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# **Risk adjustment and its Applications in global payments to providers**

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### IMPORTANT NOTICE

This paper is prepared for the Massachusetts Medical Society and is intended for educational purposes only. The materials and information presented are meant to be illustrative in nature and does not address specific issues or risks associated implementing risk adjustment. Milliman is not providing any recommendations nor is it expressing any opinions to the Massachusetts Medical Society or its members, as to how risk adjustment should be applied in payment settings. Milliman assumes no duty or liability to the Massachusetts Medical Society or its members as a result of the materials or information provided or referenced in the presentation.

## OVERVIEW

Healthcare reform calls for fundamental changes in health insurance and provider payment, in which risk adjustment plays an important role. This paper is prepared for the Massachusetts Medical Society on the use of risk adjustment in provider payment reforms. The Massachusetts Medical Society intends to use this paper as educational material for provider organizations that are about to enter into global payments or are already in such a program. We begin with a general description of risk adjustment, why it is needed, and how it has been used in healthcare financing and delivery. We then describe the risk scoring and fund allocation process in detail by walking through an example. In the next sections, we discuss the main characteristics of risk adjustment models and the key considerations when applying risk adjustment in global payment such as:

- The selection of a risk adjustment methodology
- The choice between concurrent and prospective models and how payments are organized
- Input data for risk adjustment, clinical validity, and the importance of coding
- The credibility of risk adjustment with regard to partial eligibility and patient assignment
- How risk adjustment works together with other risk mitigation programs, such as reinsurance and use of a risk corridor

## WHY RISK ADJUST?

Lisa Iezzoni, in her seminal book, *Risk Adjustment for Measuring Health Care Outcomes*,<sup>1</sup> stated that the rationale for risk adjustment is obvious. Take, for example, two patients with the same age and gender, but one who has a clean bill of health, and the other one multiple chronic illnesses. Both have their own healthcare providers. If healthcare payments are purely determined by age and gender, then the two providers would receive the same amount of payment, even though treating and managing the second patient is more complex and costly. In effect, the provider who treated the sicker patient would be underfunded, and the provider who treated the healthy patient would be overpaid. When evaluating the economic performance of these two providers, if the difference in a patient's illness burden is not accounted for properly, the provider treating the healthy patient would appear efficient, and the provider treating the sick patient would appear inefficient. Furthermore, if performance bonuses were tied to efficiency, then the "efficient" provider would be unfairly rewarded and the "inefficient" provider unfairly penalized.

Broadly speaking, without accounting for the differences in illness burden in a population—whether the population is the members of a provider panel, the enrollees of a disease management program, an employer group, or the members of an entire health plan—the evaluation and comparison of healthcare outcomes would be impossible. Because of this, risk adjustment is an important tool that assists both sides of the healthcare dichotomy, financing and delivery. In healthcare financing, risk adjustment can level the playing field across different risk-taking entities, account for adverse selection, and ensure fairer payments and healthier market competition. On the delivery side, risk adjustment controls for the differences in individuals' health status, making the evaluation and comparison of healthcare outcomes more meaningful.

In practice, risk-adjusted payment allocation is done on a large scale, typically for an entire health plan or an entire provider organization. The aggregate amount of funds transferred can be quite significant. Thus, it is essential for all stakeholders in the healthcare system to understand risk adjustment, select the appropriate methodology, and implement it successfully.

<sup>1</sup> Iezzoni, Lisa I., ed. (December 2002). *Risk adjustment for measuring health care outcomes*, third edition.

## WHAT IS RISK ADJUSTMENT?

Risk adjustment is a two-step process—first a risk assessment step, and then a fund allocation step. A successful risk adjustment program depends on both steps being accurate, robust, transparent, and practical.

In the risk assessment step, the relative morbidity level of a population is evaluated based on standard data fields in healthcare claims, such as age, gender, diagnosis codes, and pharmacy codes. The results of risk assessment are summarized into numeric values (usually centered around 1.00), called “relative risk scores.” Each individual is assigned a relative risk score based on his or her unique demographic and disease profile. The relative risk scores can be converted into dollar predictions of healthcare costs. For instance, if a 1.0 relative risk score for a population corresponds to \$4,000 a year in total healthcare cost, then an individual with relative risk score of 1.5 is expected to cost 50% more than this average, or \$6,000 a year. The relative risk scores can be averaged at the group level, allowing for direct comparisons across different groups and across time. The relative risk scores are developed using a combination of clinical rules and statistical methods called risk adjustment models, which we will discuss in more detail. They are also correlated with healthcare utilization statistics such as hospitalizations, use of emergency services, and high-tech radiology services.

In the second step, funds are transferred among participating entities in a risk adjustment program based on the relative risk scores as well as on factors such as network discounts, benefit level, members’ eligibility duration, and geography. Risk adjustment sometimes also works together with other risk mitigation programs in conjunction. For instance, in Medicare Part D, risk adjustment works together with risk corridor. Under the Patient Protection and Affordable Care Act (PPACA), funds are transferred based upon risk adjustment for all non-grandfathered and non-self-insured individuals and small employers both inside and outside a health insurance exchange. It also coordinates together with reinsurance and risk corridor, although the latter two programs are transitional while risk adjustment is permanent.<sup>2</sup>

## HOW HAS RISK ADJUSTMENT BEEN USED?

In the United States, risk adjustment has been used in setting payment rates in public programs such as Medicare Advantage, Medicare Prescription Drug Plans, and Medicaid managed care contracting. The Massachusetts Commonwealth Health Insurance Connector Authority uses risk adjustment in premium allocation among participating managed care organizations in the Commonwealth Care program, the subsidized program that attracts mostly people who did not have health insurance previously. In the PPACA, risk adjustment is used for fund transfer among all health insurers in a state both inside and outside an exchange.

In the private sector, risk adjustment has been used in a variety of applications. In accountable care organizations and patient-centered medical homes, risk adjustment can be used to determine the global capitation budget and performance-based bonuses. When evaluating the effectiveness of care and disease management programs, risk adjustment can be used to account for the differences in disease profile and illness burden of the study group and the control group. Risk adjustment has also been used together with clinical episode methodologies such as Episode Treatment Groups (ETG) and Medical Episode Groups (MEG) to evaluate the efficiency of specialty providers. On the financial side, risk adjustment has been used in trend analysis, small group underwriting, and cost and utilization benchmarking.

## HOW DOES A COMMERCIAL RISK ADJUSTMENT MODEL WORK?

Risk adjustment models for the commercially insured population have been around for 15 years or longer. Major risk adjustment developers and vendors are listed in the table in Figure 1. Each has its own proprietary algorithms and methodology, and offers a large number of application-specific risk adjustment models for users to choose from. The choice of model largely depends on the answers to the following questions. We have a section later in the paper that discusses these issues more specifically:

<sup>2</sup> See the Patient Protection and Affordable Care Act.

- What data is available—diagnoses, pharmacy, or other?
- What is the evaluation time period—is it retrospective or prospective?
- What are the intended purposes? Is it prospective payment, retrospective payment, underwriting, healthcare cost and utilization forecast, or something else?
- Are there any special considerations, such as a lag between the claim period and the projection period, or that reinsurance is in place?

**Figure 1: Commercial Risk Adjustment Developers and Vendors**

Commercial Risk Adjustment Vendors (sorted alphabetically)	Products	Short Description
Ingenix (United Health Group)	ERG, PRG	Episode-based, uses diagnosis and/or pharmacy information
Johns Hopkins University (exclusive through DST Health Solutions)	ACG	Population-based, uses diagnosis and/or pharmacy information
Milliman	MARA DxAdjuster, RxAdjuster, CxAdjuster	Population-based, uses diagnosis and/or pharmacy information
Verisk Health	DCG, RxGroups	Population-based, uses diagnosis and/or pharmacy information

All risk adjustment modeling tools follow the same process—they classify and group medical codes into predetermined classifications, generate relative risk scores for individuals measured, and provide output. Figure 2 illustrates how a commercial diagnosis-based risk adjustment model works, in this case the Milliman Advanced Risk Adjuster (MARA) prospective DxAdjuster with zero lag.<sup>3</sup>

There are over 16,000 ICD-9-CM codes in the code set. Based on body systems, etiology, and resource use intensity, the MARA DxAdjuster first classifies the detailed ICD-9-CM codes into more than 1,100 MARA categories. This allows for the rather fragmented diagnosis data to be organized into clinically homogeneous groups with adequate numbers of incidences, so that robust cost estimates can be produced with enough clinical and statistical rigor.

In the second step, the MARA DxAdjuster assigns linearly additive risk weights to each MARA category. The risk weights represent the marginal contribution of the MARA categories toward the predicted cost. In reality, many medical conditions coexist among certain subsets of a general population, e.g., diabetes and cardiovascular diseases together are more prevalent among older patients than in younger patients. The presence of cardiovascular conditions makes the treatment of diabetes more complex and vice versa. In cases like this, the total cost of treating multiple comorbidities is not a simple addition of the costs associated with treating each individual condition. To account for cases like this, the MARA DxAdjuster further modifies the risk weights based on an individual's age, gender, disease severity, and prognosis.

In the final step, the MARA DxAdjuster outputs individual-level relative risk scores for total cost and cost by service category—inpatient, outpatient, pharmacy, physician, and other. Risk drivers are also output, which provide direct insights into what medical conditions contribute to the risk scores, and by how much. This information, when used in combination with evidence-based medicine algorithms, can be useful in medical management.

<sup>3</sup> More information about MARA is available at <http://www.milliman.com/expertise/healthcare/products-tools/milliman-advanced-risk-adjusters/>.

Let's walk through an example—patient Dave Wave, a 50-year-old male. Dave was seen by different providers in 2009 for mainly three health problems—hypertension, chronic respiratory problems, and painful joints. The service dates and the medical diagnosis codes (ICD-9-CM) are listed below.

**Figure 2: Dave Wave, Male, 55 Years Old  
Calendar Year 2009 Claims**

Service From Date	Service Thru Date	Claim Paid Date	ICD-9-CM	ICD-9-CM Description
1/9/2009	1/9/2009	1/22/2009	401.1	Essential hypertension
7/14/2009	7/14/2009	8/6/2009	496	Chronic airway obstruction
8/14/2009	8/14/2009	8/27/2009	496	Chronic airway obstruction
9/9/2009	9/9/2009	12/24/2009	716.99	Arthropathy, unspecified, multiple sites
10/9/2009	10/9/2009	12/24/2009	716.99	Arthropathy, unspecified, multiple sites
11/6/2009	11/6/2009	12/24/2009	716.99	Arthropathy, unspecified, multiple sites
12/4/2009	12/4/2009	12/24/2009	496	Chronic airway obstruction

After running Dave's enrollment and claim data through the MARA DxAdjuster, we have the output information shown in the tables in Figures 3 and 4.

**Figure 3: Dave Wave's MARA DxAdjuster Output**

Inpatient Risk Score (1)	Outpatient Risk Score (2)	Pharmacy Risk Score (3)	Physician/Other Risk Score (4)	Medical Risk Score (1)+(2)+(4)	Total Risk Score (1)+(2)+(3)+(4)
0.52	0.24	0.91	0.45	1.21	2.12

**Figure 4: Dave Wave, Summary**

MARA Category	Clinical Risk Contribution (%) <sup>4</sup>
Hypertension	55.62
Other arthropathies	17.26
Chronic obstructive pulmonary disease (COPD)	27.12

<sup>4</sup> Age/sex contribution is not included in the calculation for clinical risk contribution.

To summarize, Dave Wave is expected to cost about 2.12 times the average commercially insured individual in the next 12 months. The biggest driver of the expected cost is hypertension, at 55.62%. The second biggest driver is COPD, at 27.12%.

## FROM RISK SCORES TO FUND TRANSFER

Risk scores can be aggregated to compare group-level differences in healthcare cost and utilization. Below is an illustration of how the results from a risk adjustment model may be used in fund transfer and reallocation among provider organizations. For the purpose of illustration, the only factor considered here is the group-level relative risk scores.

Let us assume that a health insurer contracts with three provider groups—I, II, and III—for the care of commercial members. The average relative risk score is 1.00 for all patients associated with the three provider groups, and the corresponding average per member per month (PMPM) total cost is \$300. Group I is a multispecialty practice group and treats mostly adult patients. Group II is a large pediatric practice. Group III has a rather balanced patient cohort in terms of their age and gender.

The table in Figure 5 provides the average scores based on age and gender alone. The table in Figure 6 provides the relative risk scores from a risk adjustment model. The age/gender score for Group I is 1.25, suggesting a 25% higher risk based on age/gender alone, and the relative risk score is 1.14, suggesting a 14% higher risk based on age/gender and medical information. A further analysis shows that patients in Group I have lower prevalence rates of serious chronic conditions such as diabetes, cancers, and heart diseases than patients of the same age and gender, and this is why their relative risk score is lower than their age/gender score. Group II treats much younger patients, but the patients are slightly sicker than suggested by their age and gender. Group III treats patients that are at the average age/gender distribution, but their relative risk score suggests that they are slightly sicker than the average. A simple age/gender-based capitation would allocate \$375, \$240, and \$306 per member per year (PMPY) for the three groups, respectively, resulting in Group I getting an unfair financial gain, and Groups II and III underfunded.

**Figure 5: Budget Reallocation, Age/Gender Adjusted**

	Number of Patients	Age/Gender Score	Age/Sex Adjusted PMPY Budget
Group I	3,040	1.25	\$375
Group II	4,075	0.80	\$240
Group III	2,900	1.02	\$306

**Figure 6: Budget Reallocation, Risk Adjusted**

	Number of Patients	Relative Risk Score	Risk Adjusted PMPY Budget
Group I	3,040	1.14	\$342
Group II	4,075	0.86	\$258
Group III	2,900	1.05	\$315

There are two types of risk-adjusted payment arrangements—prospective and retrospective. In prospective risk adjustment, patients' historical claims are used to generate the relative risk scores and set annual budgets for the

group for the upcoming year. The risk scores and budget may be updated on a quarterly basis or another schedule throughout the year. Final budget can take additional months to settle, allowing for claims to run out and membership information to be finalized. In our example, Group I's 1.14 risk score will be based on the previous year's claims. It is also possible that the health insurer may choose the average risk score from the past few years to establish the 1.14 so as to be more robust. Group I will receive a budget of \$342 PMPY for the upcoming year, and it can be adjusted, say, every quarter.

In retrospective risk adjustment, a provider group can either be paid on fee-for-service or on a fixed capitation fee to begin with. Risk scores are based on the current year's experience instead of historical claims. For this reason, final risk scores will be determined a few months after year-end, to allow for claim run-out and membership true-up.

In practice, geography (urban vs. rural) and health insurance benefit level (richer vs. leaner benefits) are often used in conjunction with the relative risk scores to determine the distribution of funds. Small size panels, and patients who were eligible for less than a certain number of months in the base year, are usually not scored until there is enough data and experience on them. In the interim, they are assigned an age/gender-based average risk score.

## MAIN CHARACTERISTICS OF RISK ADJUSTMENT MODELS

As mentioned, there are several competing risk adjustment model developers, each of which offers a large number of models for users to choose from. While the model development technologies are proprietary, the common features of risk adjustment models are:

### (1) Concurrent vs. prospective

A concurrent risk adjustment model uses 12 months' worth of healthcare claim data to explain the variability in healthcare costs within the year. A prospective model, on the other hand, uses the same information to predict healthcare costs in the future year. In other words, the prospective model is a forecasting model, while the concurrent model is not.

By design, both acute and chronic illnesses are emphasized in the concurrent model. In the prospective model, systematic factors, such as aging and chronic illnesses, outweigh acute and one-time conditions. Acute and one-time events are averaged at the age/gender group level in the prospective model. For instance, completed pregnancy typically has a large risk weight in a concurrent model, but zero risk weight in a prospective model. Similarly, appendicitis has a non-zero risk weight in a concurrent model, but zero risk weight in a prospective model.

There are pros and cons in either model choice. Some argue that the prospective model has a much lower predictive accuracy than the concurrent model judging by the R-Squared (a measure of goodness-of-fit of the model) and that therefore payments are more accurate under a concurrent framework. Some argue that the concurrent model may create a disincentive for medical management because acute conditions that resulted from loose medical management are paid in the concurrent formula, and therefore the prospective model is preferred. Many commercial health insurers are using concurrent models for provider global payments. The U.S. Department of Health and Human Services (HHS), in the most recent notice of proposed rulemaking with regard to the Medicare Shared Savings program, proposes a prospective payment model.

### (2) Input data

Depending on what data is available and credible, there are purely diagnosis-based risk adjustment models and pharmacy-based models. There are also models that use both. Generally speaking, diagnosis-based risk adjustment models are preferred over pharmacy-based models for a number of reasons. They usually have slightly higher predictive accuracy than pharmacy-based models. The results are more intuitive as they link to medical conditions directly. Pharmacy data is sensitive to treatment and prescription patterns, while diagnosis



data is not. For organizations that have incomplete diagnosis coding, because of either capitation of physician services or limitations in data capturing, pharmacy-based models would be preferred because drug codes are standard, timely, and of very good quality.

There are other data elements that are predictive of healthcare cost—procedure codes, cost, and utilization in the prior year—that most risk adjustment models do not use for payment purposes. The reason is that risk adjustment is not a purely statistical exercise. It is used in setting healthcare payment rates, therefore needs to send the right signals and set the right incentives for all participants in the system. Using procedure information and prior year's cost and utilization would result in higher payments for higher utilization. This might promote overuse and overtreatment, so is often seen as counter to health policy goals.

### (3) Predicted outcome

All vendors have risk adjustment models for total healthcare cost. Some have models for medical cost and for different service categories (such as MARA). This allows for flexibility to the users who may choose only to risk-adjust a subset of total healthcare cost. Developers can also develop new models to risk-adjust outcomes other than cost, such as inpatient days, counts of hospitalization, or use of advanced imaging tests.

### (4) Population type

As of now, risk adjustment models have been developed for each population type separately—Medicare, Medicaid, and commercial. The outputs from different models are not directly comparable to each other, because they have different reference points in terms of age, gender, and medical profile.

## KEY ISSUES TO CONSIDER WHEN APPLYING RISK ADJUSTMENT

While risk adjustment has been used in setting payment rates in public programs for quite some time, the experience with using risk adjustment in provider payment has been relatively recent, and primarily centered in accountable care organization (ACO) and patient-centered medical home (PCMH) programs.

For instance, Blue Cross Blue Shield of Massachusetts (BCBSMA) introduced a provider payment reform program, called Alternative Quality Contract (AQC), in January 2009. The AQC is a global payment model that combines inflation and risk adjustment capitation payments with performance-based incentive payments. Contracts extend over 5 years, with pre-defined targets for inflation designed to reduce AQC organizations' medical expense trend by half over the five-year contract term.<sup>5</sup> By the end of 2009, eight provider organizations had joined the AQC, and four more have joined since then. Nationwide, it has attracted a lot of attention as a potential model for curbing the escalation of healthcare costs. The Commonwealth Fund has commissioned a study to evaluate the AQC.<sup>6</sup> It notes that risk adjustment is one of the several means of risk mitigation. Without risk adjustment, the report states, "provider groups could easily lose money if they encountered high adverse patient selection." The Commonwealth Fund comments that the AQC "exemplifies the type of experimentation with novel payment models that the Affordable Care Act encourages."

A number of Blue Cross and Blue Shield health plans, such as Blue Cross Blue Shield of Illinois and Blue Shield of California,<sup>7</sup> are also rolling out ACO programs.

CareFirst BlueCross BlueShield uses risk adjustment to determine global payments in its PCMH program.<sup>8</sup> Capital District Physician Health Plan, a large physician-owned health plan in Albany, New York, also uses risk adjustment in a PCMH<sup>9</sup> program.

<sup>5</sup> "Blue Cross Blue Shield of Massachusetts. Making quality health care affordable. Retrieved June 20, 2011, from <http://www.bluecrossma.com/visitor/about-us/making-quality-health-care-affordable.html>.

<sup>6</sup> Chernew, M., Mechanic, R., Landon, B., and Safran, D.G. (January 2011). Private-payer innovation in Massachusetts: The Alternative Quality Contract. *Health Affairs*, 30(1):51-61.

<sup>7</sup> See the companies' websites for more information.

In this section, we discuss the key issues to consider when applying risk adjustment in provider payment reform.

### (1) Patient attribution

Having a reasonable patient attribution algorithm is the prerequisite to global budgeting. A reasonable algorithm should assign patients correctly to the providers that are mostly responsible for their care, and will not underidentify or overidentify the patients.

The attribution of HMO patients is straightforward, assuming the HMO itself is the provider group being reimbursed. For attribution to other plan types, such as to PPOs, it can be quite challenging, especially for patients with multiple chronic conditions who see different providers for different health issues. For instance, Dave Wave, our sample patient, had three visits relating to COPD and three visits relating to arthropathy. If the patient attribution logic is based on visit counts, we will have a tie in terms of which physician practice is primarily responsible for Dave Wave's medical care. It becomes even more complex if the two practices are not under the same ACO, or if the patient changed providers in the course of a year.

Even well-designed patient attribution algorithms may have loopholes. It is important to conduct a study using historical data and to validate the resulting patient assignments with providers prior to applying it.

### (2) Inclusion and exclusion of healthcare services

Not every provider organization can and wants to be at global risk. For instance, healthcare systems with very limited networks may choose not to be at risk for total healthcare cost. Services such as neonatal intensive care unit (NICU), high-risk pregnancies, and mental and behavioral health might be excluded from the global risk contract. Patients who receive care and disease management services may also need to be addressed separately from the rest of the population, if these services are evaluated separately from the global payment. In cases like these, it may call for either a recalibration of the existing risk adjustment models or the development of new models to meet the specific contract terms.

### (3) Selection of an appropriate risk adjustment model

When selecting a risk adjustment model, the two most important considerations are predictive accuracy and transparency.

R-Squared values and predictive ratios are commonly used in the industry to evaluate the predictive accuracy of a risk adjustment model on a given population. R-Squared is an individual level measure of how much variability in the total allowed amount can be explained or predicted by the model. A perfect model has an R-Squared value of 1. A model with no explanatory power has an R-Squared value of 0. In practice, the R-Squared value is typically between 0.15 and 0.30 for prospective models on the commercial population, and no more than 0.6 for concurrent models. Models that have R-Squared values close to these upper boundaries are more accurate and better candidates for setting provider global payments.

Predictive ratio is a group-level measure that calculates the ratio between the predicted cost and the actual cost of a certain group of people, where the group can be a disease cohort, an eligibility cohort, a cost cohort, etc. A more accurate model would have predictive ratios closer to 1.0 for the main subgroups of interest.

The R-Squared statistic cannot be used to answer question such as the percentage of high-cost patients that is correctly predicted by the model, or the percentage of patients the model predicts as high-cost but that actually are not. In this case, we need to resort to measures such as sensitivity and specificity, and receiver operating characteristic (ROC) curve. While vendors typically publish the performance statistics for different models in their product brochures, no vendor can adequately answer the question "How well does the model predict for my

<sup>8</sup> CareFirst BlueCross BlueShield. Primary care medical home program information. . Retrieved June 20, 2011, from [https://provider.carefirst.com/wps/portal/Provider/PCMH?WCM\\_GLOBAL\\_CONTEXT=/wcmwps/wcm/connect/Content-Provider/CareFirst/ProviderPortal/PCMH/Tab/pcmhProgramInformation](https://provider.carefirst.com/wps/portal/Provider/PCMH?WCM_GLOBAL_CONTEXT=/wcmwps/wcm/connect/Content-Provider/CareFirst/ProviderPortal/PCMH/Tab/pcmhProgramInformation).

<sup>9</sup> Feder, J. Lester (2011). A health plan spurs transformation of primary care practices into better-paid medical homes. *Health Affairs* 30 (3).

patient population?” without carrying out a full-fledged study. On the other hand, if the patient population is large and stable, and is similar to the kind of population the model was developed on, then it is reasonable to believe that the model will achieve a similar level of predictive accuracy. In the cases where an off-the-shelf risk adjustment model does not fit the unique characteristics of a patient population, a recalibration will be required. Or, if the provider payment contract terms are not standard, such as having carved-out services, or limiting to only adult care, then a recalibration will be required or new risk adjustment models will be needed.

It is important to realize that risk adjustment models are not perfect and may never be. All models have over-prediction and under-prediction problems for certain subsets of the population. As data gets better and richer and modeling techniques improve over time, models are expected to become more and more accurate. Health insurers and provider organizations should keep themselves informed of new developments in risk adjustment and consider adopting better models when appropriate.

Another important consideration is the transparency of a risk adjustment model—how risk scores are derived, and what drives the relative risk scores and by how much. Some of the transparency issues can be resolved by health insurers doing a good job at educating providers on risk adjustment. Some will require the model developers to be willing to open up the “black box” of the risk adjustment model, such as providing risk contribution information at the individual level.

#### (4) Data source and clinical validity

In the case of diagnosis-based risk adjustment, not every diagnosis code should be counted toward the relative risk score. For instance, diagnosis codes from lab and radiology tests should not be used because they are the diagnoses to be ruled out from the testing. Codes on transportation and durable medical equipment (DME) claims are usually not from a clinician and their accuracy and validity can be questionable. They should also be excluded from the calculation of the risk scores.

#### (5) Catastrophic patients

Risk adjustment models do not predict very well for extremely high-risk patients. When implementing risk adjustment in provider global payments, it is important to consider how to handle catastrophic patients. Should they be covered under a reinsurance program? If so, should they still be included in risk adjustment? How does the risk adjustment model work in conjunction with the reinsurance program?

#### (6) Coding

Diagnosis-based risk adjustment systems rely heavily on physicians coding diagnoses accurately, specifically, and consistently. In other words, the relative risk scores do not measure the true illness burden, but rather, the coded illness burden. Take, for example, diabetes, a chronic condition that never goes away until a patient dies. To get the correct risk adjustment payment, the system requires that a diabetes diagnosis be coded in a claim at least once in the last 12 months by a clinician. In practice, not every clinician codes thoroughly, although there may be prescription medicines, procedures, or durable medical equipment that can be directly linked to the missed diagnosis codes. History of diseases, diagnoses, and treatments in the past may also be available in electronic health records (EHR).

Every year, health plans and provider organizations invest a significant amount of money and resources to detect missed codes and truncated claim records to prevent revenue leakage. Most of these efforts are ad hoc. If risk adjustment models could work with more information than diagnoses, tie certain drugs or procedures to the underlying medical conditions, or work with EHR data, it would enhance the capturing of medical diagnosis, increase the accuracy of risk adjustment, and help alleviate some of the cost of revenue recovery.

#### (7) Partial eligibility

Patients may switch health plans or even provider organizations throughout the year. There are always new patients coming and existing patients leaving the plan. For the partially eligible patients, how much data is required to apply risk adjustment? In Medicare Advantage, CMS has a separate age/gender-based “new enrollee”

model for individuals with less than 12 months of data. Some commercial health insurers use six months as the cutoff for new enrollee. In other words, patients with seven or more months of eligibility would be assigned a full risk adjustment score, otherwise they would be assigned an age/gender risk score. The minimum eligibility criterion can be established by calculating the aforementioned model performance statistics.

(8) Frequency of risk-adjusted budget allocation

Risk-adjusted budget allocation is done at least once a year. In some risk adjustment programs, payment allocation is done on a quarterly basis, and a final settlement is done for the prior year after allowing time for adequate amount of claim run-out. More frequent budget allocation has been welcomed by risk-bearing entities because payments are more appropriate. Entities with higher-cost patients would especially want to have more frequent risk adjustment. However, it requires both the payor and the risk-bearing organization to endure some administrative overhead. The tradeoff needs to be examined.

(9) How does risk adjustment work in the broader context of risk mitigation?

Risk adjustment is the technical foundation of risk transfer among participating organizations. If done well, it can effectively mitigate adverse selection against the risk-bearing entity. It does not address the selection against a whole system. The PPACA lists risk adjustment, transitional reinsurance, and risk corridor (3R's) as a set of risk mitigation programs offered to state health insurance exchanges. The concept of the 3R's working in concert can also help ACOs in global risk contracts. Reinsurance protects an ACO financially from catastrophic cases. A health insurer that is contracting with a provider organization in global payments may offer reinsurance to them. A provider group can also choose to purchase reinsurance from a third party, or self-insure. Using a risk corridor will limit variability in risk scores, so that payment to an ACO is less volatile. Figure 7 provides an illustration of how the Medicare Part D risk corridors work.<sup>10</sup>

**Figure 7: Medicare Part D Risk Corridors**

Government Pays 80%	Plan Pays 20%	+10%
Government Pays 50%	Plan Pays 50%	+5%
Plan Pays 100%		Target Amount
Plan Keeps 100%		
Government Recoups 80%	Plan Recoups 20%	-5%
Government Recoups 50%	Plan Recoups 50%	-10%

If a plan's adjusted allowable risk corridor costs exceed the target amount, the first 5% will be paid by the plan itself. The portion that is between 5% and 10% will be shared by the government and the plan evenly. For the portion that is over 10%, 80% will be paid by government and 20% will be paid by the plan.

If a plan's adjusted allowable risk corridor costs are below the target amount, the first 5% will be retained by the plan itself. The portion that is between 5% and 10% will be shared evenly between the government and the plan. For additional savings beyond 10%, 80% will be recouped by government, and the remaining 20% will be recouped by the plan.

<sup>10</sup> Center for Medicare and Medicaid Services (Feb. 19, 2010). Note to: Medicare Advantage organizations, Prescription Drug Plan sponsors, and other interested parties.

In setting risk corridors for ACOs, the width and cutoff points should reflect the actual distribution of the patient population. If corridors are too wide, it would not be enough protection for the ACOs. Additionally, the risk corridor may not be symmetrical based on data and on the degree of risk sharing between the health insurer and the ACOs.

## CLOSING REMARKS

While risk adjustment is a relatively easy concept to grasp, it is very complex to design and implement in practice. This paper has discussed how risk adjustment models are developed and applied, laying out the most important considerations in the design and implementation of risk adjustment in provider global payments. Working through these key issues will help ensure an accurate risk adjustment program is implemented successfully and smoothly.

## OTHER CONSIDERATIONS

This white paper was prepared for the Massachusetts Medical Society (the Society) under the consulting services agreement of January 6, 2011, between the Society and Milliman. The Society intends to distribute this paper to its member physicians as educational materials. Under the consulting service agreement, this paper must be presented in its entirety. Milliman does not intend to benefit any third-party recipient of its work product, even if Milliman consents to the release of its work product to such third party. Any third party is advised to have their own appropriate professional review the work.

## FURTHER READING

### On the Medicare Advantage Risk Adjustment Model:

- Pope, G.C., Ellis, R.P., Ash, A.S., et al. (December 2000). Diagnostic cost group hierarchical condition category models for Medicare risk adjustment. Final Report to the Health Care Financing Administration under Contract Number 500-95-048. Health Economics Research, Inc. Waltham, MA.
- Pope, G.C., Kautter, M.S., Ellis, R.P., Ash, A.S., et al. (Summer 2004). Risk adjustment of Medicare capitation payments using the CMS-HCC model. *Health Care Financing Review* Vol.25(4).

### On Commercial Risk Adjustment Models:

- Winkelman, R. & Mehmud, S. (2007). A comparative analysis of claims-based tools for health risk assessment. Society of Actuaries.

### On Risk Adjustment and Healthcare Reform:

- Yi, R., & Laurent, D. (October 2010). What kind of risk adjustment systems are necessary for health insurance exchanges? Milliman Insight.
- Yi, R., & Fontana, J. (June 2010). Risk adjustment: Health calculus for the reform environment. Milliman Insight.

### On Patient Attribution in an ACO:

- Pentaly, S. (January 2011). Whose patient is it? Patient attribution in ACOs. Milliman Insight.