A RAND NOTE

SOME STATISTICAL EVIDENCE ON MERIT RATING IN MEDICAL MALPRACTICE INSURANCE

John E. Rolph

June 1981

N-1725-HHS

Prepared For

The U.S. Department of Health and Human Services

Rand
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PREFACE

Merit rating, the practice of adjusting insurance premiums on the basis of past claims experience of the policy holder, is commonly used in many types of insurance. In medical malpractice insurance, it is rarely, if ever, used. This Note gives an analysis of the actuarial feasibility of merit rating in medical malpractice insurance using fragmentary publicly available data.

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SUMMARY

Merit rating is not widely used in setting medical malpractice insurance premiums. A statistical analysis of two different data sets shows that actual malpractice claims experience is inconsistent with the notion that claims occur randomly among physicians within each specialty class. Consequently, a statistical model allowing physician specific claims propensities is fit to a recent data set. Calculations using this model indicate that the additional effect of four years of a physician's claims experience on his or her expected claims rate is comparable to the effect of knowing the physician's medical specialty. Consequently, merit rating deserves more serious attention in medical malpractice insurance.

CONTENTS

SOME STATISTICAL EVIDENCE ON MERIT RATING IN MEDICAL MALPRACTICE INSURANCE

Merit rating is commonly used in many types of insurance (e.g., automobile insurance). By contrast, medical malpractice insurers do not. Premiums typically vary by medical specialty class and by large geographical region--frequently by state. Recently there have been some physician-owned insurers that have used underwriting judgments based on a physician's individual experience in deciding whether to offer that physician insurance or to assess a surcharge, but this is the exception rather than the rule among medical malpractice insurers.

The conventional view is summarized by the senior actuarial officer of a leading medical malpractice liability insurer who says there is "no possibility of experience rating in the near future, because there is such a large chance element in malpractice. Most valid claims are produced by careful, responsible doctors who just make a mistake." [10, p. 82]. The opposing view is expressed by the president of a doctor-owned mutual liability insurer who says "we're now canceling some doctors who have bad track records. We also charge some four and five times the normal premiums." [4, p. 236]. If malpractice results from a "bad apple problem," not using claims experience in setting premiums means that good doctors have to pay for the errors of careless ones. If a doctor's

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malpractice claims history provides enough statistical information to separate out the "bad apples," the premiums for most "safe" doctors might be substantially reduced. The premiums would correspondingly increase for the most "unsafe" doctors.

To determine whether individual merit or claims experience rating in medical malpractice insurance is feasible, an up-to-date detailed data base giving individual physician malpractice claim experience over a number of years is required. Such data are not publicly available. Instead, some publicly reported aggregate statistics must be used to reach some tentative conclusions about the feasibility of merit rating in medical malpractice insurance. The viewpoint taken in this paper is primarily that of an insurer. That is, does it make sense for an insurer to use a physician's claims experience in setting malpractice insurance rates? Specifically, the calculations in this paper demonstrates that under certain assumptions, using four years of a physician's claims experience in addition to knowing the specialty class can generate premiums that differ by a factor of at least two solely on account of claims experience. The impact of merit rating from the viewpoint of the insured--the physician--is discussed briefly at the end of the paper.

Two sets of data will be analyzed. First, an article about a prominent insurance brokerage firm, Johnson and Higgins, gave some data for the early 1970's that are interpreted in the article as showing no relationship between tort history and physician quality [2, p. 156]. The second data set is of less recent vintage, malpractice claims experience in the State of Maryland between the years 1960 and 1970 [6].

The basic information provided by the Johnson and Higgins data is as follows: For a four-year period some 8,000 physicians were covered by an insurance plan in Los Angeles. These doctors had 2,300 claims against them, or an average of 575 per year. The article also reported that 46 physicians had been sued four or more times during the four-year period. These 46 physicians (0.6 percent of the 8,000) accounted for 10 percent of all suits, and 30 percent of all claims payments against the insurance plan. The second data set, collected as part of a study carried out under contract to the Executive Committee of the Medical and Chirurgical Faculty of the State of Maryland (Med-Chi), is reported in Pabst [6] in considerably more detail than the first data set. However, since the Johnson and Higgins data are the most recent, and presumably most applicable to today's environment, it will be analyzed more completely than the Med-Chi data.

Section 1 reports the results of statistical tests on both data sets aimed at determining whether the variation in frequency of malpractice claims among physicians can be attributed solely to differences in the physician's specialities or whether there remain differences in physician's malpractice claim rates within specialty classes. In Section 2, a statistical model allowing incorporation of individual physician-specific claims frequencies is fit to the Johnson and Higgins data. It also gives a discussion of merit rating from the insured's viewpoint and draws other conclusions about individual merit rating. Finally, Section 3 summarizes the findings of this analysis.

1. CLAIMS FREQUENCY BY SPECIALTY

Johnson and Higgins Data

Assuming that the 2,300 claims in the Johnson and Higgins data were distributed randomly among the 8,000, the claims frequency distribution should be Poisson distributed with rate λ estimated by $\hat{\lambda} = 2300/8000 = 0.2875$. Table 1 gives the expected claims frequencies under this assumption. Table 1 makes it clear that having 46 physicians with four or more claims under this assumption is extremely unlikely. Consequently the hypothesis that all physicians have the same underlying claim rate is untenable.

However, Table 1 lumps neurosurgeons with pediatricians. One would expect a higher claims rate for the former even if there were no observable difference among practitioners within a specialty. Allowing for differences across specialty increases the expected number of physicians

Table 1

Claim Frequency if Claims are Randomly Distributed Among All Physicians (Johnson and Higgins Data)

Number of Claims During Four Years	Expected Number (and percent) of Physicians	Actual Number (and percent) of Physicians	Expected Number of Claims	Actual Number of Claims
0	6001 (74.0)		0	
1	1725 (21.6)	7954 (99.4)	1725	2070
2	248 (3.1)		496	
3	24 (0.3)		72	
4	2 (0.0)	46 (0.6)	8	230
Over 4	0 (0.0)		0	

with at least four claims to six, still many fewer than 46 and a statistically significant difference. The computations underlying this assertion are described later in the section.

In order to construct a statistical model of malpractice claims occurrence that controls for specialty class, some data are needed on the experience by specialty class. Because the Johnson and Higgins data are not divided by specialty, it is necessary to rely on the relative distribution of physicians and claims across specialties for a national sample surveyed by the National Association of Insurance Commissioners (NAIC). NAIC Malpractice Claims reports the claim experience for seven Insurance Services Office (ISO) premium classes.[1] These seven classes, defined by equal premium payments within class, are enough different in mean size of claim, premium and claims frequency that it seems unwise to aggregate them further. Table 2 gives data on claims by the seven specialty classes. Note that the ratio of mean payment per claim between the highest and lowest class is about 1.8 to 1 while the corresponding spread for claims frequencies is about 4.5 to 1, indicating the diversity in both claims size and claims frequency across specialty classes.

While the claims data in Table 2 are a mixture of data from California and other states, their relative value by specialty should apply, approximately at last, to the Johnson and Higgins data from Los Angeles.

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[1] While the NAIC data are clearly labeled as claims paid, the nature of the Johnson and Higgins data are not clear. Inquiries to Johnson and Higgins were unable to resolve this uncertainty. For lack of a better assumption, the calculations that follow treat the Johnson and Higgins data as claims paid. The conclusions remain approximately valid if the correct definition is claims filed, as long as the probability of a filed claim being paid does not vary drastically across specialty.

Table 2

Claims Data by Specialty

ISO Class Codes	Mean Dollars per Claim	Relative Claims per Physician per Year	Fraction of Physicians in Class
Class 1 80111 (Physician no sgy.)	15,432	0.23	0.452
Class 2 80112 (Physician min. sgy.)	15,955	0.39	0.031
Class 3 80113 (GP Sgy./Card. no sgy.) 80114 (Ophthalmology sgy.) 80115 (Colon and Rectal sgy.)	19,997	0.52	0.014
Class 4 80145 (Urology sgy.)	19,145	0.73	0.022
Class 5 80142 (Otolaryngology sgy.) 80143 (General sgy. misc.) 80151 (Anesthesiology) 80155 (Pl.Sgy. Ear Nose Thr.)	25,853	0.67	0.302
Class 6 80153 (OB/GYN sgy.) 80156 (Plastic sgy. misc.)	19,383	1.08	0.089
Class 7 80144 (Thoracic sgy.) 80152 (Neurosurgery) 80154 (Orthopedic sgy.)	27,192	1.03	0.079

SOURCE: (1) "Mean Dollar Per Claim, Number of Claims" NAIC Malpratice Claims, National Association of Insurance Commissioners, Vol. 1, No. 4, May 1977. These are national data from a survey of all insurers with premiums of at least $1,000,000 covering the period July 1, 1975 to June 30, 1976.

(2) These are California premiums effective October 1, 1975.

If so, the 8,000 physicians in the Johnson and Higgins group and their claims experience should be distributed across specialties in the same proportion as the NAIC data. For example, 45 percent of the Johnson and Higgins physicians should do no surgery and their claims rate should be 0.32 times that of urologic surgeons. If the overall rate λ is 2300/8000 = 0.2875 and the relative number of claims per practitioner by specialty are those shown in Table 2, the estimated claims rates for Johnson and Higgins physicians are those given in Table 3.

The assumption that true claims frequencies are the same within specialty class can be tested by computing the expected number of physicians with at least four claims under this assumption and comparing it with the observed number of physicians using the chi-square test. Table

Table 3

Expected Claims Frequency if Claims are Homogeneous Within Specialty Classes

Specialty Class	Estimated Number of Physicians	Expected Number of Physicians with at least four claims	$\hat{\lambda}_i$ Estimated Claim rate
1	3619.15	0.03	0.13
2	246.56	0.18	0.21
3	108.97	0.02	0.28
4	181.62	0.14	0.40
5	2468.90	1.36	0.36
6	729.77	2.28	0.59
7	645.02	1.81	0.57
Total Expected	8000.00	5.67	0.29
χ^2 value: (one degree of freedom)	286.86		

3 gives the (estimated) number of physicians in each of the seven specialty classes together with the expected number of physicians with at least four claims. This expected number for class i is computed as

$$E_i = m_i\left(1 - \sum_{j=0}^{3} \frac{\hat{\lambda}_i^j}{j!} e^{-\hat{\lambda}_i}\right), \tag{1}$$

where $\hat{\lambda}_i$ and m_i are the estimated claims rate and the estimated number of physicians in specialty class i respectively.[2] The total expected number of physicians is $E = \sum_{i=1}^{7} E_i$. The expected value of E is 5.67 while the observed value is 46. The difference is statistically significant. (The reported chi-square can be referenced by a chi-square distribution with one degree of freedom to give an upper bound on the significance probability and hence a conservative test.) Thus the hypothesis that malpractice claims frequencies are constant within specialty classes is conclusively rejected for the Johnson and Higgins data.

Med-Chi Data

This hypothesis can also be tested using the Med-Chi data. Table 4 gives the Med-Chi claims experience by specialty as broken down by the four highest risk specialties and all others in contrast to the seven-category breakdown of the Johnson and Higgins data in Table 2. Because actual claims frequencies are given in the Med-Chi data, premium or loss

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[2] The value of m_i and $\hat{\lambda}_i$ are calculated from the two right-hand columns of Table 2. Define m_i to be the fraction of physicians in class i times 8000 and let $\hat{\lambda}_i$ be a constant times the relative claims per physician per year for class i where the constant is defined by the requirement that the resulting total claims rate be $\hat{\lambda} = 2300/8000$.

Table 4

Frequency of Claims in Med-Chi Data

Specialty	Number of Claims in Ten-Year Period	Percent of Claims	Percent of Med-Chi members
1 Anesthesiology	36	9.8	4.1
2 General Surgery	86	22.5	10.2
3 OB/GYN	68	17.8	9.3
4 Thoracic Surgery	9	2.2	0.8
5 All Other	182	47.7	75.6
Total	381	100.0	100.0

SOURCE: William R. Pabst, Jr., "Comments on a Survey of Professional Liability Incidence in Maryland," in Appendix: Report of the Secretary's Commission on Medical Malpractice, DHEW Publication No. (OS)73-89, January 1973.

data are not needed to reconstruct either the number of physicians (m_i) or the claims rate ($\hat{\lambda}_i$). Table 5 shows the analogous expected claim frequencies and chi-square values. Note that the Med-Chi malpractice claims occurrence experience was considerably less severe than the Johnson and Higgins data. Thus, the evidence against homogeneous physician claims frequencies within specialty class is weaker, but still statistically conclusive.

Table 5

Expected Claims Frequencies if Claims are Homogeneous
Within Specialty Class (Med-Chi Data)

Class	Number of Physicians	Expected Number of Physicians By Claim Frequency 0	1	2	3 or more	$\hat{\lambda}_i$ (Rate of Claims in the Ten-Year Period)
1 (Anesthesiology)	130	97.12	28.17	4.08	0.42	0.29
2 (General Surgery)	323	247.51	65.84	8.76	0.84	0.27
3 (OB/GYN)	294	233.94	53.81	6.19	0.50	0.23
4 (Thoracic Surgery)	25	18.21	6.01	0.99	0.12	0.33
5 (All Other)	2394	2281.33	168.60	6.41	0.16	0.076
Total Expected	3122	2815.11	322.43	26.43	2.04	0.12
Total Observed	3122	2844.00	276.00	36.00	10.00	0.12

χ^2 = 41.51 (3 degrees of freedom).

2. CLAIMS FREQUENCIES BY INDIVIDUAL PHYSICIAN

Section 1 established for both the Johnson and Higgins data and the Med-Chi data that individual physician claims frequencies are not the same within specialty class. Section 2 models how individual claim frequencies might vary within class as well as across specialty class. Using these models, it explores the efficacy of experience rating for medical malpractice insurance. In particular, it derives estimates of the expected number of future claims for an individual physician as a function of the number of paid malpractice claims against the physician in the past. These estimates depend on assuming the classic Gamma-Poisson occurrence process (described below) and would change with alternative assumptions. The Johnson and Higgins data are used because they are the most recent.

The Model

Suppose that each physician has an underlying long-term characteristic claim likelihood that can be well approximated by that physician's average number of claims per year over a long period working under constant conditions. Let X_{ij} be the number of claims from physician j in specialty class i for the four-year period of data and let λ_{ij} be his characteristic claims frequency. Given λ_{ij}, assume that X_{ij} has a Poisson distribution with mean λ_{ij}. To allow for variation within specialty class, suppose now that within each class λ_{ij} has a probability distribution. Specifically, assume that λ_{ij} has a gamma distribution with parameters (α_i, β_i) in specialty class i. Thus, the conditional frequency function of X_{ij}, given λ_{ij}, is

$$P(X_{ij} = x|\lambda_{ij}) = \frac{\lambda_{ij}^{x}}{x!} e^{-\lambda_{ij}}; \; x = 0, 1, \ldots \tag{2}$$

and the density of λ_{ij} is

$$f(\lambda_{ij}|\alpha_i, \beta_i) = \frac{\beta_i^{\alpha_i}}{\Gamma(\alpha_i)} \lambda_{ij}^{\alpha_i - 1} e^{-\beta_i \lambda_{ij}} \text{ for } \lambda_{ij} > 0 \tag{3}$$

where the gamma function Γ is defined by

$$\Gamma(\alpha_i) = \int_0^\infty u^{\alpha_i - 1} e^{-u} du. \tag{4}$$

The mean and variance of the gamma distribution are $\mu_i = \alpha_i/\beta_i$ and $\tau_i^2 = \alpha_i/(\beta_i^2)$, respectively.

The λ_{ij}'s being drawn from a probability distribution corresponds to the physicians in the Johnson and Higgins sample being drawn from a larger population of physicians in specialty class i. The compound Poisson model of claim frequencies described above is a commonly used model in insurance research. [See 8 and 3]. The approach used here is to estimate the scale parameter β_i of the gamma distribution for each specialty class separately and estimate a common shape parameter $\alpha_i \equiv \alpha$ for all specialty classes. Thus the distribution of λ_{ij} for specialty class i looks like the distribution from specialty class i' except that the scale may be changed. The fact that the Johnson and Higgins data give only the number of physicians with four or more claims together with the specialty class data in Table 2 limit the number of estimable parameters to eight. Thus, unfortunately it is necessary to assume that

$\alpha_i \equiv \alpha$. Hopefully, more complete data in the future will allow this assumption to be tested.

The parameters (α, β_i) for specialty class i are estimated as follows. From Tables 2 and 4, the mean claim frequency μ_i for specialty class i is estimated as $\hat{\mu}_i = \hat{\lambda}_i$. Since $\hat{\beta}_i = \hat{\alpha}/\hat{\mu}_i$ it remains only to estimate α using the analogue of Equation (1). That is, the expected number of claims for class i is

$$E_i = m_i(1 - \sum_{x=0}^{3} P(X_i = x)) \tag{5}$$

where the j subscript on the X's and λ's is dropped for convenience. Now since the λ_i have a gamma distribution, Equations (3) and (4) with $\alpha_i \equiv \alpha$ imply the well-known result that the unconditional distribution of X_i is the negative binomial distribution with parameters α and $1/\beta_i$. [See 5, Chapter 5, for further properties.]

$$P(X_i = x) = \binom{\alpha + x-1}{\alpha-1}\left(\frac{\beta_i}{\beta_i + 1}\right)^{\alpha}\left(1 - \frac{\beta_i}{\beta_i + 1}\right)^{x} \tag{6}$$

Therefore $E_i = m_i\ \Pi(\alpha, \beta_i)$ where

$$\Pi(\alpha, \beta_i) = 1 - \sum_{x=0}^{3} \binom{\alpha + x-1}{\alpha-1}\left(\frac{\beta_i}{\beta_i + 1}\right)^{\alpha}\left(1 - \frac{\beta_i}{\beta_i + 1}\right)^{x} \tag{7}$$

To get a method of moments estimator of (α, β_i), the expected value of the number of physicians with four or more claims can be set equal to 46, the number of doctors in the Johnson and Higgins data with four or more claims. Thus,

$$\sum_{i=1}^{7} m_i \Pi(\hat{\alpha}, \hat{\beta}_i) = 46 \tag{8}$$

subject to $\hat{\beta}_i = \hat{\alpha}/\hat{\mu}_i$ where $\hat{\mu}_i = \hat{\lambda}_i$. Equation (8) reduces to

$$\sum_{x=0}^{3} \binom{\hat{\alpha} + x-1}{\hat{\alpha}-1} \sum_{i=0}^{7} m_i \left(\frac{\hat{\alpha}}{\hat{\alpha} + \hat{\mu}_1}\right)^{\hat{\alpha}} \left(\frac{\hat{\mu}_i}{\hat{\alpha} + \hat{\mu}_i}\right) x = 7954. \tag{9}$$

The solution to this equation is $\hat{\alpha} = 0.88$. Table 6 gives estimates of (α, β_i) for the Johnson and Higgins data.

The Estimates and Their Implications

The entries in Table 6 under "no adjustment for experience" give the estimated probability distributions of the underlying claims frequencies for each specialty class of physicians--the distribution of the λ_{ij}. It is not surprising that the mean rates vary by a factor of more than four, from 0.13 claims per four years to 0.59 claims per four years. It is this difference that leads insurers to charge premiums that differ by specialty class. The more surprising finding is that the dispersion of underlying claims frequencies within specialty class is quite large. The estimated standard deviations range from 0.13 to 0.63. These estimated probability distributions imply that there are substantial differences in malpractice claim propensities among physicians in the same specialty. Hence, there is substantial overlap between classes. For example, on average, physicians doing minimal surgery (class 2) have less than half the malpractice claims of urologic surgeons (class 4), but the probability is 0.37 that a randomly drawn urologic surgeon will have a lower underlying malpractice claims frequency than a randomly drawn physician doing minimal surgery.

Table 6

Estimated Underlying Distribution of Claims Frequency
By Specialty Class
(Johnson and Higgins Data)

	No Adjustment for Experience			Experience Taken into Account				
Class	Gamma Parameters $(\hat{\alpha}, \hat{\beta}_i)$	Mean Claims Rate (per Four Years) (α/β_i)	Standard Deviation $(\sqrt{\alpha}/\beta_i)$	Mean Claims Rate (per Four Years) for Physicians with the Indicated Number of Claims: 0	1	2	3	4
1	(0.88, 7.03)	0.13	0.13	0.11	0.23	0.36	0.48	0.61
2	(0.88, 4.14)	0.21	0.23	0.17	0.37	0.56	0.75	0.95
3	(0.88, 3.11)	0.28	0.30	0.21	0.46	0.70	0.94	1.19
4	(0.88, 2.21)	0.40	0.42	0.27	0.58	0.90	1.21	1.52
5	(0.88, 2.41)	0.36	0.39	0.26	0.55	0.84	1.14	1.43
6	(0.88, 1.50)	0.59	0.63	0.35	0.75	1.15	1.55	1.95
7	(0.88, 1.54)	0.57	0.61	0.35	0.74	1.13	1.53	1.92

Note: The mean underlying claim rates given 0, 1, 2, ..., 4 claims are calculated using Bayes Theorem. Bayes Theorem states that if the distribution before experience is taken into account is gamma with parameters (α_i, β_i), then after x claims it is gamma with parameters (α_i+x, β_i+1). The mean of this distribution is $(\alpha_i+x)/(\beta_i+1)$ and is used to compute the means in the Table.

The spread of underlying malpractice claims rates within specialty class gives some grounds for hoping that including additional information about physicians might substantially reduce this spread and hence differentiate physicians still further in setting premiums. One possibility of such additional information is a physician's malpractice claims experience during the preceeding several years.

The entries under "Experience taken into account" in Table 6 shows that, from the insurer's point of view at least, there are gains to be made from merit rating. To understand Table 6, consider class 4, urologic surgeons. Before taking malpractice claim experience into account, urologic surgeons average 0.40 claims per four years or 0.10 claims per year. The same physician with four claim free years has his expected claim rate reduced 32 percent to 0.27. If this physician has one claim in the four-year period, the expected claim rate rises to 0.58. The extreme case, a physician with four claims in the four years, has an expected claim rate more than triple the initial no experience rate. Remember that multiple claims are relatively rare so that the most relevant comparison for most physicians is no claims vs. one claim. The calculations in the table assume four years of claims experience; the numbers would, of course, change for, say, two years or six years.

How much information does four years of malpractice claim experience add to knowing a physician's specialty class? The column of means in Table 6 shows that the specialty class can affect expected claim rate by as much as a factor of four and one-half--class 1 to class 6. The difference in expected future claim rates between no claims and one claim in four years is at least twofold for all specialties while the difference between no claims and four claims is about sixfold. Thus, the additional effect of four years of malpractice claim experience on expected claim rates is of the same magnitude as the initial effect of separating physicians into specialty classes.

Comparing the expected claim rates does not tell the whole story--classes defined by both specialty and claims experience are still quite heterogeneous groups with respect to the underlying claim rates of individual physicians. It is possible for many physicians with good claims experience to have higher individual underlying claim rates than those with poor experience. Figure 1 illustrates this effect for urologic surgeons with no claims in four years and with one claim in four years. Though the actuarial rates for the two classes differ by a factor of 2.1, the curves have considerable overlap. The probability of a randomly selected urologic surgeon with no claims have an underlying claim rate greater than a randomly selected urologic surgeon with one claim is 0.24. Because of the law of large numbers, it is sufficient for the insurer to look only at the average for each class; individuals can be substantially overcharged or undercharged as compared to their true underlying rates.

Thus far, the discussion of the usefulness of and desirability of merit rating has focused on how much a physician's previous malpractice claims experience affects the expected number of claims in the future. As stated above, even with knowledge of a physician's claims experience, there is still substantial uncertainty about the underlying claim rate. Since, even with merit rating, premiums are charged according to the expected claim rate for a given specialty and claims experience,

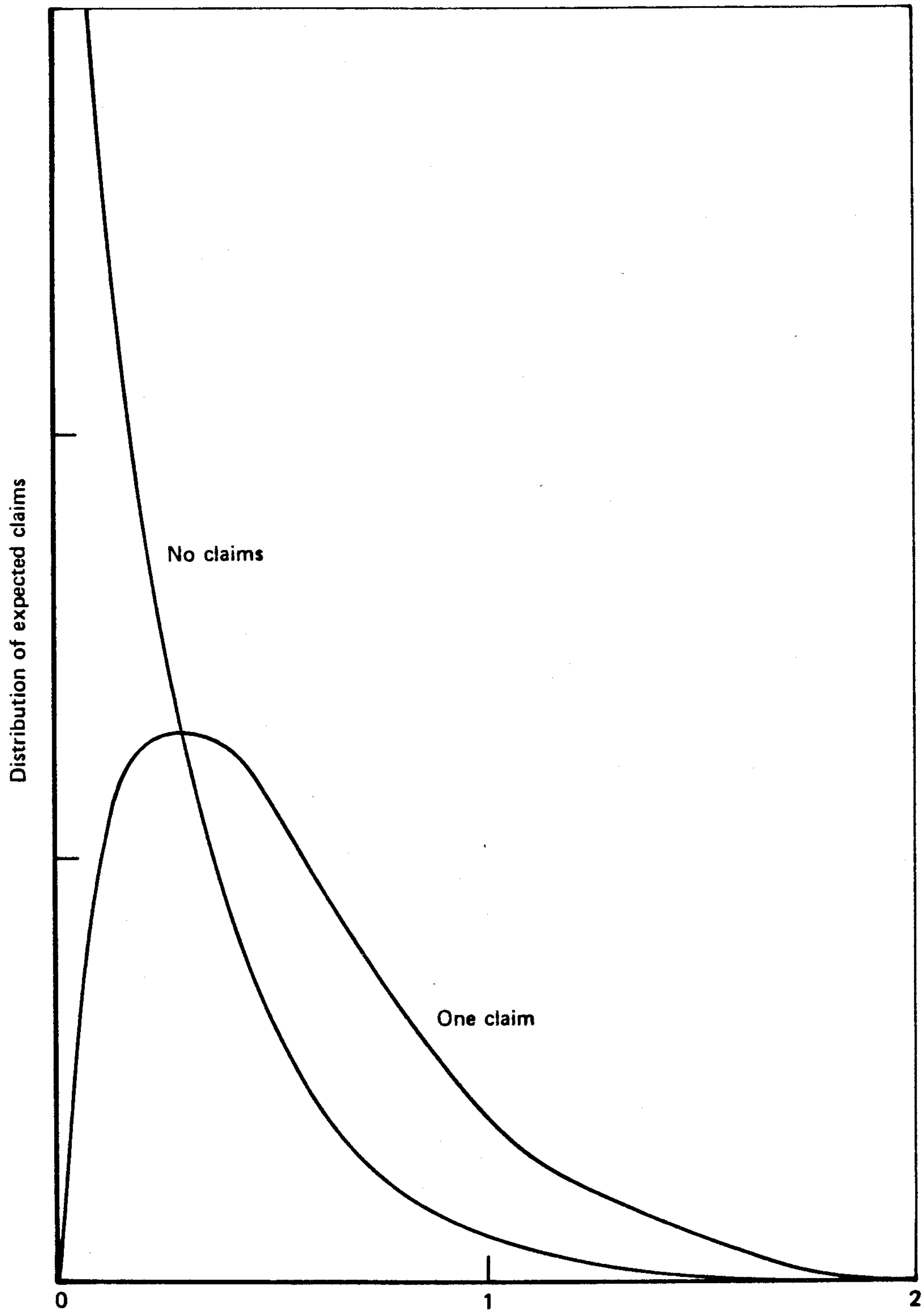

Fig. 1 — Expected loss distributions for urologists with surgery

virtually all physicians in a given class will be either overcharged or undercharged as compared to the "true charge" based on the physician's underlying rate λ_{ij}. The magnitude of this overcharging and undercharging can be reduced by including more information about each physician such as board certification or age, in the calculation of the expected underlying claim rate. But there is inevitably a balancing of accuracy in this sense against various obstacles to getting better predictive information. Some information is expensive to obtain, some is illegal, and some is impossible. In imperfect markets, a variety of factors must be weighed in defining classes of policyholders to use in setting premiums. More generally, the interests of the insurer and insured may not be the same with respect to the risk assessment techniques used in setting premiums.

In a thoughtful study of risk assessment techniques for automobile insurance, Shayer [9, p. 2-6] lists five criteria for classification variables that would seem to be relevant to medical malpractice insurance as well. They are separation, homogeneity, reliability, admissibility, and incentive value. Separation and homogeneity have been the only criteria considered thus far in this article. That is, classification variables should statistically separate the population into relatively homogeneous subpopulations. Reliability means that the classification variables are easy to administer and are not readily susceptible to fraud. Being admissible means being socially acceptable and fair. For example, distinctions based on race, religion, or national origin are clearly inadmissible. Finally, incentive value is synonymous with deterrence for classification variables in malpractice insurance.

Schwartz and Komesar [7] give an excellent exposition of the deterrence aspects of malpractice insurance.

Public policymakers may impose other admissibility and incentive value classification criteria in the insured's interest. For example, government regulators in Massachusetts [11] have recently altered the traditional actuarial method of setting automobile insurance premiums. This example may be relevant to medical malpractice insurance particularly with regard to government regulators and doctor owned insurance cooperatives. While the automobile insurance experience is instructive, further research is needed to assess how the interest of the physician might be factored into malpractice insurance rate setting both with regard to the use of claims experience as well as the use of other classification information.

3. SUMMARY

By analyzing some fragmentary publicly available data on malpractice insurance claims, this paper has marshaled some evidence that merit rating within medical specialty may be useful for malpractice insurers. First, Section 1 showed that the claims experience in both the Johnson and Higgins data and the Med-Chi data is inconsistent with the hypothesis that malpractice claims are randomly distributed among the physicians within each specialty class.

Section 2 modeled how individual physicians' underlying claims rates vary within specialty class for the most recent data set--Johnson and Higgins. This analysis showed that under certain (very strong) assumptions, the incremental effect of four years of a physician's malpractice claims experience on his or her expected claim rate over and above the effect of the physician's specialty can be substantial. Since insurance premiums are based on an individual's expected claim rates, this analysis implies that it may well pay insurers to merit rate--a practice not now employed in the malpractice insurance industry to a significant degree.

The data analysis in this paper used only differences in malpractice claim frequencies as a function of specialty class and experience. While differences in the size of claims also affect premiums, the Johnson and Higgins data on size of claims are too sketchy for statistical analysis. However, it is worth emphasizing that the 46 Johnson and Higgins physicians with four or more claims had 30 percent of all claims payments, but only 10 percent of all suits. Thus, on average, these 46 physicians had claims that were 2.3 times as large as their colleagues who had three or fewer claims in the four-year period. This group's larger claim size is additional evidence that experience rating would probably lead to substantial differences in premium levels.

The conclusion that a physician's malpractice claims experience is a useful predictor of future claims follows from statistical calculations that are based on strong assumptions due to data limitations. These limitations point to the clear need for more complete data so that a more comprehensive analysis of the feasibility of merit rating in medical malpractice insurance can be carried out. Nonetheless, this article shows that under reasonably plausible assumptions, merit rating is viable in medical malpractice insurance.

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