Does Sorry Work?

The Impact of Apology Laws on Medical Malpractice

Benjamin Ho
Cornell University

Elaine Liu*
University of Houston

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ABSTRACT

Physicians' apologies for adverse medical events are acknowledged as a factor in patients' decisions to litigate. Apology laws which render physicians' apologies inadmissible in court are written to encourage patient-physician communication and to overcome the physicians' disinclination to apologize because apologies could invite lawsuits. We present a novel model of apologies and malpractice in order to examine whether state-level apology laws have an impact on malpractice lawsuits and settlements. Using a difference-in-differences estimation, we find that apology laws could expedite the resolution process. We also find that apology laws result in the greatest reduction in average payment size and settlement time in cases involving severe patient outcomes.

JEL Classification Codes: K13, K32

"It's sad, so sad
Why can't we talk it over?
Oh, it seems to me
That sorry seems to be the hardest word"

~ "Sorry Seems to Be the Hardest Word": *Elton John*

Medical treatments often pose a probability that the patient will suffer adverse health effects. The probability of these adverse effects depend on the level of care exercised by the physician, which is not observable by the patient. Adverse outcomes can lead to medical malpractice claims. However, apologies by physicians can potentially provide a signal to the patient of the level of care, and consequently will affect the rate of litigation and medical malpractice costs. This paper presents a model of apologies and medical malpractice litigation and estimates the effect of state level laws regarding medical malpractice and apologies.

In response to trends in malpractice lawsuits and malpractice insurance premiums, national and state legislatures have proposed and enacted legislation to put into place a number of reforms, including jury award caps, insurance premium price caps, state medical malpractice funds, greater information disclosure, and of particular relevance to the current paper, apology exemptions. In 1986, Massachusetts became the first state to adopt some form of an apology law, which was designed to protect doctors from statements they might make to their patients regarding complications the patient suffered under their care. More recently, these apology laws specifically declare that a statement of apology made by a medical practitioner to a patient is inadmissible as evidence of liability. In September of 2005, then-Senators Clinton and Obama cosponsored the National MEDiC Act, which would have implemented such exemptions on a national level. As of January 2009, 36 states had implemented various forms of apology laws.

State apology laws are premised on two stylized facts. The first fact is that doctors would like to apologize to their patients for medical mistakes, but are stymied by their fear of inviting a lawsuit. Research shows that doctors are typically told to avoid admissions of fault and apologies because of the

risk of lawsuits (Lamb et al., 2003). The second fact is that a main motivation patients give when asked why they chose to sue their doctors is anger; an anger that might have been assuaged by an apology (Vincent, Phillips & Young , 1994). These two facts lead to a vicious cycle that breaks down patient-doctor communication and thereby increases litigation costs. By making apologies inadmissible as evidence in malpractice lawsuits, it is hoped that doctors would communicate with patients more effectively, thus reducing patient confusion and anger in the case of adverse complications and thereby diminish the cost of medical malpractice by eventually reducing malpractice insurance losses and premiums.

Our study examines the impact of state-level apology legislation. Although we do not observe actual apologies, the maintained assumption of this paper is that by reducing the consequences of apologies, doctors would apologize more frequently. The purpose of apologies is to maintain the doctor-patient relationships. Our model presumes that patients care about their doctors' intentions, but the relationship between a patient's health outcomes and a doctor's intentions is fundamentally uncertain. Patients are more inclined to sue a doctor with poor intention, (i.e., doctors who put in effort below the standard of care). An apology is a signal that the bad outcome arose from bad luck rather than a lack of effort.[1] More apologies would therefore reduce litigation and speed up settlements. However, the law could have perverse consequences. By reducing the cost of the apology, the laws could make apologies less effective and therefore lawsuits may become more likely. Another unintended consequence may be that patients may be induced to litigate more frequently if more apologies make patients better informed about the extent and the cause of their injuries.

To disentangle these effects we use data from the National Practitioner's Data Bank (NPDB) Public Access File (2009), which includes all medical malpractice payments made by or on behalf of a

[1] A more extensive model of apologies based on signaling and asymmetric information can be found in Ho (2011). In order to keep the focus on the litigation and maintain simplicity in the current article, we abstract away from signaling by saying that an apology increases the psychic cost of suing a doctor, implicitly assuming the patients' beliefs change.

healthcare provider since 1991. Given that the NPDB data set only consists of claims with positive payouts, it does not contain information on open claims nor closed claims without payments. Therefore, the dependent variable in most analysis would be the number of closed claims with positive payouts in a state-year.

Our analysis is conducted on two levels. The first level is a difference-in-differences analysis using the time variation from the staggered implementation of state-level apology laws to investigate the impact on the malpractice closed claims frequency and malpractice compensation payout within a state-year. We further explore the change of claim composition by the severity of injury. The second level of analysis is a duration analysis on the impact of apology laws on time to resolution (i.e., how long it takes for a malpractice suit to be resolved), which is conducted at the individual level. We further investigate the impact of apology laws on claim payment and how the size of this impact depends on the severity of medical injury.

The results from difference-in-difference would be biased if the passage of apology laws were endogenous to malpractice trends within a given state, but our results remain consistent to various robustness checks. The analysis finds that the apology laws increase the number of closed claims, particularly among cases involving the most severe medical injuries. One can attribute the increased number of closed claims to several causes. Most notably, the increase can be due to faster resolution time or an overall increase in the number of claims filed. Consistent with our theory, we find evidence that suggests that the overall increase in closed cases is due to faster settlement times, while in the long run, the total number of malpractice claims being brought forth is declining. For example, on the subset of cases involving insignificant injuries—those cases which are most likely to be resolved in the 3 to 5 years of available data—we see a 16–18% reduction in the number of closed claims. When we investigate the impact of apology laws on the duration of cases by the severity of medical outcomes, the hazard analysis results suggest that conditional on the cases resolved before 2009, the cases with most severe injuries settle 19-20% faster in states that have the apology laws relative to states that do not. As for the claim compensation payouts, again conditional on the cases resolved before 2009, apology laws reduce the

claim payouts of the most severe cases by $58,000–73,000 per case and the claim payouts of the "somewhat" severe cases by $7,000–14,000 per case. In sum, we find that apology laws induce faster resolution and lower payments for those malpractice cases brought by patients who sustained the most severe medical injuries.[2]

The remainder of the paper proceeds as follows: Section 1 provides background information on apology laws, in Section 2 we provide a model, section 3 describes out dataset, in Section 4 we discuss our empirical specification and present our findings, and Section 5 concludes.

1 Background of Apology Law

As of January 2009, apology laws had been enacted in 36 states, all of which were enacted between 1999 and 2008 (except for Massachusetts, whose law dates back to 1986).[3] Table 1 lists all of the

[2] We would expect these reductions to lead to similar reductions in malpractice insurance premiums. Data on medical malpractice insurance premiums was obtained from the Medical Liability Monitor Rate Surveys from 1995 to 2005. To make prices comparable, the data cover a typical contract based on coverage for a $1 million per incident and $3 million per year cap. The impact of the apology laws on medical malpractice premiums for three specialties—internal medicine, ob/gyn, and surgery—was also assessed, but these results turned up almost entirely insignificant.

This disconnect could be because medical malpractice insurance premiums are highly regulated and thus slow to respond. While total medical malpractice payments were trending downward after 2001, total insurance premiums continued to trend upward. Also, there appeared to be a great deal of inertia in insurance premiums, which often did not change from year to year. Or it could simply be that our data lack the power to identify the differences.

[3] The apology laws were initially identified using a search in lexis-nexis of state legal code using the words apology and malpractice. Our list was confirmed from the website of the Sorry Works Coalition, an advocacy group promoting apologies by physicians.

state legal codes pertaining to medical apologies.[4] Unlike other tort reforms, which have predominantly been a Republican issue (Durrance, 2009), apology laws are not disproportionately supported by any particular political party.[5] While there is no hard data to substantiate the following claim, it is anecdotally accepted that apology laws have been passed due to activist pressure rather than systemic changes in the litigation environment, which means that apology laws are unlikely to be correlated with other changes that affect litigation (e.g., tort reform).[6] Crucially, since studies such as Born and Viscusi (2005) and Baker, Born and Viscusi (2009) find significant effects of tort reforms—and non-economic damage awards in particular—affect malpractice payments, we find that apology laws are not significantly correlated with other tort reforms, specifically noneconomic caps, punitive caps, laws on full information disclosure, joint and several liabilities, and collateral source rules.

[Insert Table 1 About Here]

In a survey of hospital risk managers, Lamb et al. (2003) find that while 92% of managers respond to mistakes with an explanation, and 87% would initiate an investigation, only 68% would include an apology, and 33% accept responsibility. State apology laws have been enacted in order to

[4] California, Massachusetts, Florida, Tennessee, Texas, and Washington have general apology statutes that apply across all industries while the other 30 States have specific laws that only protect the statements of apology made by health care providers. The states can be first divided into two types depending on the applicability of these laws: general versus health practitioners only. We use the specification in Table 3 but we create two dummies for the general laws versus healthcare-only laws. We then perform an *F*-test checking whether we can group the general versus healthcare-only laws together, the *F*-test fails to reject the null hypotheses that these two types of apology laws have the same impact on claim frequencies and claim severity. Therefore, for the remainder of the paper, we are not going to differentiate between general and healthcare-only apology laws.

[5] In regressions not reported in the current paper, we find that political composition in the State Senate and State House has no significant explanatory power on the passage of apology laws.

[6] See, for example, the efforts of the Sorry Works Coalition.

increase these frequencies. State apology laws are very similar to one another as they tend to be copied from similar templates. Connecticut's apology law is a typical example. The Connecticut law states that:

> In any civil action brought by an alleged victim of an unanticipated outcome of medical care, or in any arbitration proceeding related to such civil action, any and all statements, affirmations, gestures or conduct expressing **apology, fault, sympathy, commiseration, condolence, compassion or a general sense of benevolence** that are made by a health care provider or an employee of a health care provider to the alleged victim, a relative of the alleged victim or a representative of the alleged victim and that relate to the discomfort, pain, suffering, injury or death of the alleged victim as a result of the unanticipated outcome of medical care shall be inadmissible as evidence of an admission of liability or as evidence of an admission against interest. (emphasis added)

Depending on the state, there is a slight variation in the types of statements that are protected by these statutes. Protected statements typically include a combination of apology, fault, sympathy, commiseration, condolence, compassion, and admissions of mistakes, errors, and liability. In the legal literature, some studies divide apology laws into one of two categories: 1) full apology laws that protect against all types of apologies including those that contain statements of fault, mistakes, errors, and liability versus 2) partial apology laws that only protect against statements of sympathy, commiseration, condolence, and compassion.[7] We use the specification in Table 3, but we create two dummies for the full laws and partial apology laws. An *F*-test fails to reject the null hypotheses that full and partial apology laws have the same impact on frequency of claims and total compensation payout; therefore, in the remaining analysis, we will not differentiate between full and partial apology laws.

To date, this paper is the first economic study to investigate the impact of the state-level apology legislation on claim frequency and claim severity.[8] Other studies, particularly in medicine and in law,

[7] The divisions between full and partial apology laws are arguably poorly defined. A paper by McDonnell and Guenther (2008) reports eight states as having full apology laws, whereas an article by Morse (2009) reports only five states as having full apology laws.

[8] Ho and Liu (2011) offers an extension of the research here. Whereas this paper focuses on identifying the effect using difference-in-difference and then using hazard rate analysis to identify speed as the mechanism that drives our results, Ho and Liu (2011) focus on using diff-in-diff-in-diff to decompose the effects of the law by physician and patient characteristics such as age, gender of patient, field of practice, etc. to identify the locus of the effect.

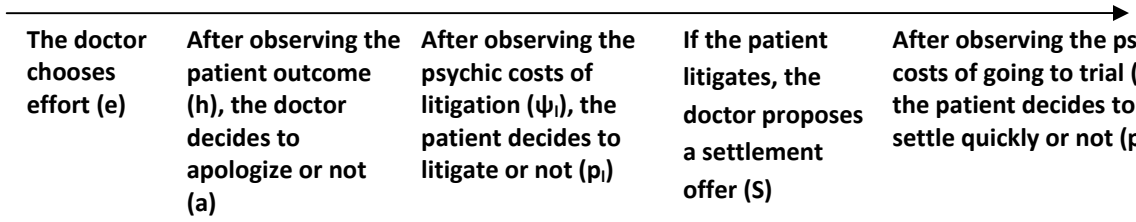
have found substantial effects of apologies on litigation. For example, subjects who are given hypothetical situations about health outcomes report that apologies may reduce the subjects' likelihood to litigate (Mazor et al., 2004; Robbenholt, 2003; Wu, 1999; Wu et al., 2009). Programs in individual hospitals in Pennsylvania (Liebman & Hyman, 2004, 2005) and Tennessee (Kraman & Hamm, 1999) that encourage apologies and disclosure of mistakes dramatically reduced malpractice payments made by the hospitals that adopted these programs. Most notably, Boothman et al. (2009) conducted at the University of Michigan Health Service reported that their per case payments decreased by 47% and the settlement time dropped from 20 months to 6 months since the introduction of their 2001 apology and disclosure program; Kachalia et al. (2010) also study the consequences of the same program and find that the cases are resolved 26% faster at any given time. While the findings associated with hospital-level apology programs are promising, one is uncertain of the generalizability of these results. The reason why the hospitals in these studies decided to pioneer such programs could be endogenous, or there could be other concurrent reforms at the hospital level, as such programs are often implemented by a charismatic administrator. Therefore, the average impact of apologies on medical malpractice litigation would be overstated, leading to concerns about external validity.

2 Theory

One reason to formally model the role of apologies in medical malpractice is to clarify the implicit assumptions inherent to the implemented policy. The other is to provide intuition on how the laws will affect the composition of cases that we will observe. We develop the model in two stages. We begin by providing a simple symmetric information model designed to illustrate the intentions of the apology law proponents. In the simplistic model, we assume that the apology laws do not devalue patients' perception of apologies and level of physicians' efforts remains constant regardless of the laws' passage. Under these assumptions, the apology laws increase the likelihood that a doctor apologizes, hasten settlement speeds, reduce total court costs, and unambiguously improve welfare. In the Online Appendix available from the author's website, we demonstrate that introducing asymmetric information

would give us ambiguous prediction of welfare improvement. For example, if physicians' efforts are unobserved, the laws could lead to increased moral hazard in quality of care. Similarly, the law could devalue apologies and reduce welfare.

Let there be two players: a patient/plaintiff (P) and a doctor/defendant (D) who play a game of healthcare provision, apology, and litigation with the following timeline:



The key novelty in this model is that the patient must care about the doctor's intention in addition to monetary payoffs. If as is standard, plaintiff and defendant care only about monetary payoffs, (Daughety & Reinganum, 2000; Farber & White, 1994; Spier, 1992), doctors would never apologize because patients would not value the apology and would just use the apology as evidence to obtain a higher malpractice payment.

We will take the patient's health outcome, h, to be exogenous in order to focus on the ligitation process, and we will assume apologies exogenously shift the patient's benefits from litigation. In a more complete model health would depend on both the doctor's effort and the patient's circumstances. Apologies would serve as a signal of the doctor's intentions, effectively signaling that the poor health outcome came from unlucky circumstance rather than low effort. We leave the details of such an asymmetric information model to the Online Appendix on the author's website and Ho (2011) and instead focus on the effect on litigation.

After observing the health outcome, the doctor decides whether to apologize ($a = 1$) or not apologize ($a = 0$). The cost of an apology for the doctor is that the apology can be used as evidence against him/her in court. If litigation occurs, since the court cannot observe the doctor's effort, we

assume that the expected judgment, $J(h,a)$,[9] is lower for better health outcomes and higher if the doctor apologized since the apology can be used as evidence against the doctor.

The benefit of an apology to the doctor is that it increases the psychic cost for the patient to litigate. Numerous case studies suggest that anger is a main motivator for litigation and can overcome the patient's aversion to litigate (Hickson et al., 1992; Vincent et al., 1994). Studies also find that apologies reduce patient anger, increase communication, and reduce the patient's motivation to litigate (Liebman & Hyman, 2004, 2005; Ohbuchi, Kameda, & Agarie, 1989; Sloan & Hsieh, 1995). We capture these psychological factors by saying there is a psychic disutility of initiating litigation, $\psi_L(a)$, and a psychic disutility for going to trial, $\psi_J(a)$. Both disutilities would increase if the doctor apologizes. These psychic costs are modeled as random valued functions of whether a doctor apologizes where $\psi_i(1)$ first order stochastically dominates $\psi_i(0)$ for $i \in \{L,J\}$. For simplicity, let $\bar{\psi}_L$ and $\bar{\psi}_J$ be constants for the additional psychic cost of litigating/seeking judgment against a doctor who apologized. Assume the psychic disutility follows a uniform distribution such that $\psi_i(a) \sim U(0,1) + \bar{\psi}_i a$ where $a = 1$ if an apology was tendered, $a = 0$ otherwise for $i \in \{L,J\}$.[10]

Let p_a be the probability the doctor decides to apologize, which will depend on the health outcome. After the doctor apologizes (or not), the patient observes the realization of his psychic disutility of litigating $\psi_L(1)$ (or $\psi_L(0)$). It is now the patient's turn to decide whether to litigate or not. Let p_L be the probability that the patient litigates. If the patient litigates, the doctor will offer a settlement S as a take-it or leave-it offer. Let p_s be the probability the patient accepts the settlement offer. If the patient

[9] This is the amount that the patient receives and the doctor is required to pay after accounting for the probability that the patient wins.

[10] All we really need is that these are random valued functions of whether a doctor apologizes where ψi(1) first order stochastically dominates ψ_i (0) for i∈{L,J}. However a uniform distribution will make calculations more convenient.

does not accept the offer, the patient incurs legal costs c_P and the doctor incurs legal cost c_D and damages are awarded according to an exogenous function: $J(h, a)$.

To summarize, the patient's utility depends on the patient's health plus expected malpractice payments net of litigation and psychic costs, while the doctor's utility depends on the doctor's cost of effort minus expected malpractice payments and the economic costs of litigation:

$$\begin{aligned} U_P(p_L, p_S) &= h(e, \varepsilon) + \Pi_{\mathrm{p}}(\mathrm{p_L}, \mathrm{p_S}) \\ U_D(e, a) &= -e - \Pi_{\mathrm{D}}(a). \end{aligned} \tag{1}$$

Where the malpractice payments net of costs Π_{p} and Π_{D} are given by:

$$\begin{aligned} \Pi_{\mathrm{P}}(\mathrm{p_L}, \mathrm{p_s}) &= p_L \left[p_s S + (1 - p_s) \left(J(h, a) - c_P - \psi_J(a) \right) - \psi_L(a) \right] \\ \Pi_{\mathrm{D}}(\mathrm{h}, \mathrm{a}) &= p_L [\, p_s S + (1 - p_s)(J(h, a) + c_D)]. \end{aligned} \tag{2}$$

We consider pure strategy sub-game perfect Nash Equilibrium. Solving by backward induction yields the following results:

Proposition 1*: In the symmetric information pure strategy Nash equilibrium with interior solution, when a doctor apologizes:*

a. *Probability of settlement p_s increases*
b. *Probability of initiating litigation p_L may increase or decrease*
    i. *An increase is more likely when the value of apology as evidence is higher $J(h, 1) - J(h, 0)$ or when the total cost of seeking court judgment $c_P + c_D + \frac{\bar{\psi}_J}{2}$ is higher.*
    ii. *A decrease is more likely when the psychic cost of litigating a doctor who apologizes $\bar{\psi}_L$ is higher.*

Proof in the Appendix.

A rational doctor would only apologize if it maximized her utility. Since we assume the doctor has only pecuniary motives, doctors who apologize have lower expected malpractice payments. Similarly, since apologizing makes it more costly for patients to litigate and to seek judgment, apologies increase the likelihood of settlement and decrease the likelihood that a patient initiates litigation. What may be

unexpected is that an apology is more likely to increase the likelihood of litigation when the costs of seeking a court judgment are higher. This result is due to the fact that one cost that deters patients from initiating litigation is the possibility of suffering costly court costs. Since an apology makes settlement outside of court more likely, it also makes it easier for the patient to litigate.

Introducing Apology Laws

Now suppose that the legislature passes a law excluding apologies as evidence in court. Assume that the law has no effect on how apologies affect psychic costs and that the only effect of an apology is to reduce judgments such that the new expected judgment function, $\hat{J}$, treats all cases as if no apology was ever tendered: $\hat{J}(h,1) = \hat{J}(h,0) = J(h,0)$. This section considers the symmetric information case to demonstrate how the law was intended to function, but we will demonstrate how asymmetric information assumptions that endogenize the effects of apologies and the size of judgments change these results in the next section.

Proposition 2*: In the symmetric information pure strategy Nash Equilibrium with interior solution, after the introduction of an apology law:*

a. Apologies p_a are more frequent

b. The probability of litigation p_L decreases.

c. The probability of settlement p_S increases.

d. For any particular case, the settlement offers S^* decrease

e. For any particular case, net expected malpractice payments Π_D and Π_P decrease

f. Excluding psychic costs, social welfare increases

Proof in the Appendix.

The law eliminates the primary cost the doctor faces from an apology.[11] Thus in a symmetric information world, the law has exactly its intended effects. Doctors apologize more often. Less litigation

[11] The only cost that remains is that an apology makes settlements more likely making it easier for patients to initiate litigation since they know court costs are now less likely to be incurred.

is pursued. The litigation that does occur is more likely to result in settlements, and when a settlement is reached, payments are smaller. Since the law reduces the number of cases that go to court, the dead weight loss of court costs are reduced, so excluding psychic costs, social welfare increases.

A key variable we will consider in the empirical analysis is the time to settlement. We think of p_S as the probability of settling early, rather than prolonging pretrial negotiations and incurring costs c_P, c_D, ψ_J from a long negotiation process. Thus we will interpret the model as predicting that apology laws should increase the speed of settlement.

Propositions 1 and 2 depend on the linearity assumptions and the uniform distributions of psychic costs, however, qualitatively similar results can be obtained using more general functional forms so long as we assume symmetric information.

Introducing Private Information

While the above results are consistent with the intentions of the law, the analysis presumes that there is no private information between players. Much of the past theoretical literature on malpractice litigation has focused on asymmetric information, and thus, introducing private information is important for increasing the validity of the model. Unfortunately, private information also makes the model's predictions indeterminate. The impacts of private information are considered in more detail in Ho (2011) as well as in the Online Appendix on the author's website.

Moral hazard and the provision of care: The current model has no moral hazard since doctor effort is symmetrically observed. However, if effort were unobserved, reducing the consequences of poor performance could reduce quality of care (Polinsky & Rubinfeld, 1988).

Disclosure of health outcomes: If patients are imperfectly informed about whether a mistake was made, laws that encourage doctors to disclose more information could induce patients to litigate more frequently.

Signaling and the value of an apology: The above model assumes an exogenous value of an apology. If instead, an apology provides information about a doctor's intentions, and the psychic cost of litigating is

the probability of suing a good doctor, rather than a negligent one, then apology laws could reduce the signaling value of apologies, and thus increase litigation.

Effects on bargaining and settlement: A substantial literature considers the effect of asymmetric information on pre-trial bargaining and the effect of over-optimism (see Spier (2002) for a review). Both literatures predict that increased information disclosure should lead to faster settlements. Unlike the other effects of private information, this literature tends to conform to the law's intentions.

Private information and judicial decision making: The law presumes that less evidence against doctors means more judgments in favor of doctors. However, if a rational risk neutral judge knows that the same level of malpractice is occurring, then the judges should on average award the same level of damages.

Summary

We are not aware of any comprehensive dataset of malpractice cases that includes information about apologies. Thus we will focus on the theory's predictions regarding the probability of litigation, the probability of settlement, and the size of claim payout. Ideally, we would like to conduct our analysis on the total number of malpractice claims ever filed (including both open and closed claims) in order to examine the probability of settlement and claim payout. Unfortunately, to our knowledge, comprehensive public data on all open claims that have yet to be resolved also does not exist. This presents some challenges which will be addressed in the next section.

3. Data

To assess the impact of these various types of apology laws, we use data drawn from the NPDB Public Use Database (2009). Due to the Federal Health Care Quality Improvement Act (HCQIA), all malpractice payments—either as part of a settlement or as part of a court judgment—made by, or on behalf of, a licensed health care provider must be reported within 30 days. The NPDB contains all malpractice cases with non-zero payments[12] and it provides additional information about each claim

[12] The NPDB dataset is not free of problems. It has been criticized because of a "corporate shield" loophole, through which malpractice payments made on behalf of a practitioner end up excising the practitioner's name from the data

beyond payment size. For each claim, there is information regarding the year the incident occurred,[13] the nature of the allegation (e.g., diagnosis related, anesthesia related, surgery related, etc.), the outcome of the incident (e.g., emotional injury, minor temporary injury, major permanent injury, death, etc.) ,[14] the practitioner's graduation year and age group, the practitioner's work and licensing state, and whether the payment was for a judgment or a settlement. This dataset has been widely used in many studies related to medical malpractice (see Baicker & Chandra, 2005; Chandra, Nundy, & Seabury, 2005; Durrance, 2009; Matsa, 2007). We restrict our analysis to the reports in which adverse events occurred after 1991 due to the incomplete reporting in the earlier years. Since the NPDB only receives information about an offense/omission when the payment is made, the dataset is truncated for offenses/omissions that occurred late in the dataset but have yet to be resolved. In Figure 1 we present a histogram of time to resolution for cases that occurred in 1992 so that we can be reasonably certain that this represents a fairly complete distribution of cases.

[Insert Figure 1 About Here]

Panel A of Table 2 provides summary statistics at the individual level. There are a total of 225,319 payment reports in our sample. Note that the average time to resolution was 3.86 years with a

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in the NPDB. Chandra, Nundy, and Seabury (2005) compare data from the NPDB with other sources of malpractice information and while they find approximately 20% underreporting, they find that underreporting is not systematically different across states. Therefore, for our analysis, which is extracting information at the state level, there is no obvious reason why the corporate shield loophole would bias the effects of the apology legislation. It is also important to note that the NPDB dataset has been used for most recent influential studies of medical malpractice reform (Currie & MacLeod, 2008)

[13] Since the finest date information we have about the case are years, we cannot use any finer definition of date (such as months, quarters) to look at the cases that took place right before the law passed and the cases that took place right after the law passed.

[14] The outcome variable only became mandatory for recording in 2004. The categories of injuries are reported by the entities that make payments to the patients.

standard deviation of 2.15. Longer resolution times are associated with cases that involve more severe injuries.

[Insert Table 2 About Here]

In order to understand the aggregate effect of the laws on number of claims and total malpractice compensation payouts, the NPDB was also used to generate an aggregate dataset where each observation is at the state-year level. At the aggregate level, several predictions that follow from the model relate to the rate of litigation and the rate of resolution; however, this dataset does not contain information on open claims and closed claims without payouts and therefore these rates cannot be computed. Instead, we consider two other measures at the state level. The first is the number of payouts made by practitioners working in a given state for offenses committed in a given year.[15] The second is the value of malpractice payments made by medical practitioners in a given state for offenses committed in a given year.[16] Panel B provides these statistics at the state level. With 51 states (including the District of Columbia) reporting over a 17-year period (1991-2007), there are 867 observations in the state-level dataset.[17] In 2000, the median number of incidents that had been resolved by 2008 per state was 184 incidents and the median total malpractice payments was $35.7 million.

[15] Another way to construct the state-level dataset is by the total number of settlements/payments made in a given year. Our goal is to analyze the impact of apology laws, which intend to encourage practitioners to apologize and communicate more openly with their patients. The impact on the settlement is hinged upon the apology. While the model in Section 3 cannot distinguish the timing of the apology, the apology is likely to be most effective soon after the incident occurs, not a few years later. Therefore, we aggregate it by the year of incident instead of the year of settlement.

[16] We adjust the payment by CPI. Therefore, all payments are in Y2000 dollars.

[17] We have excluded all cases that occurred in 2008 since only less than 100 cases which occurred in 2008 had been settled by 2009.

4. Empirical Specification and Results

The effect of apology laws on medical malpractice outcomes is estimated using a difference-in-difference method. The validity of this specification rests on the assumption that the states that have passed apology laws would have otherwise followed the same trend as those states that have not passed apology laws. Therefore, we perform various checks to examine the validity of this assumption. Another crucial assumption that merits attention is that the passage of apology laws is not correlated with any other event that would affect medical litigation—an obvious possibility being the passage of other tort reform or malpractice laws. To ensure that a correlation with other malpractice laws does not drive our results, we include controls for other tort reforms as studied by Currie and MacLeod (2009) in each of our specifications.[18] Furthermore, in each specification, we cluster standard errors by state to avoid problems of serial correlation (Bertrand, Duflo, & Mullainathan, 2004).

State-Level Analysis

There are two main outcome variables. The first variable is the number of already-resolved malpractice cases for incidents that occurred in year *t* and state *s*, while the second variable is the value of the total payments made in state *s* for incidents that occurred in year *t*. We aggregate the data by the year the incident occurred, not the year the incident settled, because our assumption is that apologies would be most effective when expressed soon after the incident. For example, if a malpractice case took place in 2000 and the law was passed in 2004, and the physician issues an apology only after the law passes, this apology is not going to be as effective in reducing the patient's intention to litigate as an apology that is issued in 2000. Essentially, we assume that the law has a very limited impact on the malpractice cases that

[18] The other law measures for which we have controlled the timing in our study include the existence of noneconomic cap, punitive cap, laws on full information disclosure, joint and several liabilities, and collateral source rule. The information on the existence of the laws (excluding information disclosure laws) is from the annual produced by the American Tort Reform Association (2009). The information on the disclosure laws is from Gibson and Del Vacchio (2006).

occurred before the law is passed. If cases that occurred before the law being passed are also affected by the apology law, our estimate would be an underestimate of the true impact.[19]

We first employ OLS to estimate the following:

$$\log Y_{st} = \lambda controls_{st} + \beta\, apology_{st} + \sum_t \delta_t Year_t + \sum_s \delta_s State_s + \varepsilon_{st},$$

where Y_{st} is the outcome variables and *apology* is a dummy variable which is one if an apology law was in effect in state *s* during year *t* and otherwise is zero. Our main coefficient of interest is β, which represents the percentage change in the number of closed claims with positive payout due to the adoption of the apology law.

Before proceeding to the regression results, we first note how the fact that the dataset consists only of closed claims with positive payouts affects our findings. If the laws are working as intended (WAI), such that they increase doctors' apologies and decrease patient anger then we would expect:

Scenario WAIa . Cases are now settled faster (p_S increases)

Scenario WAIb. Some cases that would have been litigated before the law are dropped (p_L decreases).

If on the other hand, the unintended consequences (UNC) of the laws dominate (due to devalued apologies, increased patient information, increased moral hazard, changes in judicial standards, etc.), then we would expect the alternative hypothesis to hold:

Scenario UNC. More cases are now litigated (p_L increases)

The net effect on the probability of litigation p_L is therefore ambiguous. In our closed claim dataset, we only observe a case from a given year if the case was litigated (p_L) and if the case had settled (p_S)[20] by that time. Therefore, our measure of closed claim frequency gives us $p_L * p_S$. *Scenario WAI* therefore gives ambiguous predictions on closed claims since the probability of litigation decreases while the probability of settlement increases, while *Scenario UNI* unambiguously predicts closed claims

[19] Legally, it is unclear whether apology laws would apply to cases that have occurred before the law passed.

[20] Here, we abuse notation a bit, equating the idea of probability of settlement with speed of settlement.

frequency would increase. However, in the long run, once enough time has passed, the probability that any claims that were open have settled approaches 1, then the closed claim frequency gives us the probability the patients litigated, p_L, directly. So if the law was working as intended, then for cases that originated in recent years (2008 for example) we expect ambiguous predictions, while for cases that originated early on (2001 for example), the *Scenario WAI* predicts a lower claim frequency.

	Scenario WAIa **p_S increases**	***Scenario WAIb*** **p_L decreases**	***Scenario UNI*** **p_L increases**
Short Run	# Closed Claims ↑	# Closed Claims ↓	# Closed Claims ↑
Long Run	# Closed Claims Unchanged	# Closed Claims ↓	# Closed Claims ↑

The basic regression results for closed claim frequency are presented in Table 3. Columns 1 and 4 are presented without controls, columns 2 and 5 add a full set of social policy changes (the existence of a noneconomic cap, a punitive cap, joint and several liabilities and collateral source rule, and a law on full information disclosure), while columns 3 and 6 include a set of time-varying state demographics including the number of physicians in the state, racial compositions, population, and percentage of population that are 65 or above.[21] The results show a consistent 14−15% increase in closed claim frequency with positive payouts.[22] The results for the total compensation payout also show an increase of 20−27%. The fact that the percent increase shown in columns 4-6 is larger than those in columns 1-3, suggests that the payment per case increases after the law is enacted. The same analysis has also been performed on settlements excluding all cases that went to trial and the results are similar. Later in this section, we discuss various robustness checks performed, to rule out the possibility that the results are driven by spurious relationships, such as differential time trends from the states with the law.

[21] Population, age, and racial composition data are retrieved from census data. Data on number of physicians per state was retrieved from the American Medical Association.

[22] The coefficient in Column 3 is at the borderline of the 10% level of significance. The magnitude of coefficient does not change from Column 1 or Column 2, but rather the standard errors have gone up.

[Insert Table 3 About Here]

Recall that this increase could be explained by either *Scenarios WAI* or *UNC*. Therefore, Tables 4 and 5 further addresses this question. If these results are due to the fact that cases are settling faster, as in *Scenario WAIa*, we should expect the upward bias on the effect of the laws to be more pronounced for the most recent cases. For example, if we examine the difference between states having the law to states without the law, we would expect that the upward bias to be bigger when examining cases occurring in 2008 than cases occurring in 2007, and bigger effects for cases occurring in 2007 than cases occurring in 2006, and so on. More time allows more cases to be resolved. In Table 4 we restrict our sample to the four states that passed an apology law before 2002 and those states that have never passed an apology law. For each column, the dependent variable is the natural log of the number of closed cases that occurred before that year. We include the full set of controls including other tort reforms. Column 1 considers only the number of cases that occurred before 2001 and thus gives us an estimate of the apology laws' net effect after 8 years have elapsed. Column 2 considers the effect on all cases that occurred before 2002, thereby giving an estimate of the apology laws' net effect after 7 years have elapsed. Similarly, column 8 considers the effect on cases before 2008 and thus gives us a sense of the apology laws' net effect on current cases. One notable trend from this table is that these coefficients increase from left to right and become more statistically significant. It indicates that the positive coefficients in Table 3 Columns 1 to 3 are driven by the cases that occur in more recent years. If it were due to *Scenario UNC* (more people are litigating), it would be difficult to explain this increasing trend. Table 4 suggests that the apology laws' net effect is zero (or possibly negative) in the long run.[23]

[Insert Table 4 About Here]

[23] One might think, using the aforementioned logic, that the dependent variable should be the cases that occurred in 2002 in column 1, those that occurred in 2003 in column 3, etc. However, we would only have 21 observations in each regression and would not be able to capture any general state or year trends.

Table 5 considers the composition of cases in terms of the type of injury. The dependent variable is the log frequency of closed claims in each medical injury category (e.g., insignificant injury, "somewhat" significant injury, and major permanent injury/death).[24] Restricted by the sample of cases that occurred after 2002,[25] Table 5 shows that the overall increase in closed claims observed is due entirely to the closed claims for major/permanent injury and death. For insignificant injuries, which normally settle quickly enough to see the apology laws' full effect, we see a net reduction of 16.7−18.5% in the number of cases. Consider again the possible scenarios that could explain this result. Suppose that doctors are exerting less effort after the laws are implemented *(Scenario UNC),* it is difficult to explain the pattern in Table 5. The results in Table 5 suggest that after passing the law, there is a short-term increase in the number of cases that normally take many years to resolve,[26] but an overall decrease in the number of cases involving the least significant injuries.

[Insert Table 5 About Here]

Individual-Level Analysis

Since we have data on the year in which the incident occurred and the year it was settled, hazard models provide a natural framework for modeling settlement probabilities (e.g., Hannan & McDowell, 1984). Let t be the time elapsed from the time of incident to the time of settlement, $X_i(t)$ be a vector of relevant explanatory variables, and β be a vector of coefficients. Denoting the cumulative density function as $F_i(t|X,\beta\,)Prob\,(T \le t|X,\beta)$ and the density function as $f_i(t|X\,,\beta)$, the hazard function which indicates the probability of settlement at period t, conditional upon no settlement by time $\{t-1\}$, is defined as $h_i(t|X\,,\beta) = f_i(t)/[1-F_i(t)]$.

[24] There are nine categories of injuries in the NPDB, which we group into three categories for the ease of analysis and presentation (see Table 2 for subcategories).

[25] The severity of injuries is only available for cases reported after 2002. For a similar analysis grouped by the size of payment, see Online Appendix on the author's website.

[26] From this dataset we can observe that it is true that cases involving more severely injured patients usually take longer to resolve than insignificant injury cases.

We use Cox proportional hazard model, and the advantage of the Cox model is that there is no assumption about the functional form of $h_i(t|X, \beta)$. The hazard ratios from Cox model are reported in Table 6. To interpret the coefficient, one needs to be cautious that the reported hazard ratios are conditional on resolution. Depending on which unintended consequence dominates, the theory is unclear as to how *Scenario UNC* would affect the hazard ratio as it would depend on the composition of the cases that are affected. We find that the hazard rate changes marginally for insignificant cases and the hazard ratio increase due to the apology laws being positively associated with the severity of the medical outcomes. For a case involving a major/permanent injury, conditional on resolution, the probability it resolves in any given year is increased by 19% when the apology law is in effect.[27] It is notable that Kachalia et al. (2010) examine the impact of University of Michigan's information disclosure program, and find the program increased the rate of settlement by 27%. Although our estimates are slightly smaller, it is encouraging that these two estimates are statistically the same. In Table 7 (Panel A), we consider the impact the law has on the size of malpractice claim payouts using a difference-in-difference model. In Panel A, claim severity is the dependent variable. Since one might worry that the result could be driven by outliers, Panel B presents the result of regressions using the log of payments. Before moving to the results, consider again how each scenario might affect the findings for this table.

If Scenario WAIa dominates (cases are settled faster), then we might see an increase of claim severity since the more costly cases are only resolved where the apology laws are adopted. If Scenario WAIb dominates (fewer cases are litigated), the case composition might change and the average claim severity might increase—for example, all the cases with potential payments below a certain cutoff were never litigated due to the passage of the apology law, with this truncation, the cases that remain are those

[27] We have also attempted a maximum likelihood estimate of the unconditional hazard ratio using a proportional hazards model that accounts for right truncation from Finkelstein, Moore, and Schoenfeld (1993). However, due in part to their model being weakly identified, the procedure does not converge.

with higher payouts. Lastly, if apologies simply reduced anger, apology laws should lower the claim severity.

Looking at Table 7, for "insignificant injuries," we find evidence that claim severity increases marginally. As explained above, this increase should be attributed to the change of case composition. As for "somewhat significant injuries," we find marginally insignificant results. Finally, for "major permanent injury," we find that after the law is adopted, malpractice payouts decrease by about 14-17%. Given the effect of the composition shift, this is a lower bound estimate of the true effect of apology laws. In levels, after the law is adopted, claim payout would be reduced by approximately $17,000−27,000 for somewhat severe cases and $55,000−73,000 for the most severe cases.[28]

[Insert Table 6 About Here]

[Insert Table 7 About Here]

Taken together, Tables 5, 6, and 7 suggest that apology laws are consistent with the symmetric information model presented above as well as the legislators' intent; the apology laws' combined effect is to increase apologies and decrease expected settlement time, and should in the long term speed up settlements and reduce the total number and value of malpractice payments. We see that the apology laws reduce the total number of the insignificant injury cases that tend to settle quickly as well as reducing the payment size and increasing the settlement speed of cases involving major injuries/death.

Threat to Validity: Robustness Check

It could be worrisome if the effect of the states is spurious to the structure of the data or the time period upon which we estimate the data. Therefore, we perform various robustness checks. For brevity,

[28] Regressing the same specification on different payment size quantiles finds that the law has the largest effects on the 3rd quantile and no effect on the 1st and 4th quantile. The lack of effect on 4th quantile payments could be due to the fact that apologies are likely to be less important in cases worth millions of dollars, or that the largest cases take many years to resolve and thus cases of this size have yet to be resolved in most states in which apology laws have been passed.

these robustness check results can be found on the authors' website. First, we randomly assign half of the states as having adopted the law between 2000 and 2005 and estimate the same difference-in-difference regression. Moreover, for all the states that have adopted apology laws, we subtract 3 years from the year of adoption and perform the same analysis to capture any possible spurious effect attributable to properties of the states in question rather than to the laws themselves. The coefficients remain insignificant. Lastly, as we intend to interpret the result as a causal interpretation, we need to check to see if the increase in settlements came after the adoption of the apology laws. Therefore, we include in our differences-in-differences specification a series of lead dummy variables, which specifies whether apology laws will be adopted in that state 1 year, 2 years, 3 years, 4 years, or 5 years into the future. We find that all coefficients on the lead dummies are not statistically different from zero, suggesting that the effects that we find do not predate the passing of the apology laws. Now, knowing that the results are robust and not due to spurious effect, we need to find the hypotheses that could explain the seemingly surprising results.

Given that both main outcomes of interest are non-negative, we can also reanalyze the main outcomes using a Poisson model which makes assumptions about the distribution. We still find that most of the increases in the case frequencies are from the medical cases involving the most severely injured patients and that there is little change in the frequency of the cases involving minor injuries.

We examine the sensitivity of our results with a number of alternative specifications. First, we omit in turn each of the 36 states and each of the available years, and the regressions yield similar results, suggesting that the results are not driven by a single outlier or a particular year. Furthermore, median regression and population weighted least squares yield similar positive significant results.

Our regressions above are analyzed based on the year the offense occurred because the apology laws largely apply only to apologies that were made for adverse events that occurred after the law was passed. Also, arguably apologies are most effective shortly after the adverse event occurred, so medical errors that occurred years before the law was passed should be unaffected. As a robustness check, we provide a difference-in-difference analysis in which the dependent variable is the natural log of

settlements grouped by the year of settlement, and we find that laws have no impact on the incidents that occurred before the passing of the apology laws. One of our theory's predictions is that the probability a settlement is reached should increase. It may seem natural to look at the ratio between settlements over judgments across states over time. However, given that only 3% of the cases in this dataset are judgments, and that cases that have gone to court usually take much longer to resolve and thus would not enter our dataset, this ratio cannot be meaningfully estimated.

5. Conclusion

We have presented a simple model of apologies and medical malpractice and estimated the effects of state level apology laws on medical malpractice claims. We find that in the short run the law increases the number of resolved cases, while decreasing the average settlement payment for cases involving more significant and permanent injuries. While having an insignificant impact on the settlement payments for cases involving minor injuries, the apology laws do reduce the total number of such cases. While the short term increase in malpractice settlements could be a surprise to policymakers and advocates of apology laws, we believe this is an artifact of data limitations. Our findings suggest that apology laws reduce the amount of time it takes to reach a settlement in what would normally be protracted lawsuits, leading to more resolved cases in the short run. In the long run, the evidence suggests there could be fewer cases overall.

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Appendix

Proof of Proposition I

Part (a) and Part (b)

The patient decides to settle if the benefit of settling, S, is greater than the benefit of going to trial, $J(h,a) - c_P - \psi_J(a)$. The probability of settling is given by:

$$p_s = \Pr\left[S > \left[J(h,a) - c_P - \psi_J(a)\right]\right] \tag{3}$$

The doctor proposes a settlement S to minimize her expected payment:

$$Expected\ Payment = E[p_s S + (1 - p_s)(J(h,a) + c_D)] \tag{4}$$

Minimizing the doctor's malpractice costs from Equation (2) using the probability of settlement given by Equation (3) yields the optimal settlement offer:

$$S^* = J(h,a) - \frac{c_P + \bar{\psi}_J a \quad - c_D}{2} \tag{5}$$

Doctors offer a higher settlement when their costs of going to court are higher and a lower settlement when the costs the patient faces are higher. The optimal settlement probability by the patient shows that the patient is more likely to settle as the costs of going to court rise:

$$p_s^* = \frac{c_P + \bar{\psi}_J a \quad + c_D}{2} \tag{6}$$

The patient's probability of litigating, p_L, is then given by the probability that the expected malpractice payment is greater than the psychic cost of litigating:

$$p_L^* = \Pr\left[E\left[p_s^* S^* + (1 - p_s^*)\left(J(h,a) - c_p - \psi_J(a)\right)\right] > \psi_L(a)\right] \tag{7}$$

Using the assumption that psychic costs follow a uniform distribution and that we have an interior solution, we can reduce this probability to:

$$p_L^* = \left[J(h,a) - c_p + p_s^{*2}\right] - \bar{\psi}_L a \quad . \tag{8}$$

Again, $\bar{\psi}_L a$ is the additional psychic cost for the patient to sue if the physician apologizes. Consistent with the empirical evidence (Sloan & Hsieh, 1995), the probability of litigation given in Equation (8) is increasing with more serious health outcomes, decreasing in the costs of going to trial, but increasing in the probability an early settlement is reached.

Combining these results allows us to write the closed form solution for the expected malpractice payments net of costs for patient and doctor:

$$\begin{aligned} &\text{Net Gain for Patient: } \Pi_P(h,a) = p_L^*\left[J(h,a) - c_P + p_S^{*2}\right] \\ &\text{Net Cost for Doctor: } \Pi_D(h,a) = p_L^*\left[J(h,a) + c_D - p_S^{*2}\right] \end{aligned} \tag{9}$$

Finally, consider the doctor's incentives to apologize. The doctor will apologize for all health outcomes where $\Pi_{\mathrm{D}}(h,1) < \Pi_D(h,0)$:[29]

$$p_a = \Pr\left[h \in \{h\colon \Pi_{\mathrm{D}}(h,1) < \Pi_D(h,0)\}\right] \tag{10}$$

From Equation (6) we can calculate the difference in settlement probabilities after an apology to see that settlements increase in the event of an apology:

$$p_S^*|_{a=1} - p_S^*|_{a=0} = \frac{\bar{\psi}_J}{2} \tag{11}$$

However, the effect of an apology on the likelihood of initiating litigation depends on the relative effect of the apology on the psychic costs which makes litigation less attractive, with the effect of the apology on settlement probabilities and judgment payments which makes litigation more attractive. From Equation (8) the effect of an apology on probability to litigate is given by:

$$p_L^*|_{a=1} - p_L^*|_{a=0} = J(h,1) - J(h,0) + \left(\frac{\bar{\psi}_J}{2}\right)\left(c_P + c_D + \frac{\bar{\psi}_J}{2}\right) - \bar{\psi}_L \tag{12}$$

The effect of an apology on the probability to litigate is increasing in the effect on judgment sizes—$J(h,1) - J(h,0)$ —and decreasing in the psychic costs an apology imposes, $\bar{\psi}_L$. Perhaps more interestingly, apologies make patients more likely to litigate when the costs of going to court (both actual and psychic) are higher due to the fact that one deterrent to litigation is the threat of having to pay high court costs, and apologies reduce the likelihood of going to court in the event of litigation.

[29] Note that once the health outcome is realized, doctors will apologize deterministically. p_a, therefore, represents the ex ante probability that the doctor will apologize. We include this expression for ex ante probability of apology since it will be useful for discussing moral hazard and welfare in the next section.

Proof of Proposition 2

Part (a)

We can see from Equation (6) that the apology law reduces the expected payment in case of an apology, $\Pi_D(h,1)$, but has no effect on expected payments when no apology is made, $\prod_D(h,0)$, so the set of health outcomes for which the doctor would apologize, $\{h\colon \prod_D(h,1) < \prod_D(h,0)\}$, must be larger than before the laws were passed.

Part (b)

From Equation (8), a patient decides to initiate litigation if the expected benefit from litigation outweighs the costs of litigation. Apology laws reduce judgment sizes which decreases the benefits of litigation; and thus, the probability that the patient litigates decreases.

Part (c)

From the probability of settlement given in Equation (6), the likelihood of settlement is always higher in the event of an apology. Since apologies are more frequent, we expect more settlements.

Part (d)

It can be seen from Equation (5) that settlements are smaller in the event of an apology (which are now more common) and smaller still after a law reduces $J(h,1)$.

Part (e)

Since the laws increase settlement, reduce probability of litigation, reduce both judgment and settlement sizes, then we see from Equation (2) that malpractice payments net of costs made by the doctor must also go down.

Part (f)

Given symmetric information and risk neutral parties, the welfare implication of the law is unambiguous: since we assume that doctor effort is unaffected, the only effect of litigation is a transfer from the defendant to the plaintiff that imposes a deadweight loss from the cost of litigation ($c_P + c_D$). Thus the reduced likelihood of litigation and judgment means that the law increases welfare.

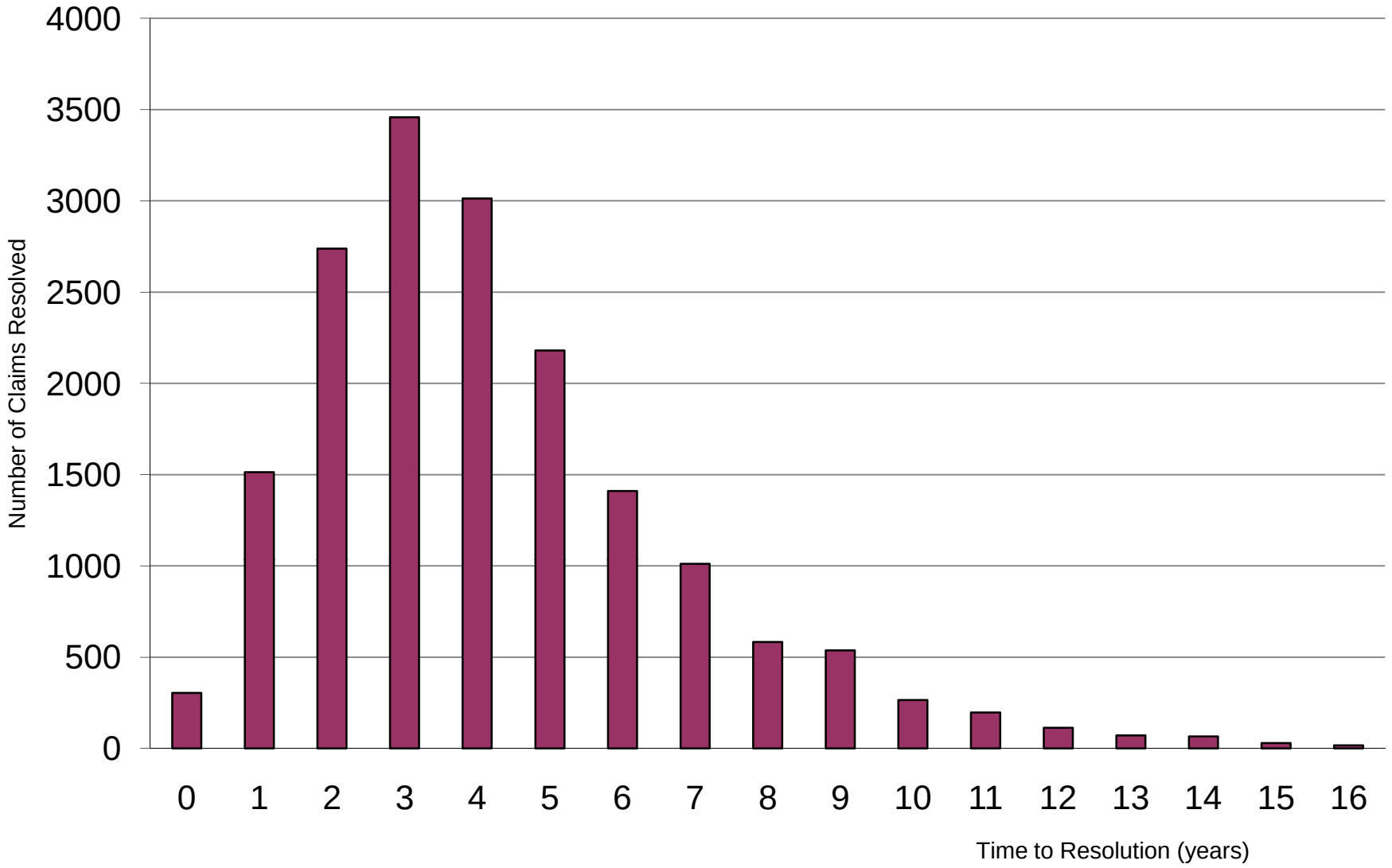

Figure 1: Histogram of Claims By Time to Resolution

Table 1. State with Statutes Pertaining to Apology Law

State	Year Law Passed	Full Versus Partial	Statutes
Massachusetts	1986	Partial	ALM GL ch. 233, § 23D (1986)
Texas	1999	Partial	Tex Civ Prac & Rem Code Ann 18.061 (1999).
California	2000	Partial	Cal Evid Code 1160 (2000).
Florida	2001	Partial	Fla Stat Ann Ch 90.4026 (2004).
Washington	2002	Partial	Rev. Code Wash. §5.66.010(2002)
Tennessee	2003	Partial	Tenn. Evid. Rule §409.1
Colorado	2003	Full	Colo Rev Stat Sec 13-25-135 (2003)
Oregon	2003	Partial	Oreg Rev Stat Sec 677.082 (2003).
Maryland	2004	Partial	Md. COURTS AND JUDICIAL PROCEEDINGS Code Ann. § 10-920
North Carolina	2004	Partial	N.C. Gen. Stat. § 8C-1, Rule 413 (2004)
Ohio	2004	Partial	ORC Ann. 2317.43 (2006)
Oklahoma	2004	Partial	(63 Okl. St. § 1-1708.1H
Wyoming	2004	Partial	Wyo Stat. § 1-1-130
Connecticut	2005	Full	Conn. Gen. Stat. § 52-184d (2005)
Louisiana	2005	Partial	La. R.S. 13:3715.5 (2005)
Maine	2005	Partial	24 M.R.S. § 2907 (2005)
Missouri	2005	Partial	Mo.Rev.Stat §538.229 (2005)
New Hampshire	2005	Partial	N.H.Rev. Stat. Ann. § 507-E:4 (2005)
South Dakota	2005	Partial	S.D. Codified Laws § 19-12-14 (2005)
Virginia	2005	Partial	Va. Code Ann. §8.01-581.20:1 (2005)
Arizona	2005	Full	A.R.S. § 12-2605
Georgia	2005	Full	O.C.G.A. § 24-3-37.1
Illinois	2005	Partial	735 ILCS 5/8-1901 (2005)
Montana	2005	Partial	Mont. Code Anno., § 26-1-814 (2005)
West Virginia	2005	Partial	W. Va. Code § 55-7-11a (2005)
Delaware	2006	Partial	Delaware Del. Code Ann. Tit. 10, 4318 (2006)
Idaho	2006	Partial	Ida. ALS 204; 2006 Idaho Sess. Laws 204;
Indiana	2006	Partial	Ind. HEA 1112
Iowa	2006	Partial	Iowa HF 2716 (2006)
South Carolina	2006	Full	South Carolina Ch.1, Title19 Code of Laws 1976, 19-1-190 (2006)
Utah	2006	Partial	2006 Ut. SB 41
Vermont	2006	Partial	Vermont S 198 Sec. 1. 12 V.S.A. 1912 (2006)
Hawaii	2006	Partial	HRS section 626-1, Hawaii Rules of Evidence Rule 409.5
Nebraska	2007	Partial	Nebraska Neb. Laws L.B. 373 (2007)
North Dakota	2007	Partial	North Dakota ND H.B. 1333 (2007)
District of Columbia	2007	Partial	D.C. Code 16-2841 (2007)

Table 2. Variable definition and NPDB Summary Statistics

Variable name		Variable Definition	Mean
Panel A: Individual Level			
Claim Payout		Average Claim Payout in Y2000 dollars	$200120
Years to Resolution		Average Year to Reach Resolution	3.86
Outcomes (Available If Reported After 2004)			
Emotional Injury		A dummy variable which takes the value 1 if the medical outcome is emotion injury and 0 otherwise	0.02
Insignificant Injury	Insig. injury	A dummy variable which takes the value 1 if the medical outcome is insignificant injury and 0 otherwise	0.03
Minor Temporary Injury	Insig. injury	A dummy variable which takes the value 1 if the medical outcome is minor temporary injury and 0 otherwise	0.15
Major Temporary Injury	Somewhat Sign. injury	A dummy variable which takes the value 1 if the medical outcome is major temporary injury and 0 otherwise	0.09
Minor Permanent Injury	Somewhat Sign. injury	A dummy variable which takes the value 1 if the medical outcome is minor permanent injury and 0 otherwise	0.14
Sign. Permanent Injury	Somewhat Sign. injury	A dummy variable which takes the value 1 if the medical outcome is sig. permanent injury and 0 otherwise	0.14
Major Permanent Injury	Sig. Injury	A dummy variable which takes the value 1 if the medical outcome is major permanent injury and 0 otherwise	0.09
Quadriplegic	Sig. Injury	A dummy variable which takes the value 1 if the medical outcome is quadriplegic and 0 otherwise	0.04
Death	Sig. Injury	A dummy variable which takes the value 1 if the medical outcome is death and 0 otherwise	0.28
Cannot be Determined		A dummy variable which takes the value 1 if the medical outcome cannot be determined and 0 otherwise	0.02
Payment Type			
Settlement		A dummy variable which takes the value 1 if the payment is a result of settlement and 0 otherwise	0.90
Judgment		A dummy variable which takes the value 1 if the payment is a result of judgment and 0 otherwise	0.03
Unknown		A dummy variable which takes the value 1 if the payment type is unknown and 0 otherwise	0.07
Panel B: State Level			
Claims Frequencies		Average state-level claim frequencies for incidents that took place in 2000	316.86
Claim Payments		Average state-level claim payment in 2000 (millions of Y2000 dollars)	71.33

Table 3. The Impact of Apology Law on Medical Malpractice Claims Frequencies and Claims Severity

Dependent Variable	*log (Claim Frequencies)*			*log (Claim Payout)*		
	(1)	(2)	(3)	(1)	(2)	(3)
Adopted Apology Law	0.142	0.153	0.147	0.279	0.276	0.202
	(0.086)	(0.083)*	(0.095)	(0.163)*	(0.163)*	(0.181)
Other Law Change[a]		X	X		X	X
Other Covariates[b]			X			X
State Fixed Effects	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X
Observation	867	867	867	867	867	867
R-squared	0.97	0.97	0.97	0.97	0.97	0.97

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Unit of Observation is State-Year. Each column shows the results from a separate diff-in-diff regressions. Standard errors are clustered at the state level. The dependent variables are either Log (Number of Cases) in a state-year or Log (Total amount of Settlement) in a state-year.

a. Other law change includes non-economic damage cap, punitive damage cap, law on medical malpractice disclosure, csr_tort and jsl_tort.

b. Covariates include population, % Black, % White, % of population that are 65 or above, and # of Physicians.

Table 4. Long Term Impact of Apology Laws on Claim Frequencies in Early Adoption States
Dependent Variable: Log (Malpractice Claim Frequencies in State-Year)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Only Includes Cases That Occurred Before the Year -							
	< 2001	< 2002	<2003	<2004	<2005	< 2006	< 2007	< 2008
Adopted Apology	0.001	0.044	0.082	0.082	0.130	0.163	0.236	0.234
Law Before 2002	(0.038)	(0.045)	(0.041)*	(0.045)*	(0.050)**	(0.061)**	(0.077)***	(0.086)**
Observations	210	231	252	273	294	315	336	357
R-squared	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98

Note: * significant at 10%; ** significant at 5%; *** significant at 1%; Robust standard errors in parentheses. Unit of observation is claim frequencies for each state-year. Each column shows the results from a separate diff-in-diff regressions including only the observations that occurred prior to the year in column heading. Only states that passed apology laws prior to 2002 and states that have never passed an apology laws are included. All regressions include state and year dummies and controlling for other law change includes non-economic damage cap, punitive damage cap, law on medical malpractice disclosure, csr_tort and jsl_tort.

Table 5. The Impact of Apology Law on Medical Malpractice Claim Frequencies by Severity of Medical Outcomes
Dependent Variable: log (claim frequencies)

	Insignificant Injury			*"Somewhat" Significant Injury*			*Major Permanent Injury/Death*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Adopted Apology Law	-0.167	-0.182	-0.194	0.118	0.091	0.047	0.270	0.265	0.217
	(0.099)*	(0.104)*	(0.101)*	(0.124)	(0.124)	(0.121)	(0.129)**	(0.133)*	(0.141)
Other Law Change[a]		X	X		X	X		X	X
Other Covariates[b]			X			X			X
State Fixed Effects	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X
N	255	255	255	255	255	255	255	255	255
R-squared	0.91	0.91	0.92	0.93	0.93	0.93	0.93	0.93	0.94

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Each column shows the results from a separate diff-in-diff regressions. Standard errors are clustered at the state level. The dependent variables are Log (claim frequencies by severity of outcome) in a state-year.

a. Other law change includes non-economic damage cap, punitive damage cap, law on medical malpractice disclosure, csr and jsl tort

b. Covariates include Population, % Black, % White, % of population that are 65 or above, and # of Physicians.

Table 6. Duration Analysis of the Impact of Apology Law on Time to Resolution
By Severity of Medical Outcomes

	Insignificant Injury			*"Somewhat" Significant Injury*			*Major Permanent Injury/Death*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Adopted Apology Law	1.116	1.126	1.129	1.148	1.146	1.153	1.198	1.195	1.192
	(0.078)	(0.074)*	(0.075)*	(0.094)*	(0.098)	(0.098)*	(0.076)***	(0.080)***	(0.079)***
State Fixed Effects	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X
Other Law Change[a]		X	X		X	X		X	X
Other Covariates[b]			X			X			X
N	12864	12864	11242	23945	23945	22586	26437	26437	25153

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. The unit of observation is per malpractice claim. Numbers reported above are hazard ratios for case resolution. Each column shows the results from a separate duration analysis with Cox hazard model. The dependent variable is time to resolution (year of resolution minus the year of incident). Errors are clustered at the state level.

a. Other law change includes non-economic damage cap, punitive damage cap, csr_tort, jsl_tort & law on information disclosure

b. Other covariates include allegation nature, patient gender, settlement type, experience of physician

Table 7: The Impact of Apology Law on Claim Payouts By Severity of Medical Outcomes

	Insignificant Injury Baseline Mean $45,019			*"Somewhat" Significant Injury Baseline Mean $155,070*			*Major Permanent Injury/Death Baseline Mean $342,869*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Dependent Variable-- Payout in Y2000 dollars									
Adopted Apology Law	-431	632	3132	-24017	-27264	-16989	-73096	-67644	-55247
	(4236)	(4131)	(3893)	(13432)*	(13564)**	(9538)*	(17334)***	(21188)***	(18022)***
Panel B: Dependent Variable--Log Claim Payout									
Adopted Apology Law	0.096	0.097	0.140	-0.083	-0.097	-0.08	-0.171	-0.177	-0.14
	(0.051)*	(0.053)*	(0.058)**	(0.090)	(0.085)	(0.071)	(0.075)**	(0.074)**	(0.067)**
Other Law Change[a]		X	X		X	X		X	X
Other Covariates[b]			X			X			X
State Fixed Effects	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X
N	13317	13317	11618	24156	24156	22780	26561	26561	25273

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. In Panel A, numbers reported above are payments in Y2000 dollar. Each column shows the result from a separate diff-in-diff regression. The dependent variable is the dollars value claim payout in Panel A and the dependent variable is the log (claim payout) in Panel B.

a. Other law change includes non-economic damage cap, punitive damage cap, csr_tort, jsl_tort & law on information closure

b. Other covariates include allegation nature, patient gender, patient age, experience of physician and square of experience