FOR ONLINE PUBLICATION

ONLINE APPENDIX

**DOES MEDICAL MALPRACTICE LAW IMPROVE HEALTH CARE QUALITY?**

*By* Michael Frakes and Anupam B. Jena

**Online Appendix A: Conditions under which Probability of Court Error Will Induce Increase in Precaution-Taking Rate.**

Consider a situation as in Figure 2 of the text. The benefits of the precaution perceived by the physician, as a function of *s*, *B\*(s)*, intersects with the costs of the precaution, *C*, at *s\**. Consider a patient with risk characteristics, *s*, just below *s\**. Typically, the physician would perceive the costs of the precaution as being greater than the benefits and elect not to provide the precaution for this patient. However, introduce the possibility that courts will err and expect that physicians indeed provide the precaution to this patient. We assume that physicians will reevaluate their inclinations not to provide the precaution to this patient by comparing the expected level of damages that may ensue from failing to provide the precaution to this patient with the perceived net cost, in the eyes of the physician, associated with providing the patient with this precaution. This latter cost is easily specified. In this range below *s\**, the cost of the precaution exceed the benefits of providing the precaution perceived by the physician by an amount equal to *C – B\*(s)*. As long as the expected liability associated with not providing the precaution to this patient is less than this perceived cost of treatment, the physician will continue to avoid providing the precaution in the face of this patient. If expected liability costs exceed these perceived net costs of precaution, the physician will go against their normal instincts and provide the precaution (note that we are simply assuming risk neutrality here). As such, to specify those conditions under which the possibility of court err in ascertaining customary practices will cause physicians to increase their precaution-taking rate, we must determine at what complication level, *s*, the expected liability costs at least equal *C – B\*(s)*.

For a given *s* in the range below *s\**, the expected liability damages associated with not providing the precaution will depend on the distribution of court-determined damages. Even though the true customary perceived benefits of providing the precaution equal *B\*(s)* at this level of *s*, assume, for instance, that a court will err by implicitly assuming that the perceived benefits equal *B\*\*(s)*, a level that now exceeds the costs, *C*, of providing the precaution. If the precaution is not provided, assume that courts will assess a level of damages equal to the forgone benefits associated with the precaution, *B\*\*(s)*, net of the costs of the precaution—i.e., *B\*\*(s) – C*. As such, the expected liability costs will equal the expected value of such amounts over the distribution of possible *B\*\*(s)*’s (subject to the condition that such damage amounts be greater than zero). For simplicity, assume that each possible *B\*\*(s)* is simply a shift upwards of *B\*(s)* by an amount equal to *k*. As such, for a given *s*, the expected liability damages equals:

Thus, in the face of uncertainty regarding the courts assessment of where customary standards lie, physicians will increase their precaution-taking rate and thus lower their operable cut-off point below *s\** until the point at which

**Additional notes regarding indirect evidence bearing on the plausibility of malpractice law’s deterrence channel**

There are many reasons to doubt whether the threat of liability will indeed induce the higher level of quality predicted by the above model. To begin, are physicians even aware of how the law expects them to behave? That is, if a jurisdiction shifts the standard of care from *s\** to , as hypothesized above, will physicians become aware of the altered expectations?[[1]](#footnote-1)

Moreover, even if physicians have knowledge of such standards, it is unclear whether they would alter their practices accordingly. Deterrent forces are potentially blunted by the fact that a very small percentage (possibly as low as 3%) of those who are harmed by a negligent medical error actually pursue a malpractice claim in the first place (Localio et al. 1991).[[2]](#footnote-2) That is, while the damages to be imposed for failure to take the expected precaution in the above model equal the foregone benefits, *B(s)*, the physician may only assign a small fraction, *α*, of this amount in weighing the costs and benefits of the proposed action. In this instance, if the courts set a new standard at the optimal cutoff, , physicians will only increase precaution-taking in the direction of (and away from their starting point, *s\**) until the point where the expected liability damages, *αB(s)—*i.e., the consequences of failing to provide the precaution—equal the costs of taking the precaution net of the perceived benefits from doing so (C-B’(s)). As can be readily shown, as *α* decreases, the level of s that satisfies this equivalency increases—that is, it becomes closer to *s\**, their baseline / customary practices. As such, as the degree to which the expected consequences of liability falls, physicians will become less likely to alter their behavior in the direction of the standards legally expected of them.

Potentially confounding this deterrent channel even further is the possibility of an ineffective targeting of damage awards towards meritorious claims. To the extent that juries extend liability to situations in which physicians, in fact, did not negligently harm patients (i.e., where either the physician did indeed undertake the required precaution, *A*, or where the complication level of the patient, *s*, is as such that the precaution need not have been taken), the law may fail to signal to physicians precisely what they must do in order to avoid liability.[[3]](#footnote-3) Early investigations into this targeting inquiry indeed invoked some concern, with as many as 59 percent of non-meritorious claims receiving some payment.[[4]](#footnote-4) In a more recent study, however, Studdert et al. (2006) find that over 70 percent of non-meritorious claims (i.e., those involving neither negligence nor injuries) received no compensation, while over 70 percent of those claims that involved both injury and negligence did. Moreover, when non-meritorious claims did receive payment, those payments were substantially lower than those extended to meritorious claims (roughly $313,000 vs. $521,000). These findings instill some hope that the system may be sending the proper signals to physicians, though the targeting remains far from perfect.

However, even when those harmed by a negligent error are successful in seeking compensation, physicians may face limited immediate financial risk from the associated damage awards considering that they are insured against such losses and that this coverage is typically not experience rated (Currie and MacLeod 2008). Moreover, claim amounts themselves rarely exceed malpractice insurance limits (Zeiler et al. 2007). As such, potentially blunting the incentives posed in a given clinical encounter, physicians may not even be exposed to the damage awards of *B(s)* for failing to take the indicated precaution. On the other hand, despite the limited financial risks directly associated with the litigation, physicians may face a number of uninsurable costs as a result of malpractice liability – e.g., reputational and psychological damage – leaving open a pathway by which physicians may respond to liability forces.[[5]](#footnote-5)

Finally, the influence of medical liability rules on observed indicators of quality may be limited by certain additional features of liability rules. Medical errors are perhaps inevitable even in the face of physicians that are habitually inclined to deliver quality care. After all, an occasional slip or mistake (and thus deviation from such habitual inclinations) is characteristic of human nature. Despite this dire assertion, commentators suggest that better designed safety systems within hospitals—e.g., medication-dispensing processes and protocols—hold great potential to reduce the incidence of errors by reducing the scope of inevitable human mistakes. In this frame of thought, one might contend that stronger incentives should be placed on hospitals and organizations to develop efficient systems of safety and that relatively less attention should be placed on incentivizing particular behaviors on the part of individual physicians. Medical liability rules, as is often argued, have this emphasis reversed. It is not altogether straightforward for a plaintiff to be able to bring a hospital into a malpractice lawsuit under traditional rules of respondeat superior in light of the legal status of many physicians as “independent contractors” rather than as employees of hospitals.[[6]](#footnote-6)

All told, a heavy cloud of uncertainty engulfs this deterrence inquiry, necessitating empirical evaluation.

**Online Appendix B:** **Data Sources, Quality Measures, and Covariates**

***National Hospital Discharge Survey***

Healthcare quality data is collected from the National Hospital Discharge Survey (NHDS), a nationally-representative sample of inpatient discharge records from short-stay, non-federal hospitals. For approximately 260,000 inpatient records per year, the NHDS contains information on, among other things: (a) primary and secondary diagnosis and procedure codes, (b) certain demographic characteristics of the patient, and (c) certain characteristics of the hospital. We supplement the public NHDS files with geographic identifiers (restricted-use variables) received pursuant to an agreement with the Research Data Center (RDC) at the National Center for Health Statistics (NCHS). All empirical work was performed onsite at the RDC in Hyattsville, Maryland. The resulting sample covers the years 1979 to 2005. While we also have access to the 1977 and 1978 NHDS records, such records use ICD-8 diagnosis codes (as distinct from the ICD-9-CM codes used thereafter), complicating the ability to form consistent formulations over time of some of the more complicated quality-indicators embraced throughout this analysis.

***Healthcare Quality Measures***

For the purposes of this study, we largely look to the AHRQ for guidance in selecting quality metrics. The AHRQ measures are particularly useful for the present study in so far as they are designed for use with administrative inpatient databases such as the NHDS. The AHRQ’s quality indicators are essentially classified into 3 modules: (1) Prevention Quality Indicators (PQIs), identifying admissions that could have been avoided through access to high-quality outpatient care, (2) Inpatient Quality Indicators (IQIs), reflecting the quality of care inside hospitals including inpatient mortality for certain medical conditions, and (3) Patient Safety Indicators (PSIs), focusing on potentially avoidable complications during inpatient care.

For the purposes of this analysis, we attempt to construct quality metrics that are meant to cover each of these three domains.

*Avoidable hospitalizations*. First, we calculate a rate of avoidable hospitalizations (AH) within each state-year cell, a measure inspired by the AHRQ’s PQIs. AH rates, generally, and the PQIs, specifically, are measures that are constructed using inpatient data, though meant to reflect the quality of care prevailing in the associated outpatient / ambulatory community. Such measures identify conditions (e.g., asthma, diabetes, malignant hypertension, etc.) with respect to which proper outpatient care would have prevented the need for hospitalization. According to the AHRQ, their PQIs grew out of research in the early 1990s by Joel Weissman and colleagues.[[7]](#footnote-7) The Weissman et al. (1992) AH classification scheme is designed in slightly more general terms than the PQIs and thus arguably lends itself to easier codification using a set of NHDS records that span several decades (considering the complexity associated with tracking variations in ICD classifications over time).[[8]](#footnote-8) For this reason, and in light of the fact that Weismann et al. developed their classification during the middle of the period in which the NCHS sampled physicians to compile the NHDS (unlike the PQIs, which came later), we elect to construct an AH rate for this analysis using the Weissman et al. classification.

To calculate avoidable hospitalization rates for each state and year in the sample, we first count the number of hospitalizations within the NHDS records for that state-year cell in which a diagnosis is indicated for any of the conditions included in the Weissman et al. (1992) classification. We perform such counts under two alternative approaches: one in which the conditions are identified in any one of the indicated diagnosis codes and one in which the conditions are identified in the primary diagnosis code only (the preferred approach that we take). To form the relevant rate, it is of course necessary to normalize these AH counts in some manner. Following Frakes (2013), we elect to use measures internal to the NHDS records to form the relevant denominator for each state-year AH rate, taking several alternative approaches to this normalization.[[9]](#footnote-9) In one approach, for example, we normalize each AH count by the number of hospitalizations associated with the delivery of a child found in the NHDS records for the relevant state and year. This approach allows for a scaling of the AH count by a measure reflective of the size of the associated state-year sample, while also offering a denominator that is itself not likely to be significantly impacted by the prevailing malpractice environment (allowing for a focus on the influence of malpractice on the AH count comprising the numerator, our margin of interest).

Primarily, however, based on the same premise as the delivery approach and following Frakes (2013), we normalize each state-year AH count by an index of hospitalizations equal to the count of admissions associated with any of the following conditions and events: (1) acute myocardial infarction, (2) stroke, (3) gastro-intestinal bleeding or (4) hip fracture. Such events represent situations characterized by relatively little variation across regions (see, for example, Wennberg 1984 and Wennberg and Cooper 1999), even in the face of environments that impose varying legal and financial incentives (i.e., where such hospitalizations are better seen as proxies for the underlying disease environment, as opposed to reflections of immediate healthcare utilization decisions). As such, this index likewise affords an appropriate scaling of the numerator count with arguably little concern over the malpractice environment impacting the scaling metric.[[10]](#footnote-10) In yet another alternative approach, we simply normalize by the count of acute myocardial infarction discharges (primary diagnosis only) for the relevant state and year.

*Low-discretionary avoidable hospitalizations*. As an alternative AH rate, we focus on those subset of avoidable hospitalizations over which physicians have less discretion in admitting patients. Use of this alternative measure will ease concerns that fluctuations in the liability regime will capture changes not just in outpatient quality but in inpatient admission decisions. Following Weismann et al. (1991), Wennberg (1988) and Twigger and Jessop (2000) for guidance, we select the following conditions out of the Weissman et al. (1992) conditions as being on the lower end of the discretionary scale: ruptured appendix, pneumonia, and congestive heart failure.

*Inpatient mortality for selected conditions*. Following the AHRQ’s IQIs, we next construct a quality measure in which we calculate the composite rate of inpatient mortality among a sub-sample of discharges in which the primary diagnosis code indicates any one of the following conditions: acute myocardial infarction, heart failure, acute stroke, gastrointestinal bleeding, hip fracture or pneumonia. Such events are generally high volume in occurrence, allowing for robust sample sizes. It is worth noting that such conditions, for the most part, also represent low-discretionary hospitalizations, whereby inpatient admissions generally follow upon their occurrence.[[11]](#footnote-11) With this in mind, mortality rates among this sub-sample of admissions can be seen as more likely reflective of the quality of care observed during the inpatient stay itself, rather than as a result of risk selection by providers or patients.

Of course, a concern arises regarding fluctuations in the proportions of the various conditions comprising this selected-conditions sub-sample. That is, a reduction in the composite mortality rate could arise from a relative increase in the rate of hip fracture admissions (where mortality rates are lower for such admissions relative to the other selected conditions), as opposed to reductions in mortalities that would actually be attributable to improvements in quality. We take two approaches to dealing with this concern. First, in some specifications, we include state-year controls for the proportion of this sub-sample made up of each of the respective conditions. In the primary approach, however, we follow the AHRQ and standardize the composite mortality rate for state-year changes in the various incidences of the conditions.

To risk adjust mortality rates, we employ an indirect standardization approach, in which we first predict the mortality rate that a national sample of patients would be expected to experience if they faced the relevant patient characteristics of each state-year cell. We generate such predictions based on the estimated coefficients from national, annual regressions of mortality incidence on the incidence of the relevant set of conditions. We then calculate the standardized mortality rate by (1) taking the ratio between the observed state-year composite mortality rate and this predicted national mortality rate and (2) multiplying this ratio by the observed national mortality rate.

*Patient safety incidents and delivery complications*. For the reasons set forth in the text, we focus our patient-safety analysis on the delivery-related PSI’s inspired by the AHRQ, which represent third and fourth degree lacerations during deliveries (aggregating this analysis across vaginal and cesarean deliveries). Again following Currie and MacLeod (2008), we supplement these PSI delivery measures by forming a measure equal to the incidence of preventable delivery complications: fetal distress, excessive bleeding, precipitous labor, prolonged labor, or dysfunctional labor.

***Behavioral Risk Factor Surveillance System***

Our data source for the cancer-screening analysis is the Behavioral Risk Factor Surveillance System (BRFSS). The data consists of repeated cross-sections for the years 1987 through 2008, collected via monthly telephone surveys of individuals aged 18 years and older. The BRFSS is a nationally representative survey of the United States and has been conducted by state health departments in coordination with the CDC for the purpose of collecting state-level data pertaining to certain personal health behaviors. Fifteen states took part in the first survey in 1984. By 1994, all 50 states and the District of Columbia became involved. The survey was administered to an average of 817 individuals per state in 1984, rising to an average of nearly 8000 per state in 2008.

***Cancer-Screening Measures***

*Sigmoidoscopy / Colonoscopy*. In our primary specification, we aimed to construct a proctoscopy screening measure in line with recommended screening guidelines. As such, we focused on the age group between 50 and 75 years old and created an indicator variable equal to “1” if the respondent has had a sigmoidoscopy or a colonoscopy within the last 5 years. In alternative specifications we simply indicate whether or not the respondent within this age range has ever had a sigmoidoscopy or a colonoscopy. Proctoscopic examination information within the BRFSS is available from 1988 onwards.

*Mammogram*. In our primary specification, we construct a mammogram screening measure in line with the recommended screening guidelines in place for most of our sample period. Accordingly, limiting our sample to those female respondents with an age between 40 and 75 year olds, we created an indicator variable reflecting whether or not the respondent received a mammogram within the last 2 years. In alternative specifications, we simply indicate whether or not the respondent within this age range has ever had a mammogram. Mammography information within the BRFSS is available from 1987 onwards.

*Physical breast exam*. Likewise in line with recommended guidelines, our primary specifications construct physical or clinical breast exam utilization measures by looking at the sample of at least 40 years of age and asking whether or not they have had a break exam within the last year. In alternative specifications, we simply indicate whether or not they have ever had a physical breast exam. Physical breast exam information within the BRFSS is available from 1990 onwards.

*PSA Testing*. Consistent with recommendations, at least with respect to those recommendations operating over our sample period, we focus on the sample of males over the age of 50 (and under the age of 75) and construct an indicator regarding whether or not they have received Prostate-Specific Antigen (PSA) Testing within the last year. In alternative specifications, we simply indicate whether or not they have ever had PSA testing. PSA testing information within the BRFSS is available from 2001 onwards.

*Digital Rectal Exam*. Consistent with recommendations, at least with respect to those recommendations operating over our sample period, we focus on the sample of males over the age of 50 (and under the age of 75) and construct an indicator regarding whether or not they have received a Digital Rectal Exam (DRE) within the last year. In alternative specifications, we simply indicate whether or not they have ever had a DRE. DRE information within the BRFSS is available from 1988 onwards, though not at sufficient numbers until 1993 onwards (with several years omitted in the late 1990s).

*Pap smear*. Consistent with recommendations, at least with respect to those recommendations operating over our sample period, we focus on the sample of females 21 years old and over and construct an indicator regarding whether or not they have received pap testing within the last year. In alternative specifications, we simply indicate whether or not they have ever had a pap smear. Pap testing information within the BRFSS is available from 1987 onwards.

***Additional Notes on Non-Economic Damage Caps***

Following Frakes (2012), we also classify states as having non-economic damages provisions if they have laws that place caps on total damages awards. Such laws, after all, necessarily cap non-economic damages as well. In light of the imposition of state fixed effects, this classification only has relevance in the context of 1 state (Texas) that adopted a total damages cap at a time when it did not have a specific non-economic damage cap in place. Only 1 additional state – i.e., Colorado – adopted a total damages cap over the sample period (2 years following the adoption of a non-economic damages cap). With this in mind, we do not separately control for the incidence of a cap on total damages. However, we estimate nearly identical results for the remaining coefficients when we do include this additional covariate and treat total and non-economic damage caps separately.

Frakes (2013) documents a relationship between the adoption of laws requiring physicians to follow national (as opposed to local) standards and a resulting convergence in physician practices across regions. In light of the fact that two of the damage-cap treatment states used in the defensive-medicine analysis below (Hawaii and Texas) were dropped from the specifications estimated in Frakes (2013) (due to an inability to classify the full history of their standard-of-care laws), we exclude controls for national-standard laws in the damage-cap specifications estimated below and focus instead on the traditional tort reform measures. However, the results presented below are robust to the inclusion of controls for national-standard laws (not shown).

***Other Tort Reforms***

A number of specifications include the incidence of additional tort measures as covariates, including reforms of the collateral source rule, caps on punitive-damages awards and other “indirect” tort reforms. Traditional collateral source rules generally prohibited defendants from introducing evidence of compensatory payments made to plaintiffs from outside sources (e.g., insurers). Thirty-three states currently have laws in place that eliminate this traditional rule, effectively reducing the scope of compensatory damage awards. Much of these reforms likewise occurred during the mid-1980s; however, there are a substantial amount of independent reforms of each type, facilitating identification of their separate impacts.

Punitive damages are awarded on a much rarer basis in malpractice actions than are non-economic damages awards (without a correspondingly large increase in average payouts).[[12]](#footnote-12) Thus, relative to non-economic damages, it is arguable that the threat of liability for punitive damages will have a weaker impact on physician behavior. Nonetheless, despite the infrequent application of such awards, considering that punitive damages are generally not insured by liability carriers, it remains reasonable to believe that physicians may be sensitive to the threat posed by punitive awards (Malani and Reif 2012). Finally, following the classification of malpractice reforms introduced by Kessler and McClellan (1996), we estimate the general impact associated with a residual reform category (labeled “indirect” reforms) that includes contingency fee limitations, requirements of periodic payment of future damages, joint and several liability reforms, and provisions for a patients’ compensation fund.[[13]](#footnote-13)

***Other Covariates (by Quality Indicator)***

*Inpatient mortality rate for selected medical conditions*. In the case of the mortality rates specifications, estimated according to equation (1) in the text, **Xs,t** represents certain demographic characteristics: the percentage of patients in various age-sex categories,[[14]](#footnote-14) race categories (white, black and other), insurance categories (private, government, no insurance and other), along with the percentage of patients visiting hospitals of various bed sizes (0-100, 100-200, 200-300, 300-500 and 500+ beds) and of various ownership types (proprietary, non-profit and government).[[15]](#footnote-15) **Zs,t** represents certain other state-year characteristics (HMO penetration rate and its square, physician concentration rate, and median household income).[[16]](#footnote-16)

In alternative specifications, we also control for the average length of stay associated with hospitalizations for such medical conditions. To the extent that medical liability forces also impact lengths of stay for such hospitalizations, any such development could confound the estimation of liability forces on inpatient mortality rates insofar as longer hospitalizations otherwise increase the probability of an inpatient mortality. The results are virtually unchanged with such controls. Supporting this insensitivity to the inclusion of length-of-stay controls, we also find, in separate specifications (available upon request), no association between the adoption of the various reforms and the length of stay associated with hospitalizations for the selected medical conditions.

*Avoidable hospitalization rates*. **Xs,t** and **Zs,t** in the AH rate specifications are identical to those of the inpatient mortality rate specifications.

*Maternal trauma rates and delivery complication rates*. In the obstetrics specifications, **X** includes mother’s age (15-19, 20-24, 25-29, 30-34, 35-39 and 40+ years old); mother’s race (white, black and other); mother’s insurance status (private, government, no insurance and other); hospital bed size (0-100, 100-200, 200-300, 300-500 and 500+ beds); and hospital ownership type (proprietary, non-profit and government). **Zs,t** includes the state-year fertility rate, the state-year OB-GYN concentration rate,[[17]](#footnote-17) the HMO penetration rate (and its square), and median household income. Obstetric specifications also include controls for cesarean delivery and episiotomy utilization. The maternal trauma specifications also include a control capturing the risk-status associated with the delivery, specified following Frakes (2013) as the predicted probability of cesarean delivery (PPC). PPC values are calculated using fitted values of a logit model (estimated annually) of the incidence of cesarean delivery on a set of individual risk factors and complications. We include this measure from Frakes (2013) simply as a way to capture all such risk factors and complications in a single measure. The results are robust to including separate indicator variables for all such measures. Note that we exclude this control in the main specification of the delivery complications specification given that the outcome variable in that context is meant to capture certain of those complications itself. In alternative specifications of the delivery complications approach, we also include controls for all non-preventable complications and risk factors. The results are virtually identical under such alternative specifications (available upon request).

*Cancer Screening Rates*. **X** in the cancer screening specifications includes various individual characteristics provided for in the BRFSS files: marital status (married, widowed, divorced, single), race (white, black, and other), educational attainment category, Hispanic origin, income (and its square), age category (by age deciles), and smoking status. **Z** includes certain characteristics of the prevailing state-year health care market (including physician concentration rate and the average number of hospital beds per capita),[[18]](#footnote-18) along with HMO penetration rates and its square.

***Note on Liability-Standards Specifications***

Following Frakes (2013), we exclude from this initially-high versus initially-low analysis the state of Maryland, which modified its standard of care laws over the 1990s to retreat from a previous national-standard adoption, insofar as it is difficult to hypothesize the direction in which practices will evolve subsequent to this retreat.

**Online Appendix C: Additional Robustness Checks**

***Dynamic Difference-in-Difference Results***

Table C1. Relationship between Damage Caps and the AHRQ-Inspired Quality Indicators: Dynamic

Difference-in-Difference Regression Results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | Inpatient Mortality Rate | AH RATE | Low-discretionAH Rate | Maternal Trauma Rate | Preventable Delivery Complica-tions |
| Non-Economic Damage Cap |  |  |  |  |  |
| 4-Year Lead Dummy | -0.084\*\*\*(0.030) | 0.023(0.032) | 0.037  (0.027) | 0.003(0.003) | -0.013(0.010) |
| 3-Year Lead Dummy | -0.012(0.034) | -0.030 (0.020) | -0.028 (0.023) | -0.002(0.002) | 0.010 (0.006) |
| 2-Year Lead Dummy | -0.010(0.056) | -0.001 (0.027) | -0.006 (0.031) | 0.001(0.003) | 0.014(0.010) |
| 1-Year Lead Dummy | 0.027(0.041) | -0.008 (0.017) | -0.008 (0.024) | -0.000(0.002) | -0.007(0.006) |
| Contemporaneous Dummy | -0.046(0.048) | 0.009(0.028) | 0.007(0.031) | 0.001(0.003)  | 0.004(0.005) |
| 1-Year Lag Dummy | 0.031(0.066) | 0.015(0.031) | -0.004 (0.023) | -0.005(0.005) | 0.005(0.010) |
| 2-Year Lag Dummy | 0.034(0.067) | -0.065\*\* (0.025) | -0.063\*\* (0.025) | -0.003(0.004) | -0.012 (0.011) |
| 3-Year Lag Dummy  | 0.033(0.054) | 0.038 (0.027) | 0.042 (0.027) | 0.007(0.005) | 0.004(0.011) |
| 4-Year Lag Dummy | -0.041(0.049) | 0.022(0.022) | -0.002 (0.020) | -0.002 (0.003) | -0.002(0.006) |
| *Notes*: robust standard errors corrected for within-state correlation in the error term are reported in parentheses. Each specification controls for state fixed effects, year fixed effects, various covariates and a set of state specific linear time trends. Specifications are weighted per their counterparts in Tables 4-7 of the text and otherwise track the specifications in such tables. Dependent variables in Columns 1 – 3 (representing state-year means of the respective measures) are logged. Dependent variables in Columns 4 and 5 represent the individual incidence of the respective measure.\*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level.\* Significant at the 10 percent level. |

Table C2. Relationship between Damage Caps and Cancer Screening Rates: Dynamic

Difference-in-Difference Regression Results

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
|  | Mammo-gram | Physical Breast Exam | Procto-scopic Exam | PSA Testing | Digital Rectal Exam | Pap Smear |
| Non-Economic Damage Cap |  |  |  |  |  |  |
| 4-Year Lead Dummy | -0.009 (0.006) | -0.006 (0.006) | -0.019\*\*\* (0.007) | 0.013 (0.015) | 0.007 (0.017) | -0.003 (0.006) |
| 3-Year Lead Dummy | 0.007 (0.004) | 0.010 (0.008) | -0.004 (0.007) | -0.023 (0.016) | -0.009 (0.015) | 0.015\* (0.007) |
| 2-Year Lead Dummy | 0.005 (0.006) | -0.001 (0.008) | -0.002 (0.007) | 0.022\* (0.011) | 0.018 (0.012) | -0.002 (0.007) |
| 1-Year Lead Dummy | 0.017\*\* (0.007) | 0.032\*\*\* (0.007) | -0.001 (0.011) | 0.024\*\*\* (0.009) | -0.006 (0.014) | 0.025\*\*\* (0.006) |
| Contemporaneous Dummy | -0.023\*\*\* (0.006) | -0.019\*\* (0.008) | -0.022 (0.014) | 0.017 (0.014) | 0.027 (0.018) | -0.018\*\*\* (0.007) |
| 1-Year Lag Dummy | 0.019\*\* (0.007) | 0.021 (0.011) | 0.018 (0.010) | -0.008 (0.010) | -0.043\*\* (0.018) | 0.021\*\* (0.010) |
| 2-Year Lag Dummy | 0.000 (0.006) | 0.001 (0.009)  | -0.007 (0.009) | 0.043\*\* (0.019) | 0.032 (0.018) | -0.004 (0.010) |
| 3-Year Lag Dummy | 0.002 (0.008) | -0.000 (0.009) | 0.013 (0.009) | 0.003 (0.017) | -0.017 (0.015) | 0.014 (0.012) |
| 4-Year Lag Dummy | 0.002 (0.006) | 0.001 (0.007) | -0.009 (0.008) | 0.022\*\* (0.010) | -0.009 (0.012) | 0.005 (0.006) |
| *Notes*: robust standard errors corrected for within-state correlation in the error term are reported in parentheses. Each specification controls for state fixed effects, year fixed effects, various covariates and a set of state specific linear time trends. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level.\* Significant at the 10 percent level. |

Table C3. Relationship between National Standard Laws and the AHRQ-Inspired Quality Indicators in Initially Low-Quality Areas: Dynamic

Difference-in-Difference Regression Results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | Inpatient Mortality Rate | AH RATE | Low-discretionAH Rate | Maternal Trauma Rate | Preventable Delivery Complica-tions |
| Non-Economic Damage Cap |  |  |  |  |  |
| 4-Year Lead Dummy | -0.041 (0.122) | 0.075 (0.086) | 0.101 (0.070) | -0.034 (0.171) | 0.001 (0.132) |
| 3-Year Lead Dummy | -0.139 (0.081) | 0.029 (0.136) | 0.082 (0.169) | -0.143 (0.299) | -0.051 (0.081) |
| 2-Year Lead Dummy | 0.095 (0.091) | -0.004 (0.074) | 0.025(0.082) | 0.134 (0.255) | -0.135\* (0.067) |
| 1-Year Lead Dummy | 0.120 (0.134) | -0.064 (0.077) | -0.116(0.094) | 0.193\*\* (0.076) | 0.040 (0.154) |
| Contemporaneous Dummy | -0.107 (0.074) | -0.007 (0.089) | -0.004(0.083) | -0.470\*\* (0.207) | -0.447\*\*\* (0.137) |
| 1-Year Lag Dummy | -0.032 (0.079) | -0.233 (0.139) | -0.257\* (0.141) | 0.048 (0.327) | 0.283\*\* (0.136) |
| 2-Year Lag Dummy | -0.077 (0.122) | 0.049 (0.066) | 0.027 (0.072) | 0.141 (0.165) | -0.152 (0.092) |
| 3-Year Lag Dummy | 0.084 (0.153) | -0.135 (0.102) | -0.138(0.100) | -0.189 (0.180) | 0.159 (0.147) |
| 4-Year Lag Dummy | -0.130 (0.095) | -0.165 (0.135) | -0.183 (0.137) | -0.116 (0.160) | 0.011  (0.126) |
| *Notes*: robust standard errors corrected for within-state correlation in the error term are reported in parentheses. Each specification controls for state fixed effects, year fixed effects, various covariates and a set of state specific linear time trends. Specifications are weighted per their counterparts in Tables 9-12 of the text. Dependent variables are logged. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level.\* Significant at the 10 percent level. |

Table C4. Relationship between National Standard Laws and the AHRQ-Inspired Quality Indicators in Initially High-Quality Areas: Dynamic

Difference-in-Difference Regression Results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | Inpatient Mortality Rate | AH RATE | Low-discretionAH Rate | Maternal Trauma Rate | Preventable Delivery Complica-tions |
| Non-Economic Damage Cap |  |  |  |  |  |
| 4-Year Lead Dummy | -0.172(0.103) | -0.084 (0.055) | -0.059(0.051) | 0.124 (0.196) | -0.041(0.137) |
| 3-Year Lead Dummy | 0.000(0.111) | -0.067 (0.105) | -0.142(0.135) | -0.197 (0.230) | -0.134(0.139) |
| 2-Year Lead Dummy | 0.286(0.284) | 0.102 (0.059) | 0.127(.0.078) | -0.115 (0.134) | -0.000(0.091) |
| 1-Year Lead Dummy | -0.058(0.147) | -0.086 (0.075) | -0.082(0.082) | 0.346\* (0.202) | 0.020(0.151) |
| Contemporaneous Dummy | 0.098(0.269) | 0.033(0.075) | -0.017(0.098) | -0.381\*\*\* (0.130) | -0.059(0.273) |
| 1-Year Lag Dummy | -0.226(0.193) | -0.049 (0.075) | 0.000(0.099) | 0.121 (0.211) | 0.012(0.168) |
| 2-Year Lag Dummy | 0.219(0.254) | 0.035(0.031) | 0.085\*\*(0.033) | -0.124 (0.121) | 0.053(0.128) |
| 3-Year Lag Dummy | -0.002(0.147) | -0.063\* (0.032) | -0.108\*\*(0.040) | 0.340 (0.188) | -0.053(0.125) |
| 4-Year Lag Dummy | 0.015(0.112) | 0.018 (0.029) | 0.037(0.039) | 0.009 (0.231) | 0.080(0.086) |
| *Notes*: robust standard errors corrected for within-state correlation in the error term are reported in parentheses. Each specification controls for state fixed effects, year fixed effects, various covariates and a set of state specific linear time trends. Specifications are weighted per their counterparts in Tables 9-12 of the text. Dependent variables are logged.\*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level.\* Significant at the 10 percent level. |

To supplement the above dynamic difference-in-difference tables, we have also produced graphical depictions of the indicated findings. Rather than presenting the full set of findings graphically, however, we only present those bearing on the hypothesis: physicians will respond to standard-of-care reforms that entail the expectation of higher levels of quality by delivering higher quality care. Note that higher levels of care entail lower levels of the AHRQ quality indicators. As such, we expect to observe a decline in such much measures following national standard adoptions in those states that begin with below-average rates and with respect to which the reform entails a heightening of standards. For the reasons indicated below (and in the text), we focus this analysis on the AHRQ-inspired indicators. The figure effectively plots the time trend in the differential quality rate between treatment and control states on a year-by-year basis, where time is measured with reference to years prior to and subsequent to a national standard adoption, where this differential is normalized to 0 in the base period (the period of time prior to 4 years before the reform). [[19]](#footnote-19) The dashed lines in the figures represent the top and bottom of the 95 percent confidence intervals for the respective coefficients.

***Additional Specification Checks***

*Construction of Avoidable Hospitalization Rates.* The results presented in the text are robust to alternative constructions of the AH Rates, including those constructions that (1) flag avoidable hospitalizations using any diagnosis field, not just the primary diagnosis field, (2) normalize avoidable hospitalization counts by the number of deliveries of children in the associated state-year cell (an alternative measure of the size of the cell that is not itself subject to influence by the prevailing liability environment), (3) normalize avoidable hospitalization counts by the number of acute myocardial infarctions in the associated state-year cell (rather than the low-variations health index that likewise includes strokes, hip fractures and gastro-intestinal bleedings), (4) use non-logged AH rates as the dependent variable and (5) focus only on the adult (18-plus) population. For instance, when using just acute myocardial infarctions as the denominator in the AH rate, the 95 percent confidence bound for the non-economic damage cap coefficient becomes [-0.092,0.063] as compared with [-0.068, 0.048] from Column 3 of Table 5. Similarly, those confidence bound becomes [-0.034, 0.058] when using any diagnosis code and [-0.046, 0.058] when focusing only on the adult population. For the purposes of brevity, we avoid setting forth this full set of findings. However, these results are available upon request from the authors.

*Construction of Inpatient Mortality Rate for Selected Medical Conditions*. The results presented in the text are robust to alternative constructions of the inpatient mortality rate for selected medical conditions, including those constructions that (1) use non-logged mortality rates as the dependent variable, (2) specify the outcome variable as the incidence of mortality out of an individual sample of admissions for the selected medical conditions (as distinct from the primary specification whose unit of observation is a given state-year cell), (3) use mortality rates as the dependent variable that are not risk adjusted for fluctuations in the state-year incidence of the underlying medical conditions, but instead include as covariates the incidence of such conditions, and (4) focus the analysis only on the adult population. For instance, when including the incidence of the underlying medical conditions as covariates (rather than risk adjusting mortality rates ahead of time for such conditions), we estimate a 95 percent confidence band for the non-economic damage cap coefficient becomes [-0.095, 0.024] as compared with [-0.099, 0.022] from Column 3 of Table 4. For the purposes of brevity, we avoid setting forth this full set of findings. However, these results are available upon request from the authors.

Note that the unit of observation in the inpatient mortality rate specification estimated in the text is a given state-year cell. In an alternative approach (not shown), we estimate linear probability models where the unit of observation is an individual discharge within the sample of inpatient admissions associated with the selected conditions (e.g., acute myocardial infarctions, strokes, etc.) and where the dependent variable is an indicator for inpatient mortality (in such models, we include controls for the incidence of the relevant conditions). The results from this alternative approach are (perhaps not surprisingly) nearly identical to those of the state-year specifications estimated in Table 4 in the text.

*Cancer Screening / Damage-Cap Results*. The cancer screening results presented in Table 8 of the text are robust to a number of alternative formulations of the relevant cancer screening measures, including alternative formulations of the age restrictions (e.g., those 40 – 75 years old in the case of proctoscopic examination, instead of 50 – 75) and alternative framing of the frequency of the screening—that is, using all of the frequency formulations provided by the BRFSS (e.g., annual, every 2 years, every 5 years, etc.). In the interests of brevity, we do not present the full extent of these alternative formulations, though they are available upon request from the authors. We do, however, present in the following table results (analogous to those from Table 8 in the text) using the incidence of ever having had the relevant screening test as the operable dependent variable.

Table C5. Relationship between Remedy-Centric Tort Reforms and Cancer Screening Rates. Alternative Formulation:

Incidence of Ever Having the Indicated Screening

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | *(1)* | *(2)* | *(3)* | *(4)* | *(5)* | *(6)* |
|  |  |  |  |  |  |  |
|  | Mammo-gram | Physical Breast Exam | Procto-scopic Exam | PSA Testing | Digital Rectal Exam | Pap Smear |
|  |  |  |  |  |  |  |
| Non-Economic Damage Cap | 0.008\* (0.005) | -0.000(0.003) | -0.004(0.007) | -0.004 (0.005) | 0.008 (0.008) | -0.002 (0.002) |
| 95% Confidence Band for Coefficient of Non-Economic Damage Cap Variable | [-0.001, 0.019] | [-0.006,0.006] | [-0.018, 0.010] | [-0.015, 0.007] | [-0.009, 0.025] | [-0.007, 0.002] |
| 95% Confidence Band, scaled by mean screening rate | [-0.001,0.026] | [-0.010,0.010] | [-0.045,0.025] | [-0.028,0.013] | [-0.018,0.050] | [-0.011,0.004] |
| N | 1010415 | 1156433 | 849445 | 252313 | 341102 | 1664055 |
| *Notes*: robust standard errors corrected for within-state correlation in the error term are reported in parentheses. All regressions included state and year fixed effects. *Source*: 1987 – 2008 Behavioral Risk Factor Surveillance System Records.\*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level.\* Significant at the 10 percent level. |
|  |  |  |

Table 8 in the text presents results from the basic difference-in-difference specification without the various control variables included. Table C2 above, which includes a full set of leads and lags of the damage-cap variable, presents results from specifications that include a range of covariates (as set forth in Online Appendix B above) along with a set of state-specific linear time trends.

*Randomization Inference*. Following Frakes (2013), we also endeavored to take an alternative route towards estimating the standard errors associated with our estimates. Accordingly, using the sample of observations from our control states, we simulate a set of placebo laws that match the distribution of timing of actual reforms. We then estimate the association between the relevant quality indicator and the placebo laws, replicating this process 5,000 times. We then observe where the actual coefficient from our primary specifications falls in the distribution of coefficients generated through these simulations. Due to time limitations on our use with the data at the NCHS’s Research Data Center, we have only performed this exercise on the liability standards analysis for the inpatient mortality rate for selected medical conditions. In the text, we demonstrate that such mortality rates fall by 7.6 percent—representing an improvement in quality—upon a national standard adoption in those treatments states that begin the sample with above-average inpatient mortality rates—i.e., in those states with initially lower-than-average quality. While we find that this estimate is statistically significant at the 5 percent level in the main text, we find that this estimate is only significant at the 10 percent level through this randomization inference approach (the estimated -7.6 coefficient falls within the bottom 4.5th percentile of this simulated distribution).

*Tort-Law Generally Damage Caps*

Damage-cap adoptions in many states applied to tort cases broadly, not simply those pertaining to medical malpractice. Damage-cap adoptions in other states applied only to medical malpractice situations. General tort-law caps are arguably likely to pose fewer legislative endogeneity concerns. As such, in other specifications, we replicate the damage-cap analysis by codifying caps using only those adoptions that apply to tort laws more broadly, dropping those states from the analysis that adopted caps in malpractice-specific contexts. If anything, the results of this alternative analysis suggest an even more modest decrease in health care quality connected with damage cap adoptions. For instance, in the case of avoidable hospitalization rates, the coefficient of this modified damage-cap variable is -0.03, with a 95 percent confidence interval of [-0.08,0.02]. In the case of inpatient mortality rates for selected medical conditions, the coefficient is -0.04, with a 95 percent confidence interval of [-0.11, 0.04]. The full set of results for this alternative approach are available upon request.

*Cancer Screening Liability Standards Analysis*.

As stated in the text, data is available for cancer screening rates over a period of time in which only 3 states modified their standard of care rules: Delaware, Indiana, and Rhode Island. Moreover, only with respect to mammography and pap testing is data available over the full BRFSS period, facilitating any ability to draw upon the experiences of these three treatment states and to properly test for pre-period trends. A further difficulty comes with the fact that even fewer treatment states are available to test the main hypothesis of interest—i.e., that quality will rise in connection with national standard adoptions among those states that begin the sample period with initially low-levels of quality. With respect to mammography, only Indiana is available as a treatment state by which to test this hypothesis. With respect to pap testing, both Indiana and Rhode Island are available for such purposes. While the results of this exercise are arguably unreliable with such few treatment states, we nonetheless present results estimating the relationship between national standard adoptions and the incidence of mammogram screening and pap testing in those states that began with lower than average screening rates and thus with respect to which national standard adoptions arguably represent a heightening of expectations.[[20]](#footnote-20) In Table C6, we demonstrate how these findings are impacted by (1) the inclusion of the relevant set of covariates discussed in Online Appendix B, (2) the inclusion of state-specific linear time trends and (3) the inclusion of a set of leads and lags of the national standard variable. Note that the analysis below only includes 3 lead periods considering that there are not enough years between the beginning of the sample and Indiana’s essential reform to facilitate the estimation of a 4-year lead period.

The findings weakly demonstrate that when liability standards change so as to arguably require a heightening of standards, cancer screening rates increase. In the case of mammography screening, rates generally increase subsequent to the reform, strongest with a long lag. However, mammography screening also spiked strongly with a 2-year lead creating some concerns that the increase in quality may reflect a trend that pre-dated the reform. Of course, 1-year lead coefficient does not support any such trend. Pap testing likewise suggests an increase in screening rates with a long lag, while also raising a concern of a pre-period trend, with a strong increase in rates occurring in the year prior to the reform. While this may in part be a reflection of an anticipation effect (Malani and Reif 2012), it may also be reflective of some external factor that correlates (perhaps spuriously) with the increase in screening and with the adoption of the liability reform.

Table C6. The Relationship between National-Standard Laws and the Incidence of Cancer Screening

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
|  | Mammogram Screening | Papsmear Screening |
| National Standard Law |  |  |  |  |  |  |
| 3-Year Lead Dummy | - | 0.012\*\* (0.005) | 0.014\*(0.007) | - | 0.038(0.029) | 0.010(0.012) |
| 2-Year Lead Dummy | - | 0.046\*\*\* (0.005) | 0.048\*\*\*(0.006) | - | -0.017(0.014) | -0.014(0.015) |
| 1-Year Lead Dummy | - | -0.020\* (0.011) | -0.000(0.009) | - | 0.029\*(0.015) | 0.023\*(0.012) |
| Contemporaneous Dummy | 0.040\*\*\* (0.006) | .0140944 .0102652 | -0.001(0.009) | 0.045(0.033) | -0.007(0.020) | 0.005(0.027) |
| 1-Year Lag Dummy | - | -0.003 (0.023) | 0.025\*\*(0.12) | - | -0.003(0.013) | 0.013(0.013) |
| 2-Year Lag Dummy | - | 0.019(0.018) | 0.006(0.014) | - | -0.014(0.011) | -0.009(0.012) |
| 3-Year Lag Dummy | - | -0.036\*(0.021) | -0.030(0.023) | - | 0.004(0.020) | -0.002(0.021) |
| 4-Year Lag Dummy | - | 0.030\*\*\*(0.007) | 0.025\*\*(0.012) | - | 0.022\*(0.011) | 0.018(0.014) |
|  N | 631592 | 520955 | 520955 | 1098595 | 912364 | 912364 |
| Control Variables? | NO | YES | YES | NO | YES | YES |
| State-Specific Linear Trends? | NO | NO | YES | NO | NO | YES |
| *Notes*: robust standard errors corrected for within-state correlation in the error term are reported in parentheses. All regressions include state and year fixed effects. The regressions also include a separate dummy variable indicating whether the state has an initially below-average cancer screen rate (coefficient omitted). Cancer screening data is from the BRFSS.\*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level.\* Significant at the 10 percent level. |

**Additional References**

Carter, Mary. Variations in Hospitalization Rates among Nursing Home Residents: The Role of Discretionary Hospitalizations. Health Services Research 38, 1177-1206.

Cohen, Thomas. 2005. Punitive Damage Awards in Large Counties, 2001. Bureau of Justice Statistics Selected Findings.

Dafny, Leemore, and Jonathan Gruber. 2005. Public Insurance and Child Hospitalizations: Access and Efficiency Effects. Journal of Public Economics 89, 109-29.

Localio, A. Russell, Ann Lawthers, Troyen Brennan, Nan Laird, Liesi Hebert, Lynn Peterson, Joseph Newhouse, Paul Weiler, and Howard Hiatt. 1991. Relation between malpractice claims and adverse events due to negligence: results of the Harvard Medical Practice Study III. New England Journal of Medicine 325, 245-51.

Malani, Anup, and Julian Reif. Accounting for Anticipation Effects: An Application to Medical Malpractice Tort Reform. NBER Working Paper No. 16593.

Peters, Phillip. 2008. Resuscitating Hospital Enterprise Liability. 73 Missouri Law Review 369, 369-97.

Studdert, David M., Michelle M. Mello, Atul A. Gawande, Tejal K. Ghandi, Allen Kachalia, Catherine Yoon, Ann Louise Puopolo and Troyen A. Brennan. 2006. Claims, Errors, and Compensation Payments in Medical Malpractice Litigation. New England Journal of Medicine 354, 2024-2033.

Weissman, Joel S., Constantine Gatsonis, and Arnold Epstein. 1992. Rates of Avoidable Hospitalization by Insurance Status in Massachusetts and Maryland. JAMA 268, 2388-2394.

Zeiler, Kathryn, Charles Silver, Bernard Black, David Hyman, and William Sage. 2007. Physicians' Insurance Limits and Malpractice Payments: Evidence from Texas Closed Claims, 1990-2003. Journal of Legal Studies 36, S9-S45.

1. In some instances, this knowledge may come through word-of-mouth among physicians following the outcomes of relevant malpractice proceedings or it may come through communications with their insurance providers. However, it is unclear whether this information comes at a level fine enough to influence clinical decisions. [↑](#footnote-ref-1)
2. When negligently harmed patients do file claims, the evidence suggests that the expected damage awards are considerable (Studdert et al. 2006). Of course, compensatory awards are generally not scaled upwards to account for the low percentage of claiming by those harmed by negligence. [↑](#footnote-ref-2)
3. Noise in this targeting process may stem from the nature of the litigation process itself. The operable standards of care in a given malpractice action are generally determined by a jury following the presentation of relevant testimony by litigant-selected expert witnesses. The case-by-case outcomes resulting from this “battle of the experts” may be relatively noisy in practice. In the face of an indeterminate and uncertain standard-setting process, physicians may be left with little guidance as to how to coordinate their prospective clinical behaviors in order to comply with the law. [↑](#footnote-ref-3)
4. Studdert et al. (2006) report this figure in surveying these earlier studies. Studdert et al. contend that these early studies suffered from various limitations, including a reliance upon the insurer’s assessment of claim validity. In their own investigation into this question, Studdert et al. instead rely upon the assessment of independent experts, who were assigned to review the medical records associated with 1452 closed malpractice claims. [↑](#footnote-ref-4)
5. Subject to certain exceptions, payments made on behalf of physicians to settle claims or to satisfy judgments must, under federal law, be registered in the National Practitioner Data Bank (NPDB), an electronic repository which is made available to hospitals and certain other health care entities. The NPDB was established by the Health Care Quality Improvement Act of 1986, as amended (42 U.S.C. 11101 et seq.). This repository may reinforce any reputational consequences of malpractice liability. [↑](#footnote-ref-5)
6. For a general discussion of these matters and of the potentially greater role for systems-based initiatives, see Peters (2008). [↑](#footnote-ref-6)
7. See http://www.qualityindicators.ahrq.gov/Downloads/Modules/PQI/PQI%20Summary%20Report.pdf. [↑](#footnote-ref-7)
8. Those conditions represented in the Weissman et al. (1992) classification include: ruptured appendix, asthma, cellulitis, congestive heart failure, diabetes, gangrene, hypokalemia, immunizable conditions, malignant hypertension, pneumonia, pyelonephritis, and perforated or bleeding ulcer. [↑](#footnote-ref-8)
9. The NHDS weights are not designed to generate representative state-specific estimates. Of course, observing within-state changes over time in the set of records included in the state-year cells nonetheless affords the ability to identify the intended relationships (Dafny and Gruber 2005). In any event, though noisier, the results of this exercise generally persist under alternative approaches that either (1) multiply observations by the NHDS sample weights and form AH rates by dividing weighted AH counts by the total population of that state (yet another normalization approach), or (2) forming dependent variables based on the natural log of the state-year AH counts (i.e., under no normalization at all). The primary approaches taken, however, soften some of the sampling variability that occurs within states over time, while normalizing by a measure that is more directly reflective of the scale of the hospital sampled. [↑](#footnote-ref-9)
10. See Frakes (2013) for empirical support over the contention that the incidences of these low-variation conditions are not sensitive to medical liability standards. Note that higher quality outpatient care may be effective at reducing some amount of hospitalizations for the above-indicated low-variation conditions, though likely to an extent less than quality care may reduce the incidence of the Weissman et al. (1992) avoidable conditions, in which case the proposed avoidable hospitalization rate nonetheless identifies a relative quality measure. [↑](#footnote-ref-10)
11. For a discussion of the selection of low-discretionary hospitalization categories, see Carter (2003). [↑](#footnote-ref-11)
12. For evidence of this claim, see Cohen (2005) and Hyman et al. (2009). [↑](#footnote-ref-12)
13. The results presented below for the damage caps and collateral source rule reform coefficients are entirely robust to inclusion of a richer set of controls for each of the individual components of Kessler and McClellan's indirect reform category. [↑](#footnote-ref-13)
14. Age-sex categories for the inpatient mortality and AH specifications are as follows: male under 30, female under 30, male 30-45, female 30-45, male 45-55, female 45-55, male 55-65, female 55-65, male 65-75, female 65-75, male over 75 and female over 75. Age-sex categories for the obstetric specifications are as follows: 15-19, 20-24, 25-29, 30-34, 35-39 and 40+ years old. [↑](#footnote-ref-14)
15. We form the incidences of the relevant demographic variables using the NHDS sample itself, though the results are entirely robust to alternative state-year controls based off of the Census data. Following Frakes (2013), in the AH rate and mortality rate specifications, we form the relevant incidences using the sample of discharges in which patients present themselves for acute myocardial infarction, stroke, gastro-intestinal bleeding or hip fracture. This subsample consists of patients that will almost universally seek hospitalization upon the occurrence of the event, in which case the sample itself is generally not sensitive to the prevailing legal environment. In any event, the results of this exercise are also robust to the formation of the demographic covariates using the entire sample of state-year NHDS discharges. In the obstetrics specifications, we form all relevant incidences using the subsample of discharges associated with deliveries. [↑](#footnote-ref-15)
16. HMO penetration rates are from Interstudy Publications. Household income data is from the decennial Census files and the American Community Surveys. Data on physician population counts are from the American Medical Association (AMA) administrative records and were obtained from the Area Resource File. [↑](#footnote-ref-16)
17. Fertility rates are calculated according to Gruber and Owings (1996) as the number of births per population and come from the Vital Statistics Natality files (also obtained via the ARF). [↑](#footnote-ref-17)
18. Average hospital bed data was likewise obtained from the ARF. [↑](#footnote-ref-18)
19. In the below figures, time is set such that year “1” in the graph represents the time in which the national standard reform is adopted. We do this (rather than setting it at year “0”) so that any decline in the indicator (representing an improvement in quality) observed over the first year will manifest itself as a downward slope between year 0 and year 1 in the graph, rather than year -1 and 0 if we were to set the year of reform at year 0, providing the misleading impression that the decline in the indicator emerged prior to the reform. [↑](#footnote-ref-19)
20. We focus here on estimating the impact of heightened liability standards as opposed to diminished standards. Estimation of this latter type of variation in the law is also compromised by such few treatment groups. Nonetheless, results of this alternative exercise are available upon request. If anything, the results actually suggest that screening rates also increase slightly upon national standard adoptions in those 1-2 states that adopt such reforms when they arguably entail a slackening of standards. [↑](#footnote-ref-20)