THE IMPACT OF A NO-FAULT TORT REFORM ON PHYSICIAN DECISION-MAKING: A LOOK AT VIRGINIA'S BIRTH INJURY PROGRAM

ARTICLE

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INTRODUCTION

UNDER THE TRADITIONAL TORT SYSTEM, PHYSICIANS FACE MEDICAL MALpractice liability for patient injuries when they deviate from the professional standard of care.[1] In theory, this compensates victims of medical negligence and deters substandard medical care. In practice, the tort system is widely criticized:[2] most patients suffering avoidable medical injuries are not compensated,[3] and health care providers assert that the threat of malpractice liability encourages "defensive medicine," the provision of costly, unnecessary care.[4]

Citing the destructive impact of "frivolous lawsuits," politicians advocate reform of the tort system to reduce health care costs.[5] Support for tort reform spans the American political spectrum, including prominent Republicans[6] and Democrats.[7] In response to widespread public support, President Barack Obama's 2009 health care reform allocated $25 million in grants for state pilot programs that "seek to lessen the impact of malpractice suits on the U.S. medical system."[8]

Nevertheless, many legal scholars and economists dismiss the importance of tort reform in reducing health care costs. University of Pennsylvania Law Profes-

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1 BARRY F. FURROW ET AL., HEALTH LAW 131–36 (6th ed. 2008).

2 Gil Seigal et al., *Adjudicating Severe Birth Injury Claims in Florida and Virginia: The Experience of a Landmark Experiment in Personal Injury Compensation*, 34 AM. J.L. & MED. 493 (2008).

3 TOM BAKER, THE MEDICAL MALPRACTICE MYTH 22 (2005).

4 David Kessler & Mark McClellan, *Do Doctors Practice Defensive Medicine?* 111 Q. J. ECON. 353, 354 (1996).

5 Rick Perry, *Gov. Rick Perry: Tort Reform Must be Part of the Health Care Reform*, WASH. EXAMINER, Aug. 13, 2009, http://www.washingtonexaminer.com/opinioncolumns/OpEd-Contributor/Tort-reform-must-be-part-of-health-care-reform-8096175.htmgel.; Charles Krauthammer, *Health-Care Reform: A Better Plan*, WASH. POST, Aug. 7, 2009, http://www.washingtonpost.com/wp-dyn/content/article/2009/08/06/AR2009080602933.html.

6 Perry, *supra* note 5 (describing Texas Governor Rick Perry's support for various tort reform measures); Annie Underwood, *Would Tort Reform Lower Costs?* N.Y. TIMES, Aug. 31, 2009, http://prescriptions.blogs.nytimes.com/2009/08/31/would-tort-reform-lower-health-care-costs (affirming Utah Senator Orrin Hatch's conviction to "getting rid of the frivolous cases.").

7 *See* Underwood, *supra* note 6 (noting Senator John Kerry's expressed agreement with Senator Hatch's assessment of the need for tort reform); *see also* Carrie Brown, *Trial Lawyers Plan Tort Reform Fight*, POLITICO, Mar. 16, 2009, http://www.politico.com/news/stories/0309/20097.html (describing how Senate Finance Committee Chairman max Baucus also "called for changes to the system.").

8 Patrician Zengerle, *White House Sets $25 Million for Medical Liability Projects*, REUTERS, Sep. 17, 2009, http://www.reuters.com/article/idUSTRE58G3XN20090917.

sor Tom Baker, author of "The Medical Malpractice Myth,"[9] frames the tort debate as "just a distraction" from serious cost-saving reforms.[10] Harvard Economist Amitabh Chandra stated that "no serious economist thinks that saving money in med[ical] mal[practice] is the way to improve productivity in the [health care] system."[11] Empirical evidence supports these conclusions. In a 2004 report, the Congressional Budget Office (CBO) concluded that medical malpractice lawsuits accounted for "less than two percent" of health care expenses in the United States.[12] Consequently, the CBO concluded that even a thirty percent reduction in malpractice costs "would not have a significant impact on total health care costs."[13]

Proponents of tort reform criticize such statements for their failure to consider the costs of an "epidemic of defensive medicine."[14] The CBO's estimates only examined the direct costs of malpractice liability such as insurance premiums. Additional tests and procedures ordered by physicians to avoid malpractice liability could add substantially to the CBO's two percent estimate. In support of this theory, tort reform advocates note that insurance premiums, though small relative to the overall cost of health care spending, constitute an enormous expense for physicians. This is particularly true in high-risk specialties such as obstetrics, where annual premiums routinely exceed $100,000.[15] Further, physicians admit that they perform more expensive procedures to avoid lawsuits.[16] Critics dismiss such surveys as flawed given physicians' incentives to exaggerate the crisis; however, the debate continues as both sides have failed to conclusively prove or disprove the extent of *defensive medicine* in response to the tort system.[17]

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9 BAKER, *supra* note 3.

10 Daphine Eviatar, *Tort Reform Unlikely to Cut Health Care Costs*, WASH. INDEPENDENT, Aug. 19, 2009, http://washingtonindependent.com/55535/tort-reform-unlikely-to-cut-health-care-costs.

11 Alex Nussbaum, *Malpractice Lawsuits Are 'Red Herring' in Obama Plan*, BLOOMBERG, June 16, 2009, http://www.bloomberg.com/apps/news?pid=newsarchive&sid=az9qxQZNmf00.

12 Congressional Budget Office, *Limiting Tort Liability for Medical Malpractice*, ECON. & BUDGET ISSUE BRIEF 1 (2004), *available at* http://www.cbo.gov/ftpdocs/49xx/doc4968/01-08-MedicalMalpractice.pdf (other sources provide similar numbers).

13 *Id*. at 6.

14 Krauthammer, *supra* note 5.

15 Karna Murthy et al., *Obstetricians' Rising Liability Insurance Premiums and Inductions at Late Preterm Gestations*, 47 MEDICAL CARE 425, 427 (2009) (for example, a physician making $400,000 per year would consider $100,000 a year in insurance as an enormous expense, even though it constitutes a much smaller percentage of total health care spending related to the obstetrician's services).

16 *See, e.g.*, MASSACHUSETTS MEDICAL SOCIETY, INVESTIGATION OF DEFENSIVE MEDICINE IN MASSACHUSETTS (November 2008); Klingman et al., *Measuring Defensive Medicine Using Clinical Scenario Surveys*, 21 J. HEALTH POL., POLICY & LAW 185 (1996).

17 In his book, Professor Baker makes a compelling case that fears of defensive practice are overblown. Nevertheless, he admits that "no one has a good handle on defensive medicine costs." BAKER, *supra* note 3, at 119-39; Underwood, *supra* note 6.

This article adds to the literature surrounding this debate by examining how a limited no-fault tort reform impacts physicians' cesarean rates, a common proxy for "defensive practice" in obstetrics.[18] The Virginia Birth-Related Neurological Injury Compensation Program (BIP)[19] is a voluntary, no-fault insurance pool. It legally precludes lawsuits for certain neurological injuries against physicians that choose to pay a yearly fee. Instead, patients must seek compensation from the BIP pool, a process that imposes little burden on physicians. In contrast, physicians that do not pay the yearly fee can be sued for these neurological injuries.[20]

Therefore, participating physicians face less exposure to the tort system than their non-participating peers.[21] As a result, this article will use regression analysis to compare the cesarean rates of participating and non-participating physicians.[22] If fear of malpractice liability leads to widespread defensive practice, as tort reform advocates suggest, the results should show lower cesarean rates among BIP participants due to their decreased exposure to lawsuits.

A number of prior studies examined malpractice liability's impact on obstetricians' cesarean rates, reaching mixed results;[23] this article will provide an additional result for comparison.[24] In addition, this article measures the threat of malpractice liability in a unique way: participation in a no-fault tort reform. Consequently, the results may differ from prior studies that relied on more conventional proxies for malpractice risk such as insurance premiums.

Moreover, these results will provide a more direct comparison for policymakers considering similar reforms. Some scholars advocate administrative, no-

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18 *See, e.g.*, S.M. Rock, *Malpractice Premiums and Primary Cesarean Section Rates in New York and Illinois*, 103 PUB. HEALTH REP., CVIII 459, 460 (1988); *see infra* Part I.B.

19 This article will use the terms "the program," "Birth Injury Program," and "BIP" interchangeably throughout the article to refer to Virginia's tort reform.

20 *See infra* Part I.B

21 JOINT LEGISLATIVE AUDIT AND REVIEW COMMISSION OF THE VIRGINIA GENERAL ASSEMBLY REVIEW OF THE VIRGINIA BIRTH-RELATED NEUROLOGICAL INJURY COMPENSATION PROGRAM 112 (2002) (*hereinafter* GENERAL ASSEMBLY REVIEW); David G. Duff, *Compensation for Neurologically Impaired Infants: Medical No-Fault in Virginia*, 27 HARV. J. LEGIS. 391, 444 (1990); Randall R. Bovbjerg & Frank A. Sloan, *No-Fault for Medical Injury: Theory and Evidence*, 67 U. CIN. L. REV. 53, 105 (1998); *see infra* Part II.C. Participants still face significant exposure to the tort system, as BIP only covers certain injuries. These injuries constitute a small subset of potential liability against physicians that can arise from their medical decision-making; however, these claims are expensive and therefore total roughly 10-20% of the cost of total liability against obstetricians, which may be enough to influence physicians.

22 *See infra* Part IV. Specifically, this article utilizes an ordinary least squares model, with BIP participation as one of several independent variables. The dependent variable is the difference between a provider's expected and actual cesarean rates; this adjusts for other factors that impact obstetricians' cesarean rates. For more detail, see *id*.

23 *See infra* Part I.B.

24 *See infra* Part IV. Statistical analysis encounters a number of problems in social science. As a result, scholarly consensus regarding a causal relationship often arises following a number of studies that return consistent results.

fault compensation reforms—like BIP—in place of the tort system for medical injuries.[25] These proposals range in scope, but Virginia's Birth Injury Program represents the kind of "piecemeal approach that American no-fault malpractice reform would likely take."[26] If limited no-fault reforms can impact physician decision-making, Virginia's reform should reflect this as obstetrics is considered arguably the field most affected by "defensive medicine."[27]

Finally, the regression analysis will control for other variables that could impact physicians' cesarean rates, such as years of experience and number of deliveries performed per year.[28] Therefore, this article may also identify alternative means—unrelated to tort reform—of influencing physician decision-making to reduce health care costs.

This article consists of five parts. Part I reviews the theory regarding "defensive medicine" in obstetrics and the literature attempting to gauge its effect. Part II discusses the history of Virginia's Birth Injury Program, its details and incentives for participants. Part III presents the dataset, variables used and their predicted impact. It also discusses other variables that may affect cesarean rates. Part IV describes the methodology used to evaluate how BIP impacts participating physicians' cesarean rates. Part V explains the descriptive statistics and model results. Part VI offers a discussion of the results' implications and potential areas for further investigation.

I. THEORY AND EVIDENCE OF DEFENSIVE MEDICINE IN OBSTETRICS

A. Defensive Medicine in Theory

Defensive medicine—despite being used as a loaded term in policy debates—can have a positive effect. The threat of tort liability gives physicians with an incentive to provide additional care.[29] This helps eliminate second-guessing that can occur in a courtroom following a patient injury. If physicians act on this incentive to provide additional care, the cost of medical treatment rises. The quality of medical care may also rise. Some legal scholars argue that the tort system is necessary to deter negligent practice by physicians; fear of liability may be necessary to force physicians to stay abreast with recent research.[30]

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25 Seigal, *supra* note 2, at 494.

26 David M. Studdert and Troyen A. Brennan, *Toward a Workable Model of "No-Fault" Compensation for Medical Injury in the United States*, 27 AM. J.L. & MED. 225, 230 (2001) (stating that it is "legally and politically unrealistic to anticipate that any state would undertake wholesale replacement of tort law with a no-fault scheme.").

27 Bovbjerg & Sloan, *supra* note 21, at 105.

28 *See infra* Part III.C.

29 BAKER, *supra* note 3, at 118-38.

30 *Id*.

In contrast, tort reform proponents argue that the tort system leads to wasteful spending with no additional benefit to the patient.[31] Such questions are beyond the scope of this article; however, the observation of defensive practice is important under either view. If the tort system impacts physician decision-making, the debate shifts to determining the optimal level of deterrence; however, if physicians do not respond to the tort system's incentives, policymakers should focus attention on alternative means of reducing health costs such as changes to payment structures and medical education.

Academics have identified an obstetrician's decision between a cesarean or vaginal birth as particularly vulnerable to influence from the tort system.[32] As a result, many studies use the cesarean rate as a proxy for defensive medicine in obstetrics.[33] Patients often bring lawsuits against physicians alleging negligent failure to perform a cesarean section but do not generally file lawsuits against physicians that perform unnecessary cesareans.[34] The Department of Health and Human Services reported in 1981 that "ninety percent of obstetric malpractice cases involve either failure or delay in performing a cesarean."[35] Therefore, healthcare providers seeking to limit malpractice liability in obstetrics possess a clear incentive to perform more cesareans in order to avoid liability.

The increased propensity of patients to sue for failure to perform a cesarean likely reflects differing burdens imposed by cesarean and vaginal births. Principally, vaginal births are associated with higher risk of postpartum hemorrhage and fetal trauma than with planned cesareans.[36] These injuries can lead to the death of the mother and fetal brain damage. Such outcomes, though rare, involve severe hardships suffered by sympathetic plaintiffs. As a result, medical malpractice lawyers can recoup large fees when trying such cases on a contingency basis.[37] Because lawsuits often result from these injuries, physicians are

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31 Kessler & McClellan, *supra* note 4, at 354.

32 The cesarean decision in particular receives less influence from other factors such as payment. Insurance companies cover both vaginal and cesarean deliveries. Further, pregnant mothers are more likely than most groups to have health coverage as Medicaid in most states covers these expenses for mothers well-above the federal poverty line.

33 Laura-Mae Baldwin et al., *Defensive Medicine and Obstetrics*, 274 JAMA 1601 (1995); Lawton R. Burns et al., *The Effect of Physician Factors on the Cesarean Section Decision*, 33 MED. CARE 365 (1995); A. Russell Localio et al., *Relationship Between Malpractice Claims and Cesarean Delivery*, 269 JAMA 366 (1993); Rock, *supra* note 18; Frank A. Sloan et al., *Tort Liability and Obstetricians' Care Levels*, 17 INT'L REV. L. & ECON. 245 (1997); A. Dale Tussing and Martha A. Wojtowycz, *Defensive Medicine and Obstetric Behavior*, 35 MED. CARE 172 (1999).

34 Rock, *supra* note 18, at 460.

35 *Id*. (citing DHHS). The quote also includes "use of forceps;" however, this was excluded as it commonly implies need for a cesarean. Statement reflects author conversations with Dr. Jennifer Schaal, an obstetrician from North Carolina.

36 Errol R. Norwitz, *Cesarean Delivery on Maternal Request*, UPTODATE.COM, http://www.uptodate.com/home/clinicians/specialties/obstetrics.html (last visited October 11, 2009).

37 Patricia Danzon & Lee Lillard, *Settlement Out of Court*, 12 J. LEGAL STUDIES 345 (1983).

forced to internalize many of the risks associated with vaginal births through the tort system.

In contrast, the primary injuries caused by cesarean sections do not readily lead to successful malpractice lawsuits.[38] These injuries include the increased cost of a cesarean section and longer maternal recovery time. Such claims are expensive to bring and have limited value, as the suffered injuries are small. This makes these claims unattractive to a plaintiff's lawyer working on a contingency fee basis.

Consequently, physicians internalize relatively fewer costs associated with cesareans through the tort system. Therefore, lawmakers may be able to lower the cesarean rate by decreasing the tort system's influence on physicians. In 2007, Virginia's cesarean rate approached thirty-five percent, well in excess of the World Health Organization's recommendation of ten to fifteen percent. The average cesarean cost exceeds the average vaginal birth cost by almost $5,000.[39] Therefore, a reduction in this amount could lead to substantial savings.

B. Review of the Literature

A number of studies have employed different datasets, statistical methods, and independent variables to measure the relationship between malpractice risk and defensive medical decision-making, as shown by elevated cesarean rates. One of the first sophisticated studies utilized 1984 hospital data from New York. After controlling for a number of independent variables, this study observed a positive relationship between some measures of malpractice risk and the cesarean rate.[40] Two measures of hospital-level risk, which reflect prevalence of lawsuits at different hospitals, showed a statistically significant relationship to higher cesarean rates. Nevertheless, the coefficients were small, leading the researchers to conclude that the impact of tort risk on physician decision-making was "not large."[41]

A study using 1987 Florida data measured malpractice risk by individual physicians' past exposure to lawsuits and the value of recent awards against obstetricians in a physician's county.[42] The results showed small, statistically insignificant relationships between risk measures and physicians' cesarean rates. In contrast, several other independent variables included in the model returned strong, statistically significant coefficients. The authors concluded that their

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38 *Id*.

39 VIRGINIA HEALTH INFORMATION, OBSTETRICAL SERVICES: A CONSUMER'S GUIDE, *Types of Delivery: Cesarean* (2009), http://www.vhi.org/ob_guide/ob_delivery_cesarean.asp (last visited October 11, 2010).

40 Localio, *supra* note 33.

41 *Id*. at 371.

42 Sloan, *supra* note 33 (this data came before Florida implemented a program similar to BIP).

study indicates that the threat of tort liability has a relatively small impact on medical decision-making.

A 1995 Washington study examined the impact of malpractice risk at the county and physician levels on cesarean rates.[43] In contrast to the expected results, cesarean rates *decreased* with higher levels of some risk measures.[44] Other risk measures correlated to increased cesarean rates, but the researchers concluded that their study "does not support an association between malpractice [risk] . . . and an increase in . . . cesarean deliveries."[45]

A 1997 Syracuse study measured malpractice risk by the cumulative number of malpractice suits in a physician's county in the previous decade.[46] Their results indicated that the fear of malpractice liability had a positive, statistically significant effect on the cesarean rate. The authors concluded that "malpractice exposure raised the [cesarean] rate by an estimated 6.6 percentage points, which is a rather substantial component of the [cesarean] rate of 27.6%."[47] Unlike the above-mentioned studies, this result indicated the potential for substantial cost savings through tort reforms that reduce physicians' exposure to malpractice risk.[48]

Finally, a 1999 study employed county fixed-effects analysis of national birth certificate data from 1990 through 1992. This study differed from others in that it used national data from several years as opposed to state data from a single year.[49] They measured malpractice risk through the cost of obstetricians' malpractice insurance premiums.[50] The researchers divided the data into several pools based on the mother's education. Interestingly, their results returned statistically significant coefficients supporting and opposing (depending on the

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43 Baldwin, *supra* note 33.

44 *Id*. at 1609.

45 *Id*.

46 Tussing, *supra* note 33, at 172. This study used 1986 data from New York State.

47 *Id*. at 182

48 *Id*. This article's methodology also differed from the prior literature by studying the impact of greater liability risk on physician use of the Electronic Fetal Monitor (EFM). Increased EFM use resulted in a greater percentage of pregnancies being diagnosed with fetal distress; such diagnoses greatly increase the likelihood of a cesarean being performed. This result suggests that studies controlling for medical factors, such as fetal distress, that fail to control for the indirect effects of higher EFM use can underestimate the impact of malpractice liability on the cesarean rate.

49 Specifically, this study used national panel data rather than cross-sectional data from a single state in a single year; it also relied on aggregate rather than individual data. Consequently, their methodology limited the risk of results being biased by unobserved factors that affect cesarean rates *and* malpractice risk, a major concern in prior studies. Lisa Dubay et al., *The Impact of Malpractice Fears on Cesarean Section Rates*, 18 J. HEALTH ECON. 503 (1999).

50 *Id*.

mother's education) the theory that physicians practice defensively in reaction to tort liability.[51]

Despite physicians' theoretical incentives to practice defensively and their self-reported proclivity to do so,[52] these studies met mixed results. Some failed to find any relationship between malpractice risk and defensive practice,[53] while others observed only small effects.[54] Consequently, prior literature fails to determine whether the threat of tort liability has *any* impact on physician decision-making. With the exception of the Syracuse study, however, these articles do indicate that physicians do not *strongly* alter their practice style in response to tort liability. These results suggest that tort reforms in medical malpractice are unlikely to significantly impact the cost of obstetrical care in the United States.

II. HISTORY AND IMPACT OF VIRGINIA'S BIRTH INJURY PROGRAM

A. Virginia's 1980s Insurance Crisis and the Birth Injury Program's Formation

In the mid-1980s, national malpractice insurance premiums soared. This increase did not result from a drastic change in patient litigiousness or jury awards, but rather reflected changing insurance market conditions.[55] After insurance companies overextended themselves in the early 1980s, they pulled back coverage dramatically in response to mounting losses.[56] Obstetricians were hit particularly hard. By 1986, following a nearly 200% increase in insurance premiums over a six year span, a clear majority of obstetricians in Virginia were considering retirement from obstetric practice.[57]

Adding to the problem of cost, Virginia faced a crisis in malpractice insurance availability. Due to mounting losses and uncertain risk, the three largest insurance companies either pulled out of the Virginia market or placed near moratoriums on new policies.[58] As a result, roughly 160 obstetricians in the state "were unable to obtain malpractice insurance at any price."[59]

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51 *Id*. at 504.

52 Graham Dresden et al., *Influence of Obstetric Practice on Workload and Practice Patterns of Family Physicians and Obstetrician-Gynecologists*, 6 ANNALS OF FAM. MED. 1 (2008), *available at* http://www.annfammed.org/cgi/reprint/6/suppl_1/S5 (last visited Oct. 15, 2010); David Studdert et al., *Defensive Medicine Among High-Risk Specialist Physicians in Volatile Malpractice Environment*, 293 JAMA 21 (2005).

53 Baldwin, *supra* note 33; Sloan, *supra* note 33; Tussing, *supra* note 33.

54 Lisa Dubay et al., *The Impact of Malpractice Fears on Cesarean Section Rates*, 18 J. HEALTH ECON. 491 (1999); Localio *supra* note 33; Rock *supra* note 33; Tussing *supra* note 33.

55 BAKER, *supra* note 3, at 51.

56 *Id*.

57 Duff, *supra* note 21, at 403.

58 *Id.*

59 GENERAL ASSEMBLY REVIEW, *supra* note 21, at 3.

In response to intense political pressure from physicians and rural communities losing local access to obstetrical care, the Virginia General Assembly sought to stabilize the malpractice insurance climate. Judges received authorization to fine plaintiffs for frivolous claims.[60] Further, the General Assembly capped punitive damages at $350,000; this added to a prior law enacted in 1976 that capped total damages in medical malpractice cases at $1 million.[61] The crisis continued to worsen, however, when these caps were struck down in a decision sustaining an $8.3 million jury verdict against an obstetrician for a neurological injury.[62]

With the goal of increasing insurance availability, the Medical Society of Virginia approached insurers. Virginia Insurance Reciprocal suggested legislation that would take "birth-related neurological injuries out of the tort system."[63] From this point, the political movement towards BIP's creation began. The main purpose of the act is evident from this initial effort. The program framers never sought to overhaul the tort system generally, but instead wished to coax insurance companies to cover additional obstetricians. Consequently, they removed the cases that cause the greatest uncertainty in malpractice awards in obstetrics: birth-related neurological injuries.

B. Program Details Regarding Eligibility and Funding

Political compromise drove many aspects of BIP's authorizing legislation,[64] which passed in 1987. The General Assembly defined the program's scope to fit two conflicting goals: "[T]he critical need to capture those cases responsible for the unpredictable and excessive risk of insuring obstetrics," and a desire to maintain the traditional tort system by bringing only a small number of cases into the program.[65] Additionally, the act established bright-line coverage requirements to reduce administration costs. The specific criteria required the following conditions: (1) an injury to the brain or spinal cord; (2) occurring in live birth from oxygen deprivation or mechanical injury; and (3) rendering the infant cognitively disabled to the point of requiring permanent assistance.[66]

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60 *Id*.

61 *Id*. The amount was set at $1 million as of 1987, the time of BIP's creation. It has subsequently been raised.

62 Duff, *supra* note 21, at 404 (discussing Boyd v. Bulala, 647 F. Supp. 781 (W.D.Va. Nov. 5, 1986)). The caps were reinstated on appeal, following the creation of BIP. *Id*.

63 *Id*. at 405 (quoting Letter from Gordon D. McLean, Executive Vice-President of The Virginia Insurance Reciprocal to Ronald K. Davis, Chairman of MSV's Professional Liability Committee) (Jan. 13, 1987) (on file with the Harvard Journal on Legislation).

64 VA. CODE ANN. § 38.2-5000 (2008).

65 Duff, *supra* note 21, at 413.

66 Seigal, *supra* note 2, at 502.

These requirements have kept the annual number of claims low, with a relatively constant average of around ten claims per year.[67] In addition, patients are only eligible to apply for BIP benefits if they were delivered by a physician that paid to participate.[68] A slightly upward trend in the number of cases likely reflects an increased number of deliveries by participating physicians rather than significant changes in the program criteria or practice quality.

With the goal of keeping administrative costs low, the framers relied on the existing Workers' Compensation Commission (W.C.C.) to administer the program. The W.C.C. receives claims from patients of participating physicians who suffered injuries that may qualify for the program. They then collect the necessary information and determine program eligibility with the help of a medical advisory board. As no-fault proceedings do not investigate the physician's actions, physician involvement is generally limited to providing medical records. Further, attorneys play only a minor role in the proceedings. This process has proved successful as administrative costs for the program have been very low relative to the amounts awarded when compared to the tort system.[69] Claims are also resolved more quickly than in the tort system.[70]

BIP also contrasts with the traditional tort system by providing continuous financial support throughout the injured party's life rather than one lump sum payment. These benefits include "all medically necessary and reasonable expenses of medical and hospital, rehabilitative, therapeutic, nursing, attendant, residential and custodial care and service, medications, supplies, special equipment or facilities and related travel."[71] The program also reimburses reasonable attorney's fees. Total compensation usually exceeds tort awards in similar cases, and claimants' families generally report satisfaction with the benefits and their administration.[72]

BIP draws funding from a variety of sources, reflecting the framers' conception of the program providing a societal benefit.[73] Specifically, participating obstetricians initially paid an annual assessment of $5,000.[74] This amount remained constant for all physicians, regardless of the quantity or risks of deliveries they

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67 VIRGINIA BIRTH-RELATED NEUROLOGICAL INJURY COMPENSATION PROGRAM, 2008 ACTUARIAL REPORT A.1, *available at* http://www.vabirthinjury.com/News_Publications.html.

68 Hospitals can also pay to participate in BIP. This allows their patients to participate in the program and shields them from any tort liability that arises from the birth. This article does not examine hospital participation.

69 Duff, *supra* note 21, at 418.

70 *Id*.

71 VA. CODE ANN. §38.2-5009 (2008).

72 GENERAL ASSEMBLY REVIEW, *supra* note 21, at 28.

73 Duff, *supra* note 21, at 409.

74 VIRGINIA BIRTH-RELATED NEUROLOGICAL INJURY COMPENSATION PROGRAM, *supra* note 67, at 80.

oversaw or their claims record. Non-participating physicians pay $250 per year.[75] Further, liability insurers can be assessed "up to one-quarter of one percent of net direct liability premiums written in Virginia."[76]

C. Participation Benefits and BIP's Impact on Insurance Cost and Availability

With respect to its primary goal of easing Virginia's insurance crisis among obstetricians, BIP achieved initial success. Specifically, Virginia Reciprocal lifted its moratorium on new polices in the Commonwealth ten days after the bill passed, quickly ending the lack of available coverage.[77] Additionally, a new insurer entered the market: the Medical Protective Company.[78] No availability crisis comparable to 1986 has occurred subsequent to BIP's implementation. Though the program initially accomplished little with respect to lowering overall insurance premiums,[79] savings appeared over time. Obstetricians in Virginia later enjoyed relatively low malpractice premiums when compared nationally. JLARC concluded that BIP's "specific role in the reduction of malpractice premiums [generally] cannot be separated out, but . . . it can reasonably be considered one factor."[80]

BIP participants primarily benefit by being shielded against malpractice liability for covered injuries. Patients eligible for BIP are *prohibited* from filing any lawsuits related to their injuries. Participating physicians are still subject to malpractice liability from patients that suffer ineligible injuries. Non-participating physicians are subject to malpractice liability from patients with all types of injuries. As BIP precludes some malpractice claims, participating obstetricians pay lower insurance premiums than their non-participating colleagues. The Act's language required insurers to "provide a credit on [participants'] annual medical malpractice liability" premiums.[81] JLARC determined in 2002 that of the ten insurance companies in the Virginia market, the average discount given to obstetricians for participation ranged "from $4,873 to more than $7,300."[82] This exceeds the minimum required by law, indicating that insurance companies calculated that BIP covered this amount of malpractice liability. Based on malpractice

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75 *Id*. at 77. Non-participating physicians still can receive some benefit from the program as patients benefitting from the program are barred from bringing tort claims against anyone involved in the birth, including additional physicians that did not participate in the program.

76 *Id*.

77 Duff, *supra* note 21, at 433.

78 *Id*. at 434.

79 *Id*.

80 GENERAL ASSEMBLY REVIEW, *supra* note 21, at 36.

81 VA. CODE ANN. §38.2-5020.1 (2008).

82 GENERAL ASSEMBLY REVIEW, *supra* note 21, at 39.

rates at that time, this suggests that on average BIP shields obstetricians from ten to twenty percent of total liability.[83]

Further, high participation rates throughout BIP's history suggest that most Virginian obstetricians perceived a benefit from program participation in excess of the $5,000 yearly assessment. This perception is likely accurate given that annual assessments on participants cover only a portion of overall expenses incurred by the program. BIP's increased cost relative to the tort system partially reflects a more lenient culpability standard and benefits in excess of the malpractice cap. Nevertheless, a large majority of BIP recipients consulted an attorney, indicating that most claims would have otherwise resulted in a lawsuit.[84] Further, such cases are associated with a relatively high rate of success and large monetary awards. Therefore, BIP likely diverts substantial sums of money from the tort system, justifying high participation rates.

D. Incentives Faced by BIP Participants Regarding Defensive Practice

For the cases it accepts, BIP almost entirely shields providers from negative consequences associated with malpractice cases in the tort system. Consequently, its value to participating physicians greatly exceeds that of traditional malpractice insurance. Principally, participants suffer no direct financial consequences from a successful BIP claim filed against them by a former patient. Following a successful BIP claim, participants are free to continue participating in the program without restriction. Yearly assessments also remain the same.[85] In contrast, insurers may refuse to cover obstetricians with past lawsuits or charge them higher premiums.[86] This gives providers a direct financial incentive to alter their practice to avoid malpractice claims, particularly with respect to expensive cases such as neurological injuries.

Further, BIP does not report successful claims against a participant to the National Practitioner Data Bank or the Virginia Board of Medicine website.[87] Consequently, participants do not encounter the credentialing and licensure problems that can follow a successful lawsuit. Successful BIP claims are also not reported publicly and involve no finding of negligence. As a result, participants avoid some of the damaging stigma associated with a malpractice lawsuit.

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83 *Id*. at 36.

84 *Id*. at 26.

85 Duff, *supra* note 21, at 445.

86 FRANK SLOAN & LINDSEY M. CHEPKE, MEDICAL MALPRACTICE 228-30 (2008). Though such practices occur to an extent in the medical malpractice insurance industry, physician fears over exponential increases in premiums or dropped coverage following a suit seem to be overblown. In general, insurance companies do not apply experience ratings to almost all physicians; *see also* BAKER, *supra* note 316 (nevertheless, physicians commonly report altering their medical decision-making in response to the threat of malpractice lawsuits.

87 Bovbjerg & Sloan, *supra* note 21, at 103.

BIP coverage also provides physicians with substantial time savings as well. The program informs physicians of claims filed against them; however, they play no role in the proceedings other than turning over medical records and are not informed of the results.[88] In contrast, malpractice lawsuits entail a long, drawn-out process with frequent attorney consultations and invasive discovery. Physicians endure disruptive depositions and discovery prior to settlement, with a much greater time burden if a case goes to trial.

As a measure to provide some deterrence of negligent medical practice, successful claims in the Virginia Birth Injury Program prompt a review by the Virginia Board of Medicine and Department of Health. In theory, the board could punish negligent physicians by revoking their medical licenses. In practice, however, JLARC found these reviews to constitute little more than a rubber stamp as only "minimal investigations of the circumstances surrounding the birth events were conducted."[89] Notably, not a single physician had received any sanction from this process as of the 2002 JLARC review.[90] One criticism attributed this to the Board of Medicine's greater "interest in protecting medical colleagues than in safeguarding the public."[91]

Addressing these concerns, the framers asserted that "so long as the [Birth Injury Program] takes the form of an adjunct to the existing tort system, an adequate deterrent effect from that system will continue to operate," leaving physician practice style unchanged.[92] A substantial incentive to avoid malpractice claims undoubtedly remains for participants given the large majority of total liability remaining in the tort system. Nevertheless, BIP participation reduces this incentive. Further, those cases covered by BIP generally constitute some of the most damaging and expensive awards in medical malpractice. Being almost entirely shielded from the "worst-case scenario" may disproportionately impact provider behavior, leading to less defensive practice. The remainder of the article examines this effect.

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88 *Id.*

89 GENERAL ASSEMBLY REVIEW, *supra* note 21, at 112.

90 *Id*.

91 Duff, *supra* note 21, at 443 (quoting Robert Derbyshire, *How Effective Is Medical Self-Regulation?*, 7 L. & HUM. BEHAVIOR 193, 196 (1983)).

92 *Id.* at 444 (quoting Ronald K. Davis & Sandra L. Kramer, *The Policy Implications of the Injured Infant Act*, 5 VA. HOSP. ASS'N PERSP. 3 (1987)).

III. THE DATASET, VARIABLES, AND THEIR PREDICTED IMPACT BASED ON PAST STUDIES

A. Cesarean Rate Data

This article employs physician-specific cesarean rate data compiled by Virginia Health Information (V.H.I.), a nonprofit public/private partnership.[93] The dataset uses 2006 obstetrical delivery statistics that hospitals are legally required to report to V.H.I. Consequently, the guide includes cesarean rates for 571 obstetricians, almost all those practicing in the Commonwealth.[94]

Physicians' cesarean rates are strongly impacted by factors other than their risk aversion to lawsuits. Principally, physicians are more likely perform cesareans when they treat riskier patients. To control for this, V.H.I. calculated the cesarean rate they would expect for each physician based on their patients' characteristics.[95] V.H.I. determined each provider's expected rate "based on a detailed statistical analysis of hospital data on all mothers discharged from a Virginia hospital during the 2006 calendar year."[96] The difference between a physician's expected and actual rate reflects non-patient factors, including a physician's desire to avoid medical malpractice lawsuits.

This article employs this difference between actual and expected rates, referred to as a physician's "adjusted cesarean rate," as the dependent variable in the regression models.[97] Relying on the physicians' adjusted cesarean rates ad-

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93 VIRGINIA HEALTH INFORMATION, OBSTETRICAL SERVICES: A CONSUMER'S GUIDE (2009), http://www.vhi.org/ob_guide/ob_about.asp. V.H.I., founded in 1993, is "governed by a Board of Directors representing business, consumers, hospitals and nursing homes, physicians, the insurance industry and state government."

94 VIRGINIA HEALTH INFORMATION, TECHNICAL MANUAL 2 (2009) *available* at http://www.vhi.org/pdf/2009OB_TECH_MANUAL.pdf (stating that the guide includes only physicians that performed over 30 deliveries in 2006). Physician characteristic data included in the guide was obtained from the Virginia Board of Medicine's website. Doctors are required to keep the information on this website up to date. *See* http:www.vahealthprovider.com.

95 The models will examine only primary cesareans, those performed on mothers with no prior cesarean births, because mothers with prior cesareans rarely have vaginal births. For the remainder of this article, the term "cesarean rate" refers to the primary cesarean rate.

96 VIRGINIA HEALTH INFORMATION, TECHNICAL MANUAL 2 (2009), *supra* note 94, at 7. To do so, V.H.I. developed a statistical model that controlled for forty five separate variables "that were identified by the Obstetric Task Force members as potential predictors for cesarean delivery." *Id*. at 6. These variables included maternal age, race, diabetes, abnormal fetal heart rate, and excessive fetal growth. V.H.I.'s model was generally able to predict whether a physician performed a cesarean in a given case. *Id*. Specifically, V.H.I.'s robustness check examined the model's c-index, "a measure of the model's capacity to discriminate between patients with and without cesarean delivery." *Id.* The c-index ranges from "0.5 for random results to 1.0 for perfect discrimination." *Id.* V.H.I.'s model returned a c-index of .86, reflecting substantial, but not complete, discrimination. *Id*.

97 A physician's adjusted cesarean rate equals their actual rate minus their expected rate. Therefore, a physician that performs more cesareans than expected will have a positive adjusted cesarean rate. A physician that performs fewer than expected will have a negative adjusted cesarean rate.

justs for a large number of medical factors that influences the decision to perform a cesarean.[98] Prior studies have also adjusted for patient characteristics that influence the cesarean decision.[99] These studies consistently found that medical indicators were a large, statistically significant determinant of a provider's cesarean rate. As a result, this adjustment for medical factors is important to reduce bias in the results.

B. BIP Participation

This article primarily examines the impact that participation in Virginia's Birth Injury Program has on physicians' adjusted cesarean rates. Using BIP participation as the measure of malpractice risk enables this study to gauge the impact of a tort reform that is fairly unique in the United States.

Further, it avoids a major drawback of many alternative measures. Prior studies have been criticized for using proxies that overstate malpractice risk per birth in areas where physicians perform more deliveries.[100] BIP participation avoids these complications. Every obstetrician and hospital participating in the program receives the same amount of protection from malpractice liability per birth regardless of how many deliveries they perform.

One limitation of the BIP is its limited scope, covering only birth-related neurological injuries that result from oxygen deprivation.[101] Therefore, BIP participants are still exposed to significant malpractice risk from the vast majority of injuries that can result from a delivery. This risk could still be sufficient to encourage those apt to practice defensively to do so, even if their risk is somewhat reduced by BIP participation.

Alternatively, participation in BIP may also have a large impact relative to its scope because the types of injuries it covers are the most expensive. Despite their rarity, such cases may disproportionately impact provider behavior based on an outsized fear of the worst-case scenario. The debate surrounding the enactment of the program suggests such a relationship.[102] Based on theory supporting defensive medicine and the seemingly disproportionate fear surrounding lawsuits

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98 After adjustment, predicted risks for individual births ranged from less than 1% to 100%.

99 Baldwin, *supra* note 33; Burns, *supra* note 33; Dubay, *supra* note 49; Localio, *supra* note 33; Sloan, *supra* note 33. These prior studies included medical factors influencing the cesarean rate directly into their models as independent variables. In contrast, this study uses a dependent variable that has been adjusted for medical factors. A direct control, like the prior studies, would be preferable; however, this data was not available from V.H.I. The use of the adjusted cesarean rate does compare favorably with prior studies in some respects by incorporating a much larger number of medical factors.

100 Dubay, *supra* note 49, at 493. These concerns apply to common proxies for malpractice risk such as claims per physician, insurance rates, and individual physicians' claims history.

101 *See supra* Part I.

102 *See* Duff, *supra* note 21, at 413.

covered by the program, the models should show a negative relationship between BIP participation and an elevated adjusted cesarean rate.

C. Variables other than Malpractice Liability that Impact the Cesarean Rate

While medical decision-making reflects ample scientific knowledge, practitioners often lack clear cut answers. Absent outside influences—such as insurance payments or the threat of malpractice liability—obstetricians will differ in their practice style: their assessments of the costs and benefits of a cesarean in a given situation.[103] Prior studies have found that certain physician characteristics and other non-medical factors impact physicians' practice styles.[104] To the extent possible, these factors are included in the models as independent variables to isolate how BIP participation affects a physician's adjusted cesarean rate.[105] In addition, the inclusion of these variables may offer policymakers further suggestions for reducing medical costs.

Peer influence plays a significant role in shaping a physician's practice style.[106] Therefore, the models include variables for several potential sources of peer influence, such as medical school attended and years of experience.[107]

Daily interactions with other physicians and hospital administrators likely provide the greatest peer influence on an obstetrician's cesarean decision.[108] Further, hospitals may actively encourage defensive practice by physicians to avoid malpractice liability.[109] Therefore, the models include variables for hospitals in which the obstetricians in the sample perform the majority of their deliveries.[110] The models also control for location by including variables for physicians practicing in Southwest Virginia, Northwest Virginia, and the Washington, Richmond and Virginia Beach Metropolitan areas.[111] These variables also help control

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103 Tussing, *supra* note 33, at 185.

104 *See Supra* Part I.B.

105 VIRGINIA HEALTH INFORMATION, *supra* note 93.

106 *See, e.g.*, Tussing, *supra* note 33, at 185.

107 Burns *supra* note 33, at 375. In order to limit the number of variables, the model only includes binary variables for medical schools with more than fourteen graduates in the dataset. A variable for foreign medical graduates is also included. The variable for years of experience was created by subtracting a physician's medical school graduation year from 2002.

108 Localio, *supra* note 33, at 368 (stating that hospitals may influence physician behavior in response to the threat of malpractice liability by "changing the environment in which staff or attending physicians practice.").

109 *Id*. (stating that hospitals may accomplish this through "informal exhortations or formal advisories, guidelines, and restrictions" such as mandatory second opinions).

110 In order to limit the number of variables, the model only includes binary variables for hospitals with at least eight physicians in the dataset.

111 Metropolitan areas were calculated based on physicians practicing within 40 miles of the city center. Regional classifications relied on V.H.I. designations. These categories do not encompass the

for varying patient litigiousness and premiums for malpractice insurance among different regions.[112]

Finally, obstetricians in small hospitals may favor cesareans due to the increased ease with which they can be planned; this is a more salient concern in communities with fewer obstetricians sharing the burden of responding to emergencies.[113] Consequently, the models include a variable for obstetricians practicing in a hospital with fewer than four other obstetricians.

IV. METHODOLOGY AND ITS LIMITATIONS

If obstetricians react to incentives from the tort system, participants in Virginia's Birth Injury Program should perform relatively fewer cesareans. This study seeks to test this theory by measuring how much program participation impacts obstetricians' cesarean rates; economists call this impact the "average treatment effect."[114] This article utilizes an ordinary least squares regression model to measure the average treatment effect of BIP participation on obstetricians' adjusted cesarean rates.[115] Specifically, this model uses obstetricians' adjusted cesarean rates as the dependent variable and BIP participation as the independent variable.

To isolate BIP participation's average treatment effect, observations would ideally be randomly assigned into treatment and non-treatment groups (participants and non-participants in BIP). In practice, obstetricians in Virginia choose whether or not to pay a yearly fee for BIP participation. This decision is not random and those opting into the program may differ substantially from those that do not, which could skew results. To address this problem, the models include independent variables for other factors that may influence physicians' cesarean rates.[116] Nevertheless, the models fall far short of including every possible factor.[117] Specifically, several variables that have been shown to impact cesarean

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entire state, with obstetricians outside of the metropolitan areas of Eastern, Northern, and Central Virginia lacking a regional variable.

Many hospitals located in Southwest and Northwest Virginia lacked enough obstetricians to warrant a separate variable. Inclusion of these regional variables captures some of this effect. Additionally, obstetricians in metropolitan areas were more likely to practice in multiple hospitals. As a result, peer influence in these areas likely extends beyond their primary hospital.

112 GENERAL ASSEMBLY REVIEW, *supra* note 21, at 36.

113 *See, e.g.*, Burns *supra* note 33, at 375. Several studies have noted higher cesarean rates among rural physicians. This may reflect obstetricians' reactions to convenience incentives, which are stronger for rural physicians.

114 The average treatment effect is "an average partial effect for a binary explanatory variable." JEFFREY M. WOOLDRIDGE, ECONOMETRIC ANALYSIS OF CROSS SECTION AND PANEL DATA 603 (2001).

115 An adjusted cesarean rate is an obstetrician's actual rate minus his expected rate. *See supra* Part III.A.

116 *See supra* Part III.C.

117 The potential of selection effects and unobserved heterogeneity provides the greatest concern.

rates are omitted from the models. These include insurance accepted,[118] a birth's time of day,[119] use of electronic fetal monitors[120] and additional patient-specific demographic characteristics.[121]

Further, the Birth Injury Program's structure facilitates adverse selection and provides incentives for riskier obstetricians and hospitals to opt into the program.[122] Adverse selection could occur if the characteristics that impact physicians' decisions to participate in the program also impact their cesarean rates. Regression models that use both cesarean rates and BIP participation may be particularly vulnerable to such bias as both are intuitively impacted by an obstetrician's personality and temperament. For example, risk-averse providers have a tendency to both opt into the program to shield them from as much liability as possible, and practice more defensively to lessen the likelihood of a lawsuit. In such a case, BIP participation could appear to positively impact the cesarean rate, even if it had the opposite effect.

Given the problem of self-selection, additional models will be employed, representing the best effort to address it directly. This study first compares the characteristics of Birth Injury Program participants and non-participants in the following section.[123] Significant differences between the two groups indicate a greater risk of self-selection bias.

V. ANALYSIS AND RESULTS

A. Descriptive Statistics

The clear majority—78.5%—of obstetricians participated in the Birth Injury Program in 2006.[124] Notably, participants differed from non-participating obstetricians, which suggests some risk of self-selection bias. For example, participants performed 3.5% more deliveries, which may reflect financial incentives from the flat-fee financing structure. Participants are also more experienced,

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118 Baldwin, *supra* note 33.

119 Dubay, *supra* note 49.

120 Localio, *supra* note 33.

121 Sloan, *supra* note 33.

122 *See supra* Part II.

123 This study also employed a propensity scoring model to account for selection tendencies into BIP. This model entails a two-stage econometric specification to capture selection effects. Specifically, this study employed "an OLS regression that simply includes the estimated propensity score as an additional regressor." WOOLDRIDGE, *supra* note 114, at 617.

The inclusion of the propensity score regressor did not have a significant impact: the propensity score was statistically insignificant and results for other variables resembled the standard OLS model. As a result, these results provided little control for self-selection and are excluded from the results.

124 VIRGINIA HEALTH INFORMATION, *supra* note 93.

averaging 16.5 years compared to 14.8 for non-participants. Graduates of medical schools in Virginia and D.C. are more likely to participate in the program than graduates of medical schools in other U.S. states and abroad.

Primary hospital also appears to significantly impact physicians' decisions to join the Birth Injury Program. This likely reflects hospital policy. For example, none of the twenty obstetricians practicing at the University of Virginia or VCU Health System hospitals participated in the program in 2006; however, the majority of physicians at other hospitals in their respective cities did participate. Finally, rural obstetricians—and those practicing in small hospitals—appear significantly less likely to utilize Virginia's Birth Injury Program than their urban counterparts.

The numerous differences between participants and non-participants indicate a considerable risk of self-selection bias. In addition, the descriptive statistics do not provide initial support for the theory that BIP participation decreases incentives for higher cesarean rates; participants exceeded their expected cesarean rate by 1.4 percentage points, while non-participants exceeded their expected rates by only 0.1%. Nevertheless, these numbers do not include any controls for significant differences between the two groups, which may strongly influence adjusted cesarean rates.

Table 1: Comparison of V.H.I. Participants and Non-Participants[125]

All V.H.I. Obstetrician Observations Comparison Table	**All V.H.I. Obstetricians (571)**	**Participating Obstetricians (448)**	**Non-Participants (123)**
BIP participation	78.5%	100.0%	0.0%
Number of Deliveries	147.5	148.6	143.6
Cesarean Rate	25.6%	25.8%	24.9%
Adjusted Cesarean Rate (Act-Exp)	1.1%	1.4%	0.1%
Years of Experience	16.1	16.5	14.8
Hospital with 3 or Fewer OBs	7.2%	5.8%	12.2%
Inova Fairfax Hospital	12.8%	15.8%	1.6%
University of Virginia	1.4%	0.0%	6.5%
VCU Health System	2.1%	0.0%	9.8%
D.C. Metro Area Location	33.3%	35.0%	26.8%
Northwest Region Location	10.2%	9.4%	13.0%

125 This table only includes results for selected variables.

B. Ordinary Least Squares Regression

This study ran an ordinary least squares regression to measure how participation in Virginia's Birth Injury Program impacts physicians' adjusted cesarean rates.[126] The regression included additional variables to control for other factors that influence obstetricians' cesarean rates; this helps isolate BIP's effect.[127] The regression results differ substantially from the descriptive statistics, indicating potential for substantial selection bias and unobserved heterogeneity in the dataset.[128]

Table 2: Ordinary Least Squares Regression Results[129]

Variable	Coefficient	Standard Error
BIP	-0.00768	0.007918
Number of Deliveries (100's)	-0.01326***	0.003795
Years of Experience	0.00072**	0.000314
Hospital with 3 or Fewer OBs	0.012533	0.017484
Inova Fairfax Hospital	0.020433	0.06811
University of Virginia	-0.07913**	0.035379
VCU Health System	-0.10549***	0.030558
D.C. Metro Area Location	0.035137	0.071277
Northwest Region Location	0.03078	0.029381
Adjusted R-Squared Value=0.2319	571 Observations	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

When controlling for other variables that influence the cesarean rate, Birth Injury Program participants had lower adjusted cesarean rates than non-participants. Specifically, the BIP variable reported a model coefficient of –0.008. This means that program participation was associated with a 0.8 percentage point decrease in the adjusted cesarean rate (actual rate minus expected rate). A decrease supports the theory that the BIP program encourages fewer cesareans; however, this result is statistically insignificant. Standard error for the BIP variable was also 0.008 and the 95% confidence interval ranged from –0.232 to

126 *See supra* Parts III.B; III.C.

127 *See supra* Part III.C.

128 *See* Table 3 in Appendix for full results.

129 This table only includes results for selected variables. For a full table, *see* Appendix.

+0.008.[130] This indicates that the association between BIP participation and lower adjusted cesarean rates could easily reflect random chance rather than a causal relationship. Further, these results demonstrate that it is very unlikely that BIP participation reduces cesarean rates by more than 2.3 percentage points.

Other variables returned more significant results. Principally, the number of deliveries (in hundreds) that an obstetrician in the dataset performed produced a model coefficient of -0.013; this result was significant at the 1% level and the standard error was .004.[131] This coefficient indicates that an increase of 100 in the number of deliveries performed by a physician corresponded to a 1.3 percentage point decrease in their adjusted cesarean rate. This result makes sense as physicians that perform more deliveries may feel more comfortable dealing with uncertainties involved with vaginal births. The results—with significance at a 2% level—indicated that physicians with more years of experience performed relatively more cesareans. Although the theory behind this relationship is unclear, the impact was fairly small: an additional decade of experience reflected only a 0.7 percentage point increase in the adjusted cesarean rate.

Several medical school and hospital variables also returned statistically significant coefficients. Providers at two of Virginia's teaching hospitals, the University of Virginia and VCU Health System, performed significantly fewer cesareans than expected, by 7.9 and 10.5 percentage points respectively; both results were significant at the 2% level.[132] George Washington and Howard Medical Schools produced positive coefficients of .031 and .041 respectively, indicating that their graduates performed more cesareans than expected by several percentage points; both coefficients were significant at the 2% level. This study did not examine individual medical schools or hospitals; however, these results may indicate that peer influences or pressures from hospital administrators differ at these institutions. Other medical schools and foreign graduates produced statistically insignificant results.

In summary, these results suggest that BIP participation has at most a minor impact on physicians' adjusted cesarean rates. Notably, region and metro variables failed to produce a single statistically-significant result. Nevertheless, some other variables—such as number of deliveries, age, and primary hospital—provided more significant results. This suggests that physicians' practice styles

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130 The confidence interval provides the range of values that the true result very likely falls within. These results indicate that the true impact of the BIP very likely is in the range of lowering cesarean rates by less than 2.3 percentage points to raising them by less than .8 percentage points. Notably, zero (or no effect) is in this range. As a point of reference, a 95% confidence interval is less certain than a 99% confidence interval.

131 Significance at the one percent level indicates that it is extremely likely that the true impact of this variable (higher number of deliveries) is negative. Significance at a two percent level is also very likely but not to the extent of significance at the one percent level.

132 Sentara Norfolk General, the other teaching hospital listed as a separate variable, also returned a negative coefficient, though it was statistically insignificant. Sentara Norfolk General is the primary teaching hospital for the obstetrics residency program at EVMS.

do change significantly in response to some factors, but that BIP participation is not among them.[133]

VI. DISCUSSION

A number of prior studies have examined the link between malpractice liability and physician decision-making through measures that capture fluctuating risk within the traditional tort system.[134] This article examined the same question in a unique way: by looking at a state no-fault reform that completely removed cases from the tort system. Virginia's tort reform shields participating physicians almost entirely from the negative effects of malpractice claims for certain injuries. As such, it could have a greater impact on physician decision-making than fluctuating risk within the traditional tort system. The results do not support this theory and provide at most mild evidence suggesting that the Birth Injury Program induces physicians to practice less defensively.

These results should not be overstated. Tort reform advocates could attribute the program's relatively small impact on cesarean rates to a number of factors. For example, Virginia's Birth Injury Program only covers a subset of all malpractice claims in obstetrics. Therefore, participants still feel pressure from the traditional tort system. Peer influence also strongly influences practice style. Due to the voluntary nature of the program, non-participating obstetricians can influence their participating counterparts; a mandatory, comprehensive no-fault system could produce substantially different results.

Moreover, one study's failure to find a significant causal link between malpractice risk and altered physician decision-making does not preclude the existence of such a relationship. Principally, this study may reflect self-selection bias.[135] If such bias existed, it would likely tend to underestimate the program's impact on reducing cesarean rates because risk-averse obstetricians would join the program and perform more cesareans.

Most statistical analysis in social science suffers similar limitations to varying extents.[136] Consequently, prior studies examining the link between malpractice risk and physician decision-making have reached mixed results.[137] Collectively, however, prior studies and this article demonstrate that tort reform advocates

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133 Results from the propensity-scoring model did not differ substantially from the ordinary least squares model. Therefore, they are omitted. *See supra* note 123.

134 *See supra* Part I.B.

135 *See supra* Part IV. The propensity scoring model was used in an attempt to control for this. Its results closely mirrored those of the OLS. Consequently, the dataset may not suffer from substantial self-selection bias. Alternatively, the propensity scoring model may have been ineffective in its control. For more discussion, see *supra* note 123.

136 *See, e.g.*, John Donohue, *The Search for Truth: In Appreciation of James J. Heckman*, 27 L. & SOC. INQUIRY 23 (2002).

137 *See supra* Part II.B.

overstate the "epidemic of defensive medicine" supposedly plaguing America's health care system.[138] For example, this article found that it is highly unlikely that BIP participation lowered cesarean rates by more than 2.3%.[139] Most physicians do not appear to alter their medical decision-making in response to incentives from the tort system.

A number of non-patient factors outside the tort system have been found to influence physicians' perceptions of the merits of cesareans relative to vaginal births. This article is no exception. Unlike BIP participation, several independent variables returned large, statistically significant results. Obstetricians delivering a large number of babies per year had considerably lower adjusted cesarean rates. Obstetricians with more years of experience had somewhat higher rates. Graduates of certain medical schools and practitioners in certain hospitals were more likely to have high adjusted cesarean rates when controlling for other factors.

These results suggest that lawmakers should look outside tort reform when seeking alternative ways to lower medical costs. Even if malpractice risk leads to defensive medicine, other non-patient factors appear to more strongly influence practice style. For example, Virginia lawmakers may be able to harness some of the considerable cost-savings of lower cesarean rates by funneling more deliveries through high-volume obstetricians at the expense of OBGYNs and family practitioners. Continuing education classes for obstetricians could place a greater focus on circumstances that require cesareans and those that do not. Finally, policymakers could examine differences between hospitals with lower and higher adjusted cesarean rates. Such decisions involve an array of factors and should not be taken lightly. Nevertheless, lawmakers would be well-advised to shift some of their focus away from tort reform towards alternative measures for cost-savings in health care.

APPENDIX

Table 3: Full Ordinary Least Squares Regression Results

Variable	Coefficient	Standard Error
BIP	-0.00768	0.007918
Number of Deliveries (100's)	-0.01326***	0.003795
Foreign Medical School	0.006866	0.009785

138 Krauthammer, *supra* note 5; *see also supra* Part II.B. Most models have found no statistically significant relationship between malpractice risk and physician decision-making. This statement reflects the author's account of the published literature. Further, a publication bias in favor of significant results that support an author's theory may overstate the existence of defensive medicine.

139 *See supra* Part V.B.

University of Virginia Medical School	0.002798	0.011387
Georgetown Medical School	-0.01028	0.015601
George Washington Medical School	0.031026**	0.015156
Howard Medical School	0.040739**	0.019329
VCU Medical School	-0.00214	0.009524
Eastern Virginia Medical School	-0.00224	0.010373
Years of Experience	0.00072**	0.000314
Inova Alexandria Hospital	-0.02135	0.068151
Augusta Medical Center	-0.0551	0.034843
Carilion Medical Center	-0.04926**	0.019824
Centra Health	-0.02785	0.024017
Chesapeake General Hospital	0.036324*	0.020582
CJW Medical Center	0.014217	0.027858
Inova Fair Oaks Hospital	-0.01458	0.069067
Inova Fairfax Hospital	0.020433	0.06811
Henrico Doctors' Hospital	0.018736	0.026106
Hospital with 3 or Fewer OBs	0.012533	0.017484
Sentara Leigh Hospital	-0.01225	0.022427
Inova Loudoun Hospital	-0.09729	0.069672
Martha Jefferson Hospital	-0.03946	0.034207
Bon Secours Mary Immaculate	0.030367	0.025332
Mary Washington Hospital	0.014499	0.02713
Bon Secours Memorial Regional	-0.01314	0.030457
Carilion New River Valley	-0.02964	0.024804
Sentara Norfolk General (EVMS)	-0.00267	0.021893
Potomac Hospital	-0.0095	0.070051
Prince William Hospital	-0.09673	0.070083
Reston Hospital Center	-0.0271	0.06901
Riverside Regional Medical	0.002102	0.022395
Rockingham Memorial	-0.02925	0.034824
Southside Regional Medical	-0.00649	0.030332
Bon Secours Saint Mary's	-0.00829	0.026684
University of Virginia	-0.07913**	0.035379
Sentara Virginia Beach	-0.00569	0.023008

VCU Health System	-0.10549***	0.030558
Virginia Hospital Center	-0.00842	0.068962
Sentara Williamsburg Regional	-0.01399	0.026658
Winchester Medical Center	0.010591	0.031519
D.C. Metro Area Location	0.035137	0.071277
Richmond Metro Area Location	0.04364	0.030241
VA Beach Metro Area Location	-0.00887	0.026483
Southwest Region Location	0.01751	0.022977
Northwest Region Location	0.03078	0.029381
Constant	0.008075	0.024696
Adjusted R-Squared Value	0.2319	

* $p < 0.10$
** $p < 0.05$
*** $p < 0.01$