

CHAPTER 4

**Mandated report: Impact of
changes in the 21st Century
Cures Act to risk adjustment for
Medicare Advantage enrollees**

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Chapter summary

The Medicare program pays managed care plans that participate in the Medicare Advantage (MA) program a monthly capitated amount to provide Medicare-covered services to its Medicare enrollees. Payment for each enrollee has two parts: a base rate and a risk score. The base rates vary by county, with the base rate for a given county reflecting the payment for an MA enrollee in that county with the health status of the national average beneficiary in fee-for-service (FFS) Medicare. The risk score indicates how costly the enrollee would be expected to be in FFS Medicare, relative to the national average FFS beneficiary.

The 21st Century Cures Act of 2016 directs the Secretary to make several changes to the CMS hierarchical condition category (CMS-HCC) model, which CMS uses to calculate enrollees' risk scores. The changes required by the 21st Century Cures Act include the following:

- Add indicators and adjustments for the total number of diseases or conditions for each enrollee.
- For beneficiaries who receive full Medicaid benefits, provide payment adjustments that are separate and different from payment adjustments for beneficiaries who receive partial Medicaid benefits. Until 2017, the CMS-HCC model had provided the same payment adjustment for these two beneficiary groups.

In this chapter

- Background on Medicare Advantage payments and risk adjustment
- Changes required by the 21st Century Cures Act
- Impacts of changes to CMS's risk adjustment model for Medicare Advantage
- Summary

- Evaluate the effects of including additional diagnosis codes for mental health disorders, substance abuse disorders, and chronic kidney disease.

In addition, the 21st Century Cures Act provides that the Secretary “may use at least two years of diagnosis data” to determine risk scores but does not appear to *require* the Secretary to do so.

CMS has implemented the mandated changes incrementally, applying different adjustments for full-benefit and partial-benefit dually eligible beneficiaries in 2017; adjustments for mental health disorders, substance abuse disorders, and chronic kidney disease in 2019; and adjustments for the number of conditions for each beneficiary in 2020. CMS has not implemented the use of two years of diagnosis data to determine risk scores.

The 21st Century Cures Act directs the Commission to evaluate the impact of these changes to the CMS–HCC model. To carry out this mandate, we evaluated five versions of the CMS–HCC model: the model that CMS used before implementing any of the changes mandated by the 21st Century Cures Act, the three models that CMS has implemented in response to the Act’s requirements, and a version that we developed that uses two years of diagnosis data to determine risk scores.

We evaluated how well each of the five versions of the CMS–HCC model predicts costs for various Medicare FFS beneficiary populations grouped by health characteristics, including type of medical conditions, number of medical conditions, and level of Medicare program spending. For each group, we calculated what each version of the CMS–HCC model predicts in costs for all of the group’s beneficiaries over one year (aggregate predicted costs). For each group, we also calculated how much Medicare actually spent on those FFS beneficiaries over one year (aggregate actual costs).

For each group, we determined a predictive ratio (PR), which is the ratio of aggregate predicted costs to aggregate actual costs. The desired result for a given group is a PR of 1.0, which would indicate that the model predicts costs for the group that are equal to the actual costs for the group. A PR less than 1.0 indicates that predicted costs for the group are less than actual costs, and the model will produce underpayments for that group. A PR greater than 1.0 indicates that predicted costs for the group are greater than actual costs, and the model will produce overpayments for that group.

In general, we found that:

- Each model produces accurate payment adjustments for groups that have characteristics defined by variables that are included in the model.
- Making distinctly different adjustments for full-benefit dual-eligible beneficiaries and partial-benefit dual-eligible beneficiaries eliminates systematic underpayments for the full-benefit dual-eligible beneficiaries and systematic overpayments for the partial-benefit dual-eligible beneficiaries that had occurred in previous models that did not distinguish between these two populations.
- Adding variables to the CMS–HCC model for mental health disorders, substance abuse disorders, and chronic kidney disease improves how accurately the model adjusts payments for beneficiaries who have those conditions. However, we caution that adding variables to the CMS–HCC model can provide additional opportunities for MA plans to increase revenue by coding more medical conditions. Such increases in coding may be especially likely when the additional variables represent conditions that are diagnosed using relatively discretionary standards.
- Adding indicators for the number of medical conditions for each beneficiary improves the model’s accuracy in adjusting payments for beneficiaries who have no conditions indicated in the model and those who have many conditions.
- All of the models produce underpayments for beneficiaries with very high levels of Medicare spending and overpayments for those with very low levels of Medicare spending. Adding indicators for the number of medical conditions for each beneficiary *slightly* improves the model’s accuracy in adjusting payments for both beneficiary groups, but underpayments and overpayments remain. These payment inaccuracies have been a persistent issue for MA risk adjustment.

We also found that using two years of diagnosis data to determine beneficiaries’ conditions produces payment adjustments that are about as accurate as using one year of diagnosis data, though it produces larger underpayments for those with high levels of Medicare spending than using one year of diagnosis data. Nevertheless, in our view, the use of two years of diagnosis data would be beneficial for MA risk adjustment because it would decrease the extent of coding differences that persist between the MA and FFS sectors of the Medicare program. Using two years of diagnosis data allows the model to capture more medical conditions among the FFS population, so that the profile of conditions among the FFS population more

closely matches the profile of conditions that would have been recorded for those beneficiaries had they been enrolled in MA. The result would be reduced payment errors that occur because of coding differences between MA and FFS.

We commend the progress that CMS has made in implementing the changes to the CMS–HCC model mandated by the 21st Century Cures Act. We encourage CMS to continue its work on this issue to complete the requirements in the 21st Century Cures Act by the mandated date of January 1, 2022. ■

Benefits of using prospective risk adjustment in Medicare Advantage

Two general arguments have been made for using a prospective risk adjustment model rather than a concurrent model in Medicare Advantage (MA):

- Relative to a concurrent model, a prospective model gives health plans greater incentive to manage their enrollees' care to prevent their enrollees from developing costly new conditions. Use of a concurrent model would move the MA program away from its intended purpose—managing the medical conditions of its enrollees—and closer to a cost-based model because plans would be paid as their enrollees' conditions occur.
- 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 data on those diagnoses 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 had a condition diagnosed in December 2019, CMS may not be able to make an adjustment to the plan's payment until 2020. Under a prospective model, conditions from the base year are used to adjust payments in the prediction year, so the likelihood that payment adjustments are needed after the prediction year is smaller.¹ ■

Background on Medicare Advantage payments and risk adjustment

Medicare pays managed care plans that participate in the Medicare Advantage (MA) program a monthly capitated amount for each Medicare enrollee to provide Medicare-covered services. Each capitated payment has two general parts: a base rate, which reflects the payment for an MA enrollee with the health status of the national average beneficiary in fee-for-service (FFS) Medicare, and a risk score, which indicates how costly the enrollee is expected to be relative to the national average FFS beneficiary. The purpose of the risk scores is to adjust MA payments so that they accurately reflect how much an MA enrollee is expected to cost relative to the national average.

Over the years, CMS has used a variety of 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.

CMS draws data for demographic variables from the year in which beneficiaries' costs are to be predicted (the prediction year). CMS bases assigned conditions on one year of diagnoses recorded on physician, hospital outpatient, and hospital inpatient claims from the year before the prediction year (base year). CMS groups 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 HCC that has the largest effect on the beneficiary's risk score is used.

The CMS-HCC model is prospective, meaning it uses conditions from a base year to predict beneficiary costs in the next year (the prediction year), as opposed to concurrent, which uses conditions diagnosed in the prediction year to predict costs in the same year (see text box on prospective risk adjustment).

The purpose of risk adjustment is not to accurately predict costs for any particular person, but on average for a group of people with the same attributes that affect health care

costs. Therefore, 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) and predicts costs that are above actual costs for others (overpredicts), but predicts accurately on average. This result is a feature of all models that use beneficiaries’ conditions to predict costs. This risk of loss faced by plans provides an incentive for plans to manage their enrollees’ conditions to keep their costs down. In addition, by paying accurately for each condition on average, the CMS–HCC model reduces incentives for plans to avoid beneficiaries with high-cost conditions.

Changes required by the 21st Century Cures Act

The CMS–HCC model is based on the standard HCC model developed by CMS (Pope et al. 2000). The CMS–HCC model differs from the standard HCC model in that it does not include all of the HCCs from the standard model. CMS has chosen not to use all of the HCCs because the agency believes that exclusion of some HCCs has a minimal effect on model performance while reducing burden on plans to submit data on their enrollees’ conditions and on CMS to process the data. However, by excluding some HCCs from the CMS–HCC model, CMS runs the risk of systematic underpayments to plans for enrollees with those conditions. In addition, CMS has always included in the CMS–HCC model an adjustment for whether a Medicare beneficiary receives some benefits from the Medicaid program (dual-eligible beneficiaries). Historically, CMS did not distinguish between dual-eligible beneficiaries with full Medicaid benefits from their state of residence and those with partial Medicaid benefits (their state paid their Medicare premiums and, in some cases, some of their Medicare cost-sharing responsibilities). However, the cost to the Medicare program is higher, on average, among the full-benefit dual-eligible beneficiaries relative to the partial-benefit dual-eligible beneficiaries. Consequently, risk adjustment that does not distinguish between these two populations produces systematic underpayments for full-benefit dual-eligible beneficiaries and systematic overpayments for partial-benefit dual-eligible beneficiaries.

In an effort to improve the CMS–HCC model, the Congress in the 21st Century Cures Act directed the

Secretary to make three changes to the CMS–HCC model (see text box on mandates, pp. 102–103):

- Add indicators for the total number of diseases or conditions for each enrollee.
- Provide separate payment adjustments for beneficiaries who receive full Medicaid benefits and for beneficiaries who receive partial Medicaid benefits. Until 2017, the CMS–HCC model had provided the same payment adjustment for these two beneficiary groups.
- Evaluate the effects of including additional diagnosis codes for mental health disorders, substance abuse disorders, and chronic kidney disease.

In addition, the 21st Century Cures Act indicates that the Secretary “may use at least two years of diagnosis data” to determine risk scores. It does not appear that use of two years of data is required.

CMS has implemented three of these changes indicated in the 21st Century Cures Act, the exception being use of at least two years of data to determine risk scores, when available.

The 21st Century Cures Act also directs the Commission to conduct an evaluation of the impact of these changes to the CMS–HCC model. In this report, we evaluated versions of the CMS–HCC model that CMS has implemented in response to the requirements in the 21st Century Cures Act:

- ***Different adjustments for MA enrollees with full Medicaid benefits and those with partial Medicaid benefits.*** The version of the CMS–HCC model that CMS used before 2017 (version 21, or V21) did not distinguish between these two groups of beneficiaries. In 2017, CMS implemented a version of the CMS–HCC model (V22) that distinguished between these two Medicare populations receiving Medicaid assistance by creating separate models for six population segments—
 - full Medicaid benefits and eligible for Medicare because of disability (disabled);
 - full Medicaid benefits and eligible for Medicare because of age (aged);
 - partial Medicaid benefits and disabled;

- partial Medicaid benefits and aged;
- no Medicaid benefits and disabled;
- no Medicaid benefits and aged.
- **Add HCCs for mental health disorders, substance abuse disorders, and chronic kidney disease.** For 2019, CMS implemented a version of the CMS–HCC model (V23) that added HCCs for mental health disorders, substance abuse disorders, and chronic kidney disease to V22 of the CMS–HCC model. CMS continued to use the six population segments from V22 in V23.
- **Include variables for the number of diseases or conditions for each beneficiary.** For 2020, CMS implemented a version of the CMS–HCC model (V24.1) that added indicators for the number of conditions for each beneficiary to V23. CMS determines the number of conditions for each beneficiary by counting the number of “payment HCCs” for each enrollee. A payment HCC is one that CMS includes in the CMS–HCC model used for payment purposes. CMS continued to use the six population segments in V22 and V23.
- **Use at least two years of diagnosis data to determine risk scores.** CMS has not implemented a version of the CMS–HCC model that uses two years of diagnosis data to determine risk scores. Nevertheless, we created and evaluated a version of the CMS–HCC model (V24.2) that is the same as model V24.1, but uses two years of diagnosis data. This version uses the same population segments used in models V22, V23, and V24.1.

We focused our evaluation of the changes that CMS has made to the CMS–HCC model on how well the resulting versions predict costs for Medicare populations defined by indicators of their health. The purpose of risk adjustment is to (1) adjust payments to MA plans such that those payments accurately reflect how much each MA enrollee is expected to cost in terms of covered services in FFS Medicare and (2) pay accurately enough so that plans do not have an incentive to attract beneficiaries because they would be profitable and avoid other beneficiaries because they would not be profitable. If risk adjustment does not pay accurately enough, plans could use beneficiaries’ health characteristics such as their medical conditions, number of health conditions, and historical health care costs to distinguish the favorable risks from the unfavorable risks.

In our analysis, we evaluated how well the CMS–HCC models implemented by CMS predict costs for beneficiary groups defined by health characteristics:

- Beneficiaries who have common medical conditions, including acute myocardial infarction (AMI), cancer, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), mental illness, schizophrenia, all strokes, and ischemic or unspecified strokes.
- Beneficiaries stratified into groups by number of medical conditions, as indicated by the number of HCCs.
- Beneficiaries stratified by Medicare program spending in the year before the beneficiary’s risk score is determined (base-year spending). We determined the distribution of Medicare program spending among all Medicare beneficiaries and identified the percentile of each beneficiary’s Medicare spending. We then stratified the beneficiaries into these seven percentile categories: lowest 20 percent, 20 percent to 40 percent, 40 percent to 60 percent, 60 percent to 80 percent, 80 percent to 95 percent, 95 percent to 99 percent, and highest 1 percent.

We used predictive ratios (PRs) to evaluate how well the different versions of the CMS–HCC model predict costs for these various groups of Medicare beneficiaries. PRs indicate how well a model predicts costs for a group of beneficiaries with the same health characteristics. For a group of beneficiaries, a PR is the cost for the group as predicted by a risk adjustment model divided by the actual cost for that group. A PR greater than 1.0 indicates predicted costs are greater than actual costs for a group (overprediction); a PR less than 1.0 indicates predicted costs are less than actual costs for a group (underprediction). For a discussion of the details of our data and methods, see the text box about estimating and evaluating (pp. 104–105).

Impacts of changes to CMS’s risk adjustment model for Medicare Advantage

Our results indicate that each of the required changes CMS has made to the CMS–HCC model improves the predictive accuracy for each of the beneficiary populations that are the focus of the changes. Creating separate

Mandates to the Secretary and the Commission to improve risk adjustment in the 21st Century Cures Act

The legislative language of Section 17006 of the 21st Century Cures Act directs the Secretary and the Commission to improve risk adjustment in the Medicare Advantage program as follows:

(f) IMPROVEMENTS TO RISK ADJUSTMENT UNDER MEDICARE ADVANTAGE.—

(1) IN GENERAL.—Section 1853(a)(1) of the Social Security Act (42 U.S.C. 1395w–23(a)(1)) is amended—

(A) in subparagraph (C)(i), by striking “The Secretary” and inserting “Subject to subparagraph (I), the Secretary”; and

(B) by adding at the end the following new subparagraph:

“(I) IMPROVEMENTS TO RISK ADJUSTMENT FOR 2019 AND SUBSEQUENT YEARS.—

“(i) IN GENERAL.—In order to determine the appropriate adjustment for health status under subparagraph (C)(i), the following shall apply:

“(I) TAKING INTO ACCOUNT TOTAL NUMBER OF DISEASES OR CONDITIONS.—The Secretary shall take into account the total number of

diseases or conditions of an individual enrolled in an MA plan. The Secretary shall make an additional adjustment under such subparagraph as the number of diseases or conditions of an individual increases.

“(II) USING AT LEAST 2 YEARS OF DIAGNOSTIC DATA.—The Secretary may use at least 2 years of diagnosis data.

“(III) PROVIDING SEPARATE ADJUSTMENTS FOR DUAL ELIGIBLE INDIVIDUALS.—With respect to individuals who are dually eligible for benefits under this title and title XIX, the Secretary shall make separate adjustments for each of the following:

“(aa) Full-benefit dual eligible individuals (as defined in section 1935(c)(6)).

“(bb) Such individuals not described in item (aa).

“(IV) EVALUATION OF MENTAL HEALTH AND SUBSTANCE USE DISORDERS.—The Secretary shall evaluate the impact of including

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versions of the model for partial Medicaid beneficiaries and full Medicaid beneficiaries produces more accurate predictions of the cost of these beneficiaries. Further, adding indicators for mental health disorders, substance abuse disorders, and chronic kidney disease improves how well the CMS–HCC predicts the cost of beneficiaries who have these conditions. However, the addition of those indicators may increase opportunities for plans to boost revenue through more intensive coding. Finally, adding

measures of the number of conditions for each beneficiary improves how well the CMS–HCC model predicts the cost of beneficiaries who have 10 or more conditions.

We also found that using two years of diagnosis data to determine beneficiaries’ conditions produces payment adjustments that are about as accurate as using one year of diagnosis data, though this model produces larger underpayments for those with high levels of Medicare spending than using one year of diagnosis

Mandates to the Secretary and the Commission to improve risk adjustment in the 21st Century Cures Act (cont.)

additional diagnosis codes related to mental health and substance use disorders in the risk adjustment model.

“(V) EVALUATION OF CHRONIC KIDNEY DISEASE.—The Secretary shall evaluate the impact of including the severity of chronic kidney disease in the risk adjustment model.

“(ii) PHASED-IN IMPLEMENTATION.—The Secretary shall phase-in any changes to risk adjustment payment amounts under subparagraph (C)(i) under this subparagraph over a 3-year period, beginning with 2019, with such changes being fully implemented for 2022 and subsequent years.

“(iii) OPPORTUNITY FOR REVIEW AND PUBLIC COMMENT.—The Secretary shall provide an opportunity for review of the proposed changes to such risk adjustment payment amounts under this subparagraph and a public comment period of not less than 60 days before implementing such changes.”.

(2) STUDIES AND REPORTS.—

(A) REPORTS ON THE RISK ADJUSTMENT SYSTEM.—

(i) MEDPAC EVALUATION AND REPORT.—

(I) EVALUATION.—The Medicare Payment Advisory Commission shall conduct an evaluation of the impact of the provisions of, and amendments made by, this section on risk scores for enrollees in Medicare Advantage plans under part C of title XVIII of the Social Security Act and payments to Medicare Advantage plans under such part, including the impact of such provisions and amendments on the overall accuracy of risk scores under the Medicare Advantage program.

(II) REPORT.—Not later than July 1, 2020, the Medicare Payment Advisory Commission shall submit to Congress a report on the evaluation under subclause (I), together with recommendations for such legislation and administrative action as the Commission determines appropriate. ■

data. Nevertheless, in our view, the use of two years of diagnosis data would be beneficial for MA risk adjustment because it would decrease the extent of coding differences that persist between the MA and FFS sectors of the Medicare program. Using two years of diagnosis data allows the model to capture more medical conditions among the FFS population, so that the profile of conditions among the FFS population more closely matches the profile of conditions that would have been recorded for those beneficiaries had they been enrolled in MA. The result would be reduced payment errors that occur because of coding differences between MA and FFS.

Separate adjustments for fully dual beneficiaries and partially dual beneficiaries improves cost predictions

Since CMS began using the CMS–HCC model in 2004, CMS has included an adjustment for beneficiaries who are also eligible for Medicaid (Centers for Medicare & Medicaid Services 2003). However, being dually eligible does not mean all these enrollees have the same level of Medicaid coverage. Some have full benefits (FBs) from their state of residence, including prescription drugs, while others have only partial benefits (PBs), such as assistance with Medicare cost sharing and Medicare premiums. The

Method for estimating and evaluating versions of the CMS–HCC model

We used a sample of 27.2 million beneficiaries in fee-for-service (FFS) Medicare to evaluate five versions of the CMS hierarchical condition category (CMS–HCC) model, which CMS uses to risk adjust payments to Medicare Advantage (MA) plans. We randomly selected half this sample—13.6 million beneficiaries—to estimate coefficients in the five model versions:

- The version of the CMS–HCC model that CMS used in the MA program before 2017 (V21).
- The version of the CMS–HCC model that CMS used in the MA program in 2017 and 2018 (V22). This model is largely the same as V21, but CMS created separate adjustments for Medicare full-benefit dual-eligible beneficiaries (full Medicaid benefits from their state of residence) and for partial-benefit dual-eligible beneficiaries (their state pays their Medicare premiums plus cost sharing in some instances).
- The version of the CMS–HCC model that CMS used in the MA program in 2019 (V23). This model is largely V22, but CMS modified or added new hierarchical condition categories (HCCs) for moderate to severe substance abuse, minor substance abuse, reactive and unspecified psychosis, personality disorder, and Stage 3 chronic kidney disease.
- Model V24.1, which CMS began using in 2020, is V23 with additional categories for the number of conditions for each beneficiary. CMS defined the number of conditions as the number of HCCs that each beneficiary’s medical diagnoses map into.
- Model V24.2 (which is V24.1, but instead of using one year of diagnosis data to determine each beneficiary’s HCCs, V24.2 uses two years of diagnosis data when available). The Commission developed this model for this study.

We used the other half of the sample (13.6 million FFS beneficiaries) to evaluate model performance using predictive ratios (PRs), which indicate how well a model predicts costs for a group of beneficiaries

with the same health characteristics. For a group of beneficiaries, a PR is the cost for the group as predicted by a risk adjustment model divided by the actual cost for that group. A PR greater than 1.0 indicates predicted costs are greater than actual costs for a group (overprediction); a PR of less than 1.0 indicates predicted costs are less than actual costs for a group (underprediction). For this analysis, the prediction year is 2017, which is the year for which we are predicting beneficiaries’ costs. The previous year (2016) is the base year from which we draw beneficiaries’ conditions to determine their HCCs, except for V24.2, which has two base years (2015 and 2016) because we used two years of diagnosis data to determine HCCs.

All beneficiaries in our sample had Part A and Part B coverage in FFS Medicare in every month of 2016 (the sample for model V24.2 had Part A and Part B coverage in every month of 2015 and 2016). Beneficiaries must have lived within the 50 U.S. states throughout 2016 and must not have had Medicare as a secondary payer in 2016. In 2017, beneficiaries must have been in FFS Medicare for at least one month, must not have had Medicare as a secondary payer, must not have had end-stage renal status, must have lived within the 50 U.S. states throughout their enrollment in FFS Medicare, and must not have received hospice care.

For each beneficiary, we determined the months in 2017 during which the beneficiary was in a long-term care facility (living in an institution) and the months during which they were not (living in the community). During each of the months in which a beneficiary was living in the community in 2017, we assigned beneficiaries to one of these population segments:

- Full Medicaid benefits and eligible for Medicare because of disability (FULL_BENEFIT_DISABLED)
- Full Medicaid benefits and eligible for Medicare because of age (FULL_BENEFIT_AGED)
- Partial Medicaid benefits and eligible for Medicare because of disability (PARTIAL_BENEFIT_DISABLED)

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

- Partial Medicaid benefits and eligible for Medicare because of age (PARTIAL_BENEFIT_AGED)
- No Medicaid benefits and eligible for Medicare because of disability (NONDUAL_DISABLED)
- No Medicaid benefits and eligible for Medicare because of age (NONDUAL_AGED)

We assigned beneficiaries living in an institution to their own population segment, regardless of Medicaid status. For V22, V23, V24.1, and V24.2, we estimated separate versions for the seven population segments (institutionalized, FULL_BENEFIT_DISABLED, FULL_BENEFIT_AGED, PARTIAL_BENEFIT_DISABLED, PARTIAL_BENEFIT_AGED, NONDUAL_DISABLED, and NONDUAL_AGED).

For each beneficiary in our sample, we created the following variables for the regressions we used to estimate the coefficients (which indicate the additional cost of a characteristic or condition):

- The 2017 costs to the Medicare program incurred while in FFS Medicare. For each beneficiary, we divided these costs into the months the beneficiary was in each of the seven population segments (institutionalized, FULL_BENEFIT_DISABLED, FULL_BENEFIT_AGED, PARTIAL_BENEFIT_DISABLED, PARTIAL_BENEFIT_AGED, NONDUAL_DISABLED, and NONDUAL_AGED). We annualized these costs by dividing them by the fraction of 2017 that the beneficiary was in each of these segments.

- 24 age/sex categories for 2017
- Two categories—one for male, one for female—indicating whether a beneficiary was eligible for Medicare in 2017 because of age but was originally eligible because of disability
- The HCCs for each version of the model
- Disease interaction terms created from beneficiaries' HCCs
- For the institutional population, disabled/disease interaction terms

In estimating each model's coefficients, we used the beneficiaries' annualized 2017 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 2017 that each beneficiary was in each of the seven population segments.

After estimating coefficients for V21, V22, V23, V24.1, and V24.2, we evaluated their efficacy using half of the 27.2 million-person full sample that we did not use to estimate the models. For each beneficiary, we determined the 2017 Medicare costs predicted by each of the five versions. We used these 2017 predicted costs to calculate PRs in nine disease categories, five HCCs that CMS introduced or modified for V23, seven categories that represent levels of beneficiaries' FFS costs in the base year of 2016, and nine categories that represent the number of conditions for beneficiaries in 2017. ■

versions of the CMS–HCC model that CMS used before 2017 did not distinguish between the FB beneficiaries and the PB beneficiaries, adjusting the capitated payments to MA plans by the same rate for all dual-eligible beneficiaries.

Research indicates that when the CMS–HCC model does not distinguish between FB beneficiaries and PB beneficiaries, the model systematically underpredicts

the cost for FB beneficiaries and overpredicts the cost for PB beneficiaries. For this analysis, we estimated how well CMS–HCC V21—which does not distinguish FB beneficiaries from PB beneficiaries—predicts costs for those two groups. Our analysis estimates an underprediction of 5 percent for FB beneficiaries and an overprediction of 5 percent for PB beneficiaries. In response to these systematic payment inaccuracies, CMS

made substantial changes to the CMS–HCC model for 2017. CMS replaced the single model for all enrollees that CMS identifies as living in the community (V21) by separating beneficiaries living in the community into population segments defined by their Medicaid eligibility status and their reason for Medicare eligibility (aged or disabled):

- full Medicaid benefits and eligible for Medicare because of disability (FULL_BENEFIT_DISABLED)
- full Medicaid benefits and eligible for Medicare because of age (FULL_BENEFIT_AGED)
- partial Medicaid benefits and eligible for Medicare because of disability (PARTIAL_BENEFIT_DISABLED)
- partial Medicaid benefits and eligible for Medicare because of age (PARTIAL_BENEFIT_AGED)
- no Medicaid benefits and eligible for Medicare because of disability (NONDUAL_DISABLED)
- no Medicaid benefits and eligible for Medicare because of age (NONDUAL_AGED)

CMS has also maintained a distinct version of the CMS–HCC model for enrollees who lived in an institutional facility (primarily nursing homes) for at least three consecutive months in the prediction year. Therefore, we evaluated how well risk adjustment predicts costs for seven population segments: six population segments in the community that are distinguished by their Medicaid status and whether they are Medicare eligible because of age or disability and one population segment for the long-term institutionalized.

We determined PRs for each of the versions for the six community population segments and for the institutional population. For all seven population segments, we found that V22 produced PRs of 1.00 for the entire population in the model.² These results indicate that the model pays accurately for each of the population segments, on average. In other words, separately estimating the model for each of the six population segments results in accurate payments for both beneficiaries who have full Medicaid benefits and beneficiaries who have partial Medicaid benefits (as well as those who have no Medicaid benefits). These accurate payments for population segments are an improvement over the single version of the CMS–

HCC model that CMS used for the community and institutionalized populations before 2017 (V21).

We also evaluated how well CMS–HCC model V22 predicts costs for groups of beneficiaries defined by other health characteristics. For each of the six community population segments and the institutional population, we:

- grouped beneficiaries by several medical conditions in the base year (AMI, cancer, CHF, COPD, diabetes, mental illness, schizophrenia, all stroke, and ischemic or unspecified stroke);
- stratified beneficiaries by the number of medical conditions, as indicated by the number of HCCs;
- stratified beneficiaries by their cost to the Medicare program in the base year of 2016; and
- grouped beneficiaries by whether they had one of the HCCs that CMS added to or modified for the CMS–HCC model in 2019 (moderate to severe substance abuse, mild substance abuse, reactive and unspecified psychosis, personality disorder, and Stage 3 chronic kidney disease).

We chose these health characteristics because they can be observed by plans, and, therefore, plans can use these characteristics to select enrollees. Plans cannot use other characteristics such as beneficiaries’ cost to the Medicare program in the prediction year (2017 for this study) because the plans cannot observe these characteristics before beneficiaries make their decisions about MA enrollment.

We found that V22 predicts accurately in each population segment for the conditions included in the model (Table 4-1, p. 108). The greatest degree of underprediction is for schizophrenia among the FULL_BENEFIT_AGED segment (PR = 0.97), and the greatest degree of overprediction is for AMI among the FULL_BENEFIT_DISABLED and NONDUAL_AGED segments (PR = 1.02). However, neither result indicates a large payment inaccuracy.

When we stratified beneficiaries by the number of conditions they had (which is not a variable in V22 but which CMS added for V24.1), we found that for each of the seven population segments, V22 predicted well for beneficiaries who had from one condition to eight conditions. However, we found some degree of underprediction in all population segments for beneficiaries with no conditions indicated in the model

(PR as low as 0.83 in the FULL_BENEFIT_DISABLED segment) and for beneficiaries with many conditions (PR as low as 0.90 for the NONDUAL_DISABLED segment who have 12 or more conditions). It may be counterintuitive that V22 underpredicted costs for a population that appeared to be quite healthy, those with no conditions indicated in the model. This underprediction occurred because many of these beneficiaries do have medical conditions, but the conditions are not included in V22; the model does not adjust payments for those medical conditions. This underprediction occurs in the other versions we evaluated for the same reason.³

We also included in Table 4-1 (p. 108) PRs for beneficiaries with conditions not included in V22 but which CMS added to V23 in 2019 (moderate to severe substance abuse, mild substance abuse, reactive and unspecified psychosis, personality disorder, and Stage 3 chronic kidney disease). In general, PRs for these conditions are less than 1.0, indicating costs are underpredicted. This result is not surprising. If a risk adjustment model does not account for a medical condition, there is no payment adjustment if a beneficiary has that condition.

Finally, when we stratified beneficiaries in each population segment by their Medicare spending in the base year, we found that for each population segment model, V22 systematically overpredicted the cost of beneficiaries with low Medicare spending in the base year and underpredicted the cost of beneficiaries with high Medicare spending in the base year. For example, under V22 for the FULL_BENEFIT_DISABLED segment, the PR for those with base-year spending in the lowest 20 percent was 1.47, indicating an average overpayment of 47 percent. At the same time, the PR for those with base-year spending at the 99th percentile or higher was 0.63, indicating an average underpayment of 37 percent. Large, systematic underpayments and overpayments are an incentive for MA plans to encourage the enrollment of beneficiaries for whom plans are systematically overpaid and discourage enrollment of beneficiaries for whom plans are systematically underpaid.

In summary, we found that V22 predicts costs well for each of the seven population segments and for groups of beneficiaries within those population segments who have conditions included in V22 (AMI, cancer, and so

on). However, CMS–HCC model V22 does not predict as accurately when we group beneficiaries by variables not in the model.

Adding variables for substance abuse disorders, mental health disorders, and chronic kidney disease to the models improves cost prediction for those conditions but could increase coding opportunities

In 2019, CMS implemented a new version of the CMS–HCC model—V23—after making several changes to the HCCs in V22, which included new HCCs for mild substance abuse, reactive and unspecified psychosis, personality disorder, and Stage 3 chronic kidney disease. In addition, CMS expanded the HCC for moderate to severe substance abuse by adding more diagnoses that map to that HCC. For V23, CMS continued to provide separate estimates for the seven population segments used in V22.

We find that—relative to V22—V23 improved prediction for some beneficiary groups and had similar predictions for other beneficiary groups. We expected that V23 would produce better PRs than V22 for the beneficiaries with diagnoses that map into the five HCCs that CMS added to or expanded for V23. For example, the predictive ratios under V22 for the six community population segments ranged from 0.80 to 0.89 for reactive or unspecified psychosis (Table 4-1, p. 108). Under V23, the PRs for reactive or unspecified psychosis improved in all of the population segments, ranging from 0.97 to 1.00 (Table 4-2, p. 109). Despite the general improvement in PRs for these five HCCs under V23, the PRs in Table 4-2 are still well below 1.00 in some instances, such as a PR of 0.84 for personality disorder in the PARTIAL_BENEFIT_AGED population. In our view, these low PRs are not a sign of poor performance by V23. Instead, we attribute the few low PRs among these five HCCs to small numbers of beneficiaries who have these conditions. For example, we used a sample of 13.6 million to evaluate PRs, but only 271 beneficiaries who were in the PARTIAL_BENEFIT_AGED segment had the HCC for personality disorder. Under samples that small, a few beneficiaries with very high costs or very low costs can substantially affect the level of the PR. For example, the two highest cost beneficiaries in the sample we used to determine PRs had costs of \$427,000 and \$330,000, while the highest cost beneficiary in the sample we used to estimate V23 had costs of \$253,000.

**TABLE
4-1**

Predictive ratios for CMS-HCC model V22

Beneficiary category	Full Medicaid		Partial Medicaid		No Medicaid		LTI
	Disabled	Aged	Disabled	Aged	Disabled	Aged	
R^2	0.123	0.116	0.081	0.105	0.080	0.122	0.096
Conditions in model V22							
AMI	1.02	0.99	0.99	1.00	0.98	1.02	1.02
Cancer	1.01	1.00	1.01	0.99	0.99	1.00	1.01
CHF	1.02	1.00	1.01	1.00	0.99	1.00	1.01
COPD	1.01	1.00	1.00	1.00	1.00	1.00	1.00
Diabetes	1.01	1.00	1.00	1.00	1.01	1.00	1.00
Mental illness	1.00	1.00	1.00	0.98	1.00	1.00	1.01
Schizophrenia	1.00	0.97	0.99	0.99	1.00	0.98	1.01
All stroke	0.99	0.98	1.02	0.98	0.98	0.99	1.01
Ischemic or unspecified stroke	0.99	0.98	1.02	0.98	0.98	1.00	1.00
Number of conditions (added in model V24.1)							
No conditions	0.83	0.90	0.89	0.92	0.86	0.96	0.82
1 condition	0.98	1.02	1.01	1.01	1.00	1.01	0.98
2 conditions	1.02	1.02	1.02	1.02	1.04	1.02	1.02
3 conditions	1.04	1.02	1.02	1.01	1.05	1.01	1.02
4 conditions	1.03	1.02	1.03	1.02	1.04	1.01	1.03
5 or more conditions	1.01	1.00	1.00	1.00	1.00	1.00	1.00
8 or more conditions	0.99	0.97	0.98	0.96	0.95	0.97	0.99
10 or more conditions	0.97	0.95	0.95	0.93	0.93	0.96	0.99
12 or more conditions	0.95	0.94	0.94	0.92	0.90	0.94	0.98
Percentile of base-year cost							
0 to 20 percentile	1.47	1.04	1.40	1.12	1.72	1.29	0.84
20 to 40 percentile	1.54	1.37	1.53	1.34	1.67	1.33	1.51
40 to 60 percentile	1.27	1.24	1.24	1.17	1.23	1.13	1.32
60 to 80 percentile	1.06	1.05	1.04	1.01	0.97	0.96	1.04
80 to 95 percentile	0.92	0.91	0.92	0.88	0.83	0.88	0.96
95 to 99 percentile	0.79	0.86	0.76	0.83	0.68	0.82	0.93
99 percentile and higher	0.63	0.76	0.58	0.69	0.50	0.67	0.83
Conditions added in 2019 for model V23							
Substance abuse, moderate to severe	0.99	0.97	1.00	0.96	1.01	0.99	0.99
Substance abuse, mild	0.76	0.80	0.84	0.72	0.78	0.83	0.85
Reactive and unspecified psychosis	0.89	0.81	0.86	0.80	0.81	0.81	0.98
Personality disorder	0.91	0.82	0.75	0.81	0.88	0.79	1.00
Chronic kidney disease, Stage 3	0.93	0.97	1.01	0.96	0.94	0.95	0.97
Number of beneficiary years (in thousands)							
	852	781	305	337	826	9,662	290

Note: CMS-HCC (CMS-hierarchical condition category), V (version), LTI (long-term institutionalized), AMI (acute myocardial infarction), CHF (congestive heart failure), COPD (chronic obstructive pulmonary disease). V22, V23, and V24.1 are versions of the CMS-HCC model that CMS used in 2017 and 2018; 2019; and 2020, respectively. We define "number of conditions" for each beneficiary as the number of HCCs for that beneficiary. "Base-year cost" is the cost to fee-for-service Medicare for each beneficiary in the base year of our analysis, 2016. "Conditions added in 2019" are the HCCs that CMS added to the CMS-HCC model in 2019. "Number of beneficiary years" is the sum across all beneficiaries in our analytic file of the fraction of the prediction year (2017) that each beneficiary was in both Part A and Part B of fee-for-service Medicare.

Source: MedPAC analysis of the version of the CMS-HCC model that CMS used to risk adjust MA payments in 2017 and 2018. Data used in this analysis include all standard analytic claims files for the inpatient, outpatient, and physician sectors in 2016; standard analytic claims for all sectors in 2017; Medicare denominator files for 2016 and 2017; and the custom Medicare enrollment file.

**TABLE
4-2**

Predictive ratios for CMS-HCC model V23, which adds HCCs for substance abuse disorders, mental health disorders, and kidney disease

Beneficiary category	Full Medicaid		Partial Medicaid		No Medicaid		LTI
	Disabled	Aged	Disabled	Aged	Disabled	Aged	
R^2	0.124	0.117	0.081	0.106	0.080	0.123	0.096
Conditions in model V22							
AMI	1.02	0.99	0.99	1.00	0.98	1.00	1.02
Cancer	1.01	1.00	1.01	0.99	0.99	1.00	1.01
CHF	1.01	1.00	1.01	1.00	1.00	1.00	1.01
COPD	1.01	1.00	1.00	1.00	1.00	1.00	1.00
Diabetes	1.01	1.00	1.00	1.00	1.01	1.00	1.00
Mental illness	1.00	1.00	1.00	0.99	1.01	1.00	1.01
Schizophrenia	1.00	0.97	0.99	1.00	1.01	0.98	1.01
All stroke	0.99	0.98	1.02	0.98	0.98	0.99	1.01
Ischemic or unspecified stroke	0.99	0.97	1.01	0.98	0.98	1.00	1.00
Number of conditions (added in model V24.1)							
No conditions	0.83	0.90	0.89	0.92	0.86	0.96	0.81
1 condition	0.98	1.02	1.00	1.01	1.00	1.01	0.99
2 conditions	1.02	1.01	1.02	1.01	1.04	1.01	1.02
3 conditions	1.03	1.02	1.02	1.01	1.06	1.01	1.02
4 conditions	1.03	1.02	1.03	1.01	1.05	1.01	1.02
5 or more conditions	1.01	1.00	1.01	1.00	1.00	1.00	1.00
8 or more conditions	0.99	0.97	0.97	0.97	0.96	0.98	0.99
10 or more conditions	0.97	0.96	0.95	0.94	0.93	0.96	0.99
12 or more conditions	0.96	0.93	0.95	0.91	0.91	0.94	0.98
Percentile of base-year cost							
0 to 20 percentile	1.45	1.02	1.39	1.11	1.72	1.28	0.84
20 to 40 percentile	1.53	1.36	1.52	1.33	1.67	1.33	1.51
40 to 60 percentile	1.26	1.23	1.24	1.16	1.23	1.13	1.32
60 to 80 percentile	1.06	1.05	1.04	1.01	0.97	0.96	1.04
80 to 95 percentile	0.92	0.92	0.92	0.89	0.83	0.88	0.96
95 to 99 percentile	0.79	0.86	0.77	0.83	0.68	0.82	0.93
99 percentile and higher	0.63	0.76	0.58	0.69	0.50	0.67	0.83
Conditions added in 2019 for model V23							
Substance abuse, moderate to severe	1.00	0.98	1.01	0.97	1.03	0.99	0.99
Substance abuse, mild	0.95	0.94	1.06	0.86	1.03	1.00	0.85
Reactive and unspecified psychosis	0.97	0.98	0.99	1.00	1.00	0.99	0.99
Personality disorder	1.04	0.93	0.83	0.84	1.05	0.93	1.00
Chronic kidney disease, Stage 3	1.00	1.00	1.07	1.00	1.00	1.00	0.97
Number of beneficiary years (in thousands)							
	852	781	305	337	826	9,662	290

Note: CMS-HCC (CMS-hierarchical condition category), V (version), LTI (long-term institutionalized), AMI (acute myocardial infarction), CHF (congestive heart failure), COPD (chronic obstructive pulmonary disease). V22, V23, and V24.1 are versions of the CMS-HCC model that CMS used in 2017 and 2018; 2019; and 2020, respectively. We define "number of conditions" for each beneficiary as the number of HCCs for that beneficiary. "Base-year cost" is the cost to fee-for-service Medicare for each beneficiary in the base year of our analysis, 2016. "Conditions added in 2019" are the HCCs that CMS added to the CMS-HCC model in 2019. "Number of beneficiary years" is the sum across all beneficiaries in our analytic file of the fraction of the prediction year (2017) that each beneficiary was in both Part A and Part B of fee-for-service Medicare.

Source: MedPAC analysis of the version of the CMS-HCC model that CMS used to risk adjust MA payments in 2019. Data used in this analysis include all standard analytic claims files for the inpatient, outpatient, and physician sectors in 2016; standard analytic claims for all sectors in 2017; Medicare denominator files for 2016 and 2017; the custom Medicare enrollment file; and Medicare risk adjustment files for 2017.

Despite the improvement in performance for beneficiaries in the five HCCs added to V23, when we stratified beneficiaries by the number of conditions they had (a variable not in V23 but added to V24.1 by CMS), we found some degree of underprediction in all population segments for beneficiaries with no conditions (PR as low as 0.83 in the FULL_BENEFIT_DISABLED segment) and for beneficiaries with many conditions (PRs as low as 0.91 for the PARTIAL_BENEFIT_AGED and NONDUAL_DISABLED segments who have 12 or more conditions) (Table 4-2, p. 109).

We also caution that adding HCCs to the model can increase opportunities for MA plans to code more intensively to increase revenue, especially if the additional HCCs represent conditions that are diagnosed using relatively discretionary standards (meaning there is more than minimal provider discretion when assigning the code). The HCCs that CMS added for V23 can be considered discretionary. Previously, CMS addressed coding intensity by removing HCCs from the model that the agency suspected were being aggressively coded by plans, including HCCs for lower severity chronic kidney disease. Empirical analyses indicate that removal of these HCCs reduced the average risk scores of MA enrollees, suggesting that it helped offset the effects of coding intensity (Kronick and Welch 2014, Medicare Payment Advisory Commission 2019b). The decision by CMS to add Stage 3 chronic kidney disease to V23 reintroduces one of the HCCs that CMS had previously removed.

In summary, we found that V23 predicts costs well for each of the population segments of dually eligible beneficiaries and for groups of beneficiaries within those population segments who have conditions included in V23 (AMI, cancer, and so on), including the beneficiaries who have conditions in the five HCCs added to V23. However, V23 does not predict accurately when we group beneficiaries by variables that are not in V23: the number of conditions they have and their Medicare program spending in the base year. In addition, we are concerned that including the five HCCs may encourage plans to increase revenues through more intensive coding by coding more discretionary medical conditions.

Adding the number of medical conditions for each beneficiary improves cost prediction

For 2020, CMS made another change to the CMS–HCC model by adding the number of conditions for each beneficiary to model V23, which resulted in V24.1. CMS

determined the number of conditions for each beneficiary as the number of HCCs that the beneficiary has in V24.1. For example, if a beneficiary had medical diagnoses that map to HCC 19 (diabetes without complications), HCC 85 (congestive heart failure), and HCC 111 (chronic obstructive pulmonary disease), CMS would determine this beneficiary has three medical conditions. CMS continued to produce separate estimates for the six community-based population segments. CMS did not add number of conditions for the institutional population, so we excluded that population from this part of our analysis.

The method we used to estimate the coefficients for V24.1 for each of the six population segments was similar to the method used by CMS. Important features of that method include:

- The number of conditions for a beneficiary is the number of HCCs indicated in the CMS–HCC model, not the number of HCCs in the full HCC model.
- We used 0/1 dichotomous variables for each number of conditions. That is, for the “one condition” category, beneficiaries who had one condition received a “1” and all other beneficiaries received a “0.” For the “two conditions” category, beneficiaries who had two conditions received a “1” and all other beneficiaries received a “0,” and so on.
- When we included the indicators for the number of conditions in our regression analysis, the categories representing fewer than four to six conditions—depending on the population segment—had negative coefficients. CMS had a similar finding.
- To be consistent with CMS, we excluded from V24.1 the indicators for the number of conditions that had negative coefficients. This approach resulted in the smallest indicator for number of conditions being four conditions for NONDUAL_AGED, five conditions for FULL_BENEFIT_DISABLED, PARTIAL_BENEFIT_DISABLED, PARTIAL_BENEFIT_AGED, and NONDUAL_DISABLED; and six conditions for FULL_BENEFIT_AGED.

Adding the number of conditions to the CMS–HCC model improves how well the model predicts costs for beneficiaries with no conditions and for those with many conditions (10 or more). For example, for the NONDUAL_DISABLED population segment (no Medicaid benefits, disabled), the PRs increased from 0.86

under V23 (Table 4-2, p. 109) to 0.94 under V24.1 for beneficiaries with no conditions (Table 4-3, p. 112), and from 0.91 under V23 (Table 4-2) to 0.94 under V24.1 for beneficiaries with 12 or more conditions (Table 4-3). Moreover, when we stratify beneficiaries by their program spending in the base year, V24.1 produces slightly better PRs relative to V23 for beneficiaries with very high levels of base-year costs (top 1 percent). Despite this slight improvement, PRs for this beneficiary group are still far from 1.00 under model V24.1.

Using two years of diagnosis data helps address coding intensity issues but slightly worsens cost prediction for beneficiaries with high spending

To date, CMS has not implemented a version of the CMS–HCC model that uses two years of beneficiaries’ diagnosis data to determine their HCCs and risk scores rather than the single year of data that CMS has used for all CMS–HCC models, including those we evaluated in this report.

To evaluate the effects of using two years of diagnosis data, we applied two years of diagnosis data to model V24.1, calling it model V24.2. One caveat: We used the same beneficiary sample to evaluate V22, V23, and V24.1 (27.2 million FFS beneficiaries), but we used a subset of that sample to evaluate V24.2 (24.7 million FFS beneficiaries). The reason is that in a given year, the number of beneficiaries who have two years of diagnosis data is less than the number of beneficiaries who have one year of diagnosis data from the Medicare FFS claims we use in this analysis.

For most of the groups and population strata we evaluated, the PRs from V24.2 are similar to the PRs from V24.1. However, we found worse (lower) PRs under V24.2 relative to V24.1 for beneficiaries with high Medicare spending in the base year of 2016—above the 95th percentile (Table 4-4, p. 113).

The PRs for beneficiaries who had high base-year spending are worse when we use two years of diagnosis data because of a combination of two factors:

- The coefficients for most HCCs in the CMS–HCC model are lower when we use two years of data than when we use one year of data.
- Beneficiaries with high base-year spending often have a high number of HCCs.

For these beneficiaries, the lower coefficients on the HCCs under two years of data produce lower risk scores (which indicate lower predicted costs). For example, a beneficiary in our analytic file had 12 HCCs recorded under one year of data and 13 HCCs recorded under two years of data. These HCCs produced a risk score of 5.87 under one year of data and 5.10 under two years of data, a decrease of 0.77, even though this beneficiary had more HCCs under two years of diagnosis data. The coefficients on HCCs and, consequently, risk scores decline under two years of diagnosis data because using two years of data captures beneficiaries with less severe cases of a given condition. These less severe cases are less costly to treat, which results in lower coefficients on the related HCCs.

Despite the decrease in the PRs for beneficiaries who have high base-year Medicare spending when using two years of diagnosis data, we believe use of two years of diagnosis data would be beneficial for MA risk adjustment because it would decrease the extent of coding differences that persist between the MA and FFS sectors of the Medicare program. When we use only one year of diagnosis data, beneficiaries are likely to have more medical conditions recorded in their medical record if they are in MA than if they are in FFS Medicare. This discrepancy in coding between sectors does not mean that providers in the MA program or in the FFS program are improperly coding conditions. This discrepancy points to a difference in incentives between the two sectors. In the MA program, payments to plans are heavily dependent on the conditions that providers record for a beneficiary. Hence, MA plans have an incentive to encourage providers to code all the conditions that an enrollee has. In the FFS program, payment for services provided in physician offices or hospital outpatient departments largely depends on the services provided, while the conditions treated do not affect payment. At the same time, payment for services provided in the hospital inpatient setting depends on the patient’s conditions, but in 2017, only 18.5 percent of FFS beneficiaries had at least one inpatient stay (Medicare Payment Advisory Commission 2019a). Hence, in most of the encounters that FFS beneficiaries have with health care providers, there is little incentive for providers to record all of a beneficiary’s conditions.

The action of risk adjustment is to adjust the payment for each MA enrollee by the percentage that the enrollee would be expected to cost in FFS Medicare relative to the national average. That is, if an MA enrollee has demographic data and HCCs that indicate that the enrollee would cost 20 percent more in FFS Medicare than the

**TABLE
4-3**

Predictive ratios for CMS-HCC model V24.1, which adds the number of conditions

Beneficiary category	Full Medicaid		Partial Medicaid		No Medicaid	
	Disabled	Aged	Disabled	Aged	Disabled	Aged
R^2	0.124	0.118	0.081	0.106	0.081	0.123
Conditions in model V22						
AMI	1.03	0.99	0.99	1.01	0.98	1.00
Cancer	1.01	1.00	1.01	1.00	0.99	1.00
CHF	1.01	1.00	1.01	1.00	0.99	1.00
COPD	1.01	1.00	1.00	1.00	1.00	1.00
Diabetes	1.01	1.00	1.00	1.00	1.01	1.00
Mental illness	1.00	1.00	1.00	1.00	1.01	1.00
Schizophrenia	1.00	0.97	0.99	1.00	1.00	0.98
All stroke	0.99	0.99	1.02	0.99	0.97	0.99
Ischemic or unspecified stroke	0.99	0.97	1.02	0.99	0.98	0.99
Number of conditions (added in model V24.1)						
No conditions	0.92	0.92	0.94	0.96	0.94	0.98
1 condition	1.00	1.04	1.03	1.02	1.02	1.02
2 conditions	1.01	1.02	1.02	1.01	1.01	1.00
3 conditions	1.00	1.01	1.00	0.99	1.00	0.99
4 conditions	0.99	1.01	1.00	0.98	0.98	1.00
5 or more conditions	1.01	0.99	1.01	1.00	1.01	1.00
8 or more conditions	1.03	0.99	1.01	1.00	1.00	1.00
10 or more conditions	1.02	0.98	1.00	0.99	0.99	1.00
12 or more conditions	0.98	0.96	0.97	0.94	0.94	0.97
Percentile of base-year cost						
0 to 20 percentile	1.52	1.04	1.43	1.14	1.78	1.30
20 to 40 percentile	1.55	1.37	1.54	1.35	1.68	1.34
40 to 60 percentile	1.27	1.24	1.24	1.16	1.22	1.13
60 to 80 percentile	1.05	1.05	1.03	1.00	0.95	0.96
80 to 95 percentile	0.90	0.91	0.91	0.88	0.82	0.87
95 to 99 percentile	0.79	0.86	0.77	0.84	0.69	0.82
99 percentile and higher	0.65	0.77	0.59	0.70	0.51	0.68
Conditions added in 2019 for model V23						
Substance abuse, moderate to severe	1.00	0.98	1.01	0.99	1.01	0.99
Substance abuse, mild	0.95	0.94	1.06	0.88	1.01	1.00
Reactive and unspecified psychosis	0.97	0.98	0.99	1.01	0.99	0.99
Personality disorder	1.04	0.93	0.83	0.88	1.04	0.93
Chronic kidney disease, Stage 3	1.00	1.00	1.07	1.00	1.00	1.00
Number of beneficiary years (in thousands)						
	852	781	305	337	826	9,662

Note: CMS-HCC (CMS-hierarchical condition category), V (version), AMI (acute myocardial infarction), CHF (congestive heart failure), COPD (chronic obstructive pulmonary disease). V22, V23, and V24.1 are versions of the CMS-HCC model that CMS used in 2017 and 2018; 2019; and 2020, respectively. We define "number of conditions" for each beneficiary as the number of HCCs for that beneficiary. "Base-year cost" is the cost to fee-for-service Medicare for each beneficiary in the base year of our analysis, 2016. "Conditions added in 2019" are the HCCs that CMS added to the CMS-HCC model in 2019. "Number of beneficiary years" is the sum across all beneficiaries in our analytic file of the fraction of the prediction year (2017) that each beneficiary was in both Part A and Part B of fee-for-service Medicare.

Source: MedPAC analysis of version of the CMS-HCC model that CMS used to risk adjust MA payments in 2020. Data used in this analysis include all standard analytic claims files for the inpatient, outpatient, and physician sectors in 2016; standard analytic claims for all sectors in 2017; Medicare denominator files for 2016 and 2017; the custom Medicare enrollment file; and Medicare risk adjustment files for 2017.

**TABLE
4-4**

Predictive ratios for CMS-HCC model V24.2, a model created by the Commission for this analysis, which is based on two years of diagnosis data

Beneficiary category	Full Medicaid		Partial Medicaid		No Medicaid		LTI
	Disabled	Aged	Disabled	Aged	Disabled	Aged	
R^2	0.121	0.114	0.076	0.102	0.103	0.119	0.090
Conditions in model V22							
AMI	1.04	1.00	1.01	1.00	1.00	1.00	1.02
Cancer	1.00	1.00	1.01	1.00	1.00	1.00	1.01
CHF	1.01	1.00	1.00	1.00	1.00	1.00	1.01
COPD	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Diabetes	1.01	1.00	0.99	1.01	1.00	1.00	1.00
Mental illness	1.00	1.00	1.00	1.00	1.00	1.00	1.04
Schizophrenia	1.00	0.98	0.99	1.00	1.02	0.99	1.01
Stroke	0.99	0.99	1.01	0.99	1.01	0.99	1.01
Ischemic or unspecified stroke	0.99	0.98	1.00	0.98	0.99	0.99	1.00
Number of conditions (added in model V24.1)							
No conditions	0.87	0.87	0.90	0.92	0.89	0.97	0.81
1 condition	0.96	1.02	1.00	1.03	1.01	1.01	0.99
2 conditions	1.00	1.02	1.01	1.02	1.01	1.01	1.02
3 conditions	1.02	1.01	1.00	1.00	1.03	1.00	1.02
4 conditions	1.01	1.01	1.01	0.99	1.02	1.00	1.02
5 or more conditions	1.01	1.00	1.00	1.00	1.00	1.00	1.00
8 or more conditions	1.01	0.99	1.00	1.00	1.00	1.00	0.99
10 or more conditions	1.04	0.98	1.00	1.00	1.02	0.98	0.99
12 or more conditions	0.99	0.94	0.97	0.94	0.96	0.94	0.97
Percentile of base-year cost							
0 to 20 percentile	1.53	1.04	1.45	1.15	1.82	1.31	0.86
20 to 40 percentile	1.56	1.38	1.54	1.36	1.72	1.35	1.53
40 to 60 percentile	1.29	1.26	1.27	1.21	1.26	1.15	1.36
60 to 80 percentile	1.08	1.09	1.06	1.03	0.99	0.94	1.09
80 to 95 percentile	0.91	0.92	0.90	0.88	0.83	0.86	0.96
95 to 99 percentile	0.75	0.81	0.71	0.78	0.66	0.77	0.89
99 percentile and higher	0.58	0.60	0.53	0.64	0.45	0.61	0.76
Conditions added in 2019 for model V23							
Substance abuse, moderate to severe	1.01	0.97	1.04	0.97	1.02	0.97	1.00
Substance abuse, mild	1.00	0.98	1.00	0.93	1.00	1.01	0.96
Reactive and unspecified psychosis	1.00	0.98	0.99	1.02	1.01	1.02	1.05
Personality disorder	0.98	0.89	0.88	0.91	1.07	0.94	1.03
Chronic kidney disease, Stage 3	1.02	0.99	1.09	1.00	1.02	0.98	1.01
Number of beneficiary years (in thousands)							
	760	692	272	310	724	8,811	272

Note: CMS-HCC (CMS-hierarchical condition category), V (version), LTI (long-term institutionalized), AMI (acute myocardial infarction), CHF (congestive heart failure), COPD (chronic obstructive pulmonary disease). V22, V23, and V24.1 are versions of the CMS-HCC model that CMS used in 2017 and 2018; 2019; and 2020, respectively, and V24.2 is a version of the CMS-HCC model that we created for this report. We define "number of conditions" for each beneficiary as the number of HCCs for that beneficiary. "Base-year cost" is the cost to fee-for-service Medicare for each beneficiary in the base year of our analysis, 2016. "Conditions added in 2019" are the HCCs that CMS added to the CMS-HCC model in 2019. "Number of beneficiary years" is the sum across all beneficiaries in our analytic file of the fraction of the prediction year (2017) that each beneficiary was in both Part A and Part B of fee-for-service Medicare.

Source: MedPAC analysis of versions of the CMS-HCC model that uses two years of diagnosis data to determine beneficiaries' conditions. Data used in this analysis include all standard analytic claims files for the inpatient, outpatient, and physician sectors in 2015 and 2016; standard analytic claims for all sectors in 2017; Medicare denominator files for 2016 and 2017; the custom Medicare enrollment file; and Medicare risk adjustment files for 2017.

national average, then the MA payment for that enrollee is adjusted upward by 20 percent. However, MA plans typically provide more complete coding of their enrollees' conditions than would be recorded on FFS claims. This more complete coding results in MA enrollees having higher risk scores than they would have if they were enrolled in FFS Medicare, which results in overpayments to MA plans.

The difference in “coding intensity” between the MA and FFS programs has been persistent. For example, the Commission found that 35 percent of FFS beneficiaries who had kidney failure recorded on a claim in 2007 did not have kidney failure recorded on a claim in 2008. In contrast, only 29 percent of MA enrollees who had kidney failure recorded in 2007 did not have kidney failure recorded in 2008 (Medicare Payment Advisory Commission 2012). However, if CMS uses two years of diagnosis data from FFS Medicare to estimate the CMS–HCC model, CMS will capture more conditions among the FFS population, and the profile of conditions among the FFS population will more closely match the profile of conditions that would have been recorded for those beneficiaries had they been in the MA program. The Commission has done analysis that indicates that use of two years of diagnosis data would reduce MA risk scores relative to FFS Medicare by 1 percent to 2 percent (Medicare Payment Advisory Commission 2016). The result would be reduced payment errors that occur because of coding differences between the MA and FFS programs.

Use of two years of data would also result in the CMS–HCC model producing more accurate estimates of the cost of having a given condition because two years of diagnosis data would identify more beneficiaries who have that condition. Use of one year of data typically identifies the more severe, higher cost cases for a given condition and misses the less severe, lower cost cases. Use of two years of data identifies more of these lower cost cases, which would produce more accurate representations of the cost of each condition in the CMS–HCC model.

Summary

In this chapter, we have reported how each of the changes to the CMS–HCC model required by the 21st Century Cures Act has affected the predictive accuracy

of the model. Our results indicate that each of the changes improves the predictive accuracy for each of the beneficiary populations that are the focus of the changes:

- Creating separate versions of the model for partial Medicaid beneficiaries and full Medicaid beneficiaries produces accurate predictions of the cost of these beneficiaries.
- Adding indicators for mental health disorders, substance abuse disorders, and chronic kidney disease improves how well the CMS–HCC model predicts the cost of beneficiaries who have these conditions, although adding such indicators may provide additional opportunities for MA plans to increase revenue by coding more intensively.
- Adding measures of the number of conditions for each beneficiary improves how well the CMS–HCC model predicts the cost of beneficiaries who have 10 or more conditions.

We note that all versions of the CMS–HCC model that we evaluated overpredict the costs of beneficiaries with low Medicare costs in the base year and underpredict the costs of beneficiaries with very high Medicare costs in the base year. These prediction errors at the extremes of the distribution of base-year costs could be an issue for future consideration.

We found that using two years of diagnosis data to determine beneficiaries' conditions produces payment adjustments that are about as accurate as using one year of diagnosis data, though it produces larger underpayments for those with high levels of Medicare spending than using one year of diagnosis data. Nevertheless, in our view, the use of two years of diagnosis data would be beneficial for MA risk adjustment because it would decrease the extent of coding differences that persists between the MA and FFS sectors of the Medicare program. The result would reduce payment errors that occur because of coding differences between MA and FFS.

The Commission commends the progress that CMS has made in implementing the changes to the CMS–HCC model mandated by the 21st Century Cures Act. We encourage CMS to continue its work on this issue to complete the requirements by the mandated date of January 1, 2022. ■

Endnotes

- 1 A delay in payment adjustment under a concurrent model could occur for any condition diagnosed, depending on how the entity that operates the risk adjustment model chooses to implement the model. For example, risk adjustment under the Affordable Care Act of 2010 (ACA) uses a concurrent system and does not adjust payments for conditions diagnosed in a given year until the following year. For example, the ACA risk adjustment model would not use conditions diagnosed in 2019 to adjust payments until 2020.
- 2 The R^2 statistics are similar across these seven segments, ranging from 0.080 for PARTIAL_BENEFIT_DISABLED to 0.123 for FULL_BENEFIT_DISABLED. The R^2 did not change much as we evaluated the other versions in this study.
- 3 CMS has determined that the full HCC model has 122 HCCs that represent chronic conditions (Centers for Medicare & Medicaid Services 2018, Centers for Medicare & Medicaid Services 2017). At the same time, V22 of the CMS-HCC model has 79 HCCs, so V22 does not adjust payments for chronic conditions that are in 43 HCCs.

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