CHAPTER 2

Improving risk adjustment in the Medicare program

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Chapter summary

Health plans that participate in the Medicare Advantage (MA) program receive monthly capitated payments for each Medicare enrollee. Each capitated payment has two general parts: a base rate, which reflects the payment if an MA enrollee has the health status of the national average beneficiary, and a risk score, which indicates how costly the enrollee is expected to be relative to the national average beneficiary. The purpose of the risk scores is to adjust MA payments so that they accurately reflect how much each MA enrollee is expected to cost.

Currently, CMS uses the CMS–hierarchical condition category (CMS–HCC) model to risk adjust MA payments. This model uses beneficiaries' demographic characteristics and medical conditions collected into hierarchical condition categories (HCCs) to predict their costliness. The demographic data are drawn from the same year for which their costs are predicted (prediction year), while HCCs are based on conditions diagnosed in the previous year (base year). Using diagnosis data from the previous year means the CMS–HCC model is prospective rather than concurrent. Concurrent risk adjustment uses conditions diagnosed in the prediction year to predict costs in the same year.

For beneficiaries who have a given condition, the CMS–HCC model has been shown to be a substantial improvement over the model that preceded it. The

In this chapter

predecessor used only beneficiaries' demographic information and predicted costs that were much lower than actual costs for many conditions and much higher than actual costs for healthy beneficiaries (Pope et al. 2004). Plans could benefit by attracting healthy beneficiaries and avoiding the unhealthy ones, a practice known as favorable selection.

Since CMS began using the CMS–HCC model, evidence indicates that favorable selection has been substantially reduced among beneficiaries who move from fee-for-service (FFS) Medicare to MA (Newhouse et al. 2012). This reduction in selection likely occurred because the CMS–HCC model predicts costs for specific conditions much better than the demographic model and because stronger restrictions now exist on when and how often beneficiaries can enroll in and disenroll from MA plans.

But Medicare costs vary widely among beneficiaries who have the same HCC classification. At the same time, the CMS–HCC model makes the same payment adjustment for all MA enrollees who have that HCC. Within a given HCC, payments are higher than actual costs for some beneficiaries and lower than actual costs for other beneficiaries. The result is that the CMS–HCC model predicts costs that are higher than actual costs (overpredicts) for beneficiaries who have very low costs and lower than actual costs (underpredicts) for beneficiaries who have very high costs. These prediction errors can cause overpayments for low-cost beneficiaries and underpayments for high-cost beneficiaries. Also, the variation in beneficiaries' costs is greater in some HCCs than in others, which can make for greater opportunities for favorable selection in some HCCs than in others. These differences in cost variation across HCCs can be addressed through any method that improves payment accuracy for high- and low-cost beneficiaries without focusing on specific HCCs.

Underpayments for high-cost beneficiaries and overpayments for low-cost beneficiaries raise an issue of equity among MA plans. Plans that have a disproportionately high share of high-cost enrollees may be at a competitive disadvantage relative to those whose enrollees have low costs. Moreover, there is a fairly strong correlation from one year to the next in beneficiaries' costs to the Medicare program. Also, after beneficiaries enroll in MA, plans are able to determine the cost of treating their enrollees. Consequently, plans have an incentive to encourage the disenrollment of their highest cost enrollees because they are underpaid for those enrollees, and the underpayments have a fairly high probability of persisting. Whether plans respond to this incentive is not clear, but it is present and undesirable. However, these high-cost beneficiaries may themselves have an incentive to disenroll if they find the less-restrictive structure of FFS Medicare more beneficial to their circumstances than the network-based structure of MA plans. Further, overpayments and underpayments for specific groups could affect quality of care. Plans have less incentive to provide quality care to groups that are systematically underpaid.

A final issue to consider is how payment inaccuracies related to level of health care costs affect equity among MA plans, FFS Medicare, and accountable care organizations (ACOs). If payment equity among these three sectors is a goal, risk adjustment that results in more accurate payments for high-cost and low-cost beneficiaries is vital. For example, if the MA sector can attract low-cost beneficiaries and avoid high-cost beneficiaries, the risk-adjusted payments in the MA sector would exceed what their enrollees would cost in ACOs or FFS Medicare. The result would be program spending that is higher than if all beneficiaries were in FFS Medicare.

In this chapter, we investigate alternative methods discussed in the literature for improving how well risk adjustment predicts costs for the highest cost and lowest cost beneficiaries. We examine:

- *A hybrid model that blends concurrent and prospective risk adjustment.* The concurrent method applies to beneficiaries who have one or more conditions we identified as chronic, costly, and easy to verify. We want to use conditions that are easy to verify in concurrent risk adjustment because plans may have more incentive to upcode under concurrent risk adjustment than under prospective risk adjustment. For beneficiaries who do not have one of these conditions, we use prospective risk adjustment, a feature of the current CMS–HCC model.
- *Using beneficiaries' base-year Medicare costs as an additional variable for predicting costs in the standard CMS–HCC model.* Base-year costs are a strong predictor of costs in the prediction year. Hence, they are strong risk adjusters.
- *A model that uses the standard CMS–HCC model but limits how much of each enrollee's costs that plans are responsible for.* For example, plans could be responsible each year only for the first $100,000 in services for each enrollee. Plans could be reimbursed for beneficiary-level costs that exceed the threshold through reinsurance, or plans could share costs above the threshold with Medicare.

A potential issue is that all three of these methods would introduce some degree of cost-based payment into the MA program, which could reduce incentives for plans to manage their enrollees' conditions to hold down costs.

Our evaluation of the three methods indicates that for both the highest and lowest cost beneficiaries, the hybrid model is worse at predicting costs than the standard CMS–HCC model. In contrast, including prior-year costs in the standard model improves how well it predicts costs for high- and low-cost beneficiaries, while truncating costs would have a small to moderate effect on those groups. However, both alternatives present issues that would have to be addressed, which we discuss in detail. Because of the limitations of these models, the Commission concludes that administrative measures may be needed to address issues of payment inaccuracies for the lowest and highest cost beneficiaries.

Finally, underprediction for high-cost beneficiaries under the CMS–HCC model raises a question of whether MA plans have been adversely affected. A recent report indicates that MA plans are profitable for the most part and that special needs plans, which purportedly serve relatively high-cost beneficiaries, are more profitable than the average MA plan (Government Accountability Office 2013). Therefore, it does not appear that financial problems from underpredictions for high-cost beneficiaries pose significant challenges for MA plans. ■

Introduction

Health plans that participate in the Medicare Advantage (MA) program receive monthly capitated payments for each Medicare enrollee. Each capitated payment has two general parts: a base rate, which reflects the payment if an MA enrollee has the health status of the national average Medicare beneficiary, and a risk score, which indicates how costly the enrollee is expected to be relative to the national average beneficiary. The purpose of the risk scores is to adjust MA payments so that they accurately reflect how much each MA enrollee is expected to cost.

Over the years, CMS has used various methods for determining MA enrollees' risk scores. Currently, CMS uses the CMS hierarchical condition category (CMS–HCC) risk-adjustment model, which uses enrollees' demographic characteristics and medical conditions (such as diabetes and stroke) to predict their costliness. The demographic variables include age, sex, Medicaid status, institutional status, eligibility based on disability, and eligibility based on age but originally eligible because of disability.

Data for all demographic variables are drawn from the year in which beneficiaries' costs are to be predicted (the prediction year), except Medicaid status, which is from the previous (base) year. The assigned conditions are based on diagnoses recorded on physician, hospital outpatient, and hospital inpatient claims in the base year.[1] CMS collects the diagnoses into broader disease categories called hierarchical condition categories (HCCs). In the CMS–HCC model, some conditions have more than one HCC, which differ by severity of the condition. Examples include diabetes and cancer. The "hierarchical" part of HCC means that if a beneficiary has diagnoses that map into more than one HCC for a specific condition, only the highest cost HCC is used. To risk adjust payments for 2014 (the prediction year), CMS uses beneficiaries' conditions diagnosed in 2013 (the base year). Using conditions diagnosed in the previous year to risk adjust payments in the current year makes the CMS–HCC model prospective, as opposed to concurrent, which uses conditions diagnosed in the current year to predict costs in the same year.

Three general arguments have been made for using a prospective model (or against using a concurrent model).

- Prospective models give plans more incentive to manage their enrollees' care to avoid future costly conditions because adjustment of MA payment after a condition has been diagnosed occurs more quickly in concurrent models than prospective models. For example, if an MA enrollee was diagnosed with a condition in January 2014, payment to the enrollee's plan would not be adjusted until 2015 under prospective risk adjustment, whereas payment would be adjusted in 2014 under concurrent risk adjustment.[2] Therefore, concurrent risk adjustment is closer to a cost-based model than is prospective risk adjustment.
- Because plans wait longer to have payments adjusted for a condition, they have less incentive to upcode relative to a concurrent model.
- Plans face less uncertainty about their revenue streams under a prospective model. Under concurrent models, payments are based on conditions diagnosed in the prediction year. But it takes time for those data to be processed so that payments can be adjusted. Plans' revenue may then require adjustments after the prediction year ends. For example, if an MA enrollee has a condition diagnosed in December 2014, CMS may not be able to make an adjustment to the plan's payment until 2015 because it takes time for a plan to collect and submit its enrollees' diagnosis data and for CMS to make the adjustment to the plan's payment. Under a prospective model, conditions from the base year are used to adjust payments in the prediction year, so the need for adjustments after the prediction year is smaller.

An underlying feature of the CMS–HCC model is that for beneficiaries who have the same HCC, it predicts costs that are below actual costs for some beneficiaries (underpredicts), predicts costs that are higher than actual costs for others (overpredicts), but predicts accurately on average. This is a feature of all models that use beneficiaries' conditions to predict costs. If plans do not have more information about their enrollees' costliness than CMS uses to risk adjust payments, then plans cannot systematically identify favorable risks. However, if plans have information about beneficiaries' costliness that CMS does not use to risk adjust payments, plans can use that information asymmetry to their benefit. Plans can try to attract beneficiaries they predict will have costs lower than payments and try to avoid beneficiaries they predict will have costs higher than payments (favorable selection).

Favorable selection was a substantial problem in the model that preceded the CMS–HCC model. The preceding model used only beneficiaries' demographic information and predicted costs that were much lower than actual costs for many conditions and much higher than actual costs for beneficiaries who were healthy (Pope et al. 2004). Research indicates that favorable selection has decreased substantially under the CMS–HCC model among beneficiaries who move from fee-for-service (FFS) Medicare to MA (Newhouse et al. 2012). This reduction in selection likely occurred because the CMS–HCC model predicts costs for specific conditions much better than the demographic model, and plans may have limited abilities to attract healthier beneficiaries within HCCs. Moreover, the rate of disenrollment from MA plans has declined, which may be due to more accurate prediction of the cost of conditions or stronger restrictions on when and how often beneficiaries can enroll in and disenroll from MA plans.

However, some plans may have a disproportionately high share of enrollees who have high costs. In particular, special needs plans (SNPs) and the Program for All-Inclusive Care for the Elderly (PACE) are intended to focus on vulnerable, high-cost populations. Because the CMS–HCC model typically underpredicts the cost of the highest cost beneficiaries, these plans can be at a financial disadvantage. Also, as MA enrollees spend more time in MA plans, the plans gain information about the cost of treating each enrollee. Research indicates that each person's health care costs the previous year are a relatively good predictor of their costs in the current year (we find a correlation coefficient of 0.4). Plans can use the information they have about their enrollees' costs in the previous year to make predictions about how much they will cost in the current year. But the CMS–HCC model does not include beneficiaries' prior-year costs. Therefore, plans have information about their existing enrollees' costliness that the CMS–HCC model does not account for.

Later in this chapter, we use 2010 as the base year and 2011 as the prediction year to evaluate a CMS–HCC model. CMS has begun using this version of the CMS–HCC model in 2014.

We show that the CMS–HCC model severely overpredicts the costs in the prediction year for beneficiaries who had relatively low costs in the base year and severely underpredicts the costs in the prediction year for beneficiaries who had relatively high costs in the base year. These results raise concerns about equity among MA plans because plans that have a relatively high share of high-cost beneficiaries may be disadvantaged. However, a recent report indicates that MA plans are profitable, on average, and SNPs, which purportedly focus on high-cost beneficiaries, have even higher profits than MA plans that serve a broad range of beneficiaries (Government Accountability Office 2013). Data on profitability in the PACE program are not as complete, but Commission staff obtained profit data from five PACE sites, which reported margins of 3 percent to 11 percent (Medicare Payment Advisory Commission 2012). These results suggest that financial problems from underpayments for high-cost beneficiaries may not be a widespread problem in MA.

Because plans have information about their enrollees' historical costs and the CMS–HCC model does not include equivalent information, plans have an informational advantage over CMS. Plans have an incentive to use this advantage to retain beneficiaries who have low historical costs and encourage disenrollment of beneficiaries who have high historical costs. It is not clear whether plans have responded to this incentive, but it is present and undesirable. Also, high-cost beneficiaries may have an incentive to disenroll from MA plans because they may prefer the less-restrictive provider choices of FFS Medicare. At least one of these incentives appears to have manifested itself. Since CMS began using the CMS–HCC model, the beneficiaries who disenrolled from MA plans are much more costly than the average beneficiary in FFS Medicare, even though the rate at which beneficiaries disenroll from MA plans has declined (Medicare Payment Advisory Commission 2012, Newhouse et al. 2012).

If we desire financial neutrality among FFS Medicare, MA plans, and accountable care organizations (ACOs), overprediction for low-cost beneficiaries and underprediction for high-cost beneficiaries could present a problem. If MA plans have high shares of low-cost beneficiaries, payments in the MA sector that are risk adjusted with the existing CMS–HCC model would exceed what Medicare would pay for their enrollees in ACOs or FFS Medicare. The result would be higher program spending than if all beneficiaries were in FFS Medicare. The opposite would happen if MA plans have high shares of high-cost beneficiaries.

In a previous report, we examined three alternatives for improving how well the CMS–HCC model predicts costs for beneficiaries who have many conditions and generally have relatively high costs: add race and income to the standard model, use two years of diagnosis data rather than one to determine beneficiaries' conditions (HCCs), and add each beneficiary's number of conditions to the standard model. We found that adding race and income would do little to improve the model's performance, but using two years of diagnosis data and the number of conditions for each beneficiary would improve how well the model predicts costs for beneficiaries who have several conditions (Medicare Payment Advisory Commission 2012).

In this chapter, we explored alternative ways for improving the CMS–HCC model's prediction of costs for both low- and high-cost beneficiaries. The model changes we investigated include:

- *A hybrid model that uses concurrent risk adjustment for beneficiaries who have been diagnosed with at least one condition we identified as chronic, costly, and easy to verify.* This model uses prospective risk adjustment for all other beneficiaries. Adding a concurrent component would provide plans larger, more immediate compensation for enrollees who develop high-cost conditions. However, concurrent adjustment raises concerns because it may reduce incentives for plans to manage their enrollees' care and may increase incentives to upcode. That is why we limited concurrent risk adjustment to conditions that are easy to verify.
- *Adding beneficiaries' base-year costs to the standard CMS–HCC model.*
- *A model that limits (truncates) how much of each beneficiary's costs a plan is responsible for.* Costs that exceed the truncation point could be covered through reinsurance. We examined two truncated models: one in which plans' costs for each enrollee are limited to $250,000 and another in which plans' costs are limited to $100,000. We chose these two dollar amounts because those limits are what is typically examined in the literature (Winkelman and Mehmud 2007).

We also evaluated an adjustment to the CMS–HCC model that we discussed in the Commission's June 2012 report to the Congress: adding beneficiaries' number of conditions as a variable. In the June 2012 report, we found this adjustment would improve how well the CMS–HCC model predicts costs for beneficiaries who have several conditions. Although beneficiaries who have several conditions generally have relatively high Medicare costs, they are not necessarily among the highest cost beneficiaries. For example, only 16 percent of beneficiaries who have five or more conditions are among the 1 percent most costly. Therefore, in this analysis we found that adding the number of conditions for each beneficiary to the CMS–HCC model would make only a small improvement over the standard CMS–HCC model in terms of predicting total costs for beneficiaries who have a history of high costs.

Analysis of predictive accuracy for conditions and cost categories

We use predictive ratios to evaluate the standard CMS–HCC model, a hybrid model, a version of the CMS–HCC model that includes beneficiaries' base-year costs, and two versions of the CMS–HCC model that truncate the beneficiary-level costs that plans are responsible for. Predictive ratios indicate how well a model predicts costs for a group of beneficiaries who have the same health characteristic, such as a condition or level of health care costs. For a group of beneficiaries, a predictive ratio is the cost for the group as predicted by a risk-adjustment model divided by the actual cost of that group. Predictive ratios are similar to payment-to-cost ratios. All predictive ratios we calculated use predicted costs from 2011 as the numerator and actual costs from 2011 as the denominator.

A predictive ratio greater than 1.0 indicates predicted costs are greater than actual costs for a group (overprediction); a predictive ratio less than 1.0 indicates predicted costs are less than actual costs for a group (underprediction); and a predictive ratio that equals 1.0 indicates predicted costs equal actual costs for a group. Predictive ratios that differ from 1.0 are a concern because they indicate plans have an opportunity to benefit financially through favorable selection rather than through effective management of their enrollees' care.

An alternative measure of model performance is the R^2, which tells us how much of the variation in individual-level health care spending is explained by the model. An R^2 of 0.40 means a model has explained 40 percent of the variation in beneficiaries' costs. The less variation explained by a model, the easier it is for plans to identify and use beneficiaries' characteristics to engage in favorable selection. However, we prefer to use the predictive ratio because efforts to engage in selection are more likely to be based on health characteristics that define groups, not specific individuals.

We evaluated predictive ratios for nine specific conditions: cancer, diabetes, chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), mental illness, schizophrenia, acute myocardial infarction (AMI),

Method for estimating and evaluating CMS–HCC model

In this analysis, we used a sample of 23.9 million beneficiaries in fee-for-service (FFS) Medicare. We randomly selected half the sample—11.9 million beneficiaries—to estimate coefficients in 5 risk adjustment models: a standard CMS hierarchical condition category (CMS–HCC) model, a hybrid model that combines prospective and concurrent versions of the CMS–HCC model, a model that adds beneficiaries' base-year costs in FFS Medicare to the standard CMS–HCC model, a version of the standard CMS–HCC model in which beneficiaries' prediction-year FFS costs are truncated at $250,000, and a version in which beneficiaries' prediction-year FFS costs are truncated at $100,000. We used the other half of the sample that we did not use in the estimation work to evaluate model performance using predictive ratios. For this analysis, the prediction year is 2011, which is the year for which we are predicting beneficiaries' costs. The previous year (2010) is the base year.

All beneficiaries in our sample had Part A and Part B coverage in FFS Medicare in every month of 2010. They also had at least one month of Part A and Part B coverage in FFS Medicare in 2011. These beneficiaries must have lived within the 50 states throughout 2010 and must not have had Medicare as a secondary payer at any time in 2010. In 2011, these beneficiaries must not have had Medicare as a secondary payer; must not have had end-stage renal disease status; must have lived within the 50 states throughout their enrollment in FFS Medicare; must not have received hospice care; and must not have been long-term institutionalized.

For each beneficiary, we created the following variables to estimate the coefficients (which indicate the additional cost of a characteristic or condition) of the standard CMS–HCC model:

- 2011 costs to the Medicare program incurred while in FFS Medicare. We annualized these costs by dividing them by the fraction of 2011 that each beneficiary was in FFS Medicare. Most beneficiaries were in FFS Medicare for all of 2011, so they had a fraction of 1.0.
- 24 age/sex categories for 2011.
- 4 categories based on Medicaid status in 2010: Medicaid, female, and eligible for Medicare because of disability; Medicaid, female, and eligible because of age; Medicaid, male, and eligible because of disability; and Medicaid, male, and eligible because of age.
- 2 categories—one for male, one for female—indicating whether a beneficiary was eligible for Medicare in 2011 because of age but was originally eligible for Medicare because of disability.
- 79 hierarchical condition categories (HCCs). We obtained beneficiaries' conditions from 2010 physician, hospital outpatient, and hospital inpatient claims. We collected these conditions into the broader HCCs.
- 6 disease interaction terms created from beneficiaries' HCCs. These include cancer with immune disorders, congestive heart failure (CHF) with chronic obstructive pulmonary disease (COPD), CHF with renal disease, COPD with unspecified stroke, and all strokes. For our analysis, our base year (the year from which we draw conditions for prospective risk adjustment) is 2010 and our prediction year is 2011. We divided our analytic sample into seven percentile categories of Medicare costliness from the base year: at or below the 20th percentile, 20th to 40th percentile, 40th to 60th percentile, 60th to 80th percentile, 80th to 95th percentile, 95th to 99th percentile, and above the 99th percentile. We calculated predictive ratios for each of these seven categories. We evaluate predictive ratios for categories of base-year costs rather than categories of prediction-year costs because base-year costs are a source of information that plans can use to identify favorable risks. It is unlikely that plans could use prediction-year costs for selection purposes because that information would not be available quickly enough for

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Method for estimating and evaluating CMS–HCC model (cont.)

cardiorespiratory failure, diabetes with CHF, and sepsis with cardiorespiratory failure.

- 6 disabled/disease interaction terms for beneficiaries who were under age 65 (eligible because of disability) and had one of the following HCCs: opportunistic infections, chronic pancreatitis, severe hematological disorders, alcohol psychosis, cystic fibrosis, and complications of specified implanted device or graft.

In estimating the coefficients in the standard CMS–HCC model, we used beneficiaries' annualized 2011 FFS costs as the dependent variable and the remaining variables listed above as the explanatory variables in a weighted least squares regression. The weights were the fraction of 2011 that each beneficiary was in FFS Medicare.

For the model that also includes beneficiaries' base-year (2010) costs, we used the same variables for estimation plus the 2010 costs as an explanatory variable. However, we found negative coefficients on some variables, most notably those indicating cardiorespiratory conditions, heart disease such as acute myocardial infarction, and stroke. We excluded these HCCs from the model.

For the models in which we truncate beneficiaries' FFS costs in 2011, we used the same variables for estimation except that the dependent variable (2011 annualized costs) was truncated at $250,000 in one model and $100,000 in the other.

The hybrid model was the most complicated to estimate. We used mutually exclusive subsamples to estimate both concurrent and prospective versions of the CMS–HCC model. The beneficiaries in the concurrent subsample had been diagnosed in the prediction year (2011) with one or more conditions that we identified as chronic, costly, and easy to verify. Cancer and cardiovascular disease are heavily represented, and we borrowed from an analysis of hybrid models in the literature to create this list (Dudley et al. 2003). The idea is to pay plans concurrently when beneficiaries develop a costly condition. But, concurrent risk adjustment gives plans incentive to upcode because of the shorter wait to have payments adjusted for newly diagnosed conditions. Therefore, we limited concurrent risk adjustment to conditions that are easily verified through audits. We placed beneficiaries who did not have a condition from the concurrent list in 2011 into the subsample for prospective risk adjustment.

Both the concurrent and prospective models were versions of the CMS–HCC model. In both models, we used each beneficiary's 2011 annualized FFS costs as the dependent variable.

After estimating coefficients for the five models, we evaluated their efficacy using the half of the 23.9 million–person full sample that we did not use to estimate the models. For each beneficiary, we determined the 2011 Medicare costs predicted by each of the five models. We used these 2011 predicted costs to calculate predictive ratios in nine disease categories and seven categories that represent levels of beneficiaries' FFS costs in 2010. ■

plans to use it, especially under the enrollment restrictions in the MA program.

Predictive ratios for condition categories are a point of interest because conditions are a source of information that plans could use to engage in selection activities before beneficiaries enroll. It is not the case that plans can explicitly know beneficiaries' conditions before they enroll, but they can use means such as benefit structure, provider networks, and advertising to appear unattractive to beneficiaries who have health characteristics that plans would like to avoid. Predictive ratios for categories of base-year costs are a point of interest for a different reason: Plans can use that information to engage in selection activities after beneficiaries enroll. For a discussion of our data and method, see the text box above.

TABLE 2–1

Predictive ratios under standard CMS–HCC risk adjustment model and alternative models for addressing payment inaccuracies for low-cost and high-cost beneficiaries

	Standard model	Hybrid model	Include prior-year costs	Truncate costs at $250,000	Truncate costs at $100,000
Conditions					
Diabetes	1.00	1.00	1.00	1.00	0.99
Cancer	1.00	1.00	1.00	1.00	1.00
COPD	1.00	1.00	1.00	1.00	1.00
CHF	1.00	1.00	1.00	1.00	0.99
Mental illness	1.01	1.00	1.01	1.01	1.01
Schizophrenia	1.01	1.01	0.99	1.01	1.00
AMI	1.02	1.01	1.24	1.02	1.02
Unspecified stroke	0.99	1.00	0.97	1.00	0.99
All strokes	1.00	1.02	0.99	1.00	1.00
Base-year cost					
≤ 20th percentile	1.62	1.87	1.39	1.62	1.63
20th–40th percentile	1.30	1.22	1.10	1.30	1.30
40th–60th percentile	1.10	1.00	0.95	1.10	1.10
60th–80th percentile	0.95	0.88	0.87	0.95	0.95
80th–95th percentile	0.86	0.81	0.92	0.86	0.85
95th–99th percentile	0.82	0.76	1.10	0.82	0.81
Above 99th percentile	0.71	0.65	1.18	0.74	0.81

Note: CMS–HCC (CMS–hierarchical condition category), COPD (chronic obstructive pulmonary disease), CHF (congestive heart failure), AMI (acute myocardial infarction). Beneficiaries' base-year costs are from the year before costs are predicted. Predictive ratios are total predicted costs for a group of beneficiaries divided by their total actual costs. In this table, predicted costs are from 2011 and base-year costs are from 2010.

Source: MedPAC analysis of 2010 and 2011 standard analytic files of physician/office claims, hospital inpatient claims, and hospital outpatient claims; 2012 Common Medicare Environment file from Acumen LLC; 2011 denominator file from Acumen LLC; 2011 beneficiary annual summary file from Acumen LLC; and 2011 risk score file from Acumen LLC.

The standard model predicts well for conditions, overpredicts for low cost, and underpredicts for high cost

We evaluated the version of the CMS–HCC model that CMS began using in 2014 to determine risk scores (standard model). This model has 24 age/sex categories, 79 condition categories defined by HCCs, 6 disabled (under age 65)/disease interaction terms, 6 disease-interaction terms, 4 dual-eligible terms, and 2 terms that indicate whether a beneficiary who is currently eligible on the basis of age was originally eligible because of disability.

The standard model produces an R^2 of 0.12, meaning it explains 12 percent of the variation in beneficiary-level costs. More important, we find this model predicts costs very well for all nine disease categories we specified above (Table 2-1). Among the beneficiaries in a disease category, the model makes prediction errors. Some predictions are too high, some are too low, but these errors are largely random, so they offset each other. However, this model makes fairly large systematic errors in some of the base-year cost categories. For beneficiaries who have base-year costs at or below the 20th percentile, the predictive ratio is 1.62, meaning aggregate predicted costs are 62 percent above aggregate actual costs. In contrast, for beneficiaries whose base-year costs are above the 99th percentile, the predictive ratio is 0.71, meaning aggregate predicted costs are 29 percent below aggregate actual costs. Such large systematic errors in prediction can benefit plans that have high shares of low-cost beneficiaries and adversely affect plans that have high shares of high-cost beneficiaries.

An implication of these results is that if the enrollees in each MA plan have the same HCC profile as FFS beneficiaries, then there is no selection problem in the MA program. Predicted costs equal actual costs. Conversely, if MA plans have a higher share of very low-cost enrollees or very high-cost enrollees than does FFS Medicare, then predicted costs will be different from actual costs and either favorable or adverse selection will be an issue.

Hybrid model has greater overprediction for low cost and underprediction for high cost than does the standard model

The hybrid model combines two versions of the CMS–HCC model: a concurrent version that includes only beneficiaries who have been diagnosed with at least one condition from a set of conditions that meet specific criteria and a prospective version for all other beneficiaries. We borrowed heavily from an existing analysis to create the list of conditions that defines the population for the concurrent version (Dudley et al. 2003). A number of conditions are represented, but the list is concentrated in cardiovascular disease and cancer. The intent is to include conditions that are chronic, costly, and easy to verify (meaning that specific test results or a few well-defined symptoms must exist before a patient can be clinically classified). The concurrent beneficiaries are 48 percent of all beneficiaries in our sample and have 83 percent of the costs in the prediction year.

Using a hybrid version of the CMS–HCC model would undoubtedly improve how well the model pays for high-cost cases in the *prediction* year since the concurrent portion of the model has an R^2 of 0.38 compared with 0.12 for the standard CMS–HCC model. However, we should not be strongly concerned about how well a model predicts costs for high-cost cases in the current year because restrictions on when and how often beneficiaries can enroll in or disenroll from the MA program strongly limit prediction-year costs from being used to identify favorable risks. Instead, our focus is on how well costs are predicted for beneficiaries who have high costs in the *base* year.

Our analysis of how well the hybrid model predicts for categories of base-year costs shows that it performs worse than the standard CMS–HCC model. Predictive ratios indicate that for beneficiaries in the lowest 20 percent of base-year costs, overprediction is greater under the hybrid model than the standard model—87 percent versus 62 percent (Table 2-1). Also, for beneficiaries whose base-year costs were above the 99th percentile, predicted costs are 35 percent lower than actual costs under the hybrid model, but only 29 percent lower under the standard model.

Total predicted cost is the same in both models. Therefore, when a predictive ratio in one of the base-year cost categories increases, it must decrease in at least one other category. Because predictive ratios decline in the six highest cost categories and increase in the “at or below 20th percentile” category, predicted costs shift from the six highest cost categories to the lowest cost category under the hybrid model.[3]

The underlying cause of this shift appears to be that some of the beneficiaries who have very low base-year costs in 2010 (those in the “at or below 20th percentile” category) developed conditions in 2011 that they did not have in 2010. Indeed, the mean number of HCCs for this group increased from 0.2 using the 2010 diagnoses to nearly 0.5 using the 2011 diagnoses. This increase causes predicted costs for 2011 for these beneficiaries to be much higher under the hybrid model—which uses conditions from 2011 for some beneficiaries—than under the standard model—which uses conditions from 2010 to predict costs in 2011 for all beneficiaries. At the same time, we use actual costs from 2011 to determine predictive ratios for both models. Therefore, higher predicted costs in the hybrid model produce a higher predictive ratio. In contrast, some beneficiaries who were among the 1 percent most costly in 2010 had fewer conditions in 2011, and the mean number of HCCs for this group decreased from 6.7 in 2010 to 4.5 in 2011. This decrease in conditions causes the predicted costs and, consequently, the predictive ratio for this group to decline under the hybrid model.

Adding base-year costs to the standard model reduces overprediction for low cost and creates overprediction for high cost

To examine the effects of using beneficiaries’ base-year costs in risk adjustment, we added each beneficiary’s cost from 2010 (base year) to the standard CMS–HCC model to predict beneficiaries’ 2011 (prediction year) Medicare costs. Adding base-year costs improved the R^2 from 0.12 to 0.18. Also, the predictive ratios for the nine conditions in our analysis generally continue to be close to 1.0 after adding the base-year costs (Table 2-1).[4]

In terms of predictive ratios for the seven base-year cost categories we have analyzed, adding base-year costs to the CMS–HCC model produces four interesting changes relative to the standard model:

- The large overpredictions of costs in the two lowest cost categories (at or below 20th percentile and 20th to 40th percentile) decrease substantially (Table 2-1).

- The large underpredictions of costs in the two highest cost categories (95th to 99th percentile and above 99th percentile) become fairly large overpredictions.
- Predicted costs shift from the four lowest cost categories (resulting in lower predictive ratios) to the three highest cost categories (resulting in higher predictive ratios).
- Costs are overpredicted for the lowest and highest cost beneficiaries and underpredicted for those whose costs are in the middle of the distribution.

Clearly, adding base-year costs would help plans that have high shares of high-cost enrollees and make high-cost beneficiaries more financially attractive to plans. However, it raises questions about how plans would view enrollees whose costs fall in the middle of the cost distribution.

Using base-year costs is a great concern because it may affect plans' incentives to manage their enrollees' care to hold down costs. It could also penalize plans that actually do so because payments increase as enrollees' base-year costs increase. This issue received considerable attention in a report from the Society of Actuaries, which included warnings about undesirable incentives (Winkelman and Mehmud 2007). However, other research is more optimistic about using base-year costs and suggests using nonpreventable hospital stays as a proxy for base-year costs to counteract incentive problems (Brown and Schone 2013). The idea is that if a plan has a lot of inpatient stays that could not have been prevented even with good care management, then payments should be increased. However, it is not known how well this variable would work as a proxy for base-year costs, nor is there a clear definition of nonpreventable inpatient stays.

Truncating costs would have small to moderate improvement among high-cost beneficiaries

The truncated model uses the standard CMS–HCC model but truncates the costs of beneficiaries that exceed a dollar threshold. Costs beyond the threshold could be covered by reinsurance. We examined the effects of two different truncation levels, $250,000 and $100,000.

In general, the effects of truncating the enrollees' costs are nearly negligible, with the exception of those whose base-year costs were in the top 1 percent. For the nine conditions analyzed, the predictive ratios are similar in the standard model and the two truncation models. The same is true for the six lowest base-year cost categories (Table 2-1, p. 30).

The only appreciable change occurs in the category of beneficiaries who had base-year costs above the 99th percentile. When we truncate costs at $250,000, the extent of underpayment fell slightly, from 29 percent to 26 percent. Truncating costs at $100,000 produces a stronger result, decreasing underpayment from 29 percent to 19 percent. It is not surprising that the nontrivial effects occur only in the highest cost category because only 0.03 percent of beneficiaries had prediction-year costs that exceeded $250,000, and only 0.6 percent of beneficiaries had prediction-year costs that exceeded $100,000.

While a policy that limits plans' exposure to unusually high costs may improve the predictive ratio in the highest cost category, such a policy has a significant drawback. Truncating the costs of MA plans is a step toward cost-based payments, which can reduce plans' incentives to manage care and hold down costs. Moreover, limitations on risk may be justified when plans face substantial uncertainty about the risk profile of their enrollees, but this is unlikely the case for MA plans. The MA program has existed for many years, so plans should have little uncertainty about the risk profile of their enrollees. Also, plans typically have enough enrollees that expenses from very costly enrollees should be largely offset by financial gains from low-cost enrollees.

Summary

The CMS–HCC model appears to have reduced the extent of favorable selection among beneficiaries who move from FFS Medicare to MA. However, it still substantially overpredicts the cost of the least costly beneficiaries and underpredicts the cost of the most costly beneficiaries. These systematic prediction errors can benefit plans that have a relatively high share of low-cost enrollees and can disadvantage plans that have a relatively high share of high-cost enrollees. Moreover, plans have information about their enrollees' historical costs, and beneficiaries' historical costs have a fairly strong correlation with their future costs. At the same time, the CMS–HCC model does not adjust payments for enrollees' historical costs. Plans can use this informational asymmetry to their advantage. Evidence suggests that plans may be doing just that because beneficiaries who disenroll from MA plans and return to FFS Medicare are much more costly than the average FFS beneficiary (Medicare Payment Advisory Commission 2012, Newhouse et al. 2012). However, it is also possible that those who disenroll from MA plans prefer the less-restrictive provider choices of FFS Medicare.

We evaluated three alternative approaches to improving how well the standard CMS–HCC model predicts costs for beneficiaries who had high costs or low costs in the base year: a hybrid model that mixes concurrent and prospective risk adjustment; a model that includes beneficiary-level cost data from the base year; and a model that truncates the beneficiary-level costs that plans are responsible for. We evaluate performance for beneficiaries who have high or low base-year costs rather than high or low prediction-year costs because restrictions on enrollment and disenrollment make prediction-year costs less important in terms of affecting plans' selection incentives. We find that the hybrid model would actually perform worse than the standard model, while the model that includes base-year costs and the model that truncates costs would improve the accuracy of payments for the lowest and highest cost beneficiaries.

But using base-year costs is not without problems because it may reduce plans' incentives to manage their enrollees' conditions to hold down their costs. In fact, it can reward plans that fail to do so and penalize plans that do. One suggestion has been to use the number of nonpreventable inpatient stays among a plan's enrollees as a proxy. However, it is not clear what defines nonpreventable inpatient stays or how well it would perform as a proxy. In addition, adding base-year costs resulted in underprediction of costs for beneficiaries who fell in the middle of the cost distribution.

A model that truncates costs could be coupled with a system of reinsurance, which would add a small degree of cost-based payment and could reduce incentives to hold down costs. Also, it would increase plans' uncertainty about their revenue streams. Currently, plans receive capitated payments for each enrollee, and these payments are largely known ahead of time. Under a model that has truncated costs coupled with reinsurance, plans would receive a smaller capitated payment but also a separate reinsurance payment. The reinsurance payments would be paid later than the capitated payments. Unlike capitated payments, the amounts that plans would receive in reinsurance payments are largely unknown ahead of time and would result in a revenue shift among plans.

In summary, the alternative approaches we evaluated either do not improve the performance of the CMS–HCC model or could create other problems, including less incentive for plans to manage care and hold down costs, penalizing plans that do so, and increasing incentives to upcode. In a previous report, we identified two modifications to the CMS–HCC model that would improve risk adjustment for beneficiaries who have several conditions and are relatively costly: adding beneficiaries' number of conditions and using two years of data to determine beneficiaries' HCCs rather than the single year that CMS uses (Medicare Payment Advisory Commission 2012). However, we find that adding the number of conditions would improve prediction for very high-cost and very low-cost beneficiaries by only a small amount, and we doubt that using two years of data would provide much improvement. Therefore, we may need to consider administrative measures to address the imprecision of the CMS–HCC model and incentives for plans to engage in selection. One possibility is penalties for disenrollment of high-cost beneficiaries. Also, CMS may be able to obtain helpful information about factors that contribute to disenrollment through surveys of disenrollees and evaluating disenrollees for changes in their risk factors over time. ■

Endnotes

1 Providers record the conditions on claims using International Classification of Diseases, Ninth Revision, codes.

2 Under perfect concurrent adjustment, the MA payment would be adjusted simultaneously with the diagnosis of the condition. However, before adjustment can be made, plans must gather the data on their enrollees' diagnoses and send them to CMS, and CMS must process those data and adjust the payments.

3 Although the hybrid model does worse than the standard model at predicting costs for beneficiaries who have high costs in the *base* year, it does much better than the standard model at predicting costs for beneficiaries who have high costs in the *prediction* year.

4 An exception is AMI, which has a predictive ratio of 1.24. This exception occurs because base-year costs are very high for beneficiaries who had AMI diagnosed in 2010, and prediction-year costs are much lower than base-year costs for these beneficiaries. When we add base-year costs to the CMS–HCC model, the adjustment to predicted costs for AMI patients is very large, resulting in a high predictive ratio.

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