# Risk Adjustment Research and Findings

**October 24, 2018**

**2:00 p.m. – 3:00 p.m. ET**

# Agenda

In response to stakeholder's request for additional information on the Payment Condition Count model proposed in the 2019 Advance Notice, the purpose of this Conference Call is to provide:

- A review of the legal requirements of the 21$^{st}$ Century Cures Act;

- A description of the model presented and discussed in the 2019 Advance Notice;

- An overview of CMS research leading to the two models with count variables presented in Part I of the 2019 Advance Notice.

- The final risk adjustment policies for PY2019.

- Findings from additional research on the Payment Condition Count model.

Following the presentation there will be an opportunity for discussion and questions with CMS staff.

# Legal Requirement of the 21st Century Cures Act

# Legal Requirements of the 21$^{st}$ Century Cures Act

Key statutory changes to risk adjustment under the 21$^{st}$ Century Cures Act include:

Section 1853(a)(1)(I) of the Social Security: IMPROVEMENTS TO RISK ADJUSTMENT FOR 2019 AND SUBSEQUENT YEARS.—

TAKING INTO ACCOUNT TOTAL NUMBER OF DISEASES OR CONDITIONS.— The Secretary shall take into account the total number of diseases or conditions of an individual enrolled in an MA plan. The Secretary shall make an additional adjustment under such subparagraph as the number of diseases or conditions of an individual increases.

# Legal Requirements of the 21$^{st}$ Century Cures Act

- EVALUATION OF MENTAL HEALTH AND SUBSTANCE USE DISORDERS.—The Secretary shall evaluate the impact of including to mental health and substance use disorders in the risk adjustment model.

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

# Legal Requirements of the 21st Century Cures Act

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

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

# Proposed PY 2019 Risk Adjustment Model

- In response to the 21st Century Cures Act requirements, CMS proposed the Payment Condition Count model in Part I of the 2019 Advance Notice, released December 27, 2017.
- This proposed model incorporated changes under existing authorities and those granted by the 21st Century Cures Act.
  - Maintained six community segments based on reason for entitlement (age or disability) and Medicaid eligibility (full benefit, partial benefit, and not dual eligible)
  - Updated data years to 2014 diagnoses predicting 2015 cost
  - Identified diagnoses from FFS claims using the same approach used to identify diagnoses used to calculate Encounter Data–based risk scores
  - Included additional HCCs for each community and institutional segment for Mental Health, Substance Use Disorder, and Chronic Kidney Disease
  - Included additional variables that accounted for the number of payment conditions a beneficiary may have.

# Alternative Risk Adjustment Model Discussed in 2019 Advance Notice

- We also discussed another model that counted conditions.
- This alternative model incorporated the following changes.
  - Maintained six community segments based on reason for entitlement (age or disability) and Medicaid eligibility (full benefit, partial benefit, and not dual eligible)
  - Updated data years to 2014 diagnoses predicting 2015 cost
  - Identified diagnoses from FFS claims using the same approach used to identify diagnoses used to calculate Encounter Data based risk scores
  - Included additional HCCs for each community and institutional segment for Mental Health, Substance Use Disorder, and Chronic Kidney Disease
  - Included additional variables that accounted for the number of total conditions a beneficiary may have

# Additional Risk Adjustment Model Presented in 2019 Advance Notice

- A third model was presented for comparison. This is the model we finalized for PY2019.

- This additional model incorporated the following changes.
  - Maintained six community segments based on reason for entitlement (age or disability) and Medicaid eligibility (full benefit, partial benefit, and not dual eligible)
  - Updated data years to 2014 diagnoses predicting 2015 cost
  - Identified diagnoses from FFS claims using the same approach used to identify diagnoses used to calculate Encounter Data based risk scores
  - Included additional HCCs for each community and institutional segment for Mental Health, Substance Use Disorder, and Chronic Kidney Disease

# Analytic Model Development

# Developing the Proposed 2019 Risk Adjustment Model

- To assess how to add a count of conditions to the model, we initially estimated approximately twenty different analytic 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.

- These analytic models were compared to a single community segment that was also calibrated for our analyses with 2014 diagnoses predicting 2015 FFS cost and without condition count variables.

- The analytic models differed by what was counted (payment or non-payment conditions) and how the count was included in the model.

# Developing the Proposed 2019 Risk Adjustment Model

**Payment Conditions**

- Single Continuous Integer Counter (starting at 2)
- Single Continuous Integer Counter (starting at 3)
- 5 Dummy Variables (1,2,3,4,5+)
- Dummy Variables (2,3,4,5+)
- Dummy Variables (3,4,5+)
- Dummy Variables (4,5,6,7,8, 9, 10+)
- Dummy Variables (5,6,7,8,9,10,11,12,13,14,15+)
- Grouped Dummies      (4-6, 7-9, 10-11, 12-14, 15+)
- Single Dummy  (4+)
- Single Dummy  (5+)

**All Conditions**

- Single continuous integer (starting at 1)
- 5 Dummy Variables (1,2,3,4,5+)
- 15 dummy Variables (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15+)
- Grouped Dummies  (1-4, 5-8, 9-14, 15+)
- Single Dummy (+5)
- Single Dummy (+10

# Developing the Proposed 2019 Risk Adjustment Model

For our initial model development work, we assessed models based on how well they improved the prediction of medical expenditures.

Three metrics were used to evaluate the model's ability to predict medical expenditure:

- $R^2$

- Mean Absolute Prediction Error (MAPE)

- Predictive Ratio by decile of predicted risk and count of chronic condition

We selected models for further development based on which one improved the most deciles by predicted expenditure and/or counts of chronic conditions.

# $R^2$ and Mean Absolute Prediction Error

| | | R-square | MAPE |
|---|---|---|---|
| Base Model | No Count Variables | 0.1323 | $ 11,546.24 |
| Payment Condition Count | Single Continuous Integer Counter (starting at 3) | 0.1323 | $ 11,546.15 |
| | Dummy Variables (4,5,6,7,8, 9, 10+) | 0.1326 | $ 11,548.07 |
| | Grouped Dummies (4-6, 7-9, 10-11, 12-14, 15+) | 0.1327 | $ 11,548.16 |
| | Single Dummy (5+) | 0.1323 | $ 11,546.20 |
| All Condition Count | Single continuous integer (starting at 1) | 0.1374 | $ 11,392.42 |
| | 5 Dummy Variables (1,2,3,4,5+) | 0.1330 | $ 11,502.37 |
| | 15 dummy Variables (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15+) | 0.1357 | $ 11,424.81 |
| | Grouped Dummies (1-4, 5-8, 9-14, 15+) | 0.1355 | $ 11,434.53 |
| | Single Dummy (+5) | 0.1329 | $ 11,505.46 |
| | Single Dummy (+10 | 0.1339 | $ 11,483.34 |

# Deciles of Predicted Risk
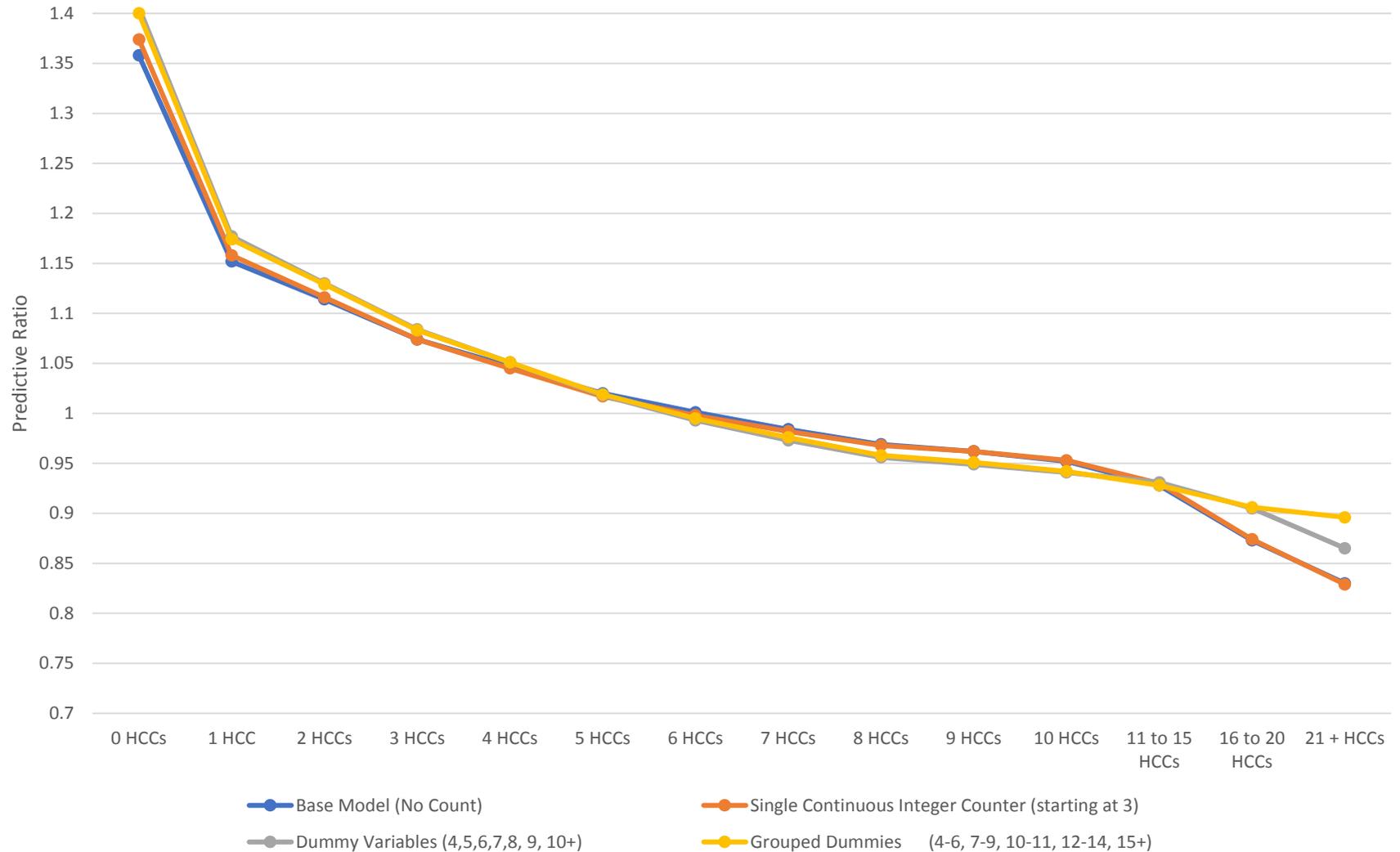# Select Payment Condition Count Models
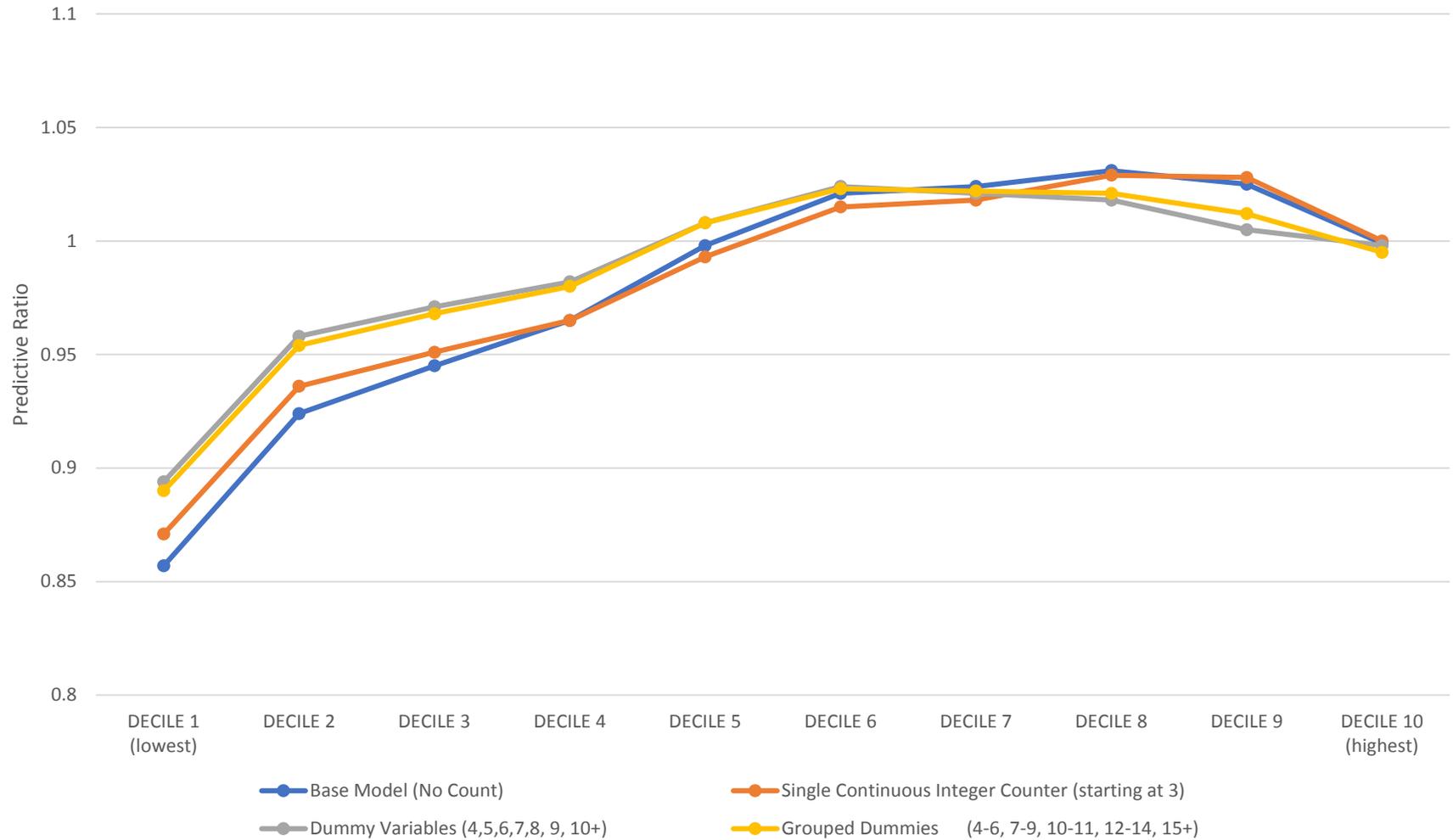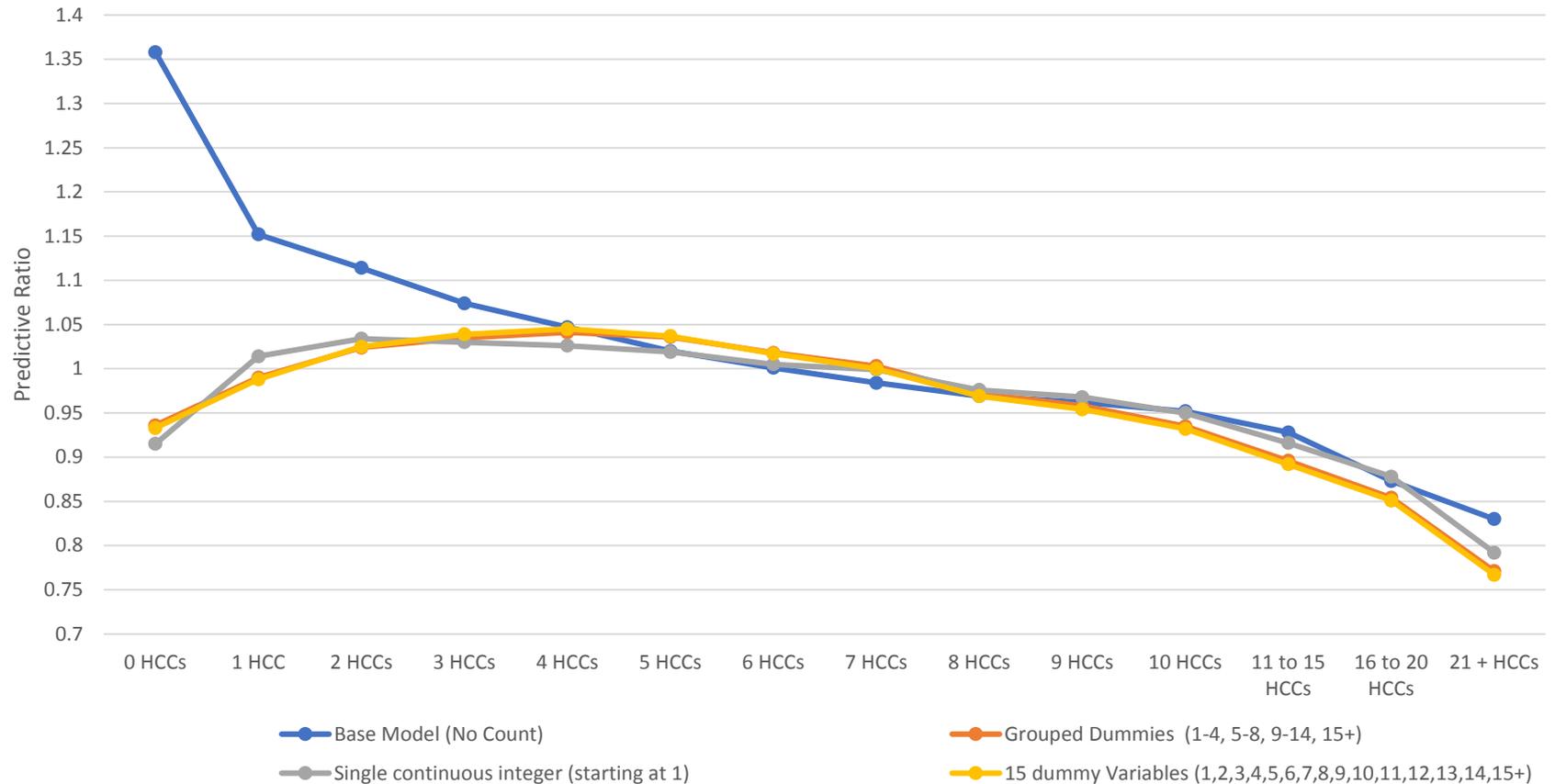
# Deciles of Predicted Risk
# Select All Condition Count Models
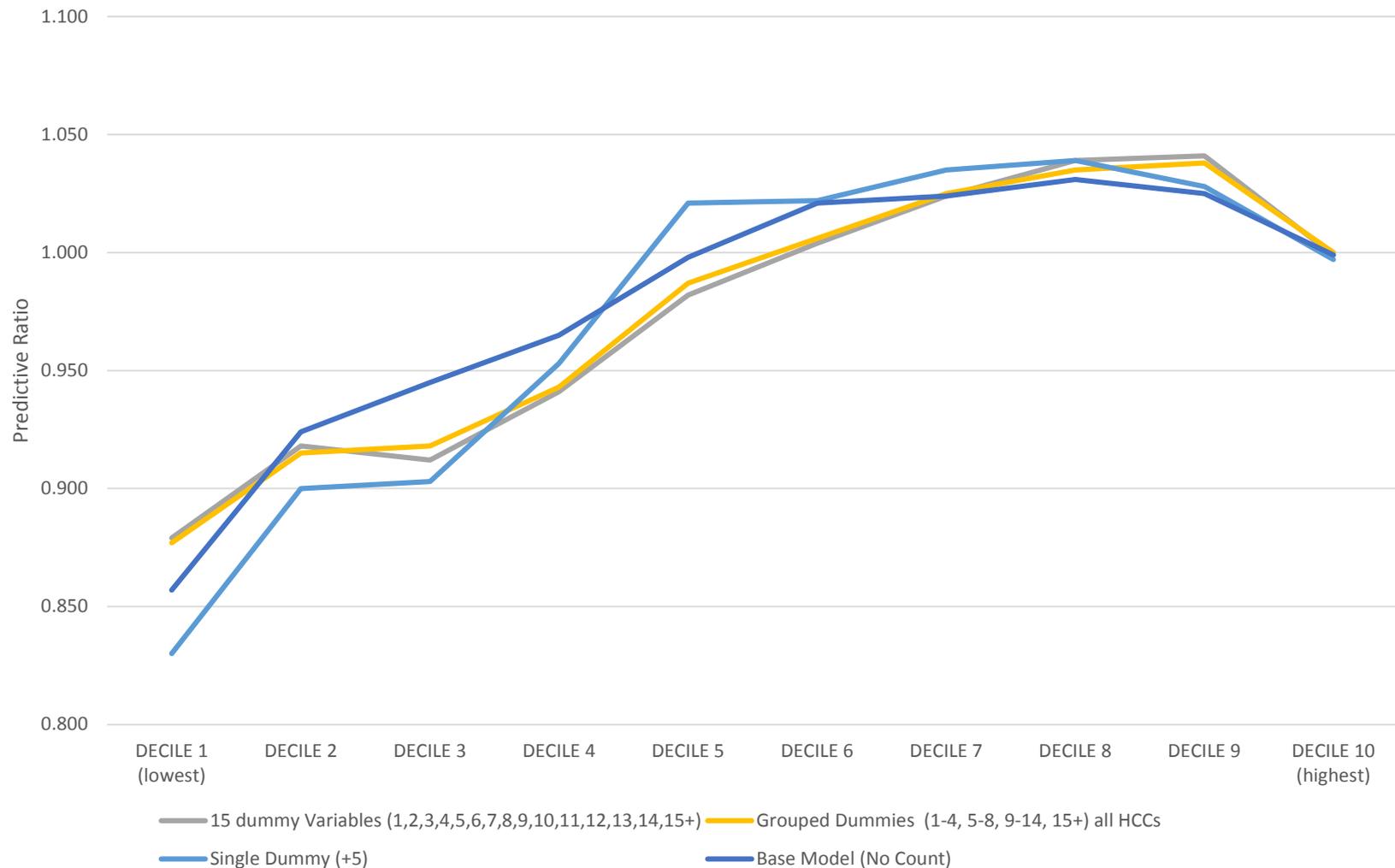
# Count of Chronic Conditions
# (Payment Condition Count Models)

# Count of Chronic Conditions (All Condition Count Models)

# Model Development Considerations

- The goal of the CMS-HCC risk adjustment model is to pay accurately across groups of beneficiaries by accurately predicting the average cost of each of these groups, thereby differentiating payments for beneficiaries with varying levels of risk compared to 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 for groups of beneficiaries.

- We selected models to propose with individual dummy variables specifying the number of conditions a beneficiary may have. These models better improved prediction by decile of risk and made an additional adjustment as the number of conditions increased, which was required by the law.

# Model Development Considerations: Count Variables

- If count variables are started at "1," in many instances the count variable coefficients are negative.
  - This is because the count variables are correlated with the HCCs themselves.
  - Each count variable works with the HCCs to predict costs; since each count variable coefficient is standard across all combinations of HCCs of that number, the HCC coefficients increase and the count variable coefficients are negative.
  - The non-dual aged segment of the All Condition Count model is an exception in that count variables starting at 1 do not result in negative coefficients.
- We wanted to avoid negative coefficients on the count variables, so we started counting at a high enough count that the coefficients were positive.
  - The model still predicts cost accurately
  - We didn't want to discourage reporting additional diagnoses.

# Model Development Considerations: Count Variables

- We started the count in each segment high enough that the coefficients were positive and statistically significant (t statistic >2).
  - When we do this, 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.
- We also made decisions about where to stop counting (the last variable is for that number of conditions and higher numbers)
  - We first counted until the next count variable coefficient was no longer higher than the previous variable and/or was not statistically significant.
  - Based on discussions with clinicians, we believe there is a point where an increase in the number of conditions is no longer a meaningful indicator of additional clinical complexity.

# Final Model Specifications

In response to considerations on the previous slides we applied several additional specifications to the proposed "Payment Condition Count" model and the "All Condition Count" model discussed in the 2019 Advance Notice.

- Started the count of conditions where the variable was positive and statistically significant. Required count variables to increase monotonically. If the monotonicity requirement was violated the count variable was constrained to the next lowest count variable.
  - o Helps to ensure stability between years
  - o Encourages complete coding (avoids scenarios where reporting a diagnosis decreases the risk score)
- Capped the count variables to maintain meaningful cost prediction of the HCCs.
  - o Payment Condition Count model was capped at 10 or more HCCs.
  - o All Condition Count model was capped at 15 or more HCCs.

# Additional Information

# Additional Information Provided to Support Evaluation

In order to support the review and evaluation of CMS risk adjustment proposals for 2019, the following information has been provided on CMS website:

- ICD-9 diagnosis to HCC mapping for all v23 HCCs

- Software for the "Payment Condition Count" model, and "All Condition Count" model proposed in Part I of the 2019 Advance Notice

# Additional Findings

- The risk score impact of the different Payment Count Models are on average nearly identical to the Payment Count model Proposed for payment year 2019

- The chart on slide 27 shows differences in predicted cost between three Payment Condition Count models:  the model proposed for 2019, a model that counts payment conditions at a fixed rate per condition, and a model that counts payment conditions in grouped ranges.
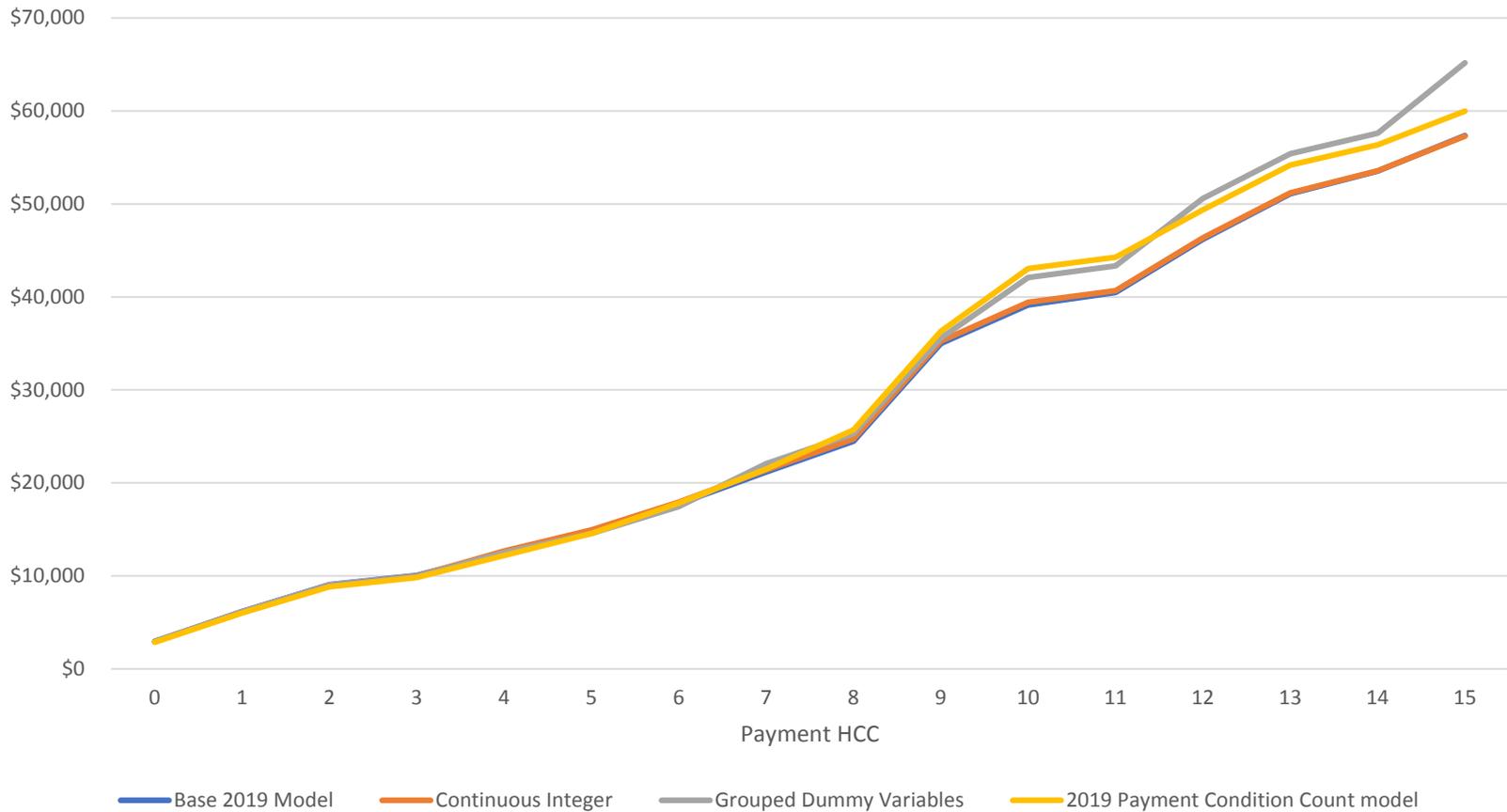
# Example: Non-Dual Aged Segment

This example is for a 65 – 69 year old male assigned to the non-dual aged segment of the community model. The following HCCs are added in numerical order.

| | | |
|---|---|---|
| HCC1 HIV/AIDS | HCC35 Inflammatory Bowel Disease | HCC88 Angina Pectoris |
| HCC11 Colorectal, Bladder, and Other Cancers | HCC54 Drug/Alcohol Psychosis | HCC114 Aspiration and Specified Bacterial Pneumonias |
| HCC19 Diabetes without complications | HCC59 Major Depressive, Bipolar, and Paranoid Disorders | HCC124 Exudative Macular Degeneration |
| HCC22 Morbid Obesity | HCC71 Paraplegia | HCC162 Severe Skin Burn or Condition |
| HCC33 Intestinal Obstruction/Perforation | HCC77 Multiple Sclerosis | HCC170 Hip Fracture/Dislocation |

# Example: Non-Dual Aged Segment



**Predicted expenditures by count of payment HCCs**

Legend: Base 2019 Model · Continuous Integer · Grouped Dummy Variables · 2019 Payment Condition Count model

# Additional Findings

Some commenters to the 2019 Advance Notice expressed concern about the impact of the updated models on the risk scores of full duals.

- Although the costs of full duals increased between the 2017 model (which was calibrated using 13/14 data) and models in the 2019 Advance Notice (which were calibrated using 14/15 data), it increased less than the average increase in costs.

- When costs for a group increase less than the average increase, their relative risk is decreased.

- This can happen with the coefficients for specific HCCs as well.

# Question and Answer

Comments or Questions related to this presentation may be submitted to [riskadjustment@cms.hhs.gov](mailto:riskadjustment@cms.hhs.gov)

**Your Feedback is important.**

**Thank You!**

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