Optimal Risk Adjustment

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What Is Optimal Risk Adjustment?

When a provider is paid using risk adjustment, the price paid to the provider is conditioned on observable characteristics of the enrollee or patient. For example, if a primary care physician accepts responsibility for providing all necessary medical services to an enrollee for a year, the capitation payment to the physician might be based on the enrollee’s age, with older enrollees having higher payments associated with them because they are expected to cost more. Methods of risk adjustment are concerned with how much more to pay the physician for an older enrollee than for a younger enrollee.

Two approaches to addressing this question have been taken in the economic literature. Conventional risk adjustment sees the goal of risk adjustment as to pay providers as close as possible to the amount the enrollee is expected to cost. If an older enrollee is expected to be twice as expensive as a younger enrollee, conventional risk adjustment would pay twice as much for the older enrollee. Many factors other than age matter for expected costs. Research on conventional risk adjustment is statistical and data oriented. Researchers seek to find the right combination of variables (referred to as risk adjustors) to include in regression models so that the explained variation in health care costs is high without relying on risk adjustors that are difficult to collect in practice or are manipulable by providers seeking to increase revenue. The premise behind this research – sometimes regarded to be so obvious as to not require justification or analysis -- is that the health care market in question will function better the better job the regression model can do in predicting health care costs of enrollees.
Optimal risk adjustment methods also yield an answer to how much more to pay for an older enrollee but by a different method. **Optimal risk adjustment** views risk adjustment as a set of incentives aimed to induce providers to behave in accordance with some well-defined objective. Calculating the optimal risk adjustment begins with an explicit model of the functioning of price in the relevant market and relates the terms of that price (e.g., the payment for young and old) to the behavior of providers and patients. The economic objective (usually efficiency) is also stated explicitly. Then, using principal-agent methods, the optimal risk adjustment is derived as the prices for young and old which maximize the efficiency of the health care market. Notice, therefore, that the term "optimal risk adjustment" does not refer to particular weights, but rather to a procedure by which the optimal weights are obtained. Optimal risk adjustment also relies on data, but the optimal weights are not in general regression coefficients, but a more complex function involving an economic maximization.

In this review, we introduce the ideas behind optimal risk adjustment by stating explicitly the different types of problems in the health care markets we expect risk adjustment to address. We then consider, for each of these problems, whether conventional risk adjustment is a good approach to solution, and whether a different approach to risk adjustment would be superior. We will see that for almost any problem in the health care market, conventional risk adjustment is dominated by another risk adjustment mechanism and that the superior mechanism depends on the specifics of the problem it tries to address. Optimal risk adjustment is better thought of as a methodological approach than a particular form of “answer.” The challenge for proponents of the idea of optimal risk adjustment is to
translate ideas from economic theory into concrete improvements in the way risk adjustment is done in practice, a topic we address at the close of the paper.

**Problems In Health Care Markets Risk Adjustment May Help Address**

The ideas presented here apply to a number of different health care markets, including physician and hospital payment. To keep the discussion simple, we will confine examples to the market for competing health plans. The settings we have in mind include the private health insurance market in the US where employers decide what to pay health plan options for employees, the US Medicare program where beneficiaries choose between regular (fee-for-service) Medicare and competing health plans paid by capitation, and public sector health insurance in a number of countries where the national or local governments pay health plans a capitation payment for each enrollee.

Risk adjustment is intended to deter certain unwanted health plan behaviors (Cutler and Zeckhauser, 2000; Van de Ven and Ellis, 2000) which can be grouped into three categories: (i) individual access problems, (ii) group access problems, and (iii) quality distortions. In what follows we will discuss each of these problems and how risk adjustment is supposed to address them.

**Ensuring individual access**

If a health plans knows that the expected cost of an identifiable enrollee will be more (or less) than the capitation payment the plan receives, the plan might take actions that discourage (or
encourage) enrollment by the individual. For example, suppose an employer paid the same amount to a health plan for any employee who joined the plan, irrespective of the age, gender, or any other characteristic of the employee. The plan could anticipate that older workers are going to be more expensive, and discriminate against them in the enrollment process. In the extreme the plan could simply deny the application of an older worker.

If the capitation payment to the plan is related to the expected cost of enrollees based on observable characteristics such as age, the plan has no motive to discriminate against the old. The plan might still have a motive to discriminate on the basis of other things it might know about the person that are not captured in the risk adjustment formula. For example, suppose the plan knows that more educated enrollees demand more health care services, but the payment formula does not include an adjustment for education. Then, the plan has a motive to discriminate against the educated in enrollment.

This individual level discrimination is the problem conventional risk adjustment is best suited to fixing. Indeed, under a certain set of assumptions about the nature of the individual access problem, it can be shown that conventional risk adjustment is also “optimal,” in other words, maximizes efficiency in the market. Suppose inefficiency exists whenever the (risk-adjusted) payment made for a potential enrollee deviates from the actual cost the enrollee would incur. In particular, suppose that the magnitude of the inefficiency is proportional to the square of the difference between the payment and the actual cost. In this case, risk adjustment derived from a least squares regression will minimize the magnitude of the inefficiency (by minimizing the residual sum of squares) and therefore be identical to the optimal risk adjustment. In other words, the loss function in terms of economic efficiency is identical to the statistical loss function minimized by a “least squares” regression.
This is not a particularly plausible formulation of inefficiency related to individual access, and more reasonable ones imply that even with respect to individual access, conventional risk adjustment is not the efficient way to do risk adjustment. First, the loss function is probably not symmetric. Underpayments may be worse in terms of an inefficiency than overpayments of the same magnitude. It may be that underpayment results in an access problem but overpayment does not result in “too much” access. Second, a gap between payment and actual cost is not really the problem. Plans react only to what they expect, so since a plan cannot forecast costs exactly, minimizing a function related to the gap between payments and actual costs is not the right objective; it is the gap between payment and the costs the plan expects an enrollee to incur that leads to access problems. To quantify this gap for a particular risk adjustment formula requires specification of what the plan’s expectations are. An asymmetric loss function and specification of what a plan might know have been incorporated in risk adjustment research designed to contend with individual access in work by Shen and Ellis (2002), who assume that a health plan can deny enrollment to an applicant if the plan expects costs to exceed payment. (The loss function in this paper is thus highly asymmetric. There is no efficiency loss if payment exceeds expected cost.) In their empirical analysis of the individual access problem using employer data, a form of optimal risk adjustment based on simple age-gender adjustment is superior to conventional risk adjustment based on more variables. Thus, in general, conventional risk adjustment is not “optimal” for dealing with individual access.

Although ensuring individual access is a major rationale for conventional risk adjustment, it is not clear that individual access is even much of a problem in practice. In the contracts that employers have with their health plans, and in regulations imposed by public
payers in the US and other countries, health plans are required to maintain “open enrollment.” In a conference on the use of risk adjustment by private payers in the US, employers’ representative believed that these contract features adequately addressed the individual access problem (Glazer and McGuire, 2001). Medicare also requires “open enrollment” for contracting plans. If a plan takes Medicare enrollees it must accept any who apply. Similar regulations against individual discrimination apply to this problem in public payment systems in other countries as well.

**Ensuring group access**

Risk adjustment has also been used to deal with access problems at the group level. In the US, health plans decide if they wish to contract with a private employer or with a public program such as Medicare. Once they do, they must take all applicants as we just noted. But if the plan anticipates drawing an “adverse selection” of the risks from the potential applicant pool, risk adjustment of the payments may ameliorate any plan concern about adequate payment. Analysis of this issue leads to important insights about risk adjustment.

Consider first the situation of a private employer, small in the local market for health plans, and wishing to offer employees choice of plans to be paid by capitation. If the employer offers only one plan no risk adjustment is necessary. With two or more plans, the employer and the plans might be concerned that the distribution of health care cost risks might not be evenly distributed among the plans. Employers enter into contracts with health plans to pay them for enrollees but virtually never use risk adjustment in these contracts (Glazer and McGuire, 2001), conventional or otherwise. It is the average capitation payment
to a plan that matters both to the plan and to the employer, so negotiations around the contract concern this average payment. Data confirm that negotiated prices characterize this market: employers pay different prices to different plans for the same coverage, and different employers pay a plan different prices for the same coverage (Glazer and McGuire, 2002a). It may seem irrational for a plan to accept the same price for an old as for a young worker, but as long as the average has been determined appropriately in negotiation, there is no reason from either party’s point of view to do any risk adjustment at all. Private markets in the US continue to disregard the call by some researchers for employers to use risk adjustment to address problems of adverse selection, and the ability of negotiated average prices to solve both sides’ problems in private markets is probably the major reason why.

Medicare, and public payers in most countries, faces a different problem. A large national program is not in a position to negotiate plan by plan but must set rules that apply nationally. In this case, risk adjustment may be a partial solution to inducing plans fearing selection to contract with Medicare. However, even in this case conventional risk adjustment is not in general the optimal mechanism. As shown in Glazer and McGuire (2000), if "sicker" individuals prefer to join one plan and "healthier" individuals prefer to join another plan, then unless the risk adjustors are perfectly correlated with the individuals' "health status", optimal risk adjustment calls for "overpaying" for some individuals and "underpaying" for the other, relative to the conventional risk adjustment rates. That is, if, for example, age is used as the only risk adjustor and age is correlated but not perfectly with individuals' health status (i.e., some old individuals are healthy and some young individuals sick) then unless risk adjustment "overpays" for the old and "underpays" for the young, plans that attract (a share above the population's share of) the sick individuals may not break even.
Furthermore, in a surprising result, the lower is the correlation between age and health status, the higher should be to overpayment for the elderly and the under payment for the young in order for all plans to break even.

**Ensuring the efficient quality of care**

In situations where competing health plans are prevented from denying enrollment to particular individuals due to open enrollment provisions, plans can still seek to attract and deter enrollees with certain characteristics by setting various dimensions of the quality of services. This is termed service-level selection and links risk adjustment with incentives to plans to provide the efficient quality of health care.

It has long been recognized that plans have an incentive to overprovide some services and underprovide others in order to deter and attract enrollees with certain characteristics (Newhouse, 1996; Van de ven and Ellis, 2000). This “plan manipulation” in the terminology of Cutler and Zeckhauser (2000), emerges when plans compete on the basis of service quality in an environment of prospective payment and potential adverse selection (Glazer and McGuire, 2000). Frank Glazer and McGuire (2000) use data from a Medicaid public payer in the US to show that plans have an incentive to distort the quality of different services to affect patterns of enrollment. Recent papers confirm the predictions that plans will differentially distort quality choices (Cao and McGuire, 2003; Mello et al., 2002).

In this context, risk adjustment can alter a plan’s incentives and balance the incentives to provide care attractive to both low-cost potential enrollees (such as primary care) and to high-cost enrollees (care for a chronic disease such as diabetes). Conventional risk
adjustment can improve incentives over no risk adjustment by increasing the payment for higher cost persons, but optimal risk adjustment can do better. The approach taken in the optimal risk adjustment literature in this context is to view the plan as making a decision about how tightly to ration the various services the plan provides. A “service” might be primary care, cardiac care, maternity care, and so on. Tighter rationing means lower cost and lower quality of care. By explicitly recognizing the financial incentives a plan has to set quality differentially, and relating these to the parameters of the risk adjustment formula, the weights on the available adjustors can be chosen so as to achieve the desired balance of incentives.

When a plan decreases the stringency of rationing on a service, i.e., increases the level of spending on a service, costs are affected because spending goes up for existing enrollees and because spending is incurred on enrollees newly attracted by the spending increase. The idea of optimal risk adjustment is to make sure that, for all services a plan is making a decision about, from those used mostly by the healthy and cheap to those used mostly by the sick and costly, these cost increases are balanced against revenue gains to the same degree. This is done by recognizing that new enrollees coming in have a payment being made on their behalf, and the terms of that payment are described by the risk adjustment parameters. There is thus a relation between the marginal cost and marginal revenue for each of the services in a plan. Balancing incentives across services essentially amounts to an equation for each service, the level of rationing being the variable and the risk adjustment weights being the parameters.

Glazer and McGuire (2002b) characterize optimal risk adjustment in a market where competing health plans choose the quality of their bundle of services and show that it
depends on the first and second moments of the distribution of health care utilization patterns by service in the population. To equalize incentives to ration all services, the covariance of the risk adjusted payment with the use of every service must track the covariance of the total predicted costs associated with the increase in use of the service. Intuitively, the optimal risk adjustment formula must have the property that by spending on a service, the cost consequences to a plan relate to the revenue consequences in the same way for all services. It is important to stress that the result for optimal risk adjustment says how a given average payment should be risk adjusted, but does not answer the question of how high or low on average the payment should be.

A key assumption in this approach is that a plan sets rationing at the service level, and does not customize rationing for each individual. Ma (2003) and Jack (2004) have both pointed out that profit maximization implies that a plan would prefer to ration services person by “type” of person, and Jack (2004) has incorporated this feature into a model of optimal risk adjustment. Glazer and McGuire (2000) justify their assumption by appealing to separate objectives of the managers and the physicians in a plan. A manager would prefer doctors to ration more tightly to the sicker (more costly) patients. Doctors in each clinical area in models of service-level rationing are viewed as being given a budget, and doing the best they can to maximize the health benefits to their pool of patients. This behavior implies that the shadow price of rationing across patients within a service area is the same, but because the managers set the budgets, the level of rationing differs across clinical areas.

The optimal risk adjustment emerges as a set of linear equations one for each service, with unknowns equal to the variables available for risk adjustment. An interesting feature of this optimal risk adjustment scheme is that the number of parameters available for risk
adjustment could be greater or less than the number of services a plan is deciding about. (Some risk adjustment systems have scores of weights.) If the number of available risk adjustment parameters is larger than the number of services whose quality the plan decides on, there may be many risk adjustors that achieve optimality in the sense of incentive balance across services. Glazer and McGuire (2002b) label and characterize “minimum variance” optimal risk adjustment as the solution to the optimal risk adjustment formula that minimizes the symmetric loss function in the square of deviations between payments and actual costs. The “second best” optimal risk adjustment, when the number of risk adjustment parameters is less than the number of services, has not yet been described in the literature.

**Optimal Risk Adjustment and the Practice of Risk Adjustment**

What promise does the economic research on optimal risk adjustment hold for the practice of risk adjustment policy in the US and other countries? As we noted above, formal risk adjustment of any stripe, conventional, optimal, or otherwise, does not appear to be needed in private employer markets in the US, where employers or their representatives choose the plans they contract with and negotiate the average rates. In contrast to other payment reforms initiated by Medicare in the areas of both physician payment and hospital payment, where the private sector followed Medicare’s lead, this is not happening in the area of risk adjusted payment for health plans.

Remaining in the US context, Medicare is in the process of phasing in more detailed risk adjustment based on diagnoses from hospital discharges from the previous year, a revision based on an improvement in the form of conventional risk adjustors used in this
program (see Ellis, this volume). The major problem in Medicare at this point is what has been referred to above as the “group access” problem, the issue of inducing health plans to offer enrollment to Medicare beneficiaries. This is mostly a payment level, not a payment mix, issue. Private markets address the group problem by negotiation; Medicare substitutes regulation, and since the Balanced Budget Amendment (BBA) of 1998, there are new regulations raising the levels in counties in which the old formula has led to low payment levels, and limiting the level and growth of payments in counties in which the old formulas led to high payments. Medicare is a large payer, so its risk adjustment formula matters (as the literature on service level selection attests) but in Medicare, the policy action is primarily in the level of payment. Similar observations apply to Medicaid programs administered by states in the US.

The larger is a payer in relation to the market for health plans, the more risk adjustment matters; indeed, the more payment policy matters across the board. Medicare is an intermediate case, large, but not the whole market. Economic analysis of risk adjustment matters most, therefore, in countries or settings with a one-payer system, such as in the national plans of Netherlands, Germany, Israel or Switzerland. Although each country is a special case, and has a complex set of regulations affecting the quality and access choices of plans, the economics of risk adjustment finds it most ready application in these settings. Thinking of optimal risk adjustment as an approach or a method leads to the following simple conclusion: economic researchers should set up a simple model of the health plan market in each country, regard the weights on the risk adjusters as the variables, and characterize the optimal weight.
In light of the widespread concern for the quality of care in many countries, it is important to consider what role risk adjustment might play in promoting quality. Obviously, if the question is the overall level of funding of the health care system, risk adjustment, which raises the payment for one person by lowering it for another, is not the issue. Risk adjustment can affect the relative incentives to provide quality of different types of health care services.
References


