December 27, 2017

NOTE TO: Medicare Advantage Organizations, Prescription Drug Plan Sponsors, and Other Interested Parties

SUBJECT: Advance Notice of Methodological Changes for Calendar Year (CY) 2019 for the Medicare Advantage (MA) CMS-HCC Risk Adjustment Model

Medicare Advantage has been successful in providing Medicare beneficiaries with options so that they can choose the healthcare that best fits their individual health needs. The Medicare Advantage program demonstrates the value of private sector innovation and creativity and CMS is committed to continuing to strengthen Medicare Advantage by promoting greater innovation, transparency, flexibility, and program simplification.

A key element in the success of Medicare Advantage is ensuring that payments to plans reflect the relative risk of the people who enroll. A critical tool that CMS uses to accomplish that goal is the use of risk adjustment models which adjust payments based on the characteristics and health conditions of each plan's enrollees.

For 2019, we are proposing important changes to the Part C risk adjustment model based on our authority under section 1853(a)(1)(C) of the Social Security Act, along with those changes based on the new subparagraph (I). These proposals reflect changes to this model that are required by the 21st Century Cures Act, including evaluating the addition of mental health, substance use disorder, and chronic kidney disease conditions in the risk adjustment model and making adjustments to take into account the number of conditions an individual beneficiary may have. The proposed changes also reflect a variety of technical updates.

Therefore, we are notifying you of proposed changes in the Medicare Advantage risk adjustment methodology applied under Part C in accordance with sections 1853(a)(1)(I)(iii) and 1853(b)(2) of the Social Security Act, as amended by section 17006 of the 21st Century Cures Act, for CY 2019. As amended by the 21st Century Cures Act, section 1853(a)(1)(I)(iii) requires that CMS provide at least 60 days for public review and comment of proposed changes to the Part C risk adjustment model that are based on new section 1853(a)(1)(I). The proposed changes also include those based on our authority under section 1853(a)(1)(C), which requires 30 days to comment on risk adjustment changes.

We are proposing the full set of risk adjustment model changes in this 60-day Advance Notice in order to provide greater transparency in our proposed changes to the Part C risk adjustment model for 2019 as we implement the risk adjustment requirements added by the 21st Century Cures Act, as well as to provide a meaningful opportunity for stakeholders to review and fully evaluate the substantive proposals in their entirety.

Pursuant to section 1853(b)(2) of the Social Security Act, we will provide notification of planned changes in the MA capitation rate methodology and other risk adjustment methodologies applied under the Act for CY 2019, along with any other proposed changes in the payment methodologies for Part D and annual adjustments to the Medicare Part D benefit parameters for the defined standard benefit, in the Advance Notice of Methodological Changes for CY 2019 for Medicare Advantage Capitation Rates, Part C and Part D Payment Policies to be released on or before January 31, 2018.

For 2019, CMS will announce the MA capitation rates and final payment policies, including the final CMS Hierarchical Condition Category (HCC) risk adjustment model, no later than Monday, April 2, 2018, in accordance with the timetables established in section 1853(b)(2) as amended by the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (MMA) (Pub. L. 108-173) and the Securing Fairness in Regulatory Timing Act of 2015 (SFRTA) (Pub. L. 114-106); the statute requires CMS to publish the Advance Notice of Methodological Changes no fewer than 60 days before the publication of the Rate Announcement, and establishes a minimum 30-day period for the public to comment on the proposals in the Advance Notice.

To submit comments or questions electronically, go to www.regulations.gov, enter the docket number "CMS-2017-0163" in the "Search" field, and follow the instructions for "submitting a comment."

Comments will be made public, so submitters should not include any confidential or personal information. In order to receive consideration prior to the April 2, 2018 release of the final Announcement of Calendar Year 2019 Medicare Advantage Capitation Rates and Medicare Advantage and Part D Payment Policies, comments must be received by 6:00 PM Eastern Standard Time on Friday, March 2, 2018.

/ s /
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Background on Part C model

The CMS-HCC Part C risk adjustment model is used to calculate risk scores that adjust capitated payments made for aged and disabled beneficiaries enrolled in Medicare Advantage (MA) plans and certain demonstrations. A risk score represents a beneficiary's expected medical cost relative to the average expected medical cost of beneficiaries entitled to Part A and enrolled in Part B, excluding those beneficiaries who are in End Stage Renal Disease (ESRD) or hospice status. For beneficiaries who are enrolled in a Medicare Advantage plan, and who are not in ESRD status, risk scores are calculated with distinct sets of coefficients depending on which segment, or group of beneficiaries, a beneficiary is assigned to. There are eight segments in total:

- New enrollees (those with less than 12 months of Part B enrollment in the data collection year)
- Continuing enrollees (those with 12 months of Part B enrollment in the data collection year) who are residing in the community in the payment month, with six different segments depending on whether they are entitled to Medicare due to age or disability (based on age as of February 1 of the payment year) and depending on whether they are full-benefit dual, partial-benefit dual, or non-dual (based on the payment month)
- Continuing enrollees who are in a long-term institutional stay (based on the payment month).

Coefficients are estimated for each segment separately to reflect the unique cost and utilization patterns of beneficiaries within the segment.

The CMS-HCC risk adjustment model is prospective in that it uses health status in a base year (i.e., data collection year) to predict a beneficiary's annual expected cost in the following year (payment year). Coefficients for continuing enrollees are estimated using cost from Original Medicare beneficiaries entitled to Part A and enrolled in Part B by regressing the total expenditures for Part A and B benefits for each beneficiary onto their demographic factors, condition categories (as indicated by their diagnoses), and interaction terms (combinations of conditions and/or demographic factors). Resulting dollar coefficients represent the marginal (additional) cost of the condition categories, demographic factors (for example, age/sex group), and interaction terms. We divide each dollar coefficient by the average annual expected cost of beneficiaries entitled to Part A and enrolled in Part B in a specific year (the "denominator year") to create relative factors. The relative factors are the marginal expected cost of a condition or model variable relative to the average expected cost in Fee-For-Service (FFS). The sum of relative factors assigned to a beneficiary is the risk score and the average FFS risk score is set at 1.0 in the denominator year. In payment year 2019, the denominator used to create relative factors for all segments of the CMS-HCC model is $9,367.34 and is calculated using a 2015 cohort of FFS beneficiaries (2014 diagnoses).

The community and institutional segments have the same age/sex variables and Hierarchical Condition Categories (HCCs), with some differing interaction terms. CMS, in consultation with a panel of outside clinicians, creates HCCs by grouping ICD-9 diagnosis codes into condition categories, such that each condition category comprises diagnoses with similar clinical characteristics and cost implications. All ICD-9 diagnosis codes are grouped into at least one condition category. However, not all condition categories are included in the risk adjustment model for payment. In a final step, hierarchies are imposed on some sets of condition categories to ensure that more severe and costly forms of a condition have a coefficient of at least the same or higher value than conditions that are less severe. Hierarchies also ensure that when a beneficiary develops a more severe manifestation of a condition in a hierarchy within the data collection period, credit is not given for both conditions in the hierarchy.[1]

21st Century Cures Act

Section 1853(a)(1)(I)(i)(I) of the Social Security Act (42 U.S.C. 1395w–23(a)(1)(I)(i)(I)), as added by section 17006(f) of the 21st Century Cures Act (Pub. L. 114-255), requires us to make improvements to Risk Adjustment for 2019 and subsequent years. The agency is, among other things,[2] specifically directed to:

- Evaluate the impact of including in the risk adjustment model:

  (1) Additional diagnosis codes related to mental health and substance use disorders, and
  (2) Including the severity of chronic kidney disease.

- Take into account the total number of diseases or conditions of an individual enrolled in an MA plan by making an additional adjustment as the number of diseases or conditions of an individual increases.
- Phase-in any changes to risk adjustment payment over a 3-year period, "beginning with 2019, with such changes being fully implemented for 2022 and subsequent years."

In response to these requirements, we are proposing the following changes to the CMS-HCC Risk Adjustment model that is used to pay for aged and disabled beneficiaries enrolled in MA plans, including Medicare-Medicaid Plans (MMPs):

1. Add the following condition categories (HCCs) to the model:
   - Drug Abuse, Uncomplicated, Except Cannabis (HCC 56),

[1] While CMS maps ICD-10 codes to HCCs in order to calculate risk scores, the current HCCs were created using ICD-9 codes, meaning that the research conducted to determine which diagnoses should be grouped in each condition category was conducted using ICD-9 codes. Further, the models discussed in this Notice were calibrated using 2014 diagnoses (ICD-9 diagnoses) to predict 2015 costs.

[2] In connection with MA payment policies, the 21st Century Cures Act also requires that the Secretary evaluate whether other factors should be taken into account in determining the capitation and risk adjustment payments for ESRD enrollees pursuant to section 1853(a)(1)(H).

- Reactive and Unspecified Psychosis (HCC 58 -- the current HCC 58 will be renumbered as HCC 59),
- Personality Disorders (HCC 60),
- Chronic Kidney Disease, Moderate (Stage 3) (HCC 138)

2. Add selected drug and alcohol "poisoning" (overdose) codes to existing "Drug/Alcohol Dependence," to create "Drug/Alcohol Dependence, or Abuse/Use with Complications" (HCC 55).
3. Add new factors to the six community and single long term institutional (LTI) segments that take into account a beneficiary's number of conditions that are in the payment model.

In conjunction with the implementation of the CMS-HCC Risk Adjustment model revisions required by the 21st Century Cures Act, CMS proposes to make the following changes under section 1853(a)(1)(C) of the Social Security Act:

1. Update the data years used to calibrate the model. The model implemented for payment year 2017 and maintained in payment year 2018 was calibrated with 2013 diagnoses predicting 2014 Fee-For-Service (FFS) costs. The model proposed in this notice is calibrated with 2014 diagnoses predicting 2015 FFS costs. The more recent data years ensure current diagnosis and cost patterns are better reflected in the updated model. While 2015 diagnosis and 2016 FFS cost data were available, we elected not to update the data years to 2015/2016, because we did not expect the diagnosis coding pattern in 2015, which was the first year ICD-10 diagnoses were implemented, to be sufficiently stable for use in model calibration.
2. Select 2014 diagnoses for calibration using the same approach we use to filter encounter data records. Specifically, in the models discussed in this Notice, we selected 2014 diagnoses that met CMS filtering criteria: diagnoses submitted on professional claims had to have a risk adjustment allowable CPT/HCPCS code;[3] diagnoses submitted on outpatient claims had to have a risk adjustment allowable CPT/HCPCS code and type of bill; and diagnoses submitted on inpatient claims had to have a risk adjustment eligible type of bill. The following institutional types of bill were considered eligible:
    - For inpatient records 11x or 41x
    - For outpatient records 12x, 13x, 43x, 71x, 73x, 76x, 77x, or 85x

In addition to evaluating additional diagnosis codes related to mental health, substance use disorder, and Chronic Kidney Disease, and making an additional adjustment as a beneficiary's number of diseases or conditions increased, the 21st Century Cures Act also requires that, with respect to individuals dually eligible for Medicare and Medicaid, we make separate adjustments for each full-benefit dual eligible individual. We believe that splitting the community segment of

[3] For the list of allowable CPT/HCPCS codes in 2014, see https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Risk-Adjustors-Items/CPT-HCPCS.html?DLPage=1&DLEntries=10&DLSort=0&DLSortDir=descending.

the CMS-HCC model into six segments based on duals status, which was first done in payment year 2017, fulfills the directive established in the 21st Century Cures Act. We therefore, interpret this provision to allow us to continue to incorporate the changes that we made to the model starting in payment year 2017 that make explicit separate adjustments for full-benefit dual eligible individuals in the community. In continuing to use these changes, we have included in the proposed "Payment Condition Count" model additional HCCs in each segment, and have separately estimated additional adjustments as a beneficiary's number of diseases or conditions increases for each segment of the model, including those who are full-benefit dual eligible. Thus, we are not proposing changes to the treatment of Medicaid status in the model for payment year 2019.

Clinical Evaluations

To meet the requirements of the 21st Century Cures Act, we evaluated substance use disorder and mental health-related condition categories, and the four chronic kidney disease condition categories. We also reviewed subsets of diagnosis codes in other condition categories with clinical concepts (e.g., poisoning codes that indicated drug or alcohol overdose) that overlapped with the condition categories we evaluated.

Three criteria for assessing when and whether certain condition categories should be added to the model were adapted from the ten criteria that guided development of the original CMS-HCC risk adjustment model. We especially focused on criteria that guided the creation and ongoing assessment of the HCC classification system.[4] Substance use disorder, mental health, and chronic kidney disease condition categories were evaluated against three criteria to determine if they should be in the model for payment:

1. ***The condition category should be clinically meaningful***. The group of diagnoses mapped to a condition category should relate to a reasonably well-specified disease or medical condition that defines the overall category. Condition categories should also include diagnoses that have similar levels of severity and expected costs over time.
2. ***The condition category should predict medical expenditures***. The condition category should produce a reasonable and statistically significant estimate of medical expenditures for Medicare Part A and B benefits. This assessment would include the number of people with the condition category, the level of predicted cost and whether it would have much effect on risk scores. In addition, we reviewed the accuracy of the prediction for people with the condition category; adding a condition category to the model should improve the accuracy of prediction for beneficiaries with that condition. However, a condition

[4] Pope, G.C., Kautter, J., Ellis, R.P., et al.: Risk Adjustment for Medicare Capitation Payments Using the CMS-HCC Model. Health Care Financing Review 25(4):121-122, Summer, 2004. See also, "Evaluation of the CMS-HCC Risk Adjustment Model," March 2011, available at https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Downloads/Evaluation_Risk_Adj_Model_2011.pdf.

category may not need to be added to the model if the condition categories in the model already predict well for beneficiaries with that condition.

3. ***The condition category should not comprise discretionary diagnoses***. The condition category should include diagnoses where there is minimal clinical discretion and that are indicative of meaningful disease burden. The diagnoses included for payment typically are chronic conditions that can be diagnosed definitively.

For the conditions we were directed to review, we also evaluated whether subsets of diagnoses in existing condition categories that are not in the 2017 CMS-HCC model could be regrouped with another condition category that was already in the model, or become a new HCC that met our model inclusion criteria. By splitting HCCs that are currently not clinically meaningful, or that include discretionary diagnoses, we produced new HCCs that were more clinically specific and better predicted medical expenditures, and thus would be more likely to meet our model inclusion criteria. Each HCC was evaluated initially using a single combined community segment to assess inclusion, and then across the six community segments that are included in the 2017 risk adjustment model to assess impacts. The community population is the largest segment of the FFS population comprising our model sample. We determined that assessing the predictive accuracy of these HCCs for this population was the most direct way to assess the impact on the Medicare Advantage program.

Mental Health

We determined which HCCs to classify as mental health by identifying all psychiatric diagnosis codes from ICD-9-CM/ICD-10-CM Chapter 5: Mental, Behavioral and Neurodevelopment Disorders, and also some related codes from the Suicide and Self-Inflicted Injury group of ICD-9 codes (E950-E959). After determining which diagnoses were classified as mental health, we identified the HCCs these diagnoses mapped to. Seven HCCs were classified as Mental Health in the existing CMS-HCC model diagnosis-to-HCC mappings.

Two HCCs classified as mental health are included in the 2017 CMS-HCC model:

1. HCC 57 Schizophrenia
2. HCC 58 Major Depressive, Bipolar, and Paranoid Disorders

Five HCCs classified as mental health are not included in the 2017 CMS-HCC model:

1. HCC 59 Reactive and Unspecified Psychosis
2. HCC 60 Personality Disorders
3. HCC 61 Depression
4. HCC 62 Anxiety Disorders
5. HCC 63 Other Psychiatric Disorders

For payment year 2019, we propose to add HCC 59 Reactive and Unspecified Psychosis and HCC 60 Personality Disorders to the CMS-HCC model. HCC 59, Reactive and Unspecified

Psychosis is a mix of acute and chronic conditions that cover a range of psychotic episodes with varying duration. In many cases, the diagnoses associated with HCC 59 are related to, but do not meet, the full criteria for schizophrenia or other specific psychotic disorders. On average, costs for HCC 59 are under predicted by the 2017 CMS-HCC model updated with 2014 diagnoses predicting 2015 FFS cost in the community population. The predictive ratio is 0.833 across the six community segments. Since HCC 59 predicts higher cost than HCC 58 and is clinically similar to HCC 57, the hierarchy would be re-ordered (and renumbered) so that "Reactive and Unspecified Psychosis" is above "Major Depressive, Bipolar, and Paranoid Disorders." The order of condition categories in a hierarchy indicates the severity of a condition category relative to other condition categories in the hierarchy. More severe conditions are placed higher in the hierarchy. This ensures the most severe manifestation of a disease process is predicting cost in the model. Once re-ordered, a beneficiary coded with both the new HCC 58 Reactive and Unspecified Psychosis and the renumbered HCC 59 Major Depressive Disorder, will only receive credit for HCC 58 in their risk score.

HCC 60 includes a variety of personality disorders that are clinically-related and well defined. When included in the model, the HCC predicts reasonable costs and the coefficient is statistically significant. Additionally, on average, costs for HCC 60 are underpredicted by the updated 2017 CMS-HCC model in the community population with a predictive ratio of 0.835 across the six community segments.

We are not proposing to include HCC 61, HCC 62, or HCC 63. HCC 61 includes a mix of long-term and short-term diagnoses, including a number of less severe conditions. When the current HCCs were developed, the ICD-9 code set distinguished major depressive disorder (HCC 58) from less severe depression (HCC 61). ICD-10 dropped this distinction among depression diagnoses, and HCC 61 now includes a mix of diagnoses with varying degrees of severity. In the updated 2017 CMS-HCC model, the predictive ratio for HCC 61 in the community population is 0.879 across the six community segments of the updated 2017 CMS-HCC model. When included in the model, HCC 61 predicts reasonable medical expenditures. However, given the range of treatments available for the diverse diagnoses that map to HCC 61, the coefficient for HCC 61 reflects an average cost with significant variation. In the future, when we prepare to calibrate a model with ICD-10 diagnoses, we will consider creating new HCCs using the ICD-10 diagnoses and we anticipate that the mental health HCCs will be reconfigured, allowing us to include the more severe conditions that currently map to HCC 61. Further, the predictive ratio for HCC 61 improves in the proposed "Payment Condition Count Model" to 0.887 across the six community segments, and in the discussed "All Condition Count Model" improves to 0.930 across the six community segments. HCC 62 and HCC 63 are not proposed because they have relatively low expected costs, and beneficiaries with these conditions are currently predicted accurately in the updated 2017 CMS-HCC model, with predictive ratios of 0.957 and 0.941 respectively across the six community segments of the updated 2017 CMS-HCC model. The predictive ratios for HCC 62 and HCC 63 as calculated with the proposed "Payment Condition Count Model" are similar

to those calculated with the updated 2017 CMS-HCC model, with predictive ratios of 0.951 and 0.935 respectively. The predictive ratios for HCC 62 and HCC 63 in the discussed "All Condition Count Model" improve to 1.018 and 0.994 respectively across the six community segments. As proposed, all seven Mental Health HCCs would be in the same hierarchy, with a beneficiary being assigned only the highest HCC in the hierarchy for which they have a reported diagnosis code. HCC 60 would be the lowest HCC in the hierarchy considered for payment, and HCC 61 through HCC 63 would only be considered for payment when counting conditions in the "All Condition Count Model," as discussed in more detail on pages 12 through 20.

Substance Use Disorders

There are three substance use disorder HCCs in the set of HCCs used to calibrate the 2017 CMS-HCC risk adjustment model. All ICD-9 diagnoses classified as substance abuse or dependence in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) are mapped to one of these HCCs.

Two substance use disorder HCCs are included in the 2017 CMS-HCC model:

1. HCC 54 Drug/Alcohol Psychosis
2. HCC 55 Drug/Alcohol Dependence

One substance use disorder HCC is not included in the 2017 CMS-HCC model:

1. HCC 56 Drug/Alcohol Abuse, Without Dependence

The substance use disorder HCCs form a hierarchy with psychosis at the top, dependence below psychosis, and nondependent abuse at the bottom. ICD-9 has separate diagnosis codes for substance abuse and substance-induced mental disorders. All substance-induced mental disorder ICD-9 diagnosis codes map to the higher payment HCC 54, Drug/Alcohol Psychosis. Dependence-level substance abuse ICD-9 diagnosis codes map to HCC 55 Drug/Alcohol Dependence. Non-dependent drug abuse ICD-9 diagnosis codes are currently not in the 2017 CMS-HCC model and map to HCC 56, Drug/Alcohol Abuse, Without Dependence.

For payment year 2019, CMS proposes to make two changes that will result in additional substance use disorder diagnoses being added to the model for payment. These changes better reflect the current ICD-10 diagnosis code classification, which bundles both the drug and level of dependence (dependence or abuse or use, unspecified) with the accompanying substance-induced disorder, if there is one.

1. We propose to add diagnoses to HCC 55 to better account for the costs related to accidental (unintentional) or undetermined overdose. Selected poisoning (overdose) codes for the following substances will be incorporated into HCC 55. HCC 55 will be renamed "Drug/Alcohol Dependence, or Abuse/Use with Complications" to reflect the

inclusion of additional diagnoses, as well as the concepts introduced with the current ICD-10 code classification:

- Heroin
- Cocaine
- Opium and other opioids
- Methadone and other synthetic or unspecified narcotics
- Lysergide (LSD) and other or unspecified hallucinogens
- Psychostimulants
- Alcohol (ethanol)

2. We also propose to split HCC 56 into three HCCs, and include in the proposed model one of these HCCs: a new HCC 56 "Drug Abuse, Uncomplicated, Except Cannabis." The other two additional HCCs, HCC 202 "Drug Use, Uncomplicated, Except Cannabis" and HCC 203 "Alcohol Abuse and Cannabis Use/Abuse, Uncomplicated, Non-Psychoactive Substance Abuse, and Nicotine Dependence," would be excluded from the model for payment, but would be considered in the count of all conditions in the alternative model.

Including this new HCC 56 in the model and adding diagnoses to HCC 55 will allow the model to distinguish between psychoses due to substance abuse, complicated versus uncomplicated abuse, and specific substances abused. These proposed revisions would more comprehensively capture clinically significant substance use disorder diagnoses in the CMS-HCC model, including those related to opioids.

Chronic Kidney Disease

Chronic Kidney is identified by five stages of severity. Stage 1 indicates the lowest level of severity and Stage 5 indicates the highest level of severity.

Two stages of Chronic Kidney Disease are included in the 2017 CMS-HCC model:

- HCC 136 Chronic Kidney Disease, Stage 5
- HCC 137 Chronic Kidney Disease, Severe (Stage 4)

Three stages of Chronic Kidney Disease are not included in the 2017 CMS-HCC model:

- HCC 138 Chronic Kidney Disease, Moderate (Stage 3)
- HCC 139 Chronic Kidney Disease, Mild or Unspecified (Stages 1-2 or Unspecified)

The stage of Chronic Kidney Disease is diagnosed based on the glomerular filtration rate (GFR). In addition to GFR, there are albuminuria categories that indicate level of risk. Stage 3 is unique in that there are two levels, Stage 3a and 3b. Stage 3a is generally considered mild to moderate in terms of severity and is diagnosed based on a GFR of 45-59. Stage 3b is considered moderate to

severe and is diagnosed based on a GFR of 30-44. Both Stage 3a and Stage 3b include categories of albuminuria that indicate low to high risk individuals. However, there is a single diagnosis code for Stage 3 (N183 *Chronic kidney disease, stage 3 (moderate)* in ICD-10; 5853 *Chronic kidney disease stage III* in ICD-9).[5] According to the United States Renal Data System 2016 Annual Report on Chronic Kidney Disease, about half of Stage 3 patients saw a nephrologist in 2014.[6] We note that HCC 138 is already predicted well by the updated 2017 CMS-HCC model, with a predictive ratio of 0.938. Since Chronic Kidney Disease Stage 3 is well specified, and for many beneficiaries will indicate significant medical expenditures, CMS proposes to include HCC 138 for payment in the CMS-HCC model. Including HCC 138 in the model ensures that beneficiaries with HCC 138 remain well predicted, however as observed, including HCC 138 does not substantially increase predicted cost.

Note that, when a condition count variable is added to the model in such a way that the count variables are positive, the coefficients for all HCCs decrease, and in the discussed "All Condition Count" model, the coefficient for HCC 138 becomes negative and is constrained to zero across all segments. While HCC 138 does not predict additional marginal cost in the "All Condition Count" model, because predicted cost for a beneficiary is the sum of all model factors, the discussed "All Condition Count Model" accurately predicts the total annual cost for beneficiaries with HCC 138. Across all community segments, the predictive ratio for beneficiaries with HCC 138 is 1.016. In the proposed "Payment Condition Count Model" the predictive ratio is 1.001.

HCC 139, which includes Chronic Kidney Disease Stage 1, 2, and unspecified, does not meet our criteria of clinical meaningfulness, since there are a wide range of diagnoses mapped to the HCC that vary in severity. Further, the predictive ratio for HCC 139 across the six community segments of the updated 2017 CMS-HCC model is 0.915. While HCC 139 is predicted sufficiently well across the six community segments of the updated 2017 CMS-HCC model, it is not as well predicted as HCC 138. The additional underprediction of HCC 139 is the result of unspecified chronic kidney disease, which is likely a more severe manifestation of chronic kidney disease that has not been coded to specificity. We do not propose including HCC 139 for payment in the CMS-HCC model for two reasons: (1) our intention is to encourage specific coding, and (2) the HCC includes such a wide range of severity levels that the actual cost of many conditions that fall into this HCC would not be predicted well by the average expected cost of conditions mapped to this HCC. In the proposed "Payment Condition Count" model, the predictive ratio of for HCC 139 remains similar to the updated 2017 CMS-HCC model with a

[5] KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Official Journal of the International Society of Nephrology. 3(1): 2013. Available at http://www.kdigo.org/clinical_practice_guidelines/pdf/CKD/KDIGO_2012_CKD_GL.pdf.

[6] 2016 USRDS Annual Data Report: Epidemiology of Kidney Disease in the United States. Volume 1: CKD in the United States. Available at https://www.usrds.org/2016/download/v1_CKD_16.pdf.

predictive ratio of 0.912 and, in the discussed "All Condition Count" model, the predictive ratio for HCC 139 improves to 0.956.

Taking Into Account the Number of Conditions of an Individual

We interpreted the statutory requirement to "take into account the total number of diseases or conditions of an individual" to mean that, in addition to the increase in the risk score that occurs today for each additional condition in the payment model that a beneficiary has, the CMS-HCC risk adjustment model should also account for the number or *count* of conditions a beneficiary has. Since the model is already additive, and already effectively providing an adjustment as the number of conditions increases, this requirement means that payment conditions are taken into account in two different ways in CMS-HCC models that have count variables: once with a coefficient for the specific condition included in the model, and a second time with a coefficient for a variable that counts the number of conditions a beneficiary has. When a count of conditions is introduced into the CMS-HCC model, the total predicted expenditures for each beneficiary would be the result of demographic variables, the specific conditions the beneficiary has that are in the model, as well as the count of the number of conditions that the beneficiary has.

Initial Model Research

To assess how to add a count of conditions to the model, we initially estimated over twenty different models using a single community segment and the set of 79 HCCs included in the 2017 CMS-HCC model. These models were calibrated using 2014 diagnoses predicting 2015 costs for a FFS population, and were compared to a single community segment that was also calibrated with 2014 diagnoses predicting 2015 FFS cost and without condition count variables. We estimated a number of models that varied by (a) which HCCs were counted: either the conditions in the 2017 CMS-HCC model ("payment conditions"), or all conditions (which includes both payment conditions plus non-payment conditions); and (b) how the conditions were counted: either a single continuous integer count variable (i.e., a coefficient C that is applied by multiplying it by the number of conditions a beneficiary has, for example, a beneficiary with 1 condition has 1 x C, a beneficiary with 2 conditions had 2 x C, etc.), individual dummy variables (individual coefficients estimated separately for 1, 2, 3, 4 conditions etc.), variables for grouped ranges of counts (a coefficient estimated for 0-3, 4-6, 7-10 conditions etc.), or a single variable for more than a specified number of conditions (a coefficient estimated for 5+, 10+, etc.). Because the model development work was conducted in parallel to the evaluation of the mental health, substance use disorder, and Chronic Kidney Disease HCCs, we utilized the current version of the HCCs, which include 79 payment HCCs, and 201 total HCCs, of which 186 are conditions. Hierarchies were applied prior to counting conditions, which is the same as when we calculate risk scores today: if a beneficiary was coded with multiple conditions in the same hierarchy, then only the most severe manifestation of the condition was attributed to the risk score.

In our initial research, models that counted "payment conditions" included 79 condition categories (HCCs) in the count, and models that counted "all conditions" included 186 out of 201 condition categories in the count. All ICD-9 diagnosis codes (which were used in the model calibration) are mapped to a condition category, which are groupings of clinically similar diagnosis codes. However, not all condition categories are unique conditions, and some are not conditions. Therefore, some "non-payment" condition categories (i.e., conditions not included in the payment model) are not counted in the "all conditions" model. Some diagnosis codes are symptoms resulting from a condition, are causes of conditions, are treatments or devices, indicate a status, or indicate a history of disease rather than a current condition. The HCCs that these "non-condition" diagnosis codes map to were excluded from the count of all conditions. Further, one HCC was duplicative of other condition categories. Thus, in order to count only unique conditions, we excluded 18 non-payment HCCs from the count of all conditions in the discussed "All Condition Count" model. Table 1 lists the 18 condition categories that were excluded from the discussed "All Condition Count" model, along with the reason for their exclusion. The list of 18 non-payment HCCs in Table 1 includes the 15 non-payment HCCs we originally excluded in our research.

Table 1: HCCs excluded when counting all conditions

HCC	HCC Label	Reason for exclusion
20	Type I Diabetes Mellitus	Duplicate condition category. Beneficiaries coded with this condition will also be mapped to HCC 17 Diabetes with Acute Complications, HCC 18 Diabetes with Chronic Complications or HCC 19 Diabetes without Complication.
132	Kidney Transplant Status	These condition categories indicate ESRD status. Beneficiaries with ESRD status receive a risk score calculated using a separate model.
133	End Stage Renal Disease (ESRD)	
178	Major Symptoms, Abnormalities	These two condition categories are symptoms, not diseases or conditions. The condition causing the symptom would be captured in an HCC that is already included in the count.
179	Minor Symptoms, Signs, Findings	
185	Major Organ Transplant (procedure)	These condition categories are treatments or devices, not diseases or conditions.
191	Post-Surgical States/Aftercare/Elective	
192	Radiation Therapy	
193	Chemotherapy	
194	Rehabilitation	
195	Screening/Observation/Special Exams	
196	History of Disease	This condition category does not represent active disease.
197	Supplemental Oxygen	These condition categories are treatments, devices, or causes of conditions, not diseases or conditions.
198	CPAP/IPPB/Nebulizers	
199	Patient Lifts, Power Operated Vehicles, Beds	
200	Wheelchairs, Commodes	
201	Walkers	
204	External Causes of Morbidity, Except Self-Inflicted Injury	

Initial Model Evaluation

We evaluated the performance of each model using several approaches, including comparing parameter estimates, the R-squared of each model, and the mean absolute prediction error for individual conditions and the model overall. However, primarily we evaluated predictive ratios, a measure of accuracy calculated by dividing predicted cost by actual cost for subgroups of

beneficiaries in the population.[7] We typically look at predictive ratios for deciles of predicted risk (all beneficiaries in the model sample sorted into ten equal groups by predicted cost), and continued to do so in this research. Also, because we believe the 21st Century Cures Act was focused on improving risk adjustment for beneficiaries with multiple chronic conditions, as discussed by stakeholders who submitted comments to the Senate Chronic Care Work Group, we evaluated how well the models predicted cost for beneficiaries with multiple chronic conditions.[8]

In order to assess the model performance for beneficiaries with multiple chronic conditions, we needed to identify beneficiaries' chronic conditions. The lack of a unanimous definition for "chronic condition" required empirical analyses and clinical judgment to determine which conditions within the condition categories (HCCs) to count as chronic. With the methods outlined below, each unique condition and condition category – a grouping of clinically similar ICD-9 diagnosis codes – was classified as chronic or non-chronic.

1. First, we weighted each ICD-9 code in each unique health condition category by the number of beneficiaries in our model sample with that ICD-9 code. We then identified which diagnoses were chronic with the AHRQ HCUP Chronic Condition Indicator (CCI).[9] CCI categorizes each ICD-9-CM diagnosis code as either chronic or non-chronic. In some cases many diagnosis codes map to a single HCC, and while diagnoses within an HCC are clinically similar, not all diagnoses in an HCC were considered chronic by AHRQ's Chronic Condition Indicator. For each HCC we counted, the count of unique beneficiary-chronic ICD-9 code combinations was divided by the total count of unique beneficiary- ICD-9 code combinations within an HCC based on the Medicare 2014 community sample. When the resulting percentage was larger than 51%, the condition category was classified as chronic.
2. The second empirical method relied on the duration of a condition to determine its chronicity. The number of individuals with a condition category in two consecutive years (Medicare 2013-2014 sample) was divided by the number of individuals with the condition category in the base year, 2013. Condition categories were categorized as chronic when more than 51% of beneficiaries with the HCC were coded in 2013 and 2014.

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[7] For additional discussion of the use of predictive ratios in the measuring performance of the risk adjustment model, please see "Evaluation of the CMS-HCC Risk Adjustment Model," March 2011, available at https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Downloads/Evaluation_Risk_Adj_Model_2011.pdf.

[8] For background, see congressional testimony: "A Pathway to Improving Care for Medicare Patients with Chronic Conditions: Hearings before the Committee on Finance, Senate, 114th Cong. 1 (2015), and "The Bipartisan Chronic Care Working Group Policy Options Document" (December 2015) with related comments.

[9] AHRQ. *Chronic Condition Indicator (CCI) for ICD-9-CM*. 4/11/2017], available at https://www.hcup-us.ahrq.gov/toolssoftware/chronic/chronic.jsp.

3. The third empirical method compared the coefficient for the condition category using a prospective model to the coefficient using a concurrent model. Prospective models use demographic information and diagnoses collected in a base year (2014) to predict medical expenditures in the following year (2015). They tend to emphasize the influence of chronic conditions on costs, whereas concurrent models use diagnoses and expenditures from the same year (2015) and reflect the costs of acute health events. If the ratio of prospective to concurrent coefficient was larger than 0.8, a condition category was considered chronic.
4. In the event that there was disagreement in the categorization of a condition among empirical methods, CMS sought the input of clinicians to make the final determination.

This method resulted in our determination that 122 out of the total number of HCCs (204 – three non-payment HCCs were created as a result of the evaluation) were chronic. Of the 186 conditions that are counted in the discussed "All Condition Count" Model, 116 are chronic conditions. Seventy-six percent of the model sample was determined to have three or more chronic conditions and 54% of the model sample was determined to have five or more chronic conditions. In the proposed "Payment Condition Count," model 64 of the 83 payment HCCs are considered chronic.

In our initial model evaluation, none of the models that counted either payment conditions or all (payment and non-payment) conditions consistently improved all evaluation statistics relative to the base model. In general, each of the condition count models resulted in a small increase in R-squared, a slight reduction in the mean average prediction error, and some improvement in the predictive accuracy of the model for beneficiaries with a high number of chronic conditions. We selected for further evaluation the model that most improved predictive accuracy for each of the two types of model: one model that counted all conditions, and one model that counted only payment conditions. We determined which model in each category performed best by comparing the number of deciles of predicted risk with predictive ratios that improved (closer to 1.0), and whether or not the predictive ratio for beneficiaries with three or more chronic conditions improved.

After selecting two models, we calibrated seven full risk segments with condition count variables (six community and one Long Term Institutional) and again assessed whether or not the model improved accuracy relative to the 2017 CMS-HCC model with updated data years and no condition count variables. For each model and segment, we evaluated model performance by assessing the number of deciles with a predictive ratio closer to 1.0, and whether or not the predictive ratio for beneficiaries with different counts of chronic conditions was closer to 1.0.

Final Model Specifications

In the two HCC count models we evaluated, count variables are included in addition to the demographic and HCC variables. Like all of the other variables in the CMS-HCC models, the

count variables are dummy variables, meaning that a beneficiary either meets the criteria for having the coefficient added to their risk score, or they do not. There are separate variables included in the models for different numbers of conditions that a beneficiary may have, and a coefficient is estimated from the subgroup of beneficiaries in the model sample with the specific count of conditions for each count variable in the model. For example, all beneficiaries with five conditions would receive a coefficient that is estimated independently of the coefficient for beneficiaries with six conditions.

By design, the average risk score in FFS is 1.0 regardless of which CMS-HCC model is used to calculate the risk score. When the model changes, costs are redistributed among the variables in the model. Coefficients for some variables will increase and some will decrease, but the result remains a model with an average FFS risk score of 1.0. Which variables' coefficients will increase or decrease depends on how variables are correlated within the model. In the condition count models, there is correlation between the individual dummy count variables and the conditions in the model for payment. The degree of correlation varies by HCC count type (payment or all conditions). Correlation is stronger between "payment conditions" and the count of payment conditions than it is between "payment conditions" and the count of all conditions. Including individual dummy count variables starting from a count of one condition results in negative coefficients for the payment HCC count dummy variables across all segments, while the all-condition count dummy variables are positive for some segments. The negative coefficients for the count variables occur in order to set uniform coefficients for all beneficiaries with the same number of conditions, and are offset by higher coefficients for HCCs and other variables in the model in order to predict the same overall cost.

Although a model with negative coefficients would produce accurate risk scores, we are concerned that negative coefficients might create a disincentive to report diagnosis codes by suggesting that having more conditions could reduce predicted expenditures. In addition, we wanted to avoid scenarios where the risk score could actually decrease with the reporting of additional diagnoses. For example, in the all condition count model, if the coefficients for the count variables were negative, a beneficiary's risk score would decrease as the number of non-payment HCCs increased. In the payment condition count model, it is possible that, with a negative count coefficient, the increase from the coefficient of an additional payment HCC could be less than the decrease from the next count variable. Our goal for the model is not only to predict accurately and reduce selection incentives, but also to encourage accurate and complete coding. Thus, we started the count variables in each segment of the model at a high enough number of conditions to result in positive coefficients for the count variables that were also statistically significant (t-statistic greater than two). In the discussed "All Condition Count Model," the count variables begin with between one and eight conditions in the six community segments, and begin with 10 conditions in the long term institutional segment. In the proposed "Payment Condition Count Model," the count variables begin with between four and six conditions in the six community segments, and begin with six conditions in the long term

institutional segment. Where the count variables begin in each model segment was determined independently by iteratively dropping the lowest count variables until the minimum positive and statistically significant coefficient was reached. Effectively this is the same as starting the count at one, but constraining the coefficient for lower count variables to zero. Note that when the count variables start at a high enough number so that count variable coefficients are positive, the coefficients for many HCCs in the model are lower than in a model without count variables. This is because the model is predicting the same total cost and any variable that is correlated with the count variables must decrease in order to offset the positive coefficient for the count variable.

In addition to starting the condition count variables at more than one condition in some segments, we also capped the count variables, meaning that we did not include dummy variables up to the highest possible count of conditions in each segment. The last count variable in each model is for that number of conditions, plus any more. For example, in the proposed "Payment Condition Count" model, 10 conditions is the last dummy variable in each segment. It applies for 10 or more conditions.

We determined where to cap the count variables for each segment in the proposed "Payment Condition Count Model" and the discussed "All Condition Count Model" in this Notice with only statistical criteria. The count was stopped when the estimate was not statistically reliable – because either the sample size had become too small (less than 1,000 beneficiaries), or including an additional dummy variable in the count resulted in a coefficient for the highest dummy variable that was less than the coefficient for the second highest dummy variable (i.e., the count variable was no longer monotonically increasing).

Applying only the statistical criteria, the count for the all condition count model stops at between 27 and 32 conditions in the six community segments, and 38 conditions in the institutional segment. However, when the count increases to these levels, the coefficients for the individual HCCs decrease substantially. For example, in the non-dual aged segment of the discussed "All Condition Count" model, the HCC coefficients decreased by 42% on average. Further, 22 of the HCCs in this segment decreased by over 50%. When only the statistical criteria are applied, the cap for the "Payment Condition Count Model" is between 11 and 16 conditions in the six community segments, and 15 conditions in the institutional segment. The HCC coefficients in the non-dual aged segment of the payment condition count model decreased by nine percent on average, one HCC decreased by more than 50%.

We are concerned that if we included all count variables that met the statistical criteria, the clinical nature of the model would be significantly reduced. Risk adjustment is intended to account for the risk faced by plans when enrolling sicker beneficiaries, by differentiating payments for individual beneficiaries by the expected cost of the specific conditions that they have. This is intended to compensate plans for the cost of providing benefits to enrollees who are sicker. The CMS-HCC model is intended to compensate plans with additional funds that are aligned with the risk of their enrolled beneficiaries' specific chronic conditions and with those

conditions' levels of severity. Including count variables in the model appears to differentiate levels of disease burden, given the number of conditions, but it may no longer be sufficient to differentiate relative expected cost differences between conditions when the coefficients for the individual condition categories are significantly reduced. For example, in the "All Condition Count Model," beneficiaries with four severe conditions would receive the same adjustment as beneficiaries with four non-severe acute conditions. The additional amount added to the beneficiary's risk score for having four conditions is only modestly tied to the actual medical conditions the beneficiary has (i.e., the average additional expected medical cost of all beneficiaries with four conditions is reflected in the coefficient). If emphasis in the model is placed on the count of conditions, the beneficiary's risk score will instead be increased mainly by the number of the conditions he or she has, regardless of what those conditions are, and may or may not appropriately reflect the expected cost of providing care to that beneficiary.

We capped the count of conditions in the models lower than the statistical criteria would suggest to address several concerns with using only statistical, and not clinical, considerations. First, with the significant drop in HCC coefficients, and without having had enough time to fully evaluate the interaction between increasing the number of count variables and change in risk scores, we are concerned that including condition count variables that met only statistical considerations would result in wide swings in contract-level risk scores. Second, the clinicians with whom we consulted did not think it was clinically meaningful to distinguish between beneficiaries with, for example, 15 versus 38 conditions (the maximum number of conditions with at least 1,000 beneficiaries in the "All Condition Count Model") when counting "All conditions," because many of the conditions included in the "All Condition Count" model are non-severe and non-chronic. The clinicians concurred that after 15 conditions an individual is considered to be complex; each additional condition would not indicate a significant increase in the degree of clinical complexity and recommended that higher counts not be added to the count of conditions.

In the "Payment Condition Count" Model proposed in this Notice, we capped the count of conditions at 10 payment conditions. In the "All Condition Count Model" also discussed in this Notice, we capped the six community and single long term institutional segments at 15 conditions. With a cap on the condition count at 15 conditions, the HCC coefficients in the non-dual aged segment of the "All Condition Count" model decrease by 21% on average. Given the already severe and chronic nature of most payment conditions, the clinicians with whom we consulted did not think it was clinically meaningful to distinguish between 10 and 16 conditions (the maximum number of payment conditions with at least 1,000 beneficiaries) in the "Payment Condition Count" model for the same reasons explained on page 20. With a cap on the condition count at 10 conditions, the HCC coefficients in the non-dual aged segment of the payment condition count model decrease by three percent on average. When the cap on the count variables resulted in one of the count variables becoming either statistically insignificant or no longer monotonically increasing, we constrained the count variable to the coefficient for the previous count variable. For example, if the coefficient for seven conditions was lower than the

coefficient for six conditions, the coefficient for seven conditions was constrained to the same value as the coefficient for six conditions.

Improving Risk Adjustment

Section 17006(f), the provision of the 21st Century Cures Act amending the Part C risk adjustment requirements in section 1853(a)(1) of the Act, bears the heading, "Improvements to Risk Adjustment under Medicare Advantage;" we believe this evidences that the goal of these provisions is to improve risk adjustment by aligning the risk adjustment payments to the actual expected costs of providing care to enrollees. Section 1853(a)(3) directed, in connection with the initial development of methodologies to risk adjust payments to MA plans, that such adjustments "account[] for variations in per capita costs based on health status." Therefore, the goal of the CMS-HCC risk adjustment model is to accurately differentiate between beneficiaries who have annual costs that are higher or lower than the average annual cost of providing Medicare Parts A and B benefits in the Original Medicare program. We interpreted the statute's directive to improve risk adjustment to mean improving the accuracy of the risk adjustment model.

Adding a count of payment conditions improves the risk adjustment model by improving accuracy across deciles of predicted risk, by either decreasing over-prediction observed in some deciles or decreasing under-prediction in other deciles. However, this model slightly increases the under prediction for beneficiaries with five or more chronic conditions. Adding a count of all conditions improves predictive accuracy for beneficiaries with five or more chronic conditions, but reduces predicted accuracy for beneficiaries with fewer than 5 chronic conditions, and reduces predictive accuracy across almost all deciles of predicted risk (both low and high). Thus, overall, we consider the "All Condition" count model to reduce, rather than improve, the accuracy of risk adjustment.

In Tables 1 - 3 of the attachment, we provide predictive ratios – across the seven segments – for different versions of the CMS-HCC model:

- A model with updated data (2014 diagnoses selected with filtering logic applied as we do with encounter data, e.g., using CPT/HCPCS codes to identify risk adjustment eligible diagnoses on professional encounters, predicting 2015 costs), and additional mental health, substance use disorder, and chronic kidney disease HCCs;
- A model with updated data (2014 diagnoses selected with filtering logic applied as we do with encounter data, e.g., using CPT/HCPCS codes to identify risk adjustment eligible diagnoses on professional encounters, predicting 2015 costs), additional mental health, substance use disorder, and chronic kidney disease HCCs, and variables counting all conditions; and
- The proposed model with updated data (2014 diagnoses selected with filtering logic applied as we do with encounter data, e.g., using CPT/HCPCS codes to identify risk adjustment eligible diagnoses on professional encounters, predicting 2015 costs),

additional mental health, substance use disorder, and chronic kidney disease HCCs, and variables counting payment conditions.

Risk Score Impacts

In addition to evaluating the model accuracy, we assessed the impact on MA risk scores of adding count variables to the model. We first isolated the impact of adding count variables by comparing risk scores from the updated version of the 2017 CMS-HCC model to risk scores from the preliminary models with the two approaches to counting conditions. For models with non-payment conditions in the count variables, we included risk adjustment eligible diagnoses from encounter data as an additional source of diagnosis codes to amend the RAPS data used to calculate the risk scores under each model. Including diagnoses from encounter data allowed us to better estimate the payment impact since not all plans report non-model diagnoses to RAPS.

In isolation, adding either "Payment Condition" or "All Condition" count variables to the model did not change the mean MA risk score appreciably. However, at a contract level, the range of risk score impacts differs by model and the contract's clinical profile, including how many conditions their enrollees have. In some cases, there is noticeable variation among risk scores for the same contract under each of the model approaches.

CMS-HCC Risk Adjustment Model Proposal

For 2019, we propose to implement a model with additional HCCs for mental health, substance use disorder, and Chronic Kidney Disease, individual dummy variables counting payment conditions, and 2014 FFS diagnoses, selected using the same filtering logic that we apply to encounter data records, predicting 2015 FFS cost. We believe counting payment conditions (i.e., those conditions included in the 2017 model, plus the additional conditions we propose to include for payment in this Advance Notice) best meets the statute's directive to improve risk adjustment. Further, we believe that this approach maintains stability in risk adjustment system.

We also believe that the risk adjustment requirements in section 1853(a)(1)(I) can be interpreted as all HCCs that are conditions. Thus, for payment year 2019, an alternative interpretation of the statutory requirement would be to count all conditions. We have also provided coefficients for another model that counts "All Conditions" so that stakeholders can comment on this interpretation. The "All Condition Count" model is calibrated with additional HCCs for mental health, substance use disorder, and Chronic Kidney Disease, individual dummy variables counting the 83 payment conditions in the proposed "Payment Condition Count" model plus 103 non-payment conditions, and 2014 diagnoses selected using the filtering logic applied to encounter data records predicting 2015 cost.

The conditions in the payment model tend to be more clinically severe and most are chronic conditions. As previously discussed, counting all conditions would count many conditions that do not meet our criteria to be included for payment. For example, there are "non-payment"

condition categories for some infections that are acute, and would typically be treated and cured in a single course of therapy. If included in the model, the predicted cost would not be substantive or consistent over time. Thus, we would not expect such an HCC to predict cost accurately in a prospective model. Further, between the two models that count conditions, counting only payment conditions would better maintain the clinical nature of the model.

Three sets of model coefficients can be found in Attachment 1:

1. The proposed model with count variables for payment conditions,
2. A model that is identical to the proposed model, but with count variables for all conditions, and
3. For comparison, a model without count variables, but with updates to the 2017 CMS-HCC model based on our authority under section 1853(a)(1)(C)(i):
    - Adding additional HCCs for mental health, substance use disorder, and Chronic Kidney Disease,
    - Using 2014 diagnoses to predict 2015 costs, and
    - Using diagnoses selected using the filtering logic applied to encounter data records.

Three Year Phase-In (2019-2022)

The 21st Century Cures Act requires that any changes to risk adjusted payments under section 1853(a)(1)(C)(i) resulting from the implementation of section 1853(a)(1)(I) must be phased-in over a 3-year period, beginning with 2019, with such changes being fully implemented for 2022 and subsequent years. The statute thus requires a three year phase-in over a four year period. Given this, we interpret the statute's direction to mean that the proposed changes to the risk adjustment model under section 1853(a)(1)(C)(i) resulting from the proposed implementation of section 1853(a)(1)(I) for 2019 could be implemented without the required provisions from section 1853(a)(1)(I), or could be implemented with provisions from section 1853(a)(1)(I) and further modified in 2020. The model finalized for 2020 would then be phased-in, in that modified form, over three years such that 100% of risk adjusted payments to Medicare Advantage organizations in 2022 are based on the risk adjustment model finalized for 2020.

For Payment Year 2019, we propose to begin implementation of proposed changes to the risk adjustment model by calculating risk scores by summing:

- 25% of the risk score calculated with the proposed "Payment Condition Count" CMS-HCC model with
- 75% of the risk score calculated with the 2017 CMS-HCC model.

Table 2 provides a proposed model phase-in schedule.

Table 2: Proposed Model Phase-In Schedule

	Proposed "Payment Condition Count" CMS-HCC model	2017 CMS-HCC model
2019	25%	75%
2020	50%	50%
2021	75%	25%
2022	100%	NA

We seek comment on which model – the "Payment Condition Count Model" or the "All Condition Count Model" – would be most appropriate to implement and why, and the criteria we should use when determining which model best improves risk adjustment. As explained above, we believe that the Payment Condition Count Model" is most consistent with the statutory intent and requirements. Comments on clinical considerations regarding the most appropriate model to adopt are also invited. We also note that we interpret the statutory language regarding the implementation timeline to authorize us to not change our risk adjustment model for 2019 or to implement changes based on our authority under section 1853(a)(1)(C)(i) (i.e., to begin the phase-in of section 1853(a)(1)(I) in 2020, after discussing the model changes in this CY2019 Advance Notice) and implement additional specifications in 2020. Specifically, we believe that the statutory language requiring us to phase-in the model over three years between 2019 and 2022 (i.e., a four year time period), may allow us to use the 2019 Advance Notice and comment process to collect comments and reconsider options to propose for 2020. We welcome comments on this approach as well.

Encounter Data as a Diagnosis Source for 2019

For PY 2018, CMS calculated risk scores by adding 15% of the risk score calculated using encounter data and FFS diagnoses with 85% of the risk score calculated using RAPS and FFS diagnoses. For PY 2019, CMS proposes to calculate risk scores by adding 25% of the risk score calculated using diagnoses from encounter data and FFS diagnoses with 75% of the risk score calculated with diagnoses from RAPS and FFS diagnoses.

Specifically, we propose to calculate the encounter data-based risk scores as follows:

- With the proposed "Payment Condition Count" CMS-HCC model,
- Using diagnoses from encounter data and FFS, and amended (as an additional source) with RAPS inpatient diagnoses. CMS observes that Encounter Data inpatient submissions are low compared to corresponding RAPS inpatient submissions. Amending inpatient diagnoses from Encounter Data with inpatient diagnoses from RAPS will improve the completeness of the data for payment in 2019.

RAPS risk scores would be calculated as follows:

- With the 2017 CMS-HCC model,

- Using diagnoses from RAPS and FFS.

Thus, as proposed, encounter data based risk scores only would be calculated with only the "Payment Condition Count" model proposed in this Notice.

For PACE organizations for PY 2019, we propose to continue the same method of calculating risk scores that we have been using since PY 2015, which is to pool risk adjustment-eligible diagnoses from the following sources to calculate a single risk score (with no weighting): (1) encounter data, (2) RAPS, and (3) FFS claims. We are not proposing to change the model used to calculate risk scores for PACE organizations in PY 2019.

Additional 21st Century Cures Act Risk Adjustment Requirements

The 21st Century Cures Act also requires CMS to evaluate the risk adjustment model, including the ESRD model. This initial evaluation, required to be completed by December 31st, 2018, will include a discussion of the model criteria that CMS uses to develop models and to determine incremental changes. These criteria, which are considered together, have been published in several publications, including "Risk Adjustment of Medicare Capitation Payments Using the CMS-HCC Model" (Pope, 2004)[10] and our 2011 risk adjustment evaluation. As part of this effort, we will produce a wide range of predictive ratios, for various subgroups, including very high and very low cost enrollees, groups defined by the number of chronic conditions for enrollees, and for each condition category, similar to our 2011 evaluation.

[10] Pope, G. C., Kautter, J., Ellis, R. P., Ash, A. S., Ayanian, J. Z., Iezzoni, L. I., Robst, J. (2004). Risk Adjustment of Medicare Capitation Payments Using the CMS-HCC Model. Health Care Financing Review, 25(4), 119–141.

Attachment I. Predictive Ratios and CMS-HCC Risk Adjustment Factors

Table 1. Predictive Ratios by Decile of Predicted Risk and Count of Chronic HCCs – All HCC Count Model

All HCC Count Model							
Decile	**Non Dual Aged**	**Non Dual Disabled**	**Full Dual Aged**	**Full Dual Disabled**	**Partial Dual Aged**	**Partial Dual Disabled**	**Institutional**
First (lowest)	0.953	1.054	0.953	1.040	0.970	0.890	0.823
Second	0.964	0.929	0.979	0.909	0.975	0.916	0.926
Third	0.955	0.935	0.975	0.858	0.954	0.928	0.980
Fourth	0.963	0.910	0.972	0.877	0.959	0.955	1.003
Fifth	0.981	0.936	0.976	0.945	0.980	0.939	1.031
Sixth	0.985	0.948	0.997	0.973	0.981	0.963	1.031
Seventh	1.001	0.975	1.011	1.028	1.008	1.013	1.040
Eighth	1.024	1.032	1.028	1.039	1.031	1.067	1.036
Ninth	1.035	1.067	1.024	1.058	1.030	1.066	1.019
Tenth (highest)	1.002	1.009	0.995	1.005	0.999	0.995	0.981
Top 5%	0.985	0.977	0.986	0.978	0.978	0.964	0.975
Top 1%	0.945	0.950	0.951	0.945	0.944	0.962	0.960
Counts of Chronic Conditions							
0	0.998	1.014	0.914	0.962	1.008	0.969	0.738
1	0.965	0.970	0.978	0.986	0.941	1.005	0.963
2	0.983	0.998	1.001	0.985	0.982	0.989	0.978
3	0.992	0.977	0.988	0.981	0.989	0.973	0.967
4	1.000	0.995	0.988	0.997	0.988	0.985	0.987
5 +	1.002	1.003	1.004	1.003	1.002	1.004	1.002

NOTES:

1. Predictive ratios are the ratio of predicted cost to actual cost for the applicable subgroup. A predicted ratio of 1.0 indicates average predicted cost is equal to the average actual cost. Values below 1.0 indicate underprediction. Values over 1.0 indicate overprediction.
2. Each model is calibrated with 2014-2015 data, and includes the proposed additional mental health, substance use disorder, and Chronic Kidney Condition HCCs.
3. Dual status is defined in the payment year.

SOURCE: RTI International analysis of 2014-2015 Medicare 100% data.

Table 2. Predictive Ratios by Decile of Predicted Risk and Count of Chronic HCCs – Payment HCC Count Model

Payment HCC Count Model							
Decile	**Non Dual Aged**	**Non Dual Disabled**	**Full Dual Aged**	**Full Dual Disabled**	**Partial Dual Aged**	**Partial Dual Disabled**	**Institutional**
First (lowest)	0.962	1.082	0.958	1.083	0.989	0.933	0.874
Second	0.980	0.957	1.011	1.021	1.001	1.058	0.968
Third	0.994	0.981	0.994	0.892	0.981	0.954	1.003
Fourth	0.993	0.980	1.001	0.948	0.989	0.989	0.998
Fifth	1.006	0.959	0.999	0.982	1.001	0.979	1.021
Sixth	1.002	0.994	0.999	0.997	0.998	0.996	1.019
Seventh	1.006	0.982	1.005	1.018	1.006	1.013	1.019
Eighth	1.003	1.011	1.006	1.022	1.007	1.023	1.013
Ninth	1.004	1.028	1.000	1.010	1.003	1.013	1.013
Tenth (highest)	1.002	1.001	1.001	1.001	1.000	0.996	0.993
Top 5%	0.999	0.991	1.004	0.995	0.996	0.988	0.989
Top 1%	0.985	0.996	0.981	0.985	0.997	0.999	0.965
Counts of Chronic Conditions							
0	1.490	1.403	0.967	1.235	1.183	1.307	0.797
1	1.166	1.158	1.050	1.199	1.084	1.255	1.068
2	1.121	1.104	1.082	1.133	1.100	1.146	1.094
3	1.081	1.039	1.070	1.072	1.080	1.065	1.085
4	1.046	1.021	1.059	1.044	1.051	1.028	1.096
5 +	0.957	0.950	0.987	0.962	0.970	0.958	0.989

NOTES:

1. Predictive ratios are the ratio of predicted cost to actual cost for the applicable subgroup. A predicted ratio of 1.0 indicates average predicted cost is equal to the average actual cost. Values below 1.0 indicate underprediction. Values over 1.0 indicate overprediction.
2. Each model is calibrated with 2014-2015 data, and includes the proposed additional mental health, substance use disorder, and Chronic Kidney Condition HCCs.
3. Dual status is defined in the payment year.

SOURCE: RTI International analysis of 2014-2015 Medicare 100% data.

Table 3. Predictive Ratios by Decile of Predicted Risk and Count of Chronic HCCs – Updated CMS-HCC Model without count variables

Updated CMS-HCC Model without count variables							
Decile	**Non Dual Aged**	**Non Dual Disabled**	**Full Dual Aged**	**Full Dual Disabled**	**Partial Dual Aged**	**Partial Dual Disabled**	**Institutional**
First (lowest)	0.943	1.012	0.945	0.973	0.966	0.861	0.859
Second	0.963	0.906	0.992	0.901	0.981	0.993	0.960
Third	0.979	0.934	0.984	0.863	0.965	0.912	0.995
Fourth	0.981	0.942	0.982	0.920	0.975	0.954	1.000
Fifth	0.999	0.946	1.000	0.967	0.992	0.969	1.022
Sixth	0.999	0.981	1.001	0.999	0.997	0.991	1.023
Seventh	1.007	0.989	1.007	1.031	1.010	1.030	1.028
Eighth	1.010	1.026	1.015	1.045	1.017	1.051	1.019
Ninth	1.018	1.060	1.011	1.043	1.020	1.044	1.015
Tenth (highest)	1.003	1.005	0.998	1.001	0.999	0.995	0.989
Top 5%	0.993	0.981	0.995	0.982	0.986	0.973	0.986
Top 1%	0.965	0.966	0.966	0.965	0.970	0.985	0.966
Counts of Chronic Conditions							
0	1.465	1.331	0.951	1.129	1.160	1.220	0.778
1	1.152	1.132	1.039	1.151	1.070	1.214	1.050
2	1.111	1.091	1.071	1.109	1.089	1.124	1.080
3	1.075	1.035	1.062	1.064	1.072	1.055	1.075
4	1.044	1.024	1.055	1.047	1.047	1.029	1.090
5 +	0.959	0.957	0.989	0.969	0.973	0.965	0.990

NOTES:

1. Predictive ratios are the ratio of predicted cost to actual cost for the applicable subgroup. A predicted ratio of 1.0 indicates average predicted cost is equal to the average actual cost. Values below 1.0 indicate underprediction. Values over 1.0 indicate overprediction.
2. Each model is calibrated with 2014-2015 data, and includes the proposed additional mental health, substance use disorder, and Chronic Kidney Condition HCCs.
3. Dual status is defined in the payment year.

SOURCE: RTI International analysis of 2014-2015 Medicare 100% data.

Table 4. 2019 Payment HCC Count Model Relative Factors for Continuing Enrollees

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
Female								
0-34 Years		-	0.239	-	0.351	-	0.382	0.926
35-44 Years		-	0.313	-	0.352	-	0.413	1.131
45-54 Years		-	0.347	-	0.378	-	0.417	1.068
55-59 Years		-	0.380	-	0.440	-	0.415	1.089
60-64 Years		-	0.430	-	0.500	-	0.415	1.092
65-69 Years		0.321	-	0.437	-	0.356	-	1.265
70-74 Years		0.388	-	0.530	-	0.410	-	1.172
75-79 Years		0.460	-	0.624	-	0.489	-	1.037
80-84 Years		0.550	-	0.774	-	0.575	-	0.905
85-89 Years		0.679	-	0.955	-	0.692	-	0.821
90-94 Years		0.835	-	1.101	-	0.831	-	0.691
95 Years or Over		0.843	-	1.172	-	0.930	-	0.523
Male								
0-34 Years		-	0.154	-	0.242	-	0.388	1.126
35-44 Years		-	0.198	-	0.237	-	0.281	1.026
45-54 Years		-	0.241	-	0.311	-	0.312	0.989
55-59 Years		-	0.288	-	0.409	-	0.341	1.041
60-64 Years		-	0.331	-	0.537	-	0.375	1.085
65-69 Years		0.307	-	0.488	-	0.366	-	1.308
70-74 Years		0.395	-	0.607	-	0.428	-	1.350
75-79 Years		0.480	-	0.734	-	0.511	-	1.340
80-84 Years		0.573	-	0.848	-	0.564	-	1.232
85-89 Years		0.717	-	1.070	-	0.689	-	1.146
90-94 Years		0.883	-	1.233	-	0.874	-	1.014
95 Years or Over		1.033	-	1.374	-	1.090	-	0.846

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
Medicaid and Originally Disabled Interactions								
Medicaid		-	-	-	-	-	-	0.062
Originally Disabled, Female		0.251	-	0.171	-	0.136	-	0.002
Originally Disabled, Male		0.148	-	0.183	-	0.083	-	0.002
Disease Coefficients	**Description Label**							
HCC1	HIV/AIDS	0.335	0.291	0.596	0.394	0.480	0.203	1.710
HCC2	Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	0.372	0.417	0.488	0.533	0.332	0.300	0.309
HCC6	Opportunistic Infections	0.415	0.737	0.557	0.796	0.312	0.661	0.512
HCC8	Metastatic Cancer and Acute Leukemia	2.650	2.713	2.546	2.793	2.446	2.657	1.286
HCC9	Lung and Other Severe Cancers	1.018	0.908	0.998	0.994	0.994	0.878	0.606
HCC10	Lymphoma and Other Cancers	0.671	0.666	0.709	0.757	0.643	0.670	0.447
HCC11	Colorectal, Bladder, and Other Cancers	0.302	0.343	0.304	0.346	0.325	0.349	0.279
HCC12	Breast, Prostate, and Other Cancers and Tumors	0.148	0.213	0.155	0.210	0.153	0.182	0.198
HCC17	Diabetes with Acute Complications	0.305	0.353	0.344	0.420	0.331	0.374	0.437
HCC18	Diabetes with Chronic Complications	0.305	0.353	0.344	0.420	0.331	0.374	0.437
HCC19	Diabetes without Complication	0.105	0.124	0.109	0.142	0.089	0.122	0.175
HCC21	Protein-Calorie Malnutrition	0.493	0.686	0.745	0.730	0.499	0.690	0.252
HCC22	Morbid Obesity	0.244	0.182	0.369	0.291	0.226	0.204	0.436
HCC23	Other Significant Endocrine and Metabolic Disorders	0.193	0.379	0.207	0.298	0.172	0.322	0.357
HCC27	End-Stage Liver Disease	0.878	1.067	1.104	1.095	0.735	0.888	0.849
HCC28	Cirrhosis of Liver	0.360	0.334	0.402	0.359	0.403	0.341	0.463

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC29	Chronic Hepatitis	0.144	0.314	0.031	0.285	0.177	0.237	0.463
HCC33	Intestinal Obstruction/Perforation	0.218	0.501	0.262	0.534	0.237	0.551	0.334
HCC34	Chronic Pancreatitis	0.283	0.576	0.346	0.751	0.367	0.594	0.400
HCC35	Inflammatory Bowel Disease	0.305	0.522	0.268	0.543	0.273	0.540	0.338
HCC39	Bone/Joint/Muscle Infections/Necrosis	0.398	0.376	0.554	0.673	0.437	0.435	0.379
HCC40	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.417	0.366	0.363	0.321	0.345	0.263	0.278
HCC46	Severe Hematological Disorders	1.368	3.564	1.210	4.301	1.237	4.136	0.783
HCC47	Disorders of Immunity	0.663	0.861	0.450	0.690	0.673	0.592	0.553
HCC48	Coagulation Defects and Other Specified Hematological Disorders	0.191	0.312	0.223	0.295	0.189	0.329	0.169
HCC54	Drug/Alcohol Psychosis	0.344	0.549	0.683	0.894	0.386	0.684	0.158
HCC55	Drug/Alcohol Dependence, or Abuse/Use with Complications	0.344	0.279	0.505	0.350	0.380	0.274	0.158
HCC56	Drug Abuse, Uncomplicated, Except Cannabis	0.344	0.245	0.505	0.342	0.380	0.274	0.158
HCC57	Schizophrenia	0.595	0.362	0.684	0.386	0.568	0.315	0.178
HCC58	Reactive and Unspecified Psychosis	0.520	0.362	0.684	0.250	0.568	0.258	0.178
HCC59	Major Depressive, Bipolar, and Paranoid Disorders	0.343	0.169	0.355	0.129	0.337	0.112	0.178
HCC60	Personality Disorders	0.343	0.112	0.355	0.104	0.287	0.069	-
HCC70	Quadriplegia	1.300	1.030	1.120	1.019	1.048	1.161	0.545
HCC71	Paraplegia	1.094	0.764	0.950	0.980	1.048	0.965	0.484
HCC72	Spinal Cord Disorders/Injuries	0.500	0.377	0.551	0.393	0.527	0.346	0.274

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC73	Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease	1.016	1.136	1.128	1.251	0.718	0.949	0.461
HCC74	Cerebral Palsy	0.343	0.103	-	-	0.125	-	-
HCC75	Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy	0.472	0.483	0.410	0.400	0.292	0.316	0.315
HCC76	Muscular Dystrophy	0.519	0.623	0.399	0.593	-	0.287	0.343
HCC77	Multiple Sclerosis	0.434	0.574	0.764	0.796	0.285	0.466	0.023
HCC78	Parkinson's and Huntington's Diseases	0.675	0.533	0.703	0.480	0.613	0.459	0.150
HCC79	Seizure Disorders and Convulsions	0.257	0.208	0.292	0.150	0.299	0.178	0.050
HCC80	Coma, Brain Compression/Anoxic Damage	0.511	0.302	0.534	0.132	0.735	0.168	-
HCC82	Respirator Dependence/Tracheostomy Status	0.985	0.787	2.149	1.461	0.828	0.775	1.598
HCC83	Respiratory Arrest	0.345	0.403	0.909	0.531	0.371	0.775	0.481
HCC84	Cardio-Respiratory Failure and Shock	0.282	0.390	0.495	0.531	0.368	0.345	0.286
HCC85	Congestive Heart Failure	0.337	0.450	0.388	0.487	0.345	0.424	0.206
HCC86	Acute Myocardial Infarction	0.195	0.263	0.376	0.416	0.293	0.377	0.343
HCC87	Unstable Angina and Other Acute Ischemic Heart Disease	0.195	0.263	0.297	0.416	0.279	0.377	0.343
HCC88	Angina Pectoris	0.130	0.110	0.023	0.143	0.147	0.147	0.343
HCC96	Specified Heart Arrhythmias	0.269	0.263	0.389	0.307	0.266	0.281	0.240
HCC99	Intracranial Hemorrhage	0.258	0.195	0.425	0.516	0.261	0.176	0.093

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC100	Ischemic or Unspecified Stroke	0.258	0.156	0.425	0.332	0.261	0.176	0.093
HCC103	Hemiplegia/Hemiparesis	0.460	0.294	0.515	0.305	0.465	0.320	-
HCC104	Monoplegia, Other Paralytic Syndromes	0.342	0.277	0.360	0.264	0.306	0.166	-
HCC106	Atherosclerosis of the Extremities with Ulceration or Gangrene	1.511	1.536	1.761	1.758	1.531	1.544	0.867
HCC107	Vascular Disease with Complications	0.384	0.464	0.570	0.646	0.464	0.450	0.289
HCC108	Vascular Disease	0.296	0.304	0.312	0.268	0.302	0.316	0.086
HCC110	Cystic Fibrosis	0.507	2.669	0.497	3.500	0.397	3.042	0.589
HCC111	Chronic Obstructive Pulmonary Disease	0.336	0.247	0.435	0.325	0.361	0.267	0.308
HCC112	Fibrosis of Lung and Other Chronic Lung Disorders	0.218	0.238	0.161	0.272	0.205	0.229	0.106
HCC114	Aspiration and Specified Bacterial Pneumonias	0.543	0.243	0.671	0.385	0.530	0.204	0.140
HCC115	Pneumococcal Pneumonia, Empyema, Lung Abscess	0.131	-	0.256	-	0.096	0.081	0.140
HCC122	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.217	0.228	0.260	0.258	0.176	0.198	0.376
HCC124	Exudative Macular Degeneration	0.512	0.313	0.277	0.138	0.383	0.155	0.205
HCC134	Dialysis Status	0.456	0.412	0.720	0.595	0.470	0.483	0.451
HCC135	Acute Renal Failure	0.456	0.412	0.720	0.595	0.470	0.483	0.451
HCC136	Chronic Kidney Disease, Stage 5	0.288	0.231	0.260	0.320	0.285	0.262	0.234
HCC137	Chronic Kidney Disease, Severe (Stage 4)	0.288	0.105	0.260	0.132	0.282	0.036	0.193
HCC138	Chronic Kidney Disease, Moderate (Stage 3)	0.070	0.022	0.020	-	0.045	-	0.083
HCC157	Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone	2.039	2.063	2.456	2.540	2.057	2.476	0.823

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC158	Pressure Ulcer of Skin with Full Thickness Skin Loss	1.085	1.198	1.483	1.361	1.180	0.910	0.293
HCC161	Chronic Ulcer of Skin, Except Pressure	0.529	0.605	0.757	0.594	0.555	0.556	0.293
HCC162	Severe Skin Burn or Condition	0.232	0.503	0.172	0.312	-	0.332	-
HCC166	Severe Head Injury	0.511	0.302	0.534	0.132	0.735	0.168	-
HCC167	Major Head Injury	0.111	0.018	0.187	0.057	0.068	0.045	-
HCC169	Vertebral Fractures without Spinal Cord Injury	0.490	0.377	0.551	0.393	0.527	0.346	0.236
HCC170	Hip Fracture/Dislocation	0.388	0.400	0.464	0.475	0.392	0.341	-
HCC173	Traumatic Amputations and Complications	0.208	0.172	0.212	0.518	0.176	0.185	0.071
HCC176	Complications of Specified Implanted Device or Graft	0.582	0.914	0.680	0.986	0.522	0.836	0.448
HCC186	Major Organ Transplant or Replacement Status	0.823	0.442	0.714	0.854	0.427	0.610	1.013
HCC188	Artificial Openings for Feeding or Elimination	0.538	0.762	0.768	0.776	0.528	0.739	0.502
HCC189	Amputation Status, Lower Limb/Amputation Complications	0.521	0.441	0.803	0.927	0.699	0.630	0.340
Disease Interactions								
HCC47_gCancer	Immune Disorders*Cancer	0.829	0.457	0.831	0.668	0.646	0.601	-
Diabetes_CHF	Congestive Heart Failure*Diabetes	0.119	0.023	0.187	0.038	0.111	-	0.151
CHF_gCopdCF	Congestive Heart Failure*Chronic Obstructive Pulmonary Disease	0.152	0.120	0.223	0.150	0.156	0.140	0.174
HCC85_gRenal_V23	Congestive Heart Failure*Renal	0.151	0.404	0.171	0.456	0.179	0.381	-
gCopdCF_CARD_RESP_FAIL	Cardiorespiratory Failure*Chronic Obstructive Pulmonary Disease	0.354	0.371	0.511	0.445	0.377	0.475	0.405

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC85_HCC96	Congestive Heart Failure*Specified Heart Arrhythmias	0.081	0.278	0.126	0.353	0.097	0.299	-
gSubstanceAbuse_gPsychiatric_V23	Substance Abuse*Psychiatric	-	0.139	-	0.190	-	0.201	-
SEPSIS_PRESSURE_ULCER	Sepsis*Pressure Ulcer	-	-	-	-	-	-	0.124
SEPSIS_ARTIF_OPENINGS	Sepsis*Artificial Openings for Feeding or Elimination	-	-	-	-	-	-	0.464
ART_OPENINGS_PRESSURE_ULCER	Artificial Openings for Feeding or Elimination*Pressure Ulcer	-	-	-	-	-	-	0.345
gCopdCF_ASP_SPEC_BACT_PNEUM	Chronic Obstructive Pulmonary Disease*Aspiration and Specified Bacterial Pneumonias	-	-	-	-	-	-	0.205
ASP_SPEC_BACT_PNEUM_PRES_ULC	Aspiration and Specified Bacterial Pneumonias*Pressure Ulcer	-	-	-	-	-	-	0.472
SEPSIS_ASP_SPEC_BACT_PNEUM	Sepsis*Aspiration and Specified Bacterial Pneumonias	-	-	-	-	-	-	0.339
SCHIZOPHRENIA_gCopdCF	Schizophrenia*Chronic Obstructive Pulmonary Disease	-	-	-	-	-	-	0.413
SCHIZOPHRENIA_CHF	Schizophrenia*Congestive Heart Failure	-	-	-	-	-	-	0.124
SCHIZOPHRENIA_SEIZURES	Schizophrenia*Seizure Disorders and Convulsions	-	-	-	-	-	-	0.572
Disabled/Disease Interactions								
DISABLED_HCC85	Disabled, Congestive Heart Failure	-	-	-	-	-	-	0.269

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
DISABLED_PRESSURE_ULCER	Disabled, Pressure Ulcer	-	-	-	-	-	-	0.546
DISABLED_HCC161	Disabled, Chronic Ulcer of the Skin, Except Pressure Ulcer	-	-	-	-	-	-	0.474
DISABLED_HCC39	Disabled, Bone/Joint Muscle Infections/Necrosis	-	-	-	-	-	-	0.449
DISABLED_HCC77	Disabled, Multiple Sclerosis	-	-	-	-	-	-	0.470
DISABLED_HCC6	Disabled, Opportunistic Infections	-	-	-	-	-	-	0.414
Payment HCC Counts								
K1	1 payment HCCs	-	-	-	-	-	-	-
K2	2 payment HCCs	-	-	-	-	-	-	-
K3	3 payment HCCs	-	-	-	-	-	-	-
K4	4 payment HCCs	0.012	-	-	0.035	-	-	-
K5	5 payment HCCs	0.043	0.040	-	0.079	0.038	0.093	-
K6	6 payment HCCs	0.088	0.122	0.061	0.195	0.070	0.102	0.060
K7	7 payment HCCs	0.136	0.230	0.061	0.306	0.070	0.334	0.073
K8	8 payment HCCs	0.242	0.439	0.131	0.474	0.228	0.429	0.110
K9	9 payment HCCs	0.282	0.439	0.205	0.604	0.380	0.543	0.110
K10P	10 or more payment HCCs	0.567	0.942	0.473	1.150	0.599	0.921	0.245

NOTES:

1. The denominator is $9,367.34.
2. In the "disease interactions" and "disabled interactions," the variables are defined as follows:
   Immune Disorders = HCC 47
   Cancer = HCCs 8-12
   Congestive Heart Failure = HCC 85
   Diabetes = HCCs 17-19
   Chronic Obstructive Pulmonary Disease = HCCs 110-112
   Renal = HCCs 134-138
   Cardiorespiratory Failure = HCCs 82-84
   Specified Heart Arrhythmias = HCC 96

Substance Abuse = HCCs 54-56
Psychiatric = HCCs 57-60
Pressure Ulcer = HCCs 157-158
Chronic Ulcer of Skin, except Pressure = HCC 161
Bone/Joint/Muscle Infections/Necrosis = HCC 39
Multiple Sclerosis = HCC 77
Opportunistic Infections = HCC 6
Sepsis = HCC 2
Artificial Openings for Feeding or Elimination = HCC 188
Aspiration and Specified Bacterial Pneumonias = HCC 114
Schizophrenia = HCC 57
Seizure Disorders and Convulsions = HCC 79

SOURCE: RTI International analysis of 2014-2015 Medicare 100% data and RTI International analysis of 2014-2015 Medicare 100% institutional sample.

Table 5. 2019 Payment HCC Count Model Relative Factors for Aged and Disabled New Enrollees

	Non-Medicaid & Non-Originally Disabled	Medicaid & Non-Originally Disabled	Non-Medicaid & Originally Disabled	Medicaid & Originally Disabled
Female				
0-34 Years	0.804	0.969	-	-
35-44 Years	0.947	1.202	-	-
45-54 Years	1.015	1.305	-	-
55-59 Years	1.016	1.307	-	-
60-64 Years	1.122	1.408	-	-
65 Years	0.520	0.993	1.122	1.462
66 Years	0.515	0.897	1.174	1.887
67 Years	0.544	0.919	1.174	1.887
68 Years	0.597	0.950	1.174	1.887
69 Years	0.600	0.950	1.174	1.887
70-74 Years	0.690	0.985	1.174	1.887
75-79 Years	0.860	1.133	1.174	1.887
80-84 Years	1.014	1.352	1.174	1.887
85-89 Years	1.293	1.535	1.293	1.887
90-94 Years	1.293	1.701	1.293	1.887
95 Years or Over	1.293	1.701	1.293	1.887
Male				
0-34 Years	0.442	0.734	-	-
35-44 Years	0.657	1.059	-	-
45-54 Years	0.864	1.353	-	-
55-59 Years	0.903	1.418	-	-
60-64 Years	0.921	1.550	-	-
65 Years	0.517	1.144	0.921	1.811
66 Years	0.533	1.094	1.071	2.198
67 Years	0.582	1.151	1.123	2.198
68 Years	0.626	1.202	1.123	2.198
69 Years	0.690	1.202	1.319	2.198
70-74 Years	0.785	1.298	1.408	2.198
75-79 Years	1.059	1.407	1.408	2.198
80-84 Years	1.246	1.555	1.408	2.198
85-89 Years	1.497	1.777	1.497	2.198
90-94 Years	1.497	1.777	1.497	2.198
95 Years or Over	1.497	1.777	1.497	2.198

NOTES:

1. The denominator is $9,367.34.
2. For payment purposes, a new enrollee is a beneficiary who did not have 12 months of Part B eligibility in the data collection year. CMS-HCC new enrollee models are not based on diagnoses, but include factors for different age and gender combinations by Medicaid and the original reason for Medicare entitlement.

SOURCE: RTI International analysis of 2014-2015 100% Medicare data.

Table 6. 2019 Payment HCC Count Model Relative Factors for New Enrollees in Chronic Condition Special Needs Plans (C-SNPs)

	Non-Medicaid & Non-Originally Disabled	Medicaid & Non-Originally Disabled	Non-Medicaid & Originally Disabled	Medicaid & Originally Disabled
Female				
0-34 Years	1.521	1.783	-	-
35-44 Years	1.521	1.783	-	-
45-54 Years	1.521	2.018	-	-
55-59 Years	1.623	2.104	-	-
60-64 Years	1.693	2.132	-	-
65 Years	1.010	1.382	1.826	2.210
66 Years	1.010	1.382	1.826	2.210
67 Years	1.081	1.490	1.846	2.227
68 Years	1.118	1.563	1.846	2.254
69 Years	1.172	1.580	1.846	2.335
70-74 Years	1.319	1.791	2.015	2.428
75-79 Years	1.522	1.969	2.116	2.546
80-84 Years	1.748	2.177	2.472	2.733
85-89 Years	1.968	2.455	2.472	2.733
90-94 Years	2.153	2.633	2.472	2.733
95 Years or Over	2.153	2.633	2.472	2.733
Male				
0-34 Years	1.286	1.539	-	-
35-44 Years	1.286	1.539	-	-
45-54 Years	1.507	1.859	-	-
55-59 Years	1.640	2.046	-	-
60-64 Years	1.677	2.174	-	-
65 Years	0.989	1.533	1.679	2.182
66 Years	0.989	1.533	1.679	2.182
67 Years	1.026	1.650	1.734	2.185
68 Years	1.091	1.650	1.753	2.185
69 Years	1.148	1.650	1.809	2.185
70-74 Years	1.353	1.968	1.945	2.414
75-79 Years	1.589	2.127	2.078	2.488
80-84 Years	1.838	2.252	2.342	2.768
85-89 Years	2.096	2.584	2.342	2.768
90-94 Years	2.349	2.584	2.342	2.768
95 Years or Over	2.349	2.584	2.342	2.768

NOTES:

1. The denominator is $9,367.34
2. For payment purposes, a new enrollee is a beneficiary who did not have 12 months of Part B eligibility in the data collection year. CMS-HCC new enrollee models are not based on diagnoses, but include factors for different age and gender combinations by Medicaid and the original reason for Medicare entitlement.

SOURCE: RTI International analysis of 2014-2015 100% Medicare data.

Table 7. Disease Hierarchies for the 2019 Payment HCC Count Model

Hierarchical Condition Category (HCC)	If the Disease Group is Listed in this column…	…Then drop the Disease Group(s) listed in this column
	Hierarchical Condition Category (HCC) LABEL	
8	Metastatic Cancer and Acute Leukemia	9, 10, 11, 12
9	Lung and Other Severe Cancers	10, 11, 12
10	Lymphoma and Other Cancers	11, 12
11	Colorectal, Bladder, and Other Cancers	12
17	Diabetes with Acute Complications	18, 19
18	Diabetes with Chronic Complications	19
27	End-Stage Liver Disease	28, 29, 80
28	Cirrhosis of Liver	29
46	Severe Hematological Disorders	48
54	Drug/Alcohol Psychosis	55, 56
55	Drug/Alcohol Dependence, or Abuse/Use with Complications	56
57	Schizophrenia	58, 59, 60
58	Reactive and Unspecified Psychosis	59, 60
59	Major Depressive, Bipolar, and Paranoid Disorders	60
70	Quadriplegia	71, 72, 103, 104, 169
71	Paraplegia	72, 104, 169
72	Spinal Cord Disorders/Injuries	169
82	Respirator Dependence/Tracheostomy Status	83, 84
83	Respiratory Arrest	84
86	Acute Myocardial Infarction	87, 88
87	Unstable Angina and Other Acute Ischemic Heart Disease	88
99	Intracranial Hemorrhage	100
103	Hemiplegia/Hemiparesis	104
106	Atherosclerosis of the Extremities with Ulceration or Gangrene	107, 108, 161, 189
107	Vascular Disease with Complications	108
110	Cystic Fibrosis	111, 112
111	Chronic Obstructive Pulmonary Disease	112
114	Aspiration and Specified Bacterial Pneumonias	115
134	Dialysis Status	135, 136, 137, 138
135	Acute Renal Failure	136, 137, 138
136	Chronic Kidney Disease, Stage 5	137, 138
137	Chronic Kidney Disease, Severe (Stage 4)	138
157	Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone	158, 161
158	Pressure Ulcer of Skin with Full Thickness Skin Loss	161
166	Severe Head Injury	80, 167

How Payments are Made and Counts are Calculated with a Disease Hierarchy:

EXAMPLE: If a beneficiary triggers Disease Groups 135 (Acute Renal Failure) and 136 (Chronic Kidney Disease, Stage 5), then DG 136 will be dropped. In other words, payment and payment HCC counts will always be associated with the DG in column 1, if a DG in column 3 also occurs during the same collection period. Therefore, the organization's payment and payment HCC counts will be based on DG 135 rather than DG 136.

Table 8. 2019 All HCC Count Model Relative Factors for Continuing Enrollees

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
Female								
0-34 Years		-	0.149	-	0.267	-	0.256	0.861
35-44 Years		-	0.202	-	0.246	-	0.272	1.074
45-54 Years		-	0.220	-	0.255	-	0.272	1.001
55-59 Years		-	0.238	-	0.307	-	0.270	1.019
60-64 Years		-	0.273	-	0.360	-	0.268	1.016
65-69 Years		0.152	-	0.402	-	0.277	-	1.189
70-74 Years		0.198	-	0.487	-	0.319	-	1.091
75-79 Years		0.257	-	0.570	-	0.386	-	0.950
80-84 Years		0.339	-	0.717	-	0.464	-	0.814
85-89 Years		0.464	-	0.895	-	0.573	-	0.728
90-94 Years		0.623	-	1.042	-	0.711	-	0.599
95 Years or Over		0.662	-	1.121	-	0.820	-	0.448
Male								
0-34 Years		-	0.114	-	0.209	-	0.333	1.083
35-44 Years		-	0.141	-	0.186	-	0.209	0.982
45-54 Years		-	0.170	-	0.239	-	0.230	0.937
55-59 Years		-	0.207	-	0.322	-	0.256	0.989
60-64 Years		-	0.240	-	0.438	-	0.286	1.027
65-69 Years		0.174	-	0.476	-	0.327	-	1.251
70-74 Years		0.236	-	0.587	-	0.380	-	1.285
75-79 Years		0.304	-	0.700	-	0.451	-	1.266
80-84 Years		0.386	-	0.804	-	0.496	-	1.147
85-89 Years		0.520	-	1.018	-	0.611	-	1.054
90-94 Years		0.683	-	1.179	-	0.788	-	0.915
95 Years or Over		0.841	-	1.318	-	0.996	-	0.752

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
Medicaid and Originally Disabled Interactions								
Medicaid		-	-	-	-	-	-	0.065
Originally Disabled, Female		0.232	-	0.157	-	0.112	-	0.004
Originally Disabled, Male		0.157	-	0.169	-	0.066	-	0.004
Disease Coefficients	**Description Label**							
HCC1	HIV/AIDS	0.288	0.223	0.575	0.359	0.444	0.154	1.681
HCC2	Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	0.365	0.452	0.481	0.575	0.328	0.347	0.236
HCC6	Opportunistic Infections	0.362	0.720	0.537	0.816	0.274	0.649	0.517
HCC8	Metastatic Cancer and Acute Leukemia	2.560	2.605	2.476	2.725	2.357	2.563	1.229
HCC9	Lung and Other Severe Cancers	0.952	0.837	0.946	0.959	0.935	0.823	0.568
HCC10	Lymphoma and Other Cancers	0.601	0.586	0.653	0.704	0.580	0.600	0.397
HCC11	Colorectal, Bladder, and Other Cancers	0.228	0.247	0.246	0.279	0.253	0.266	0.226
HCC12	Breast, Prostate, and Other Cancers and Tumors	0.080	0.122	0.105	0.148	0.089	0.104	0.144
HCC17	Diabetes with Acute Complications	0.188	0.184	0.251	0.272	0.209	0.207	0.360
HCC18	Diabetes with Chronic Complications	0.188	0.184	0.251	0.272	0.209	0.207	0.360
HCC19	Diabetes without Complication	0.037	0.021	0.067	0.058	0.027	0.025	0.123
HCC21	Protein-Calorie Malnutrition	0.527	0.755	0.754	0.818	0.508	0.755	0.215
HCC22	Morbid Obesity	0.170	0.071	0.327	0.196	0.165	0.102	0.408
HCC23	Other Significant Endocrine and Metabolic Disorders	0.123	0.302	0.165	0.257	0.118	0.271	0.326
HCC27	End-Stage Liver Disease	0.856	1.064	1.090	1.134	0.733	0.884	0.842
HCC28	Cirrhosis of Liver	0.324	0.306	0.375	0.360	0.366	0.317	0.453

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC29	Chronic Hepatitis	0.085	0.255	-	0.261	0.134	0.192	0.453
HCC33	Intestinal Obstruction/Perforation	0.129	0.419	0.211	0.485	0.165	0.481	0.294
HCC34	Chronic Pancreatitis	0.195	0.506	0.297	0.722	0.297	0.552	0.383
HCC35	Inflammatory Bowel Disease	0.213	0.416	0.212	0.473	0.200	0.453	0.303
HCC39	Bone/Joint/Muscle Infections/Necrosis	0.357	0.336	0.545	0.684	0.409	0.411	0.373
HCC40	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.307	0.245	0.288	0.229	0.246	0.158	0.221
HCC46	Severe Hematological Disorders	1.337	3.518	1.193	4.252	1.214	4.080	0.764
HCC47	Disorders of Immunity	0.603	0.815	0.431	0.679	0.638	0.578	0.555
HCC48	Coagulation Defects and Other Specified Hematological Disorders	0.134	0.277	0.202	0.291	0.157	0.311	0.145
HCC54	Drug/Alcohol Psychosis	0.285	0.422	0.650	0.791	0.329	0.563	0.126
HCC55	Drug/Alcohol Dependence, or Abuse/Use with Complications	0.285	0.182	0.478	0.279	0.327	0.186	0.126
HCC56	Drug Abuse, Uncomplicated, Except Cannabis	0.285	0.143	0.478	0.257	0.327	0.186	0.126
HCC57	Schizophrenia	0.555	0.313	0.638	0.348	0.515	0.289	0.124
HCC58	Reactive and Unspecified Psychosis	0.450	0.308	0.638	0.190	0.513	0.201	0.124
HCC59	Major Depressive, Bipolar, and Paranoid Disorders	0.260	0.087	0.292	0.064	0.268	0.050	0.124
HCC60	Personality Disorders	0.260	0.044	0.292	0.046	0.217	0.026	-
HCC70	Quadriplegia	1.274	0.906	1.081	0.918	1.025	1.077	0.495
HCC71	Paraplegia	1.036	0.649	0.907	0.888	1.025	0.853	0.435
HCC72	Spinal Cord Disorders/Injuries	0.400	0.278	0.478	0.316	0.430	0.261	0.201

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC73	Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease	0.954	1.065	1.082	1.247	0.670	0.898	0.412
HCC74	Cerebral Palsy	0.276	0.037	-	-	0.070	-	-
HCC75	Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy	0.391	0.413	0.358	0.376	0.224	0.268	0.271
HCC76	Muscular Dystrophy	0.455	0.552	0.362	0.551	-	0.236	0.312
HCC77	Multiple Sclerosis	0.356	0.496	0.722	0.744	0.221	0.405	-
HCC78	Parkinson's and Huntington's Diseases	0.583	0.445	0.645	0.413	0.536	0.395	0.093
HCC79	Seizure Disorders and Convulsions	0.203	0.135	0.248	0.079	0.252	0.114	0.005
HCC80	Coma, Brain Compression/Anoxic Damage	0.553	0.305	0.582	0.169	0.733	0.188	-
HCC82	Respirator Dependence/Tracheostomy Status	1.030	0.818	2.186	1.507	0.843	0.789	1.602
HCC83	Respiratory Arrest	0.352	0.412	0.913	0.474	0.395	0.789	0.483
HCC84	Cardio-Respiratory Failure and Shock	0.236	0.326	0.453	0.474	0.311	0.282	0.255
HCC85	Congestive Heart Failure	0.198	0.288	0.271	0.308	0.206	0.255	0.123
HCC86	Acute Myocardial Infarction	0.151	0.208	0.368	0.449	0.267	0.337	0.316
HCC87	Unstable Angina and Other Acute Ischemic Heart Disease	0.134	0.208	0.257	0.395	0.223	0.337	0.316
HCC88	Angina Pectoris	0.057	0.018	-	0.084	0.080	0.071	0.316
HCC96	Specified Heart Arrhythmias	0.169	0.160	0.318	0.239	0.179	0.199	0.192
HCC99	Intracranial Hemorrhage	0.194	0.171	0.389	0.561	0.204	0.140	0.040

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC100	Ischemic or Unspecified Stroke	0.194	0.102	0.389	0.325	0.204	0.140	0.040
HCC103	Hemiplegia/Hemiparesis	0.455	0.272	0.504	0.303	0.458	0.306	-
HCC104	Monoplegia, Other Paralytic Syndromes	0.296	0.217	0.336	0.215	0.257	0.130	-
HCC106	Atherosclerosis of the Extremities with Ulceration or Gangrene	1.441	1.489	1.692	1.752	1.464	1.506	0.806
HCC107	Vascular Disease with Complications	0.317	0.418	0.514	0.640	0.401	0.420	0.240
HCC108	Vascular Disease	0.198	0.217	0.227	0.193	0.213	0.243	0.031
HCC110	Cystic Fibrosis	0.389	2.520	0.407	3.344	0.290	2.896	0.526
HCC111	Chronic Obstructive Pulmonary Disease	0.238	0.117	0.352	0.204	0.261	0.135	0.215
HCC112	Fibrosis of Lung and Other Chronic Lung Disorders	0.105	0.117	0.068	0.156	0.095	0.119	-
HCC114	Aspiration and Specified Bacterial Pneumonias	0.593	0.347	0.715	0.465	0.594	0.311	0.070
HCC115	Pneumococcal Pneumonia, Empyema, Lung Abscess	0.099	-	0.244	-	0.077	0.083	0.070
HCC122	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.194	0.195	0.248	0.238	0.163	0.180	0.360
HCC124	Exudative Macular Degeneration	0.453	0.214	0.221	0.078	0.319	0.076	0.147
HCC134	Dialysis Status	0.358	0.334	0.643	0.559	0.366	0.415	0.375
HCC135	Acute Renal Failure	0.358	0.334	0.643	0.559	0.366	0.415	0.375
HCC136	Chronic Kidney Disease, Stage 5	0.206	0.128	0.202	0.236	0.206	0.171	0.166
HCC137	Chronic Kidney Disease, Severe (Stage 4)	0.206	-	0.202	0.040	0.206	-	0.113
HCC138	Chronic Kidney Disease, Moderate (Stage 3)	-	-	-	-	-	-	-
HCC157	Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone	2.146	2.138	2.526	2.634	2.180	2.546	0.764

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC158	Pressure Ulcer of Skin with Full Thickness Skin Loss	1.150	1.276	1.526	1.422	1.242	1.018	0.234
HCC161	Chronic Ulcer of Skin, Except Pressure	0.459	0.549	0.713	0.551	0.505	0.514	0.234
HCC162	Severe Skin Burn or Condition	0.164	0.412	0.118	0.269	-	0.237	-
HCC166	Severe Head Injury	0.553	0.305	0.582	0.169	0.733	0.188	-
HCC167	Major Head Injury	0.047	-	0.140	-	0.007	-	-
HCC169	Vertebral Fractures without Spinal Cord Injury	0.385	0.278	0.478	0.316	0.430	0.261	0.129
HCC170	Hip Fracture/Dislocation	0.286	0.328	0.387	0.433	0.293	0.292	-
HCC173	Traumatic Amputations and Complications	0.185	0.192	0.227	0.549	0.186	0.198	0.084
HCC176	Complications of Specified Implanted Device or Graft	0.494	0.813	0.642	0.949	0.453	0.765	0.414
HCC186	Major Organ Transplant or Replacement Status	0.791	0.394	0.680	0.829	0.389	0.586	1.010
HCC188	Artificial Openings for Feeding or Elimination	0.543	0.752	0.775	0.770	0.532	0.745	0.452
HCC189	Amputation Status, Lower Limb/Amputation Complications	0.543	0.437	0.826	0.976	0.705	0.636	0.338
Disease Interactions								
HCC47_gCancer	Immune Disorders*Cancer	0.879	0.528	0.861	0.750	0.683	0.656	-
Diabetes_CHF	Congestive Heart Failure*Diabetes	0.192	0.130	0.234	0.174	0.173	0.118	0.208
CHF_gCopdCF	Congestive Heart Failure*Chronic Obstructive Pulmonary Disease	0.231	0.231	0.282	0.294	0.225	0.257	0.228
HCC85_gRenal_V23	Congestive Heart Failure*Renal	0.252	0.578	0.237	0.671	0.267	0.548	-
gCopdCF_CARD_RESP_FAIL	Cardiorespiratory Failure*Chronic Obstructive Pulmonary Disease	0.439	0.492	0.580	0.616	0.449	0.596	0.464

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC85_HCC96	Congestive Heart Failure*Specified Heart Arrhythmias	0.169	0.401	0.197	0.497	0.179	0.421	-
gSubstanceAbuse_gPsychiatric_V23	Substance Abuse*Psychiatric	-	0.191	-	0.241	-	0.243	-
SEPSIS_PRESSURE_ULCER	Sepsis*Pressure Ulcer	-	-	-	-	-	-	0.243
SEPSIS_ARTIF_OPENINGS	Sepsis*Artificial Openings for Feeding or Elimination	-	-	-	-	-	-	0.565
ART_OPENINGS_PRESSURE_ULCER	Artificial Openings for Feeding or Elimination*Pressure Ulcer	-	-	-	-	-	-	0.367
gCopdCF_ASP_SPEC_BACT_PNEUM	Chronic Obstructive Pulmonary Disease*Aspiration and Specified Bacterial Pneumonias	-	-	-	-	-	-	0.268
ASP_SPEC_BACT_PNEUM_PRES_ULC	Aspiration and Specified Bacterial Pneumonias*Pressure Ulcer	-	-	-	-	-	-	0.504
SEPSIS_ASP_SPEC_BACT_PNEUM	Sepsis*Aspiration and Specified Bacterial Pneumonias	-	-	-	-	-	-	0.433
SCHIZOPHRENIA_gCopdCF	Schizophrenia*Chronic Obstructive Pulmonary Disease	-	-	-	-	-	-	0.426
SCHIZOPHRENIA_CHF	Schizophrenia*Congestive Heart Failure	-	-	-	-	-	-	0.134
SCHIZOPHRENIA_SEIZURES	Schizophrenia*Seizure Disorders and Convulsions	-	-	-	-	-	-	0.567
Disabled/Disease Interactions								
DISABLED_HCC85	Disabled, Congestive Heart Failure	-	-	-	-	-	-	0.290

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
DISABLED_PRESSURE_ULCER	Disabled, Pressure Ulcer	-	-	-	-	-	-	0.522
DISABLED_HCC161	Disabled, Chronic Ulcer of the Skin, Except Pressure Ulcer	-	-	-	-	-	-	0.483
DISABLED_HCC39	Disabled, Bone/Joint Muscle Infections/Necrosis	-	-	-	-	-	-	0.465
DISABLED_HCC77	Disabled, Multiple Sclerosis	-	-	-	-	-	-	0.435
DISABLED_HCC6	Disabled, Opportunistic Infections	-	-	-	-	-	-	0.427
All HCC Counts								
Z1	1 all HCCs	0.064	-	-	-	-	-	-
Z2	2 all HCCs	0.078	0.049	-	-	-	-	-
Z3	3 all HCCs	0.098	0.061	-	-	0.035	0.036	-
Z4	4 all HCCs	0.116	0.090	-	0.034	0.041	0.056	-
Z5	5 all HCCs	0.144	0.116	-	0.050	0.051	0.084	-
Z6	6 all HCCs	0.163	0.154	-	0.077	0.086	0.124	-
Z7	7 all HCCs	0.195	0.177	-	0.117	0.102	0.149	-
Z8	8 all HCCs	0.227	0.229	0.032	0.151	0.136	0.231	-
Z9	9 all HCCs	0.263	0.243	0.063	0.170	0.182	0.232	-
Z10	10 all HCCs	0.300	0.300	0.085	0.217	0.213	0.278	0.040
Z11	11 all HCCs	0.337	0.329	0.130	0.246	0.231	0.298	0.086
Z12	12 all HCCs	0.374	0.381	0.142	0.296	0.259	0.367	0.143
Z13	13 all HCCs	0.418	0.401	0.164	0.336	0.310	0.382	0.182
Z14	14 all HCCs	0.452	0.480	0.222	0.366	0.360	0.436	0.233
Z15P	15 or more all HCCs	0.718	0.821	0.481	0.742	0.627	0.782	0.540

NOTES:

1. The denominator is $9,388.55
2. In the "disease interactions" and "disabled interactions," the variables are defined as follows:
   Immune Disorders = HCC 47

Cancer = HCCs 8-12
Congestive Heart Failure = HCC 85
Diabetes = HCCs 17-19
Chronic Obstructive Pulmonary Disease = HCCs 110-112
Renal = HCCs 134-138
Cardiorespiratory Failure = HCCs 82-84
Specified Heart Arrhythmias = HCC 96
Substance Abuse = HCCs 54-56
Psychiatric = HCCs 57-60
Pressure Ulcer = HCCs 157-158
Chronic Ulcer of Skin, except Pressure = HCC 161
Bone/Joint/Muscle Infections/Necrosis = HCC 39
Multiple Sclerosis = HCC 77
Opportunistic Infections = HCC 6
Sepsis = HCC 2
Artificial Openings for Feeding or Elimination = HCC 188
Aspiration and Specified Bacterial Pneumonias = HCC 114
Schizophrenia = HCC 57
Seizure Disorders and Convulsions = HCC 79

SOURCE: RTI International analysis of 2014-2015 Medicare 100% data and RTI International analysis of 2014-2015 Medicare 100% institutional sample.

Table 9. 2019 All HCC Count Model Relative Factors for Aged and Disabled New Enrollees

	Non-Medicaid & Non-Originally Disabled	Medicaid & Non-Originally Disabled	Non-Medicaid & Originally Disabled	Medicaid & Originally Disabled
Female				
0-34 Years	0.802	0.967	-	-
35-44 Years	0.945	1.200	-	-
45-54 Years	1.013	1.302	-	-
55-59 Years	1.014	1.304	-	-
60-64 Years	1.119	1.405	-	-
65 Years	0.519	0.991	1.119	1.458
66 Years	0.514	0.895	1.171	1.883
67 Years	0.543	0.917	1.171	1.883
68 Years	0.596	0.948	1.171	1.883
69 Years	0.599	0.948	1.171	1.883
70-74 Years	0.688	0.983	1.171	1.883
75-79 Years	0.858	1.131	1.171	1.883
80-84 Years	1.011	1.349	1.171	1.883
85-89 Years	1.290	1.532	1.290	1.883
90-94 Years	1.290	1.697	1.290	1.883
95 Years or Over	1.290	1.697	1.290	1.883
Male				
0-34 Years	0.441	0.732	-	-
35-44 Years	0.656	1.057	-	-
45-54 Years	0.862	1.349	-	-
55-59 Years	0.901	1.415	-	-
60-64 Years	0.918	1.547	-	-
65 Years	0.516	1.141	0.918	1.807
66 Years	0.532	1.092	1.069	2.193
67 Years	0.581	1.148	1.121	2.193
68 Years	0.625	1.199	1.121	2.193
69 Years	0.688	1.199	1.316	2.193
70-74 Years	0.784	1.295	1.405	2.193
75-79 Years	1.057	1.404	1.405	2.193
80-84 Years	1.243	1.551	1.405	2.193
85-89 Years	1.494	1.773	1.494	2.193
90-94 Years	1.494	1.773	1.494	2.193
95 Years or Over	1.494	1.773	1.494	2.193

NOTES:

1. The denominator is $9,388.55.
2. For payment purposes, a new enrollee is a beneficiary who did not have 12 months of Part B eligibility in the data collection year. CMS-HCC new enrollee models are not based on diagnoses, but include factors for different age and gender combinations by Medicaid and the original reason for Medicare entitlement.

SOURCE: RTI International analysis of 2014-2015 100% Medicare data.

Table 10. Disease Hierarchies for the 2019 All HCC Count Model

Hierarchical Condition Category (HCC)	If the Disease Group is Listed in this column…	…Then drop the Disease Group(s) listed in this column	All HCC Count Model P - payment and count C - count only
	Hierarchical Condition Category (HCC) LABEL		
3	Bacterial, Fungal, and Parasitic Central Nervous System Infections	4	C
8	Metastatic Cancer and Acute Leukemia	9, 10, 11, 12, 13, 14, 15, 16	P
9	Lung and Other Severe Cancers	10, 11, 12, 13, 14, 15, 16	P
10	Lymphoma and Other Cancers	11, 12, 13, 14, 15, 16	P
11	Colorectal, Bladder, and Other Cancers	12, 13, 14, 15, 16	P
12	Breast, Prostate, and Other Cancers and Tumors	13, 14, 15, 16	P
13	Other Respiratory and Heart Neoplasms	14, 15, 16	C
14	Other Digestive and Urinary Neoplasms	15, 16	C
15	Other Neoplasms	16	C
17	Diabetes with Acute Complications	18, 19	P
18	Diabetes with Chronic Complications	19	P
27	End-Stage Liver Disease	28, 29, 30, 31, 80	P
28	Cirrhosis of Liver	29, 31	P
29	Chronic Hepatitis	31	P
30	Acute Liver Failure/Disease	31	C
46	Severe Hematological Disorders	48, 49	P
47	Disorders of Immunity	49	P
48	Coagulation Defects and Other Specified Hematological Disorders	49	P
50	Delirium and Encephalopathy	53	C
51	Dementia With Complications	52, 53	C
52	Dementia Without Complication	53	C
54	Drug/Alcohol Psychosis	55, 56, 202, 203	P
55	Drug/Alcohol Dependence, or Abuse/Use with Complications	56, 202, 203	P
56	Drug Abuse, Uncomplicated, Except Cannabis	202, 203	P
57	Schizophrenia	58, 59, 60, 61, 62, 63	P
58	Reactive and Unspecified Psychosis	59, 60, 61, 62, 63	P
59	Major Depressive, Bipolar, and Paranoid Disorders	60, 61, 62, 63	P
60	Personality Disorders	61, 62, 63	P
61	Depression	62, 63	C
62	Anxiety Disorders	63	C
64	Profound Intellectual Disability/Developmental Disorder	65, 66, 67, 68, 69	C
65	Severe Intellectual Disability/Developmental Disorder	66, 67, 68, 69	C
66	Moderate Intellectual Disability/Developmental Disorder	67, 68, 69	C
67	Mild Intellectual Disability, Autism, Down Syndrome	68, 69	C

Hierarchical Condition Category (HCC)	If the Disease Group is Listed in this column…	…Then drop the Disease Group(s) listed in this column	All HCC Count Model P - payment and count C - count only
68	Other Developmental Disorders	69	C
70	Quadriplegia	71, 72, 103, 104, 105, 169	P
71	Paraplegia	72, 104, 105, 169	P
72	Spinal Cord Disorders/Injuries	169	P
82	Respirator Dependence/Tracheostomy Status	83, 84	P
83	Respiratory Arrest	84	P
85	Congestive Heart Failure	94, 95	P
86	Acute Myocardial Infarction	87, 88, 89	P
87	Unstable Angina and Other Acute Ischemic Heart Disease	88, 89	P
88	Angina Pectoris	89	P
90	Heart Infection/Inflammation, Except Rheumatic	91, 93	C
91	Valvular and Rheumatic Heart Disease	93	C
92	Major Congenital Cardiac/Circulatory Defect	93	C
94	Hypertensive Heart Disease	95	C
96	Specified Heart Arrhythmias	97	P
99	Intracranial Hemorrhage	100, 101, 102	P
100	Ischemic or Unspecified Stroke	101, 102	P
101	Precerebral Arterial Occlusion and Transient Cerebral Ischemia	102	C
103	Hemiplegia/Hemiparesis	104, 105	P
104	Monoplegia, Other Paralytic Syndromes	105	P
106	Atherosclerosis of the Extremities with Ulceration or Gangrene	107, 108, 109, 161, 189, 190	P
107	Vascular Disease with Complications	108, 109	P
108	Vascular Disease	109	P
110	Cystic Fibrosis	111, 112, 113	P
111	Chronic Obstructive Pulmonary Disease	112, 113	P
112	Fibrosis of Lung and Other Chronic Lung Disorders	113	P
114	Aspiration and Specified Bacterial Pneumonias	115, 116	P
115	Pneumococcal Pneumonia, Empyema, Lung Abscess	116	P
121	Retinal Detachment	125	C
122	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	123, 125	P
123	Diabetic and Other Vascular Retinopathies	125	C
124	Exudative Macular Degeneration	125	P
134	Dialysis Status	135, 136, 137, 138, 139, 140, 141	P
135	Acute Renal Failure	136, 137, 138, 139, 140, 141	P
136	Chronic Kidney Disease, Stage 5	137, 138, 139, 140, 141	P
137	Chronic Kidney Disease, Severe (Stage 4)	138, 139, 140, 141	P
138	Chronic Kidney Disease, Moderate (Stage 3)	139, 140, 141	P

Hierarchical Condition Category (HCC)	If the Disease Group is Listed in this column…	…Then drop the Disease Group(s) listed in this column	All HCC Count Model P - payment and count C - count only
139	Chronic Kidney Disease, Mild or Unspecified (Stages 1-2 or Unspecified)	140, 141	C
140	Unspecified Renal Failure	141	C
146	Female Infertility	147, 148	C
147	Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	148	C
150	Ectopic and Molar Pregnancy	151, 155, 156	C
151	Miscarriage/Terminated Pregnancy	155, 156	C
152	Completed Pregnancy With Major Complications	153, 154, 155, 156	C
153	Completed Pregnancy With Complications	154, 155, 156	C
154	Completed Pregnancy With No or Minor Complications	155, 156	C
155	Uncompleted Pregnancy With Complications	156	C
157	Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone	158, 159, 160, 161	P
158	Pressure Ulcer of Skin with Full Thickness Skin Loss	159, 160, 161	P
159	Pressure Ulcer of Skin with Partial Thickness Skin Loss	160	C
162	Severe Skin Burn or Condition	163	P
166	Severe Head Injury	80, 167, 168	P
167	Major Head Injury	168	P
180	Extremely Immature Newborns, Including Birthweight < 1000 Grams	181, 182, 183, 184	C
181	Premature Newborns, Including Birthweight 1000-1499 Grams	182, 183, 184	C
182	Serious Perinatal Problem Affecting Newborn	183, 184	C
183	Other Perinatal Problems Affecting Newborn	184	C
186	Major Organ Transplant or Replacement Status	187	P
202	Drug Use, Uncomplicated, Except Cannabis	203	C

How Payments are Made and Counts Calculated with a Disease Hierarchy:

EXAMPLE: If a beneficiary triggers Disease Groups 135 (Acute Renal Failure) and 136 (Chronic Kidney Disease, Stage 5), then DG 136 will be dropped. In other words, payment and/or HCC counts will always be associated with the DG in column 1, if a DG in column 3 also occurs during the same collection period. Therefore, the organization's payment and HCCs eligible for counting will be based on DG 135 rather than DG 136. Column 4 identifies whether the HCC in column 1 is used for payment and payment HCC counts or for HCC counts only.

Table 11. 2019 CMS-HCC without Count Variables Model Relative Factors for Continuing Enrollees

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
Female								
0-34 Years		-	0.225	-	0.326	-	0.357	0.898
35-44 Years		-	0.297	-	0.322	-	0.387	1.103
45-54 Years		-	0.331	-	0.345	-	0.392	1.041
55-59 Years		-	0.363	-	0.404	-	0.389	1.062
60-64 Years		-	0.413	-	0.462	-	0.388	1.065
65-69 Years		0.316	-	0.427	-	0.347	-	1.241
70-74 Years		0.381	-	0.520	-	0.401	-	1.148
75-79 Years		0.452	-	0.613	-	0.479	-	1.013
80-84 Years		0.540	-	0.762	-	0.564	-	0.882
85-89 Years		0.668	-	0.942	-	0.680	-	0.799
90-94 Years		0.823	-	1.087	-	0.818	-	0.669
95 Years or Over		0.831	-	1.158	-	0.917	-	0.502
Male								
0-34 Years		-	0.143	-	0.220	-	0.367	1.098
35-44 Years		-	0.184	-	0.209	-	0.258	0.999
45-54 Years		-	0.226	-	0.280	-	0.288	0.961
55-59 Years		-	0.272	-	0.374	-	0.317	1.014
60-64 Years		-	0.315	-	0.499	-	0.349	1.058
65-69 Years		0.301	-	0.478	-	0.358	-	1.284
70-74 Years		0.388	-	0.597	-	0.420	-	1.326
75-79 Years		0.472	-	0.724	-	0.502	-	1.316
80-84 Years		0.564	-	0.837	-	0.554	-	1.208
85-89 Years		0.707	-	1.058	-	0.678	-	1.122
90-94 Years		0.872	-	1.220	-	0.862	-	0.990
95 Years or Over		1.021	-	1.359	-	1.077	-	0.822

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
Medicaid and Originally Disabled Interactions								
Medicaid		-	-	-	-	-	-	0.061
Originally Disabled, Female		0.248	-	0.168	-	0.133	-	0.001
Originally Disabled, Male		0.146	-	0.180	-	0.080	-	0.001
Disease Coefficients	**Description Label**							
HCC1	HIV/AIDS	0.344	0.294	0.604	0.410	0.491	0.213	1.723
HCC2	Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	0.428	0.527	0.534	0.658	0.393	0.411	0.332
HCC6	Opportunistic Infections	0.446	0.808	0.592	0.888	0.359	0.732	0.535
HCC8	Metastatic Cancer and Acute Leukemia	2.654	2.713	2.551	2.814	2.450	2.666	1.302
HCC9	Lung and Other Severe Cancers	1.027	0.919	1.007	1.028	1.004	0.899	0.623
HCC10	Lymphoma and Other Cancers	0.675	0.671	0.714	0.778	0.649	0.683	0.461
HCC11	Colorectal, Bladder, and Other Cancers	0.309	0.350	0.311	0.370	0.332	0.364	0.293
HCC12	Breast, Prostate, and Other Cancers and Tumors	0.153	0.221	0.161	0.230	0.160	0.197	0.211
HCC17	Diabetes with Acute Complications	0.307	0.354	0.344	0.432	0.331	0.379	0.442
HCC18	Diabetes with Chronic Complications	0.307	0.354	0.344	0.432	0.331	0.379	0.442
HCC19	Diabetes without Complication	0.106	0.123	0.108	0.149	0.089	0.125	0.179
HCC21	Protein-Calorie Malnutrition	0.554	0.799	0.788	0.857	0.556	0.797	0.275
HCC22	Morbid Obesity	0.262	0.200	0.389	0.318	0.247	0.226	0.460
HCC23	Other Significant Endocrine and Metabolic Disorders	0.212	0.417	0.228	0.355	0.197	0.371	0.379
HCC27	End-Stage Liver Disease	0.913	1.126	1.136	1.184	0.783	0.950	0.873
HCC28	Cirrhosis of Liver	0.381	0.365	0.421	0.416	0.426	0.382	0.486

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC29	Chronic Hepatitis	0.153	0.329	0.040	0.320	0.190	0.263	0.486
HCC33	Intestinal Obstruction/Perforation	0.243	0.551	0.289	0.606	0.267	0.608	0.355
HCC34	Chronic Pancreatitis	0.308	0.625	0.373	0.826	0.394	0.656	0.423
HCC35	Inflammatory Bowel Disease	0.315	0.536	0.287	0.576	0.292	0.564	0.357
HCC39	Bone/Joint/Muscle Infections/Necrosis	0.431	0.430	0.588	0.756	0.475	0.495	0.403
HCC40	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.426	0.378	0.374	0.349	0.357	0.282	0.293
HCC46	Severe Hematological Disorders	1.394	3.597	1.237	4.334	1.269	4.166	0.802
HCC47	Disorders of Immunity	0.683	0.910	0.476	0.759	0.703	0.654	0.577
HCC48	Coagulation Defects and Other Specified Hematological Disorders	0.214	0.360	0.249	0.363	0.221	0.385	0.192
HCC54	Drug/Alcohol Psychosis	0.368	0.564	0.709	0.912	0.415	0.700	0.178
HCC55	Drug/Alcohol Dependence, or Abuse/Use with Complications	0.368	0.283	0.524	0.358	0.400	0.282	0.178
HCC56	Drug Abuse, Uncomplicated, Except Cannabis	0.368	0.249	0.524	0.348	0.400	0.282	0.178
HCC57	Schizophrenia	0.606	0.372	0.697	0.398	0.589	0.327	0.188
HCC58	Reactive and Unspecified Psychosis	0.546	0.372	0.697	0.274	0.589	0.285	0.188
HCC59	Major Depressive, Bipolar, and Paranoid Disorders	0.353	0.176	0.365	0.141	0.350	0.123	0.188
HCC60	Personality Disorders	0.353	0.123	0.365	0.120	0.299	0.088	-
HCC70	Quadriplegia	1.338	1.031	1.141	1.032	1.083	1.185	0.562
HCC71	Paraplegia	1.121	0.764	0.968	0.995	1.083	0.972	0.501
HCC72	Spinal Cord Disorders/Injuries	0.519	0.403	0.568	0.426	0.547	0.377	0.290

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC73	Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease	1.026	1.131	1.139	1.286	0.740	0.968	0.475
HCC74	Cerebral Palsy	0.354	0.105	-	-	0.135	-	-
HCC75	Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy	0.491	0.518	0.430	0.461	0.313	0.360	0.332
HCC76	Muscular Dystrophy	0.533	0.631	0.409	0.609	-	0.304	0.357
HCC77	Multiple Sclerosis	0.441	0.582	0.774	0.822	0.299	0.484	0.033
HCC78	Parkinson's and Huntington's Diseases	0.686	0.552	0.715	0.524	0.628	0.495	0.162
HCC79	Seizure Disorders and Convulsions	0.277	0.226	0.308	0.171	0.321	0.204	0.065
HCC80	Coma, Brain Compression/Anoxic Damage	0.575	0.370	0.592	0.213	0.783	0.246	-
HCC82	Respirator Dependence/Tracheostomy Status	1.051	0.873	2.198	1.554	0.886	0.854	1.626
HCC83	Respiratory Arrest	0.404	0.496	0.954	0.590	0.439	0.854	0.512
HCC84	Cardio-Respiratory Failure and Shock	0.314	0.435	0.517	0.590	0.392	0.394	0.313
HCC85	Congestive Heart Failure	0.310	0.404	0.355	0.441	0.306	0.376	0.204
HCC86	Acute Myocardial Infarction	0.220	0.306	0.410	0.508	0.333	0.434	0.366
HCC87	Unstable Angina and Other Acute Ischemic Heart Disease	0.219	0.306	0.318	0.489	0.302	0.434	0.366
HCC88	Angina Pectoris	0.143	0.132	0.036	0.191	0.162	0.182	0.366
HCC96	Specified Heart Arrhythmias	0.271	0.276	0.390	0.344	0.267	0.305	0.253
HCC99	Intracranial Hemorrhage	0.276	0.257	0.443	0.613	0.281	0.223	0.108

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC100	Ischemic or Unspecified Stroke	0.276	0.188	0.443	0.398	0.281	0.223	0.108
HCC103	Hemiplegia/Hemiparesis	0.498	0.331	0.540	0.359	0.503	0.368	0.016
HCC104	Monoplegia, Other Paralytic Syndromes	0.368	0.300	0.380	0.302	0.333	0.203	0.016
HCC106	Atherosclerosis of the Extremities with Ulceration or Gangrene	1.537	1.588	1.779	1.836	1.556	1.599	0.881
HCC107	Vascular Disease with Complications	0.401	0.503	0.585	0.714	0.482	0.501	0.302
HCC108	Vascular Disease	0.305	0.327	0.318	0.306	0.312	0.348	0.094
HCC110	Cystic Fibrosis	0.509	2.646	0.497	3.469	0.401	3.018	0.601
HCC111	Chronic Obstructive Pulmonary Disease	0.335	0.244	0.430	0.333	0.356	0.269	0.311
HCC112	Fibrosis of Lung and Other Chronic Lung Disorders	0.216	0.235	0.154	0.273	0.199	0.231	0.109
HCC114	Aspiration and Specified Bacterial Pneumonias	0.612	0.371	0.732	0.515	0.610	0.333	0.160
HCC115	Pneumococcal Pneumonia, Empyema, Lung Abscess	0.164	-	0.286	0.063	0.133	0.147	0.160
HCC122	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.232	0.253	0.273	0.296	0.193	0.232	0.394
HCC124	Exudative Macular Degeneration	0.522	0.328	0.286	0.170	0.393	0.185	0.216
HCC134	Dialysis Status	0.474	0.461	0.729	0.671	0.481	0.538	0.472
HCC135	Acute Renal Failure	0.474	0.461	0.729	0.671	0.481	0.538	0.472
HCC136	Chronic Kidney Disease, Stage 5	0.284	0.227	0.251	0.333	0.276	0.265	0.245
HCC137	Chronic Kidney Disease, Severe (Stage 4)	0.284	0.089	0.251	0.125	0.271	0.023	0.201
HCC138	Chronic Kidney Disease, Moderate (Stage 3)	0.068	0.012	0.014	-	0.038	-	0.092
HCC157	Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone	2.112	2.157	2.512	2.646	2.144	2.574	0.838

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC158	Pressure Ulcer of Skin with Full Thickness Skin Loss	1.153	1.295	1.536	1.462	1.250	1.019	0.308
HCC161	Chronic Ulcer of Skin, Except Pressure	0.551	0.645	0.776	0.650	0.580	0.604	0.308
HCC162	Severe Skin Burn or Condition	0.262	0.537	0.195	0.378	-	0.371	-
HCC166	Severe Head Injury	0.575	0.370	0.592	0.213	0.783	0.246	-
HCC167	Major Head Injury	0.143	0.043	0.213	0.089	0.101	0.080	-
HCC169	Vertebral Fractures without Spinal Cord Injury	0.508	0.403	0.568	0.426	0.547	0.377	0.251
HCC170	Hip Fracture/Dislocation	0.406	0.441	0.481	0.543	0.411	0.391	-
HCC173	Traumatic Amputations and Complications	0.249	0.251	0.256	0.612	0.230	0.263	0.095
HCC176	Complications of Specified Implanted Device or Graft	0.609	0.957	0.713	1.063	0.556	0.893	0.475
HCC186	Major Organ Transplant or Replacement Status	0.855	0.472	0.734	0.892	0.455	0.648	1.039
HCC188	Artificial Openings for Feeding or Elimination	0.581	0.818	0.803	0.846	0.573	0.805	0.518
HCC189	Amputation Status, Lower Limb/Amputation Complications	0.567	0.487	0.837	1.007	0.738	0.684	0.365
Disease Interactions								
HCC47_gCancer	Immune Disorders*Cancer	0.847	0.490	0.843	0.718	0.661	0.633	-
Diabetes_CHF	Congestive Heart Failure*Diabetes	0.152	0.079	0.214	0.116	0.145	0.064	0.170
CHF_gCopdCF	Congestive Heart Failure*Chronic Obstructive Pulmonary Disease	0.191	0.190	0.256	0.239	0.196	0.215	0.191
HCC85_gRenal_V23	Congestive Heart Failure*Renal	0.202	0.520	0.215	0.587	0.234	0.488	-
gCopdCF_CARD_RESP_FAIL	Cardiorespiratory Failure*Chronic Obstructive Pulmonary Disease	0.384	0.429	0.542	0.529	0.410	0.526	0.415

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
HCC85_HCC96	Congestive Heart Failure*Specified Heart Arrhythmias	0.111	0.325	0.156	0.414	0.132	0.348	-
gSubstanceAbuse_gPsychiatric_V23	Substance Abuse*Psychiatric	-	0.164	-	0.220	-	0.224	-
SEPSIS_PRESSURE_ULCER	Sepsis*Pressure Ulcer	-	-	-	-	-	-	0.140
SEPSIS_ARTIF_OPENINGS	Sepsis*Artificial Openings for Feeding or Elimination	-	-	-	-	-	-	0.480
ART_OPENINGS_PRESSURE_ULCER	Artificial Openings for Feeding or Elimination*Pressure Ulcer	-	-	-	-	-	-	0.347
gCopdCF_ASP_SPEC_BACT_PNEUM	Chronic Obstructive Pulmonary Disease*Aspiration and Specified Bacterial Pneumonias	-	-	-	-	-	-	0.216
ASP_SPEC_BACT_PNEUM_PRES_ULC	Aspiration and Specified Bacterial Pneumonias*Pressure Ulcer	-	-	-	-	-	-	0.465
SEPSIS_ASP_SPEC_BACT_PNEUM	Sepsis*Aspiration and Specified Bacterial Pneumonias	-	-	-	-	-	-	0.347
SCHIZOPHRENIA_gCopdCF	Schizophrenia*Chronic Obstructive Pulmonary Disease	-	-	-	-	-	-	0.415
SCHIZOPHRENIA_CHF	Schizophrenia*Congestive Heart Failure	-	-	-	-	-	-	0.128
SCHIZOPHRENIA_SEIZURES	Schizophrenia*Seizure Disorders and Convulsions	-	-	-	-	-	-	0.573
Disabled/Disease Interactions								
DISABLED_HCC85	Disabled, Congestive Heart Failure	-	-	-	-	-	-	0.278

Variable	Description Label	Community, NonDual, Aged	Community, NonDual, Disabled	Community, FBDual, Aged	Community, FBDual, Disabled	Community, PBDual, Aged	Community, PBDual, Disabled	Institutional
DISABLED_PRESSURE_ULCER	Disabled, Pressure Ulcer	-	-	-	-	-	-	0.546
DISABLED_HCC161	Disabled, Chronic Ulcer of the Skin, Except Pressure Ulcer	-	-	-	-	-	-	0.478
DISABLED_HCC39	Disabled, Bone/Joint Muscle Infections/Necrosis	-	-	-	-	-	-	0.451
DISABLED_HCC77	Disabled, Multiple Sclerosis	-	-	-	-	-	-	0.468
DISABLED_HCC6	Disabled, Opportunistic Infections	-	-	-	-	-	-	0.407

NOTES:

1. The denominator is $9,367.51.
2. In the "disease interactions" and "disabled interactions," the variables are defined as follows:
   Immune Disorders = HCC 47
   Cancer = HCCs 8-12
   Congestive Heart Failure = HCC 85
   Diabetes = HCCs 17-19
   Chronic Obstructive Pulmonary Disease = HCCs 110-112
   Renal = HCCs 134-138
   Cardiorespiratory Failure = HCCs 82-84
   Specified Heart Arrhythmias = HCC 96
   Substance Abuse = HCCs 54-56
   Psychiatric = HCCs 57-60
   Pressure Ulcer = HCCs 157-158
   Chronic Ulcer of Skin, except Pressure = HCC 161
   Bone/Joint/Muscle Infections/Necrosis = HCC 39
   Multiple Sclerosis = HCC 77
   Opportunistic Infections = HCC 6
   Sepsis = HCC 2
   Artificial Openings for Feeding or Elimination = HCC 188
   Aspiration and Specified Bacterial Pneumonias = HCC 114
   Schizophrenia = HCC 57
   Seizure Disorders and Convulsions = HCC 79

SOURCE: RTI International analysis of 2014-2015 Medicare 100% data and RTI International analysis of 2014-2015 Medicare 100% institutional sample.

Table 12. 2019 CMS-HCC without Count Variables Model Relative Factors for Aged and Disabled New Enrollees

	Non-Medicaid & Non-Originally Disabled	Medicaid & Non-Originally Disabled	Non-Medicaid & Originally Disabled	Medicaid & Originally Disabled
Female				
0-34 Years	0.804	0.969	-	-
35-44 Years	0.947	1.202	-	-
45-54 Years	1.015	1.305	-	-
55-59 Years	1.016	1.307	-	-
60-64 Years	1.122	1.408	-	-
65 Years	0.520	0.993	1.122	1.462
66 Years	0.515	0.897	1.174	1.887
67 Years	0.544	0.919	1.174	1.887
68 Years	0.597	0.950	1.174	1.887
69 Years	0.600	0.950	1.174	1.887
70-74 Years	0.690	0.985	1.174	1.887
75-79 Years	0.860	1.133	1.174	1.887
80-84 Years	1.013	1.352	1.174	1.887
85-89 Years	1.293	1.535	1.293	1.887
90-94 Years	1.293	1.701	1.293	1.887
95 Years or Over	1.293	1.701	1.293	1.887
Male				
0-34 Years	0.442	0.734	-	-
35-44 Years	0.657	1.059	-	-
45-54 Years	0.864	1.353	-	-
55-59 Years	0.903	1.418	-	-
60-64 Years	0.920	1.550	-	-
65 Years	0.517	1.144	0.920	1.811
66 Years	0.533	1.094	1.071	2.198
67 Years	0.582	1.151	1.123	2.198
68 Years	0.626	1.202	1.123	2.198
69 Years	0.690	1.202	1.319	2.198
70-74 Years	0.785	1.298	1.408	2.198
75-79 Years	1.059	1.407	1.408	2.198
80-84 Years	1.246	1.555	1.408	2.198
85-89 Years	1.497	1.777	1.497	2.198
90-94 Years	1.497	1.777	1.497	2.198
95 Years or Over	1.497	1.777	1.497	2.198

NOTES:

1. The denominator is $9,367.51.
2. For payment purposes, a new enrollee is a beneficiary who did not have 12 months of Part B eligibility in the data collection year. CMS-HCC new enrollee models are not based on diagnoses, but include factors for different age and gender combinations by Medicaid and the original reason for Medicare entitlement.

SOURCE: RTI International analysis of 2014-2015 100% Medicare data.

Table 13. Disease Hierarchies for the 2019 CMS-HCC without Count Variables Model

Hierarchical Condition Category (HCC)	If the Disease Group is Listed in this column…	…Then drop the Disease Group(s) listed in this column
	Hierarchical Condition Category (HCC) LABEL	
8	Metastatic Cancer and Acute Leukemia	9, 10, 11, 12
9	Lung and Other Severe Cancers	10, 11, 12
10	Lymphoma and Other Cancers	11, 12
11	Colorectal, Bladder, and Other Cancers	12
17	Diabetes with Acute Complications	18, 19
18	Diabetes with Chronic Complications	19
27	End-Stage Liver Disease	28, 29, 80
28	Cirrhosis of Liver	29
46	Severe Hematological Disorders	48
54	Drug/Alcohol Psychosis	55, 56
55	Drug/Alcohol Dependence, or Abuse/Use with Complications	56
57	Schizophrenia	58, 59, 60
58	Reactive and Unspecified Psychosis	59, 60
59	Major Depressive, Bipolar, and Paranoid Disorders	60
70	Quadriplegia	71, 72, 103, 104, 169
71	Paraplegia	72, 104, 169
72	Spinal Cord Disorders/Injuries	169
82	Respirator Dependence/Tracheostomy Status	83, 84
83	Respiratory Arrest	84
86	Acute Myocardial Infarction	87, 88
87	Unstable Angina and Other Acute Ischemic Heart Disease	88
99	Intracranial Hemorrhage	100
103	Hemiplegia/Hemiparesis	104
106	Atherosclerosis of the Extremities with Ulceration or Gangrene	107, 108, 161, 189
107	Vascular Disease with Complications	108
110	Cystic Fibrosis	111, 112
111	Chronic Obstructive Pulmonary Disease	112
114	Aspiration and Specified Bacterial Pneumonias	115
134	Dialysis Status	135, 136, 137, 138
135	Acute Renal Failure	136, 137, 138
136	Chronic Kidney Disease, Stage 5	137, 138
137	Chronic Kidney Disease, Severe (Stage 4)	138
157	Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone	158, 161
158	Pressure Ulcer of Skin with Full Thickness Skin Loss	161
166	Severe Head Injury	80, 167

How Payments are Made and Counts are Calculated with a Disease Hierarchy:

EXAMPLE: If a beneficiary triggers Disease Groups 135 (Acute Renal Failure) and 136 (Chronic Kidney Disease, Stage 5), then DG 136 will be dropped. In other words, payment and payment HCC counts will always be associated with the DG in column 1, if a DG in column 3 also occurs during the same collection period. Therefore, the organization's payment and payment HCC counts will be based on DG 135 rather than DG 136.