# CATEGORICAL ADJUSTMENT INDEX (CAI) METHODOLOGY

*This attachment provides details of the methodology employed to select the adjusted measure set for the CAI and to calculate and apply the CAI values. In addition, the methodology to determine the LIS/DE indicator for plans operating solely in Puerto Rico is detailed.*

The Categorical Adjustment Index (CAI) was introduced in 2017 to address the average within-contract disparity in performance revealed through our research among beneficiaries who receive a low income subsidy, are dual eligible (LIS/DE), and/or are disabled. CMS developed the CAI as an interim analytical adjustment while we develop a long-term solution.

The adjustment factor varies by a contract's categorization into a final adjustment category that is determined by a contract's proportion of LIS/DE beneficiaries and beneficiaries with disability status. By design, the CAI values are monotonic and thus, contracts with larger LIS/DE and/or disability status percentages realize larger positive adjustments.

MA-PD contracts can have up to three mutually exclusive adjustments – one for the overall Star Rating and one for each of the summary ratings (Part C and Part D). MA-only contracts can have one adjustment for the Part C summary rating. PDPs can have one adjustment for the Part D summary rating.

## LIS/DE and DISABILITY STATUS DATA SOURCES

### *Data Sources for the Determination of the CAI values*

- Monthly enrollment files
- Social Security Administration and Railroad Retirement Board Record System
- Centers for Medicare & Medicaid Services Integrated Data Repository (IDR)

The development and calculation of the CAI values rely on the use of data from the previous year's Star Ratings Program. For example, the 2018 Star Ratings CAI values were determined using data from the 2017 Star Ratings year. The 2018 CAI values used data from the 2015 measurement period for all measures except CAHPS measures which, by design, employ data from the 2016 measurement period.

*The use of data from the previous year's Star Ratings Program allows the CAI values to be published in advance of their application. The CAI values are released in the draft Call Letter in February of the ratings' year.*

## PERCENTAGES OF LIS/DE and DISABILITY STATUS BENEFICIARIES

### *Contract Assignment*

A beneficiary is assigned to a contract based on his/her enrollment information using the December file of the Medicare enrollment data that aligns with the data used for the calculation of the CAI values. A beneficiary must have been alive for part or all of the month of December to be assigned to a contract and included in an enrollment count.

### *Contract Enrollment*

Contract enrollment for the development of the CAI is determined using the information from the contract assignment. Medicare enrollment data from the previous Star Ratings year's measurement year is used to determine contract enrollment, with the requirement that a beneficiary must have been alive for part or all of the month of December to be assigned to a contract.

### *Percentage of LIS/DE per Contract*

Once contract assignment per beneficiary is completed, the percentage of beneficiaries who are LIS/DE is determined using the monthly indicators in the Medicare enrollment data of the applicable measurement period. If a beneficiary was designated as full or partially dually eligible or received a LIS at any time during the applicable measurement period, the beneficiary is categorized as LIS/DE.

The percentage of LIS/DE for a contract is calculated as the quotient of the number of LIS/DE beneficiaries in a contract and the contract enrollment determined (using the method presented previously). To convert the proportion to a percentage, the quotient is multiplied by 100.

### *Percentage of Disability Status Beneficiaries per Contract*

The categorization of a beneficiary as disabled employs information from the Social Security Administration (SSA) and Railroad Retirement Board (RRB) record systems. Disability status is determined using the variable Original Reason for Entitlement (OREC) for Medicare. Disability status is assigned to beneficiaries if OREC is coded as a 1 or 3, and non-disability status is assigned to beneficiaries for all other codes.

OREC ORIGINAL REASON FOR ENTITLEMENT
0 = Beneficiary insured due to age
1 = Beneficiary insured due to disability
2 = Beneficiary insured due to ESRD
3 = Beneficiary insured due to disability and current ESRD
9 = None of the above

*If a beneficiary was originally eligible for Medicare because of disability, the beneficiary is categorized as having disability status even after they become age 65.*

The percentage of disablilityity status beneficiaries is calculated as the quotient of the number of disabled beneficiaries in a contract and the contract enrollment determined (using the method presented previously). To convert the proportion to a percentage, the quotient is multiplied by 100.

## ADJUSTED MEASURES

### *Adjusted Measure Selection*

The adjusted measure scores of a subset of the Star Ratings measures serve as the foundation for the determination of the CAI values. Measures are excluded as candidates for adjustment if the

measures are already case-mix adjusted for SES (for example, CAHPS and HOS outcome measures), if the focus of the measurement is not a beneficiary-level issue, but rather a plan or provider-level issue (for example, appeals, call center, Part D price accuracy measures), if the measure is scheduled to be retired or revised during the Star Rating year in which the CAI is being applied, or if the measure is applicable to only Special Needs Plans (SNPs) (for example, SNP Care Management, Care for Older Adults measures).

The selection of the adjusted measures from the subset of the Star Ratings measures (the subset of the measures refers to the measure set after applying the criteria in the preceding paragraph) is based on the analysis of the dispersion of the LIS/DE within-contract differences using all reportable numeric scores for all contracts required to report the measure in the previous ratings year. For the selection of the Part D measures, MA-PDs and PDPs are independently analyzed.

CMS employs a logistic mixed effects model that includes LIS/DE as a predictor, random effects for contract, and the interaction of contract and LIS/DE. For each contract, the proportion of beneficiaries receiving the measured clinical process or outcome for LIS/DE and non-LIS/DE beneficiaries is estimated separately, and the difference between the LIS/DE and non-LIS/DE performance rates per contract is calculated.

Using the results of all contracts that are included in the modelling, the measures for adjustment are selected by employing the following decision criteria: (1) the median absolute difference between LIS/DE and non-LIS/DE beneficiaries for all contracts analyzed is 5 percentage points or more or (2) the LIS/DE subgroup performed better or worse than the non-LIS/DE subgroup in all contracts.

In order to apply consistent adjustments across MA-PDs and PDPs, the Part D measures are selected by applying the selection criteria to MA-PDs and PDPs independently and, then, selecting measures that met the criteria for either delivery system. The set of Part D measures for MA-PDs and PDPs is the same after applying the selection criteria and pooling the Part D measures for MA-PDs and PDPs.

***Adjusted Measure Scores and Associated Measure-Level Stars***

The adjusted measures scores for the selected measures are determined using results from regression models of beneficiary-level measure scores that adjust for the average within-contract difference in measure scores for MA or PDP contracts. The approach used to determine the adjusted measure scores approximates case-mix adjustment using a beneficiary-level, logistic regression model with contract fixed effects and beneficiary-level indicators of LIS/DE and disability status, similar to the approach currently used to adjust CAHPS patient experience measures. However, unlike CAHPS case-mix adjustment, the only adjusters are LIS/DE and disability status.[1] A separate set of models using only contract fixed effects is used to calculate unadjusted scores of the subset of measures selected for the development of the CAI.

[1] If a measure specification requires adjustment for non-SES factors, the measure would be included in the candidate set and the specification would be followed for its analysis and if selected, for its adjustment. For example, Plan All-Cause Readmission, requires risk adjustment weights in the form of an offset term to align with the HEDIS specification. The risk adjustment weights are used in the LIS/DE disparity analysis. If the measure is selected as an adjusted measure, the risk adjustment weights would be included in the adjustment along with LIS/DE and disability status.

The sole purpose of the adjusted measure scores is for the determination of CAI values. The adjusted measure scores are converted to a measure-level rating using the measure thresholds (cut points) from the previous Star Ratings year.[2,3]

The measures selected for adjustment for the determination of the current Star Ratings CAI values are published in the draft Call Letter and noted in the Medicare Part C & D Star Ratings Technical Notes.

## CALCULATION OF CAI VALUES

As discussed previously, the adjusted measure scores are converted to measure-level star ratings using the cut points published in the Technical Notes for the applicable Star Ratings' year. Once all measures selected for adjustment have been converted to measure-level star ratings, the CAI values are determined by completing the following steps:

### *Creation and Assignment of Initial Categories Based on LIS/DE and Disabled Percentages*

(1) The distributions of the percentages of LIS/DE and disabled beneficiaries for all contracts that received ratings in the prior year are examined.
(2) The distributions are disaggregated into equal-sized groups using one dimension at a time (LIS/DE or disabled percentage). The lower and upper limit for each group is determined.
(3) Each contract is categorized into an LIS/DE group based on its percentage of LIS/DE beneficiaries.
(4) Each contract is categorized into a disabled group based on its percentage of disabled beneficiaries.
(5) Initial categories are formed using the information from the LIS/DE groups and the disabled groups. For example, if the LIS/DE distribution is disaggregated into 10 equal-sized LIS/DE groups and the disabled distribution is disaggregated into 5 equal-sized disabled groups, a total of 10 x 5 or 50 initial categories are formed using the information from both groupings. Table 1 illustrates the example of the creation of 50 initial categories based on 10 groups for LIS/DE (the columns of the matrix) and 5 groups for disabled (the rows in the matrix).

**Figure 1: Initial Categories**

| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | | |
| **2** | | | | | | | | | | |
| **3** | | | | | | | | | | |
| **4** | | | | | | | | | | |
| **5** | | | | | | | | | | |

[2] The thresholds (cut points) for the measures are determined using hierarchical clustering of the measure scores from all contracts required to report the measure for the applicable Star Ratings year.
[3] Since the CAI is added to or subtracted from the unadjusted Star Ratings, the reward factor is determined using unadjusted measure scores. In addition, the Part C and D improvement measures use unadjusted measure scores for both years being compared.

(6) Each contract is assigned to an initial category based on its categorization for LIS/DE and disabled.

*Note: Each initial category does not need to contain the same number of contracts. It is possible that some initial categories will have only a small number of contracts or perhaps no contracts based on the distribution of the contracts' percentages for LIS/DE and disabled beneficiaries.*

***Adjusted Overall and Summary Star Ratings (as applicable based on contract-type)***

(7) The adjusted overall and summary Star Ratings are calculated using the adjusted measure-level stars of the adjusted measures and all other unadjusted measure-level stars.

(8) The unadjusted overall and summary Star Ratings are calculated using unadjusted measure-level stars of the measures selected for adjustment and all other unadjusted measure-level stars.

(9) Within each of the initial categories by rating type (overall for MA-PDs, Part C summary for MA-PDs and MA-only, Part D summary for MA-PDs, and Part D summary for PDPs), the difference between the adjusted Star Rating and the corresponding unadjusted Star Rating is computed.

(10) Within each of the initial categories, the mean difference between the adjusted Star Rating and the corresponding unadjusted Star Rating is determined.

***Final Adjustment Categories***

(11) The mean differences for the initial categories per rating-type in step (10) are examined and the initial categories are collapsed to form final adjustment categories. The collapsing of the initial categories is done to enforce monotonicity in at least one dimension (LIS/DE or disabled) and would strive to achieve a minimum number of contracts (i.e. 30 contracts for MA-PD and 10 for PDPs) per final adjustment category.

*Note: Initial categories are combined such that, as the percentages of LIS/DE or disabled beneficiaries within a category increases and the other dimension does not decrease, the adjustment (value of the CAI) increases. The final adjustment categories will be created trying to have a minimum number of 30 contracts per each final MA adjustment group and 10 contracts per each final PDP adjustment group. The guideline for the number of contracts per final adjustment group is designed to maintain the stability of the estimates. If possible, final adjustment categories will be collapsed such that CAI values differ by at least 0.01 units in at least one of the two dimensions (LIS/DE and disability). (It may not always be possible to have final CAI category values differing by at least 0.01 units in at least one dimension given the goal of imposing monotonicity across both the DE/LIS and disability dimensions.)*

***CAI Values***

(12) Using the contracts that fall within each of the final adjustment categories for each rating-type, (overall for MA-PDs, Part C summary for MA-PDs and MA-only, Part D summary for MA-PDs, and Part D summary for PDPs ), the mean difference between the adjusted Star Rating and the corresponding unadjusted Star Rating is computed.

(13) The sets of mean differences within each rating-type's final adjustment categories found in Step (12) are the CAI values.

## APPLICATION OF THE CAI VALUES

The rating-specific CAI value is added to or subtracted from the corresponding unadjusted, unrounded Star Rating. The reward factor is determined using unadjusted scores. The unadjusted stars are created using the same methodology but using the unadjusted scores above.

### *HPMS CAI Page*

During the first plan preview period, contracts are provided their enrollment and associated percentages for LIS/DE and disabled for categorization into each rating-specific final adjustment category for the current Star Ratings. In addition, the rating-specific final adjustment category and associated CAI value is displayed in HPMS on the CAI page.

Contract assignment, contract enrollment and the percentages of LIS/DE and disabled are determined using the same method as used for the calculation of the CAI, but using the current Star Ratings year's data.

*Note: The CAI value can be either positive or negative. A positive CAI value will result in an increase of the unrounded Star Rating, while a negative CAI value will result in a decrease of the unrounded Star Rating.*

# METHODOLOGY FOR THE PUERTO RICO MODEL

Puerto Rico has a unique health care market with a large percentage of low-income individuals in both Medicare and Medicaid and a complex legal history that affects the health care system in many ways. Puerto Rican beneficiaries are not eligible for LIS. The categorization of contracts into final adjustment categories for the Categorical Adjustment Index (CAI) relies on both a contract's percentage of beneficiaries with Low Income Subsidy/Dual Eligible status (LIS/DE) and disabled beneficiaries. Since the percentage of LIS/DE is a critical element in the categorization of contracts to identify the contract's CAI, an additional adjustment is done for contracts that solely serve the population of beneficiaries in Puerto Rico to address the lack of LIS. The additional analysis for the adjustment results in a modified percentage of LIS/DE beneficiaries that is subsequently used to categorize the contract in its final adjustment category for the CAI.

The contract-level modified LIS/DE percentage for Puerto Rico for a Star Ratings year is developed using the following sources of information:

### *Data Sources for the Determination of the CAI values*

The data to develop the model is limited to the 10 states, drawn from the 50 states plus the District of Columbia, with the highest proportion of people living below the FPL as identified by the 1-year ACS estimates.

The most recent data available at time of the development of the model is employed. The data include:

- 1-year American Community Survey (ACS) estimates for the percentage of people living below the Federal Poverty Level (FPL);
- 5-year estimates for Puerto Rico and the 10 highest-poverty states of the percentage of people living below 150% of the FPL; and
- Medicare enrollment data file that aligns with the Star ratings year.

Further, the Medicare enrollment data would be aggregated from MA contracts that had at least 90 percent of their enrolled beneficiaries with mailing addresses in the 10 highest poverty states.

## LIS/DE INDICATOR MODEL

A linear regression model is developed using the known LIS/DE percentage and the corresponding DE percentage from the subset of MA contracts identified in the 10 states with the highest poverty levels.

The following steps are employed to determine the modified percentages of LIS/DE for MA contracts solely serving the population of beneficiaries in Puerto Rico.

1. The 10 states with the highest proportion of people living below the FPL are identified, based on the 1-year data from ACS.

2. Data are aggregated from Medicare Advantage contracts that had at least 90% of their beneficiaries enrolled with mailing addresses within the 10 highest poverty states identified in step (1).
3. A linear regression model is developed using the known LIS/DE percentage and the corresponding DE percentage from the MA contracts in the 10 highest poverty states with at least 90% of their beneficiaries with mailing addresses in one of these ten states.
4. The model for Puerto Rico is developed using the model in step (3) as its base.

   The estimated slope from the linear fit in the previous step (3) is retained to approximate the expected relationship between LIS/DE for each contract in Puerto Rico and its DE percentage. However, as Puerto Rico contracts are expected to have a larger percentage of low income beneficiaries, the intercept term is adjusted to be more suitable for use with Puerto Rico contracts as follows:

   The intercept term for the Puerto Rico model is estimated by assuming that the Puerto Rico model will pass through the point (x, y) where x is the observed average DE percentage in the Puerto Rico contracts, and y is the expected average percentage of LIS/DE in Puerto Rico. The expected average percentage of LIS/DE in Puerto Rico (the y value) is not observable, but is estimated by multiplying the observed average percentage of LIS/DE in the 10 highest poverty US states identified in step (1) by the ratio based on the current 5-year ACS estimates of the percentage living below 150% of the FPL in Puerto Rico compared to the corresponding percentage in the 10 highest poverty US states.

   The resulting LIS/DE model for Puerto Rico would be in the format:

   $\widehat{LIS/DE}$ = ( Slope * PR contract's DE percentage ) + ( PR intercept ) **Equation (1)**

5. To obtain each Puerto Rico contract's modified LIS/DE percentage, a contract's observed DE percentage is used in the Puerto Rico model developed in the previous step (4).

   A contract's observed DE percentage is multiplied by the slope estimate, and then the newly derived intercept term (PR intercept) is added to the product. The estimated modified LIS/DE percentage is capped at 100%. Any estimated LIS/DE percentage that exceeds 100% is categorized in the final adjustment category for LIS/DE with an upper bound of 100%.

   *All estimated modified LIS/DE for Puerto Rico are rounded to six decimal places when expressed as a percentage. (This rounding rule aligns with the limits for the adjustment categories for LIS/DE for the CAI.)*

***Summary of the LIS/DE Indicator Model***

The LIS/DE model is developed to estimate the LIS/DE percentage for a contract operating solely in Puerto Rico using its DE percentage. The generic form (Equation 1) is as follows:

$$\widehat{LIS/DE} = (\text{ Slope } * \text{ PR contract's DE percentage }) + (\text{PR intercept}) \qquad \textbf{Equation (1)}$$

The model uses the slope of the relation between LIS/DE and DE in the 10 states with the highest poverty rates and adjusts the intercept using ACS data. The resulting intercept for the model is represented by *PR intercept* in Equation 1.

Using the data from the 10 highest poverty states, the estimated slope and intercept are calculated and result in Equation 2 as follows:

$$\widehat{LIS/DE} = (\text{ slope } * \text{ contract's DE percentage }) + (\text{ intercept }) \qquad \textbf{Equation (2)}$$

Next, the intercept for the Puerto Rico model is adjusted using the point (x, y) where x is the observed average DE percentage in Puerto Rico contracts (d%) and y is an estimated expected average percentage of LIS/DE in Puerto Rico.

Referring to the values in Table 1, the intercept for the LIS/DE model is calculated as follows:

**Table 1: Values used to Modify Intercept**

| Description | Value |
|---|---|
| Percent of PR residents below 150% of FPL | a |
| Percent of US residents in the 10 poorest states below 150% of FPL | b |
| Observed average LIS/DE percentage in the 10 poorest US states | c |
| Observed average DE percentage in Puerto Rico contracts | d |

To calculate the estimated expected average percentage of LIS/DE in Puerto Rico, the observed average percentage of LIS/DE in the 10 poorest US states identified (value c in Table 1) is multiplied by the ratio of the percentage of Puerto Rico residents living below 150% of the FPL to the analogous percentage of US residents of the 10 highest poverty US states (values a and b respectively in Table 1).

The product thus becomes $\left(c * \frac{a}{b}\right)$.

The new intercept for the Puerto Rico model is found as follows:

$$\text{PR intercept} = \left(c * \frac{a}{b}\right) - (\text{slope} * d)$$

The LIS/DE model to estimate the percentage of LIS/DE in Puerto Rico model becomes:

$$\widehat{\text{LIS/DE}} = (\text{slope} * \text{PR contract's DE percentage}) + \left((c * \frac{a}{b}) - (\text{slope} * d)\right)$$

Annually, while the CAI is employed in the Star Ratings Program, the LIS/DE Indicator model and an example of the use of the model will be provided in the Medicare Advantage Part C and D Technical Notes.