

MEASURE INFORMATION ABOUT THE MEDICARE SPENDING PER BENEFICIARY, CALCULATED FOR THE 2015 MID-YEAR QRURs

A. Measure Names

Medicare Spending Per Beneficiary (MSPB)

B. Measure Description

The Medicare Spending Per Beneficiary (MSPB) Measure evaluates solo practitioners and groups of practitioners (including physicians) on their efficiency and is specialty-adjusted to account for the group's specialty mix. Solo practitioners and groups of practitioners (including physicians) are identified by their Taxpayer Identification Number (TIN). Specifically, the MSPB Measure assesses the cost to Medicare of services performed by TINs during an MSPB episode, which comprises the period immediately prior to, during, and following a patient's hospital stay.

C. Rationale

Medicare is transforming from a system that rewards volume of service to one that rewards efficient, effective care and reduces delivery system fragmentation. To advance this transformation, CMS provides financial incentives to hospitals based on their performance on selected quality measures. By measuring the cost of care through the MSPB Measure, CMS aims to reward TINs that can provide efficient care at a lower cost to Medicare.

The Centers for Medicare & Medicaid Services (CMS) uses the Per Capita Cost for All Attributed Beneficiaries Measure in combination with the Medicare Spending per Beneficiary (MSPB) and Per Capita Costs for Beneficiaries with Specific Conditions Measures to determine each TIN's relative cost of care. Information on TINs' performance on this measure is included in the Mid-Year and Annual Quality and Resource Use Reports (QRURs) and used in the calculation of the Value Modifier.

D. Measure Outcome (Numerator)

The numerator for a TIN's specialty-adjusted MSPB Measure is the TIN's average MSPB Amount, which is defined as the sum of standardized, risk-adjusted spending across all of a TIN's eligible episodes divided by the number of episodes for that TIN. This ratio is multiplied by the national average standardized episode cost. An MSPB episode includes all Medicare Part A and Part B claims with a start date falling between 3 days prior to an Inpatient Prospective Payment System (IPPS) hospital admission (also known as the "index admission" for the episode) through 30 days post-hospital discharge.

E. Population Measured (Denominator)

The denominator for a TIN's MSPB Measure is the specialty-adjusted MSPB expected cost based on the national specialty-specific expected cost of the specialties represented by the TIN's eligible professionals (EPs). Methodology for specialty-adjustment is discussed in the "Specialty adjustment" section below.

Beneficiary populations eligible to be included in the MSPB Measure are made up of beneficiaries who were enrolled in both Medicare Parts A and B for the period 93 days prior to IPPS hospital admission until 30 days after discharge from a short-term acute care hospital stay, where the stay occurs during the period of performance. Defining the population in this manner ensures that each beneficiary's claims record contains sufficient fee-for-service (FFS) data both for measuring spending levels and for risk adjustment purposes.

Only claims for beneficiaries admitted to subsection (d) hospitals during the period of performance are included in the calculation of the MSPB Measure. Subsection (d) hospitals are hospitals in the 50 States and D.C. other than: psychiatric hospitals, rehabilitation hospitals, hospitals whose inpatients are predominantly under 18 years old, hospitals whose average inpatient length of stay exceeds 25 days, and hospitals involved extensively in treatment for or research on cancer. The claims for inpatient admissions to subsection (d) hospitals are grouped into "stays" by beneficiary, admission date, and provider.

F. Exclusions

Beneficiary populations excluded from the MSPB calculation are those with episodes where at any time 93 days before admission through 30 days post-discharge, the beneficiary is enrolled in a Medicare Advantage plan, or Medicare is the secondary payer. Episodes where the beneficiary becomes deceased during the episode are also excluded. Regarding beneficiaries whose primary insurance becomes Medicaid during an episode due to exhaustion of Medicare Part A benefits, Medicaid payments made for services rendered to these beneficiaries are excluded; however, all Medicare Part A payments made before benefits are exhausted and all Medicare Part B payments made during the episode are included.

Further, any episode in which the index admission inpatient claim has a \$0 actual payment or a \$0 standardized payment is excluded. In addition, acute-to-acute transfers (where a transfer is defined based on the claim discharge code) are not considered index admissions. In other words, these cases do not generate new MSPB episodes; neither the hospital which transfers a patient to another subsection (d) hospital, nor the receiving subsection (d) hospital will have an index admission or associated MSPB episode attributed to them.

Admissions to hospitals that Medicare does not reimburse through the IPPS system (e.g., cancer hospitals, critical access hospitals, hospitals in Maryland) are not considered index admissions and are therefore not eligible to begin an MSPB episode. If an acute-to-acute hospital transfer or a hospitalization in a PPS-exempt hospital happens during the 30-days following discharge from an index admission, however, these post-discharge costs will count toward in the measure.

G. Data Collection Approach and Measure Collection

The MSPB Measure is calculated from all Medicare Parts A and B claims during the performance period that include inpatient hospital; outpatient; skilled nursing facility; home health; hospice; durable medical equipment, prosthetics, orthotics, and supplies (DMEPOS); and Medicare Part B carrier (non-institutional physician) claims. The measure also uses Medicare beneficiary enrollment data. This measure does not require any additional measure submission by groups. Medicare Part A and B claims are used to attribute beneficiaries to groups for this measure, as described below. Part D-covered prescription drug costs are not included in the calculation of the MSPB Measure.

H. Methodological Information and Measure Construction

Episode Definition. An MSPB episode includes all Medicare Part A and Part B claims with a start date falling between 3 days prior to an IPPS hospital admission (index admission) through 30 days post-hospital discharge. An episode includes the 30 days after a hospital discharge in order to emphasize the importance of care transitions and care coordination in improving patient care. Only discharges occurring at least 30 days before the end of the performance period are counted as index admissions. Admissions which occur within 30 days of discharge from another index admission are not considered to be index admissions.

Payments made by Medicare and the beneficiary (i.e., allowed charges) are counted in the MSPB episode as long as the start of the claim falls within the episode window of 3 days prior to the index admission through 30 days post-hospital discharge. IPPS outlier payments (and outlier payments in other provider settings) are also included in the calculation of the MSPB Measure.

Attribution. Each MSPB episode is attributed to the one TIN responsible for the plurality of Part B carrier (PB) services, as measured by Medicare allowed amounts, performed by EPs during the episode's index hospitalization. PB services are defined as all physician services that are billed on non-institutional claims. PB services during the episode's index hospitalization is the period between the admission date and discharge date of the hospital stay, inclusive. We consider any PB services billed by EPs on admission date and in a hospital setting, with place of service restricted to inpatient, outpatient, or emergency room hospital; or during the index hospital stay, regardless of place of service; or on discharge date and in an inpatient hospital.¹ If more than one TIN has the plurality of PB services and the same count of services during a given episode's index hospitalization, the MSPB episode is randomly attributed to one TIN.

Measure construction. The MSPB Measure is calculated using the following steps: (1) standardize Medicare payments included in MSPB episode costs, (2) calculate expected payment-standardized episode costs, (3) calculate risk-adjusted MSPB Amount, (4) calculate the specialty-adjusted expected cost, and (5) calculate the specialty-adjusted MSPB Measure. Below is a detailed outline of each step.

¹ There is no place of service restriction for the time during the index admission because a beneficiary may need to receive specialty services in other locations. This is rare, but occurs when certain services are not available at the admitting hospital (e.g., MRI in a nearby outpatient hospital or dialysis in an ESRD facility).

1. Calculate payment-standardized MSPB episode costs.

Calculate standardized spending during an episode by summing all the standardized Medicare claims payments made during the MSPB episode (i.e., between 3 days prior to the hospital admission until 30 days after discharge). More information about payment standardization is provided in the “Payment standardization” section below.

2. Calculate expected MSPB episode costs.

- a) To estimate the relationship between the independent variables described in the risk-adjustment section below (i.e., age, HCC, enrollment status, ESRD status, comorbidity interactions, long-term care, and MS-DRG) and standardized episode cost, the MSPB methodology uses an ordinary least squares (OLS) regression. Using a separate model for episodes within each major diagnostic category (MDC), these variables are regressed on standardized episode cost. The MDC is determined by the MS-DRG of the index hospital stay. The predicted values from this regression represent the expected spending for each episode.
- b) To prevent creating extreme expected cost values, truncate expected values at the 0.5th percentile.^{2, 3} In addition, renormalize the expected values to ensure that the average expected episode spending level for each MDC is the same before and after truncating. This renormalization occurs by multiplying the truncated expected values by the ratio of the average standardized spending level within each MDC and the average truncated expected spending level within each MDC.
- c) Calculate the residual for each episode as the difference between the standardized episode spending level and the truncated expected value of spending for that episode.
- d) Exclude outlier episodes, which are MSPB episodes whose residuals fall above the 99th percentile or below the 1st percentile of the distribution of residuals across all MSPB episodes. Excluding outliers based on residuals eliminates the episodes that deviate most from their expected values in absolute terms. Renormalize the expected values to ensure that the average expected episode spending levels are the same as average standardized spending levels after outlier exclusions. This renormalization multiplies the expected values after excluding outliers by the ratio of the average standardized spending level and the average truncated expected spending level after excluding outliers.

3. Calculate risk-adjusted MSPB Amounts for each TIN.

For each TIN, divide the ratio of the total standardized cost across that TIN’s associated, non-outlier episodes by the total expected and renormalized cost across that TIN’s non-outlier episodes. More information about the calculation of predicted costs is provided in

² In this memorandum, “truncate” is equivalent to “Winsorize.” Winsorization is a statistical transformation that limits extreme values in data to reduce the effect of possibly spurious outliers. Thus, all predicted values below the 0.5th percentile are assigned the value of the 0.5th percentile.

³ To ensure that the lowest predicted values within an MDC are adjusted even for MDCs with few episodes, this methodology first sets the lowest predicted value within the MDC to the second lowest predicted value within the MDC before truncating at the 0.5th percentile.

the “Risk Adjustment” section below. Multiplying this ratio by the total standardized cost averaged over the universe of attributed, non-outlier episodes gives the risk-adjusted MSPB Amount for each TIN.

4. Calculate the specialty-adjusted expected cost for each TIN.

Calculate a specialty-adjusted expected cost for each TIN from the national specialty-specific expected costs of all the specialties in the TIN. Methodology for specialty-adjustment calculation is discussed in the “Specialty adjustment” section below. For each TIN, weight the national specialty specific expected cost for each of its constituent specialties by those specialties’ shares of that TIN’s charges incurred by EPs. Summing these weighted specialty-specific costs within each TIN gives a TIN-level specialty-adjusted expected cost.

5. Calculate the specialty-adjusted MSPB Measure.

Calculate the specialty-adjusted MSPB Measure for each TIN by dividing the TIN MSPB Amount by the TIN’s specialty-adjusted expected cost. The ratio of the group’s MSPB Amount and the TIN’s specialty-adjusted expected cost is multiplied by the average standardized episode cost taken over all attributed, non-outlier episodes to create the TIN’s specialty-adjusted MSPB Measure.

Payment standardization. The MSPB Measure is payment standardized to take into account payment factors that are unrelated to the care provided (such as add-on payments for medical education and geographic variation in Medicare payment amounts). The standardized payment methodology achieves the following:

1. Eliminates adjustments made to national allowed payment amounts to reflect differences in regional labor costs and group expenses (measures by hospital wage indexes and geographic practice cost indexes).
 2. Eliminates payments to hospitals for larger program goals, including graduate medical education indirect medical education (IME); serving a disproportionate population of poor and uninsured (i.e., disproportionate share payments (DSH)); and payments associated with incentive payment programs.
 3. Substitutes a national amount for services paid on the basis of state fee schedules.
 4. Maintains differences in actual payments resulting from the choice of setting in which a service is provided, the choice of who provides the service, and the choice of whether to provide multiple services in the same encounter.
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Risk adjustment. To account for case-mix variation and other factors, the MSPB risk adjustment methodology incorporates expected costs that reflect the beneficiary’s age and severity of illness. Expected costs are calculated using a model that broadly follows the CMS-HCC risk adjustment methodology, which is derived from Medicare Part A and B claims and is

used in the Medicare Advantage (MA) program.⁴ Although the MA risk adjustment model includes 24 age/sex variables, the MSPB methodology does not adjust for sex and only includes 12 age categorical variables. Severity of illness is measured using 70 hierarchical condition category (HCC) indicators derived from the beneficiary's claims during the period 90 days prior to the start of the episode, an indicator of whether the beneficiary recently required long-term care, and the MS-DRG of the index hospitalization. As described above, episodes where the beneficiary is not enrolled in both Medicare Part A and Medicare Part B for the 90 days prior to the episode are excluded. This "look back period" captures beneficiaries' comorbidities for use in risk adjustment. The MSPB risk adjustment methodology also includes status indicator variables for whether the beneficiary qualifies for Medicare through disability or age and End-Stage Renal Disease (ESRD). In addition, the model accounts for disease interactions by including interactions between HCCs and/or enrollment status variables that are included in the MA model. Interaction terms are included because the presence of certain comorbidities increase costs in a greater way than predicted by the HCC indicators alone.⁵ The MSPB risk adjustment method does not control for the beneficiary's sex and race. Tables 1 through 6 in Section K present the final set of risk adjustment variables.

Specialty-adjustment. Specialty-adjustment accounts for TIN-level differences in specialty mix that can affect medical costs, regardless of the care provided. The MSPB Measure is specialty-adjusted so that TINs can be compared more fairly with their peers. Specialty-adjusted costs for a TIN with a disproportionate number of specialists with high-cost beneficiaries will be lower than the group's non-specialty-adjusted costs because the specialists with high-cost beneficiaries will generate expected costs that exceed the average cost across all TINs; similarly, specialty-adjusted costs will be higher than non-specialty-adjusted costs for TINs that have a disproportionate number of specialists with low-cost beneficiaries. The specialty-adjustment methodology uses three steps:

1. Compute national specialty-specific expected costs for each specialty

The national specialty-specific expected cost for each specialty is calculated as the weighted average of MSPB Amount where the weight for each TIN is that specialty's share of EPs in the TIN, multiplied by specialty's number of EPS in the TIN and number of episodes in the TIN.

2. Compute the specialty-adjusted expected cost for each TIN

For each TIN, the specialty-specific expected cost (calculated in Step 1) for each of its constituent specialties are weighted by those specialties' shares of the TIN's charges incurred by EPs. Summing these weighted specialty expected costs within each TIN gives a TIN-level specialty-adjusted expected cost.

⁴ Centers for Medicare and Medicaid Services, Office of the Actuary. "Announcement of Calendar Year (CY) 2009 Medicare Advantage Capitation Rates and Medicare Advantage and Part D Payment Policies." April 2008. <https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/downloads/announcement2009.pdf>

⁵ Centers for Medicare and Medicaid Services. Medicare Managed Care Manual, Chapter 7 – Risk Adjustment, Section 70.2.7 – Disease and Disabled Interactions. 2014. <https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/mc86c07.pdf>

3. Compute the specialty-adjusted MSPB Measure for each TIN.

The ratio of the TIN's MSPB Amount and the TIN's specialty-adjusted expected cost is multiplied by the average standardized episode cost taken over all attributed, non-outlier episodes to calculate specialty-adjusted MSPB Measure.

I. For Further Information

More information on the payment standardization algorithm,⁶ the Physician Feedback/Value-Based Payment Modifier Program, and how the Condition-Specific Total Per Capita Cost measure is used in calculations of the VM is located in the Detailed Methodology Document for the 2015 QRUR and 2017 VM found on the [CMS Physician Feedback Program QRUR webpage here](#).

J. References

Final details of MSPB episode construction and application in the Hospital Value-Based Purchasing (VBP) Program are in the [FY 2012 IPPS/LTCH PPS Final Rule](#) (76 FR 51618 through 51626) and the [FY 2013 IPPS/LTCH Final Rule](#).

K. Tables

The following tables present the final set of risk adjustment variables used to calculate expected MSPB episode costs, as referenced in Section H.

Table 1: Age Variables

Age Range	Description Label
0-34	Age between 0 and 34 years old
35-44	Age between 35 and 44 years old
45-54	Age between 45 and 54 years old
55-59	Age between 55 and 59 years old
60-64	Age between 60 and 64 years old
65-69	Age between 65 and 69 years old (reference category) ⁷
70-74	Age between 70 and 74 years old
75-79	Age between 75 and 79 years old
80-84	Age between 80 and 84 years old
85-89	Age between 85 and 89 years old
90-94	Age between 90 and 94 years old
95+	Age greater than or equal to 95 years old

⁶ The payment-standardization algorithm is also used for CMS' Medicare MSPB measure for the Hospital Value-Based Purchasing Program.

⁷ The 65-69 age indicator variable serves as the reference category and is omitted from the regression.

Table 2: Severity of Illness Measures (Hierarchical Condition Categories (HCCs) Included in the CMS-HCC Risk-Adjustment Model)

Indicator Variable	Description Label
HCC1	HIV/AIDS
HCC2	Septicemia/Shock
HCC5	Opportunistic Infections
HCC7	Metastatic Cancer and Acute Leukemia
HCC8	Lung, Upper Digestive, and Other Severe Cancers
HCC9	Lymphatic, Head and Neck, Brain, and Other Cancers
HCC10	Breast, Prostate, Colorectal, and Other Cancers and Tumors
HCC15	Diabetes with Renal or Peripheral Circulatory Manifestation
HCC16	Diabetes with Neurologic or Other Specified Manifestation
HCC17	Diabetes with Acute Complications
HCC18	Diabetes with Ophthalmologic or Unspecified Manifestation
HCC19	Diabetes without Complication
HCC21	Protein-Calorie Malnutrition
HCC25	End-Stage Liver Disease
HCC26	Cirrhosis of Liver
HCC27	Chronic Hepatitis
HCC31	Intestinal Obstruction/Perforation
HCC32	Pancreatic Disease
HCC33	Inflammatory Bowel Disease
HCC37	Bone/Joint/Muscle Infections/Necrosis
HCC38	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease
HCC44	Severe Hematological Disorders
HCC45	Disorders of Immunity
HCC51	Drug/Alcohol Psychosis
HCC52	Drug/Alcohol Dependence
HCC54	Schizophrenia
HCC55	Major Depressive, Bipolar, and Paranoid Disorders
HCC67	Quadriplegia, Other Extensive Paralysis
HCC68	Paraplegia
HCC69	Spinal Cord Disorders/Injuries
HCC70	Muscular Dystrophy
HCC71	Polyneuropathy
HCC72	Multiple Sclerosis
HCC73	Parkinson's and Huntington's Diseases
HCC74	Seizure Disorders and Convulsions
HCC75	Coma, Brain Compression/Anoxic Damage
HCC77	Respirator Dependence/Tracheostomy Status
HCC78	Respiratory Arrest
HCC79	Cardio-Respiratory Failure and Shock
HCC80	Congestive Heart Failure
HCC81	Acute Myocardial Infarction
HCC82	Unstable Angina and Other Acute Ischemic Heart Disease
HCC83	Angina Pectoris/Old Myocardial Infarction
HCC92	Specified Heart Arrhythmias
HCC95	Cerebral Hemorrhage
HCC96	Ischemic or Unspecified Stroke

Indicator Variable	Description Label
HCC100	Hemiplegia/Hemiparesis
HCC101	Cerebral Palsy and Other Paralytic Syndromes
HCC104	Vascular Disease with Complications
HCC105	Vascular Disease
HCC107	Cystic Fibrosis
HCC108	Chronic Obstructive Pulmonary Disease
HCC111	Aspiration and Specified Bacterial Pneumonias
HCC112	Pneumococcal Pneumonia, Empyema, Lung Abscess
HCC119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage
HCC130	Dialysis Status
HCC131	Renal Failure
HCC132	Nephritis
HCC148	Decubitus Ulcer of Skin
HCC149	Chronic Ulcer of Skin, Except Decubitus
HCC150	Extensive Third-Degree Burns
HCC154	Severe Head Injury
HCC155	Major Head Injury
HCC157	Vertebral Fractures without Spinal Cord Injury
HCC158	Hip Fracture/Dislocation
HCC161	Traumatic Amputations
HCC164	Major Complications of Medical Care and Trauma
HCC174	Major Organ Transplant Status
HCC176	Artificial Openings for Feeding or Elimination
HCC177	Amputation Status, Lower Limb/Amputation Complications

Table 3: Enrollment Status Variables

Indicator Variable	Description Label
ORIGDS	Originally Disabled.
ESRD	End-Stage Renal Disease

Table 4: Long-Term Care Variables

Indicator Variable	Description Label
LTC_Indicator	Long-Term Care

Table 5: Variable Interaction Terms

Indicator Variable	Description Label
DM_CHF	Diabetes Mellitus*Congestive Heart Failure
DM_CVD	Diabetes Mellitus*Cerebrovascular Disease
CHF_COPD	Congestive Heart Failure*Chronic Obstructive Pulmonary Disease
COPD_CVD_CAD	Chronic Obstructive Pulmonary Disease*Cerebrovascular Disease*Coronary Artery Disease
RF_CHF	Renal Failure*Congestive Heart Failure
RF_CHF_DM	Renal Failure*Congestive Heart Failure*Diabetes Mellitus
D_HCC5	Disabled, Opportunistic Infections
D_HCC44	Disabled, Severe Hematological Disorders
D_HCC51	Disabled, Drug/Alcohol Psychosis
D_HCC52	Disabled, Drug/Alcohol Dependence
D_HCC107	Disabled, Cystic Fibrosis

Table 6: Indicator Variable

Indicator Variable	Description Label
MS-DRGs	For a complete list of all MS-DRGs, see the Table 5 in the download section of this CMS FY2012 Final Rule and Correction Notice webpage .