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# Adverse Selection in Health Insurance

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## Executive Summary

Individual choice among health insurance policies may result in risk-based sorting across plans. Such adverse selection induces three types of losses: efficiency losses from individuals' being allocated to the wrong plans; risk-sharing losses, because premium variability is increased; and losses from insurers' distorting their policies to improve their mix of insureds. We discuss the potential for these losses and present empirical evidence on adverse selection in two groups of employees: Harvard University and the Group Insurance Commission of Massachusetts (serving state and local employees). In both groups, adverse selection is a significant concern. Harvard's decision to contribute an equal amount to all insurance plans led to the disappearance of the most generous policy within three years. The Group Insurance Commission has contained adverse selection by subsidizing premiums proportionally and managing the most generous policy very tightly. A combination of prospective or retrospective risk adjustment, coupled with reinsurance for high-cost cases, seems promising as a way to provide appropriate incentives for enrollees and to reduce losses from adverse selection.

Individuals who expect high health care costs differentially prefer more generous and expensive insurance plans; those who expect low costs choose more moderate plans. This phenomenon, called adverse selection, is a major theoretical concern in health insurance markets.

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Adverse selection can lead to three classes of inefficiencies: Prices to participants do not reflect marginal costs, hence on a benefit-cost basis individuals select the wrong health plans; desirable risk spreading is lost; and health plans manipulate their offerings to deter the sick and attract the healthy.

Discussions of health care reform have often become stuck over the issue of adverse selection. Concerns about adverse selection have been raised in the context of Medicare reform, changes in employment-based health insurance, and the efficiency of individual insurance markets (see Cutler 1996 for discussion). But how important are these concerns empirically? Should we be greatly worried about adverse selection or consider it a minor issue? What measures might mitigate its effects?

We address these issues in this chapter, focusing in particular on individuals' choice of a health insurance plan from a menu set by their employer. We draw heavily on case studies of two entities for which we have detailed information that enables us to assess the importance of adverse selection: Harvard University and the Group Insurance Commission of Massachusetts. We conclude that adverse selection is a real and growing issue in a world where most employers offer multiple alternative insurance policies. Adverse selection eliminated the market for a generous preferred provider organization at Harvard and threatens to do the same with a generous indemnity policy at the Group Insurance Commission, absent measures to diminish adverse selection.

We begin the chapter with a discussion of adverse selection. We then consider the empirical importance of this phenomenon, using data from our two examples. Finally, we discuss strategies—including mandatory reinsurance and payment adjustments to plans that enroll high risks—to mitigate the effects of adverse selection.

## **I. The Theory of Adverse Selection**

We illustrate the issues involved in adverse selection by considering employer-administered health plans, although the issues could just as well apply to government-sponsored insurance or individuals purchasing insurance on their own. (The original treatment of adverse selection is Rothschild and Stiglitz 1976.) Typically, employers offer individuals multiple health plans to promote competition and to cater to individual tastes in styles of medical care delivery and choice of medical providers.

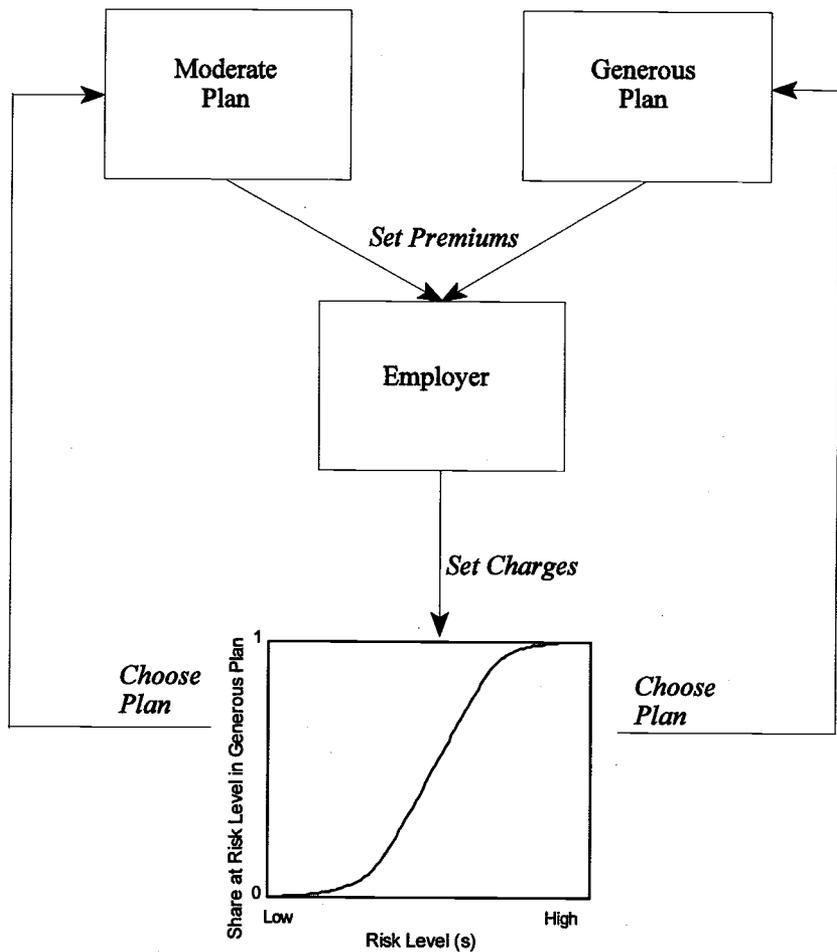
When employers set out multiple insurance offerings and allow insurers flexibility in designing their plans, high-risk individuals may differentially choose some plans and low risks another. We label this process differential selection. When differential selection occurs because individuals are not charged marginal cost when choosing among plans, it is called adverse selection, and it has implications for efficiency.

Three parties play a role in differential selection. Insurers set premiums on the basis of the riskiness of the people they enroll and their negotiations with employers. Employers pay some portion of the premiums and require some contribution by employees. Employees choose a health care plan based on a benefit-cost calculation—those who believe they are likely to need more care buy the more expensive policy—as well as preferences, such as the plan’s geographic locations, whether they can continue to see doctors with whom they have already established relationships, or whether friends recommend the plan. If such preferences exert sufficient influence, risk-based selection is a minor consideration; as they become less important, adverse selection increases.

Figure 1.1 shows how the confluence of actions by insurers, employers, and employees produces an outcome yielding plan premiums, employee charges, and an allocation of people to plans. This process can lead to inefficient allocation of employees across plans, incomplete risk spreading, and perverse incentives for plans to attract particular employees differentially, as we now show.

*Adverse Selection and Inefficient Allocation: An Example* We illustrate the adverse-selection process with a simple hypothetical example. An employer offers two health plans, a generous plan and a moderate plan. We also assume two types of individuals—high risk and low risk. The costs for treating individuals under the plans, and their gains in benefit from the generous plan, are

	Resource costs of coverage			Benefit difference:
	Moderate	Generous	Difference	generous less moderate plan
Low-risk individuals	\$40	\$60	\$20	\$15
High-risk individuals	70	100	30	40



**Figure 1.1**  
Differential selection: Plan, employer, and employee actions

High risks are more expensive than low risks, and spending is greater under the generous plan for each risk type. The last column shows the posited gain in benefits the different types of individuals receive from the generous as opposed to the moderate plan. It is assumed that high risks benefit more than low risks from increased plan generosity.

The efficient outcome in this example is for high-risk people to be in the more generous plan and low risk people to be in the moderate plan. High risks should be in the generous plan because the incremental value of that plan to them (\$40) is greater than its additional cost (\$30). For low risks, the opposite is true ( $\$15 < \$20$ ).

We suppose that insurers charge the same premium for everyone enrolled in the plan, possibly because individuals are indistinguishable to the insurer, equal premiums are required by law, or employers adopt this policy to help spread risks.<sup>1</sup> Starting at the efficient equilibrium, the premiums that would cover costs in this case are \$40 for the moderate plan and \$100 for the generous plan. If these premiums were offered, however, all of the high-risk people would switch to the low-risk plan: the additional cost to high risks of the more generous plan (\$60) is not worth the additional benefit (\$40). Thus, everyone would wind up in the moderate plan. The reason is simple: A person who switches from the generous to moderate plan benefits by mixing in with lower-risk individuals, and since premiums reflect risk mixes, this distorts choices towards the moderate plan.

*A More Complete Model* We now examine adverse selection in a more realistic framework. As before, the employer offers two health insurance plans, generous and moderate. The generous plan may offer a greater choice of providers, lower cost sharing, or less officious gatekeepers than the moderate plan. The generous policy might be a fee-for-service (FFS) indemnity policy or a preferred provider organization (PPO), whereas the moderate policy might be a health maintenance organization (HMO). For the moment, we take the characteristics of the two policies as fixed and focus on the employer's most important decision: What portion of the premium should he pay, and what portion should be charged to the employee?

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1. Even if insurance premiums do vary across insureds, they may not fully reflect the cost differences that individuals know they are likely to experience.

Three decades ago, many employers offered just one health plan. Those who offered more than one plan frequently charged employees the same amount for each, subsidizing whatever difference there was between what employees paid and the premiums the plans charged the employer. The dollar amounts were not great, and the subsidy was tax advantaged, being deductible to the employer but not taxed to the employee.

Since then, health care costs have escalated and marginal personal tax rates have declined, making subsidies to health insurance less attractive. Employers have responded by reducing subsidies to health insurance. They have also sought to set employee charges for the different plans that would make their employees face appropriate incentives when choosing among the plans, which can now differ substantially in cost. A common practice is to offer the same dollar subsidy whichever plan is chosen, the so-called equal contribution rule. Other employers subsidize a fixed percentage of each plan's costs. The question that we ask is how these two pricing strategies affect outcomes. For expositional ease, we label as "premium" the per employee amount that plans charge for enrollment, "contribution" what the employer pays toward the premium, and "charge" the amount that the employer requires an employee to pay to enroll in a plan.

We assume employees know their expected sickness,  $s$ , which we normalize as expected spending in the generous plan. Sicker people will value the more generous policy over their healthier brethren, because they will take greater advantage of its additional generosity. This differential value is represented as  $V(s)$ , where  $V$  increases with  $s$ .

Suppose that the employee charge to enroll in the more generous plan is  $D$ , for differential. All individuals who have  $V(s) > D$  will enroll in the more generous plan; those who have  $V(s) < D$  will choose the moderate plan. We denote enrollment in the moderate plan as a function  $s^*(D)$ . As  $D$  increases, so does  $s^*$ .

We now need to consider plan premiums and the employer's pricing decision. In general, we would expect the moderate plan to cost less than the generous plan for anyone. Moreover, the sicker the individual, the greater will be the differential in resource costs between the plans. We denote the cost for a person enrolled in the moderate plan as  $\alpha s$ , where  $\alpha < 1$ . Miller and Luft (1994), for example, estimate, in comparing HMOs with fee-for-service plans, that  $\alpha = .9$ .

Denote the mean level of  $s$  for  $s > s^*$  as  $s_G$ , with  $s_M$  the mean for  $s < s^*$ , where the subscripts denote "generous" and "moderate." These

means are the spending per person enrolled respectively in the generous and moderate plans. If plans offer policies with no administrative load, then  $P_G = s_G$  and  $P_M = \alpha s_M$  where  $P$  denotes the plan premium. The premium difference between the plans is

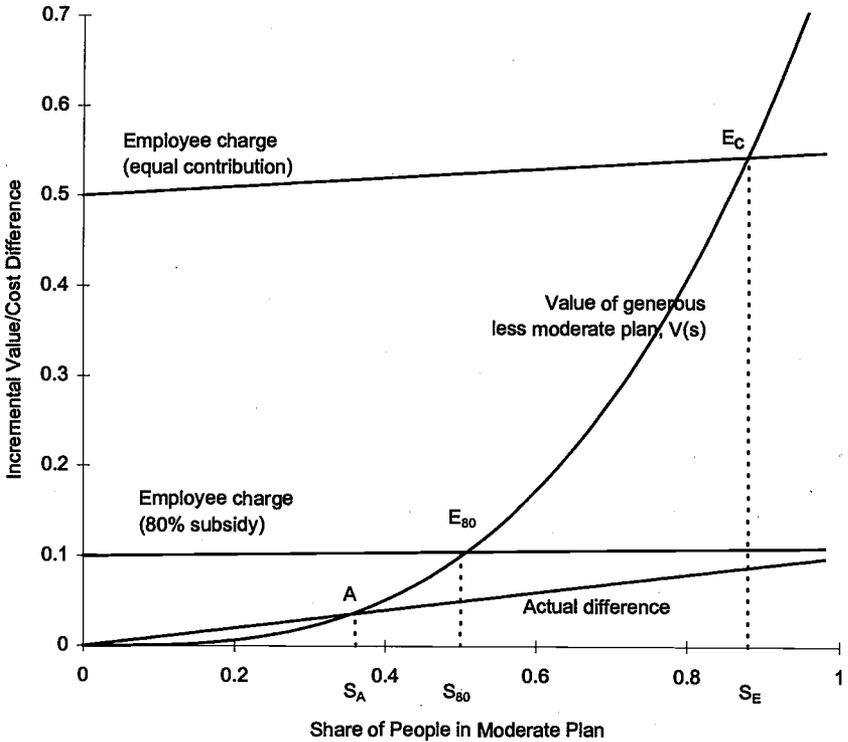
$$P_G - P_M = s_G - \alpha s_M = (1 - \alpha) s_M + (s_G - s_M). \quad (1.1)$$

The premium difference depends on two factors. The first is the resource cost savings in the less generous plan,  $(1 - \alpha)s_M$ . The second factor is adverse selection; sicker people are more likely to be enrolled in the more generous plan  $(s_G - s_M)$ .

Not all of the difference in plan premiums need be translated into differences in employee costs. Employers may make employees pay none, some, or all of the additional cost of the more generous policy. We consider two cases: In the equal-contribution case, the employer pays a fixed dollar subsidy independent of plan, and the employee pays the difference between the subsidy and the premium for his plan. In the proportional-subsidy case, the employer pays a fixed proportion of the premium cost of whatever plan the employee chooses, and the employee pays the rest. Holding plan design fixed, the interplay between the employer's pricing rules and the distribution of sickness in the population determines the severity of adverse selection.

Figure 1.2 shows a possible situation with the equal-contribution approach. Sickness,  $s$ , is assumed to be distributed uniformly from 0 to 1. The  $V(s)$  curve is upward sloping, reflecting the increased value of the more generous plan as  $s$  increases. The curve labeled "Actual difference" shows the difference between the two plans in costs of medical care for a person of sickness  $s$ . Efficiency is achieved where the cost for the individual equals the gain in value he receives from the plan, as shown at point A. Efficiency requires that everyone to the right of  $s_A$  be in the generous plan, and everyone to the left in the moderate plan.

However, the differential charges paid by employees reflect not their own incremental costs, but rather the difference in average costs between the two plans for people who have currently chosen them. The curve labeled "Employee charge (equal contribution)" reflects the difference in what employees would pay as a function of  $s^*$ , assuming  $s^*$  were the dividing line for plan choice: That is, those with sickness above  $s^*$  choose the generous plan and those with sickness below  $s^*$  choose the moderate plan (we assume that  $\alpha = .9$ ). Given equal contributions by the employer, equilibrium in the market is achieved where the charged difference equals  $V(s)$ ; at point  $E_C$ .



**Figure 1.2**  
Plan choice equilibria

The actual equilibrium is far from efficient—many fewer people will be in the generous plan than ought to be in that plan. Indeed, for some combinations of  $V(s)$ ,  $\alpha$ , and the distribution of  $s$ , the generous plan empties completely. This is termed an “adverse selection death spiral.”

Initially, the fact that the equal-contribution rule is inefficient may be surprising for economists, who believe that subsidies should be constant across alternatives. For example, if employers were giving employees choices among computers, an equal-contribution rule—“Here’s a fixed subsidy, pick the computer you want”—would be optimal. However, the cost of a health plan depends on who chooses it. The same is not true for computers; hence, the equal-contribution rule is efficient in the computer example because the individual pays the difference in cost if he chooses a better computer. The equal-contribution approach to health plans fails because it does not charge

individuals the difference in costs that they impose when choosing one plan over another. Rather, it charges individuals the difference in average costs for people who choose the different plans, and populations can vary dramatically from plan to plan because of adverse selection.

For health insurance plans, the optimal second-best single charge is roughly the average difference for all individuals who have little or no preference between the two plans. The cost difference for the marginal individual, not the average individual, is the appropriate basis for pricing those who currently have to decide among plans.

A common alternative approach for employer subsidies is to pay a constant percentage of the premium, implying that some plans get a greater dollar subsidy than others. Figure 1.2 shows a proportional plan with an 80% subsidy. The equilibrium is at  $E_{80}$ . Note that far fewer individuals choose the moderate plans with the proportional-subsidy than with the equal-contribution rule. Within a fixed employer budget, the proportional subsidy has the employer pay more and the employee less for the generous plan. Hence, it gets chosen more often. In effect, proportional subsidies provide an indirect approach to "risk adjusting" plan payments, a topic we return to below.

At the outset, we mentioned three difficulties arising from adverse selection. We now briefly discuss the other two.

*Loss of Risk Spreading* The second loss from adverse selection results from less than optimal risk spreading. In the adverse-selection equilibrium, sick people pay substantially more for health insurance than healthy people because they choose the more expensive plan and because they are mixed in with other sick people. If we asked people in advance, they would want to insure against the risk that they will be high cost and thus would prefer the generous and more expensive policy. They would want to insure still more if there were additional costs due to adverse selection. Yet there is no way to purchase insurance against the condition of wanting high coverage; the absence of a market generates an efficiency loss.

Consider three polar pricing approaches for two plans: (1) charging the employee the same amount for each plan; (2) charging employees the actual difference in their expected costs across plans; and (3) making equal contributions across plans so that employees are charged the full difference in plan premiums. The first approach would spread risks fully but would suffer moral hazard: All insureds would pick the

generous plan because it is available at no extra charge. The second approach would eliminate adverse selection, but there would still be a risk-spreading loss: The sick would spend more than the healthy for medical insurance. The third approach would have more risk-spreading losses than the second: Cost differences due to adverse selection would be added to actual cost differences.

If insureds could contract before knowing their condition, they would prefer a price difference lying between the first and second approaches, where the reduction in losses from moral hazard because the generous policy is insufficiently priced just balances the increased risk-spreading loss from increased premium differences. The policies would be priced closer together than their actuarially fair amounts and much closer together than the equal-contribution rule would produce.

*Plan Manipulation* The third inefficiency from adverse selection derives from insurers' manipulation of plan offerings. The premiums that insurers are paid may not fully reflect their population mix, say because premiums are set in advance or because employers do not fully assess the mix of enrollees before bargaining with a plan over the premium. In such circumstances, premiums stay the same even if healthier people enter a plan or sick people leave it.

In such circumstances, insurers have incentives to attract healthy insureds and repel sick insureds, a process called risk selection. Employers usually prohibit insurers from merely denying enrollment to sick or high-cost people; insurers thus need more subtle methods. Utilization management—onerous processes for referrals or follow-up visits, or high copayments—disproportionately discourages high-intensity users. Discounts for memberships in health clubs might attract the right people, an outstanding oncology program the wrong ones.

Plans are also sensitive about what they are known to offer. The Massachusetts Group Insurance Commission (discussed below) conducted an informal study in 1994 of the mental health services of ten HMOs they offered their enrollees. Each claimed to enrollees to offer the minimum mental health coverage the state mandated. In fact, however, eight plans actually offered more generous benefits for critical cases. They did not advertise this fact because they wanted to avoid being selected against.<sup>2</sup>

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2. Charles Slavin, personal communication, May 21, 1997.

Plan manipulation may impose significant losses, denying to both sick and healthy individuals the coverage they would most like. Even though people might pay a lot for the best cancer care, no plan may provide it.

## II. A Tale of Two Entities

To examine adverse selection's empirical importance, we focus on the experience of two entities that allow individual choice among health insurance plans: Harvard University and the Group Insurance Commission (GIC) of Massachusetts (the purchasing group for state and local employees in Massachusetts). The two groups are similar in many respects: both offered a costly, generous plan and several HMOs (many of which serve both Harvard and the GIC); both have a long-term commitment to providing high-quality insurance; and both have been attempting to save money by reducing their health insurance costs over time. But the recent experiences of these two entities have been remarkably different, primarily because of how they have chosen to subsidize different health plans.

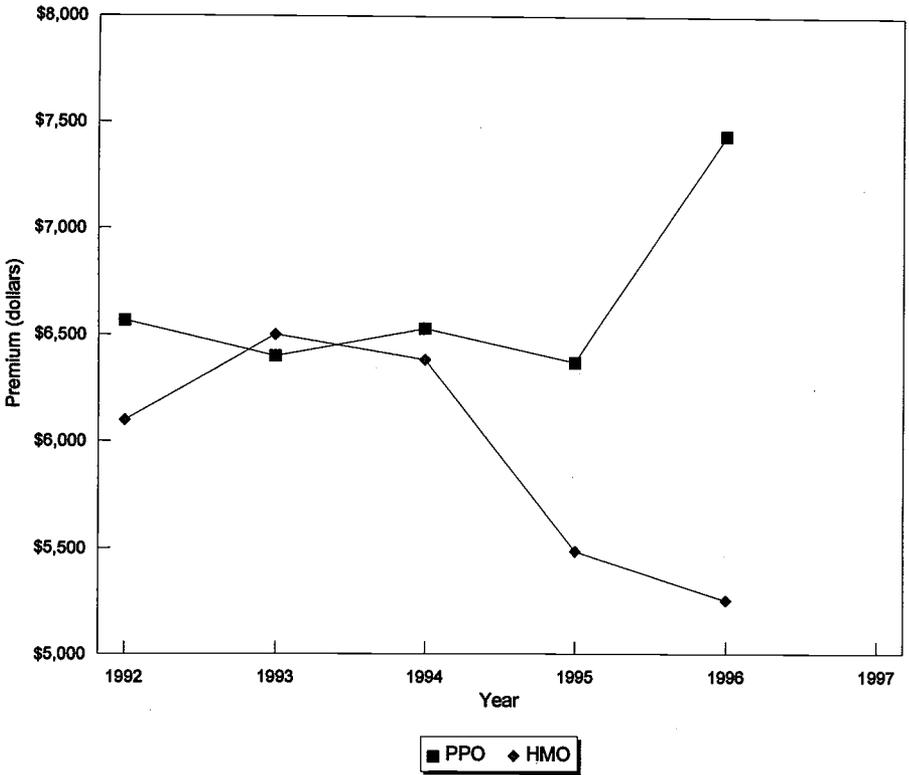
### Harvard University

Harvard University offers health insurance to about 10,000 full- and part-time employees.<sup>3</sup> Beginning in 1992, Harvard offered two types of health plans: a generous PPO run by Blue Cross/Blue Shield of Massachusetts, and several HMOs. Figure 1.3 shows the real (1996\$) premiums for a family policy in the PPO and the average HMO. (Throughout this chapter, all dollar amounts are in real (1996) dollars, and premiums and charges are for a family policy.<sup>4</sup>) In its first year, 1992, the PPO cost about \$500 more than the HMOs, because in the absence of information about the enrollment mix, the initial price was set very high. Over the next two years, the PPO and HMO premiums converged to within \$100 of each other.

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3. See Cutler and Reber 1998 for more detail on the Harvard experience. For additional discussion of plan choice issues, see Feldman and Dowd (1993), Royalty and Solomon (1995), and Buchmueller and Feldstein (1996).

4. Some analyses use a weighted average of family and individual premiums. We choose instead to rely on a particular commodity found in the market.



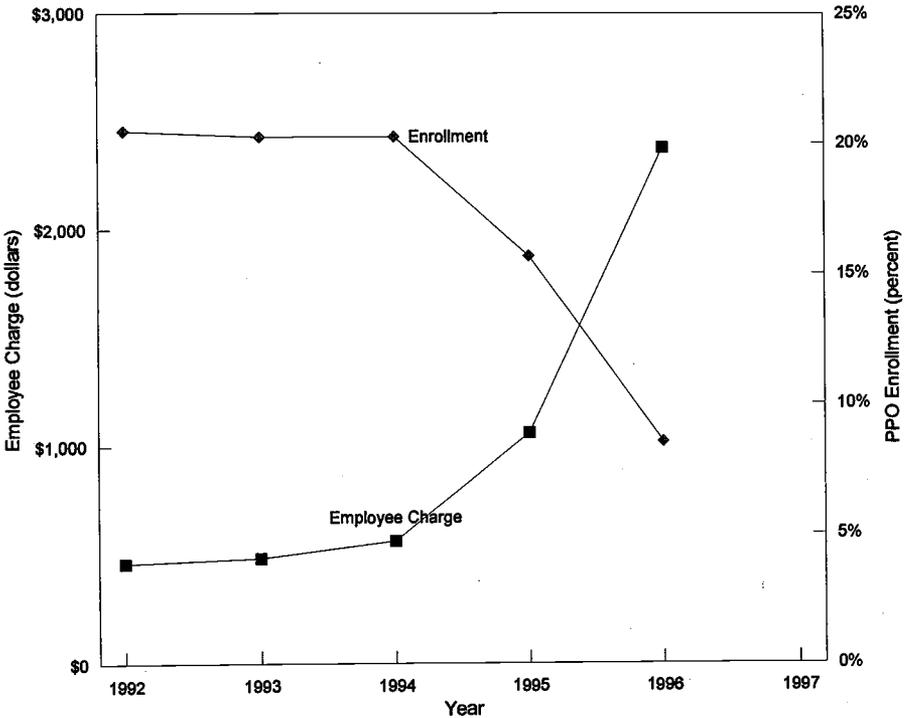
Note: Premiums are in 1996 dollars

Figure 1.3  
Real family premiums at Harvard

Because the premiums for the different plans were so similar, the PPO's additional cost to the employee was generally low. As figure 1.4 shows, between 1992 and 1994 employees paid an average of between \$400 and \$500 to enroll in the PPO instead of an HMO.<sup>5</sup> The figure also shows that enrollment in the PPO was stable at about 20% of Harvard employees.

In the mid-1990s, the University identified the rising cost of health benefits as an important culprit in the deficit it was facing. Harvard undertook a two-pronged response to the health cost increase. First, it

5. We ignore issues concerning these payments' tax status. Employee charges at Harvard are made on a pretax basis, so the after-tax contribution, in terms of consumption given up to enroll in the PPO, is smaller.



Note: Employee charge is in 1996 dollars and is for a family policy.

Figure 1.4  
Real employee charge for the PPO and enrollment in the PPO at Harvard

implemented an equal-contribution rule for each of the plans. This arrangement began with about half of the employees in 1995; the other half joined in 1996.<sup>6</sup> Employees now pay the additional cost of more expensive plans. Second, Harvard engaged in strenuous negotiations with its health insurers, stressing that its new equal-contribution policy would produce large enrollment swings toward plans with lower rates and pressing its insurers to reduce their premiums.

HMO premiums fell substantially in 1995 in response to these measures—by close to \$1,000 in real terms, as shown in figure 1.3. PPO premiums, in contrast, remained constant. This translated into a notable increase in the employee charges to enroll in the PPO, as shown in

6. Union contracts prohibited an immediate change for all unionized employees.

figure 1.4. In 1995, the cost of the PPO rose about \$500, to roughly \$1,000.

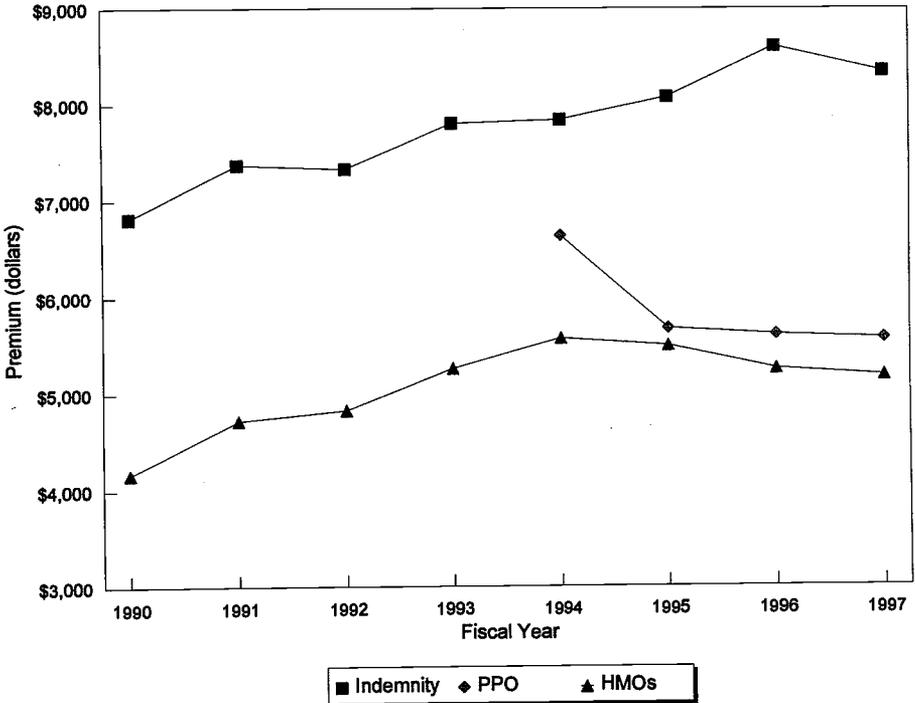
As expected, PPO enrollment fell as an initial response to this price increase. As figure 1.4 shows, PPO enrollment in 1995 fell from 20% to 15%, a significant response given that the change affected only half the employees that year. The employees who disenrolled from the PPO were healthier and younger than those who stayed (a mean age of 46 versus 51 years). As a result of the departure of healthy enrollees, the PPO lost money in 1995 and had to raise premiums in 1996.

The rise in premiums in 1996, combined with the change in policy for the remainder of the Harvard employees, resulted in a substantial increase in employee charges for the remaining PPO enrollees. As figure 1.4 shows, the required contribution for the PPO, which was about \$500 in 1994, rose to more than \$2,000 in 1996. Not surprisingly, enrollment in the PPO plummeted to about 9% of total employees. Those who left the plan were again younger than those who remained; the average age difference was five years. Blue Cross/Blue Shield's analysis showed that those who left the policy that year were 20% healthier than the average employee in the year before they left. As a result, the PPO lost substantial money once again. By the beginning of the 1997 rate negotiation period, it was clear that the PPO premium and charges would have to increase dramatically for the plan to break even. This was untenable both to the University and Blue Cross/Blue Shield, and the PPO was disbanded. Harvard's health insurance system lost its heavily populated PPO within three years of moving to an equal-contribution arrangement. The adverse selection death spiral twisted swiftly.

### The Group Insurance Commission

The GIC provides insurance to roughly 133,000 employees and 245,000 total lives, making it one of the largest insurance purchasers in New England and many times larger than Harvard. As the 1990s began, the GIC, like Harvard, offered a traditional, more generous and costly indemnity policy and a passel of HMOs.

Figure 1.5 shows premiums the insurance plans charged the GIC. The annual premium for the indemnity policy was roughly \$2,500 higher than the HMOs' premiums. Employees paid 10% of the cost for the policy in which they enrolled and the state paid the remaining 90%;



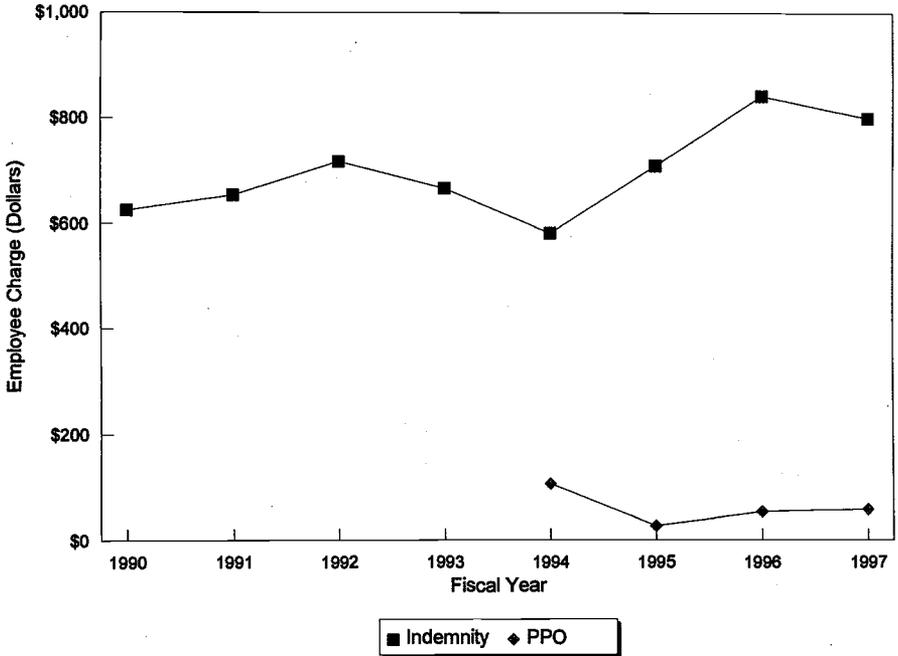
Note: Premiums are in 1996 dollars.

Figure 1.5  
Real family premiums in the GIC

in 1995 the employee share was increased to 15%.<sup>7</sup> The legislature sets these employee shares. (Most legislators are believed to be enrolled in the generous indemnity policy.) Such proportional subsidies heavily subsidize the high-cost policies. As figure 1.6 shows, the indemnity policy cost employees only about \$600 more than an HMO. Enrollment in the indemnity policy was relatively constant from 1990 to 1994 at about 30% (see figure 1.7).

In 1994, the GIC consolidated a number of Blue Cross/Blue Shield HMOs into a PPO, also offered by Blue Cross/Blue Shield. The plan change was intended partly to eliminate some marginally performing

7. Most employees accepted a small add-on to the indemnity policy for a catastrophic rider that increased the employee charge for the indemnity plan to about 15% through 1994 and about 20% after 1995.



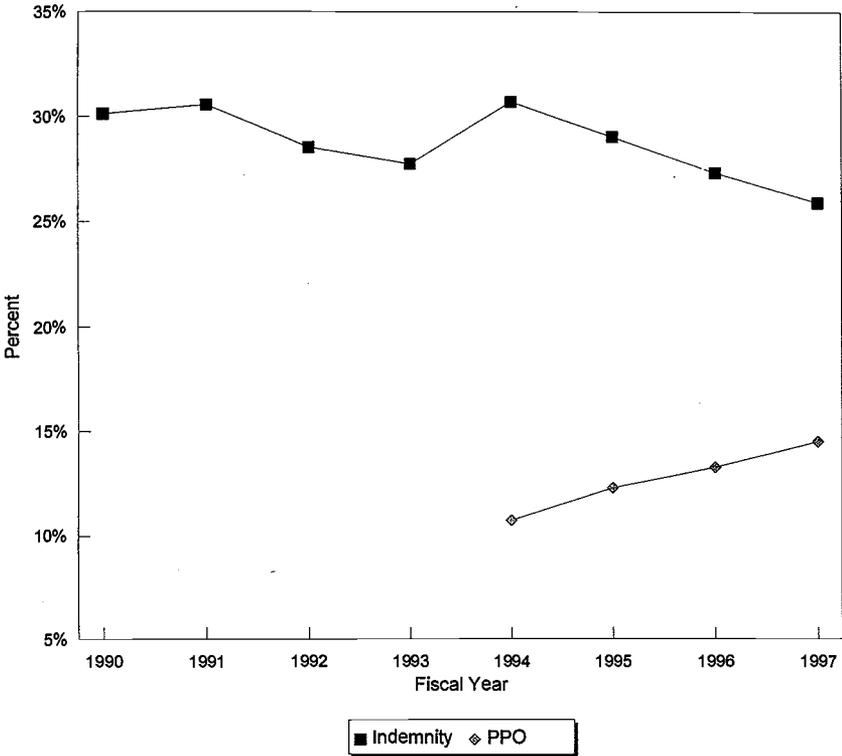
**Note: Employee charge is in 1996 dollars and is for a family policy.**

Figure 1.6

Real employee charge for indemnity and PPO policies at the GIC

HMOs and partly to encourage relatively healthy HMO enrollees to move into the experience-rated PPO and indemnity plan. This effort largely succeeded; the PPO drew a number of people from the HMOs, and enrollment in the indemnity policy actually increased. The risk mix in the PPO was sufficiently favorable that in 1995 the PPO premium fell to a level roughly equal to that of the HMOs.

The GIC thus appears to offer a quite stable plan menu. But over the course of the 1990s, adverse selection has been a serious issue. The indemnity policy has slowly been losing population, dropping to 27% of all enrollees by 1997. Real premiums for the HMOs have been flat or falling in recent years, whereas the costs of the indemnity policy have continued to rise. Real HMO premiums declined \$400 between 1994 and 1997; real premiums for the indemnity policy rose over \$500 (see figure 1.5). The reduction in HMO premium growth is not unique to the GIC: HMO premiums have not increased substantially in the Boston area for the past few years (Cutler and Reber 1998).



**Figure 1.7**  
Enrollment in indemnity and PPO policies at the GIC

To examine the importance of adverse selection in the GIC's health insurance plans, and to consider potential solutions to the adverse-selection problem, we obtained detailed data on all the health insurance claims of GIC enrollees over the 30-month period encompassing fiscal years 1994 and 1995 and the first half of fiscal year 1996. With 245,000 total lives covered, the number of claims is quite large: nearly 65,000 hospital admissions and almost 15 million outpatient records.

The distribution of medical spending in the GIC pool is heavily skewed, as it is nationally. The upper 10% of people in a year (that is, the 10% with the highest medical expenditures) account for two-thirds of the total dollars spent; indeed, the top 1% of spenders account for nearly 30% of medical dollars (see table 1.1). This is very close to the distribution of spending found in national samples (Berk and Monheit 1992). Table 1.2 shows the share of enrollees in each type of plan in

**Table 1.1**  
Distribution of spending in the GIC

Percentile	Amount	Cumulative share
Mean	\$1,944	—
10 <sup>th</sup>	\$60	0.2%
25 <sup>th</sup>	174	1.0
50 <sup>th</sup>	507	5.1
75 <sup>th</sup>	1,433	16.4
90 <sup>th</sup>	3,955	34.4
99 <sup>th</sup>	24,414	72.8

*Note:* The data are for individuals in fiscal year 1994. There are 180,837 observations.

**Table 1.2**  
Age distribution across insurance plans, GIC data

Measure	Plan		
	Indemnity	PPO	HMOs
Number of enrollees	76,185	22,434	128,709
<i>Percent of enrollees, by age</i>			
<1	0%	1%	0%
1-19	14	23	23
20-44	36	50	50
45-64	42	24	23
65+	8	1	4
Total	100%	100%	100%
Spending index	\$1,623	\$1,194	\$1,264
[Ratio to HMO]	[1.28]	[0.94]	[1.00]

*Note:* Data are for fiscal year 1994. The spending index is an average of the age and sex distribution of enrollees weighted by average spending in 1987.

1994 by age.<sup>8</sup> The HMOs had 27% of their enrollees above age 45 and the PPO had 25%, whereas the indemnity plan had 50% above 45. Because medical spending is substantially greater for the old than for the young, these mix differentials have significant implications for cost.

The last two rows of table 1.2 provide summary measures for demographic selection. Using data from the 1987 National Medical Expenditure Survey, we computed average spending by age<sup>9</sup> and gender. We then formed a weighted average of "projected spending" in each plan using the plan's demographic enrollment shares as weights. The average HMO enrollee was predicted to spend \$1,264; in contrast, predicted spending in the indemnity policy was 28% higher (\$1,623). Recall that the premium for the indemnity policy is about 40% higher than the premium for the HMOs; the demographic mix of enrollees explains 28/40, or more two-thirds, of that difference.

Selection by age tells only a part of the story. For example, people of a given age who do not expect to need substantial medical care are likely to opt out of the indemnity plan, whereas those who do will opt in. To examine the importance of selection by health status, we focused on two important conditions for the under-65 population: pregnancy and heart attacks. Both are expensive; births cost several thousand dollars on average and heart attack costs average nearly \$25,000.

Table 1.3 shows age- and gender-adjusted incidence rates for pregnancy and heart attacks. In each case, we found the rates in each plan by five-year age group (women aged 15–44 for pregnancy, men and women aged 45–64 for heart attacks) and then calculated a weighted average for each type of plan.<sup>10</sup> Both pregnancy and heart attack rates are higher in the indemnity plans than in the PPO, and both are higher in the PPO than in the HMOs. The differences are fairly large: After adjusting for age and sex, individuals in the indemnity plan have 30% more pregnancies and 90% more heart attacks than those in the HMOs.

We used claims information on individuals in the first two years of enrollment, 1994 and 1995, to examine whether selection is increasing

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8. The GIC reimburses plans the same amount for each enrollee regardless of age and requires plans to accept anyone who wants to enroll in the plan. Hence, differential selection by age is an important form of adverse selection.

9. We divided the population into nine groups: <1, 1–4, 5–14, 15–24, 25–34, 35–44, 45–54, 55–64, and 65+.

10. The weights are the share of the GIC's entire population in that age and gender group.

**Table 1.3**  
Age- and gender-adjusted incidence of plan utilization, GIC data

Condition	Percent with condition, by plan		
	Indemnity	PPO	HMOs
Pregnancy	3.4%	2.8%	2.5%
Heart attack	0.51%	0.34%	0.27%

*Note:* Pregnancy rate is for women aged 15–44. Heart attack rate is for those aged 45–64. Both rates are standardized to the age and gender distribution for the group as a whole using five-year age and gender (for heart attack) groups.

or falling over time. Overall, transitions among plans are relatively small. About 2% of people move from the indemnity plan to an HMO each year, and about 1% move in the reverse direction. The stickiness of plan choice from year to year is consistent with the evidence in Neipp and Zeckhauser 1985. Of course, the proportion of switchers might increase, as Harvard saw, if the indemnity plan were to lose its "excess" subsidy, so that the charge for the indemnity plan would jump substantially.

Table 1.4 summarizes individuals' medical spending before and after they switch plans. We show the share of switchers by their quartile in the spending distribution before they switched (1994) and again after they switched (1995). If movement between plans were random, the percentage in each cell would be 25%. The table's first column shows that 43% of the people who moved from the indemnity plan to an HMO were in the lowest quartile of spenders in the indemnity plan in 1994. By contrast, the third and fourth quartiles of spending were underrepresented among movers. In the subsequent year, people who moved to an HMO spent slightly less than average, with 53% being below median.

Among movers from HMOs to the indemnity policy, the shares are about 25% in each cell. Thus, those leaving the HMOs are not those who are particularly expensive to treat in either an HMO or in an indemnity setting.

These patterns of movement tell an intriguing story of adverse selection, somewhat at variance with the traditional account within economics. In recent GIC experience, at least, adverse selection occurs because low-risk people drop out of generous, high-cost plans; the selection into high-cost plans of high-risk people is not a significant factor. Since costs are skewed on the high end, not the low, such dynamics affect the mix of costs less quickly.

**Table 1.4**  
Transition of families by plan and position in spending distribution, GIC data

Spending quartile	Indemnity → HMO (1.8% of indemnity enrollees)		HMO → Indemnity (0.9% of HMO enrollees)	
	Indemnity	HMO	HMO	Indemnity
1 <sup>st</sup> (lowest)	43%	29%	26%	26%
2 <sup>nd</sup>	26	24	22	19
3 <sup>rd</sup>	15	27	25	27
4 <sup>th</sup> (highest)	16	21	27	29
Total	100%	100%	100%	100%
<i>Average Spending</i>				
All	\$6,833	\$3,668	\$3,173	\$6,941
Movers	4,646	4,445	4,865	7,987
Ratio	68%	121%	153%	115%

*Note:* Transitions to or from the PPO are not included.

The GIC commissioners have noted that the GIC plans are increasingly subject to adverse selection. Over the past several years, the GIC has taken several steps to enhance the indemnity policy's viability. First, it has made sure that budget savings apply to all plans roughly equally. For example, when the state needed to save money in 1992, cost sharing was increased for both HMOs and the indemnity plan, leaving the relative generosity of the plans roughly unchanged, even though some commissioners thought the indemnity plan should have been reduced more.<sup>11</sup>

Perhaps most important, however, the GIC has been actively involved in managing the indemnity plan to reduce its costs. In 1992, for example, the GIC completed a "carve out" of pharmacy benefits in the indemnity plan, subsequently extended to the PPO when it was established in 1994. Most pharmacy benefits are now provided on a mail-order basis, with a pharmacy PPO providing the rest. Bulk purchasing allows the GIC to save money on prescription drugs. Similarly, in 1994 the GIC "carved out" mental health and substance abuse benefits from

11. Indeed, the GIC commissioned a relative-value analysis of its 1996 plans (Group Insurance Commission 1995). The difference between the most and least generous plans was just 1.3%. By contrast, the indemnity plan had a premium 90% above the cheapest plan and 40% above the second most expensive plan. The relative value calculation looked solely at plan benefits and did not take into account how vigorously a plan was managed. Had it done so, it would have weakened the HMOs' relative values.

the indemnity and PPO plans. When a person in either of these plans needs mental health services, these services are managed by a company that specializes in these conditions. As a result of the carve out, mental health expenditures have fallen from \$25 million to \$10 million per year (in nominal terms). The indemnity plan also manages outpatient benefits more tightly than a traditional indemnity policy does. High-cost outpatient users are now identified and their care is reviewed for appropriateness. And the indemnity plan has an exclusive contract with an outpatient laboratory service for nonemergency services; again, bulk purchasing brings price discounts. Finally, using the leverage of substitution on laboratory services, the indemnity plan has bargained with its twenty-five highest cost hospitals in Massachusetts for lower rates.

As a final measure, the GIC is undertaking a thorough study of the health status of the individuals in its different plans and their care utilization. From the results of this study, the GIC may undertake a risk adjustment scheme for its health insurance plans. Appropriate risk adjustment in pricing has the potential to diminish substantially any problems from adverse selection, as we discuss in the next section.

## Summary

Our case studies suggest that adverse selection is a significant factor among employer-based health plans. In both the entities we examine, adverse selection became an important issue in recent years. And in both cases, the proximate reason for adverse selection is the same: healthy people selected out of the most generous plan as the cost of the less generous policies fell. At Harvard, the problem was not fully recognized until after the effects were known; at the GIC, the problem has been recognized, but no long-term solution has yet been implemented.

## III. Strategies to Deter Adverse Selection

The most immediate issue raised by the experiences of Harvard and the GIC is, If an employer wants to deter adverse selection across insurance plans, how should it do so? How can we encourage individuals to select appropriate plans—plans they would choose if they faced the true costs they would impose by choosing one plan over another?

One possibility would be to look at individuals' characteristics, then assign them to appropriate plans, given geographic location, health status, and announced preferences. But such an approach would run contrary to the norms of our nation and the movements of the health sector in recent years toward greater choice for consumers and greater competition among health plans. We therefore confine our analysis to decentralized systems, in which individuals choose from a menu with varied plans and contribution rates.

Can we have such freedom of choice but avoid severe problems of adverse selection? Standardizing plans (e.g., requiring the same coverage in all plans) might help. That way, those with particular concerns, say mental health visits or diabetes care, would not migrate among plans to the one most generous for their needs. Indeed, the GIC staff recently proposed standardizing a variety of aspects of insurance plans, with adverse selection concerns in mind.<sup>12</sup> Debate on standardization frequently focuses on the particulars of the benefits to be standardized.<sup>13</sup>

There is another issue as well. Standardizing plan offerings may impede valuable competition on program design. For example, if the employer standardizes drug copayments (say for formulary generic, formulary brand name, and nonformulary brand name), HMOs will be inhibited in designing better plans on this dimension. And what is right for one plan may not be right for other plans, depending on the ability of plans to manage utilization or negotiate with providers. HMOs might not want limits on the number of well-baby care visits, for example, preferring to let people have all the visits their providers can spare, while fee-for-service plans may find such limits valuable. The greater the employer's confidence that he knows the optimal design of coverage and that this is optimal across plans, the more willing he should be to standardize plan choices. But standardization is not always called for.

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12. The proposal was for all plans to remove the \$1 million cap on lifetime expenditures; mandate a minimum of 80% coverage on durable medical equipment and appliances; mandate out-of-network benefits for mental health; set a \$1,000 maximum benefit for hearing aids; set standard visits and copayments for occupational, speech, and physical therapy; allow annual pediatric exams up to age eighteen; implement a uniform \$10 copayment for formulary drugs and \$15 copayment for brand name nonformulary drugs; and standardize vaccination and immunization coverage.

13. One of the authors of this chapter, for example, speculates that the copay charges for different types of drugs were likely set too close together.

Even if plans are standardized, however, they will still have disparate populations. If we wish to know the true cost of plans, the prices to charge employees if they are to make efficient choices, we will have to adjust for these disparities in plan enrollment. The employer can still offer freedom of choice, if he can price appropriately. Appropriate pricing means charging less than a plan costs if it has disproportionate numbers of high-risk people, and more than a plan costs if it disproportionately enrolls healthier people. In essence, we must adjust prices to account for the risk mix in each plan. This section evaluates four potential mechanisms for risk adjustment.

### Premium Subsidies

The crudest, albeit best-known, method of risk adjustment is the one that Harvard employed prior to 1995 and that the GIC still employs: subsidize the premium of the most generous policy so that it is more affordable than risk differences alone would indicate. Although this solution has historically been the most common way to deter adverse selection, we do not believe it is the most appropriate solution. To begin with, it pays no attention to the actual composition of populations within health plans; it simply assumes that if a plan is more expensive, this must be due to a worse mix of enrollees. Although subsidizing premiums deters adverse selection, it also reduces the incentives for employees to choose their health insurance plans efficiently. Moreover, it eliminates many incentives for plans to operate efficiently or price competitively. Suppose, for example, that the most expensive plan raises its premium by \$1 in an effort to boost profits. If the employer is subsidizing the expensive policy by 90%, employees will see only a \$.10 increase in price. This substantially limits employees' incentives to seek out the most cost-effective plans.

A comparison of Harvard University and the GIC (Hill and Wolfe (1997) also discuss this issue) provides some tentative evidence on the effect of subsidy rates on premiums. As table 1.5 shows, real HMO premiums fell more rapidly at Harvard after it implemented the equal-contribution rule (9.7% annually between 1994 and 1996) than they did at the GIC (2.9% annually) in the same period. Indeed, figure 1.3 shows a large decline in premiums at Harvard in 1995, the year the equal-contribution rule was implemented. This premium reduction was not matched at the GIC, despite the similarities of the policies offered. The more rapid decline in HMO premiums at Harvard did not merely

**Table 1.5**  
Change in Real HMO Premiums, Harvard and the GIC

Period	Annual percentage change	
	Harvard	GIC
1990-94	4.9%	7.3%
1994-96	-9.7%	-2.9%

*Note:* Each entry is the average annual percentage change in real family premiums. Premiums are weighted across HMOs using contemporaneous enrollment rates.

offset more rapid premium growth prior to 1994; between 1990 and 1994, real premium growth at Harvard was also below the level at the GIC. This suggests that the equal-contribution rule resulted in premium reductions for Harvard employees in HMOs.

We suspect that marginal subsidies to more expensive plans result in higher charges from the plans than would have otherwise prevailed. Because one goal for employers is to realize the lowest premiums possible, perpetuating a marginal subsidy to high-cost plans does not seem like the appropriate solution.

### Reinsurance

The highest-cost users account for a large share of medical expenditures. Thus, having mandatory reinsurance for high-cost people could be one way to risk adjust premiums.<sup>14</sup> Suppose that all expenses over a certain amount (perhaps \$25,000 annually) were paid for out of a central account funded by a uniform tax on all insurance premiums. Then, plans would pay for high-cost users in proportion to total revenues in their plan, not the specific enrollment of the high-cost group. If the high-cost group were primarily responsible for the high costs of the more generous plans, this could reduce the adverse selection problem. The compensating danger is that once the expenses of high-cost users are pooled, the plans lose the incentive to monitor their utilization.

The reinsurance strategy parallels the mental health/substance abuse carve out. In that case, all spending for a particular condition is removed from plan premiums; in the reinsurance case, all spending above a certain amount is removed from plan premiums. The implicit

14. See Cutler and Zeckhauser 1997 for a more general discussion of reinsurance.

rationale is that the individuals carved out, whether by condition or expense level, account for most of the adverse selection, measured on a dollar basis.

How much of the difference in costs would reinsurance overcome? If high spenders are the problem, then reinsurance may be the solution. Figure 1.8 shows the share of the difference between the indemnity policy and the HMOs at the GIC accounted for by particular parts of the spending distribution. For example, the last bar in the figure shows that spending in amounts above \$100,000 per person accounts for only 5% of the total spending difference between the two sets of plans.<sup>15</sup> Indeed, spending above \$25,000 per year accounts for only 8% of the difference in spending between more-generous and less-generous plans. Contrary to what many would expect, the vast bulk of the difference between the plans is that small users in the indemnity policy average much higher annual claims than in the HMO. Spending in amounts below \$5,000 per person accounts for two-thirds of the overall differences in plan costs. This may result from more severe moral hazard in the indemnity policy, different prices paid for services, or less restrictive use of gatekeepers.

If risk mixes for patients who are not extremely expensive to treat differ substantially among plans, then reinsurance for high-cost users does not significantly reduce the consequences of adverse selection.

### Prospective and Retrospective Risk Adjustment

The final two methods of risk adjustment are prospective and retrospective adjustment. Older people, women of childbearing age, and people with certain conditions spend more on medical care than those in other groups or without those conditions. Thus, if we could measure the distribution of plan enrollees *ex ante* or *ex post*, we could adjust per capita payments to each plan to account for these differences. If the plans were compensated for the differences in risk among their insureds, then in a competitive market premiums would differ only by their pure efficiency differences.

Using the notation of Section II, suppose we observed  $s_G$  and  $s_M$ , the average healthiness of enrollees in the more- and less-generous policies. We could then set employer payments across plans of  $E_G = s_G$  and

15. Note that this is not total spending of people using over \$100,000 of services in a year but rather the amount of that spending that is above \$100,000. Under a reinsurance system, this is the amount that would be reinsured.

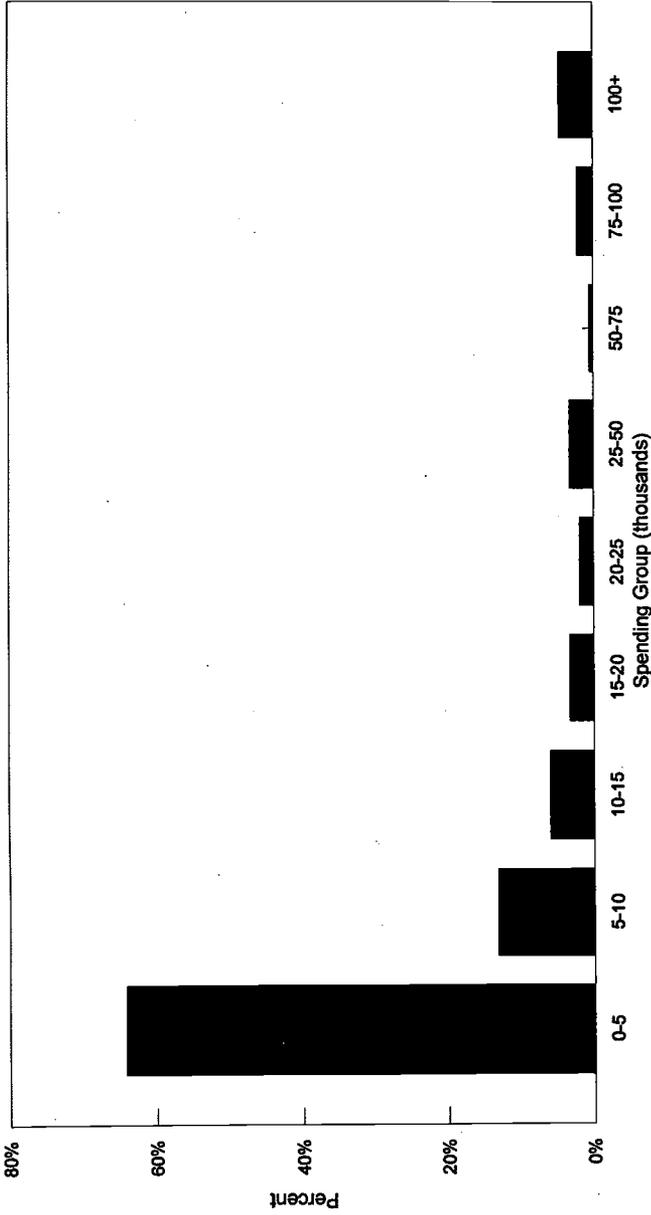


Figure 1.8  
Share of total cost difference by spending level, GIC

$E_M = s_M$ . Because these payments would eliminate the bias in employee charges caused by adverse selection, the only difference in charges facing employees would be the efficiency savings in the moderate plan. This charge arrangement would provide employees with appropriate incentives to choose the most efficient plan.<sup>16</sup>

Measuring risk differences *ex ante* is termed prospective risk adjustment; measuring risk differences *ex post* is termed retrospective risk adjustment. If these methods can be implemented effectively, they yield the right prices, and individual choices produce an efficient outcome. The major question is whether all the factors that influence costs can be observed. For example, not all people with high blood pressure have a major cardiovascular incident. If among those with high blood pressure, the people who sense they are more likely to have a major incident select into the more generous policy, a risk adjustment strategy based only on the presence or absence of high blood pressure would be incomplete.

The incompleteness of risk adjustment is problematic because the distribution of medical spending is so skewed. If individuals know they will be in the extreme tail of the spending distribution because of factors we cannot observe, adverse selection can still be economically important even if risk adjustment is good "on average." Our GIC data suggested that most of the difference in costs across plans was not in the distribution's tail. The experience of other entities may differ, perhaps because of differing historical patterns of plan offerings.

Prospective or retrospective risk adjustment is severely hindered if insurers can alter their coding practices in light of the risk adjustment system. For example, if employers pay a surcharge to plans that enroll people with high blood pressure and insurers pay particular attention to noting whether a person has that diagnosis, the risk adjustment system depends as much on insurers' ability and willingness to record this information accurately as on the true incidence in the population. Indeed, this "upcoding" problem was particularly severe with the implementation of the DRG rating system for Medicare (Carter and Ginsberg 1985).

Research on effective risk adjustment methods has been progressing rapidly (see Newhouse, Beeuwkes, and Chapman 1997 for a review).

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16. This works well if health plan choice depends only on  $s$ , so that the cost savings for the marginal person, with no preference among the plans, appropriately guides the market. But if personal preferences also play a role (if, for example, some low  $s$  people particularly like the indemnity plan), the correct price would be different for each person, and charging everyone the same price would not be efficient.

Current methods of prospective risk adjustment can explain about 5–10% of the variance in individual medical spending. Although this percentage is not large, in designing a risk adjustment system we care about the share of expected medical spending that can be explained, not actual medical spending. Estimates of the difference between expected and actual medical spending suggest that expected spending differences are about 20–25% of actual spending differences, so that current risk adjustment systems achieve 20% (5/25) to 50% (10/20) of ideal effectiveness.

Whether this degree of success—with or without reinsurance—is enough to limit adverse selection, we do not know. To date, there have been few experiments involving insurance choice in a system with risk adjustment that would allow us to provide an answer.

#### IV. Conclusions

Most Americans receive health insurance through plans administered and subsidized by employers. Typically, charges to employees depend on the plan they choose—the higher the premium to the employer, the higher the charge to employees, with the result that people who choose more generous insurance policies must pay to subsidize the sicker people who choose the more expensive policy. This arrangement invites adverse selection.

The experiences of Harvard University, which provides equal contributions across plans, and the Massachusetts GIC, which subsidizes 85% of premiums regardless of plan cost, show that adverse selection is a real-world concern. Harvard's PPO crashed in a death spiral when Harvard implemented an equal-contribution rule. Adverse selection was so great that the most generous policy could not be offered at a reasonable price. The GIC has avoided such a situation, in part by not moving to an equal-contribution rule and in part by undertaking steps to reduce the most generous plan's costs. This has been challenging, however, and adverse selection remains a concern.

To motivate the right insureds to choose the right plans, employers who offer employees a choice among plans should charge them the additional cost the employee would incur in the more generous plan. The mixes of insureds in the actual plans should not affect charges to employees; only the cost savings for a particular individual should affect his decision. In such a system, employers vary the premium across plans based on ex ante differences in demographics and observed health status across plans and may make further corrections to

payments based on ex post claims experience. Careful empirical assessment is essential to guide this process. For example, two of our most important findings about the GIC were surprises: Spending above \$25,000 per year accounted for only 8% of the difference in costs between the indemnity and HMO policies, and the vast majority of adverse selection resulted from the movement of low-risk employees. Implementing a carefully designed and empirically informed risk adjustment system is essential to making health insurance competition work well.

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