

# Rate adjusters for Medicare under capitation

by Joseph P. Newhouse

*This article addresses three issues related to capitation. First, the average adjusted per capita cost (AAPCC) fluctuates with the mix of risks in the fee-for-service system. More sensitive adjusters in the AAPCC are needed. Second, the AAPCC, as now estimated, exhibits large geographic variance; so-called shrinkage estimators may help. Third, the AAPCC*

*requires new adjusters to yield more homogeneous risk classes. Otherwise, the portion of the Medicare population under capitation may experience access problems at alternative delivery systems. Until such adjusters are developed, it seems better to rely upon a blend of capitation and fee-for-service than the present AAPCC.*

## Introduction

Until recently, Medicare has made little use of capitation, the practice by which an organization is paid a fixed annual amount per person to provide necessary medical services. Several recent trends, however, have given impetus to increasing Medicare's reliance on capitation.

First, it has become more widely accepted that group and staff model health maintenance organizations (HMO's), the premier examples of capitated delivery systems, practice a less expensive style of medicine, with little or no adverse effect on health (Luft, 1981; Manning et al., 1984; Ware et al., 1986). Many attribute the cost reduction to the incentive of capitation.<sup>1</sup>

Second, capitation is seen as an answer to the incentives in the prospective payment system (PPS) to "unbundle," that is, to shift services out from under the fixed price the hospital receives for the inpatient stay (Morrisey et al., 1984). A clear example of unbundling is the earlier discharge of patients from the hospital to a skilled nursing facility (SNF) or to home health care, both of which are reimbursed separately from the fixed payment made to the hospital. If Medicare paid one organization an annual amount and looked to that organization to be fiscally responsible for all services, the unbundling problem should be minimal.<sup>2</sup>

Increased reliance on capitation, however, makes more acute the problems involved in setting the capitated rate. In this article I examine three such problems: the present link between the capitation rate and fee-for-service payments; the likelihood that the present method used to calculate the capitation rate introduces too much spread (variance) across geographic areas in the rates; and the characteristics

of enrollees in a capitated system that should be accounted for in computing the rate. I will term these characteristics "adjusters," because they are used to adjust the rate.

## Link between capitation and fee-for-service

### Adjusted average per capita cost

The original Medicare Act made little accommodation to capitated delivery systems such as health maintenance organizations (HMO's). Indeed, it had no arrangements for a prospective capitated rate at all and simply provided that HMO's could be reimbursed at cost. After the 1971 Nixon White Paper endorsing HMO's, Congress enacted the 1972 amendments to the Social Security Act, which provided that Medicare could sign at-risk contracts with HMO's (i.e., could use a prospective capitated rate). The regulations implementing this legislation defined the adjusted average per capita cost (AAPCC). Conceptually, the AAPCC was the estimated cost to Medicare if the HMO enrollees had instead remained in the fee-for-service system. If HMO costs were less than the AAPCC, the HMO could keep one-half the difference, up to a maximum of 10 percent of the AAPCC.

The AAPCC is calculated by county, beginning with the cost to Medicare per fee-for-service enrollee.<sup>3</sup> One then adjusts that cost to the extent the HMO enrollees differ from the fee-for-service population of the county in terms of age, sex, welfare status, and institutional status.<sup>4</sup> The adjustment factors are based

<sup>1</sup>See, for example, President Nixon's February 18, 1971, message to Congress on HMO's, as quoted in Iglehart (1982). See also Iglehart (1985). Although much commentary focuses on the incentives of capitation, some have pointed out that large multispecialty groups, whether prepaid or fee-for-service, may practice with a less hospital-intensive style (Nobrega, Krishan, Smoldt, et al., 1982; Gaus, Cooper, and Hirschman, 1976).

<sup>2</sup>I use minimal rather than nonexistent, because there might still be some attempt to substitute uncovered services, such as drugs, for covered services.

Reprint requests: Joseph P. Newhouse, Rand Corporation, 1700 Main St., P.O. Box 2138, Santa Monica, California 90406.

<sup>3</sup>The statement in the text is a slight oversimplification. The AAPCC multiplies the national per capita cost in any year by the ratio of the county per capita cost to the national per capita cost, but the latter ratio is defined over a 5-year moving average.

<sup>4</sup>See Kunkel and Powell (1981); Beebe, Lubitz, and Eggers (1985); or the *Federal Register* (1985) for a technical description of the AAPCC.

NOTE: This research was supported by the Health Care Financing Administration under Cooperative Agreement Number 15-C-98489/0-03. The opinions expressed herein are those of the author and should not be construed as representing the opinions or policy of any agency of the U.S. Government.

on national (fee-for-service) experience.<sup>5</sup> For example, there are five age groups considered by the AAPCC, and the adjustment factor for each age group reflects expenditures by that age group in the national program.

The AAPCC concept is still employed by Medicare in modified form, and, as the number of those enrolled in capitated systems expands, a difficulty is becoming increasingly evident. Because the AAPCC bases the capitation rate on the utilization of those remaining in the fee-for-service system, it is vulnerable if capitated systems, as a group, obtain a nonrepresentative group of enrollees within the AAPCC's age, sex, welfare status, and institutional status categories. In a given year, for example, HMO's might increase their enrollment of low-cost individuals within each category. If this were to happen, the Medicare program would overpay HMO's in two senses: 1) Medicare would pay an average rate (actually, 95 percent of the AAPCC) for a below-average cost group; and 2) when the AAPCC is recomputed next year, the average for those remaining in the fee-for-service system will be higher, and so, next year, HMO's will receive even more payment. The difficulty arises because the AAPCC links the HMO payment to what Medicare pays for fee-for-service enrollees.

### **Adjusted community rate**

The Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982 caused the regulations to change in 1985; TEFRA introduced the concept of the adjusted community rate (ACR), which partially addresses the vulnerability of the AAPCC just described. The ACR is based on rates an HMO or alternative delivery system charges for its private business (for patients under 65 years of age), adjusted for differences between the privately insured population and the Medicare population (Trieger, Galblum, and Riley, 1981). The HMO is paid 95 percent of the AAPCC, but if that amount exceeds the ACR, the difference must be used to provide Medicare enrollees additional benefits or reduce their cost sharing.<sup>6</sup> If 95 percent of the AAPCC is less than the ACR, however, the HMO need not extend additional benefits.

Because the ACR is determined by what HMO's charge in their private business, and not what Medicare pays fee-for-service providers, it is unaffected by HMO's enrolling a nonrepresentative (within age-sex categories) group of Medicare beneficiaries. Medicare payments are still vulnerable to nonrepresentative enrollment, however, because such enrollment affects the AAPCC, and any excess of 95 percent of the AAPCC over the ACR is

funneled back to beneficiaries.<sup>7</sup>

Perhaps more important, the promise of the ACR to pay alternative delivery systems on the basis of a market rate, rather than an administratively determined rate, appears negated in practice because of major implementation problems. The difficulty arises from the adjustments necessary to make the Medicare rate comparable with the HMO rate for the under-65 population.

Adjustments must be made for both differences in benefits between the Medicare program and private business, as well as the higher rates at which the elderly use any given benefit.<sup>8</sup> Consider first the benefit differences. Some arbitrariness can be introduced in costing benefits the HMO provides in its private business that Medicare does not provide. For example, an HMO that provides its under-65 population a prescription drug benefit has an incentive to minimize the reported cost of that benefit because Medicare does not cover outpatient drugs; an HMO also has an incentive to maximize the reported cost of hospital and physician services that Medicare does cover.<sup>9</sup> The problem becomes even more acute if Medicare covers a benefit that the HMO does not provide in its private business (or provides to few individuals, such as home health services); in that case, Medicare does not observe a market rate and so cannot reimburse on such a basis.

In practice, however, the more serious problem is probably the adjustment for the higher use of the elderly. This adjustment has, in fact, been based on the observed use of the elderly relative to the non-elderly within any given HMO. Such an adjustment clearly moves away from the notion of a market price for the elderly that the HMO takes as a given. If, for example, the HMO decides to increase its services to the elderly by 10 percent, while keeping constant its services to the nonelderly, the HMO's reimbursement would rise 10 percent, up to a limit of 95 percent of the AAPCC. Using factors based on national experience to adjust the HMO's rate would eliminate this problem, but would raise another: Both the aged and the non-aged who are enrolled in any given HMO may differ from the national population. Thus, use of national experience would raise the same problem that now plagues the AAPCC, namely, how to adjust rates for varying characteristics of those enrolled in the HMO.

### **Excessive geographic variance**

As noted earlier, the AAPCC is based on mean fee-for-service costs in the enrollee's county of residence. Some have suggested that the resulting rates

<sup>5</sup>The three categories of Medicare beneficiaries, the aged, the disabled, and those with end stage renal disease, are treated separately in making these calculations.

<sup>6</sup>The HMO could accept reduced payments, but there is clearly no reason to do so.

<sup>7</sup>Regulations preclude HMO's from charging a sham rate on a tiny volume of private business by a requirement that one-half (or more) of the enrollees not be Medicare or Medicaid beneficiaries.

<sup>8</sup>The elderly use services at more than three times the rate of the nonelderly (Fisher 1980).

<sup>9</sup>In particular, an HMO will seek accounting rules that allocate as much joint cost as possible away from services such as drugs; for further analysis of this problem see Danzon (1982).

seem to have too much spread. Greenlick (1985), for example, notes that the five AAPCC's in the five counties that make up the Portland (Oregon) metropolitan area vary by a factor of 2, and it does not seem likely that expected annual costs of caring for Medicare beneficiaries vary that much among contiguous counties.<sup>10</sup>

Part of the problem may be the use of the (sample) county mean to estimate the AAPCC for the county. Consider what turns out to be an analogous problem, estimating the end-of-season batting averages of baseball players from their first 50 at bats. Those who follow baseball know that there will be more spread in batting averages after only 50 at bats than at the end of the season.

Recent advances in statistics show that if one wants to predict the batting average of each player at the end of the season, one can do better than simply using his average after 50 at bats. Similarly, if one wants to estimate the true (population) mean expenditure rate for many counties, one can do better than use each county's sample mean.

The better method uses a weighted combination of the individual county mean and the mean of a larger population (the metropolitan mean, for example, or the mean of several rural counties). The weight on the individual county mean is less as the spread among all the county means decreases and as the number of county means being considered increases. Such a procedure shrinks all the county means toward the mean of the larger group (i.e., it will reduce the spread in the county means); this procedure can be shown to have lower mean square error for estimating the true mean of each county than using the sample mean for each county.<sup>11</sup>

One may ask why the county is the appropriate geographic area to use rather than, say, the mean of a larger area, perhaps a metropolitan area. Essentially, the choice of area size is a tradeoff between the reduction in variance (or noise) one would obtain with a larger area versus the (likely) increased heterogeneity within the area; for example, the mean of a metropolitan area would mask any true differences in the means among the various counties it comprises. Exploring this tradeoff would be a worthy future research project.

<sup>10</sup>Part of this variation, perhaps a large part, reflects style differences among providers (Wennberg and Gittelsohn, 1973; Chassin et al., 1986). The shrinkage estimator proposed here does not address that issue, but rather the problem that the actual mean costs per county in any year may be a noisy estimate of expected costs because of the skewness of the expenditure distribution.

<sup>11</sup>For a nontechnical account see Efron and Morris (1977), who use the batting average example. A very similar problem to estimating the AAPCC for each county is to estimate the true rate of false alarms from any given fire alarm box. The solution to this problem is given in Carter and Rolph (1974). Methods proposed by Efron and Morris (1972) are also relevant for this problem.

## Adjusting rates for beneficiary characteristics

One can divide the problem of setting rates into that of setting the level of rates (i.e., the base price or average payment per person), and setting the structure of rates (i.e., appropriate differences across persons). I am principally concerned with the rate structure and have only a brief initial comment on the issue of level. The AAPCC uses the fee-for-service system to set the level. The main alternatives involve the alternative delivery system's quoting a price. Beneficiaries could be given vouchers and told to shop among systems, or systems could be asked to bid. In either case, however, the issue would arise of how the price (or value of the voucher) should vary with the characteristics of the beneficiary.

Another way to frame the same question is to ask: What variables should be included in the AAPCC? That is, what variables should be used to adjust for differential risk of treatment among people who are enrolled in a capitated health plan? As noted earlier, the present AAPCC uses age, sex, welfare status, and institutional status, but there is near universal agreement that this list is inadequate because it explains only 0.6 percent of the variance in Medicare expenditure (Lubitz, Beebe, and Riley, 1985). Although 0.6 percent is, clearly, too low a number, it is less clear what amount of variance one should seek to explain.

In principle, one wants to estimate the expected expenditure for each individual; actual expenditure in any year will differ, depending on how sick the person is that year.<sup>12</sup> Thus, one wants to know how much expected expenditure varies across people. In a longer version of this paper (Newhouse, 1986), I critique the literature on this issue, and conclude that at least 20 percent (and probably much more) of the variance is predictable by an alternative delivery system.

Because the present adjusters explain only a tiny fraction of the variance in expected expenditure, there will, necessarily, exist a group of people whom the delivery system perceives as having higher expected costs than it is reimbursed for. Although each delivery system makes money on some people, any such system can always improve its bottom line if it does not have the "losers" as enrollees. This is especially so if the delivery system does not enroll the top few percent of spenders (e.g., the top 5 percent account for one-half the total costs). Such high-spending individuals, to the degree the delivery system can predict their expenses, are like the queen of spades in a game of Hearts: each system may well try to send

<sup>12</sup>I do not take up the normative issue that Medicare may not wish to pay for some services (e.g., harmful or nonefficacious care). To keep the discussion focused on the problem of heterogeneity among individuals, I will treat the actual expenditure by each individual as proportional to (more specifically, a linear function of) the care Medicare wishes to pay for. Also, I note that the actual AAPCC uses location, which explains some additional, presumably modest portion of the variance.

these individuals elsewhere; those systems that do not may soon find themselves saddled with so many such individuals that the systems must send them elsewhere or go broke. I call this diversion of some patients "the problem of selection."

If there is a residual fee-for-service system, high-spending individuals could tend to remain in that system. In such a case, those whose expected costs are less than the capitated rate will tend to enroll in alternative delivery systems.<sup>13</sup>

Medicare, in fact, attempts to prohibit selection by regulations, but such regulations appear, ultimately, unenforceable. If physicians want to discourage particular patients from seeing them, there are many subtle ways to do so (e.g., appearing unsure about the patient's diagnosis, being curt, or keeping the patient waiting).

## A contrary view

On the basis of the data sketched earlier and presented in more detail in Newhouse (1986), the case that the current version of the AAPCC needs modification seems compelling and is, in fact, widely accepted. Nonetheless, a contrary view holds that the problem of selection is exaggerated (Pauly, 1984, 1985). Pauly believes that the empirical evidence for the actual extent of biased selection is weak (see next section). Pauly also argues that the theoretical case for inefficiency as a result of selection is based on a model described by Rothschild and Stiglitz (1976), the inefficiency therein being that good health risks cannot obtain as much insurance as they wish. Pauly correctly notes that no one has presented evidence that establishes such an inefficiency, and he draws the overall conclusion that "as long as one avoids things like community rating and too easy switches across policies, adverse selection need not be a difficulty."

Pauly's dismissal of adverse selection follows logically from his premise, but the premise is of doubtful validity. I take "avoids . . . community rating" to mean not paying the same amount for individuals with different expected costs; thus, either the capitated rate is set individually, or nearly homogeneous risk groups are defined, but the 0.6 value for explained variance suggests that we are a long way from homogeneous risk groups.<sup>14</sup>

Although community rating is the principal issue, the avoidance of "too easy switches" in the Medicare program is also an issue; enrollees can, at present, change plans every month. This regulation on plan changing probably should be changed to once a year,

<sup>13</sup> The systems make extra profits on all but the marginal cases; these profits, however, may be competed away in amenities, just as airlines with regulated fares competed away profits by having frequent, but not very full, flights. (Held and Pauly, 1983). In any event, expenditures by the Government will rise.

<sup>14</sup> If the alternative delivery system states a price for each individual that reflects that individual's expected costs, then selection should not be an issue. This appears to be what Pauly has in mind. However, the common situation seems that of a price for a heterogeneous class of enrollees, viz., the AAPCC (Newhouse, 1984).

the general standard in the private sector. In sum, because the Medicare program, under current arrangements, can scarcely be said to have avoided community rating, and because plan switches by Medicare beneficiaries seem easy, we have no reason, on a priori grounds, to be optimistic about selection.

Some object to individual rating on the grounds that it fails to insure against bad luck at birth; that is, sickly individuals would face higher premiums because they have higher expected costs. If desired, however, more sickly individuals could be given higher vouchers; in any event, this issue of equity is not the issue I am addressing here. Rather, I wish to focus on the extent to which individual rating is feasible, i.e., what adjusters can be used, and the consequences, if the adjusters actually used are not very good.

## Evidence on adverse selection

The argument to this point has been that we have some indirect or theoretical reasons to expect that adverse selection could be a serious problem. Such an argument certainly is not as compelling as direct evidence. But what evidence is there that adverse selection is an important empirical problem? Unfortunately, there is rather little direct evidence one way or the other. Much of it comes from comparing those who either enroll in, or disenroll from, HMO's with those who remain in whatever system they have chosen; these two generic types of studies yield conflicting evidence.

## Evidence on enrollment

Several studies have compared use rates of HMO enrollees and nonenrollees at a time prior to HMO enrollment, when both groups were in the fee-for-service system (Eggers, 1980; Eggers and Prihoda, 1982; Luft, 1981; Jackson-Beeck and Kleinman, 1983; Buchanan and Cretin, 1986). These studies tend to show that when HMO enrollees and non-HMO enrollees were both enrolled in the fee-for-service system, the HMO enrollees used less care.<sup>15</sup> For example, Eggers (1980) compared the hospitalization rates of Medicare beneficiaries who enrolled in an HMO with those who remained in the fee-for-service system; the rates were for a time just prior to their choice, when both groups were in the fee-for-service system. The factor-of-2 difference between the two groups, as shown by the two columns in Table 1, suggests strong selection.

## Evidence on disenrollment

If selection is a problem, one might expect to see that disenrollees from HMO's use more services than those who remain in HMO's. A number of studies of

<sup>15</sup> Buchanan and Cretin (1986) note that in the year immediately preceding HMO enrollment, utilization was even lower than in the years before that for HMO enrollees, suggesting that they were postponing utilization until they were enrolled in the HMO.

disenrollees have been conducted (Wollstadt, Shapiro, and Bice; 1978; Wersinger and Sorenson, 1982; Mechanic, Weiss, and Cleary, 1983; Hennelly and Boxerman, 1983; Griffith, Baloff and Spitznagel, 1984; Lewis, 1984; Buchanan and Cretin, 1986). In contrast to the studies of enrollees, most studies of disenrollees show little, if any, evidence of adverse selection. (Buchanan and Cretin [1986] are an exception.) Can we conclude from these studies that adverse selection is only a problem in theory and that we can proceed toward capitation without much concern for additional adjusters?<sup>16</sup> I think not.

**Table 1**  
**Comparison of hospital days of care between persons choosing a health maintenance organization and those remaining in fee-for-service: 1974-76**

| Year | Days of care per 1,000 persons |                             |
|------|--------------------------------|-----------------------------|
|      | Joined HMO in October 1976     | Remained in fee-for-service |
| 1974 | 1,152                          | —                           |
| 1975 | 849                            | 1,761                       |
| 1976 | 731                            | 1,929                       |

SOURCE: (Eggers, 1980)

One should distinguish four reasons for disenrollment: 1) mandatory disenrollment: The individual moves out of the HMO service area, or changes employers, and the HMO is not offered by the new employer; 2) disenrollment because of a change in the relative prices of the HMO and fee-for-service options (or perhaps some change in the non-price amenities of the two systems of care, such as the HMO's closing a clinic); 3) disenrollment because the person made a mistake in enrolling; and, finally, 4) selection, meaning HMO-induced disenrollment of those with expenditures expected to be above average.

One should expect that large samples would be needed to detect adverse selection because the first three causes of disenrollment could tend to obscure it. The reason may become clearer by considering each category in turn.

Mandatory disenrollment, the first group, can for the most part be regarded as outside the control of the HMO. Hence, for purposes of detecting selection (signal), it acts like noise. Some studies distinguish mandatory disenrollment, but not all do.

Those who disenroll because of a change in relative prices, the second group, are those who are nearly indifferent between enrollment in fee-for-service and the HMO (e.g., those who live quite far from an HMO clinic or who, for the monetary savings, are just barely able to "tolerate" an organized system of care). The group that is nearly indifferent between belonging to the HMO and the fee-for-service system may be only weakly related to the group that the HMO would like to see disenroll; hence, the nearly

<sup>16</sup>All of these studies were of non-Medicare populations and the AAPCC was not involved. These studies are relevant, nonetheless, because few, if any, adjusters were included in the premium.

indifferent group, too, may act mostly like noise for purposes of detecting selection.

The third group of disenrollees, those who made a mistake, may well be the largest group of disenrollees in any given period (especially if relative premiums have not changed). It is probably impossible to be certain, without actually joining, just how much one will like care at the HMO.<sup>17</sup> Thus, a number of people will join with the expectation that they will prefer the HMO, only to find that they made a mistake, and withdraw. This is especially true of new HMO's; for well-established HMO's, one may be able to form an idea of how well one will like the HMO by speaking with current members.<sup>18</sup>

Detecting HMO-induced disenrollment is more difficult because of the skewness of the expenditure distribution. The HMO need only induce a few people to leave in order to have a substantial effect on profitability (1 percent of the population accounts for about one-quarter of the expenditure on medical care), but the same skewness makes it difficult to detect a difference in spending between those who leave and those who stay; differences in medical expenditures between two groups tend to have large standard errors unless samples are on the order of several-thousand individuals. Only quite large HMO's will have that many disenrollees in a year. The studies in the literature mostly have samples of disenrollees in the hundreds.<sup>19</sup> The study with the largest sample (Buchanan and Cretin, 1986) also was the study that found evidence of adverse selection among those who disenroll.

In sum, the studies of disenrollment may simply have failed to detect selection behavior. We cannot be very confident from their negative results that selection behavior is not an important problem.

## Other evidence

The Rand Health Insurance Experiment randomized into an HMO individuals who were receiving care in the fee-for-service system. When analysts compared their use rates with those of individuals already enrolled in the HMO, they found virtually no difference, implying no selection (Manning, Leibowitz, Goldberg, et al., 1984). For present purposes, however, this finding must be regarded as merely one observation; it is not strong evidence that there would be no selection in a world of competing delivery systems.<sup>20</sup> A related point is that virtually all

<sup>17</sup>In the jargon of economics, HMO's are an experience good.

<sup>18</sup>For this reason, it is not surprising that Wollstadt, Shapiro, and Bice (1978) found that the first cohort of enrollees in a new HMO exhibited the highest disenrollment rates.

<sup>19</sup>Griffith, Baloff, and Spitznagel (1984) show significantly fewer physician visits among disenrollees, as does Lewis (1984). They interpret this as evidence against selection, but the case is weak because the result could be true if the second and third groups, described in the article, have lower true mean rates of visits. Any enrollees with above-average-expected expense will still find that every organization will have an incentive to purge them.

<sup>20</sup>To conclude from this finding that selection will not occur would be like observing community rating at Blue Cross in the 1930's and concluding that experience rating will not occur.

existing evidence comes from studies of communities with one HMO and a fee-for-service system. As competition among capitated systems increases, selection behavior may well increase.

### Additional adjusters for rate formula

Despite the agreement that the current AAPCC is inadequate, there is considerable disagreement on what should be done about it. One may approach the issue by identifying some desirable characteristics of adjusters, beginning with the most important.

- The set of adjusters should result in reasonably homogeneous categories with respect to expected expenditure, just as the diagnosis-related group (DRG) system is intended to be a reasonably homogeneous classification system for hospital cases; a necessary condition is that an adjuster predict medical expenditure. (This is the criterion that I have been emphasizing.)
- An adjuster should not have excessive collection costs.
- An adjuster should be reasonably cheap to audit or verify, so that it is inexpensive to keep fraud to a minimal level.
- An adjuster should not induce changes in behavior by patients so they can be classified in a category with higher reimbursement rates.

### Disability status

Lubitz, Beebe, and Riley (1985) have shown that disability status before age 65 predicts medical expenditure. Table 2 is taken from their paper; it can be seen that those disabled before the age of 65 spend 56 percent more after the age of 65 than those not disabled ( $1,704/1,091 = 1.56$ ).

Moreover, Lubitz, Beebe, and Riley (1985) present some evidence of selection on prior disability status. In two of three demonstration HMO's, the percentage of formerly disabled enrollees was 30 to 38 percent less than in a comparison fee-for-service group; in the third HMO, the percentages were nearly equal.

Disability status seems like an almost ideal adjuster. Because it exists in administrative records, the cost of collecting it is small. So too is the cost of auditing it. If disability status is included, it seems unlikely to

**Table 2**

**Average expenditures for Medicare enrollees age 65 or over, by age and prior disability status: 1980**

| Age              | All persons | Formerly disabled | Not formerly disabled |
|------------------|-------------|-------------------|-----------------------|
| Total            | \$1,127     | \$1,704           | \$1,091               |
| 65-69 years      | 846         | 1,635             | 748                   |
| 70-74 years      | 1,008       | 1,761             | 958                   |
| 75 years or over | 1,440       | 2,014             | 1,433                 |

SOURCE: (Lubitz, Beebe, and Riley, 1985)

much affect behavior in an undesired way; i.e., it seems unlikely that there is much additional incentive to become disabled before age 65 if the Medicare formula recognizes disability.<sup>21</sup>

The only difficulty with including disability before the age of 65 is a short-run practical problem: The current formula includes institutional status, but there are no data on institutional status in routine administrative data and no data on disability status in the survey data used to set the current adjustment factors.

Even if this difficulty is overcome, adding disability status to the formula is likely to increase explained variance by only a modest amount. Lubitz, Beebe, and Riley (1985) do not give data on how much variance disability status explains; however, only about 3 million disabled under 65 years of age were eligible for Medicaid in 1983 (*Health Care Financing Review*, 1984). Hence, the vast majority of aged do not become disabled before the age of 65, and disability status cannot explain any variance within that group.<sup>22</sup> As a result, although there is a good case for adding disability status as an adjuster, it almost certainly cannot come close to solving the problem.

### Health status and functional status

The case for adding health status variables seems straightforward on the surface. Health status measures are known to be important predictors of variance (Manning, Newhouse, and Ware, 1982). For example, individuals with chronic health problems, such as cancer or congestive heart failure, will tend to have higher expected costs than individuals without such problems (assuming the present AAPCC adjusters). For that reason, McClure (1984) and Thomas et al. (1983) have strongly argued for research into the means by which health status measures could be added to the formula.

Unfortunately, there are important practical problems in adding health status measures (Lubitz, Beebe, and Riley, 1985). Not surprisingly, these problems are conceptually similar to those associated with the prospective payment system (PPS), which can be seen as an effort to incorporate clinical or health status adjusters into the method for paying hospitals. The problems may be briefly summarized as follows:

(1) Patients with the same condition might warrant more or less intensive treatment, depending on the severity of that condition. For example, a physician might choose not to treat someone with a diastolic blood pressure of 95 mm Hg, but treat immediately someone with a diastolic blood pressure of 125 mm Hg. Yet, if there is simply a fixed additional amount for those with hypertension, the payment system is not recognizing any costs associated with treating

<sup>21</sup>If this were a problem, one might make the requirement that one had to be disabled at an earlier age than 65, for example, 60.

<sup>22</sup>Any variance within the disabled group will also remain unexplained.

those with more elevated levels of blood pressure (e.g., more frequent follow-up or other increased intensity of treatment). This problem is analogous to the so-called "severity" problem (within-group variance) in PPS.

One solution, in principle, to the severity problem is to vary the payment with the level of a physiologic measure (e.g., pay more for the person with a diastolic blood pressure of 125 mm Hg). However, treatment may change the level of the physiologic measure. If one pays a certain amount for someone with a natural diastolic blood pressure of 95 mm Hg, but an additional amount for someone with a reading of 125 mm Hg, one must decide how much is paid if medication lowers blood pressure to 95 mm Hg. Such an individual clearly costs more to treat than an individual with a naturally occurring blood pressure of 95 mm Hg. At first glance, it may seem desirable to pay on the basis of the uncontrolled value (in the example, 125 mm Hg), but if the person's blood pressure is, in fact, controlled, the uncontrolled value would not be observed, and it would be dangerous and unethical to try to observe it.

A similar problem arises if, as some suggest, payment is based on maintenance or improvement of health status. On average, the health of elderly people can be expected to deteriorate; an organization paid on the basis of maintaining or improving health status faces a Sisyphean task. Conceptually one would like to vary payment on the basis of deviations from expected prognosis, but physicians may disagree on expected prognosis.

(2) Just as it is possible to engage in DRG creep (Carter and Ginsburg, 1985), it appears possible to manipulate some health status measures used to adjust capitation amounts, particularly self-reported health status measures. For example, if Medicare pays more for patients who report their health as poor instead of fair, there is an incentive for the patient and the provider to collude against the Government to report the patient's condition as poor.<sup>23</sup>

(3) Just as comorbid conditions complicate setting a price for PPS, they complicate setting a price in a capitated system. An individual who is healthy, except for hypertension, may be relatively easy to rate. An individual with hypertension, diabetes, kidney failure, and congestive heart failure may require more treatment than merely the adjustments implied by the four diagnoses separately.<sup>24</sup> As was done with PPS, one can simplify by equating all conditions and simply making an adjustment for the presence of any comorbid condition, but some conditions may be "more equal" than others.

<sup>23</sup>Presumably, Medicare could prevent the provider's overtly encouraging the patient to give fraudulent answers. Patients may discover, however, that at least some providers give more attention and courtesy to patients for whom they receive more reimbursement. This may well encourage some patients to fudge their answers.

<sup>24</sup>Technically, there may be a very large number of interactions to estimate.

(4) Just as implementing DRG's added data collection expense, some point out that collecting health status data would add expense. Indeed it would, but McClure (1984) argues implicitly that the collection cost issue has been overstated. He notes that delivery systems would need to collect measures of health status for their own purposes, and he would place the onus of notifying Medicare about the enrollee's health status on the delivery system. I agree with McClure's judgment that the delivery system can collect health status data relatively cheaply, but he does not address the issue of auditing, which may not be a straightforward task. This would be particularly true if the health status reported to Medicare by the delivery system subsequently changes, either for natural reasons or because of treatment. Hence, collection costs do appear to be an issue.

(5) Just as the weights assigned to DRG's must be updated to account for new technology, so must capitated payments. The prices paid for new technical procedures, however, are a problem in the present fee-for-service system as well, but perhaps less of a problem because one need not project annual utilization.

These arguments should not impede a research effort on adding health status measures, but they do suggest that a small-scale effort is unlikely to meet with much success (see also Lubitz, 1985). Most research to date has focused on the use of functional status as an adjuster (Lubitz, Beebe, and Riley, 1985; Thomas and Lichtenstein, 1986). Functional status describes limitations on mobility and, like disability status, it predicts Medicare expenditure (controlling for the four variables now in the AAPCC). Also like disability status, functional status is clearly observable by the delivery system. Both these considerations argue for the inclusion of functional status in the payment formula, but, unlike disability status, data on functional limitations do not now exist in administrative records, so special collection efforts would have to be instituted. Moreover, like self-reported health status, data on functional status may be vulnerable to manipulation (the analog of DRG creep).

### Patients at high risk of death

Research into inclusion of health status measures as adjusters might begin by finding measures that identify patients at high risk of death. Such patients will often be known to the delivery system to have higher expected expenditure. An organization that chose to engage in selection might well attempt to send such patients elsewhere at a time of open enrollment.

Some argue that an HMO would not want a reputation for dumping its patients and therefore would not do so, but if an HMO engaged in this behavior only occasionally, its actions might well not be detected and it would not acquire such a reputation. See the Technical Note for the example that shows the difficulty of using mortality rates to

detect selection. The difficulty also applies to using mortality rates as an adjuster. Nonetheless, if the difference between the reimbursement and expected cost for a patient at high risk of death is great enough, the profits to be made by dumping even a few patients could be substantial. Consequently, the possibility of dumping at least some patients at high risk of death needs to be taken seriously.

The implication is that there should be a higher capitation rate for such patients, but the practical problems of defining such an adjustment remain formidable. Indeed, physicians have considerable discretion in treating patients at high risk of death (Garber, Fuchs, and Silverman, 1984), so the magnitude of the adjustment is also a difficult question.

### **Prior utilization as an adjuster**

Several analysts (Anderson and Knickman, 1984a, 1984b; Lubitz, Beebe, and Riley, 1985) have investigated adding measures of past utilization to the AAPCC. They demonstrate that past utilization predicts future expenditure; moreover, it is observable both by the HMO and by an agency such as the Health Care Financing Administration (HCFA), and the data are cheap to collect. A different group of analysts (Thomas et al., 1983; McClure, 1984) believes past utilization is inappropriate to include as an adjuster because of its incentive effects. McClure, for example, notes that inclusion of prior utilization will reward a patient of a more "elaborate provider" (or might reward the provider himself or herself) and penalize the patient of a more "conservative provider."

The response to this objection on the part of those proposing past utilization as an adjuster is not entirely satisfactory. They note that the adjustment would not be so large that a delivery system could profit by adding more services, by which they mean that it would not pay to take healthy people and, say, hospitalize them. That argument, however, ignores the fact that decisions are made at the margin. Although it will not pay to hospitalize a healthy person, a not-very-sick person may be kept out of the hospital if there is no adjustment for prior utilization, but may be hospitalized if there is such an adjustment. If prior utilization is included in the formula, more elaborate care of a given patient will, in general, be rewarded; McClure's argument is correct. His conclusion that utilization should be excluded from the payment formula, however, does not necessarily follow.

### **Where to from here?**

McClure (1984) and Lubitz (1985) make a compelling case for a greater allocation of research resources into methods to improve capitation. McClure notes the great disparity between the resources that have gone into developing PPS and those that have gone into developing a method for adjusting capitation rates; he argues that at least as

sustained an effort as went into the development of DRG's should go into the development of risk-adjusted capitation methods.

I agree, although I would caution against taking resources from the effort to refine PPS in order to develop capitation methods. Well-developed capitation schemes are, at best, several years in the future; in the meantime, there are several known technical problems with PPS. Given the size of the Medicare program and current research budget levels, it is important that efforts to resolve or ameliorate those problems not be diminished.

Part of the greater research effort concerning capitation ought to include some demonstrations of new capitation schemes (just as the New Jersey experience with DRG's could be thought of as a demonstration of PPS). The use of functional health status and other measures of health status can be tried out in a demonstration. The introduction of disability status as an adjuster may be straightforward enough as not to warrant a demonstration.

In addition to the research effort, however, consideration should be given to a blend of capitation with fee-for-service. For example, a delivery system might receive one-quarter of the current or, better yet, a refined AAPCC for each person it enrolled, while three-quarters of its payment might be based on fee-for-service. To do so would show recognition of the imperfect nature of all adjustment methods now available; although research should improve matters, it may well not produce a workable solution.<sup>25</sup> Consequently, some thought should be given to the situation in which the available adjusters are not fully satisfactory. In such a situation, a blend has much to recommend it; the weight on the capitated portion might increase as adjusters became better.

Moreover, for the period during which there is not a completely satisfactory set of adjusters, a blend seems to be an improvement over capitated rate adjusted for prior utilization.<sup>26</sup> The latter is similar to a blend of capitation and prior use, with a weight on prior use given by a regression coefficient. A blend with current use shows recognition of changes in health status as they occur, rather than with a delay. Moreover, such a blend avoids the problem that no past utilization data are available for a new cohort of enrollees.

On the other hand, those who object to the incentive effects of prior utilization will probably object even more strongly to current utilization as the basis of payment, given its presumed stronger incentive effects. The differences in incentive effects between using prior or current utilization, however,

<sup>25</sup>Analysts at HCFA, for example, believe that "no AAPCC will ever be ever be perfect" (Beebe, Lubitz, and Eggers, 1985). Technically, we are in a second-best world.

<sup>26</sup>The two proposals are not strictly comparable. I propose using an unspecified weighted average of current utilization (or fee-for-service) and capitation; those recommending prior utilization, in effect, establish a weight for it through the regression coefficient that prior utilization receives. For purposes of this discussion, assume that the weight on current utilization is about the same as for past utilization.

turn out to be more apparent than real. For example, because payment for prior utilization occurs in the subsequent year, it is discounted; however, the discount factor is not likely to be large enough to be of any quantitative importance.

A second seeming difference in incentives between use of prior and current utilization turns out, on closer inspection, also to be unimportant. If an individual disenrolls or dies, the HMO could receive no adjustment if prior utilization is used as an adjuster, because there is no future AAPCC to be adjusted for that person; however, the HMO does receive an adjustment if current utilization is used. Thus, use of prior utilization may seem to be bad in the case of death (the HMO receives no compensation for the extra expenses before death) and good in the case of disenrollment (it reduces the incentive to dump). In fact, however, the two methods can be made equal on this score. If prior utilization is used as an adjuster, an extra payment could be made, after the fact, for a deceased person. Similarly, if desired, payment based on current utilization could be retroactively scaled down for those who voluntarily disenroll.

Hence, I conclude that prior and current utilization are similar in their incentive effects (or can be made so), but current utilization is a more sensitive measure of predictable variation in expected cost.

More generally, many believe that incentive problems result if any part of the payment is based on utilization, either prior or current, but this belief is correct only if fee-for-service prices exceed marginal cost.<sup>27</sup> Unfortunately, given the administered price nature of insurer reimbursement and the extreme difficulty of observing marginal cost, prices exceeding marginal cost may be common. Although some worry about excessive fee-for-service utilization for this reason (and because the patient is insured), others worry that pure capitation will produce underutilization. If both worries are justified, a blend of the two should produce an appropriate amount of utilization.<sup>28</sup>

I have left for future research the topic of optimal weights in a blend. It is not obvious, however, that the weight on utilization should be the same for every enrollee, as the current proposals for incorporating prior utilization as an adjuster implicitly suggest. For example, in classes of enrollees with higher variances (e.g., the very old), capitation will require that the HMO accept higher risk. Perhaps in such classes one should weight the fee-for-service system payment more heavily. More generally, the "shrinkage" methods referred to in the section on geographic variance may well prove useful for determining weights.

It is also likely that at least some HMO's will object to anything less than complete capitation for the same

<sup>27</sup>Pauly (1980) points out that fee-for-service prices equal to marginal cost will give the physician an incentive to act as a perfect agent; moral hazard remains.

<sup>28</sup>For a similar argument in a different context, see Ellis and McGuire (1986) and Ginsburg, Newhouse, Mitchell, et al. (1986).

reason that the original Medicare reimbursement regulation was not popular: HMO's prefer not to bill fee-for-service. Two responses might be made:

(1) Prior to PPS, hospitals were not set up to bill using DRG's. Just as hospitals have adapted to DRG's, so too could HMO's adapt to fee-for-service. Indeed, most HMO's already have a capability for generating fee-for-service bills for cases such as those covered by Workmen's Compensation.

(2) HMO's may argue that they would not engage in unethical behavior, such as dumping, despite the monetary incentive to do so. Although I am skeptical that all HMO's would show such restraint,<sup>29</sup> one could put the argument to the test, using a blend as a fallback position.

## Goals and means

The Medicare program seeks to achieve several goals; two that are central to the present argument are economic efficiency and access for beneficiaries. Fee-for-service (with prices above marginal cost) poses no access problem, but is clearly inefficient and costly. The movement toward reform embodied in PPS suggest that taxpayers are unwilling to pay the costs of a fee-for-service system with prices above marginal cost. Capitation may stimulate greater economic efficiency.<sup>30</sup> But capitation poses an access problem for high-expected-cost beneficiaries if the capitated rate is applied to a group with diverse expected costs. Thus, it appears difficult to satisfy both goals simultaneously. In choosing how to compromise between these two goals, a blend opens more options than merely the two extremes of pure fee-for-service or pure capitation.

There is one other argument for a blend. Although moving partway toward a capitated system, using a blend of capitation and fee-for-service, will be seen by some as limiting the gains of a pure capitated system, it also limits the risks. At a minimum, therefore, it would seem to be a good candidate for a transition strategy.

## Technical note

Anderson and Gertman (1983), cited in Lubitz, Beebe, and Riley (1985) have proposed using mortality rates among enrollees in each system to detect selection. Some might also propose that mortality rates could be used to adjust rates because they reflect health status. These proposals have both incentive and statistical problems. The incentive problem is that HMO's with poor results on mortality are implicitly rewarded, and those with good results may be penalized (i.e., they look as if they are dumping).

<sup>29</sup>Elsewhere (Newhouse, 1982) I have made the analogy with community rating and experience rating. Even if a given group of HMO's fully intend to community rate, the actions of others may force them not to do so.

<sup>30</sup>I have only touched on the problems of setting a proper price level. Without a proper price level, capitation will obviously not be efficient either.

Statistically, an organization that was dumping some patients at high risk of death may stand a good chance of remaining undetected. Suppose there are two HMO's, each with 10,000 Medicare beneficiaries. Suppose 500 (5 percent) of the beneficiaries die annually in both organizations. Now, suppose one HMO tries to persuade some patients at high risk of death to move elsewhere. Suppose, to keep the exposition simple, all the patients at high risk of death will die with certainty. If those known to be at high risk of death are 20 percent of all deaths in the Medicare population (100 persons in the example) and one HMO sheds one-third of those individuals, it loses 33 patients; its true death rate falls to 4.67 percent. Using a 95 percent chance of Type I error, the chances are only about 1 in 3, in any given year, that one will detect a difference between the two HMO's with these size samples. (This assumes that the other HMO does not gain these individuals, but that they are dispersed among providers.) Although chances would be higher with a larger sample, I have optimistically assumed that the true mortality rates in the two HMO's are known to be the same (or that one can perfectly adjust for any difference). In practice, there would most likely be a considerable debate about whether true mortality rates in the two HMO's were equal (just as teaching hospitals argue for higher PPS payments on the grounds that they treat more severely ill patients).

## Acknowledgments

I would like to thank my colleagues Stephen Carroll, Shan Cretin, Willard Manning, and Richard Neu, as well as James Lubitz of the Health Care Financing Administration, for helpful comments on a preliminary draft. They, of course, are not responsible for any remaining errors, nor do they necessarily subscribe to the ideas presented here.

## References

- Anderson, G., and Knickman, J.: Patterns of expenditure among high utilizers of medical care services: The experience of Medicare beneficiaries from 1974 to 1977. *Med Care* 22:143-149, Feb. 1984a.
- Anderson, G., and Knickman, J.: Adverse selection under a voucher system: Grouping Medicare recipients by level of expenditure. *Inquiry* 21:135-143, Summer 1984b.
- Anderson, J., and Gertman, P.: Monitoring of HMO enrollment practices. *AAPCC Technical Note No. 5*. Health Policy Center, Heller Graduate School, Brandeis University, 1983 (cited in Lubitz, Beebe, and Riley, 1985).
- Beebe, J., Lubitz, J., and Eggers, P.: Using prior utilization to determine payments of Medicare enrollees in health maintenance organizations. *Health Care Financing Review*. Vol. 6, No. 3. HCFA Pub. No. 03198. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Spring 1985.
- Buchanan, J., and Cretin, S.: *Fee-for-Service Health Care Expenditures: Evidence of Selection Effects Among Subscribers Who Choose HMO's*. Publication No. R-3341-HHS. Prepared for Department of Health and Human Services. Santa Monica, Calif. Rand Corporation, 1986.
- Carter, G., and Ginsburg, P.: *The Medicare Case-Mix Index Increase: Medical Practice Changes, Aging, and DRG Creep*. Publication No. R-3292-HCFA. Prepared for the Health Care Financing Administration. Santa Monica, Calif. Rand Corporation, 1985.
- Chassin, M. R., Brook, R. H., Park, R. E., et al.: Variations in the use of medical and surgical services by the Medicare population. *N Engl J Med* 314(5):285-290, 1986.
- Danzon, P.: Hospital 'profits': The effects of reimbursement policies. *J Health Economics* 1(1):29-52, May 1982.
- Efron, B. and Morris, C.: Limiting the risk of Bayes and Empirical Bayes estimators—Part II: The empirical Bayes case. *J Am Statistical Association* 67(337):130-139, Mar. 1972.
- Efron, B., and Morris, C.: Stein's paradox in statistics. *Sci Am* 236:119-127, May 1977.
- Eggers, P.: Risk differential between Medicare beneficiaries enrolled and not enrolled in an HMO. *Health Care Financing Review*. Vol. 1, No. 3. HCFA Pub. No. 03027. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Winter 1980.
- Eggers, P., and Prihoda, R.: Preenrollment reimbursement patterns of Medicare beneficiaries enrolled in at-risk HMO's. *Health Care Financing Review*. Vol. 4, No. 1. HCFA Pub. No. 03146. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Fall 1982.
- Ellis, R. P., and McGuire, T.: Provider behavior under prospective reimbursement: Cost sharing and supply. *J Health Economics* 5(2):129-151, June 1986.
- Federal Register*: Washington, D.C., Jan. 10, 1985, pp. 1378-1381.
- Fisher, C.: Differences by age group in health care spending. *Health Care Financing Review*. Vol. 1, No. 4. HCFA Pub. No. 03045. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Spring 1980.
- Garber, A., Fuchs, V. R., and Silverman, J.: Case mix, costs, and outcomes: Differences between faculty and community services in a university hospital. *N Engl J Med* 310(19): 1231-1237, 1984.
- Gaus, C., Cooper, B., and Hirschman, C.: Contrasts in HMO and fee-for-service performance. *Soc Secur Bull* 39(5):3-14, May 1976.
- Ginsburg, P. B., Newhouse, J. P., Mitchell, J. B., et al.: *Planning a Demonstration of Per-Case Reimbursement for Inpatient Physician Services Under Medicare*. Publication No. R-3378-HCFA. Prepared for Health Care Financing Administration. Santa Monica, Calif. Rand Corporation, 1986.
- Greenlick, M. R.: Comments on Medicare capitation payments to HMO's. In R. Scheffler and L. Rossiter, eds., *Advances in Health Economics and Health Services Research*. Vol. 6. Greenwich, Conn. JAI Press, 1985.

- Griffith, M. J., Baloff, N., and Spitznagel, E. L.: Utilization patterns of health maintenance organization disenrollees. *Med Care* 22(9):827-834, Sept. 1984.
- Health Care Financing Review: Health Care Financing Trends*. Vol. 6, No. 1. HCFA Pub. No. 03176. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Fall 1984.
- Hennelly, V. D., and Boxerman, S. B.: Out-of-plan use and disenrollment: Outgrowths of dissatisfaction with a prepaid group plan. *Med Care* 21(3):348-359, Mar. 1983.
- Held, P. J., and Pauly, M. V.: Competition and efficiency in the end stage renal disease program. *J Health Economics* 2(2):95-118, Aug. 1983.
- Iglehart, J.: The future of HMO's. *New Engl J Med* 307(7):451-456, 1982.
- Iglehart, J.: Medicare turns to HMO's. *New Engl J Med* 312(2):132-136, Jan. 1985.
- Jackson-Beeck, M., and Kleinman, J.: Evidence for self-selection among health maintenance organization enrollees. *J Amer Med Assoc* 250(20):2826-2829, Nov. 1983.
- Kunkel, S. A., and Powell, C. K.: The adjusted average per capita cost under risk contracts with providers of health care. *Transactions of the Society of Actuaries* 33:57-66, 1981.
- Lewis, K.: Comparison of use by enrolled and recently disenrolled populations in a health maintenance organization. *Health Services Research* 19(1):1-22, Apr. 1984.
- Lubitz, J.: Health status adjustments for Medicare capitation. Unpublished material. Health Care Financing Administration, 1985.
- Lubitz, J., Beebe, J. and Riley, G.: Improving the Medicare HMO payment formula. In R. Scheffler and L. Rossiter, eds., *Advances in Health Economics and Health Services Research*. Vol. 6. Greenwich, Conn. JAI Press, 1985.
- Luft, H. S.: *Health Maintenance Organizations*. New York. John Wiley and Sons, Inc., 1981.
- McClure, W.: On the research status of risk-adjusted capitation rates. *Inquiry* 21(3):205-213, Fall 1984.
- Manning, W. G., Leibowitz, A., Goldberg, G., et al.: A controlled trial of the effect of a prepaid group practice on use of services. *N Engl J Med* 310(23):1505-1510, 1984.
- Manning, W. G., Newhouse, J. P., and Ware Jr., J. E.: The status of health in demand estimation. In V. Fuchs, ed., *Economic Aspects of Health*. Chicago. University of Chicago Press, 1982.
- Mechanic, D., Weiss, N., and Cleary, P.: The growth of HMO's: Issues of enrollment and disenrollment. *Med Care* 21(3):338-347, Mar. 1983.
- Morrisey, M., Conrad, D. A., Shortell, S. M., et al.: Hospital rate review: A theory and empirical review. *J Health Economics* 3(1):25-47, Apr. 1984.
- Newhouse, J. P.: Is competition the answer? *J Health Economics* 1(1):109-115, May 1982.
- Newhouse, J. P.: Cream skimming, asymmetric information, and a competitive insurance market. *J Health Economics* 3(1):97-100, Apr. 1984.
- Newhouse, J. P.: *Capitation and Medicare*. Publication No. R-3455-HCFA. Prepared for the Health Care Financing Administration. Santa Monica, Calif. Rand Corporation, 1986.
- Nobrega, F., Krishan, I., Smoldt, R., et al.: Hospital use in a fee-for-service system. *J Amer Med Assoc* 247(6):806-810, Feb. 1982.
- Pauly, M. V.: Doctors and Their Workshops: Economic Models of Physician Behavior. Chicago. University of Chicago Press, 1980.
- Pauly, M. V.: Is cream skimming a problem for the competitive medical market? *J Health Economics* 3(1):87-95, Apr. 1984.
- Pauly, M. V.: What is adverse about adverse selection? In R. Scheffler and L. Rossiter, eds., *Advances in Health Economics and Health Services Research*. Vol. 6. Greenwich, Conn. JAI Press, 1985.
- Rothschild, M., and Stiglitz, J.: Equilibrium in competitive insurance markets: An essay in the economics of imperfect information. *Quarterly J Economics* 90(4):629-649, Nov. 1976.
- Thomas, J. W., Lichtenstein, R.: Functional health measure for adjusting health maintenance organization capitation rates. *Health Care Financing Review*. Vol. 7, No. 3. HCFA Pub. No. 03222. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, 1986.
- Thomas, J. W., Lichtenstein, R., Wyszewianski, L., et al.: Increasing Medicare enrollment in HMO's: The need for capitation rates adjusted for health status. *Inquiry* 20(3):227-239, Fall 1983.
- Trieger, S., Galblum, T. W., and Riley, G.: HMO's: Issues and alternatives for Medicare and Medicaid. HCFA Pub. No. 03107. Washington. U.S. Government Printing Office, Apr. 1981.
- Ware, Jr., J. E., Rogers, W. H., Davies, A. R., et al.: Comparison of health outcomes at a health maintenance organization with those of fee-for-service care. *Lancet* 1(848):1017-1022, May 3, 1986.
- Wennberg, J., and Gittelsohn, A.: Small area variations in health care delivery. *Science* 182(4117):1102-1108, Dec. 1973.
- Wersinger, R. P., and Sorenson, A. A.: Demographic characteristics and prior utilization experience of HMO disenrollees compared with total membership. *Med Care* 20(12):1188-1196, Dec. 1982.
- Wollstadt, L. J., Shapiro, S., and Bice, T. W.: Disenrollment from a prepaid group practice: An actuarial and demographic description. *Inquiry* 15(2):142-150, June 1978.