WHY ARE FEWER HOSPITALS IN THE DELIVERY BUSINESS?

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Executive Summary

A steady decline in the number of hospitals and a significant drop in the fraction of hospitals providing obstetric services led to reduced availability of hospital-based obstetric services in rural communities from the mid-1980s to the early 2000s. As a result, 44 percent of non-metropolitan counties lacked hospital-based obstetric services in 2002, compared with 24 percent in 1985. Women of childbearing age living in the most rural counties -- those counties where there was no residential 'place' with a population of 2,500 or more per square mile -- were disproportionately affected. In the mid-1980s, residents in about half of these counties had access to obstetric services in a local hospital; by the early 2000s, only about one-fifth of the most rural counties had at least one hospital providing obstetric services.

While a variety of demand- and supply-side factors have contributed to the decline of hospital-based obstetric services in rural counties, health-care providers often identify medical malpractice pressure as an important factor influencing decisions about whether to provide certain high-risk services. Three waves of rapidly increasing malpractice premiums over the past 30 years and a perceived lack of availability of affordable malpractice insurance in many communities have attracted public attention. In response, many state legislatures have enacted tort reforms covering numerous aspects of medical malpractice litigation. This study examines the impact of five types of direct medical malpractice reforms -- caps on total damages, non-economic damages and punitive damages, the mandatory offset of collateral source rule[1], and the periodic payment arrangements -- on the availability of hospital-based obstetric services in rural counties.

We measure access to care by examining whether residents of rural communities are able to obtain obstetrics services in at least one hospital in their home county. Counties are relatively arbitrary geographic units, so whether a county has hospital-based obstetric services may not be the best measure of access for some rural communities. It is not necessary or feasible for every county to have at least one hospital that provides obstetric services. However this measure provides a proxy for proximity to hospital-based obstetrics

[1] The mandatory offset rule requires a plaintiff's damage award to be offset by compensations from collateral sources such as the plaintiff's own insurance coverage.

care. An important advantage of this measure is that it can be examined over time, on a nationwide basis, with available data.

Data for this analysis were extracted from multiple sources, including the Area Resource File from the Health Resources and Services Administration (HRSA), the Census Bureau, the Bureau of Economic Analysis, and the natality data files from the National Center for Health Statistics (NCHS). Our study years included 1985, 1990, 1995 and 2000. We used multivariate analysis techniques to control for differences in counties' socioeconomic characteristics and time trends, and found limited evidence on the influence of direct tort reforms on the presence of county hospital-based obstetric services. All of the reforms studied except periodic payment arrangements appear to be positively associated with access to hospital-based obstetric services in rural communities. However, due to limitations in the data and/or the economic model we employed, the estimates of the effects of tort reforms lack sufficient precision for us to draw firm conclusions.

Our multivariate analysis confirms the observation that rural counties were much less likely to have at least one hospital that provided obstetric services during our study years. The fraction of hospitals owned by the government, the size of the county population and the proportion of county residents who were eligible for Medicare were all found to be positively associated with a higher probability that a county had hospital-based obstetric services. The size of a county's population and the proportion of county residents eligible for Medicare might affect the availability of hospital-based obstetric services by increasing the likelihood that a county has at least one hospital due to a higher demand for medical services in general and more stable reimbursements for services rendered to Medicare enrollees. Given that a hospital is present in a county, the provision of obstetric services in this county is more likely because of economies of scope within the hospital.

In order to capture local perceptions of the impact of the loss of hospital-based obstetric services and provide policy-makers with more detailed and direct information on reasons why hospitals closed their obstetric units, we conducted informal discussions with hospitals that closed their obstetric units in recent years. We contacted hospital administrators and/or directors of nursing from 40 hospitals by phone and obtained complete responses from 28 facilities. The most frequently cited reasons for closing obstetric units were low volume of deliveries in the community, financial vulnerability due to a high proportion of patients on Medicaid, and difficulty in staffing an obstetric unit.

Reasons for difficulty in staffing an obstetric unit included malpractice burdens for OB/GYNs and family practitioners, changes in physicians' attitude toward work, family, and leisure, and the difficulty and costs involved in recruiting supporting specialists such as anesthesiologists and surgeons.

To assess the impact of the closure of hospital obstetric units on local communities, we asked hospital administrators or directors of nursing the approximate distance and travel time between their hospitals and hospitals where most local residents went to deliver babies. More than 60 percent of hospitals that closed their obstetric units are within 30 miles of and a 30-minute drive to another hospital that provided at least basic obstetric services. However, women at high risk for complications during labor and delivery may have had to travel longer distances to obtain specialized care.

Our discussions with hospitals and the econometric analysis suggest a number of possible policy responses that could either help to improve access to hospital-based obstetric services in rural communities or mitigate the adverse consequences of lack of access. While not having access to obstetric services in a local hospital is inconvenient to pregnant women and could even lead to adverse birth outcomes for high-risk patients[2], it is certainly not cost-effective for all counties to have at least one hospital that provides obstetric services. Some hospital administrators suggest that it may be more important to promote the provision of prenatal care in rural communities without access to hospital-based obstetric services. Making prenatal care available locally and sending patients to hospitals that are outside the county, but within reasonable travel distance for delivery-related services, may be the most cost-effective way of organizing the delivery of obstetric services for many rural counties. The feasibility of relying more heavily on registered nurses and physician assistants for obstetric services in medically under-served areas should also be explored. Meanwhile, arranging for outside physicians to visit the county and provide prenatal care on a regular basis may be an effective coping strategy for dealing with physician shortages in rural areas.

Statistics show that women of childbearing age who live in counties with no hospital-based obstetric services are served by half as many OB/GYNs and/or family practitioners as their counterparts who live in counties with hospital-based obstetric services. Publicly-funded incentive mechanisms such as financial assistance for medical training in return for committed services in rural communities are important in order to encourage physicians to

[2] The issue of access to OB services for high risk women is beyond the scope of this study.

practice in certain areas. Measures may be needed to relieve family practitioners of medical malpractice burdens as most rural communities rely on these physicians for obstetric services. Even though there was limited evidence from our multivariate analysis that the mandatory offset of collateral source rule and caps on total or non-economic damages increased the likelihood that a county had hospital-based obstetric service, we cannot draw firm conclusions about the effectiveness of tort reforms due to lack of sufficient precision in our estimates. Further research is needed on the effectiveness of alternative measures that are designed to improve the availability of malpractice insurance and curb premium spikes. For example, no-fault systems such as the ones implemented in Virginia and Florida concerning brain damages during births may be more efficient than tort reforms in compensating the injured while keeping malpractice litigation pressures in check.

Low Medicaid reimbursement for obstetric services could be financially detrimental for hospitals that serve a high proportion of Medicaid patients. Under the current environment in which reductions in Medicaid spending are expected in many states, rural hospitals may find it even more difficult to remain financially viable if Medicaid patients constitute a high proportion of their patient pools. Some hospital administrators in states that had not adopted cost-based reimbursement policies for Medicaid obstetric services, similar to that used for reimbursement for Medicaid services rendered to patients in critical access hospitals, argued that their states should adopt such policies. Further research is certainly warranted. Responses to our informal discussions also raised a question about the impact of the Emergency Medical Treatment and Labor Act of 2003 (EMTALA) on the availability of hospital-based obstetric services in rural areas. Some hospital administrators appear to have misinterpreted EMTALA as requiring that a hospital's OB unit be staffed with on-call physicians at all times. These administrators attribute their inability of maintaining an OB unit to the enforcement of EMTALA. However, as the CMS final rule clearly states that EMTALA does not require a hospital's emergency departments be operated continuously[3], it is more likely that other factors such as the 24/7 duty intrinsic to OB services and the desire of OB/GYNs and family practitioners to maintain a more family-friendly balance between work and family/leisure are at work.

[3] Centers for Medicare and Medicaid Services, HHS, *Clarifying Policies Related to the Responsibilities of Medicare Participating Hospitals Treating Individuals with Emergency Medical Condition,* http://www.cms.hhs.gov/providers/emtala/cms-1063f.pdf.

Introduction

From the mid-1980s to the year 2000, there was a steady decline in the total number of hospitals[4] in the United States. Even though this trend appears to have leveled-off in the early 2000s, there were still significantly fewer hospitals in the country in 2002 than in 1985 (6,013 vs. 7,102, or 18 percent fewer). One consequence of the decline in the number of hospitals is that over time, an increasing fraction of counties lost the provision of medical care by a local hospital. In the early 2000s, almost one-fifth of counties lacked a single hospital, up from 16% in 1985. Moreover, hospitals that stayed in operation had on average fewer beds. The average number of beds per hospital fell steadily from 200 in 1985 to 166 in 2000, a 17 percent drop over fifteen years. The decline in the number of hospitals and the number of beds per hospital nationwide has been accompanied by even more pronounced declines in certain types of health services provided by hospitals. From 1985 to 2000, the number of hospitals that provided obstetric services dropped by 23 percent. As a result, more than one-third of counties in the US lacked hospital-based obstetric services in 2000, significantly more than the one-fifth of counties without hospital-based obstetric services in 1985.

Health researchers, federal and state policy-makers, and local health officials are concerned that the combined effect of fewer hospitals and changing patterns of practice may have led to a critical lack of access to certain types of health services in some geographic regions. They are particularly concerned that women in rural communities may have inadequate access to obstetrics services. Since 99 percent of babies are delivered in hospitals and some obstetric procedures treating complicated maternity and newborn cases can only be carried out in a hospital setting[5], lack of access to hospital-based obstetric services could have serious implications for the health outcomes of newborns and their mothers.[6] This study first documents changes in the number of hospitals providing obstetric services and examines the availability of hospital-based obstetric care at the county level between 1985

[4] In this study, hospitals refer to those registered by the American Hospital Association (AHA). AHA has a set of criteria (such as a minimum of 6 beds, cribs or bassinets continually available for patient care, see http://www.aha.org/aha/resource_center/content/registration%20requirements%20for%20hospitals.pdf for details) for registration as a hospital facility. Registered hospitals include AHA member hospitals as well as nonmember hospitals.

[5] The issue of access to OB services for high risk women is beyond the scope of this study.

[6] Access problems usually lead to longer travel time, greater travel distances and delivery in hospitals without OB services.

and 2002.[7] In particular, it compares the availability of hospital-based obstetric services in rural areas with that in non-rural areas to determine whether access to obstetric services in rural communities was disproportionately affected by the nationwide trend.[8] It then investigates factors that may affect the likelihood that a rural county has at least one hospital providing obstetric services. Finally, it reports findings from informal discussions with hospitals which had closed their obstetric units between 1995 and 2002 concerning reasons and perceived impact of the closure on local communities.

We measure access to care by examining whether residents of rural communities are able to obtain obstetrics services in at least one hospital in their home county. Counties are relatively arbitrary geographic units, so whether a county has hospital-based obstetric services may not be the most relevant measure of access for some rural communities. It is not necessary or feasible for every county to have at least one hospital that provides obstetric services. However, this measure is a useful proxy for proximity to hospital-based obstetrics care. An important strength of this measure is that it can be examined over time, on a nationwide basis, with available data.

I. Decline in the availability of hospital-based obstetric services

A. Data

The main source of data underlying the analysis in this section is the survey databases from the American Hospital Association (AHA). The AHA has been conducting a survey of hospitals annually since 1946. The surveys are a census of all registered hospitals and are regarded as the most comprehensive source of data available on individual hospitals. We obtained AHA survey databases for each year from 1985 to 1995 and from 2000 to 2002.

Using supplemental information in the documentation of the AHA annual survey databases as well as information from state hospital associations, we compiled a separate

[7] Counties are relatively arbitrary geographic units, so whether or not a county has hospital-based obstetric services may not be the accurate measure of access to care. It is not necessary or feasible for every county to have at least one hospital that provides obstetric services. However, due to data constraints, we use the availability of hospital-based obstetric services at the county level as an approximate measure for access to obstetric care.

[8] Due to lack of county-level data for most variables used in this study, Alaska is excluded from all analyses. US outlying and associated areas are also excluded because data are not available for them for the early years of the time series this study examines. Independent cities are grouped with their original counties because we expect that economic behaviors in independent cities would not only be similar to but also integrated in their original counties to a large extent.

database containing detailed information on hospital closures, mergers and acquisitions, de novo hospital openings, de-mergers, and conversions between hospitals and other types of institutional health care providers from 1984 to 2000. This database provides a record of the dynamics of the hospital sector between the mid-1980s and 2000.

B. The Decline in the Number of Hospitals that Provided Obstetric Services

A hospital is defined as providing obstetric services if the hospital had at least one obstetric bed or one pediatric bassinet, or delivered more than 15 babies in a given year.[9] To identify rural counties, we used the 1995 Rural-Urban Continuum Codes for Metro and Non-metro Counties developed by the Department of Agriculture,[10] which is available in the Area Resource Files (ARF).[11] A county is defined as rural if it was a non-metropolitan county.[12] Furthermore, we examined separately 'remote' counties, i.e., counties that did not have a place within the county with a population of 2,500 or more per square mile in 1990, whether or not the county is adjacent to a metropolitan area.

Access to hospital-based obstetric services is affected by the availability of hospitals in a community as well as the provision of obstetric services by hospitals in the community. Figure 1 documents the decline in the number of hospitals as well as the decline in the number of hospitals that provided obstetric services in rural counties over time.[13] The number of hospitals and the number of hospitals that provided obstetric services both saw a steady and noticeable decline from 1985 to 2002. However, the decline in the number of hospitals that provided obstetric services (33 percent) more than doubled the loss of

[9] The 15 births a year threshold is to account for instances where a hospital does not provide obstetric services but expecting mothers had nowhere else to go other than the local hospital and their babies were delivered in the hospital's emergency department.

[10] The rural/urban continuum codes were first designed in 1975 based on the 1970 census. The codes were later updated after the 1980 and the 1990 census using the original coding scheme with somewhat more restrictive procedures for determining metro adjacency. In 2003, major changes were incorporated in the coding scheme, making the 2003 rural/urban continuum codes noticeably different from earlier versions. Since our study focuses on the period between 1985 and 2002, we use the 1995 version of the rural/urban continuum codes throughout the study.

[11] The ARF is a secondary data source published by the Bureau of Health Professions every year. The ARF contains about 6,000 county-year variables on health professions, health facilities, measures of resource scarcity and health status compiled from various primary sources such as the AMA physician master file, the population census, and the mortality and natality data extracted by the National Center for Health Statistics from death and birth certificates.

[12] Metropolitan counties have an urban/rural continuum code ranging from 4 to 9.

[13] Since long-term hospitals and specialty hospitals other than Obstetrics/Gynecology hospitals are irrelevant to the provision of obstetric services, we only include short-term general and short-term Obstetrics/Gynecology hospitals here.

hospitals (16 percent) during the 18-year period. The difference is even more drastic among the remote counties (see Figure 2). Compared with 1985, there were 17 percent fewer hospitals in remote areas than in 2000, and the downward trends slowed down in 2001 and 2002. In contrast, there were 56 percent fewer hospitals that provided obstetric services in 2000 than in 1985, and the number kept declining in 2001 and 2002. Underlying the diverging rates of decline between the number of hospitals and the number of hospitals that provided obstetric services is a significant drop in the fraction of hospitals that provided obstetric services. In 1985, over 87 percent of hospitals in remote areas provided obstetric services. Seventeen years later, less than half of existing hospitals offered obstetric services to their communities.

Over the same period of time, the number of hospitals reduced at a comparable rate in non-rural areas as in rural areas -- between 1985 and 2002, the total number of hospitals (both with and without obstetric facilities) fell by 21 percent in metropolitan counties (see Figure 3). However, the fraction of hospitals that provided obstetric services experienced opposite trends. In metropolitan counties, 11 percent more hospitals operating in 2002 provided obstetric services than those operating in 1985. In contrast, the fraction of all rural hospitals that provided obstetric services shrank by 20 percent while in completely rural areas, the decline was as high as 52 percent from the mid-1980s to the early 2000s.

C. Lack of Hospital-based Obstetric Services at the County Level

Declines in the number of hospitals and the proportion of hospitals providing obstetric services have resulted in a significant fall in the number of counties with hospital-based obstetric care. As shown in Figure 4, there was an upward trend in the percentage of counties with no hospital-provided obstetric services over the past two decades for both rural and non-rural counties. Moreover, rural counties were disproportionately affected. From 1985 to 2002, the cumulative increase in the fraction of counties that lacked hospital-based obstetric services was 81 percent in rural areas, compared with a 49 percent drop in non-rural areas. As a result, rural residents, especially those in remote areas, were far less likely to have access to obstetric care in a local hospital. In the mid-1980s, residents in about half of remote counties had access to obstetric services in a local hospital; in the early 2000s only about one-fifth of these counties had at least one hospital providing obstetric services.

In contrast, women of childbearing age living in most non-rural counties, 89 percent in 1985 and 82 percent in 2002, had access to obstetric care provided by a local hospital.

II. Factors associated with whether or not a county has hospital-based obstetric services

Medical malpractice pressure has periodically attracted public attention in the past three decades due to three waves of rapidly increasing malpractice premiums and health care providers' corresponding behavioral changes. While a variety of factors on both the demand- and supply-side could have contributed to the lack of hospital-based obstetric services in a county, health care providers often identify medical malpractice pressure as an important determinant in their decision making concerning whether or not to provide certain types of services to patients in certain geographic regions who are considered high-risk for malpractice lawsuits. In this section, we examine empirical evidence on the association between medical malpractice pressure and the likelihood that a county has hospital-based obstetric services through multivariate analyses conducted with a panel data set, controlling for a range of covariates such as county socioeconomic characteristics and time trends in the provision of obstetric services by hospitals at the county level. Rural counties are studied separately as well as combined with non-rural counties.

A. Medical Malpractice Environment

Rapid rate hikes and shortages of malpractice insurance providers occurred first in the mid-1970s, were repeated in the mid-1980s and have again surfaced in the late 1990s and the early 2000s. The average premiums for all physicians nationwide rose by 15 percent between 2000 and 2002, almost twice as fast as total health care spending per person during the same period.[14] Moreover, changes in malpractice insurance premiums differ by specialty and geographic locations, leading to rate increases for some specialties in particular areas that were substantially higher than the national average. From July 1999 to July 2002, internists saw a 62.25 percent increase in their medical malpractice premiums, general surgeons saw a 58.13 percent increase and obstetricians/gynecologists (OB/GYNs) saw a 46.5 percent

[14] The Congressional Budget Office, *Limiting Tort Liability for Medical Malpractice*, [2004], http://www.cbo.gov/showdoc.cfm?index=4968&sequence=0.

increase.[15] Institutional health care providers have also experienced marked malpractice insurance premium increases. Almost half of the hospitals responding to a survey in early 2003 reported that their medical malpractice premiums had doubled or more than doubled over the previous two years and another 21.4 percent claimed a rate increase of between 50 and 99 percent during the same period of time.[16] The average medical liability insurance premiums paid by nursing homes rose by 131, 143 and 51 percent in 2001, 2002 and 2003, respectively.[17]

Accompanying premium hikes in the medical malpractice insurance market is reduced availability of affordable malpractice insurance, caused by some of the major providers withdrawing from the market. In late 2001, St. Paul Companies, then the second-largest medical malpractice carrier in the country insuring about 750 hospitals and 42,000 physicians in 45 states,[18] announced that it would phase out of the market over a two-year period as its existing insurance contracts expired. Other providers followed suit. As a result, the number of insurance carriers in some states has decreased substantially in recent years. For example, the number of active professional liability providers in Florida declined by more than 80 percent, from 66 to 12, between the late 1990s and 2002. In Missouri, more than 30 insurance companies were licensed to write medical liability insurance in 2001. Today, only 3 are willing or able to write new business. In Arkansas, there were 88 companies underwriting medical liability in 1996, and only 9 of them remained in 2003, of which only 4 were writing new policies.

In response to rate hikes and the difficulty in finding affordable insurance, there are many popular press accounts of providers' behavioral responses including re-location to a different region where malpractice insurance was easier and cheaper to obtain, early retirement, newly-imposed limits on the type or scope of procedures performed, restriction of services to 'low-risk' populations, or closing down of practices. A 2002 survey of OB/GYNs by the American College of Obstetricians and Gynecologists (ACOG) reported

[15] Percentage changes calculated from data published by Medical Liability Monitor cited in the ASPE 2003 study. ASPE, *Addressing the Health Care Crisis: Reforming the Medical Litigation System to Improve the Quality of Health Care* (Washington, DC: Department of Health and Human Services, [2003]).
[16] American Hospital Association, *Professional Liability Insurance: A Growing Crisis: Results of the AHA Survey of Hospitals on Professional Liability Experience,* [2003].
[17] Theresa W. Bourdon and Sharon C. Dubin, *Long Term Care General Liability and Professional Liability 2004 Actuarial Analysis* (Washington DC: The American Health Care Association, [2004]).
[18] AHA Trend Watch, *June 2002, Vol. 4, No. 3.*

that 76 percent of respondents in 9 states under heightened liability pressure had been forced to retire, relocate, or modify their practice (e.g. decrease surgical procedures, stop obstetrics, and/or decrease the amount of high-risk obstetric care). These behavioral changes, often referred to as negative defensive medicine, as they are induced by liability pressure, may lead to reduced access to care, particularly for people with high-risk medical conditions and those who are perceived as litigious by the medical professionals.

Health care providers and insurance companies attribute rapid premium increases and the contracting supply of malpractice insurance to the size of jury awards or out-of-court settlements for medical malpractice claims. In response, they have called for tort reforms in hopes that these reforms would reduce the frequency of malpractice claims and curb the increase in malpractice verdicts or settlements in general. They argue that lower malpractice awards resulting from tort reforms would translate into lower insurance premiums and thus ameliorate the liability pressure perceived by health care providers, which would then encourage the provision of health services. However, it is not clear if tort reforms do indeed mitigate the practice of negative defensive medicine and improve access to care.

After an extensive search in publications in paper form or on the internet by government agencies, state legislatures, trade associations and law firms, we compiled a comprehensive database on various types of state tort reforms enacted between 1975 and 2002. Tort reforms in the past three decades are widespread across states and cover a multitude of aspects of medical malpractice. This study will focus on five types of reforms -- caps on total damages, caps on non-economic damages, caps on punitive damages, the mandatory offset of collateral source rule, and periodic payment arrangements -- as they arguably have a more direct and significant impact on the size of medical malpractice awards than other types of reforms.

Medical malpractice damages, the money award that the judgment of a court requires the defendant in a malpractice lawsuit to pay to the plaintiff as compensation for the loss or injury inflicted due to negligence by the plaintiff can be classified as either compensatory or punitive. Compensatory damages are damages awarded according to the amount of actual harm suffered by the plaintiff and are awarded before punitive damages are considered.[19]

[19] Definition by the Legal Information Institute and can be found at http://www.law.cornell.edu/lexicon/compensatory_damages.htm.

Punitive damages are considered punishment and are awarded when the defendant's behavior is found to be especially harmful, but are normally not awarded in the context of a breach of contract claim. Punitive damages are awarded in addition to actual damages in certain circumstances.[20] Compensatory damages can be further divided into economic damages and non-economic damages. Economic damages are relatively well defined and include the costs of future medical treatment and lost wage and salary arising from the injury. In contrast, non-economic damages intended to compensate plaintiffs for harms such as pain and suffering, emotional distress, and loss of consortium or companionship, are often hard to quantify.

The offset of collateral source rule requires a plaintiff's jury award to be offset by monetary compensation from other sources (called collateral sources) such as payments from the plaintiff's life insurance or health insurance providers. The main normative argument for the offset of collateral source rule is that plaintiffs should not be compensated for their injuries more than once. Those who argue against the reform point out that negligent doctors should not benefit from a plaintiff's choice to protect him or herself against risks by enrolling in a life insurance and/or a health insurance plan. Moreover, such protection involves costs such as insurance premiums. To address concerns from both sides, some states have adopted the offset of collateral source rule but only require that the net compensation from collateral sources (i.e., the total compensation minus the costs the plaintiff incurred in order to receive the compensation) be deducted from jury awards.

The periodic payment arrangement allows part or all of future damages to be disbursed in the form of an annuity that pays out over time. Some states even relieve the defendants of the remaining damages that represent compensation for future pain and suffering and medical expenses when the plaintiff dies. Since a noticeable proportion of medical malpractice claims are awarded or settled with a substantial amount of money, not having to pay the total award in a lump sum could not only make the financial burden more manageable but may also mitigate emotional stress for the defendants at the time of the verdict or settlement.

Figure 5 shows the frequency of states adopting these five types of tort reforms since the mid-1970s. There are clearly three distinct clusters of reforms between 1975 and 2002.

[20] Definition by the Legal Information Institute and can be found at: http://www.law.cornell.edu/lexicon/punitive_damages.htm

The first wave occurred between 1975 and 1977 and was led by California's Medical Injury Compensation Reform Act (MICRA) legislation enacted in 1975. This wave of reform can be ascribed to the availability and affordability problems in malpractice insurance during the same period. During the three-year period, 10 states established a cap on total damages and 5 established a cap on non-economic damages; 11 states mandated the offset of net compensation from collateral sources; and 5 states allowed periodic payment of future damages. The second major wave of tort reforms spanned from 1984 to 1990 and was once again a response to rapidly rising medical malpractice insurance premiums and a reduction in malpractice insurance providers. A flurry of tort reforms went into effect in these years, especially in 1986 when as many as 14 states instituted caps on non-economic damages and 4 states instituted caps on punitive damages. In addition, 10 states gave defendants the option to make periodic payments of damage awards, and 6 states enacted the mandatory offset of collateral source rule. In 1992 and 1993, there again emerged signs of another medical malpractice insurance crisis, as health care providers complained about remarkable increases in insurance premiums. Fortunately, this mini-crisis did not develop into a full-blown national phenomenon as it had in the mid-1970s and the mid-1980s. Accordingly, it triggered the third wave of tort reforms albeit on a much smaller scale, and with a longer delay than in the past. In 1995, 8 states initiated some form of direct reforms, most in the form of caps on non-economic and punitive damages.

B. Multivariate Analysis of the Likelihood that a County Has Hospital-based Obstetric Services

While the liability environment in which a hospital operates may affect its decision on whether or not to provide obstetric services, other factors such as a county's socioeconomic characteristics may also play a role. To study the associations between various factors and the likelihood that a county has at least one hospital that provides obstetric services, a multivariate analysis is needed so that the confounding effects from different factors could be controlled for.

Data for the multivariate analysis were extracted from multiple sources, including the Area Resource File, the Census Bureau, the Bureau of Economic Analysis and the natality data files from the National Center for Health Statistics (NCHS). We created a county-level panel data set that contains information on whether a county had at least one hospital that provided obstetric services in 1985, 1990, 1995 and 2000, the time-variant socioeconomic

characteristics of the county in these four years and the number of years the county was subject to each of the five types of tort reforms in the five years prior to each of the study years. We do not include tort reforms simply as dummy variables in our regression because it is reasonable to argue that, if tort reforms do encourage hospitals to provide obstetric care, then the longer a reform has been in place, the more likely a hospital subject to the reform is to provide obstetric services. It usually takes time for changes in laws to affect economic agents. Medical malpractice disputes involve multiple parties, including patients, health care providers, lawyers and insurance companies, who all need time to identify the possible consequences of the reforms and make appropriate behavioral adjustments. For example, malpractice insurance premiums, one possible channel for altering physicians' perception of liability pressures, might take years to respond to changes in the legal environment. Even if insurance companies were perfectly forward looking in calculating premiums, they have to take into account the fact that malpractice lawsuits take 7 years to settle on average. More generally, changes in the provision of hospital-based obstetrics services cannot happen overnight. Opening or closing an obstetric unit by a hospital is a strategic decision that requires careful planning and may involve the acquisition of equipment and facility space and the recruitment of OB/GYNs and possibly doctors from other specialties such as anesthesia as well as supporting staff. Furthermore, liability reforms could have long-run effects on hospitals' ability to maintain obstetric facilities by affecting medical students' choice of specialty and thus the supply of OB/GYNs.

We employed a linear probability model to examine how various demand- and supply-side factors as well as tort reforms affect the likelihood that a county has hospital-based obstetric services after controlling for county and year fixed effects.[21] We allowed for

[21] Even though the dependant variable in our analysis is discrete, we choose a linear probability model rather than a logistic model in order to control for county fixed effects. Although fitting a linear probability model to a discrete dependant variable has some inherent weaknesses, such as the possibility of having predicted probabilities falling out of the [0, 1] range, it is commonly argued that a linear probability model produces estimates that are comparable to those from a generalized linear model such as a logistic model. On the other hand, aside from the county socioeconomic characteristics included in our model, there are many time-invariant county characteristics that also affect the probability that a county has hospital-based obstetric services. Yet, these characteristics may not be easily measured or data measuring them may not be available. Controlling for these characteristics with county fixed effects is important for producing unbiased estimates of the reforms variables as it is possible that some of the missing county characteristics could be correlated with both the likelihood that a county is subject to tort reforms and the likelihood the county has hospital-based obstetric services. A simple comparison demonstrates the explanatory power of the missing time-invariant county characteristics captured with county fixed effects. When we estimated the simplest version of Equation (1) by including only the reform variables, the R^2 was 0.018; when we

arbitrary correlations between errors within a state. Results from the multivariate analysis are presented in Appendix A.

The imposition of all direct reforms except that of periodic payment arrangements was found to be associated with an increased likelihood of having hospital-based obstetric services. The magnitude of these effects is relatively modest however. When rural counties are studied alone, tort reforms, especially the offset rule, appear to have a stronger impact on the probability of a county having hospital-based obstetric services. After controlling for confounding factors, a rural county in a state that enforces the offset rule in one of the five most recent years is found to be 0.76 percentage points more likely to have at least one hospital that provides obstetric services than a rural county in a state that does not impose such a rule. The cumulative effect of having the offset rule in place for five consecutive years amounts to a 3.8 percentage point increase in the fraction of rural counties with hospital-based obstetric services. This is equivalent to a 6.6 percent increase over the probability that a rural county had hospital-based obstetric services in 2000. The impact of caps on different components of malpractice claims are similar in rural counties as that in all counties combined. It should be noted that even though we should not readily dismiss the possible effects of the offset rule and caps on total damages and non-economic damages given the size of their estimated coefficients, we can not draw firm conclusions about the effectiveness of these reforms on the likelihood that a county has hospital-based obstetric services. The data and/or the economic model we employed simply lack enough statistical power.

All year dummies have a negative sign and are statistically significant, consistent with the downward time trend documented in Section I across all counties from 1985 to 2000. Moreover, the larger year effects in the regression with rural counties only and the interaction of county rural status with year fixed effects when all counties were studied together both suggest that rural counties had a steeper downward trend than non-rural counties. All else equal, a rural county was about 11 percentage points less likely to have hospital-based obstetric services in 1990 than in 1985. Over the same period the likelihood that a non-rural county had hospital-based obstetric services declined by only 4 percentage

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controlled for county fixed effects in addition to the reform variables, the R^2 increased to 0.831. However, since there are more than 3,000 counties in the US, controlling for county fixed effects in a logistic model is not computationally feasible with the current computing technology available to us.

points. The gap between rural counties and non-rural counties widened over time. In 1995, a rural county was 16 percentage points less likely to have at least one hospital that provided obstetric services than in 1985 while a non-rural county was only 7 percentage points less likely to have obstetric services. In 2000, the difference further increased to 11 percentage points with rural counties being 19 percentage points less likely to have hospital-based obstetric services than in 1985.

Estimated coefficients for socioeconomic characteristics included in the model all have expected signs and some estimates, including those for the share of government-owned hospitals, county population, and the fraction of elderly county residents, are statistically significant. The model predicts that a 10 percentage point increase in hospital ownership by the government (equivalent to about one third of the share of government ownership in 2000) would lead to a 1.1 percentage point increase in the probability of a rural county having hospital-based obstetric services. A rural county with 10,000 more residents than an otherwise identical county would be 8 percentage points more likely to have hospital-based obstetric services available. A 10 percentage point increase in the fraction of elderly residents in a rural county is found to be associated with a 7 percentage point increase in the probability that a county has hospital-based obstetric services. The marginal effect of a larger population on the likelihood that a county has hospital-based obstetric services is almost three times as large in rural counties as in all counties combined. The size of a county's population and the proportion of county residents eligible for Medicare might affect the availability of hospital-based obstetric services by increasing the likelihood that a county has at least one hospital due to a higher demand for medical services in general and more stable reimbursements for services rendered to Medicare enrollees. Given that a hospital is present in a county, the provision of obstetric services in this county is more likely because of economies of scope within the hospital.

III. Reasons and impact of loss of hospital-based obstetric services – findings from informal discussions with hospital administrators

While our county-level quantitative analyses shed light on access to hospital-based obstetric care, it will be helpful to study hospitals as well since decisions concerning whether or not to provide obstetric services are made at the hospital level. In order to capture local perceptions of the impact of the loss of hospital-based obstetric services and provide policy-

makers with more detailed and direct information on reasons why hospitals closed their obstetric units, we conducted informal discussions with hospitals that have closed their obstetric units in recent years. We contacted administrators from 71 hospitals that met the following criteria[22]:

- the hospital ceased offering obstetric services between 1995 and 2002;[23]
- the hospital is still in operation as of August 2005;
- in 2002, no hospital-based obstetric services were available in the county where the hospital is located;
- there were at least 100 births to women living in the county in 2002.[24]

Most of these hospitals are small and are located in non-metropolitan counties. Fifty-six percent of them operate in counties with fewer than 20,000 people and another 30 percent serve populations in remote areas where there is no place[25] with 2,500 or more people.[26] More than one-third of the 71 hospitals had fewer than 25 beds and another 37 percent had no more than 50 beds. Only 1 hospital reported having more than 100 beds in the 2002 AHA annual survey database.

We first randomly selected 40 hospitals and obtained contact information, including phone numbers and email addresses when available, from various sources on the internet. When a hospital rejected the discussion request or could not be reached after three attempts, we substituted it with another candidate from the pool of 71 hospitals. We restricted our substitute hospital pool to only those hospitals in counties where at least 200 babies were delivered to women living in the county. Over-sampling hospitals that operate in counties with higher delivery volumes provides us with the opportunity of finding out reasons

[22] We used rudimentary survey methods to compile a list of hospital administrators to contact. For this reason we refer to these hospitals as 'sampling frame' and our discussants as 'survey respondents' hereafter.

[23] A hospital was considered as providing obstetric services in a year if it reported in the AHA annual survey that it had at least one obstetric bed or one bassinet set up and staffed, or it delivered more than 15 babies in the year. We examine hospitals that ceased providing obstetric services up to 2002 because this is the most recent year for which we have data (the AHA's Annual Survey of Hospitals).

[24] The total number of births by county was extracted from the 2002 Area Resource File and accounts for the period between July 1, 2002 and July 1, 2003.

[25] According to the Census Bureau, a place is an incorporated city, village, borough or a Census designated place.

[26] We used the 1995 rural/urban continuum codes set up by the Department of Agriculture and contained in the 2002 Area Resource File to define a county's rurality status.

beyond 'insufficient demand' for which hospitals discontinued delivering babies. As of late August 2005, we completed discussions with 27 hospitals.

We conducted phone conversations[27] with hospital administrators or directors of nursing,[28] depending on who was available at the time of discussion or who was more knowledgeable about the hospital's operating history. During the conversations, we sought the following information:

1) Why did your hospital close its obstetric unit?
2) How far away from your hospital are the facilities where women living in your county go to deliver babies?
3) How much time does it take to travel by car from your hospital to the facilities where women in your county go to deliver babies?
4) Is your hospital interested in bringing obstetric services back?
5) If your hospital is interested in bringing obstetric services back, what government policies could help you achieve that goal?

A. Reasons that hospitals discontinued providing obstetric services

The most frequently cited responses to the open-ended question on reasons that hospitals ceased providing obstetric services include low volume of delivery, difficulty in staffing an obstetric unit, and financial vulnerability due to high proportions of patients on Medicaid (see Table). Almost half of the responding hospitals reported that the number of deliveries was too low to sustain their obstetric unit prior to its closure. Low volume of delivery makes it hard for doctors and nurses to maintain their skills and thus imposes an increasing liability risk to the hospital. Meanwhile, a small number of deliveries every year may not generate enough revenue to cover the fixed capital and labor costs required to keep an obstetric unit open. Another demand-side factor that has contributed to the discontinuation of obstetric care in some hospitals is a high percentage of Medicaid patients and associated low reimbursement rates for delivery services. About one-fifth of the hospital administrators stated that more than half of the patients seeking obstetric care in their hospital before the hospital closed its obstetric unit were Medicaid patients and their

[27] We sent e-mails with the survey instrument to five hospitals whose email addresses were available on the internet. Only one hospital responded.
[28] In one instance, the Chief Financial Officer responded to our survey.

hospital had incurred significant financial losses in serving these patients due to low Medicaid reimbursement rates.

Difficulty in staffing was another main reason that hospitals closed their obstetric facility. Medical malpractice burdens for OB/GYNs and family practitioners, changes in physicians' attitude toward work and quality of life, and the difficulty and costs involved in recruiting supporting specialists such as anesthesiologists and surgeons all contributed to hospitals' decision to cease providing obstetric services. Forty-four percent of respondents noted that, to their knowledge, high liability insurance costs and the threat of being sued forced doctors to quit delivering babies in their hospitals. Medical malpractice burdens seem to affect the availability of obstetric services in rural areas disproportionately. Obstetric units in rural counties are often staffed by family practitioners who earn significantly less than OB/GYNs on average.[29] However, they are charged liability insurance premiums similar to OB/GYNs if they opt to deliver babies. The higher liability risk associated with a low volume of deliveries in rural areas could result in even higher insurance costs for these physicians. According to the respondents, liability costs often comprise such a high share of operating costs that it becomes financially unviable for family practitioners in rural areas to deliver babies.

Hospital administrators also observed a shift in physicians' attitude toward work and quality of life. More so than in the past, physicians aim to strike a balance between work and family/leisure activities. About one-fifth of the hospitals we had a discussion with reported that the rural setting of their facility and the burden for physicians to be on call 24/7 were reasons that they lost or failed to recruit OB/GYNs or family practitioners for their obstetric unit.

Since delivering babies often involves not only OB/GYNs or family practitioners but also anesthesiologists and in some cases surgeons, supporting specialists must be available for a hospital to maintain an obstetric unit. Unfortunately, along with OB/GYN and family practice, anesthesia and general surgery are among the specialties that are most affected by rising malpractice insurance premiums. The recruitment of physicians in these two specialties is also hindered by recent changes in physicians' attitude toward work, family

[29] The Occupational Employment Statistics Survey carried out annually by the Bureau of Labor Statistics shows that the average annual income for OB/GYNs was $176,630 in 2003, 26% higher than that of family and general practitioners.

and leisure. It is therefore especially challenging for rural hospitals to recruit anesthesiologists and general surgeons to cover an obstetric unit. This is reflected in our discussions with hospital administrators -- 30 percent of hospital administrators identified difficulty and costs of recruiting supporting specialists as one of the main reasons that their hospitals discontinued providing obstetric services. The implementation of the Emergency Medical Treatment and Labor Act of 2003 (EMTALA) may make things even more difficult for rural hospitals. At least two hospitals directly and a few others indirectly attributed the difficulty in staffing an obstetric unit to EMTALA's requirement that hospitals maintain an on-call list of physicians for emergency care.

Our discussion with hospital administrators shows that factors identified by hospitals as reasons that they ceased to provide obstetric services are inter-related. For example, low volume of deliveries makes it difficult for hospitals to recruit physicians to staff their obstetric units because of increased liability risk to both physicians and the hospital, and insufficient revenues relative to the fixed cost of operating an obstetric facility. On the other hand, failure in attracting and retaining physicians in a county may result in patients bypassing local hospitals because patients are most likely to follow their physicians and deliver babies at a hospital where their physicians have privileges. This results in reduced volume of deliveries at local hospitals. Discussions with hospitals revealed that the loss and lack of hospital-based obstetric services result from an array of intertwined factors. Its reversal, if deemed necessary, calls for coordinated measures that should target innovations in organizing the delivery of services, incentive mechanisms that will bring physicians to under-served areas, and possibly changes in government policies concerning the reimbursement of obstetric care and the stabilization of medical malpractice insurance burdens. We will discuss in more detail the policy implications of our findings in Section IV.

B. Impact of the loss of hospital-based obstetric unit on county residents

In order to assess the impact of the closure of hospital obstetric units on local communities, we asked hospital administrators the approximate distance and travel time between their hospitals and hospitals where most local residents went to deliver babies. Table 2 shows the distribution of travel distance and time reported by all respondents. Since in some cases more than one hospital in the surrounding counties routinely provided obstetric services to local residents and in other cases high-risk patients had to go to

hospitals that were farther away, we tabulated both the closest and farthest distance that local residents traveled to deliver their babies and the corresponding travel time.

The distribution of the lower bound of travel distance in Table 2 shows that the majority (63 percent) of hospitals that closed their obstetric units are within 30 miles of another hospital that provided at least basic obstetric services. Another third of the responding hospitals have one or more hospital obstetric facilities that are between 30 and 60 miles away. In terms of the farthest distance residents may have to travel to receive needed obstetric services, 41 percent of the respondents reported between 30 and 60 miles and 11 percent reported more than 60 miles. This partly reflects the fact that high-risk women have to travel longer distances to receive needed care for potential complications during labor and delivery. In three instances, respondents reported that the nearest hospital that had the capacity to care for high-risk pregnancies was more than 90 miles away.

Table 2 also shows that travel time appear to be proportionate to travel distance as most of the hospitals are in rural areas where traffic is not a big concern. Almost two-thirds of the hospitals are within a 30-minute drive to the nearest hospital that provides obstetric services. However, similar to what is indicated by travel distance, it may take longer for high-risk women to receive the special care they need. In three cases, it could take as long as 1.5 hours by car to reach the nearest hospital for care for high-risk pregnancies.

While the closure of obstetric units in most hospitals that participated in our discussion does not seem to cause significant increases in travel time, it does impose inconvenience on them and their families considering that the majority of them may have to travel an additional 15 to 30 miles. As one respondent put it, 'if I were in labor, I wouldn't want to drive that far!' For Medicaid enrollees and other indigent women who may not have access to an effective means of transportation, the closure of the obstetric unit in a local hospital could result in delayed care and possibly adverse outcomes for their babies as well as themselves.

IV. Discussion

Our quantitative analyses show that counties without hospital-based obstetric services are more likely to be located in rural areas. Compared with counties in which at least one hospital provides obstetric services to the local community, they are economically less well-off, have relatively fewer births and are served by fewer OB/GYNs and family

practitioners. These findings are echoed in the informal discussions with hospitals we conducted as a supplement to the quantitative analyses. Hospitals that discontinued providing obstetric services in recent years identified insufficient volume of deliveries, a high fraction of Medicaid patients, and difficulty in recruiting and retaining physicians as the main reasons that they closed their obstetric units. Despite the limitations of this study, some of its findings have important policy implications and also point to a number of areas that would benefit from additional research.

A. Limitations

First, due to data constraints, we used the availability of hospital-based obstetric services at the county level as an approximate measure for access to obstetric care. However, since counties are relatively arbitrary geographic units, whether or not a county has hospital-based obstetric services may not fully capture access to care. Future research could focus on measures that reflect access to care more precisely. For example, using Geographic Information System (GIS) techniques, one can calculate the distances between a county's population centroid and the nearest hospitals that provide different levels of obstetric services.

Second, our multivariate analysis provides limited evidence that some types of tort reforms, such as caps on total damages and the mandatory offset of collateral source rule, increase the likelihood that a county has hospital-based obstetric services. However, it should be emphasized that our finding concerning the effectiveness of tort reforms is inconclusive because our estimates lack sufficient precision.

B. Policy implications and future research

- Organizing the delivery of obstetric services in rural areas

While not having access to obstetric services in a local hospital is inconvenient to pregnant women and could even lead to adverse birth outcomes for high-risk patients, it is certainly not cost effective for all counties to have at least one hospital that provides obstetric services. In fact, 59 percent of participants in our informal conversations stated that their hospital was not interested or did not need to bring obstetric services back to their hospital. These responses reflect a cost-benefit assessment. The benefits from resuming

obstetric services in these hospitals may be low, as most of them were within a 30-minute drive of a hospital in a neighboring county that provided obstetric services. On the other hand, the costs could be prohibitive relative to the benefits. As both our quantitative analyses and discussions with hospital administrators indicate, many rural counties have such a low density of women of childbearing age and a low birth rate that the number of deliveries in the county is simply not sufficient to allow physicians and nurses to maintain the skills necessary for safe deliveries. Instead of availability of hospital-based obstetric services, some respondents suggested that it was more important to ensure the provision of prenatal care in their county. Making prenatal care available locally and sending patients to hospitals that are outside the county but within reasonable travel distance for delivery-related services may be the most cost-effective way of organizing the delivery of obstetric services for many rural counties. While government policies designed to encourage physicians to practice in rural areas are needed, the feasibility of relying more on registered nurses and physician assistants for obstetric services in medically under-served areas should also be explored. Meanwhile, arranging for doctors from outside to visit the county and provide prenatal care on a regular basis may be an effective coping strategy for dealing with physician shortages in rural counties.

- Incentives to encourage physicians to practice in rural areas

Statistics show that women of childbearing age who live in counties with no hospital-based obstetric services are served by half the number of OB/GYNs and/or family practitioners than their counterparts who live in counties with hospital-based obstetric services (see Appendix B). Most participants in our informal discussions stated that the difficulty in recruiting and retaining physicians was one of the reasons that led their hospitals to discontinue the provision of obstetric services. Successful publicly-funded incentive mechanisms, such as financial assistance for medical training in return for committed services in rural communities, are important in order to encourage physicians to practice in certain areas. Measures may need to be taken to relieve family practitioners of medical malpractice burdens. Physicians and insurance companies call for tort reforms and the Federal government has put forward proposals. Even though there was limited evidence from our multivariate analysis that the mandatory offset of collateral source rule and caps on total or non-economic damages increased the likelihood that a county had hospital-based

obstetric service, we cannot draw firm conclusions about the effectiveness of tort reforms due to lack of sufficient precision in our estimates. Further research is needed on the effectiveness of alternative measures that are designed to improve the availability of malpractice insurance and curb premium spikes. For example, no-fault systems, such as those implemented in Virginia and Florida[30] concerning brain damage during births, may be more efficient than tort reforms in compensating the injured while keeping physicians' liability in check.

- Incentives for hospitals to provide obstetric services

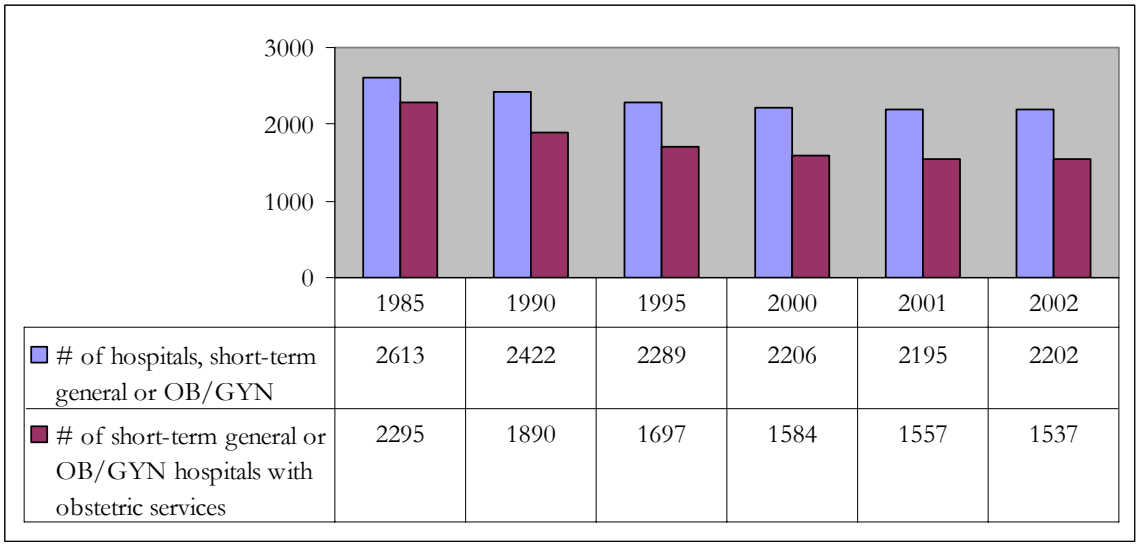
Low Medicaid reimbursement for obstetric services could be financially detrimental for hospitals that serve a high proportion of Medicaid patients. One hospital administrator noted that his state paid $13 per emergency visit by Medicaid enrollees, a fraction of the average reimbursement from private insurers. Under the current environment in which reductions in Medicaid spending are expected in many states, rural hospitals may find it even more difficult to remain financially viable if Medicaid patients constitute a high proportion of their patient pool. Some hospital administrators in states that had not adopted cost-based reimbursement policies for Medicaid obstetric services, similar to that used for reimbursement for Medicaid services rendered to patients in critical access hospitals, argued that their states should adopt such policies. Further research is certainly warranted. Our informal discussions with hospital administrators also raised a question about the impact of the Emergency Medical Treatment and Labor Act of 2003 (EMTALA) on the availability of hospital-based obstetric services in rural areas. A few respondents explicitly or implicitly attributed their inability to operate an obstetric unit to their understanding that EMTALA requires that hospitals be staffed with physicians (including obstetricians or family practitioners as well as supporting specialists or sub-specialists) who can be on-call at all times. However, EMTALA does not require that a hospital's OB unit provide 24/7 coverage, or that physicians be on call at all times. In fact, CMS states in its final rule on EMTALA that 'CMS allows hospitals flexibility to comply with EMTALA obligations by maintaining a level of on-call coverage that is within their capability' and, 'generally, in

[30] For a summary of the Florida and Virginia child brain injury compensation programs, please refer to a research report published by the Connecticut General Assembly available at: http://www.cga.ct.gov/2003/olrdata/ph/rpt/2003-R-0620.htm

determining EMTALA compliance, CMS will consider all relevant factors, including the number of physicians on staff, other demands on these physicians, the frequency with which the hospital's patients typically require services of on-call physicians, and the provisions the hospital has made for situations in which a physician in the specialty is not available or the on-call physician is unable to respond.'[31] However, the specific requirements of EMTALA notwithstanding, the intrinsic characteristics of labor and delivery may necessitate that an OB or family practitioner be available 24/7 in rural areas where OB/GYNs or family practitioners are in short supply. The increasing preference of younger physicians, who put more weight on family/leisure in seeking a balance between work and family/leisure activities, rather than the constraint imposed by EMTALA, may limit the provision of hospital-based obstetric services.

[31] Centers for Medicare and Medicaid Services, HHS, *Clarifying Policies Related to the Responsibilities of Medicare Participating Hospitals Treating Individuals with Emergency Medical Condition,* http://www.cms.hhs.gov/providers/emtala/cms-1063f.pdf.

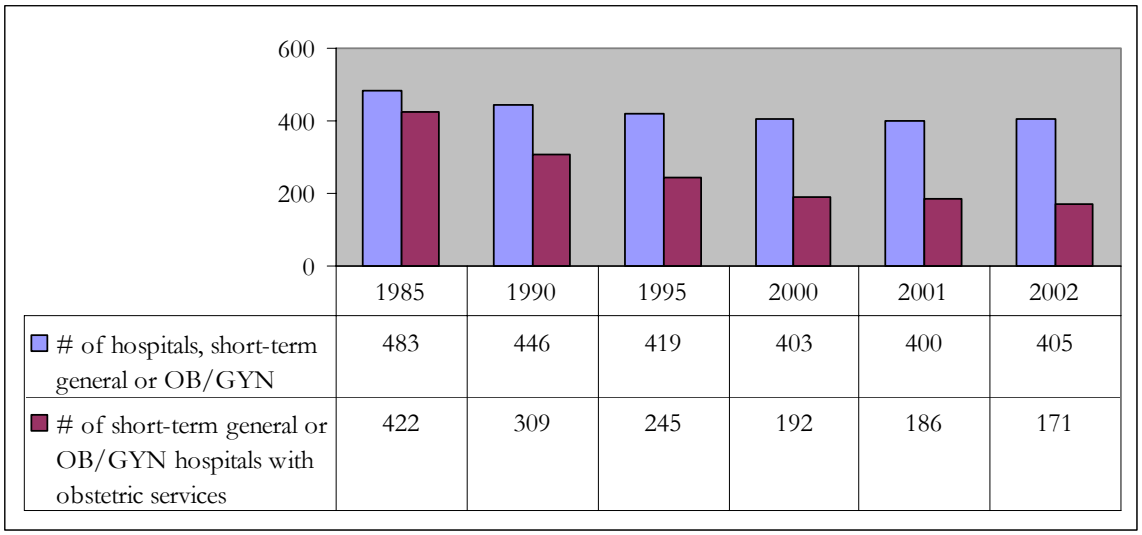
Figure 1: Time trend of the number of hospitals and hospitals with obstetric services, non-metropolitan counties



	1985	1990	1995	2000	2001	2002
# of hospitals, short-term general or OB/GYN	2613	2422	2289	2206	2195	2202
# of short-term general or OB/GYN hospitals with obstetric services	2295	1890	1697	1584	1557	1537

Source: Tabulation by NORC using the American Hospital Association's Annual Survey of Hospitals 1985, 1990, 1995, 2000-2002.

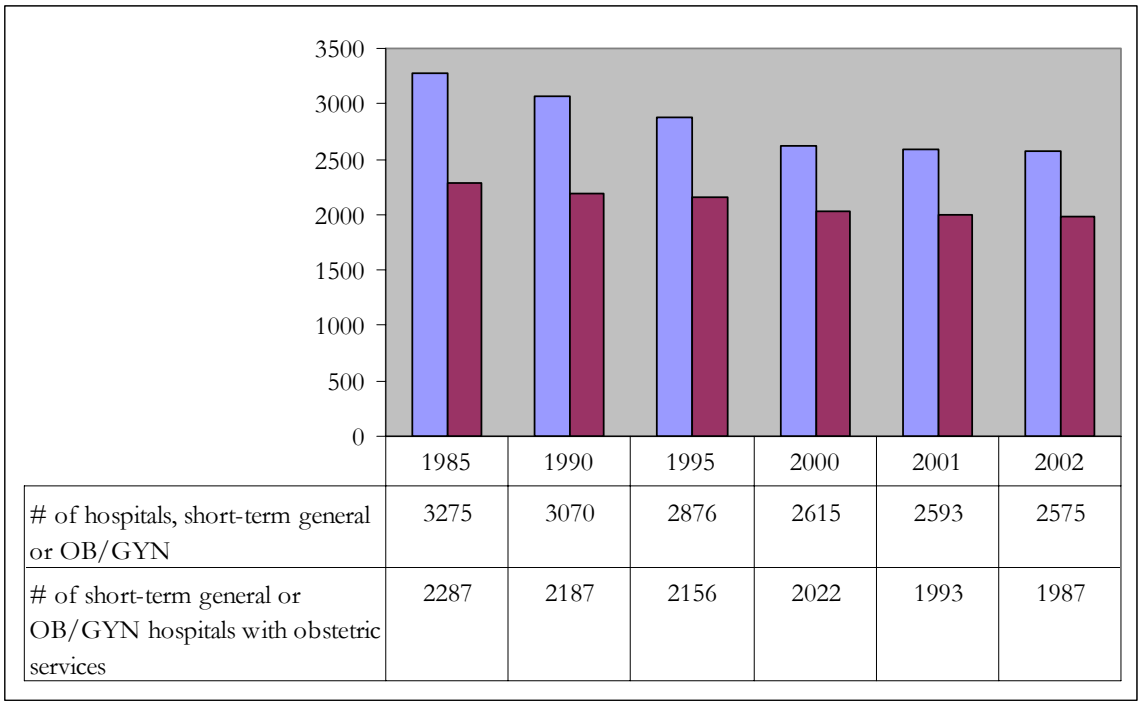
Figure 2: Time trend of the number of hospitals and hospitals with obstetric services, remote counties only



	1985	1990	1995	2000	2001	2002
# of hospitals, short-term general or OB/GYN	483	446	419	403	400	405
# of short-term general or OB/GYN hospitals with obstetric services	422	309	245	192	186	171

Source: Tabulation by NORC using the American Hospital Association's Annual Survey of Hospitals 1985, 1990, 1995, 2000-2002.

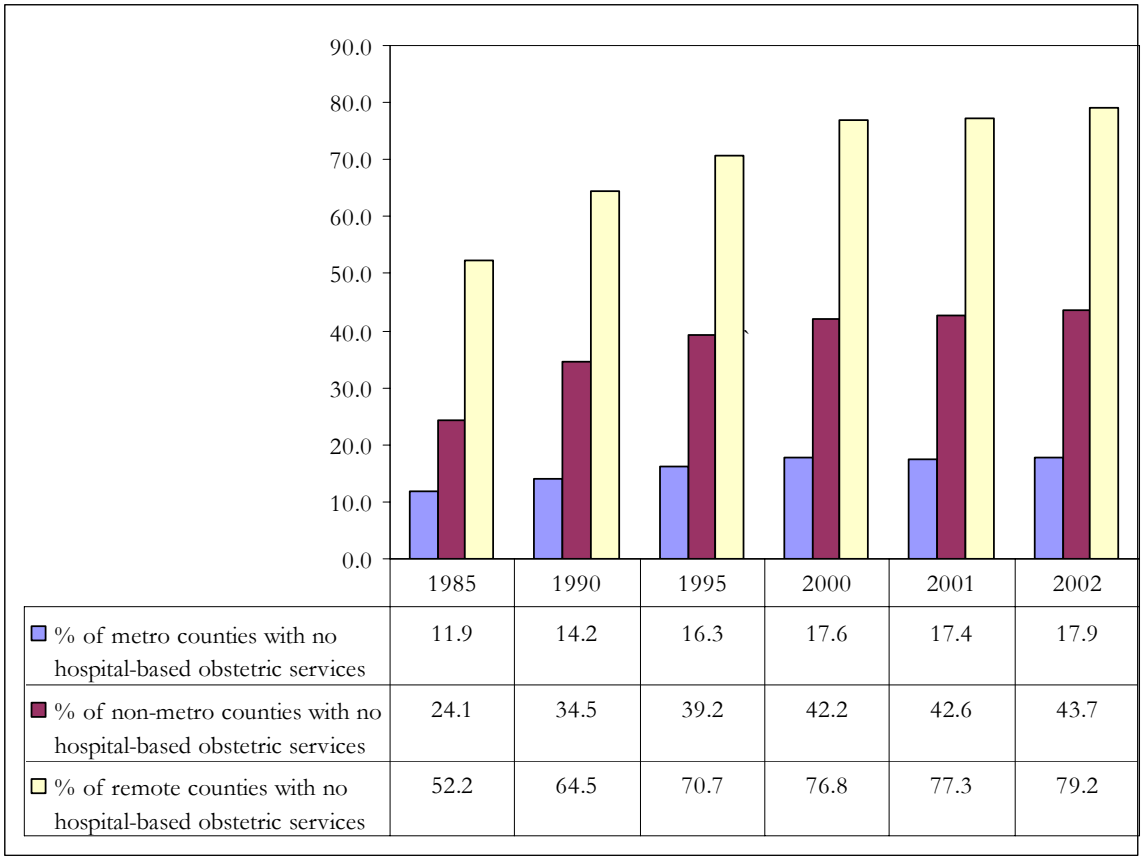
Figure 3: Time trends of the number of hospitals and the number of hospitals with obstetric services, metro counties



	1985	1990	1995	2000	2001	2002
# of hospitals, short-term general or OB/GYN	3275	3070	2876	2615	2593	2575
# of short-term general or OB/GYN hospitals with obstetric services	2287	2187	2156	2022	1993	1987

Source: Tabulation by NORC using the American Hospital Association's Annual Survey of Hospitals 1985, 1990, 1995, 2000-2002.

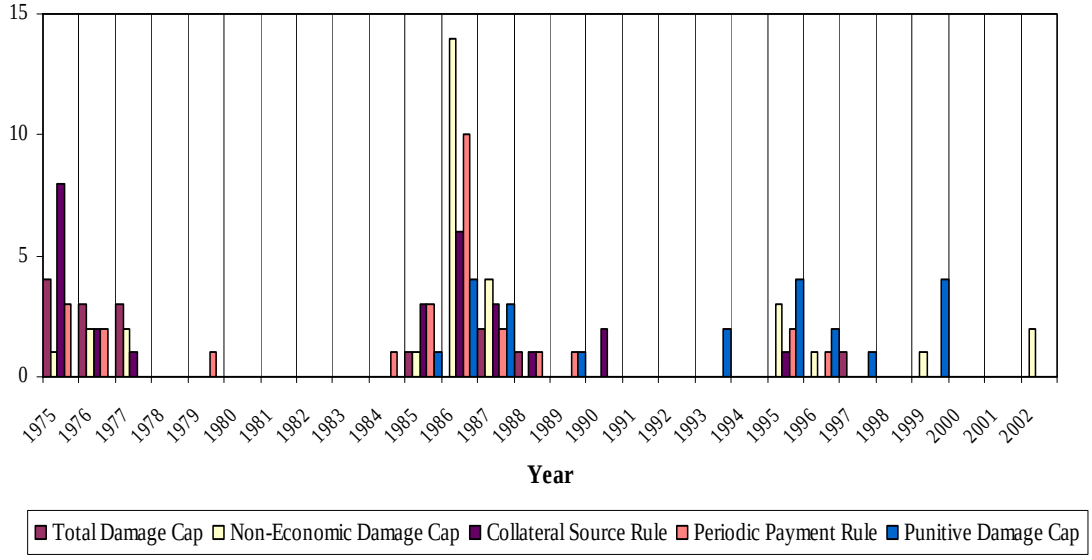
Figure 4: Percent of counties with no hospital-based obstetric services



	1985	1990	1995	2000	2001	2002
% of metro counties with no hospital-based obstetric services	11.9	14.2	16.3	17.6	17.4	17.9
% of non-metro counties with no hospital-based obstetric services	24.1	34.5	39.2	42.2	42.6	43.7
% of remote counties with no hospital-based obstetric services	52.2	64.5	70.7	76.8	77.3	79.2

Source: Tabulation by NORC using the American Hospital Association's Annual Survey of Hospitals 1985, 1990, 1995, 2000-2002 and the Area Resource File, 2002.

Figure 5: Number of states enacting direct reforms



Source: Tort reforms by state 1975-2002, compiled by NORC.

Table 1: Most frequently identified reasons for ceasing obstetric services by hospitals.

	number of responses	% of responding hospitals
Low volume of delivery	13	48
Difficulty in staffing an obstetric unit		
Medical liability burden too high for obstetric care	12	44
Changes in physicians' attitude toward work and quality of life	5	19
Difficulty and costs of recruiting supporting specialists	8	30
Medicaid reimbursement rates too low	5	19

Source: informal discussions with hospitals, NORC 2005.
Note: Some hospitals identified more than one reason for closing their obstetric units. Therefore the percentages do not add up to 100.

Table 2: Distribution of travel distance and time between hospitals that discontinued providing obstetric services and hospitals where women in the county go to deliver their babies

Travel Distance				
	Shortest		Farthest	
	Number of responses	% of responses	Number of responses	% of responses
0-15 miles	4	14.81	3	11.11
16-30 miles	13	48.15	10	37.04
31-60 miles	9	33.33	11	40.74
61 miles and more	1	3.70	3	11.11
Total	27	100	27	100
Travel Time				
	Shortest		Longest	
	Number of responses	% of responses	Number of responses	% of responses
0-30 minutes	17	62.96	12	44.44
31-60 minutes	9	33.33	11	40.74
61 minutes and more	1	3.70	4	14.81
Total	27	100	27	100

Source: Informal discussions with hospitals, NORC 2005.

Appendix A

Appendix Table A: Multivariate analysis of the availability of hospital-based obstetric care

***Dependant variable*: whether or not a county had hospital-based obstetric services**

	Rural Counties Only	All Counties
Years with Reform in the 5 Most Recent Years		
Cap on Total Damages	0.0053	0.0050
	(0.0070)	(0.0068)
Cap on Non-economic Damages	0.0027	0.0026
	(0.0042)	(0.0037)
Cap on Punitive Damages	0.0006	0.0000
	(0.0034)	(0.0029)
Periodic Payment Arrangements	-0.0017	-0.0006
	(0.0028)	(0.0022)
Mandatory Offset of Compensation from Collateral Sources	0.0076	0.0060
	(0.0051)	(0.0037)
County Socioeconomic Characteristics		
log of Per Capita Income	-0.0021	0.0020
	(0.0471)	(0.0445)
Wage per Job	-0.0138	0.0340
	(0.0641)	(0.0566)
Unemployment Rate	-0.0023	-0.0016
	(0.0020)	(0.0018)
% of Women at Childbearing Age who are Black	-0.2783	0.2690
	(0.5087)	(0.3426)
% of Hospitals Owned by Government	0.1095*	0.1005*
	(0.0303)	(0.0261)
Births per Woman at Childbearing Age	0.4293	0.1926
	(0.2466)	(0.1316)
Women Density	-0.0041	0.0001
	(0.0051)	(0.0001)
Ratio of the Elderly to Population	0.7216*	0.7973*
	(0.3864)	(0.4118)
Population (in '10,000s)	0.0793**	0.0027**
	(0.0141)	(0.0010)
Time Trend		
Year 1990	-0.1019*	-0.0418*
	(0.0191)	(0.0144)
Year 1995	-0.1420*	-0.0650*
	(0.0226)	(0.0170)

***Dependant variable*: whether or not a county had hospital-based obstetric services**

	Rural Counties Only	**All Counties**
Years with Reform in the 5 Most Recent Years		
Year 2000	-0.1739*	-0.0837*
	(0.0226)	(0.0227)
Year 1990 * rural		-0.0780*
		(0.0131)
Year 1995 * rural		-0.0983*
		(0.0161)
Year 2000 * rural		-0.1083*
		(0.0165)
Number of Observations	8,912	12,176
R^2	0.831	0.841

Notes:
1) Standard errors are reported in parenthesis below the estimates.
2) Standard errors reported assume arbitrary correlations between errors within a state.
3) Both models include county fixed effects.
4) * and ** denote statistical significance at 5% and 10% level respectively.

Appendix B

Appendix Table B: Comparison of OB/GYNs and family practitioners per woman of childbearing age by county with and without hospital-based obstetric services.

	1985		1990		1995		2000	
	OB	No OB	OB	No OB	OB	No OB	OB	No OB
Number of FPs and OB/GYNs per 1,000 Woman of Child-bearing Age	1.10 (0.74)	0.52 (0.67)	1.33 (0.82)	0.66 (0.74)	1.52 (0.90)	0.73 (0.83)	1.88 (1.53)	0.89 (1.07)
Number of Counties	2,427	647	2,177	897	2,054	1020	1,982	1,092

Source: Tabulation by NORC, using the American Hospital Association's Annual Survey of Hospitals 1985, 1990, 1995, 2000-2002 and the Area Resource File 2002.
Notes:
1) Columns labeled "OB" describe counties with at least one hospital that provides obstetric services.
2) Columns labeled "No OB" describe counties with no hospital that provides obstetric services.
3) Standard deviations are reported in parentheses below population means.