A PUBLIC POLICY

Practice Note

Medicaid Risk Adjustment

June 2026

Developed by the Medicaid Committee of the Health Practice Council

American Academy of Actuaries

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American Academy of Actuaries
Medicaid Committee
Medicaid Risk Adjustment Practice Note

I. Limitations

The purpose of this practice note is to provide information and support for actuaries as they determine how to adjust the Medicaid managed care capitation rates for the underlying morbidity profile of various populations.

This practice note is not a promulgation of the Actuarial Standards Board (ASB), is not an actuarial standard of practice (ASOP), is not binding upon any actuary, and is not a definitive statement as to what constitutes generally accepted practice in the area under discussion. Events occurring subsequent to the publication of this practice note may render the practices described herein irrelevant or obsolete.

This practice note was prepared by and reflects the views of the American Academy of Actuaries' Health Practice Council's Medicaid Risk Adjustment Practice Note Work Group (Work Group). The Work Group makes no representation of completeness, as other approaches may also be in use and applied. Each actuary should consider the facts and circumstances specific to their particular situation and how the information provided in this practice note may inform their thinking. Note that any references to laws, regulations, or public data may become outdated if those items are revised after the publication of this practice note.

II. Introduction

The Medicaid and Children's Health Insurance Program (CHIP) programs provided health care coverage for more than 76.8 million[1] beneficiaries in the United States and territories as of October 2025, with annual expenditures of more than $900 billion in federal fiscal year (FFY) 2024,[2] and are financed by both the federal and state governments. In FY 2023, Medicaid managed care expenditures were $495 billion,[3] with expenditures and managed care enrollment distributed across all Medicaid eligibility categories.

Since the introduction of actuarial soundness requirements in the 2002 Medicaid Managed Care regulations,[4] actuaries have been an integral part of the development of "[a]ctuarially sound capitation rates [that] are projected to provide for all reasonable, appropriate, and attainable costs that are required under the terms of the contract and for the operation of the MCO, PIHP, or PAHP *for the time period and the population covered under the terms of the contract*…."[5]

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[1] Medicaid and CHIP Eligibility Operations and Enrollment Snapshot; *Medicaid.gov*; last visited June 12, 2026; Historical; cms.gov; last visited June 12, 2026.
[2] MACStats: Medicaid and CHIP Data Book; *Medicaid and CHIP Payment and Access Commission*; December 2024.
[3] Ibid. Exh 17.
[4] 42 CFR Part 438—Managed Care; *ecfr.gov*; May 6, 2016.
[5] 42 CFR § 438.4 Actuarial soundness; *ecfr.gov*; May 6, 2016.

The use of risk adjustment methodologies and tools has become a key actuarial technique to adjust the payments between the state Medicaid agencies and contracted MCOs to reflect various beneficiary risk characteristics in the development and payment of actuarially sound capitation rates. These risk adjustment methodologies may be incorporated into the capitation rate structure through age, gender, geographic region, Medicaid eligibility category, or other rate classifications. Additionally, risk adjustment models or tools may be used on a concurrent basis, referred to by the Centers for Medicare and Medicaid Services (CMS) as "retrospective risk adjustment" at 42 CFR § 438.5(a), or on a prospective basis. The risk adjustment models utilize some or all of the following: medical diagnosis data, pharmaceutical data (from which disease or diagnoses may be inferred), or other risk characteristics. The risk adjustment tools are used to adjust capitation payments to the contracted Managed Care Organizations (MCOs), Prepaid Inpatient Health Plans (PIHPs), or Prepaid Ambulatory Health Plans (PAHPs), collectively referred to as MCOs hereafter.

This practice note was developed to assist the actuary in identifying key considerations in the application of these various risk adjustment methodologies and tools to develop or assess actuarially sound capitation rates and payments to MCOs. The practice note does not analyze the average predictive accuracy of each of the commonly used risk adjustment models in Medicaid managed care programs. Rather, it highlights key actuarial considerations that are generally applicable to these risk adjustment models.

This practice note is specific to acute Medicaid managed care programs and the related risk adjustment tools. It may not be appropriate to refer to this document in connection with other managed care programs, including Medicaid Long-term Services and Supports (LTSS) contracts, Medicare Advantage contracts, Marketplace Exchange contracts, and dual eligible (i.e., Medicare and Medicaid eligible) contracts.

III. Risk Adjustment Models

Risk adjustment models were developed to estimate health risk among beneficiaries based on demographic and claim characteristics in addition to those parameters found in an eligibility file system, such as age, gender, geographic region, or Medicaid eligibility category. The risk adjustment models were initially developed using medical diagnosis codes found on hospital inpatient, hospital outpatient, and physician or ambulatory claims, along with the characteristics found within an eligibility file system. Risk adjustment models have been expanded to include prescription drug codes, social determinants of health, and other population characteristics. The risk adjustment models estimate health acuity over a period of time, typically a year, because federal regulation[6] defines a rating period as a 12-month period.

The following risk adjustment models are currently used in various Medicaid, Medicare, or commercial health insurance programs:

- Adjusted Clinical Groups (ACG)
- Chronic Illness and Disability Payment System (CDPS)
- Chronic Illness and Disability Payment System + Medicaid Rx (CDPS+Rx)
- Clinical Risk Groups (CRG)

[6] 42 CFR § 438.2 Definitions; *ecfr.gov*; May 6, 2016.

- CMS Hierarchical Condition Categories (CMS-HCC)
- Diagnostic Cost Groups (DxCG)
- HHS Hierarchical Condition Categories (HHS-HCC)
- Medicaid Rx
- Milliman Advanced Risk Adjusters (MARA)
- Symmetry Episode Risk Groups (ERG)
- Wakely Risk Assessment (WRA)

Each model uses various methods to determine the relative risk weights or risk scores for each beneficiary or insured member. Several of the risk adjustment models provide standard relative weights, while other risk adjustment models rely on the user to develop custom relative risk weights based on population-specific expenditures and data related to diagnoses or disease.

Groupers and Regression Models

There are two general types of models used in commercially available risk adjustment models.

- **Grouper models:** A grouper risk adjustment model usually classifies beneficiaries into mutually exclusive categories. These categories are typically designed using causal reasoning about disease type, severity, and interactions among comorbidities.

- **Component-weighted regression models:** A component-weighted regression risk adjustment model develops relative weights (regression parameters) by minimizing a loss function. The relative weights may be developed on either an additive or multiplicative basis, depending on the type of model. These types of risk adjustment models may be considered more transparent as each beneficiary's risk score may be decomposed by the incremental cost of each weight.

Both risk adjustment model types can rely implicitly on a structural causal model outlining how recorded diagnoses, comorbidities, and disease severity interact to determine relative morbidity, which is usually measured by health care costs. Other models may make non-causal design choices to maximize predictive accuracy.

In the application of a risk adjustment model, the actuary will often rely on commercially available risk adjustment models due to resource limitations and other constraints. These third-party risk adjustment models are developed by researchers, including university professors, clinicians, data scientists, data analysts, and actuaries. When using a risk adjustment model developed by a third party, the actuary should refer to ASOP No. 56, *Modeling*, which is discussed later.

Other types of risk adjustment models may be used for risk scores or relative weights to adjust the capitation payments. The actuary may expand simple linear models to generalized linear models (GLMs) through various link functions and statistical error distributions. Relatively newer machine learning methods, such as gradient boosting or artificial neural networks, may also be used to capture non-linear patterns with a tradeoff in some model transparency.

Risk Adjustment Model Parameters

Both types of risk adjustment models, grouper or regression models, have limitations related to the number of parameters, groups, or weights. When developing a risk adjustment model or modifying the number of parameters in a third-party risk adjustment model, the actuary should balance model complexity—avoiding both underfitting and overfitting.

Component-weighted regression models may be more flexible in the combination of unique beneficiary characteristics than the number of groups in a grouper model. The component-weighted regression model's flexibility may allow for greater predictive accuracy, all else being equal, with an increased risk of overfitting. However, predictive accuracy is not the sole or sufficient criterion for evaluating or selecting a model. Moreover, regression models usually require interactions between variables to be explicitly modeled as separate parameters.

A grouper model does not explicitly minimize a loss function, potentially resulting in slightly lower predictive accuracy than a more flexible model, all else being equal. However, the grouper model's deterministic structure may create a model that is robust to outliers or small changes in coding patterns. The grouper model may also inherently capture interactions among multiple clinical conditions.

Some models, such as CDPS+Rx for a component-weighted regression model or CRG for a grouper model, use hierarchies within disease categories so that only the most severe condition within a group contributes to the risk score for a single beneficiary. By utilizing a hierarchical methodology, the model will avoid and discourage inflating scores by adding multiple related diagnoses to claims. However, the hierarchical methodology does not fully deter or eliminate diagnosis coding processes that maximize the number of different disease categories. Because MCOs benefit from maximizing their risk scores, they may establish programs or incentives for providers to consider additional diagnoses based on the MCOs' review of claims. Policies that address these programs or incentives, including policies that deter gaming or upcoding, are outside the scope of this document, but should be considered in model development.

Risk adjustment models typically have pre-selected parameters for disease conditions or demographic characteristics, although the actuary may need to customize the pre-selected parameters to meet contractual or state Medicaid program needs. When developing, selecting, or modifying risk adjustment parameters, the actuary may take into consideration the following criteria related to the independent variables of the model:

- **Predictive:** The presence of the parameter may be associated with notable cost differences, such as a strong signal-to-noise ratio.

- **Persistent:** The variable represents health care conditions with stable cost implications across multiple years.

- **Consistency:** The health care condition should be reliably detected and consistently coded by health care providers.

- **Resistant to Upcoding or Gaming:** Choose clinically well-defined diagnoses that are rarely used for unrelated conditions.

- **Causal:** The actuary may take into account the extent to which scientific evidence supports the relationships between conditions, their interactions with other model variables, and the magnitude and direction of cost effects.

- **Demographic Parameters:** Identification parameters within a risk adjustment model related to protected characteristics (e.g., gender, race or ethnicity) are generally not allowable in commercial and Medicare health care programs. However, these parameter restrictions are not explicitly found within standard Medicaid risk adjustment processes.

- **Reasonableness of the model output (i.e., risk scores)**: The actuary should review and assess the output of the risk adjustment model (i.e., member-level risk scores) for reasonableness. A statistically developed risk adjustment model does not always produce reasonable risk scores for rate setting purposes. For example, an overall negative risk score would not be common in the overall process and should be checked for reasonableness.

Risk Adjustment Model Development and Application

Risk adjustment models are often used as part of the Medicaid capitation rate development process, with the selection of the model based on the given purpose. For example, risk adjustment models may be used to adjust for population changes due to a new policy, such as enrollment policy changes during and after the COVID public health emergency (PHE). Further, risk adjustment models may be used to reflect the expected relative morbidity distribution of beneficiaries across MCOs in a budget-neutral manner.

Risk adjustment models may be used on a retrospective basis to identify individuals who have a specific disease or illness or to impute a missing diagnosis; however, this type of application is outside the scope of this practice note.

This section identifies actuarial considerations in the use of risk adjustment models.

I. Concurrent vs. Prospective Risk Adjustment

Risk adjustment models may be applied concurrently or prospectively. Each of these methods may be used by a state Medicaid agency for different applications of the model.

Concurrent Risk Adjustment Model—The use of a risk adjustment model on a concurrent basis is the use of medical diagnosis or pharmaceutical information in a year to predict health care expenditures or relative morbidity in the same year. Concurrent models are useful for situations in which historical data cannot serve as parameter training data or when timely assessment is crucial in assessing the risk. For example, during the unwinding of the COVID-19 PHE, an actuary may have calculated concurrent risk scores for calendar year (CY) 2024 for the beneficiaries enrolled during CY 2024. The concurrent CY 2024 risk scores were compared to the concurrent risk scores for the beneficiaries from the historical period (e.g., CY 2022) that was used to develop the managed care capitation rates. The change in the concurrent risk scores from CY 2022 to CY 2024 was utilized to inform the actuary about the level of morbidity changes between the two periods and whether the general morbidity of the population had increased, decreased, or remained consistent.

Prospective Risk Adjustment Model—The use of a risk adjustment model on a prospective basis is the use of medical diagnosis or pharmaceutical information in a base year to predict health care expenditures or relative morbidity in a more recent period than the base year. This model is helpful when anticipatory planning is essential to allocate resources effectively and manage expected health care needs. For example, an actuary may calculate prospective risk scores and apply them on a budget-neutral basis to reflect the beneficiaries' relative morbidity between multiple MCOs in a state Medicaid program. Prospective risk scores are often applied on a budget-neutral basis to distribute the actuarially sound capitation rates between or among multiple MCOs. If an MCO has an average prospective risk score below the all-MCO average risk score, then the MCO has a population with expected morbidity below the average morbidity associated with the actuarially sound capitation rate. In a budget-neutral calculation, the lower-risk-score MCO would receive a lower capitation rate payment than the overall average capitation rate. Similarly, an MCO with an average prospective risk score above the all-MCO average risk score would receive a higher capitation rate payment than the overall average capitation rate.

II. Relative Weights

Risk adjustment models require the use of relative weights to establish the morbidity profile of individual beneficiaries who have a specific disease or illness. Risk adjustment models have standard relative weights or the actuary may use state-specific data to develop custom relative weights. The actuary should be aware of the underlying parameters or assumptions that were used to develop the relative weights, and how the parameters align with the contractual risks, as well as how relevant the historical data used to train the relative weights are.

The relative weight represents the relative morbidity associated with a specific disease (e.g., diabetes), illness (e.g., pneumonia), or combination of diseases and illnesses (e.g., a beneficiary with two or more chronic conditions). The relative weights are generally determined using health care expenditures as the measure, consistent with the model type.

- The relative weights for a *concurrent risk adjustment model* are determined using health care expenditures that occur in the same period as the base diagnosis period.
- The relative weights for a *prospective risk adjustment model* are determined using health care expenditures in a future period from the base diagnosis period.

The use of a concurrent relative weight and the resulting risk score may not be considered appropriate in the application of a prospective risk model, as the relative weight associated with a particular disease or illness may not be the same in a future period as in the base period. For example, an individual diagnosed with cancer generally has higher treatment costs during the initial treatment period than later in the course of treatment.[7] However, the costs of treating a patient with diabetes generally reflect ongoing maintenance of care and acute events throughout the patient's lifetime. The illustration of these two health care cost patterns is shown in Table 1, reflecting the concurrent risk scores and prospective risk scores from the CDPS+Rx Model. While the CDPS+Rx Model is one of the more commonly used risk adjustment models, the illustration may not be appropriate for other relative weight methodologies associated with other risk adjustment models. The actuary should have an understanding of the development of the relative weights used in the risk adjustment models.

Table 1: CDPS version 7.2: Concurrent and Prospective Weights by Supplemental Security Income (SSI) and Temporary Assistance for Needy Families (TANF) Populations[8]

CDPS v7.2 Description	SSI Concurrent	SSI Prospective	TANF Child Concurrent	TANF Child Prospective
Diabetes, type 1	0.777	1.050	6.615	8.343
Diabetes, type 2	0.265	0.374	0.939	1.692
Cancer, very high	4.905	4.107	40.976	25.869
Cancer, high	2.681	2.719	15.533	23.089
Cancer, medium	0.406	0.822	0.828	3.735
Cancer, low	0.000	0.103	0.828	1.459

This table illustrates how the relationship of health care costs or morbidity between a patient with cancer and a patient with diabetes, determined on a concurrent basis, varies from that when determined on a prospective basis. For example, the relationship ratio between the Cancer, high risk category weight and the Diabetes, Type 1 risk category weight is 3.45 (i.e., 2.681 *divided* by 0.777) on a concurrent basis but a lower ratio of 2.59 (i.e., 2.719 *divided by* 1.050) on a prospective basis. Similar observations may be made for other risk category weight relationships for both the SSI population and the Children population.

As stated in ASOP No. 56, 3.1.3., Using the Model, "When using the model, the actuary should make reasonable efforts to confirm that the model structure, data assumptions, governance and controls, and model testing and output validation are consistent with the intended purpose."[9] When developing or using relative weights, the actuary should confirm that the risk adjustment model's relative weight is consistent with the intended purpose of the model.

III. Additional Considerations in Development of Relative Weights

The actuary may need to reflect the following in the use or development of relative weights to ensure that the intended purpose of the model is aligned with its application:

[7] Financial Burden of Cancer Care; *National Cancer Institute*; April 2025.
[8] The American Academy of Actuaries would like to thank the CDPS model developers for sharing these weights.
[9] ASOP No. 56, Modeling, 3.1.3., Using the Model; *Actuarial Standards Board*; December 2019.

- **Large claim protection**: A relative weight is often developed to reflect the expected health care costs associated with a particular disease or illness categorization. Large claim protection may be offered under the terms of a contract that would limit the MCO's exposure risk for an individual beneficiary. As such, a relative weight would need to be adjusted to reflect the large claim protection benefit. Large claim protection may come in many forms, including:
    - Maximum expenditure limit per person per year; for example, a $1 million annual limit per person;
    - Maximum expenditure limit on a particular category of service; for example, a $250,000 annual limit on hospital inpatient claims or pharmaceutical claims;
    - Maximum expenditure limit with coinsurance participation above the maximum; for example, a $250,000 annual limit and 80% large claim protection with 20% retained risk above the annual limit; or
    - Maximum limit per claim or incident; for example, a $50,000 limit per maternity delivery.

The actuary should consider reviewing and adjusting the standard relative weights or developing relative weights to reflect any large claim protection arrangements.

- **Risk sharing, risk pools**: Some states include risk sharing or risk pools to limit or distribute certain morbidity risk (e.g., transplants, high-cost drugs). Under risk sharing arrangements, a portion of the capitation risk is transferred back to the Medicaid state agency from the plans as a per-member-per-month (PMPM) allowance. This is sometimes called a withhold, but this should not be confused with the operational definition of withholds in 42 CFR § 438.6. In contrast, risk pools transfer risk among the MCOs, as the state Medicaid agency might set how much the MCO pays and then calculate the MCOs' payout amounts based on the MCOs' relative cost experience.[10] In both cases, the actuary should consider reviewing and adjusting the risk-adjustment model data to exclude costs overlapped with other risk-mitigation arrangements, which includes risk-adjusting a subset of the capitation rate PMPM with the value of these arrangements excluded.

- **Provider reimbursement changes**: The actuary may need to update the relative weights within the risk adjustment model due to material provider reimbursement changes. For example, if state directed payments move from a pass-through basis to being included in the at-risk cost per unit, the relative weight associated with particular diseases may be impacted at a greater rate due to the change in provider reimbursement.

- **New therapies**: Similar to provider reimbursement changes, the actuary may need to update the relative weights to reflect new therapies that were not reflected in the development of the original relative weights by disease classification. The new therapies may have a material impact on health care expenditures associated with the disease classification.

[10] This may sound like risk adjustment, but the result is sometimes based on actual costs, which includes a provider network contracting element absent in risk-adjustment.

- **Presence of other primary health insurance coverage**: As with large claim protection, the presence of additional health coverage can significantly change the observed relationship between beneficiaries' claim costs and underlying health conditions. For example, risk-adjustment models calibrated on claims from Medicaid-only populations would generally not be applied to individuals who are dually eligible for both Medicare and Medicaid, as Medicaid, generally the payer of last resort, will usually only see portions of claims partially paid by Medicare first (i.e., crossover claims).

- **Carved-out services**: Medicaid managed care contracts often carve out services, either due to the service being retained as fee-for-service (e.g., mental health services, pharmacy services) or due to the service being low frequency and high cost (e.g., hemophilia-related drugs). The actuary should consider reviewing and adjusting the relative weights to reflect the carve-out of the service. The actuary may also consider retaining the diagnosis codes associated with the carved-out services. By retaining the diagnosis information, the resulting relative weights will recognize that carved-out services still serve as markers for different morbidity that manifests across all covered services, not just the carved-out service itself.

- **Rule-out diagnoses**: The actuary may want to take into account which diagnosis codes are included in the development of the relative weights and the individual beneficiary risk scores. Diagnosis codes are often included on laboratory and radiology medical claims as the potential or anticipated diagnosis for the test being performed. Therefore, the individual beneficiary may or may not have the indicated diagnosis. The actuary may want to consider excluding diagnosis codes from certain types of medical claims, such as laboratory and diagnostic radiology. Diagnoses on therapeutic radiology claims are generally not excluded. The actuary may want to maintain consistency between the application of the exclusion of diagnosis codes in both the development of the relative weights and the development of the individual beneficiary risk scores.

- **Case rate payments**: A case rate payment is used in a managed care contract to pay for a specific service. The services and related expenditures are carved out of the base capitation rate cell and moved to a specific, stand-alone capitation rate cell. As such, the relative weights and the individual beneficiary risk scores for the base capitation rate cell would reflect the transfer of the case rate payment services and related expenditures. For example, maternity services related to the delivery are often paid as a separate case rate to the MCO. Therefore, these expenditures would be carved out of the associated capitation rate cells, which would reduce the relative weight value.

- **Budget neutrality**: In many cases, risk adjustment is used to estimate the relative acuity between or among MCOs. The relative acuity calculation is then used to redistribute funding on a budget-neutral basis among the MCOs. The actuary should perform the budget-neutral calculation consistently with the risk adjustment categorization. Further, the actuary will want to ensure that the risk adjustment process complies with 42 CFR §§ 438.5(b)(6) and 438.7(b)(5), which state, "...select a risk adjustment methodology that uses generally accepted models and apply it in a budget-neutral manner across all MCOs...."[11] If the risk adjustment process is not developed to be budget-neutral, the actuary will need to communicate the reason for the variation. However, an actuary would not be expected to adjust a prospective risk adjustment model to be budget neutral due to actual enrollment shifts and variations.

Overall, the actuary should consider reviewing, adjusting, and maintaining consistency between the risk transferred under the terms of the managed care contract, the development of the relative weights, and the calculation of individual beneficiary risk scores.

IV. Risk Scores Frequency

In many Medicaid managed care programs, individual-level and plan-average risk scores are developed on an annual basis. However, the frequency of developing risk scores depends on the stability of the population across MCOs and the Medicaid program, as well as the overall size of the population enrolled. There are state Medicaid managed care programs that update the beneficiary and MCO overall risk scores more frequently (e.g., quarterly or semi-annually).

The following situations may warrant the need to update the beneficiary and MCO overall risk scores more frequently than on an annual basis.

- **New population**: If there is a new population being enrolled in Medicaid and the MCOs, the risk scores will emerge during the initial 12 to 36 months. As the diagnosis and pharmaceutical information are being submitted through claims every month or quarter, the actuary may want to consider monitoring the changes in the beneficiary risk scores across the MCOs.

- **Eligibility policy changes**: As observed during the COVID-19 PHE, there were federal and state policy changes that influenced beneficiary enrollment. During the initial periods of the PHE, a new eligibility policy emerged that generally prevented disenrollment. The average risk score changed from historical periods when beneficiaries would be enrolled and disenrolled regularly. Furthermore, after the PHE ended, disenrollments resumed, beginning around May 2023.[12] The redetermination and subsequent disenrollment of many beneficiaries resulted in yet another change in the overall risk score of the beneficiaries remaining enrolled in Medicaid, which encouraged monitoring risk scores more frequently than once a year.

- **Enrollment shifts across MCOs**: State Medicaid agencies generally contract with MCOs for a three- to five-year period with optional extensions. At the end of the contract period, the state may issue a new contract for bidding, which may result in new MCOs entering or leaving the state Medicaid managed care market. The change in contracted MCOs within a state Medicaid program may result in beneficiaries shifting

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[11] 42 CFR §§ 438.5(b)(6); *ecfr.gov*; May 6, 2016.
[12] 10 Things to Know About the Unwinding of the Medicaid Continuous Enrollment Provision; *kff.org*; June 9, 2023.

between MCOs. MCOs may also receive auto-assigned beneficiaries during an open enrollment period. Further, there may be situations that impact provider networks and result in members shifting between the MCOs.

In general, the actuary should take into account the potential magnitude and speed of shifting population acuity when determining an appropriate frequency for updating risk scores. The actuary may communicate the related issues with the state Medicaid agency to determine the appropriate frequency for updating risk scores.

V. Auto-Assigned Beneficiaries

Newly enrolled Medicaid beneficiaries are given a period (e.g., 60 days) to choose an MCO. If a beneficiary fails to do so, the state Medicaid agency will auto-assign the beneficiary to an MCO. The auto-assignment criteria may have several parameters, including other family members already enrolled in an MCO; a prior relationship with an MCO due to previous Medicaid coverage; or a prior relationship with a primary care provider. In addition, newly contracted MCOs may receive preference for auto-assigned beneficiaries to increase the enrollment in those MCOs.

The actuary may want to consider reviewing and reflecting the impact of auto-assigned beneficiaries in the implementation of risk adjustment with consideration for the consistency and persistency of the enrollment identification parameter as a risk adjustment variable.

VI. Credibility

There are multiple types of credibility associated with the use of risk adjustment models.

- **Number of months of claims and enrollment**: In using historical claim and enrollment data, the actuary will need to decide on a minimum number of months of data and the related number of months of claim runout to use. In general, actuaries use 12 months of claims and enrollment data with three to six months of claim runout. Fewer months of data may be utilized, depending on the use of the resulting relative weights or risk scores. In selecting the number of months of data used, the actuary may want to consider disparities in access to care. For example, if there are fewer months of data used, populations with difficulties accessing care are more likely to have their diagnoses excluded. When developing risk scores across time periods or MCOs, the actuary should consider utilizing a consistent number of months of claim and enrollment information, as well as a consistent number of months of claim runout, for each of the time periods or MCOs.

- **Number of months of eligibility for a beneficiary**: When determining the data set to utilize to calculate the risk scores, the actuary will need to decide on the minimum number of months a beneficiary must meet during the historical period to be included in the analysis. The minimum number of months is required to establish a period of time during which a beneficiary would have enough exposure to be managed by an MCO and either have a claim with the related diagnosis or illness or establish that the beneficiary does not have one of the risk adjustment model-related conditions. A common actuarial method generally requires that a beneficiary have at least six to nine months of enrollment during the historical period to be included in the development of the overall population risk score. Newborn populations may be included in the risk adjustment process without regard to minimum months of enrollment.

In addition to establishing the minimum number of months of eligibility, the actuary will need to determine the weighting of the beneficiary's risk score in the overall average risk score. The actuary may choose to adjust the relative weight for members with fewer months of eligibility. However, the state or the actuary may choose not to adjust the beneficiary's risk score as long as the beneficiary has met the minimum number of months.

- **Non-scored beneficiaries**: The actuary should determine how many months of eligibility in the base data are required to be included in the risk score calculation. Beneficiaries meeting the minimum eligibility criteria will receive a risk score using the risk adjustment model. For non-scored beneficiaries, the actuary will determine an appropriate method to assign a relative risk score. The following are common approaches actuaries use to incorporate non-scored beneficiaries into the risk adjustment process.
    - All non-scored beneficiaries receive a 1.000 risk score, which assumes that the beneficiaries are of average acuity for the total population.
    - All non-scored beneficiaries receive the MCO's average risk score, assuming new and existing enrollees of that MCO share similar morbidity.

- **Number of members used to develop a risk score**: The actuary will also need to determine the minimum number of members used to determine the MCO's average risk score. Risk scores assigned to small cohorts may not be reliable for estimating the average morbidity risk of the cohort and the actuary may use a broader population average risk score rather than the cohort-specific average risk score. In determining a minimum threshold, the actuary may take into account the reliability of the model risk scores, membership churn within the population, and the purpose of the risk adjustment model. The actuary may also know whether applying partial credibility is appropriate for cohorts not meeting the minimum credibility threshold. In lieu of using standard credibility weighting methods, the actuary may consider using other statistical credibility methods, such as Bayesian priors.[13]

[13] Credibility In Bayesian terms:

- The broader population is the prior
- The model structure provides the likelihood function
- The cohort-specific data is evidence for updating

The posterior risk score for small cohorts becomes a weighted combination of the prior (population) distribution and the cohort-specific evidence, with weighting determined by cohort size and (un)certainty of the data. The stronger the evidence, the more the cohort data is used, and the prior plays a lessened role.

To bolster statistical credibility, the actuary may combine the data of one or more rate cells for the data used to train the relative risk weights (e.g., Males, Ages 21-44, plus Males, Ages 45-64, for one set of risk weight parameters).

VII. Adjustment for risk already accounted for in rate cell structure

Capitation rate cells may be stratified by age, gender, and program eligibility. For example, the capitation rate structure may separate children from adults or create specific categories for traditionally low-income family populations versus newer Affordable Care Act (ACA) adult expansion populations. Further stratification may create age ranges and gender-specific capitation rate cells. Each capitation rate cell receives a different PMPM capitation rate that reflects the expected average cost for beneficiaries in that capitation rate cell. Risk adjustment further refines payments based on individual health or demographic characteristics. For example, risk adjustment models can consider both demographic factors (e.g., age, gender, or region), clinical conditions (e.g., disease or diagnosis classifications), and pharmaceutical data to predict relative costs.

Because of statistical credibility or limited resources, the actuary may combine demographic rate cells into a single data set to fit the risk adjustment model. The actuary will need to determine a method to apply the relative risk scores by capitation rate cell, which may be either separate risk scores within each capitation rate cell or a single risk score across all capitation rate cells.

Including demographic parameters in the model is important, even when similar demographic characteristics separate the rate cells being combined in the risk adjustment process. Consider elderly beneficiaries who have both higher health care costs and higher diabetes rates. Excluding age forces the diabetes parameter to absorb age-related costs, creating an upward bias on that parameter. Demographic inclusion ensures that clinical parameters reflect only the incremental cost of conditions.

The following sections illustrate two methods of application of risk adjustment, both within and across capitation rate cells.

Separate Scores Within Each Capitation Rate Cell

Under this application methodology, each capitation rate cell will have its own risk score for each MCO. A budget-neutral risk score is calculated to scale the individual capitation rate cells to a 1.000 value when weighted across plans. Table 2 illustrates that the risk score calculation under this methodology assumes that there are only two capitation rate cells (Male, Ages 21–44, and Male, Ages 45–64) and two MCOs. The capitation rate risk scores are normalized between the two MCOs for each individual capitation rate cell.

Table 2: Example of Risk Scores by MCO and Rate Cell

Measure	MCO A Males Ages 21–44	MCO A Males Ages 45–64	Composite MCO A	MCO B Males Ages 21–44	MCO B Males Ages 45–64	Composite MCO B	All MCO Composite
Total Population	24%	16%	40%	18%	42%	60%	100%
Within MCO	60%	40%		30%	70%		
Base Capitation Rate	$270	$428		$270	$428		**$362**
Average Risk Score	0.60	1.15	0.88	0.95	1.25	1.19	1.07
Budget Neutral Risk Score	0.56	1.07		0.88	1.16		1.00
Rate Cell Specific Risk Score	0.70	1.14		0.70	1.14		
MCO Adjusted Risk Score	**0.80**	**0.94**		**1.27**	**1.02**		
Risk-Adjusted PMPM	**$216**	**$403**		**$342**	**$438**		**$362**

Notes:

a. Average Risk Score—this represents the raw risk score for the MCO and capitation rate cell from the risk adjustment model.
b. Budget Neutral Risk Score—this represents the normalized risk score that will composite to a 1.00 value for all MCOs and capitation rate cells.
c. Rate Cell Specific Risk Score—this represents the composite risk score for the specific rate cell across the MCOs.
d. MCO Adjusted Risk Score—this represents the MCO's relationship between the MCO's Budget Neutral Risk Score divided by the overall Rate Cell Specific Risk Score.
e. Risk-Adjusted PMPM—this is calculated as the MCO Adjusted Risk Score times the Base Capitation Rate.

When the actuary uses separate risk scores per rate cell, it eliminates the required capitation rate cell mix adjustment, which is shown in the following example.

Uniform Risk Score Across Capitation Rate Cells

Under this application methodology, a single composite risk score adjustment factor is developed for each MCO across all capitation rate cells. When a single uniform risk score is used across all capitation rate cells for each MCO, the actuary will need to adjust MCO risk score factors to reflect each MCO's relative risk scores inherent in the MCO's relative and specific mix of the combined rate cells. This adjustment is needed to avoid double counting an MCO's relative cost compared with other plans. The MCO's relative cost is reflected through the capitation rate development process for each individual capitation rate cell.

To normalize for the rate cell relativity, the actuary would compare the MCO's composite capitation rate with the all-MCO composite capitation rate. This calculates a ratio of the MCO's mix of rate cells versus the average mix of rate cells across all MCOs. The resulting adjustment will remove the within-MCO mix variation. Table 3 illustrates an example of using a single risk score across all capitation rate cell categories.

Table 3: Example of Uniform Risk Score by MCO

Measure	MCO A Males Ages 21–44	MCO A Males Ages 45–64	Composite MCO A	MCO B Males Ages 21–44	MCO B Males Ages 45–64	Composite MCO B	All MCO Composite
Total Population	24%	16%	40%	18%	42%	60%	100%
Within MCO	60%	40%	100%	30%	70%	100%	
Base Capitation Rate	$270	$428	$333	$270	$428	$381	**$362**
Relative Rate Cell Mix			0.92			1.05	1.00
Uniform Average Risk Score			0.82			1.16	1.03
Budget Neutral Risk Score			0.79			1.12	1.00
MCO Factor			0.86			1.07	0.99
Mix and MCO Adjusted Risk Score	**0.87**	**0.87**		**1.08**	**1.08**		1.00
Risk-Adjusted PMPM	**$235**	**$372**	**$290**	**$291**	**$461**	**$410**	**$362**

Notes:

a. Relative Rate Cell Mix – This represents the capitation rate cell mix reflected within the capitation rate cell structure.
b. Uniform Average Risk Score—this represents the raw risk score for each MCO across capitation rate cells from the risk adjustment model.
c. Budget Neutral Risk Score—this represents the normalized risk score that will composite to a 1.000 value for all MCOs. The All MCO Composite is developed on a weighted average basis.
d. MCO Factor—this represents the composite risk score normalized for the MCO's capitation rate cell mix. It is calculated by dividing the Budget Neutral Risk Score by the Relative Rate Cell Mix factor.
e. Mix and MCO Adjusted Risk Score—this represents the risk score that will be applied to the MCO's individual capitation rates.
f. Risk-Adjusted PMPM—this is calculated as the Mix and MCO Adjusted Risk Score times the Base Capitation Rate.

This example makes the relative rate cell mix explicit. Note how the value would be 1.000 if there were only one rate cell and nothing to mix. This default to 1.000 happens when MCO factors are calculated within a single rate cell.

The individual MCOs receive different revenue amounts under each of these examples, as the rate cell relationships developed for the capitation rates do not directly equal the relationship found in the risk score development.

VIII. Review of the Risk Adjustment Model

This section identifies actuarial considerations in the review and use of risk adjustment models.

Data Completeness

The actuary should review the data that will be used in the development of the risk scores for completeness. Medicaid programs usually rely on statewide data to run the risk adjustment model, either from the fee-for-service program or from the contracted MCOs. The actuary should consider analyzing the completeness of the eligibility, medical diagnosis data, and pharmaceutical data using a cross comparison to the financial data used in developing the capitation rates, as well as the high-level summary data reported by MCOs. The completeness of the data may vary between fee-for-service and managed care encounter data, and data completeness may vary between MCOs.

Data completeness encompasses a wide variety of areas of consideration in the development of the risk scores for a Medicaid managed care program:

- **Diagnosis codes**: The risk score development requires that the actuary collect encounter and fee-for-service claim data from multiple sources, when available, including individual MCOs and the state Medicaid agency. The actuary should confirm that the diagnosis code information is consistent across the various entities. This could be done by verifying that there is consistency across entities in the number of diagnosis codes per claim and in the number of diagnosis codes considered on claims throughout the risk adjustment process. Further, the actuary should confirm that all types of claims have submitted diagnosis codes, e.g., confirm that diagnosis codes have been submitted for facility and professional claims.

- **Carved-out services**: Medicaid managed care services may have certain health care services excluded from the contract. For example, treatment for certain medical conditions or certain provider types may be excluded from the at-risk contract with the MCOs. These services may be provided on a fee-for-service basis or may be under separate risk contracts between the state Medicaid agency and other at-risk organizations. While the expenditures of these services may not be at-risk for the MCOs, the diagnosis codes associated with the services may provide insight into the morbidity profile of the beneficiaries receiving the carved-out service. The actuary will need to determine the inclusion or exclusion of these service diagnosis codes and the related completeness of the diagnosis codes.

- **Sub-capitated services**: The MCOs may contract with certain providers on a sub-capitation basis. As this may not occur for all MCOs, the actuary should have an understanding of MCO contracting and whether certain services are sub-capitated. Sub-capitation may result in underreporting of diagnosis codes.

- **Encounter data**: The MCOs are contractually required to submit encounter data to the state Medicaid agency. It is important to review the encounter data for completeness to verify that the data is consistent across MCOs. Consistency measures may include claims information for all provider types, the number of claims per person, the number of beneficiaries with and without claims or diagnosis information, and claims completeness based on a consistent claim runout period.

- **Eligibility**: The actuary should review the eligibility file for completeness, including verifying that beneficiaries identified with claims in the encounter data have eligibility information. If beneficiaries with claims are not included in the eligibility file, the actuary may discuss the issue with the MCO or the state Medicaid agency and identify the reason for this or any other inconsistency.

- **Claim runout period**: Consistent with other analyses using claim data, the actuary should verify that an appropriate claim runout period has been identified to allow for claims to be processed and submitted. The impact of the claim runout period will vary depending on the risk adjustment model used. If the risk adjustment model only requires one instance of a diagnosis to identify a beneficiary as having the related condition, then the claim runout period may have a lower impact since the beneficiary would have a greater likelihood of having other reported claims with the related diagnosis. Further, if a risk adjustment model uses both diagnosis and pharmaceutical data, the claim runout period may have a lower impact if the risk adjustment identifies the beneficiary as having the related diagnosis with either a diagnosis or a prescription drug. If an actuary is using multiple data sources (e.g., multiple MCOs or MCO and fee-for-service data), the actuary should review the data and consider whether it is appropriate to maintain consistent claim runout periods.

As this is not a complete list of issues related to data completeness and review, the actuary should review ASOP No. 23, *Data Quality*, for guidance on issues and recommended practices.

Review of Model Results

Upon developing the relative risk scores from the historical data and reviewing the results, the actuary may want to consider the following issues related to risk adjustment models.

a. **Standard Weights vs. Custom Weights**

Many of the commercially available risk adjustment models are provided with standard weights. Some are national models, such as CMS-HCC, which is used for the Medicare Advantage program. With CMS-HCC, the actuary will use the standard weights with no other choice for customization. In other applications, such as Medicaid Managed Care programs, the actuary can modify or update the relative weights to reflect state-specific data, populations, or both. The customization may also include changing which variables are removed or added from the standard parameter model. For example, a state Medicaid actuary using CDPS+Rx may wish to calculate custom weights for an ACA adult expansion population based on state-specific data and include social determinants of health (SDOH) variables in the regression. The actuary should understand the original model developers' instructions, predictive modeling best practices, and ASOP No. 56, when modifying or updating the relative weights.

b. Volatility and Uncertainty in Model Parameters

Probability distributions are formal tools for modeling uncertainty. The true value of any model parameter, such as a risk adjustment weight, remains uncertain, constrained by incomplete background information, imperfect measurements, and future contingent events. Typically, weights are communicated as a point estimate, or a single number. However, all model parameters are conditional probability distributions given the actuary's background information, the model, and observed data.

Due to the uncertainty regarding the risk adjustment parameters, the actuary should communicate the uncertainty and potential volatility in the risk adjustment model, as discussed in ASOP No. 41, *Actuarial Communications*,[14] and ASOP No. 56.

c. Application of Individual Beneficiary Risk Scores

A risk adjustment model estimates a relative risk score for each beneficiary who meets the eligibility criteria for inclusion in the risk adjustment model. The actuary will need to determine the methodology that will be used to apply the individual beneficiary risk scores within the capitation payment process.

d. Monotonicity

Hierarchical diagnostic categories are often used in risk adjustment models to distinguish the variation in morbidity between beneficiaries who have different levels of severity of a condition. For example, the CDPS model includes four cancer variables with increasing levels of severity. Reviewing for monotonicity in risk adjustment involves ensuring that the coefficients assigned to condition categories in the risk adjustment model follow a logical clinical hierarchy, in which more severe conditions are assigned higher weights than less severe conditions within the same category. To perform this review, the actuary should examine the resulting regression coefficients to confirm that relative weights by disease classification increase appropriately with the level of severity of the condition. If an increasing pattern is not present, related parameters may be combined (i.e., combining two severity levels) in the regression analysis to establish monotonicity. The actuary may perform this process iteratively until the final model is produced with all relative weight parameters that meet the established monotonicity requirements.

An alternative is to parametrize the model such that the software or algorithm constrains the parameters to be monotonically increasing during the model fitting. For example, declaring each disease type parameter (e.g., diabetes) to be an ordered vector of increasing risk weight parameters (e.g., low severity, medium severity, high severity). Under both methods, the actuary should exercise professional judgment if the inclusion or combination of parameters is not consistent with ASOP No. 56, and follow the guidance of ASOP No. 41, regarding deviation from an actuarial standard of practice.

e. **Cross validation criteria**

When creating or modifying risk adjustment models, the actuary may evaluate model performance beyond in-sample fit metrics. While minimizing in-sample error is the underlying optimization of model fitting, this approach may result in overfitting, where the model fits noise or outliers in the training data, leading to poor performance on new data not previously seen by the model.

[14] As of the date of this publication, comments were being considered on the third exposure of ASOP 41.

To assess a model's predictive accuracy on new observations, the actuary may consider out-of-sample fit metrics using cross-validation techniques. This can be done with multiple subsets of the training data or "folds." The model is trained on a portion of the data (training set or hold-out data), and fit metrics are measured on the remaining portion (validation set). This process repeats with each fold serving as the validation set once. The actuary can then average out-of-sample fit metrics across folds, providing a robust estimate of the expected out-of-sample error metric. This process can also be done with bootstrapping instead of folds, allowing higher-sample distributions of the fit metrics.

ASOP No. 56 states that "The actuary should validate that the model output reasonably represents that which is being modeled," which may include 3.6.2.b, "evaluating whether the model applied to hold-out data produces model output that is reasonably consistent with model output developed without the hold-out data," and the actuary should consider section 3.1.4.d, "whether there is a material risk of the model overfitting the data."[15]

Cross-validation helps the actuary balance predictive model complexity and accuracy. A noticeable difference between in-sample error and out-of-sample error could be a sign of overfitting. When both errors are high, the model may be underfitting. The actuary can use cross-validation to evaluate different model parameterizations (e.g., number of disease categories, demographic characteristics) and select the model that best fits beneficiary morbidity patterns while maintaining predictive accuracy for new observations. Model-fitting methods may employ regularization techniques, such as Bayesian priors or the Least Absolute Shrinkage and Selection Operator (LASSO), to help balance this complexity.

ASOP No. 56, *Modeling* Considerations

The actuary's intended purpose in using risk-adjustment models is to combine the classification of beneficiaries into disease and severity groups. The actuary may use the results of the risk adjustment process to adjust historical data to current beneficiary morbidity, to adjust a composite capitation rate to reflect beneficiary morbidity by MCO, to measure changes in morbidity over time, or for other needs in the Medicaid managed care program. In all of these situations, an actuary will need to take into account the guidance found in ASOP No. 56.

The following highlights several key sections of ASOP No. 56 that relate to the use of risk adjustment models. The actuary should review and understand the guidance found in ASOP No. 56.

3.2 Understanding the Model

a. Important aspects of the model being used, including but not limited to, basic operations, important dependencies, and major sensitivities.

The actuary should perform due diligence in reviewing model documentation with attention to groupings, severity classifications, and interactions between conditions and how these are encoded. Understanding the model helps avoid misalignment. For example, does the model offer appropriate classifications for the population being adjusted, like children versus adults?

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[15] ASOP No. 56, Modeling; *Actuarial Standards Board*; December 2019.

The actuary should consider whether the data can be subset to match the model's intended purpose. For example, do rate cell structures or state risk-mitigation strategies already adjust for the risk the model is trying to predict, such as large claim protection arrangements?

3.4 Reliance on Models Developed by Others

> *If the actuary relies on a model designed, developed, or modified by others, such as a vendor or colleague, and the actuary has a limited ability either to obtain information about the model or to understand the underlying workings of the model, the actuary should disclose the extent of such reliance. In addition, the actuary should make a reasonable attempt to have a basic understanding of the model...*

The actuary should document reliance on others for the development of the model and any sensitivities, model tradeoffs, or both. For example, a regression model offers transparency, but linear models are also sensitive to outliers, and component models (e.g., additive) might incentivize gaming diagnoses.

3.6.2 Model Output Validation

> *The actuary should validate that the model output reasonably represents that which is being modeled.*

Actuaries will frequently use commercially available risk adjustment models. When relying on third-party models, the actuary should perform due diligence to understand the model. The actuary should verify that the model's output parameters or results align logically and with known background information. Further, the actuary should verify that output parameters react as expected to a change in the input parameters.

The actuary should review model fit, using actuarial methods or practices such as reviewing residuals or cross-validation metrics to assess possible overfitting and the model's ability to explain past observations and reasonably predict unseen ones. Another review would be to triangulate model results against historical results, external benchmarks, or clinical logic.

Reviewing model fit by subpopulations may assist the actuary in assessing whether the model is under- or over-predicting risk scores and whether it indicates possible sampling or model bias.

4.1 Model Disclosures

> *When issuing an actuarial report under this standard (i.e., ASOP No. 56), the actuary should refer to ASOP Nos. 23 and 41. In addition, the actuary should disclose the following in such actuarial reports:*
>
> *a. the intended purpose of the model, as discussed in section 3.1;*
>
> *b. material inconsistencies, if any, among assumptions, and known reasons for such inconsistencies, as discussed in section 3.1.6(c);*
>
> *c. unreasonable output resulting from the aggregation of assumptions, if material, as discussed in section 3.1.6(e);*
>
> *d. material limitations and known weaknesses, as discussed in section 3.2;*

e. extent of reliance on models developed by others, if any, as discussed in section 3.4; and

f. extent of reliance on experts, if any, as discussed in section 3.5.

When using a third-party risk adjustment model, the actuary should identify the risk adjustment model being used and any related model version. For example, if the actuary used CDPS+Rx, the actuary would indicate in an actuarial report the use of "the risk adjustment model CDPS+Rx v7.1 (or the version used) developed by the researchers at the University of California, San Diego."

The actuary should also disclose the customizations or input parameters selected for the use of the risk adjustment model, such as deviations from standard variables or weights included in the model.

In addition to ASOP No. 56, the actuary should follow the guidance in ASOP No. 45 and ASOP No. 49, *Medicaid Managed Care Capitation Rate Development and Certification*.

IX. Other Considerations of Relative Weights by Risk Adjustment Model

Comparison and Applicability of Relative Weights

The actuary should use skill and care when comparing weights or risk scores between risk adjustment models, capitation rate cells, or data periods. Each risk adjustment model is developed using a specific set of training data, parameters, covered services, and eligibility criteria to establish the relative weights.

The actuary should ensure that the risk adjustment parameters within the model are applicable to the demographic and diagnosis data used to develop beneficiary risk scores. For example, when the model's regression weights include both demographic and diagnosis parameters and if the actuary subsequently uses the model to fit the relative weights using data that lacked demographic variables, the resulting risk scores would not capture the marginal demographic relative costs. However, the exclusion of data elements from the diagnosis data would not preclude the actuary from using the model. For example, if the model uses only diagnosis data and not pharmacy codes, but the source claims data includes both diagnosis and pharmacy codes, the actuary may exclude the pharmacy codes in the development of the relative risk scores as the model may still develop the risk scores from the demographic and diagnosis codes. Thus, the actuary will want to understand the cost basis and the risk adjustment model parameters to compare weights, or risk scores, from two different models.

Further, when the actuary applies risk scores on a relative basis between the MCOs and includes a budget-neutral adjustment, the actuary needs to understand the relative basis and budget-neutral calculations to be able to interpret changes in an MCO's relative risk score. For example, if an MCO realizes an increase in the budget-neutral plan factor or risk score, it may not be a statement about its population increasing in morbidity. Rather, the MCO's *relative* morbidity has increased in relation to the morbidity of all populations across MCOs. This phenomenon could occur even if the MCO's absolute morbidity were decreasing.

Member Shift Between Eligibility Categories

It is valuable to understand the alignment between risk score components and capitation rate parameters —eligibility category, age, gender, geography, etc. Per ASOP No. 12, *Risk Classification*, section 3.2.1, *"the actuary should select risk characteristics that are related to expected outcomes."*[16] Eligibility categories can offer a natural classification of health care expenses, such as a relatively healthy adult in TANF versus an adult with an SSI-qualifying disability. As such, risk adjustment models may offer different models and parameters calibrated to specific populations.

When a beneficiary shifts between categories (e.g., from TANF to SSI), the beneficiary's eligibility status used to calculate risk scores will need to be adjusted to align with the beneficiary's eligibility status during the rating period when the scores are applied. Misalignment between these statuses may introduce inconsistencies when relative scores for one eligibility category are weighted using weights from a different eligibility category. The underlying development of the relative weights for the risk adjustment model will need to be understood when using relative weights across eligibility categories or other parameters.

For example, CDPS provides standard relative weights for different eligibility categories: TANF Adult and SSI Disabled Adult. However, the standard relative weights between the two eligibility categories are not relational. For example, if a Medicaid beneficiary receives a 1.45 risk score under the TANF Adult eligibility category using CDPS, the same 1.45 risk score would not be applicable if the same Medicaid beneficiary moves to the SSI Disabled Adult eligibility category. Therefore, the actuary needs to be aware of how beneficiaries may be scored when they move between different eligibility categories when using CDPS. This may also apply to other risk adjustment models.

Risk score application to capitation rates

The actuary may apply the risk scores to a portion of or the full certified Medicaid capitation rate. As described in ASOP No. 49, Medicaid capitation rates consist of forecasted medical expenses and non-benefit components, such as an administrative component, underwriting margin component, or tax component. When determining the appropriate application, the actuary will want to understand the underlying cost drivers for each rate component.

- **Benefit expense**: Risk adjustment models are typically calibrated based on medical expense. Therefore, applying the risk score to the medical portion of the capitation rate directly links payments to the estimated medical expense of the MCO.
- **Administrative component**: Certain administrative expenses, such as claims adjudication, may increase and decrease with transactions that correlate to beneficiary morbidity. Other administrative expenses, such as network management or corporate overhead, may be fixed or vary with the number of enrolled beneficiaries with the MCO.
- **Underwriting margin component**: This margin provides for the cost of capital and a margin for risk or contingency, generally displayed as a percentage of the premium.

[16] ASOP No. 12, *Risk Classification*; *Actuarial Standards Board*; May 2011.

- **Tax component**: Either a fixed amount or a percentage of the premium and viewed as independent of underlying population morbidity.

A capitation payment may include several benefit expense components, such as acute medical, long-term care, pharmacy, behavioral health, dental and vision, and transportation services. The actuary needs to determine if the risk adjustment model predicts the cost appropriately for each type of benefit cost and if each component of the capitation payment should be risk adjusted.

In general, expenses that vary with beneficiary morbidity may be adjusted via the risk adjustment process. In addition, components of rate development that are applied as a percentage of premium, as the underwriting margin often is, may inherently change with the application of risk scores to other rate components. Typically, the entire capitation rate, including both the medical component and the administration component, are risk adjusted.

X. Summary

With more than $450 billion annually in the Medicaid managed care program and actuarial soundness criteria within federal regulation, the use of risk adjustment models is an important and highly visible component of the actuary's services to state Medicaid agencies and other intended users, including the contracted MCOs. The risk adjustment models are used for many purposes and may result in the transfer of millions of dollars, either from the state Medicaid program to the MCOs or between the contracted MCOs. This practice note identifies many of the considerations for an actuary performing risk adjustment calculations or using risk adjustment models.

Glossary

- **Beneficiary**—An individual entitled to Medicaid benefits. Beneficiaries, sometimes called enrollees or members, are often enrolled in an MCO.
- **Budget Neutral**—An adjustment methodology that ensures total capitation payments remain constant when plan factors are applied. MCOs with relatively higher morbidity risk populations receive increased payments, while MCOs with relatively lower morbidity risk populations receive proportionally reduced payments, maintaining the original aggregate PMPM before risk adjustment.
- **Capitation Payment**—A fixed, periodic payment, usually measured as a per-member-per-month (PMPM) rate amount established and certified by contracted actuaries of state Medicaid agencies, approved by the Centers for Medicare & Medicaid Services (CMS), and paid to Managed Care Organizations (MCOs) for providing covered health care services to enrolled beneficiaries. These certified rates can be adjusted by risk adjustment, modifying MCO payments.
- **Carve-out Services**—Specific health care services that are excluded from the terms of the managed care contract.
- **Covered Services**—Specific health care services that are included in the terms of the managed care contract.
- **Credibility**—The statistical reliability of an estimate, typically measured by the sample size of beneficiaries, claim dollars, or claim counts.
- **Temporary Assistance for Needy Families (TANF)**—Medicaid eligibility category for low-income families with children.
- **Managed Care Organization (MCO)**—An entity contracted by a state Medicaid agency that provides and manages health care benefits for beneficiaries through networks of providers. Sometimes, they are referred to as health plans or plans for short.
- **Morbidity**—The presence, severity, or burden of one or more medical conditions, diseases, or illnesses. It is often used in risk adjustment to reflect expected resource use, usually measured in terms of relative costs.
- **Parameter**—A type of statistical, financial, economic, mathematical, or scientific value that is used as input to certain types of models. Risk adjustment model parameters include relative weights, which are used in calculating risk scores.

- **Plan Factor**—An MCO-level average risk score (usually an enrollment-weighted mean). If this factor has been normalized to be relative to the average risk score across all MCOs, then it is a budget-neutral plan factor.

- **Prepaid Ambulatory Health Plan**—An entity that: (a) provides services to beneficiaries under contract with the state, and on the basis of capitation payments, or other payment arrangements that do not use State Plan payment rates; (b) does not provide or arrange for, and is not otherwise responsible for the provision of any inpatient hospital or institutional services for its beneficiaries; and, (c) does not have a comprehensive risk contract.

- **Prepaid Inpatient Health Plan**—An entity that: (a)provides medical services to enrollees under contract with the state Medicaid agency on the basis of prepaid capitation payments; (b) includes responsibility for arranging inpatient hospital care; and (c) does not have a comprehensive risk contract.

- **Rate Cell**—A set of mutually exclusive cohort categories for determining the capitation rate and making the capitation payment.

- **Relative Weight or Relative Cost**—A measure indicating the expected health care expenditures of beneficiaries compared to an average or baseline cost. It is typically represented through relative weights or risk scores.

- **Risk Model**—A statistical representation of beneficiaries' relative costs associated with demographic or health characteristics. Outputs typically include relative weights or risk scores.

- **Risk Score**—A numeric measure (usually relative to an average of 1.000 for a cohort of beneficiaries) estimating resource use, usually in the context of health care costs for a beneficiary based on diagnoses, health care service use, or demographic characteristics.

- **Social Determinants of Health**—Non-medical factors that affect health outcomes. They include the conditions in which people are born, grow, work, live, and age. They also include the broader forces and systems that shape everyday life conditions. These forces and systems encompass economic policies, development agendas, social norms, social policies, racism, climate change, and political structures.

- **SSI – Supplemental Security Income**—A Medicaid eligibility category for persons with disabilities and older adults who have little or no income or resources.

- **Volatility**—The degree of uncertainty, variability, standard deviation, differences in scenarios, or range in model parameters or estimated risk scores.

- **Weight**—A subset of risk model parameters that estimate the marginal resource use associated with a diagnosis code, pharmaceutical use, demographic, or other characteristic attributed to a beneficiary. Typically, these are expressed in terms of relative costs and thus called relative weights or risk weights.