PATIENT SELF-SELECTION IN HMOS

by Gail R. Wilensky and Louis F. Rossiter

Prologue: Who enrolls in health maintenance organizations and for what reasons? Answering these questions is a perplexing, but increasingly important public policy challenge as the federal government demonstrates growing interest in capitation as its payment method of choice. In this essay, economists Gail Wilensky of Project HOPE and Louis Rossiter of the Medical College of Virginia address the issue of patient self-selection by summarizing the current literature and an important collection of recently released new studies. The patient selection issue has grown in importance because as the health delivery system becomes more price competitive, health plans are developing more sophisticated methods for enrolling new members. This issue is pronounced in relationship to Medicare beneficiaries. Because older people in general consume far more medical resources, the health status of any elderly person becomes an important economic question for a health maintenance organization (HMO) that is operating at financial risk. If a disproportionate share of these high users of care enroll in a single HMO, the plan could suffer serious economic losses, even bankruptcy, because medical expenses could far exceed revenues. The selection issue also is of concern to employers, some of whom worry that their employee benefit costs are higher because more healthy workers enroll in HMOs, leaving employees who use more care in the fee-for-service alternative. Wilensky, who holds a Ph.D. in economics from the University of Michigan, managed the National Medical Care Expenditure Survey at the Department of Health and Human Services before joining Project HOPE in 1983. Most recently, Wilensky directed a HOPE study on physician reimbursement strategies for the Health Care Financing Administration (HCFA). Rossiter, who holds a Ph.D. in economics from the University of North Carolina, became very active in patient selection issues as a consequence of his central involvement in an evaluation of HCFA’s Medicare HMO demonstrations.
The remarkable growth in the number of health maintenance organizations (HMOs) is one indication of the unprecedented choice facing consumers of health care. What’s currently unknown is whether certain consumers are systematically directed towards or away from particular types of health insurance or health delivery systems. If there is systematic selection—either directly because of consumers’ expectations or indirectly because of the ways HMOs are marketed or operated—the outcome may be market failure for some health plans and cost-containment may be hindered. To better understand the reasons for this potential outcome, it will be useful to briefly discuss the concept of biased selection.

Patient self-selection is said to be biased when premium payments for health care do not equal actual costs because some, perhaps unknown, factor about the insured population influencing service use and costs is not factored into the calculation of the payment. Bias in patient self-selection is said to be adverse when higher than average expected risks are enrolled for a prospective capitated payment. Favorable selection is said to occur when lower than average expected risks enroll. The expected risk varies for a number of difficult to measure reasons that rely upon information not readily available to insurers. Thus, the biased selection issue can be thought of as an information problem. It might be said that if only insurers knew perfectly the risk of coverage for the population, fair premiums could be established. On the other hand, selection becomes a market problem if some insurers are able to attract favorable risks and still receive the average premium. These insurers would gain, while other insurers, left with higher than average risks while receiving the average premium, would lose.

The problem with biased selection is that it may lead to an unraveling of the market. Several rounds of favorable selection among some health plans can leave those plans with adverse selection in poor financial condition, serving an increasingly higher risk population. Increasing adverse selection may lead to a premium spiral in which ever higher premiums must be paid by the least healthy segment of the population, defeating the purpose of insurance, which is to pool risk. Depending upon the structure of the patient selection process, premiums might increase if low-risk patients disproportionately choose average premium plans and there is no mechanism in place for the premium to be adjusted downward to recognize the lower risk selection.

The financial implications for the premium payers and the insured industry make patient self-selection an important issue. The HMO industry in the U.S. has been the focus of considerable attention and

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controversy. It has upset prevailing provider relationships in most areas of the country. The growth in HMO enrollment has been substantial in recent years and sustained for nearly fifteen years. Almost all studies on the subject agree that for those who enroll in HMOs, hospital service use and costs are lower than under the fee-for-service system. Whether HMOs can and should also be accused of biased selection is not clear.

In this paper we address the patient self-selection issue by summarizing the literature on this subject, including an important collection of new studies released last year at a conference on the subject held in Berkeley, California. This review raises a number of issues about whether biased selection exists, how big a factor it is in the market for health insurance, how big a factor it may be in the long run, and whether or not it is an insurmountable problem. We conclude that the changes in the market are such that definitive answers are not yet available for many of these issues, and that many research issues and policy questions remain to be resolved.

Is Self-Selection A Major Issue?

Evidence exists for biased selection among HMOs. Jackson-Beeck and Kleinman use unadjusted means to report evidence of biased selection in an employed population. Price and May find similar effects among members of the Federal Employees Health Benefits Program, with high option Blue Cross and Blue Shield drawing, on average, high-risk enrollees, and HMOs, on average, enrolling lower than average risks. Gruenberg, in reviewing several studies, including those of Eggers, finds evidence to suggest that HMO enrollees among the Medicare population are lower risks than average within underwriting cells. In a controlled trial, researchers at the Rand Corporation uncover evidence for favorable selection in one HMO, which clouds the issue of whether HMOs lower costs, but does not negate the finding in their study.

In general then, there seem to be unique aspects of patient self-selection for HMOs for which available studies are either inconclusive or indicate favorable selection for HMOs. This is discussed in more depth later.

The problem is how to interpret these results. Are the motivations of patients a problem or are HMOs guilty of favorable selection? Are younger, lower risk people more likely to join HMOs because they do not have strong or established provider ties and are less concerned than others that joining an HMO might mean giving up their existing provider? Do HMOs conduct their marketing with special benefits, low patient cost sharing, and fancy promotional campaigns with the intention of attracting a low-risk population? If HMOs conduct biased marketing, or marketing that leads to biased selection, what is to stop competitors from marketing in the same way or in ways that limit their own risk? If the answer to these
questions is yes today, are these effects likely to continue in the long run when the HMO industry is more mature?

**Detailed findings on patient self-selection.** The available published research studies on patient self-selection are summarized in Exhibit 1. The studies in Exhibit 1 concern only patient selection and HMOs. Other studies are available for other health care selection problems, but are not considered in this discussion. An especially important related area is biased disenrollment from HMOs and other health plans.

Most studies look at the choice between one HMO option and a fee-for-service option. A few, mostly recent ones, examine the choice between multiple options among which a number of HMO and fee-for-service options are available. The earlier studies all use some measure of prior enrollment or at-enrollment health status, either self-reported or implied by preenrollment service use in the patient’s previous plan of choice. There are methodological problems in using prior service use or perceived health status, which are discussed in the next section. In sum, the earlier studies showed mixed results, while most of the later studies indicated that HMOs were enrolling a lower risk population.

**Persistence.** Among the most clever and provocative of the new studies discussed is the study by Neipp and Zeckhauser.\(^6\) They conclude that much of the concern of employers about patient self-selection could be addressed if premiums were adjusted for the age of the enrollee, since age and risk under health insurance are directly related. They suggest that much of the discussion is much ado about nothing. The literature looks with alarm at a 5 percent population of switchers and ponders whether adverse or favorable selection has occurred, forgetting in this case that while 5 percent may have switched health insurance, 95 percent have persisted in their choice of health insurance. In data from the Polaroid Corporation and Harvard University, the persistence in choice of health insurance plan was 97 percent and 92 percent, respectively. HMOs, or any new plan in the market for that matter, will attract younger, perhaps lower risk enrollees because this group has lower transition costs for switching. Thus, the problem is not that HMOs are deliberately attempting to take all the low risks, although any plan would try to do so. It is just easier as the new entrant in the market to do so, and those who pay premiums unwittingly fail to adjust the premium for the differences in enrollment.

**Regression toward the mean.** For the highest risk population, Medicare elderly beneficiaries, the problems of biased selection may be of greatest consequence because their costs are high and their health problems complex. Several recent studies have furthered the pioneering work of Eggers who examined prior service use and claims experience among HMO enrollees in a single HMO compared to those who remained in the fee-for-service sector, and found evidence of favorable selection.\(^7\) Welch,
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however, suggests that Eggers results are not as much a problem for HMO participation in Medicare as would otherwise be implied.\textsuperscript{8} The correlation of health expenses across time is extremely low. Also, once low-risk Medicare beneficiaries enroll in an HMO they gradually become higher risks because of aging while in the plan. By the same token, if higher than average risks enroll under Medicare into HMOs, the HMOs might be expected to obtain better management of the patient and bring down service use rates and costs toward the average. Thus, “regression toward the mean” suggests that, in time, both lower and higher than average risks move toward the mean risk experience. Regression toward the mean, however, does not mean that there is complete return to the average level of expenditures. It has been found, for example, that individuals who were initially observed to have low expenditures continued to have somewhat lower than average expenditures even after seven years.

Welch believes that there is a permanent and a transitory component of Medicare expenditures. The transitory component is most affected by regression toward the mean. The transitory component is not a problem because it is self-correcting, and efforts made to adjust risk-based payments under Medicare to HMOs should focus on the permanent component of different levels of observed Medicare expenses.

We would expect that the largest permanent component of consistently high health expenses occurs among the elderly. But a study by Lubitz, Beebe, and Riley indicates that the tendency for health expenses to be related over time is very small, even among the high-risk elderly.\textsuperscript{9} Looking at data for seven years among 19,000 Medicare beneficiaries beginning in 1974, they found that those among the lowest use category (not meeting the 1974 deductible) started with 1.8 percent of the Medicare expenses of the entire average population, but within three years had reached 54 percent, 66 percent, and 73 percent of the average, slowly rising to 76 percent of the average by the seventh year. According to the Lubitz, Beebe, Riley study, this means that if a Medicare HMO is able to attract only these low-risk beneficiaries, in several years, costs for the enrolled population would increase forty-two times (76/1.8). The HMO would still experience costs for this select population below the payments that the Health Care Financing Administration (HCFA) makes to HMOs under provisions of the Tax Equity and Fiscal Responsibility Act of 1982 (95 percent of the adjusted average per capita costs in the

area); however, the magnitude of the impact of regression toward the mean is remarkable, according to this new data. We know of no similar study for the employed population.

The Darwinian imperative. In a series of studies that use data from the Federal Employees Health Benefits Program, Price and May and other authors find that biased selection is apparent from the pattern of changes in the premiums paid for options available under the program. They suggest that premiums that spiral quickly upward over time reflect the effects of adverse selection, and that plans attempt to adjust premiums in one year for losses in a previous year. In many of the health plan options they examined, the effects of favorable and unfavorable selection deteriorate over time, suggesting that plans with effective leadership, and the means to do so, respond to the influence of the market through premium adjustments. Their analysis also suggests that weak plans will ultimately exit the market and that strong plans will eventually become weak plans. Thus, there is a life cycle for health insurance plans whereby those that enjoy favorable selection in one time period eventually evolve into plans with adverse selection either because the relative risk in the market has changed while the risk pool within the plan has remained the same, or the risk pool in the plan has aged and grown from a healthy, low-risk population to a sickly, high-risk population.

The principal concern about patient self-selection for Price and May is that it causes the competition in the marketplace to emphasize enrolling low-risk groups instead of improving efficiency. Marketing and promotional efforts might be excessive and costly in a market that focuses too much on patient self-selection, jeopardizing quality or efficiency.

Complexity. Another recent study of prior use experience to detect differences in patient self-selection is by Ellis. The study is limited because it has data from only one employer group, but it is important because it points out the complexity of the patient selection problem particularly for an employer group with multiple options. In a special analysis of the choice between several HMO options on one hand and all other options, there was some evidence that younger employees with families were more likely to choose the HMO option. However, the interactions between independent variables were significant. For example, single male employees with no children at age twenty had an implied probability of 9.7 percent of choosing one of the HMOs. Similar single, male employees at age thirty had only a 5.2 percent probability of choosing an HMO option, and by age fifty the probability was 2.4 percent. As Ellis suggests, the interaction between age, sex, and family size is complex. Consequently, the tendency for smaller family size to lower expected costs, may be offset by the tendency for age to increase expected costs, which might be offset by the tendency for males compared to females to have lower costs. In summary, single dimension characteriza-
tions of biased selection effects are probably unreliable and difficult to interpret.

An important point made in a new paper by Luft and others in their study of the University of California health benefits system is that patient self-selection results from two decision-making processes: (1) the decisions of employees concerning their choice of health plan, and (2) the decisions of employers concerning the plans to be offered. A poorly designed menu of choices could lead to a “self-fulfilling spiral” according to the authors. To combat the effects of increasing segregation of high-risk employees into high-premium, low cost-sharing plans, employers should encourage changes in traditional plans that promote efficient care, such as preferred provider options, elimination of the high-costs traditional plan, and effective utilization controls. The study also provides a vivid illustration of a well-known characteristic of health expenditures. Health expenditures tend to be skewed, with only a few people accounting for very high expenses. In the University of California data during the period 1982-83, 227 individuals in the traditional insurance plan accounted for nearly $6.0 million in covered charges which was 41 percent of all reimbursed charges under that option. The decisions of only a few individuals can lead to the patient self-selection problems discussed previously.

In summary, the complexity of patient selection involves more than just health status and prior provider relationships. There is a significant random component that no insurer or researcher can predict.

Benefit design. In perhaps the most useful study to date on patient self-selection, Farley and Monheit find little evidence for biased selection in the U.S. health insurance system in the late 1970s when about 18 percent of employees had some choice of health insurance. Their study is not just an analysis of an isolated employer or a particular region or state. Instead, the study uses nationally representative data in an econometric analysis of biased selection effects and finds that an increased availability of options exacerbates the health care cost-increasing effects of employer subsidies and tax subsidies for health insurance premiums. In other words, their findings imply that offering multiple options is no substitute for restructuring employer premium contributions. In fact, if the goal is lower health care costs, we believe choices should not be offered if the employer contributions are not structured with a fixed contribution.

The findings of the latest study of patient self-selection in the Twin Cities confirm an increasingly heard complaint about HMOs. The combination of mandatory community rating for HMOs and the provisions of the HMO Act that permit HMOs to require employers to offer the HMO option to employees may lead to a difference between premium payments and actual health care costs that the employer is unable to capture. Their data from several employers in the Twin Cities would
confirm the complaint because older employees with more chronic conditions were more likely to belong to traditional service benefits health plans. The authors speculate that the strategy of Twin Cities HMOs is to provide high quality and low-cost services, while at the same time pegging premium payments to the existing market. If so, the HMOs were capturing any cost savings offered by HMOs and not passing it on to employers. Some feature of the market was not permitting employers and employees to benefit financially from any improvements in service use or costs. One additional disturbing aspect of the study for employer costs is that if the cost to premium differential is explained by biased selection effects, as hypothesized, biased selection may not be a short-term problem. The history of HMO experience in the Twin Cities should be enough to say the effects are not short term, but rather the problem lies in the structure of a market that mandates community rating and requires choices.

Thus, the most recent studies on patient self-selection in HMOs tell us several significant things. While individual choice of health insurance among several alternatives is certainly a new feature of the health care market, plan switching is not the order of the day. The most overwhelming feature of the market for health insurance is persistence in plan choice. Patient self-selection is not a particular problem if regression toward the mean occurs, and there is new evidence that this does occur, even among the least likely group—the high-risk Medicare population. Plans that cover all patient costs and have few utilization controls have experienced premium spirals which probably reflect biased selection, but may also reflect a life cycle for such plans having more to do with the evolution rather than failure of the market. Patient self-selection effects are complex and reflect many factors, including the random nature of health risks, Sometimes federal or state regulations, or the health benefit contribution policies of employers lead to patient selection problems when HMOs or patients are only playing by the established rules.

**Strategies For Self-Selection Adjustments In HMOs**

When we examine all of these issues carefully, at the root of the patient self-selection problem is the payment rate. HMOs or any other plan should not object in principle to high risks if they are appropriately compensated. The question then would seem to be how to establish an appropriate payment rate.

**Actuarial standards.** Most payment setting systems rely a great deal upon the actuarial approach to rate setting. A population is identified that will potentially enroll in an HMO, and a payment rate is built upon their current fee-for-service experience. Service use and cost patterns are used to estimate what the fee-for-service equivalent cost would have
been, and this is used as the payment rate or as a rough estimate of the appropriate payment rate. The approach is used because many HMOs are new, and often there are no other data or experience upon which to draw for rate setting. The new Medicare risk-based contracting system, for example, uses the adjusted average per capita cost (AAPCC) in the county in which the Medicare beneficiary resides as the basis of the risk-based capitation payment. The AAPCC is the average fee-for-service Medicare reimbursement per beneficiary in that area. Blue Cross and Blue Shield actuaries, establishing premiums for all of the new Blue Cross/Blue Shield HMOs around the country, probably start with the claims experience of their already enrolled groups to establish new rates for the HMO products being offered.

The approach is reasonable because often it is the only one to take. The fee-for-service sector generates good data on use and costs because claims are generated for provider payments. Using fee-for-service equivalents is attractive to HMOs because they are likely to be conservative capitation payments; thus, a good HMO should be able to reduce inpatient services and costs while maintaining quality, yet do well financially. Fee-for-service equivalent costs can therefore be an encouragement for HMOs to enroll members actively with the notion that they can compete with the fee-for-service equivalent price and do well. If they do well, they can keep the savings; thus, the fee-for-service equivalent resembles a competitive model, encouraging new entrants when excess profits can be made at the established price.

The biased selection issue is addressed through competitively established fee-for-service equivalent payment rates. The notion is that if HMOs experience adverse selection, the implicit overpayment described above should blunt the adverse selection or compensate the HMOs, to the extent they occur because inpatient hospital use is lower based upon fee-for-service equivalent experience. The HMOs do not do well compared to fee-for-service equivalent payments with no adverse selection, but their apparent ability to lower hospital service use and retain the savings can be used to subsidize the adverse selection. If HMOs experience favorable selection while receiving fee-for-service equivalent payments, they will make economic profits and additional HMOs will enter the market or new alternative delivery systems will enter the market. Recent experience would suggest this is happening with a doubling of the number of HMOs in the last three years from about 200 to 400 plans. The growth of preferred provider organizations may also reflect the market entry phenomena. The market entry should progress until the economic profits disappear through a process of price competition between plans. There is little evidence that health care markets have reached this point yet, however.

Market mechanisms. Departing from the actuarial approaches to rate
setting leads to a discussion of an approach with even greater reliance on the market. Payments could be set in a competitive bidding framework to rely upon market forces for their determination. In the market for relatively healthy, employed individuals, competitive bidding has been used for a very long time, except that the bidding has led to only one supplier of insurance, and usually this has been a traditional service benefits plan. In the past, only employers or unions received the competitive bids and determined the winner of the bid. The inherent reluctance to accept change in the system, which also involved an insurer providing other employment-related insurance benefits (for example, life, disability, retirement), resulted in only 18 percent of all employees having a choice in health insurance benefits in 1977. Consequently, some of the institutional characteristics of employment-related health insurance have led to a less than effective market influence on premiums and benefits.

Some argue that if competitive bidding, with market forces setting the payment rate, is to be truly effective, individual employee or consumer choice is a prerequisite. Very little evidence is available, with only one published article addressing the issue and leading to disappointing results for the market approach. If the market approach is effective, however, the trick for addressing biased selection would be to allow the competitive bidding to occur within actuarial underwriting categories. Even a stratification by age of the primary insured would be a beginning point for market-determined payment rates that allowed flexible adjustments for biased selection effects. Other actuarial categories, such as family size, prior chronic conditions, or other health status adjustments could be adopted if the risk categories needed refinement.

**Political aspects**, Among the options for rate setting for biased selection adjustments are politically negotiated HMO payment rates. In many parts of Europe and in Canada, for example, certain providers (mostly of primary care) receive risk-based capitation payments that are set on last year's payment with a negotiated payment increase. Little attention is paid to actual individual service use and costs or resource costs; rather, the available budgeted funds and the political climate are determining factors. Rates reflect the wishes of the prevailing interest group and the political will to withstand their pressure.

Politically established rates are relevant for HMOs under public programs and HMOs in states with regulated premium rates. The closest thing to this in the U.S. is negotiated Medicaid risk-based capitation payment rates. In some of the ongoing Medicaid competition demonstrations, for example, political pressures influenced the final outcome for payment after the actuarial results had been determined. The risk-based capitation system in Santa Barbara, California, for example, was established under special legislation that requires its payment rate to be tied to fee-for-service equivalent experience. In another plan in Kansas
City, Missouri, once the actuaries had made their estimates of an adequate and appropriate payment rate, undocumented adjustments were made to the rate, in part to reflect differences in risk selection. In Minneapolis, Minnesota, the state allows free choice for Medicaid eligibles among seven HMOs. If the HMOs have adverse risk selection, the state shares 50 percent of the losses in the first few years of the program—amounting to a state-established risk pool.

In sum, there are several strategies for adjusting for biased selection—actuarial, market, political—that sometimes substitute for, complement, or augment one another. Each has been used or is being tested for private and public risk-based capitation programs. It is impossible to gauge which one is the most useful, because each can be useful depending upon the circumstances. If the structure of the market continues to change in the way indicated earlier in this paper, and HMOs continue their growth, it is clear that actuarial approaches based on fee-for-service experience will diminish in importance, and market-based or political approaches particularly for public programs will be more prevalent.

What Issues Can New Research Address?

Currently, both public and private HMO payment systems use demographic factors to vary the payment rates. Thus, more is paid for family coverage and less for individual. Age, sex, and location may be underwriting categories that vary, the HMO payment with historical differences in service use and costs between the categories. In this way a plan that enrolls a disproportionate share of individuals in high- or low-risk categories receives a higher or lower payment. The effect is to attempt to blunt or compensate for any bias in which individuals select themselves into plans, or plans select individuals. Because the payment is predetermined and unchanged with actual service use or cost experience, such adjustments must be made up front at the beginning of the period covered by the payment. Thus, the fundamental research question in the past has been how best to predict future service use and cost experience.

Whether the underwriting factors currently used are sufficient to correct for biased selection is a debatable issue. In the Medicare program, for example, only 0.3 percent of the variation in charges and payments is predicted by all the underwriting factors. Thus, the search is on for other factors that might account for service use and cost differences, yet will remain out of the control of providers or HMOs.

This last point is important because if a biased selection correction factor can be manipulated, the risk of covered services could be transferred back to the premium payer thereby defeating the purpose of HMO payments. For this reason, the service use and cost experience of enrollees in a previous time period are not suitable adjustment factors for
HMOS. Prior use adjustments amount to an individualized experience rating system, eliminating the risk-based features providing cost-effective incentives, and are not compatible with HMOs. Furthermore, payment rates established one year for high or low risks may be inadequate and inappropriate the next year because of regression toward the mean. Health care service use and costs are unpredictable and vary markedly over time. For this reason, establishing prior use adjustments is like trying to hit a moving target and is probably not a fruitful avenue for research.

With actuarial, market-oriented, and political approaches to setting HMO payment rates all at work at the present time, no single, desirable approach has emerged. It is in this area where most research and development is needed. There are probably as many variations in actuarial detail to HMO payment setting as there are actuaries. The problem of setting adequate and appropriate rates still depends upon case-by-case examination to be resolved, and no unified, generally acceptable methods exist to set payment rates adjusted for patient self-selection. Perhaps because our experience has been rather limited until recently, there has been no need for clear, agreed upon methods, but this is expected to change as HMOs in various parts of the country expand.

More understanding of the importance and role of community versus experience rating must be developed. Experience rating can be viewed as the most efficient form because, in the extreme, it matches premiums paid to marginal costs, but it also undermines the social contract implied by community rating, whereby the healthy are expected to subsidize the sick. Two of the largest and most expensive social programs ever devised, Medicare and Medicaid, embody community rating features that underscore the social welfare significance of community rating. The role of adjustments or allowances for patient self-selection within experience and community rating systems is not well understood.

Finally, patient self-selection and adverse selection may be another way of saying that certain insurers in the market are unable to devise competitive premium and benefit packages—thus, they experience biased selection. If asymmetric information is the problem, then this aspect should be researched and better methods devised for stopping, or compensating for, biased selection. If the problem is insurers who are cumbersome and outdated with excessive administrative slack, either unable or unwilling to respond to market demands, then perhaps biased selection is the natural progression for insurers who are unable to remain competitive and eventually must leave the market. More research should be undertaken to understand this phenomenon, with particular attention paid to determining whether biased selection leads to unstable markets as economic theory would suggest. The empirical evidence would suggest it is not a problem for the market, only for certain participants in the market.
A better understanding is needed of the HMO payment rate setting process when actuarial approaches are no longer useful because the fee-for-service equivalent data are no longer available. In particular, methods of rate setting that reveal insurer/provider long-run supply prices are needed. That is, rate setting that yields adequate and appropriate rates at levels just sufficient to induce the supply of insurance and covered health care services for low- and high-risk individuals should be developed. We are rapidly moving toward this development in reality, and it is important that researchers recognize it when it happens.

NOTES


2. The conference, entitled “Biased Selection in Health Care Markets,” was held under the joint sponsorship of The University of California, Berkeley; SRI International; Project HOPE; and the Medical College of Virginia.


7. Eggers, “Risk Differential Between Medicare Beneficiaries,” and Eggers and Prihoda, “Pre-Enrollment Reimbursement Patterns of Medicare Beneficiaries.”


10. Regression toward the mean is even more striking for those who start in the highest risk group. For Lubitz, Beebe, and Riley, the high-risk group included those with a hospitalization in 1974. In the first year, the year of the hospitalization, the highest risk group experienced Medicare expenses 469 percent (4.69 times) the average of all beneficiaries in the sample. In the next year this had fallen to 180 percent (1.8 times) and at the end of seven years it had fallen to 145 percent.


