



Risk Adjustment in the Expanded HHVBP Model

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Risk Adjustment in the Expanded HHVBP Model

The expanded Home Health Value-Based Purchasing (HHVBP) Model uses risk adjustment to allow for meaningful comparisons of quality measure performance between home health agencies (HHAs).

What is Risk Adjustment?

Risk adjustment is a statistical process that considers patients' underlying health conditions, functional status, and other characteristics when predicting health care use and health outcomes to level the playing field by accounting for HHAs' different case-mix profiles. Risk adjustment accounts for differences in risk factors so that providers' performance on measures is not disproportionately affected by accepting certain types of patients, thereby reducing incentives for providers to selectively accept or decline patients. **In the expanded HHVBP Model, all applicable quality measures are risk-adjusted.**

This resource provides the following information –

- 1) A summary of applicable quality measures included in the CY 2025 and CY 2026 measure sets, including measure definition, interpretation, and range (see **Exhibit 1**)
- 2) A high-level summary of the risk adjustment approach by applicable measure and where to find additional details on each measure's specifications (see **Exhibit 2**). Note that risk adjustment approaches differ by measure or measure category.
- 3) Contact information for questions related to HHVBP and other relevant help desks (see "Contact Us").
- 4) A detailed description of the risk adjustment approach by applicable measure (see "Appendix"). **Note that the step-by-step language in the appendix does not include every detail needed to replicate measure calculation and requires consulting the additional risk adjustment resources listed in Exhibit 2.**

Exhibit 1. Applicable Measure Details for CY 2025 and CY 2026 Performance Years

Quality Measure	When Included (Y/N)?		Measure Details			
	CY 2025	CY 2026	Definition	Interpretation	Range	Data Source
OASIS-based						
Discharge Function Score (DC Function)	Y	Y	Percentage of HH quality episodes in which the observed discharge function score is equal to or greater than an expected discharge function score. <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH quality episodes (based on OASIS data) Minimum data threshold: 20
Improvement in Dyspnea	Y	Y	Percentage of HH quality episodes during which the patient became less short of breath or dyspneic. <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH quality episodes (based on OASIS data) Minimum data threshold: 20
Improvement in Management of Oral Medications	Y	Y	Percentage of HH quality episodes during which the patient improved in ability to take their medicines correctly (by mouth). <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH quality episodes (based on OASIS data) Minimum data threshold: 20
Improvement in Bathing	N	Y	Percentage of HH quality episodes during which the patient got better at bathing self. <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH quality episodes (based on OASIS data) Minimum data threshold: 20
Improvement in Upper Body Dressing	N	Y	Percentage of HH quality episodes during which the patient improved in ability to dress upper body. <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH quality episodes (based on OASIS data) Minimum data threshold: 20
Improvement in Lower Body Dressing	N	Y	Percentage of HH quality episodes during which the patient improved in ability to dress lower body. <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH quality episodes (based on OASIS data) Minimum data threshold: 20

Quality Measure	When Included (Y/N)?		Measure Details			
	CY 2025	CY 2026	Definition	Interpretation	Range	Data Source
Claims-based						
Home Health Within-Stay Potentially Preventable Hospitalization (PPH)	Y	Y	Percentage of HH stays with potentially preventable hospitalization or potentially preventable observation stays that occur within a HH stay for all eligible stays. <u>Note: This measure is a one-year measure.</u>	A lower measure value indicates better measure performance.	The measure value ranges from 0 (highest) to 100 (lowest).	HH stays (based on claims data) Minimum data threshold: 20
Discharge to Community-Post Acute Care (DTC-PAC)	Y	Y	Percentage of HH stays during which patients were discharged to the community, did not have an unplanned admission to an acute care hospital or LTCH in the 31 days following discharge to community, and remained alive in the 31 days following discharge to community. <u>Note: This measure is a two-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH stays (based on claims data) Minimum data threshold: 20
Medicare Spending Per Beneficiary-Post Acute Care (MSPB-PAC)	N	Y	Total Medicare spending during an HH payment episode and the 30 days following the episode, relative to the national median. <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates worse measure performance.	The measure value is expressed as a ratio, ranging from greater than zero (0) to any positive number since resource use cannot be negative. A measure value of less than 1 means the HHA's resource use is less than the national median HHA; greater than 1 means the HHA's resource use is higher than the national median HHA; and equal to 1 means the HHA's resource use is the same as the national median HHA.	HH payment episodes (based on claims data) Minimum data threshold: 20

Quality Measure	When Included (Y/N)?		Measure Details			
	CY 2025	CY 2026	Definition	Interpretation	Range	Data Source
HHCAHPS Survey-based						
Care of Patients	Y	N	Percentage of patients surveyed who said the HH team gave care in a professional way. <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH patient surveys (based on HHCAHPS data) Minimum data threshold: 40
Communication Between Providers and Patients	Y	N	Percentage of patients surveyed who said the HH team always communicated well. <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH patient surveys (based on HHCAHPS data) Minimum data threshold: 40
Specific Care Issues	Y	N	Percentage of patients surveyed who said the HH team discussed medicines, pain, and home safety with them. <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH patient surveys (based on HHCAHPS data) Minimum data threshold: 40
Overall Rating of Home Health Care	Y	Y	Percentage of patients surveyed who gave their HHA a 9 or 10 on a scale of 0 (lowest) to 10 (highest). <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH patient surveys (based on HHCAHPS data) Minimum data threshold: 40
Willingness to Recommend the Agency	Y	Y	Percentage of patient surveys surveyed who said yes, they would definitely recommend the HHA. <u>Note: This measure is a one-year measure.</u>	A higher measure value indicates better measure performance.	The measure value ranges from 0 (lowest) to 100 (highest).	HH patient surveys (based on HHCAHPS data) Minimum data threshold: 40

Exhibit 2. Risk Adjustment Approach by Applicable Measure for CY 2025 and CY 2026 Performance Years

Measure Category	Applicable Measures	Summary of Risk Adjustment Approach	Risk Adjustment Resources
OASIS-based	<ul style="list-style-type: none"> Improvement in Dyspnea Improvement in Management of Oral Medications Improvement in Bathing Improvement in Upper Body Dressing Improvement in Lower Body Dressing 	<p>HHA-level risk-adjusted measures are calculated as the HHA's observed rate + national predicted rate – HHA's predicted rate.</p> <p>First, calculate the HHA's observed rate for all HH quality episodes in a 12-month reporting period as the ratio of numerator and denominator defined as follows:</p> <ul style="list-style-type: none"> Calculate the denominator as the number of eligible HH quality episodes. Calculate the numerator as the number of HH episodes that patients improved in status at end of care (EOC) as compared to their status at start or resumption of care (SOC/ROC). <p>Next, calculate the predicted probability of improved status for each measure (also called predicted values) using statistical modeling controlling for patient-level characteristics:</p> <ul style="list-style-type: none"> Calculate HHA-level predicted rates as the average of all predicted values across HH quality episodes for the HHA. Calculate the national predicted rate as the average of all predicted values across HH quality episodes for all HHAs nationwide. <p>Finally, calculate the risk-adjusted measure values by adding the national predicted rate to the HHA's observed rate and subtracting the HHA's predicted rate.</p> <p>The risk-adjusted measure values are calculated first for each month and then across a 12-month period by averaging the HHA's monthly risk-adjusted rate weighted by the HHA's number of eligible quality episodes in each month over the 12-month period.</p> <p>If the calculated risk-adjusted measure value is greater than 100 percent, it is set to 100. If the calculated risk-adjusted measure value is smaller than zero percent, it is set to zero.</p> <p>Note: All applicable measures are rounded to the third decimal.</p> <p>Exhibit A-1 in the Appendix includes a more detailed, step-by-step description of this risk adjustment approach.</p>	<p>Found at Home Health Quality Measures CMS in the "Downloads" section:</p> <ul style="list-style-type: none"> Home Health Quality Reporting Program Quality Measure User's Manual (Chapter 6 describes how the risk-adjusted measure value is calculated; Chapter 7 outlines the measure specifications, see Table 7-11; Appendix A-3 shows the risk factor-specific coefficients used to risk-adjust the measure) Risk Adjustment Technical Specifications (Chapter 2 describes how the risk-adjusted measure value is calculated, Chapter 3 provides pseudo code to create risk factor-specific covariates, Appendix Table 2 shows the risk factor-specific coefficients used to risk-adjust the measure) Home Health Quality Measures (Overview of key measure metrics in tabular form, page 4)

Measure Category	Applicable Measures	Summary of Risk Adjustment Approach	Risk Adjustment Resources
OASIS-based	<ul style="list-style-type: none"> Discharge Function Score (DC Function) 	<p>This HHA-level risk-adjusted measure is calculated as <u>the proportion of HHA’s quality episodes where observed discharge function is equal to or greater than the expected discharge function.</u></p> <p>First, calculate the observed discharge score and expected discharge score for all eligible HH quality episodes in a 12-month reporting period, along with the difference between the observed and expected discharge scores.</p> <p>Then, split the HH quality episodes into two groups: (1) observed discharge function was <u>equal to or greater than</u> the expected discharge function and (2) observed discharge function was <u>lower than</u> the expected discharge function.</p> <p>Lastly, for each HHA, calculate the measure numerator as the number of episodes in group (1) and calculate the measure denominator as the number of episodes in groups (1) and (2). The resulting HHA-level risk-adjusted measure value is the ratio of numerator and denominator multiplied by 100.</p> <p><u>Note: All applicable measures are rounded to the third decimal.</u></p> <p>Exhibit A-2 in the Appendix includes a more detailed, step-by-step description of this risk adjustment approach.</p>	<p>Found at Home Health Quality Measures CMS in the “Downloads” section:</p> <ul style="list-style-type: none"> HHQRP - HHVBP Discharge Function Score Measure Overview (Measure overview) Home Health Quality Measures – Outcomes (Overview of key measure metrics in tabular form, page 6) Home Health Quality Reporting Program Quality Measure User’s Manual (Chapter 6 describes how the risk-adjusted measure value is calculated; Chapter 7 outlines the measure specifications) Risk Adjustment Technical Specifications (Chapter 4 provides pseudo code to create risk factor-specific covariates) Home Health Discharge Function Technical Report (Section 2 provides a measure overview and key features; Section 3 describes measure specifications, including denominator, numerator, imputation, and risk adjustment approach; Appendix A shows the risk factor-specific coefficients used to risk-adjust the measure) DC-Function-Imputation-Appendix-HH (XLSX) (provides details on imputation for missing OASIS data)

Measure Category	Applicable Measures	Summary of Risk Adjustment Approach	Risk Adjustment Resources
Claims-based	<ul style="list-style-type: none"> Home Health Within-Stay Potentially Preventable Hospitalization (PPH) Discharge to Community-Post Acute Care (DTC-PAC) 	<p>These HHA-level risk-adjusted measures are calculated as <u>the ratio of the HHA’s average predicted rate and the HHA’s average expected rate, multiplied by the observed national average.</u></p> <p>First, calculate predicted and expected values for all eligible HH stays using statistical modeling controlling for stay-level fixed effects and HHA-level random effects. The predicted values capture the outcome the statistical model <u>predicts</u> based on both patient characteristics and the agency’s own performance (i.e., accounting for both patient-level fixed and HHA-level random effects). The expected values capture the outcome the statistical model <u>expects</u> for a given patient if they were treated by an average HHA (i.e., accounting for patient-level fixed effects only).</p> <ul style="list-style-type: none"> For PPH, the expected and predicted values reflect the probability that the patient had a PPH event during the HH stay. For DTC-PAC, the predicted and expected values reflect the probability that the patient was discharged to the community without unplanned hospitalizations and no death in the 31 days following discharge. <p>Next, calculate the Standardized Risk Ratio (SSR) as the average <u>predicted</u> value across the HHA’s divided by the average <u>expected</u> value across the HHA’s stays.</p> <p>Finally, calculate the HHA’s risk-adjusted measure value as the product of the HHA’s SRR and the national average of the observed measure value.</p> <p>Note: All applicable measures are rounded to the third decimal.</p> <p>Exhibit A-3 in the Appendix includes a more detailed, step-by-step description of this risk adjustment approach.</p>	<p>Found at Home Health Quality Measures CMS in the “Downloads” section:</p> <p><u>PPH:</u></p> <ul style="list-style-type: none"> Home Health Quality Reporting Program Quality Measure User’s Manual (Chapter 2 provides a measure overview) Specifications for the Home Health Within-Stay Potentially Preventable Hospitalization Measure for the Home Health Quality Reporting Program (Measure specifications, including denominator, numerator, and risk adjustment approach) Home Health Quality Measures – Outcomes (Overview of key measure metrics in tabular form, page 11) <p><u>DTC-PAC:</u></p> <ul style="list-style-type: none"> Home Health Quality Reporting Program Quality Measure User’s Manual (Chapter 2 provides a measure overview) Proposed Specifications for HH QRP Quality Measures and Standardized Patient Assessment Data Elements (SPADEs) (Chapter 4 outlines measure specifications, including denominator, numerator, and risk adjustment approach) Home Health Quality Measures – Outcomes (Overview of key measure metrics in tabular form, page 8)

Measure Category	Applicable Measures	Summary of Risk Adjustment Approach	Risk Adjustment Resources
Claims-Based	<ul style="list-style-type: none"> Medicare Spending Per Beneficiary-Post Acute Care (MSPB-PAC) 	<p>This HHA-level risk-adjusted measure is calculated as the ratio of the HHA's average Medicare spending relative to the national median value. This calculation uses standardized payment amounts, which means all payments are adjusted to a common scale to allow for comparison across providers and regions. The calculation also uses statistical techniques to adjust for or remove outlier payments.</p> <p>First, for each payment episode, calculate predicted standardized episode spending using statistical modelling.</p> <p>Then, for each payment episode, calculate an episode-level spending ratio as the observed standardized spending value divided by predicted standardized spending value. Calculate the HHA's average episode spending ratio, defined as the HHA's average of the episode-level ratios.</p> <p>Finally, calculate the HHA's risk-adjusted measure value as the HHA's average episode spending ratio divided by the national median average episode spending ratio.</p> <p>Note: All applicable measures are rounded to the third decimal.</p> <p>Exhibit A-4 in the Appendix includes a more detailed, step-by-step description of this risk adjustment approach.</p>	<p>Found at Home Health Quality Measures CMS in the "Downloads" section:</p> <ul style="list-style-type: none"> Home Health Quality Reporting Program Quality Measure User's Manual (Chapter 2 provides a measure overview) Home Health Quality Measures – Outcomes (Overview of key measure metrics in tabular form, page 9) <p>Measure Specifications: Medicare Spending Per Beneficiary - Post-Acute Care Resource Use Measures (Measure specifications, including denominator, numerator, and risk adjustment approach)</p>

Measure Category	Applicable Measures	Summary of Risk Adjustment Approach	Risk Adjustment Resources
HHCAHPS Survey-Based	<ul style="list-style-type: none"> • Care of Patients • Communication Between Providers and Patients • Specific Care Issues • Overall Rating of Home Health Care • Willingness to Recommend the Agency 	<p>Prior to public reporting, HHAs' HHCAHPS Survey scores are adjusted for the effects of case mix. Case mix refers to characteristics of the patient that are not under control of the HHA that may affect reports of home health experiences. Case-mix adjustment is performed within each quarter of data after data cleaning. The current case-mix adjustment model includes the following variables: patient age, patient education, self-reported overall health, self-reported mental health, diagnosis of schizophrenia or dementia, whether the patient lives alone, whether the patient or a proxy answered the survey, and language in which the survey was completed. The model used and adjustments are updated quarterly and are available on the HHCAHPS website. Based on testing the revised survey in a 2022 Mode Experiment, CMS reviewed the variables included in the case-mix adjustment models currently in use for the HHCAHPS Survey to determine if any changes needed to be introduced along with the revised survey starting with the April 2026 sample month. We found that while no case-mix variables need to be added the diagnosis adjustments were no longer significant. As such, CMS dropped diagnoses of schizophrenia or dementia from the case-mix adjustment model with the revised survey.</p> <p><u>Note: All applicable measures are rounded to the third decimal.</u></p> <p>Exhibit A-5 in the Appendix includes a more detailed, step-by-step description of this risk adjustment approach.</p>	<p>Patient Survey Rating For Home Health Agencies Medicare (Measure overview)</p> <p>Calculating HHCAHPS Global Ratings and Composite Scores (Overview)</p> <p>HHCAHPS Stars Tech Notes Revised March 2016 (Technical specifications)</p> <p>Revised HHCAHPS Survey Mode Adjustments (Adjustment Values)</p> <p>Patient-Mix Adjustment Quarterly Memos (Starting with the July 2024-June 2025 data) (Summary Information)</p>

Contact Us

For questions regarding the expanded HHVBP Model, please contact the HHVBP Help Desk at HHVBPquestions@cms.hhs.gov.

Other help desks –

- For support with registration for the Internet Quality Improvement and Evaluation System ([iQIES](#)), please contact our **QIES/iQIES Service Center** by phone at **(800) 339-9313** or by email at iqies@cms.hhs.gov. You may also refer to the iQIES Onboarding Guide posted to QTSO for registration support: <https://qtso.cms.gov/software/iqies/reference-manuals>
- To receive email updates about the expanded Model, please subscribe to the [Expanded HHVBP Model listserv](#). Enter your email address in the contact form, then select “Home Health Value-Based Purchasing (HHVBP) Expanded Model” from the Innovations list.
- Please contact the **Home Health Quality Reporting Program (HH QRP) Help Desk** at homehealthqualityquestions@cms.hhs.gov for questions about the following: Home Health Quality, including Care Compare (excluding HHCAHPS), OASIS coding and OASIS documentation, quality reporting requirements & deadlines, data reported in quality reports, measure calculations, Quality of Patient Care Star Rating (excluding suppression requests), public reporting, risk adjustment, and Quality Assessment Only (QAO)/Pay for Reporting (P4P).
- Please contact the **Home Health CAHPS Help Desk** at hcahps@rti.org for questions related to the HHCAHPS Survey or Patient Survey Star Ratings.

Not sure which help desk to use? Check out the [Guide to Home Health Help Desks!](#)

Appendix

Exhibit A-1. Risk Adjustment Approach for Improvement in Bathing, Dyspnea, Management in Oral Medications, Upper Body Dressing, and Lower Body Dressing

Risk Adjustment Stage	Description of Steps
Calculate the monthly HHA's observed rate	<p>Step 1. Calculate the number of HH quality episodes that do not meet the exclusion criteria (i.e., eligible quality episodes).</p> <p>Step 2. Calculate the number of eligible HH quality episodes meeting numerator criteria.</p> <p>Step 3. Divide the numerator count (step 2) by the denominator count (step 1) to obtain the HHA's observed rate. For a definition of numerator and denominator counts, see "Home Health Quality Reporting Program Quality Measure User's Manual" at Home Health Quality Measures CMS in the "Downloads" section.</p>
Calculate the predicted value for each eligible HH quality episode nationally	<p>Step 4. Determine presence or absence of the risk factors for each HH quality episode. For a list of risk factors, see "Home Health Quality Reporting Program Quality Measure User's Manual" at Home Health Quality Measures CMS in the "Downloads" section.</p> <p>Step 5. Calculate the predicted value for each HH quality episode using:</p> <p>[1] Episode-level predicted value = $1 / [1 + e^{-X}]$ where e is the base of natural logarithms and X is a linear combination of the constant and the logistic regression coefficients times the covariate scores (from Formula [2], below).</p> <p>[2] Event occurred at end of care (EOC) (yes=1, no=0) = $B^0 + B^1 * COV^1 + B^2 * COV^2 + \dots + B^N * COV^N$ where B^0 is the logistic regression constant, B^1 is the logistic regression coefficient for the first covariate, COV^1 is the presence of the first risk factor covariate, etc. For a list of the regression coefficients, see "Home Health Quality Reporting Program Quality Measure User's Manual" at Home Health Quality Measures CMS in the "Downloads" section.</p>
Calculate the HHA's monthly predicted rate	<p>Step 6. Calculate the mean HHA-level predicted rate by averaging all episode-level predicted values for that HHA calculated in step 4.</p>
Calculate the national monthly predicted rate	<p>Step 7. Calculate the mean national-level predicted rate by averaging all episode-level predicted values calculated in step 4.</p>
Calculate the HHA's monthly risk-adjusted rate	<p>Step 8. Calculate the agency-level monthly risk-adjusted rate using the following formula:</p> <p>[3] HHA's risk-adjusted rate = HHA's observed rate + national predicted rate – HHA's predicted rate.</p>
Calculate the agency's 12-month risk adjusted measure value	<p>Step 9. Calculate the 12-month risk-adjusted measure value by averaging the HHA's monthly risk-adjusted rate weighted by the HHA's number of eligible quality episodes in each month over the 12-month period. If the calculated risk-adjusted measure value is greater than 100 percent, it is set to 100. If the calculated risk-adjusted measure value is smaller than zero percent, it is set to zero.</p>

Note: The step-by-step language in this exhibit does not include every detail needed to replicate measure calculation and requires consulting the additional risk adjustment resources listed in **Exhibit 2**.

Exhibit A-2. Risk Adjustment Approach for Discharge Function Score

Risk Adjustment Stage	Description of Steps
<p>Calculate the HHA's observed and expected discharge score for HH quality episodes in 12-month reporting period</p>	<p>Step 1. Calculate the observed discharge function score at discharge, as outlined in Section 3.4.1 in Home Health Discharge Function Technical Report. For details on when and how function scores are imputed, refer to Section 3.5 in Home Health Discharge Function Technical Report at Home Health Quality Measures CMS in the "Downloads" section.</p> <p>Step 2. Exclude HH quality episodes using the criteria mentioned in Section 3.3 in Home Health Discharge Function Technical Report at Home Health Quality Measures CMS in the "Downloads" section.</p> <p>Step 3. Calculate the expected discharge function score based on information submitted at start or resumption of care (SOC/ROC). For each HH quality episode, the intercept and regression coefficients are used to calculate the expected discharge function score using the formula mentioned in Section 3.6 in Home Health Discharge Function Technical Report at Home Health Quality Measures CMS in the "Downloads" section. Note: Any expected discharge function score greater than the maximum (i.e., 60) would be recoded to the maximum score.</p> <p>Step 4. Calculate the difference in observed and expected discharge score and classify the difference into 1) observed discharge function is equal to or greater than the expected discharge function or 2) observed discharge function is lower than the expected discharge function.</p>
<p>Calculate the HHA's discharge function score measure value based on HH episodes in 12-month reporting period</p>	<p>Step 5. Determine the denominator count (i.e., the number of HH quality episodes not meeting exclusion criteria, per step 2. This count is equivalent to summing the number of HH quality episodes where the difference between observed and expected discharge function is either equal to or greater than the expected discharge function and the number of HH quality episodes where the difference between observed and expected function is lower than the expected discharge function, as defined in step 4).</p> <p>Step 6. Determine the numerator count (i.e., the number of HH quality episodes in which the observed discharge function score is the equal to or greater than the expected discharge function score).</p> <p>Step 7. Calculate the HHA-level discharge function percent by dividing the HHA's numerator count (step 6) by its denominator count (step 5) and multiplying by 100.</p>

Note: The step-by-step language in this exhibit does not include every detail needed to replicate measure calculation and requires consulting the additional risk adjustment resources listed in **Exhibit 2**.

Exhibit A-3. Risk Adjustment Approach for Discharge to Community – Post Acute Care and Potentially Preventable Hospitalizations

Risk Adjustment Stage	Description of Steps
Calculate the HHA's predicted and expected values for each HH stay	<p>Step 1. Use hierarchical logistic regression method to predict the probability of the binary outcome measure occurring for each eligible home health stay. When computing the HHA effect, hierarchical modeling accounts for stay-level risk factors such as patient characteristics (i.e., the fixed effects) and an HHA-level random effect.</p> <ul style="list-style-type: none"> For <u>PPH</u>, the expected and predicted values reflect the probability that the patient had a PPH event during the HH stay. For <u>DTC-PAC</u>, the predicted and expected values reflect the probability that the patient was discharged to the community without unplanned hospitalizations and no death in the 31 days following discharge. <p>Step 2. The predicted values are calculated as the sum of the predicted probabilities from the fixed effects and the random effect.</p> <p>Step 3. The expected values are calculated as the sum of the predicted probabilities from the fixed effects only.</p>
Calculate the HHA's standardized risk ratio for each HHA	<p>Step 4. Calculate the Standardized Risk Ratio (SRR) for each HHA, equal to the average predicted value across all the HHA's stays, divided by the average expected value across all the HHA's stays. This ratio is a measure of the degree to which the outcome measures are higher or lower than what would otherwise be expected</p>
Calculate the HHA's risk-adjusted measure value	<p>Step 5. Calculate the risk-standardized measure value for each HHA as the SRR multiplied by the overall national observed rate for the outcome.</p>

Note: The step-by-step language in this exhibit does not include every detail needed to replicate measure calculation and requires consulting the additional risk adjustment resources listed in **Exhibit 2**.

Exhibit A-4. Risk Adjustment Approach for Medicare Spending Per Beneficiary – Post Acute Care

Risk Adjustment Stage	Description of Steps
Calculate Predicted Episode Payments	<p>Step 1. Estimate the relationship between risk factors and total standardized episode payments using ordinary least squares (OLS) regression.</p> <p>Step 2. Calculate predicted episode payments for each payment episode.</p> <p>Note: All risk adjustment steps are performed separately for the following HH MSPB-PAC episode types:</p> <ul style="list-style-type: none"> • HHA Standard, • HHA Low Utilization Payment Adjustment (LUPA), and • HHA Partial Episode Payment (PEP).
Winsorize (Bottom Code) Predicted Values	<p>Step 3. If the distribution of predicted values includes extremely low values, Winsorization is performed at the low end of the distribution (i.e., “bottom coding”). If a predicted value of a payment episode is less than the 0.5th percentile of predicted values, then the predicted bottom code value is equal to the 0.5th percentile of predicted values nationally. Otherwise, the predicted bottom code value is equal to the predicted value. If the distribution of predicted values does not have extremely low values, Winsorization is not required to ensure meaningful ratios of observed to predicted spending.</p> <p>Step 4. The resultant values are renormalized to maintain a consistent average episode payment. Renormalization multiplies the Winsorized predicted values by the ratio of the average original predicted payment and the average Winsorized predicted payment. This re-normalization ensures that the average of the resulting winsorized predicted values is equal to the average of the original predicted values.</p>
Calculate Residuals	<p>Step 5. The residuals for each payment episode are calculated as the difference between observed standardized episode spending and predicted standardized episode spending for each payment episode.</p>
Exclude Episodes with Outlier Residuals	<p>Step 6. Episodes with residuals below the 1st percentile or above the 99th percentile of the residual distribution are excluded. Predicted values after outlier exclusion are renormalized by multiplying each value by the ratio of the average standardized un-risk adjusted payments to the average of the standardized predicted payments remaining after exclusion of episodes with outlier residuals.</p>
Calculate the HHA’s MSPB-PAC Measure	<p>Step 7. Calculate for each episode predicted standardized episode spending using ordinary least squares (OLS) regression.</p> <p>Step 8. For each payment episode, calculate an episode spending ratio as the observed standardized episode spending divided by predicted standardized episode spending.</p> <p>Step 9. Calculate HHA-level average episode spending ratios as the average of the episode-level ratios within each HHA.</p> <p>Step 10. Calculate the risk-adjusted MSPB-PAC measure as each HHA’s average episode spending ratio divided by the national median average episode spending ratio across all HHAs.</p>

Note: The step-by-step language in this exhibit does not include every detail needed to replicate measure calculation and requires consulting the additional risk adjustment resources listed in **Exhibit 2**.

Exhibit A-5. Risk Adjustment Approach for HHCAHPS Survey-based Measures

Risk Adjustment Stage	Description of Steps
Calculate the quarter-specific raw HHCAHPS scores for the composite measures, overall rating, and willingness to recommend variables.	Step 1: Calculate the quarter-specific unadjusted scores for each HHA for each individual survey question.
Calculate the quarter-specific coefficients for the HHCAHPS patient-mix characteristic variables.	<p>Step 2: Calculate the quarter-specific national coefficients using Ordinary Least Squares regression analyses on each separate HHCAHPS response item for the identified patient characteristics.</p> <p>Step 3: Patient-mix adjustment factors are calculated directly from these national regression coefficients for each HHCAHPS response item by multiplying the coefficients by -1.0.</p>
Calculate the quarter-specific HHA's means on patient-mix characteristic variables.	Step 4: Calculate the mean HHA-level proportions of each patient mix characteristic variable.
Calculate the quarter-specific national means on the patient-mix characteristic variables.	Step 5: Calculate the national mean proportion of each patient mix characteristic variable.
Calculate the quarter-specific adjusted HHCAHPS scores using the regression coefficients to calculate a case-mix adjustment.	<p>Step 6: Calculate the HHA-level adjusted scores using the following formula:</p> $Y' = y + a1(h1 - m1) + a2(h2 - m2) + a3(h3 - m3) + \dots + a19(h19 - m19)$ <p>Where:</p> <p>Y' is the HHA's adjusted score for the respective HHCAHPS response item;</p> <p>Y is the HHA's unadjusted score, or mean on the respective unadjusted top box HHCAHPS response item as calculated in Step 1;</p> <p>a1 to a19 are the individual survey question-level adjustments for the patient characteristics in the table expressed as a national proportion rather than as a percentage as calculated in Steps 2 & 3;</p> <p>h1 to h19 are the HHA's mean proportions of patients with each of the patient characteristics in the same row as calculated in Step 4; and</p> <p>m1 to m19 are the national mean proportions of patients with each of the patient characteristics in Table 5 across the HHAs participating in HHCAHPS as calculated in Step 5.</p> <p>Step 7: Calculate the adjusted composite scores where:</p> <ul style="list-style-type: none"> Composite 1: Q9, Q16, Q19, and Q24 Composite 2: Q2, Q15, Q17, Q18, Q22, and Q23 Composite 3: Q3, Q4, Q5, Q10, Q12, Q13, and Q14
Calculate the HHA's 12-month adjusted score.	Step 8: Calculate the 12-month adjusted score by averaging the HHA's quarterly adjusted scores. The final adjusted HHCAHPS score is rounded to the nearest integer and expressed as a percentage.

Note: The step-by-step language in this exhibit does not include every detail needed to replicate measure calculation and requires consulting the additional risk adjustment resources listed in **Exhibit 2**.