Appendix J: Detailed Critique of Reynolds et al. and Lewin-VHI Estimates

In chapter 3 of this report, the Office of Technology Assessment (OTA) reviewed two wide] y publicized estimates of the costs of defensive medicine and the medical malpractice system-one published in 1987 by Reynolds and colleagues at the American Medical Association (194) and the other published in 1993 by Lewin-VHI, Inc. (1 25). This appendix provides a detailed critique of the data, methods, and assumptions that underlie those estimates.

THE REYNOLDS ESTIMATES

Method 1: Survey of Physicians

Reynolds and colleagues tried to estimate the full impact of the malpractice system on physician costs, including:

- malpractice insurance premiums;
- the time lost in defending against malpractice claims and lawyers' fees not covered by malpractice insurance; and
- practice changes, including
  - —increased recordkeeping,
  - —use of more tests or treatment procedures,
  - —increased time spent with patients. and
  - —increased followup visits.

Of all the practice changes, only two-increases in tests or treatment procedures and followup vis--its—fall within OTA's definition of defensive medicine. Though some observers would claim that more time spent with patients or in documenting medical records is defensive medicine, OTA excluded these practices because it is extremely difficult to measure their frequency and magnitude and because the positive impact of these practices on the
quality of care is less equivocal. In contrast, procedures and followup visits are documented in utilization data, offering an empirical check.

Estimation of malpractice insurance premiums was based on the American Medical Association (AMA) Socioeconomic Monitoring System (SMS) survey, which asks physicians to report their malpractice insurance premiums and other practice costs. The SMS also gives information on days lost from work to defend against malpractice claims and the amount paid for outside attorneys. These data items, though subject to the usual problems of recall bias, are sufficiently accurate for the purposes at hand. (They are also subject to verification with objective premium data and other survey data.) The main problem comes in esti-

mating the net costs of practice changes resulting from malpractice liability.

In its fourth quarter 1984 survey, the AMA asked a series of questions about whether physicians were maintaining mm-e detailed records, prescribing more diagnostic tests and treatment procedures, spending more time with patients. and having more followup visits with patients in the last 12 months in response to their malpractice risks (194). If physicians answered in the affirmative to any of these items, they were asked to quantify the change over the past 12 months in percentage terms.

Table J-1 summarizes the results of the survey. The physicians reported that in 1984 they increased tests and procedures by 3.2 percent and followup visits by 2.6 percent in response to changes in the frequency of malpractice claims. These two practice changes fall within OTA's definition of defensive medicine. The other practice changes, such as increasing recordkeeping and time spent with the patient, may result from the same desire to avoid a malpractice suit, but these practice changes lead to increases in the cost per visit or procedure. Such cost increases would be passed on to consumers in the form of higher fees rather than additional procedures or visits.

Reynolds estimated the cost of all of the 1984 practice changes *except* the cost of extra tests and procedures, which was excluded because the researchers could not find a good way to estimate the average cost of such a diverse array of services. The average cost per physician of the remaining practice changes was $4.600. of which $1,900 was the cost of reported changes in followup visits.

The authors computed the ratio of the 1984cost of practice changes ($4,600) to the 1984 increase in malpractice insurance premiums ($ 1,300), and applied this ratio (3.53) to the average 1984 malpractice premium ($8,400) to arrive at a per-physician cost of practices done in response to the malpractice system: $29,700. or 14percent of average physician revenues. In the aggregate, this cost corresponds to $10.6 billion in 1984.

To summarize, under method 1. Reynolds' total estimate of the cost of the malpractice system for physicians—$ 13.7 billion in 1984---comprises the following elements:

- premiums-$3.O billion.
- other costs of incurring malpractice claims-$0.1 billion, and
- practice changes-$ 10.6 billion.

Of the $13.7 billion in total cost, about $4.3 billion, or 30 percent, represents defensive medicine under OTA's definition.

The estimate of the cost of practice changes has several potential sources of bias. On the one hand, there is reason to believe that Reynolds' estimate of the malpractice system's impact on health care costs is too low because Reynolds and colleagues excluded the reported 1984 cost impact of increased tests and treatment procedures. The importance of this exclusion is unknown. but it rep-

TABLE J-1: Reported Practice Changes in Response to Increasing Liability Risk, 1984

Activity	Percent of physicians making change in 1984	Average percent change in 1984[a]
Increased recordkeeping	31.0%	**2 9%**
Prescription of more test or treatment procedures	**200**	**3 2**
Increased time spent with patients	170	2 4
Increased followup visits	170	2 6
Percent of physicians with at least 1 listed practice charge	41 8	

[a] Calculations include zeros for physicians who did not make practice change

SOURCE American Medical Association Socioeconomic Mon toring System survey as reported in R A Reynolds J A Rizzo and M L Gonzalez "The Cost of Medical Professional Liability *Journal o/ American Medical Association* 257(20) 2776-2781 May 2229 1987

resents the essence of OTA's definition of defensive medicine and means that the Reynolds estimate probably does not capture the greatest part of defensive medicine.

On the other hand, there is reason to believe that Reynolds' estimate is too high, because the survey may have prompted physicians, who regularly articulate negative feelings about malpractice liability, to overestimate the impact of rising malpractice claims on their practices. Data from the National Ambulatory Medical Care Survey (NAMCS) show no change between 1981 and 1985 in the per-capita number of followup visits; they also show an annualized rate of increase of less than 1 percent in total per-capita physician office visits over the period (70). Barring some dramatic factor at work between 1983 and 1984 to otherwise reduce the frequency of followup visits by as much as 2.3 percent, physicians' responses to the AMA survey appear to exaggerate their actual change in behavior. 1 If physicians overestimated the malpractice system's impact on follow up visits, they may also have done so with the other practice changes.

Finally, Reynolds' approach involved an arbitrary assumption with unknown effects on the validity of the estimate. Reynolds assumed that the ratio of the *change* in practices (in response to malpractice risk) to the *change* in premiums can predict the ratio of the level of such activities to the *level* of premiums in 1984. The authors had no empirical evidence for this assumption, and there is reason to believe that it may be inaccurate.[2] As a consequence of these issues, OTA concluded that Reynolds' first method does not offer a sufficiently reliable estimate of the full cost impacts of malpractice liability and does not offer a basis for estimating the costs of defensive medicine.

Method 2: Relationship Between Reported Malpractice Risk and Physician Fees and Utilization

The researchers examined the relationship between the level of malpractice liability risk, as measured by the 1984 malpractice premium reported by each physician responding to the AMA survey, and the physician's fees and volume of' selected services reported in the same survey. Regression of utilization and fees on premiums[3] and other demographic variables (e.g., physicians per 1,000 population, years in practice, board certification, etc.) gave estimates of the impact of each $1 of premium on the utilization or fee for a given procedure. Doctors with higher premiums were found to have higher fees, but they had lower lev-

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1 It is theoretically feasible that physicians responding to the AMA survey were able to differentiate between extra followup visits they would like to have provided and extra visits that they actually realized, after other independent impacts on visits were taken into account. If, for example, the demand for visits declined over the period, physicians might have ordered more follow up visits for defensive reasons but nevertheless actually provided fewer net visits overall. To accept this possibility y, one would have to believe that physicians responding to surveys could accurately estimate the partial impact of their defensive behavior on the volume of visits.

2 The assumption implies a linear relationship between the frequency of the cited practices and the level of malpractice insurance Premiums, with the graph of the line intersecting the y-axis at the origin. Because ordering extra tests, procedures, and visits does not cost physicians money and is often financially remunerative, there is no reason to believe that as malpractice premiums decline, the motive to practice defensively declines in a linear fashion to the origin. Indeed, one would expect that physicians in 1984 were practicing on the "flat of the curve" where they were already as defensive as they knew how to be. Thus, to the extent that their reported 1984 behavior changes reflect reality, the linearity assumption would understate the amount of defensive medicine. On the other hand, practice changes that take up more time (such as increased time with the patient) would increase the physician's costs and presumably be more directly responsive to increases in premiums. Whether the relationship is linear or not is unknown.

3 The malpractice premium used in the regression analysis was an estimated value based on a first-stage regression of premiums on demographic characteristics, the status of various malpractice reforms in the physician state, and the malpractice claim frequency in the state. This two-stage method of estimation is referred to as the *instrumental variable* technique. The rationale for such an approach is to make the instrumental variable (premiums m this case) a better measure of the actual variable (malpractice risk in this case) than it would be were the actual value used in the regression.

els of use of the most important services studied. Table J-2 summarizes the results for each service.

Reynolds took the findings presented in table J-2 as the basis for estimating what utilization and fees would have been if malpractice insurance premiums (and, presumably, malpractice liability risk) had been zero in 1984. These rates were compared with actual reported utilization and fees to obtain an estimate of the impact of premiums on physician revenues.

The eight services chosen for the analysis represented about 70 percent of the average revenues of self-employed physicians in 1984. Without any malpractice insurance premiums, these revenues would have been reduced (according to the regression estimates) by 11.2 percent of average revenues. In the aggregate, a reduction of 11.2 percent in average physician revenues represents an $8.4 billion saving in expenditures if there were no malpractice insurance premiums (and presumably no malpractice liability system). If the services constituting the 30 percent of average revenues not studied by Reynolds were influenced by premiums to the same extent as the eight studied, the physician revenues saved by no malpractice liability would amount to $12.1 billion in 1984.

The most striking feature of this analysis is that virtually all of the impact on cost comes through increased fees, *not* through increases in utilization of procedures. In fact, utilization of most of the procedures studied appeared to be reduced by higher malpractice insurance premiums. Any pos-

TABLE J-2: Effects of Professional Liability Premiums on Physician Fee and Utilization Levels, 1984

Procedure	Coefficient	Standard Error	% change in fee or utilization per % change in premiums[a]
Fees			
Established patient office visit	O 85	0 17b	O 272
New patient office visit	1 16	0 .37b	0212
Followup hospital visit	1 18	0 .22b	0340
Electrocardiogram	148	0 .46[b]	O 205
Obstetric care, normal delivery	2224	4 .53b	O 427
Hysterectomy	2538	5 .74b	0349
Hernia repair	311	566	0069
Cholecystectomy	-238	860	-0033
Monthly utilization			
Established patient office visit	-6641	28 .97[b]	-0171
New patient office visit	-1381	7 .33c	-0209
Followup hospital visit	-4515	20 .84[b]	-0297
Electrocardiogram	606	3499	0073
Obstetric care, normal delivery	146	1 31	0168
Hysterectomy	-049	063	-0276
Hernia repair	-051	1 12	-0224
Cholecystectomy	070	095	0217

[a] The premium levels used in the computation are the averages for the specialties used in estimating the premium effect for each procedure For patient visits, these include all specialties except radiology, psychiatry, pathology and anesthesiology for electrocardiograms general family practice and internal medicine for obstetric care and hysterectomies, obstetrics-gynecology, and for hernia repairs and cholecystectomies, general surgery

b Indicates regression coefficient is different from O at the 01 significance level

[c] Indicates regression coeff icient is different from O al the 10 sign ificance level

SOURCE R A Reynolds J A Rizzo and M L Gonzalez 'The Cost of Medical Professional Liability, *The Journal of American Medical Association 257(20) 2776-2781,* May *22/29 1987* table 2

itive effects of malpractice risk on defensive medicine are apparently overshadowed by the negative effect of malpractice risk on demand that results from the higher fees that physicians with higher malpractice risk charge their patients. Thus, if the statistical analysis is correct, high malpractice risk depresses the demand for services as much as or more than it increases defensive medicine.

The method underlying the estimates is based on a standard econometric technique, but as with all econometric analyses, the results might be sensitive to the specification of the statistical model and the ability to measure the relevant variables.[4] Just how sensitive they might be is impossible to tell without more analysis of the quality of the premium measure of malpractice risk or corroborating evidence from other analyses.

To turn the results of the statistical analysis into an estimate of the net costs of the malpractice system, the authors assumed that the relationship between malpractice insurance premiums and practice fees and volumes is linear throughout the range of potential premiums. The assumption that defensive medicine or other practice changes decline in lock-step linear fashion with declines in premiums all the way to the point of zero premiums is unlikely to be accurate, for reasons discussed above. Thus, OTA is unable to verify the accuracy of the estimates derived from the second method.

Even if the total cost estimates are accurate, they do not allow any inferences about the extent or cost of defensive medicine, whose practice is embedded in a larger set of utilization changes resulting from the malpractice system. High or low rates of defensive medicine are equally consistent with the results of the statistical model.

LEWIN-VHI ESTIMATES

Lewin-VHI began with the Reynolds" estimates of the cost of the malpractice system (an average $18.8 million in 1991 constant dollars) and added another $6.1 billion for extra costs incurred in hospitals. Lewin-VHI obtained this hospital cost estimate by assuming that the cost of hospital professional liability in excess of hospital malpractice insurance premiums ($2.7 per dollar of premium) was the same as the ratio of physicians costs to physicians' premiums estimated in the Reynolds study.[5] The preliminary total cost of malpractice—$24.9 billion in 199l—was then reduced by three percentages (80, 60, and 40). This produced "low,''($5 billion) "medium" ($10 billion) and '*high" ($1 4.9 billion) final estimates of the net costs of defensive medicine to the health care system in 1991. The adjustments were made because Lewin-VHI researchers wanted to exclude that portion of defensive medicine not caused solely by liability concerns.

To help justify their estimates, Lewin-VHI researchers described three technologies whose utilization may be influenced by malpractice risk: electronic fetal monitoring in labor and delivery, skull x-rays in emergency rooms, and preoperative laboratory testing.[6] Lewin-VHI researchers concluded that the low estimate of defensive medicine costs ($5 billion) represents a reasonable lower bound on defensive medicine costs based on a brief review of the literature on "unneces-

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[4] For example, the assertion that individual physicians premiums are a good measure of liability risk using the instrumental variables technique cannot be assessed with the information presented in the paper or its unpublished technical appendix Recent research suggests that if an instrumental variable is not a good one, it can lead to misleading and biased results (173,213). The authors had a measure of claim frequency available to them, which they might also have used as a direct measure of malpractice risk. Whether these factors would change the results is impassible to know without carrying out such analyses.

[5] Lewin-VHI obtained this ratio (2.7) from AMA researchers; it is lower than the ratio published in the Reynolds study (3,2).

[6] For example, the authors cited one study of preoperative tests that claimed about $2.7 billion extra is spent each year for unnecessary preoperative testing (138). Because doctors typically do not gain financially from ordering such tests, the Lewin-VHI authors concluded that an appreciable portion of these costs results from fear of malpractice liability (125).

sary" use of these three procedures. Lewin-VHI offered no justification for the upper bound of the range.

Although the Lewin-VHI researchers acknowledged the great uncertainty surrounding any estimate of defensive medicine, the objective basis for their specific adjustments from the Reynolds estimate is weak. The evidence presented in the three clinical examples used for the lower bound estimate does not necessarily reflect the percentage of unnecessary procedures motivated solely (or even primarily) by fear of malpractice liability. Also, the estimates of the number of unnecessary procedures in the studies cited by Lewin-VHI were based on small and sometimes subjective assessments. Finally, they represent only three relatively narrow areas of medicine.

To summarize, Lewin-VHI began with the estimates by Reynolds and colleagues, whose accuracy is unknown and unverifiable, and then made downward adjustments using a fragile base of evidence. Consequently, the Lewin-VHI estimate is not a reliable gauge of the possible range of defensive medicine costs.