered.

In the analyses of overall health care spending per capita, eliminating joint-and-several liability is associated with statistically significant increases in spending in both the model of health care spending per capita and the model of hospital spending per capita. Caps on noneconomic damages are associated with reductions in spending per capita for all three spending measures, though those coefficients are not statistically significant at conventional levels. As in the analysis of Medicare spending, the sums of the coefficients are not statistically significant at conventional levels for any of the spending measures.

Specification tests, however, raise some questions as to whether those associations between certain tort limits and spending reflect causal impacts. In several of the cases where a tort limit was found to have a statistically significant association with changes in spending, either positive or negative, there was evidence that relative spending was already moving in the direction of the estimated effect prior to the implementation of those tort limits. This evidence of a "lead" or anticipatory effect is consistent with the possibility of there being an outside factor that may have caused changes in relative spending in states that passed tort limits, and that was correlated with the passage of tort limits. One possible such factor is the general concern among the states about high medical costs, and efforts, in addition to placing limits on torts for medical mal-

practice, to control those costs. Another possible factor is changes in Medicare's payment policies for hospitals that took place during the period of the analysis. Variables were added to the main models to control for the differential impact across states of the introduction of Medicare's PPS for hospitals. The addition of those PPS control variables produced an estimated impact of noneconomic caps on Medicare Part A spending that was substantially closer to zero than in the results in Table 3, and not statistically significant.

The potentially lower quality of the data on state health expenditures could be a reason that less evidence of a relationship between tort limits and spending is found using those data than using the Medicare data. However, further analysis indicates that the quality of those data does not appear to have had an important impact on the results presented here.

Rules governing medical malpractice claims are one of a host of factors potentially affecting the delivery and cost of health care services in the United States. Although this analysis provides some evidence of links between tort limits and health care spending, the results are inconsistent and depend on the particular relationships and specifications tested. The mixed results also demonstrate the difficulty of disentangling any effects of tort limits from other factors that affect levels of spending for health care. CBO continues to monitor the work of other researchers and conduct its own research on the issue.

Appendix A: Adjusting Health Care Spending per Capita for Demographics

State-year measures of health care spending per capita are adjusted to incorporate demographics to the largest extent possible given the available data. A crude method is used for adjusting measures of overall health care spending per capita, and a separate method is used for adjusting measures of Medicare spending per beneficiary. A more refined method can be used for adjusting Medicare spending measures because the Medicare spending data are available at the person-year level.

To adjust health care spending per capita, a predicted spending level for each state in each year is generated on the basis of the age composition of that state's population:

$$\hat{H}_{stj} = \sum_{a} z_{aj} \frac{n_{ast}}{N_{st}}$$

where z_{aj} is the measure of health care spending per capita in age group a for service j, n_{ast} is the population in age group a in state s in year t, and N_{st} is the total population in state s in year t. A national predicted spending level is also generated for each year:

$$\hat{H}_{tj} = \sum_{a} z_{aj} \frac{n_{at}}{N_{t}}$$

where n_{at} is the U.S. population in age group a in year t, and N_t is the U.S. population in year t.

Adjusted health care spending per capita for service j in state s in year t equals:

$$\tilde{H}_{stj} = H_{stj} \frac{\hat{H}_{tj}}{\hat{H}_{stj}}$$

where H_{stj} is unadjusted health care spending per capita for service j. To estimate age-group-specific health care spending per capita, z_{aj}, the Medical Expenditure Panel Surveys (MEPS) for 1996 through 2000 are pooled, and separate measures are calculated for spending on all health care, hospital care, and physician and clinical services.[1] To make spending from different years of the MEPS comparable, spending is inflated using the gross domestic product (GDP) deflator to a common year. Spending per capita is then estimated separately for 10-year age groups (less than 6, 6 to 14,

1. Joel Cohen and others. "The Medical Expenditure Panel Survey: A National Health Information Resource," *Inquiry*, vol. 33, no. 4 (Winter 1996), pp. 373-389.

15 to 24, and so on, and concluding with ages 85 and up). Note that only the relative level of spending across age groups is relevant for the demographic adjustment; the level does not matter, which makes it possible to use the same measures of age-group-specific health care spending per capita for adjusting spending in all years. It is possible to calculate separate age-group-specific health care spending for each year, but relative spending across age groups has not changed so dramatically that such a measure is necessary.[2]

For adjusting Medicare spending, the Continuous Medicare History Sample includes detailed data on demographics and spending. That allows adjustment of Medicare spending per beneficiary using a more sophisticated approach. Predicted Medicare spending per beneficiary in state s in year t equals:

$$\hat{M}_{st} = \sum_{d} m_{dt} \frac{b_{dst}}{B_{st}}$$

where m_{dt} is national Medicare spending per beneficiary in demographic group d in year t, b_{dst} is the number of Medicare beneficiaries in demographic group d in state s in year t, and B_{st} is total Medicare beneficiaries in state s in year t. Year-specific Medicare spending in each demographic group equals:

$$m_{dt} = \frac{\sum_{i} m_{idt}}{B_{dt}}$$

where i indexes beneficiaries, m_{idt} equals spending by beneficiary i in demographic group d in year t, and B_{dt} equals the number of beneficiaries in demographic group d in year t. National Medicare spending per beneficiary is also calculated:

$$M_{t} = \frac{\sum_{i} m_{it}}{B_{t}}$$

where i indexes beneficiaries, m_{it} equals spending by beneficiary i in year t, and B_{t} equals the number of beneficiaries in year t. Adjusted Medicare spending per beneficiary for state s in year t equals:

$$\tilde{M}_{st} = M_{st} \frac{M_{t}}{\hat{M}_{st}}$$

where M_{st} is unadjusted Medicare spending per beneficiary in state s and year t.

2. Ellen Meara, Chapin White, and David M. Cutler, "Trends in Medical Spending by Age, 1963-2000," *Health Affairs*, vol. 23, no. 4 (July/August 2004), 176-183.

Appendix B:
Detailed Regression Results

The regression results that appear in this appendix include the findings presented in the main section of the analysis (see Tables 2 and 3 on pages 22 and 23 and Figure 2 on page 24). The appendix also features other regression output and the results from additional specifications.

Table B-1.

Regressions of Overall Health Care Spending per Capita

	Main Results (Weighted by Population)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Tort Limit Variables				
Cap on noneconomic damages	-0.014 (0.010)	-0.011 (0.007)	n.a.	-0.011 * (0.006)
Elimination of joint-and-several liability[a]	0.040 *** (0.011)	0.029*** (0.008)	n.a.	0.014 ** (0.005)
Cap on attorneys' fees	0.007 (0.021)	0.015 (0.016)	n.a.	0.008 (0.010)
Collateral-source rule (jury notification)[b]	-0.032 (0.024)	-0.017 (0.017)	n.a.	-0.015 (0.012)
Cap or ban on punitive damages	-0.007 (0.011)	-0.011 (0.010)	n.a.	-0.001 (0.007)
Sum of tort limit coefficients	-0.005 (0.034)	0.005 (0.028)	n.a.	-0.004 (0.018)
Any "direct" tort limit	n.a.	n.a.	-0.008 (0.011)	n.a.
Any "indirect" tort limit	n.a.	n.a.	0.020 (0.015)	n.a.
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.203 ** (0.085)	-0.233 *** (0.052)	-0.223 ** (0.084)	-0.234 *** (0.057)
Attorneys per capita[c]	0.160 *** (0.056)	0.175 *** (0.043)	0.185 *** (0.063)	0.004 (0.080)
Gross state product per capita[c]	0.184 *** (0.046)	0.181 *** (0.031)	0.207 *** (0.052)	0.183 *** (0.035)
Age-adjusted mortality rate[c]	0.089 (0.192)	0.179 (0.113)	0.126 (0.212)	0.188 *** (0.069)
Percentage of adults without a high school diploma	-1.947 *** (0.291)	-1.614 *** (0.213)	-1.603 *** (0.229)	-0.110 (0.577)
Percentage of people that are black	-0.609 (0.644)	-0.674 * (0.369)	-0.324 (0.982)	-3.020 *** (1.051)
Percentage of people residing in urban areas	-0.207 (0.285)	-0.058 (0.202)	-0.215 (0.296)	-0.617 * (0.351)
Percentage of the workforce that is unemployed	0.794 * (0.414)	0.580 ** (0.270)	0.952 ** (0.463)	0.096 (0.146)

Continued

Table B-1.

Continued

	Main Results (Weighted by Population)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Model Characteristics				
Number of observations	1,071	1,071	1,071	1,071
Degrees of freedom	987	987	990	936
Years included	1980-2000	1980-2000	1980-2000	1980-2000
Partial R-squared[d]	0.2186	0.1394	0.2050	0.5591
p-value on F test of joint significance of tort limits	0.0002 ***	0.0066 ***	0.3944	0.0089 ***
Weight	Population	Unweighted	Population	Population

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

Each column represents a separate regression model. The dependent variable equals the natural logarithm of spending per capita. The natural logarithm of spending per capita is adjusted for demographics as described in Appendix A. All models include state- and year-fixed effects (coefficients are not shown). "Any 'direct' tort limit" equals one if any of the following limits are in place (and zero otherwise): a cap on noneconomic damages, a cap on total damages, a ban on punitive damages, or a collateral-source rule (mandatory offset). "Any 'indirect' tort limit" equals one if either of the following limits is in place (and zero otherwise): a cap on attorneys' fees or modification or elimination of joint-and-several liability.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Table B-2.

Regressions of Overall Hospital Care Spending per Capita

	Main Results (Weighted by Population)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Tort Limit Variables				
Cap on noneconomic damages	-0.016 (0.012)	0.012 (0.016)	n.a.	-0.018 * (0.010)
Elimination of joint-and-several liability[a]	0.047 *** (0.015)	0.035 ** (0.014)	n.a.	0.011 (0.010)
Cap on attorneys' fees	-0.018 (0.023)	-0.019 (0.019)	n.a.	-0.002 (0.014)
Collateral-source rule (jury notification)[b]	-0.037 (0.030)	-0.030 (0.025)	n.a.	-0.005 (0.017)
Cap or ban on punitive damages	-0.019 (0.014)	-0.042 ** (0.016)	n.a.	-0.007 (0.011)
Sum of tort limit coefficients	-0.044 (0.043)	-0.044 (0.038)	n.a.	-0.022 (0.024)
Any "direct" tort limit	n.a.	n.a.	-0.024 (0.014)	n.a.
Any "indirect" tort limit	n.a.	n.a.	0.023 (0.019)	n.a.
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.477 *** (0.106)	-0.452 *** (0.092)	-0.506 *** (0.105)	-0.336 *** (0.082)
Attorneys per capita[c]	0.128 * (0.071)	0.169 ** (0.079)	0.154 * (0.085)	0.075 (0.133)
Gross state product per capita[c]	0.038 (0.067)	0.039 (0.043)	0.070 (0.072)	0.170 ** (0.064)
Age-adjusted mortality rate[c]	0.216 (0.254)	0.310 ** (0.152)	0.222 (0.267)	0.195 (0.138)
Percentage of adults without a high school diploma	-1.821 *** (0.465)	-1.465 *** (0.426)	-1.387 *** (0.377)	-0.991 (0.952)
Percentage of people that are black	-1.850 ** (0.910)	-1.997 *** (0.688)	-1.323 (1.264)	-2.942 * (1.467)
Percentage of people residing in urban areas	0.014 (0.420)	0.189 (0.306)	-0.047 (0.428)	-0.567 (0.423)
Percentage of the workforce that is unemployed	0.578 (0.416)	0.420 (0.316)	0.657 (0.485)	0.134 (0.257)

Continued

Table B-2.

Continued

	Main Results (Weighted by Population)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Model Characteristics				
Number of observations	1,071	1,071	1,071	1,071
Degrees of freedom	987	987	990	936
Years included	1980-2000	1980-2000	1980-2000	1980-2000
Partial R-squared[d]	0.2236	0.1523	0.2140	0.5099
p-value on F test of joint significance of tort limits	0.0212 **	0.0370 **	0.2178	0.2423
Weight	Population	Unweighted	Population	Population

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

Each column represents a separate regression model. The dependent variable equals the natural logarithm of spending per capita. The natural logarithm of spending per capita is adjusted for demographics as described in Appendix A. All models include state- and year-fixed effects (coefficients are not shown). "Any 'direct' tort limit" equals one if any of the following limits are in place (and zero otherwise): a cap on noneconomic damages, a cap on total damages, a ban on punitive damages, or a collateral-source rule (mandatory offset). "Any 'indirect' tort limit" equals one if either of the following limits is in place (and zero otherwise): a cap on attorneys' fees or modification or elimination of joint-and-several liability.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Table B-3.

Regressions of Overall Spending on Physician and Clinical Services per Capita

	Main Results (Weighted by Population)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Tort Limit Variables				
Cap on noneconomic damages	-0.018 (0.017)	-0.024 (0.015)	n.a.	-0.002 (0.010)
Elimination of joint-and-several liability[a]	0.022 (0.021)	0.011 (0.017)	n.a.	0.019 (0.013)
Cap on attorneys' fees	0.001 (0.035)	0.027 (0.033)	n.a.	0.012 (0.019)
Collateral-source rule (jury notification)[b]	-0.007 (0.020)	0.005 (0.019)	n.a.	-0.017 (0.011)
Cap or ban on punitive damages	0.002 (0.014)	0.012 (0.012)	n.a.	0.000 (0.008)
Sum of tort limit coefficients	-0.001 (0.031)	0.033 (0.040)	n.a.	0.013 (0.021)
Any "direct" tort limit	n.a.	n.a.	-0.003 (0.014)	n.a.
Any "indirect" tort limit	n.a.	n.a.	0.000 (0.019)	n.a.
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.154 (0.103)	-0.209 ** (0.088)	-0.150 (0.111)	-0.425 *** (0.076)
Attorneys per capita[c]	0.364 *** (0.109)	0.324 *** (0.081)	0.382 *** (0.100)	-0.045 (0.086)
Gross state product per capita[c]	0.458 *** (0.076)	0.376 *** (0.052)	0.465 *** (0.083)	0.243 *** (0.069)
Age-adjusted mortality rate[c]	-0.141 (0.228)	0.062 (0.207)	-0.090 (0.232)	0.303 *** (0.111)
Percentage of adults without a high school diploma	-1.487 *** (0.405)	-1.446 *** (0.333)	-1.350 *** (0.322)	0.273 (1.053)
Percentage of people that are black	0.938 (0.703)	0.836 ** (0.372)	0.917 (0.924)	-6.202 ** (2.319
Percentage of people residing in urban areas	-0.818 ** (0.326)	-0.699 ** (0.325)	-0.843 ** (0.340)	-0.703 (0.506)
Percentage of the workforce that is unemployed	1.987 *** (0.610)	1.513 *** (0.405)	2.094 *** (0.664)	0.529 *** (0.174)

Continued

Table B-3.

Continued

	Main Results (Weighted by Population)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Model Characteristics				
Number of observations	1,071	1,071	1,071	1,071
Degrees of freedom	987	987	990	936
Years included	1980-2000	1980-2000	1980-2000	1980-2000
Partial R-squared[d]	0.1160	0.0952	0.1122	0.3957
p-value on F test of joint significance of tort limits	0.2863	0.2727	0.9825	0.2839
Weight	Population	Unweighted	Population	Population

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

Each column represents a separate regression model. The dependent variable equals the natural logarithm of spending per capita. The natural logarithm of spending per capita is adjusted for demographics as described in Appendix A. All models include state- and year-fixed effects (coefficients are not shown). "Any 'direct' tort limit" equals one if any of the following limits are in place (and zero otherwise): a cap on noneconomic damages, a cap on total damages, a ban on punitive damages, or a collateral-source rule (mandatory offset). "Any 'indirect' tort limit" equals one if either of the following limits is in place (and zero otherwise): a cap on attorneys' fees or modification or elimination of joint-and-several liability.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Table B-4.

Regressions of Medicare Spending per Beneficiary

	Main Results (Weighted by Number of Beneficiaries)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Tort Limit Variables				
Cap on noneconomic damages	-0.040 ***	-0.044 ***	n.a.	-0.038 ***
	(0.014)	(0.013)		(0.010)
Elimination of joint-and-several liability[a]	0.053 ***	0.032 *	n.a.	0.027 *
	(0.018)	(0.016)	.	(0.015)
Cap on attorneys' fees	-0.005	0.019	n.a.	-0.023
	(0.024)	(0.026)		(0.014)
Collateral-source rule (jury notification)[b]	-0.043	-0.008	n.a.	0.004
	(0.036)	(0.031)		(0.019)
Cap or ban on punitive damages	0.017	0.002	n.a.	0.009
	(0.015)	(0.015)		(0.011)
Sum of tort limit coefficients	-0.018	0.001	n.a.	-0.020
	(0.049)	(0.050)		(0.024)
Any "direct" tort limit	n.a.	n.a.	-0.035 *	n.a
			(0.019)	
Any "indirect" tort limit	n.a.	n.a.	0.028	n.a
			(0.027)	
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.176	-0.145	-0.149	-0.158 *
	(0.143)	(0.095)	(0.126)	(0.082)
Attorneys per capita[c]	0.105 *	0.090	0.137	0.007
	(0.061)	(0.060)	(0.088)	(0.085)
Gross state product per capita[c]	-0.202 **	-0.057	-0.179 **	-0.110
	(0.082)	(0.062)	(0.086)	(0.078)
Age-adjusted mortality rate[c]	0.157	0.314 *	0.156	0.111
	(0.223)	(0.172)	(0.222)	(0.138)
Percentage of adults without a high school diploma	-1.591 ***	-1.547 ***	-1.431 ***	0.466
	(0.406)	(0.416)	(0.314)	(0.988)
Percentage of people that are black	-0.240	2.074 ***	-0.017	-5.566 **
	(0.926)	(0.670)	(1.104)	(2.614)
Percentage of people residing in urban areas	-0.090	0.152	0.031	-0.663
	(0.307)	(0.283)	(0.292)	(0.589)
Percentage of the workforce that is unemployed	0.759 *	0.323	0.941 **	0.106
	(0.401)	(0.322)	(0.432)	(0.277)

Continued

Table B-4.

Continued

	Main Results (Weighted by Number of Beneficiaries)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Model Characteristics				
Number of observations	1,224	1,224	1,224	1,224
Degrees of freedom	1,137	1,137	1,140	1,086
Years included	1980-2003	1980-2003	1980-2003	1980-2003
Partial R-squared[d]	0.1261	0.0767	0.1030	0.3177
p-value on F test of joint significance of tort limits	0.0005 ***	0.0062 ***	0.2114	0.0044 ***
Weight	Number of beneficiaries	Unweighted	Number of beneficiaries	Number of beneficiaries

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

Each column represents a separate regression model. The dependent variable equals the natural logarithm of spending per capita. The natural logarithm of spending per capita is adjusted for demographics as described in Appendix A. All models include state- and year-fixed effects (coefficients are not shown). "Any 'direct' tort limit" equals one if any of the following limits are in place (and zero otherwise): a cap on noneconomic damages, a cap on total damages, a ban on punitive damages, or a collateral-source rule (mandatory offset). "Any 'indirect' tort limit" equals one if either of the following limits is in place (and zero otherwise): a cap on attorneys' fees or modification or elimination of joint-and-several liability.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Table B-5.

Regressions of Medicare Part A (Hospital) Spending per Beneficiary

	Main Results (Weighted by Number of Beneficiaries)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Tort Limit Variables				
Cap on noneconomic damages	-0.052 ***	-0.051 ***	n.a.	-0.051 ***
	(0.017)	(0.015)		(0.015)
Elimination of joint-and-several liability[a]	0.056 **	0.031	n.a.	0.035
	(0.024)	(0.019)		(0.023)
Cap on attorneys' fees	-0.011	0.021	n.a.	-0.032
	(0.029)	(0.035)		(0.022)
Collateral-source rule (jury notification)[b]	-0.061	-0.014	n.a.	-0.001
	(0.042)	(0.036)		(0.023)
Cap or ban on punitive damages	0.021	0.005	n.a.	0.008
	(0.018)	(0.017)		(0.016)
Sum of tort limit coefficients	-0.047	-0.008	n.a.	-0.042
	(0.055)	(0.060)		(0.032)
Any "direct" tort limit	n.a.	n.a.	-0.046 *	n.a.
			(0.023)	
Any "indirect" tort limit	n.a.	n.a.	0.023	n.a.
			(0.032)	
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.030	-0.030	-0.006	-0.028
	(0.149)	(0.098)	(0.130)	(0.116)
Attorneys per capita[c]	0.190 ***	0.181 ***	0.225 **	0.036
	(0.064)	(0.062)	(0.096)	(0.096)
Gross state product per capita[c]	-0.151 *	-0.046	-0.130	-0.064
	(0.076)	(0.059)	(0.082)	(0.101)
Age-adjusted mortality rate[c]	-0.066	0.135	-0.061	-0.046
	(0.248)	(0.205)	(0.249)	(0.188)
Percentage of adults without a high school diploma	-1.350 ***	-1.305 ***	-1.162 ***	-0.498
	(0.427)	(0.426)	(0.334)	(1.340)
Percentage of people that are black	-0.449	1.572 **	-0.162	-5.032
	(0.981)	(0.596)	(1.311)	(3.376)
Percentage of people residing in urban areas	-0.128	0.217	0.061	-0.510
	(0.362)	(0.329)	(0.355)	(0.762)
Percentage of the workforce that is unemployed	1.056 **	0.481	1.267 **	0.215
	(0.469)	(0.379)	(0.473)	(0.450)

Continued

Table B-5.

Continued

	Main Results (Weighted by Number of Beneficiaries)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Model Characteristics				
Number of observations	1,224	1,224	1,224	1,224
Degrees of freedom	1,137	1,137	1,140	1,086
Years included	1980-2003	1980-2003	1980-2003	1980-2003
Partial R-squared[d]	0.0787	0.0469	0.0508	0.2161
p-value on F test of joint significance of tort limits	0.0018 ***	0.0154 **	0.1388	0.0106 **
Weight	Number of beneficiaries	Unweighted	Number of beneficiaries	Number of beneficiaries

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

Each column represents a separate regression model. The dependent variable equals the natural logarithm of spending per capita. The natural logarithm of spending per capita is adjusted for demographics as described in Appendix A. All models include state- and year-fixed effects (coefficients are not shown). "Any 'direct' tort limit" equals one if any of the following limits are in place (and zero otherwise): a cap on noneconomic damages, a cap on total damages, a ban on punitive damages, or a collateral-source rule (mandatory offset). "Any 'indirect' tort limit" equals one if either of the following limits is in place (and zero otherwise): a cap on attorneys' fees or modification or elimination of joint-and-several liability.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Table B-6.

Regressions of Medicare Part B (Physician) Spending per Beneficiary

	Main Results (Weighted by Number of Beneficiaries)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Tort Limit Variables				
Cap on noneconomic damages	-0.016 (0.015)	-0.030 ** (0.014)	n.a.	-0.008 (0.009)
Elimination of joint-and-several liability[a]	0.040 ** (0.019)	0.030 * (0.017)	n.a.	0.003 (0.013)
Cap on attorneys' fees	0.002 (0.015)	0.011 (0.014)	n.a.	-0.011 (0.017)
Collateral-source rule (jury notification)[b]	0.015 (0.026)	0.017 (0.029)	n.a.	0.039 * (0.022)
Cap or ban on punitive damages	0.001 (0.015)	-0.009 (0.015)	n.a.	0.008 (0.009)
Sum of tort limit coefficients	0.043 (0.036)	0.019 (0.041)	n.a.	0.031 (0.024)
Any "direct" tort limit	n.a.	n.a.	-0.014 (0.017)	n.a.
Any "indirect" tort limit	n.a.	n.a.	0.037 ** (0.018)	n.a.
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.462 *** (0.142)	-0.386 *** (0.122)	-0.426 *** (0.133)	-0.339 *** (0.075)
Attorneys per capita[c]	-0.008 (0.071)	-0.049 (0.075)	0.017 (0.076)	-0.025 (0.071)
Gross state product per capita[c]	-0.348 *** (0.123)	-0.115 (0.084)	-0.316 ** (0.121)	-0.249 *** (0.090)
Age-adjusted mortality rate[c]	0.522 ** (0.207)	0.581 *** (0.212)	0.492 ** (0.202)	0.272 (0.187)
Percentage of adults without a high school diploma	-2.157 *** (0.442)	-2.157 *** (0.495)	-2.096 *** (0.375)	2.120 * (1.072)
Percentage of people that are black	-0.026 (1.181)	2.849 *** (0.914)	0.014 (1.129)	-6.159 *** (2.258)
Percentage of people residing in urban areas	0.040 (0.320)	0.066 (0.314)	-0.063 (0.278)	-0.895 (0.562)
Percentage of the workforce that is unemployed	0.060 (0.506)	-0.014 (0.419)	0.113 (0.547)	-0.242 (0.292)

Continued

Table B-6.

Continued

	Main Results (Weighted by Number of Beneficiaries)	Unweighted Results	Indirect/Direct Tort Limit Variables	State-Specific Time Trends
Model Characteristics				
Number of observations	1,224	1,224	1,224	1,224
Degrees of freedom	1,137	1,137	1,140	1,086
Years included	1980-2003	1980-2003	1980-2003	1980-2003
Partial R-squared[d]	0.2110	0.1191	0.2074	0.4493
p-value on F test of joint significance of tort limits	0.3815	0.1068	0.1307	0.3478
Weight	Number of beneficiaries	Unweighted	Number of beneficiaries	Number of beneficiaries

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

Each column represents a separate regression model. The dependent variable equals the natural logarithm of spending per capita. The natural logarithm of spending per capita is adjusted for demographics as described in Appendix A. All models include state- and year-fixed effects (coefficients are not shown). "Any 'direct' tort limit" equals one if any of the following limits are in place (and zero otherwise): a cap on noneconomic damages, a cap on total damages, a ban on punitive damages, or a collateral-source rule (mandatory offset). "Any 'indirect' tort limit" equals one if either of the following limits is in place (and zero otherwise): a cap on attorneys' fees or modification or elimination of joint-and-several liability.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Appendix C: Regression Results, Including Leads of Tort Limits

For each tort limit examined in this analysis of leads of tort limits, a "*change lead 1-to-3*" variable is created that equals one if the tort limit is put in place one to three years in the future and otherwise equals zero. The construction of the *change lead 1-to-3* variables is illustrated for noneconomic caps in Table C-1.

Tables C-2 through C-7 present the regression results including the lead variables. In the models of health care spending per capita, only two of the coefficients on the "*limit in place*" variables are statistically significant: eliminating joint-and-several liability in the models of health care spending per capita and hospital spending per capita. In both of those cases, the "*change lead 1-to-3*" variable has the same sign as the *limit in place* variable and is statistically significant.

In the models of Medicare spending per beneficiary, eight of the coefficients on the *limit in place* variables are statistically significant: noneconomic caps in the models of Medicare spending per beneficiary and Medicare Part A spending per beneficiary; eliminating joint-and-several liability in all three models of Medicare spending per beneficiary; direct tort limits in the models of Medicare spending per beneficiary and Medicare Part A spending per beneficiary; and indirect tort limits in Medicare Part B spending per beneficiary. In four of those eight cases, the *change lead 1-to-3* variable has the same sign as the *limit in place* variable, but only one is statistically significant: the *change lead 1-to-3* variable for a cap on noneconomic damages in the model of Medicare Part A spending per beneficiary.

Table C-1.

Illustration of Leads of Tort Limit Variables (Noneconomic Caps in Alaska and Alabama)

	State	Noneconomic Cap in Place	Change Lead 1-to-3	State	Noneconomic Cap in Place	Change Lead 1-to-3
1977	AK	0	0	AL	0	0
1978	AK	0	0	AL	0	0
1979	AK	0	0	AL	0	0
1980	AK	0	0	AL	0	0
1981	AK	0	0	AL	0	0
1982	AK	0	0	AL	0	0
1983	AK	0	1	AL	0	0
1984	AK	0	1	AL	0	1
1985	AK	0	1	AL	0	1
1986	AK	1	0	AL	0	1
1987	AK	1	0	AL	1	0
1988	AK	1	0	AL	1	0
1989	AK	1	0	AL	1	0
1990	AK	1	0	AL	1	0
1991	AK	1	0	AL	1	0
1992	AK	1	0	AL	0	0
1993	AK	1	0	AL	0	0
1994	AK	1	0	AL	0	0
1995	AK	1	0	AL	0	0
1996	AK	1	0	AL	0	0
1997	AK	1	0	AL	0	0
1998	AK	1	0	AL	0	0
1999	AK	1	0	AL	0	0
2000	AK	1	0	AL	0	0
2001	AK	1	0	AL	0	0
2002	AK	1	n.a.	AL	0	n.a.
2003	AK	1	n.a.	AL	0	n.a.
2004	AK	1	n.a.	AL	0	n.a.

Source: Congressional Budget Office.

Note: n.a. = not applicable.

Table C-2.

Regressions of Overall Health Care Spending per Capita, Including Leads

	Individual Tort Limit Variables		Indirect/Direct Tort Limit Variables	
Tort Limit Variables				
Cap on noneconomic damages				
Change lead 1-to-3	-0.009	(0.009)	n.a.	
Limit in place	-0.017	(0.012)	n.a.	
Elimination of joint-and-several liability[a]				
Change lead 1-to-3	0.018 *	(0.010)	n.a.	
Limit in place	0.050 ***	(0.015)	n.a.	
Cap on attorney fees				
Change lead 1-to-3	0.002	(0.011)	n.a.	
Limit in place	0.008	(0.025)	n.a.	
Collateral-source rule (jury notification)[b]				
Change lead 1-to-3	0.002	(0.011)	n.a.	
Limit in place	-0.032	(0.027)	n.a.	
Cap or ban on punitive damages				
Change lead 1-to-3	0.000	(0.008)	n.a.	
Limit in place	-0.007	(0.013)	n.a.	
Any "direct" tort limit				
Change lead 1-to-3	n.a.		0.008	(0.006)
Limit in place	n.a.		-0.003	(0.013)
Any "indirect" tort limit				
Change lead 1-to-3	n.a.		0.007	(0.011)
Limit in place	n.a.		0.022	(0.017)
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.205 **	(0.082)	-0.232 ***	(0.081)
Attorneys per capita[c]	0.157 ***	(0.057)	0.188 ***	(0.062)
Gross state product per capita[c]	0.189 ***	(0.045)	0.210 ***	(0.051)
Age-adjusted mortality rate[c]	0.079	(0.194)	0.124	(0.210)
Percentage of adults without a high school diploma	-1.949 ***	(0.293)	-1.582 ***	(0.226)
Percentage of people that are black	-0.635	(0.630)	-0.346	(0.989)
Percentage of people residing in urban areas	-0.212	(0.288)	-0.220	(0.299)
Percentage of the workforce that is unemployed	0.810 **	(0.395)	0.974 **	(0.461)

Continued

Table C-2.

Continued

	Individual Tort Limit Variables	Indirect/Direct Tort Limit Variables
Model Characteristics		
Number of observations	1,071	1,071
Years included	1980–2000	1980–2000
Partial R-squared[d]	0.2266	0.2053
p-value on F test of joint significance of lead variables	0.0482 **	0.2653
Weight	Population	Population

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Table C-3.

Regressions of Overall Hospital Spending per Capita, Including Leads

	Individual Tort Limit Variables		Indirect/Direct Tort Limit Variables	
Tort Limit Variables				
Cap on noneconomic damages				
Change lead 1-to-3	-0.011	(0.012)	n.a.	
Limit in place	-0.019	(0.014)	n.a.	
Elimination of joint-and-several liability[a]				
Change lead 1-to-3	0.028 **	(0.013)	n.a.	
Limit in place	0.061 ***	(0.018)	n.a.	
Cap on attorneys' fees				
Change lead 1-to-3	0.016	(0.015)	n.a.	
Limit in place	-0.011	(0.028)	n.a.	
Collateral-source rule (jury notification)[b]				
Change lead 1-to-3	-0.001	(0.018)	n.a.	
Limit in place	-0.038	(0.035)	n.a.	
Cap or ban on punitive damages				
Change lead 1-to-3	0.004	(0.011)	n.a.	
Limit in place	-0.019	(0.018)	n.a.	
Any "direct" tort limit				
Change lead 1-to-3	n.a.		-0.002	(0.010)
Limit in place	n.a.		-0.022	(0.017)
Any "indirect" tort limit				
Change lead 1-to-3	n.a.		0.031 **	(0.015)
Limit in place	n.a.		0.035	(0.021)
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.479 ***	(0.107)	-0.511 ***	(0.105)
Attorneys per capita[c]	0.124 *	(0.070)	0.160 *	(0.082)
Gross state product per capita[c]	0.048	(0.060)	0.086	(0.068)
Age-adjusted mortality rate[c]	0.200	(0.256)	0.209	(0.264)
Percentage of adults without a high school diploma	-1.815 ***	(0.474)	-1.360 ***	(0.376)
Percentage of people that are black	-1.878 **	(0.874)	-1.394	(1.256)
Percentage of people residing in urban areas	0.007	(0.421)	-0.051	(0.431)
Percentage of the workforce that is unemployed	0.612	(0.386)	0.668	(0.479)

Continued

Table C-3.

Continued

	Individual Tort Limit Variables	Indirect/Direct Tort Limit Variables
Model Characteristics		
Number of observations	1,071	1,071
Years included	1980–2000	1980–2000
Partial R-squared[d]	0.2402	0.2214
p-value on F test of joint significance of lead variables	0.0745 *	0.1369
Weight	Population	Population

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Table C-4.

Regressions of Overall Spending per Capita for Physician and Clinical Services, Including Leads

	Individual Tort Limit Variables		Indirect/Direct Tort Limit Variables	
Tort Limit Variables				
Cap on noneconomic damages				
Change lead 1-to-3	-0.005	(0.015)	n.a.	
Limit in place	-0.020	(0.021)	n.a.	
Elimination of joint-and-several liability[a]				
Change lead 1-to-3	0.006	(0.013)	n.a.	
Limit in place	0.025	(0.025)	n.a.	
Cap on attorneys' fees				
Change lead 1-to-3	-0.024	(0.032)	n.a.	
Limit in place	-0.009	(0.045)	n.a.	
Collateral-source rule (jury notification)[b]				
Change lead 1-to-3	-0.010	(0.018)	n.a.	
Limit in place	-0.012	(0.022)	n.a.	
Cap or ban on punitive damages				
Change lead 1-to-3	-0.002	(0.013)	n.a.	
Limit in place	0.000	(0.019)	n.a.	
Any "direct" tort limit				
Change lead 1-to-3	n.a.		0.021 **	(0.010)
Limit in place	n.a.		0.005	(0.016)
Any "indirect" tort limit				
Change lead 1-to-3	n.a.		-0.025 **	(0.011)
Limit in place	n.a.		-0.011	(0.021)
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.154	(0.098)	-0.164	(0.111)
Attorneys per capita[c]	0.360 ***	(0.109)	0.381 ***	(0.100)
Gross state product per capita[c]	0.459 ***	(0.078)	0.450 ***	(0.081)
Age-adjusted mortality rate[c]	-0.138	(0.225)	-0.076	(0.229)
Percentage of adults without a high school diploma	-1.486 ***	(0.398)	-1.340 ***	(0.321)
Percentage of people that are black	0.921	(0.712)	0.964	(0.944)
Percentage of people residing in urban areas	-0.828 **	(0.324)	-0.851 **	(0.337)
Percentage of the workforce that is unemployed	1.998 ***	(0.606)	2.127 ***	(0.668)

Continued

Table C-4.

Continued

	Individual Tort Limit Variables	Indirect/Direct Tort Limit Variables
Model Characteristics		
Number of observations	1,071	1,071
Years included	1980–2000	1980–2000
Partial R-squared[d]	0.1219	0.1211
p-value on F test of joint significance of lead variables	0.9165	0.0282**
Weight	Population	Population

Source: Congressional Budget Office.

Notes: Estimated standard errors are in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Table C-5.

Regressions of Medicare Spending per Beneficiary, Including Leads

	Individual Tort Limit Variables		Indirect/Direct Tort Limit Variables	
Tort Limit Variables				
Cap on noneconomic damages				
Change lead 1-to-3	-0.018	(0.013)	n.a.	
Limit in place	-0.058 ***	(0.021)	n.a.	
Elimination of joint-and-several liability[a]				
Change lead 1-to-3	-0.001	(0.016)	n.a.	
Limit in place	0.060 **	(0.024)	n.a.	
Cap on attorneys' fees				
Change lead 1-to-3	0.003	(0.017)	n.a.	
Limit in place	0.002	(0.030)	n.a.	
Collateral-source rule (jury notification)[b]				
Change lead 1-to-3	0.030 *	(0.015)	n.a.	
Limit in place	-0.035	(0.035)	n.a.	
Cap or ban on punitive damages				
Change lead 1-to-3	-0.001	(0.011)	n.a.	
Limit in place	0.019	(0.018)	n.a.	
Any "direct" tort limit				
Change lead 1-to-3	n.a.		0.000	(0.015)
Limit in place	n.a.		-0.045 *	(0.026)
Any "indirect" tort limit				
Change lead 1-to-3	n.a.		-0.008	(0.018)
Limit in place	n.a.		0.031	(0.031)
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.075	(0.142)	-0.082	(0.123)
Attorneys per capita[c]	0.145 *	(0.078)	0.206 *	(0.113)
Gross state product per capita[c]	-0.229 ***	(0.085)	-0.185 **	(0.089)
Age-adjusted mortality rate[c]	0.177	(0.273)	0.190	(0.280)
Percentage of adults without a high school diploma	-1.892 ***	(0.410)	-1.530 ***	(0.326)
Percentage of people that are black	-0.116	(0.915)	0.234	(1.182)
Percentage of people residing in urban areas	-0.132	(0.361)	-0.042	(0.354)
Percentage of the workforce that is unemployed	0.519	(0.413)	0.807 *	(0.474)

Continued

Table C-5.

Continued

	Individual Tort Limit Variables	Indirect/Direct Tort Limit Variables
Model Characteristics		
Number of observations	1,122	1,122
Years included	1980–2001	1980–2001
Partial R-squared[d]	0.1256	0.0945
p-value on F test of joint significance of lead variables	0.4614	0.9101
Weight	Number of beneficiaries	Number of beneficiaries

Source: Congressional Budget Office.

Notes: Estimated standard errors are in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Table C-6.

Regressions of Medicare Part A (Hospital) Spending per Beneficiary, Including Leads

	Individual Tort Limit Variables		Indirect/Direct Tort Limit Variables	
Tort Limit Variables				
Cap on noneconomic damages				
Change lead 1-to-3	-0.034 *	(0.017)	n.a.	
Limit in place	-0.079 ***	(0.026)	n.a.	
Elimination of joint-and-several liability[a]				
Change lead 1-to-3	-0.008	(0.021)	n.a.	
Limit in place	0.061 *	(0.031)	n.a.	
Cap on attorneys' fees				
Change lead 1-to-3	0.013	(0.022)	n.a.	
Limit in place	0.002	(0.034)	n.a.	
Collateral-source rule (jury notification)[b]				
Change lead 1-to-3	0.035	(0.022)	n.a.	
Limit in place	-0.054	(0.041)	n.a.	
Cap or ban on punitive damages				
Change lead 1-to-3	0.011	(0.015)	n.a.	
Limit in place	0.028	(0.023)	n.a.	
Any "direct" tort limit				
Change lead 1-to-3	n.a.		-0.007	(0.019)
Limit in place	n.a.		-0.062 *	(0.032)
Any "indirect" tort limit				
Change lead 1-to-3	n.a.		-0.001	(0.026)
Limit in place	n.a.		0.029	(0.040)
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	0.088	(0.157)	0.065	(0.137)
Attorneys per capita[c]	0.236 ***	(0.081)	0.311 **	(0.124)
Gross state product per capita[c]	-0.189 **	(0.081)	-0.136	(0.086)
Age-adjusted mortality rate[c]	0.019	(0.331)	0.025	(0.335)
Percentage of adults without a high school diploma	-1.626 ***	(0.469)	-1.190 ***	(0.383)
Percentage of people that are black	-0.285	(0.997)	0.108	(1.491)
Percentage of people residing in urban areas	-0.172	(0.453)	0.014	(0.451)
Percentage of the workforce that is unemployed	0.808	(0.495)	1.134 **	(0.527)

Continued

Table C-6.

Continued

	Individual Tort Limit Variables	Indirect/Direct Tort Limit Variables
Model Characteristics		
Number of observations	1,122	1,122
Years included	1980–2001	1980–2001
Partial R-squared[d]	0.0927	0.0538
p-value on F test of joint significance of lead variables	0.3589	0.9332
Weight	Number of beneficiaries	Number of beneficiaries

Source: Congressional Budget Office.

Note: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Table C-7.

Regressions of Medicare Part B (Physician) Spending per Beneficiary, Including Leads

	Individual Tort Limit Variables		Indirect/Direct Tort Limit Variables	
Tort Limit Variables				
Cap on noneconomic damages				
Change lead 1-to-3	0.018	(0.013)	n.a.	
Limit in place	-0.014	(0.018)	n.a.	
Elimination of joint-and-several liability[a]				
Change lead 1-to-3	0.015	(0.016)	n.a.	
Limit in place	0.049**	(0.021)	n.a.	
Cap on attorneys' fees				
Change lead 1-to-3	-0.004	(0.019)	n.a.	
Limit in place	0.005	(0.022)	n.a.	
Collateral-source rule (jury notification)[b]				
Change lead 1-to-3	0.021*	(0.013)	n.a.	
Limit in place	0.026	(0.024)	n.a.	
Cap or ban on punitive damages				
Change lead 1-to-3	-0.029**	(0.013)	n.a.	
Limit in place	-0.011	(0.018)	n.a.	
Any "direct" tort limit				
Change lead 1-to-3	n.a.		0.018	(0.015)
Limit in place	n.a.		-0.009	(0.020)
Any "indirect" tort limit				
Change lead 1-to-3	n.a.		-0.016	(0.014)
Limit in place	n.a.		0.034*	(0.018)
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.401***	(0.136)	-0.376***	(0.125)
Attorneys per capita[c]	0.027	(0.085)	0.054	(0.091)
Gross state product per capita[c]	-0.358***	(0.124)	-0.329***	(0.120)
Age-adjusted mortality rate[c]	0.423*	(0.212)	0.429*	(0.220)
Percentage of adults without a high school diploma	-2.466***	(0.425)	-2.295***	(0.356)
Percentage of people that are black	0.031	(1.288)	0.235	(1.153)
Percentage of people residing in urban areas	0.058	(0.349)	-0.165	(0.292)
Percentage of the workforce that is unemployed	-0.188	(0.501)	-0.035	(0.581)

Continued

Table C-7.

Continued

	Individual Tort Limit Variables	Indirect/Direct Tort Limit Variables
Model Characteristics		
Number of observations	1,122	1,122
Years included	1980–2001	1980–2001
Partial R-squared[d]	0.2058	0.1833
p-value on F test of joint significance of lead variables	0.1327	0.2343
Weight	Number of beneficiaries	Number of beneficiaries

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Appendix D: Regression Results, Including Controls for Medicare's Prospective Payment System for Hospitals

The regression results in this appendix place the main findings on Medicare spending side-by-side with results from an alternative specification that includes controls for Medicare's prospective payment system for hospitals.

Table D-1.

Regressions of Medicare Spending per Beneficiary with Prospective Payment System Controls

	Main Results		Indirect/Direct Tort Limit Variables	
	Without PPS Controls	With PPS Controls	Without PPS Controls	With PPS Controls
Tort Limit Variables				
Cap on noneconomic damages	-0.040 ***	-0.016	n.a.	n.a.
	(0.014)	(0.014)		
Elimination of joint-and-several liability[a]	0.053 ***	0.041 **	n.a.	n.a.
	(0.018)	(0.019)		
Cap on attorneys' fees	-0.005	0.002	n.a.	n.a.
	(0.024)	(0.023)		
Collateral-source rule (jury notification)[b]	-0.043	-0.028	n.a.	n.a.
	(0.036)	(0.027)		
Cap or ban on punitive damages	0.017	0.017	n.a.	n.a.
	(0.015)	(0.015)		
Sum of tort limit coefficients	-0.018	0.015	-0.007	0.008
	(0.049)	(0.041)	(0.022)	(0.020)
Any "direct" tort limit	n.a.	n.a.	-0.035 *	-0.012
			(0.019)	(0.018)
Any "indirect" tort limit	n.a.	n.a.	0.028	0.020
			(0.027)	(0.023)
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.176	-0.163	-0.149	-0.131
	(0.143)	(0.123)	(0.126)	(0.107)
Attorneys per capita[c]	0.105 *	0.187 ***	0.137	0.216 ***
	(0.061)	(0.055)	(0.088)	(0.071)
Gross state product per capita[c]	-0.202 **	-0.062	-0.179 **	-0.035
	(0.082)	(0.078)	(0.086)	(0.080)
Age-adjusted mortality rate[c]	0.157	-0.029	0.156	-0.073
	(0.223)	(0.162)	(0.222)	(0.146)
Percentage of adults without a high school diploma	-1.591 ***	-1.156 ***	-1.431 ***	-0.941 ***
	(0.406)	(0.405)	(0.314)	(0.341)
Percentage of people that are black	-0.240	0.680	-0.017	0.835
	(0.926)	(0.614)	(1.104)	(0.768)
Percentage of people residing in urban areas	-0.090	-0.299	0.031	-0.204
	(0.307)	(0.284)	(0.292)	(0.264)
Percentage of the workforce that is unemployed	0.759 *	1.031 ***	0.941 **	1.181 ***
	(0.401)	(0.361)	(0.432)	(0.352)

Continued

Table D-1.

Continued

	Main Results		Indirect/Direct Tort Limit Variables	
	Without PPS Controls	With PPS Controls	Without PPS Controls	With PPS Controls
Model Characteristics				
Number of observations	1,224	1,224	1,224	1,224
Degrees of freedom	1,091	1,091	1,094	1,094
Years included	1980-2003	1980-2003	1980-2003	1980-2003
Partial R-squared[d]	0.1261	0.1269	0.1030	0.1131
p-value on F test of joint significance of tort limits	0.0005 ***	0.0134 **	0.2114	0.6573
Weight	Number of beneficiaries	Number of beneficiaries	Number of beneficiaries	Number of beneficiaries

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

Each column represents a separate regression model. The dependent variable equals the natural logarithm of spending per capita. The natural logarithm of spending per capita is adjusted for demographics as described in Appendix A. All models include state- and year-fixed effects (coefficients are not shown). "Any 'direct' tort limit" equals one if any of the following limits are in place (and zero otherwise): a cap on noneconomic damages, a cap on total damages, a ban on punitive damages, or a collateral-source rule (mandatory offset). "Any 'indirect' tort limit" equals one if either of the following limits is in place (and zero otherwise): a cap on attorneys' fees or modification or elimination of joint-and-several liability.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; PPS = prospective payment system; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)

Table D-2.

Regressions of Medicare Part A (Hospital) Spending per Beneficiary with Prospective Payment System Controls

	Main Results		Indirect/Direct Tort Limit Variables	
	Without PPS Controls	With PPS Controls	Without PPS Controls	With PPS Controls
Tort Limit Variables				
Cap on noneconomic damages	-0.052 ***	-0.023	n.a.	n.a.
	(0.017)	(0.016)		
Elimination of joint-and-several liability[a]	0.056 **	0.045 *	n.a.	n.a.
	(0.024)	(0.025)		
Cap on attorneys' fees	-0.011	-0.005	n.a.	n.a.
	(0.029)	(0.027)		
Collateral-source rule (jury notification)[b]	-0.061	-0.045	n.a.	n.a.
	(0.042)	(0.032)		
Cap or ban on punitive damages	0.021	0.022	n.a.	n.a.
	(0.018)	(0.019)		
Sum of tort limit coefficients	-0.047	-0.006	n.a.	n.a.
	(0.055)	(0.043)		
Any "direct" tort limit	n.a.	n.a.	-0.046 *	-0.018
			(0.023)	(0.023)
Any "indirect" tort limit	n.a.	n.a.	0.023	0.014
			(0.032)	(0.027)
Demographic and Economic Controls				
Percentage of Medicare beneficiaries in managed care	-0.030	-0.042	-0.006	-0.009
	(0.149)	(0.125)	(0.130)	(0.110)
Attorneys per capita[c]	0.190 ***	0.274 ***	0.225 **	0.307 ***
	(0.064)	(0.054)	(0.096)	(0.074)
Gross state product per capita[c]	-0.151 *	0.010	-0.130	0.036
	(0.076)	(0.071)	(0.082)	(0.077)
Age-adjusted mortality rate[c]	-0.066	-0.251	-0.061	-0.300 *
	(0.248)	(0.174)	(0.249)	(0.163)
Percentage of adults without a high school diploma	-1.350 ***	-0.865 **	-1.162 ***	-0.595
	(0.427)	(0.429)	(0.334)	(0.370)
Percentage of people that are black	-0.449	0.671	-0.162	0.894
	(0.981)	(0.677)	(1.311)	(1.014)
Percentage of people residing in urban areas	-0.128	-0.373	0.061	-0.214
	(0.362)	(0.340)	(0.355)	(0.314)
Percentage of the workforce that is unemployed	1.056 **	1.370 ***	1.267 **	1.546 ***
	(0.469)	(0.408)	(0.473)	(0.393)

Continued

Table D-2.

Continued

	Main Results		Indirect/Direct Tort Limit Variables	
	Without PPS Controls	With PPS Controls	Without PPS Controls	With PPS Controls
Model Characteristics				
Number of observations	1,224	1,224	1,224	1,224
Degrees of freedom	1,091	1,091	1,094	1,094
Years included	1980-2003	1980-2003	1980-2003	1980-2003
Partial R-squared[d]	0.0787	0.0794	0.0508	0.0538
p-value on F test of joint significance of tort limits	0.0018 ***	0.0637 *	0.1388	0.7284
Weight	Number of beneficiaries	Number of beneficiaries	Number of beneficiaries	Number of beneficiaries

Source: Congressional Budget Office.

Notes: Estimated standard errors appear in parentheses. Standard errors are estimated using the Huber/White correction, with observations clustered at the state level.

Each column represents a separate regression model. The dependent variable equals the natural logarithm of spending per capita. The natural logarithm of spending per capita is adjusted for demographics as described in Appendix A. All models include state- and year-fixed effects (coefficients are not shown). "Any 'direct' tort limit" equals one if any of the following limits are in place (and zero otherwise): a cap on noneconomic damages, a cap on total damages, a ban on punitive damages, or a collateral-source rule (mandatory offset). "Any 'indirect' tort limit" equals one if either of the following limits is in place (and zero otherwise): a cap on attorneys' fees or modification or elimination of joint-and-several liability.

* = $p<0.10$; ** = $p<0.05$; *** = $p<0.01$; PPS = prospective payment system; n.a. = not applicable.

a. The principle of joint-and-several liability allows a claimant to recover the entire amount of a damage award from any of the parties found to be responsible for an injury, regardless of each party's degree of responsibility for that injury. Modifying or eliminating joint-and-several liability would generally limit each party's share of damages to his or her level of responsibility for the injury.

b. Collateral-source benefits are compensation for an injury from sources other than a malpractice award, such as health or disability insurance.

c. The natural logarithm of these variables is used in the model.

d. "Partial R-squared" statistics reflect the explanatory power of the tort limit and control variables only and do not reflect the explanatory power of the state- and year-fixed effects. (The R-squared statistics calculated for models that include state- and year-fixed effects are quite high—above 0.97—in all models.)