Georgia Skilled Nursing Facility (SNF) Quality Incentive Payment Program
Technical Report 2: Recommendations for Bonus Payment Allocation Process, the Implementation of a Quality Incentive Program Formula, and an Analysis of the Existing Quality Incentive Payment Program

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Executive Summary

The State of Georgia allocated approximately $36 million in state Fiscal Year 2022 to improve the quality of care for Medicaid recipients in Skilled Nursing Facilities (SNFs) through a supplemental quality incentive payment program that provides bonuses to eligible facilities meeting certain quality improvement thresholds. Previously, Technical Report 1 evaluated quality measures collected and reported by the Centers for Medicare & Medicaid Services (CMS) through the *Care Compare* website for inclusion in a quality incentive payment program.

The purpose of Technical Report 2 is to provide recommendations for the measurement, design, and implementation of a quality incentive payment program based on quality measures whose validity was established based on their reliable statistical associations with health inspections and claims-based risk-adjusted hospitalization and emergency department visit rates as described in Technical Report 1.

Technical Report 1 recommended the use of seven quality measures. Given that each of these seven measures has a distinct distribution, it is recommended that these measures be transformed into national percentile rankings (PRs) which standardize each measure and make each measure directly comparable to one another. Further, using national PRs, rather than state rankings alone, has several advantages. First, this method helps to isolate the quality of care that is within the SNF's control from broader national trends that are impacting the entire industry and are outside of the SNF's control. Second, by measuring quality of care and improvement relative to the entire nation, SNFs within the state are incentivized to examine and compete against SNFs nationally on quality, which should improve the overall quality profile of SNFs within the state over time.

Using national PRs for each of the seven measures, Technical Report 2 recommends measuring overall quality using a system of equations regression approach to determine optimal weights for each PR and converting the seven separate PRs into a weighted PR called the Quality Score (QS) which is suggested for use in measuring overall quality. The QS is computed as a weighted average of PRs using the following weights:

Measure (Long-Stay Residents)	Proposed Weight
Long-stay risk-adjusted hospitalizations per 1,000 resident days (Measure 551)	33.5%
Long-stay risk-adjusted emergency room visits per 1,000 resident days (Measure 552)	33.5%
Percentage of long-stay residents that have a need for help with daily activities that has increased (Measure 401)	9.0%
Percentage of long-stay residents who have pressure ulcers (Measure 453)	9.0%
Percentage of long-stay residents that lose too much weight (Measure 404)	5.0%
Percentage of long-stay residents that have a urinary tract infection (Measure 407)	5.0%
Percentage of long-stay residents that received an antipsychotic medication (Measure 419)	5.0%

To measure Quality Improvements (QIs), it is further suggested to use the difference between the current quarter's QS and a weighted moving average of previous quarterly QSs as a Baseline Quality Score (BQS) to determine quality improvements for a SNF in a given quarter. Under this quality improvement model, SNFs that fail to improve within a given quarter (i.e., those for whom the QS in a given quarter is less than or equal to their BQS) are ineligible for quality improvement bonus payments for that quarter. In addition, this process should establish criteria for eligibility that incentivizes continuous improvement, even for those who demonstrate an improvement in the current period (i.e., those for whom QS-BQS > 0). Eligibility criteria should consider previously observed QS performance for the SNF to establish a minimum QS necessary in the current quarter to demonstrate *continuous* quality improvement. By establishing a minimum QS necessary for eligibility, the program not only incentivizes continuous improvement, but helps to mitigate problematic strategic behavior (such as cyclical attempts to alter scores for the purpose of obtaining bonus payments).

Rewarding quality improvements places the greatest emphasis and incentive on low performing SNFs capable of experiencing dramatic improvements in QS performance relative to SNFs who are already providing higher quality care. To incentivize SNFs who are already providing high quality care to maintain and improve, it is recommended that the quality improvement program include a mechanism for providing bonus payments to high performers who have continuously demonstrated excellence in their care, i.e., a quality adjustment.

Using the national distribution of BQSs, this Technical Report measures the maximum observed quality improvement across the distribution of BQSs to determine how much improvement is practically achievable by SNFs based on their initial quality level. Based on the results of this analysis, it is strongly suggested that the quality improvement payment program include a performance adjustment mechanism that automatically rewards high performers using their BQS and current QS with performance adjustment points automatically assigned for eligible high performers. This performance adjustment mechanism assigns more performance adjustment points with higher performance implying that even high performers are incentivized to maintain and improve their quality under the performance adjustment mechanism.

Using the suggested quality improvement and performance adjustment mechanisms should incentivize continuous quality improvements among both low and high performing SNFs. Adding these two mechanisms to construct a Performance Adjusted Continuous Quality Improvement (PACQI) score, the PACQI score can be combined with the number of resident days a SNF delivered in a quarter to determine quarterly bonus payments. This mechanism adjusts bonus payments for the SNF's size in terms of how many resident days they improved care for Georgia residents.

In contrast to the proposed method for allocating quality incentive payments described in this this Technical Report 2, the existing methodology includes four self-reported quality measures that originate from the Minimum Data Set (MDS), three of which were validated in Technical Report 1 as having reliable statistical associations with health inspections and claims-based risk-adjusted hospitalization and emergency department visit rates. While the method in this report

recommends using the MDS-based measures to create a composite quality score, quality improvements for each measure under the existing method are evaluated independently by calculating the change in the raw percentage for Georgia SNFs and ranking the change into deciles with lump sum payments provided to SNFs based on their decile. Finally, the existing method awards quality improvement payments equally regardless of how many patients each SNF serves and does not provide safeguards to ensure continuous improvement at each SNF. Instead, the method in this report proposes to create an equal incentive for SNFs to improve care by adjusting quality improvement payments for the number of patients they serve instead of over-incentivizing smaller SNFs and under-rewarding larger SNFs whose quality improvements will impact more Georgians.

1. Introduction

Technical Report 1 assessed the statistical association between self-reported MDS-based quality measures with both health inspection scores and claims-based quality scores (for long-stay risk-adjusted hospitalization rates and emergency department visit rates). The report concluded that a composite measure of quality for the Georgia Skilled Nursing Facility Quality Incentive Payment Program should include the following claims-based risk-adjusted measures:

- Long-stay hospitalizations per 1,000 resident days (Measure 551)
- Long-stay emergency department visits per 1,000 resident days (Measure 552)

In addition, given robust evidence of a strong statistical relationship in the correct direction with quality, it was suggested that five MDS-based measures be included in a composite quality index:

- Percentage of long-stay residents that have a need for help with daily activities that has increased (Measure 401)
- Percentage of long-stay residents who lose too much weight (Measure 404)
- Percentage of long-stay residents who have a urinary tract infection (Measure 407)
- Percentage of long-stay residents who received an antipsychotic medication (Measure 419)
- Percentage of long-stay residents who have pressure ulcers (Measure 453)

This report documents a proposed method for constructing a composite quality of care index, describes how the method could be implemented to allocate bonus payments to SNFs who maintain excellence or who improve the quality of their care, and briefly compares the proposed method with the current program methodology.

2. Percentile Rank as Common Units

The seven included measures of quality have distinct units and/or distributions from one another which makes them incomparable from the standpoint of relative performance. To place each quality measure in a directly comparable context, the easiest approach is to convert each measure to its Percentile Rank (PR) defined as the percentage of scores that are less than or equal to the currently observed score within the national distribution. By examining a Georgia SNF's

performance relative to all SNFs nationally, we can incentivize quality improvements within the state by benchmarking quality performance relative to SNFs in the rest of the nation.[1]

The PR is defined (using Hazen's rule) as:

$$PR = \frac{CF - (0.5 \times F)}{N} \times 100 \quad (1)$$

Where *CF* is the cumulative frequency, i.e., the total number of scores that are ranked less than or equal to the current score, *F* is the frequency of occurrence of the current score of interest, and N is the total number of observations in the list. An example that demonstrates the computation of PR for a sample of 11 SNFs is presented for 2020Q2 long-stay risk-adjusted hospitalization rates in Table 1.

Before calculating the PR of SNFs within Table 1, the risk-adjusted scores are sorted in descending order given that higher hospitalization rates demonstrate worse performance. The frequency component of this formulation ensures that SNFs with the same score are provided with identical PRs (as illustrated by the PA SNF and GA SNF E in the table). National PRs for each included measure for quarters 2018Q4 through 2021Q1 constructed from *Care Compare* archives are provided in Supplemental Appendix Folder A and for the sample of Georgia SNFs in Supplemental Appendix Folder B.

Table 1: Example of Calculation of Percentile Rank for Risk-Adjusted Hospitalizations per 1,000 Long-Stay Resident Days (Measure 551) Using a Sample of SNFs Observed in 2020Q2

	(1)	(2)	(3)	(4)	(5)	(6)
Provider Name	Risk-Adjusted Score 551	Rank	Frequency (F)	Cumulative Frequency (CF)	N	Percentile Rank $\frac{(4) - .5 \times (3)}{(5)} \times 100$
AL SNF	5.5433321	1	1	1	11	4.55
GA SNF A	3.2308769	2	1	2	11	13.64
GA SNF B	3.0746591	3	1	3	11	22.73
MO SNF	2.0531600	4	1	4	11	31.82
GA SNF C	2.0416181	5	1	5	11	40.91
TX SNF	1.9718540	6	1	6	11	50.00
GA SNF D	1.5382700	7	1	7	11	59.09

[1] The concept of using firms outside of the market as benchmarks for the regulation of firms, i.e., Yardstick competition, within the market is well established within the industrial organization/regulation literature and is a commonly employed tactic by CMS. See, for example, the Diagnosis Related Group reimbursement method for hospitals, or the former Customary, Reasonable, and Prevailing charge system for reimbursing physicians.

PA SNF	1.3681051	8	2	9	11	72.73
GA SNF E	1.3681051	9	2	9	11	72.73
GA SNF F	1.2400110	10	1	10	11	86.36
NY SNF	0.4710310	11	1	11	11	95.45

3. Development of Weights for the Importance of Each Quality Measure's Percentile Rank

While using PR converts each quality measure into directly comparable units, from the standpoint of relative performance, it is not necessarily clear how these units should be included in a composite quality index. While each of the suggested measures may have distinct features, it is likely that at least some elements of each quality PR move together based on the underlying quality of care provided in the SNF. In other words, each of these quality measures may have some shared common variance and using a simple addition of the quality PRs may overemphasize common elements of the production of quality of care while ignoring other key elements that would improve quality for residents within the state.

Rather than arbitrarily choosing weights for each quality measure's PR, pre-pandemic quarterly observations from 2018Q4 to 2019Q4 were used to estimate a structural equation model with underlying common quality as a latent (unobserved) independent variable to determine the relative contribution of each PR measure towards a composite quality index. More specifically, the maximum likelihood estimator in the statistical package Stata 17 was used with the structural equation builder function to estimate the following system of equations model for SNF *i* observed in quarter *t*:

$$PR551_{it} = \beta_1 Quality_{it} + \theta_1 + \epsilon_1 \quad (2)$$

$$PR552_{it} = \beta_2 Quality_{it} + \theta_2 + \epsilon_2 \quad (3)$$

$$PR401_{it} = \beta_3 Quality_{it} + \theta_3 + \epsilon_3 \quad (4)$$

$$PR404_{it} = \beta_4 Quality_{it} + \theta_4 + \epsilon_4 \quad (5)$$

$$PR407_{it} = \beta_5 Quality_{it} + \theta_5 + \epsilon_5 \quad (6)$$

$$PR419_{it} = \beta_6 Quality_{it} + \theta_6 + \epsilon_6 \quad (7)$$

$$PR453_{it} = \beta_7 Quality_{it} + \theta_7 + \epsilon_7 \quad (8)$$

where $\beta_2 - \beta_7$, $\theta_1 - \theta_7$, and $Quality_{it}$ on the right-hand side are estimated for the model. Under this model each β represents the relationship between unobserved quality and the observed quality measure's PR, θ represents an estimated constant, and ϵ represents the error term. Using predicted quality estimates from this model, the following equation was constructed for quality for SNF *i* observed in quarter *t*:

$$\widehat{Quality}_{it} = \alpha_0 + \alpha_1 PR551_{it} + \alpha_2 PR552_{it} + \alpha_3 PR401_{it} + \alpha_4 PR404_{it} + \alpha_5 PR407_{it} + \alpha_5 PR419_{it} + \alpha_6 PR453_{it} \quad (9)$$

where each α estimate represents the partial correlation of the quality measure's PR with latent predicted quality. Each of these partial correlations can be thought of as the observable measure's independent contribution towards overall quality, approximating its weight toward the composite quality index. Estimates of these values are reported in Table 2 with the underlying structural equation estimates reported in Supplemental Appendix A Table A1.[2]

Under this analysis, the claims-based quality measures (551 and 552) display the largest unique contribution, followed by measures for activities of daily living score increases (401), and pressure ulcers (453). Measures for weight loss (404), urinary tract infection (407), and antipsychotic use (419) displayed the lowest contributions. Assigning a 33.5% weight for each claims-based quality measure (i.e., the approximate average of their implied weights), 9% weight for the moderate contribution measures, and 5% weight for low contribution measures, a Quality Score (QS) can be defined for SNF *i* observed in quarter *t* as:

$$QS_{it} = 0.335 \times PR551_{it} + 0.335 \times PR552_{it} + 0.09 \times PR401_{it} + 0.09 \times PR453_{it} + 0.05 \times PR404_{it} + 0.05 \times PR407_{it} + 0.05 \times PR419_{it} \quad (10)$$

Given that the QS uses the underlying performance of each quality measure in terms of their respective PR, the QS can be thought of as a weighted PR. Using this method, the total points available for a SNF is 100, and an improvement relative to the national distribution in any included area will result in a higher overall quality score.

Table 2: System of Equations Partial Correlation and Implied Quality Weights

Measure Code	Description	Partial Correlation Estimate	Implied Weight	Contribution	Assigned Point Value
551	Risk-Adjusted Number of hospitalizations per 1000 long-stay resident days	0.19	27.6%	High	0.335
552	Risk-Adjusted Number of outpatient emergency department visits per 1000 long-stay resident days	0.27	40.2%	High	0.335

[2] Alternatively, relative weights were estimated using several versions of factor analysis methods which produced directly comparable weights. Estimates of these weights under factor analysis models are reported in Supplemental Appendix A Table A2.

401	Percentage of long-stay residents whose need for help with daily activities has increased	0.05	7.8%	Moderate	0.09
404	Percentage of long-stay residents who lose too much weight	0.04	5.6%	Low	0.05
407	Percentage of long-stay residents with a urinary tract infection	0.03	4.9%	Low	0.05
419	Percentage of long-stay residents who received an antipsychotic medication	0.03	5.0%	Low	0.05
453	Percentage of high-risk long-stay residents with pressure ulcers	0.06	8.9%	Moderate	0.09

Notes: Partial Correlation Estimates are obtained from predicted quality (Equation 9) using estimates from the structural equation model estimated using the maximum likelihood estimator. Structural equation estimates are reported in Supplemental Appendix A Table A1.

4. Measuring Quality Scores

In this section, Technical Report 2 describes how to construct QSs for SNFs. To construct QSs, first sort each measure and identify the national PR in outcome performance for each quality measure and quarter, with higher PRs reflecting better performance (as the example illustrated in Table 1). For the population of Georgia SNFs, assign the QS using each measure's PR and weights as illustrated in Equation 10 to obtain quality scores. A summary of the actual QS calculations for six Georgia SNFs is reported in Table 3. Within this Table, Georgia SNF #1's QS for 2020Q2 is calculated using the weights from Equation 10 as:

$$QS = 0.335 \times 17.54 + 0.335 \times 6.51 + 0.09 \times 21.68 + 0.09 \times 11.48$$
$$+0.05 \times 20.95 + 0.05 \times 16.10 + 0.05 \times 8.04 = 13.29$$

Table 3: Percentile Ranks and Quality Scores for a Sample of SNFs Observed in 2020Q2

Provider Name	PR551	PR552	PR401	PR404	PR407	PR419	PR453	Quality Score (QS)
GA SNF #1	17.54	6.51	21.68	20.95	16.10	8.04	11.48	13.29
GA SNF #2	35.45	20.66	18.97	54.43	51.67	63.70	3.67	29.32
GA SNF #3	70.74	83.16	4.09	79.37	67.47	24.73	38.90	64.00
GA SNF #4	91.05	76.73	50.40	37.82	26.06	41.21	33.03	68.97
GA SNF #5	55.94	97.43	82.42	60.91	12.10	11.30	79.38	70.16
GA SNF #6	96.01	89.90	77.52	87.69	19.42	27.58	47.11	80.23

Calculated quality scores for all available Georgia SNFs for quarters 2018Q4 through 2021Q1 are provided in Supplemental Appendix Folder C in 01_QualityScores.xls.

5. Measuring Baseline Quality Scores

To measure improvements in quality performance, an underlying Baseline Quality Score (BQS) must be determined to measure any changes against it. The purpose of this section is to establish recommendations for the construction of a BQS. Examining Pearson's correlation coefficients of quality scores by quarter suggests that quality scores, while highly correlated with each other (given that they are based on four-quarter moving average measures), evolve over time. Table 4 suggests that the QS for the previous quarter is highly correlated with the current quarter (correlation coefficient>.90), whereas the correlation coefficient even three quarters prior to the current quarter is less strongly correlated (correlation coefficient>.60).

Table 4: Pearson's Correlation Coefficients of Quality Scores by Quarter (For National Sample)

	2018Q4	2019Q1	2019Q2	2019Q3	2019Q4	2020Q2	2020Q4	2021Q1
2018Q4	1.00							
2019Q1	0.85	1.00						
2019Q2	0.77	0.93	1.00					
2019Q3	0.69	0.85	0.93	1.00				
2019Q4	0.65	0.76	0.85	0.92	1.00			
2020Q2	0.60	0.64	0.66	0.74	0.82	1.00		
2020Q4	0.55	0.58	0.59	0.61	0.63	0.81	1.00	
2021Q1	0.52	0.54	0.55	0.56	0.58	0.71	0.91	1.00

Given the gradual evolution of QSs over time, it is suggested to use a weighted moving average QS as a BQS to compare the current period against. For example, a three-quarter moving average BQS can be defined for SNF *i* observed in quarter *t* as:

$$BQS_{it} = \frac{3 \times BQS_{it-1} + 2 \times BQS_{it-2} + 1 \times BQS_{it-3}}{6} \tag{11}$$

where *t* represents the current period within which we wish to estimate a quality improvement score and where *t*-1, *t*-2, and *t*-3 represent the previous three most recently available periods. This method helps to incentivize continuous improvements and maintenance of quality given its reliance on lagged values will increase the measured quality gains for improving performance and stabilize baselines used for comparison SNFs who experience abnormal quarterly scores. The weighted moving average places more emphasis on more recent observations with 50%=3/6 weight placed on the last observation, 33.33%=2/6 weight on the second to last observation, with 16.66%=1/6 weight on the third to last observation. An example of this calculation is provided for a sample of SNFs in Table 5 (with calculations for all Georgia SNFs for quarters 2020Q2 through 2021Q1 reported in Supplemental Appendix Folder C-02_QI_PA.xls in column G based on columns D, E, and F). Given that the pandemic has disrupted some data releases on *Care Compare*, in evaluating quality improvement for the second quarter of 2020, the three previously available values are from the fourth, third, and second quarter of 2019. Using these values, the weighted three-quarter moving average BQS for Georgia SNF #6 can be calculated as:

$$BQS_{10,2020Q2} = \frac{3 \times 81.52 + 2 \times 72.29 + 76.78}{6} = 77.6$$

Table 5: Determination of Baseline Quality Score for 2020Q2 for a Sample of GA SNFs

Provider Name	QS2019Q4	QS2019Q3	QS2019Q2	BQS2020Q2
GA SNF #1	6.08	8.47	13.47	8.11
GA SNF #2	32.88	24.81	25.96	29.03
GA SNF #3	75.56	70.19	69.82	72.81
GA SNF #4	69.55	70.25	56.80	67.66
GA SNF #5	60.36	61.69	62.56	61.17
GA SNF #6	81.52	72.29	76.78	77.65

6. Measuring Quality Improvement

Assume that for SNF *i*, a BQS has been determined using an additive/multiplicative function of the national PR for each quality metric included in the quality improvement program. To assess the improvement in quality in a subsequent quarter, *t*, a QS can be calculated for SNF *i* observed in quarter *t* using the same additive/multiplicative function of the national PR for each quality metric (Equation 10). Since quality performance in quarter *t* is measured relative to NHs nationally in the same quarter, this metric will adapt with national trends impacting the entire NH industry and reward those who demonstrate relative improvements. Quality Improvement (QI) in the given quarter can be measured for SNF *i* observed in quarter *t* as:

$$QI_{it} = QS_{it} - BQS_{it} \; if \; QS_{it} - BQS_{it} > 0$$
$$QI_{it} = 0 \; if \; QS_{it} - BQS_{it} < 0 \qquad (12)$$

The QI calculation is illustrated in Table 6 for a sample of Georgia SNFs (with calculations for all Georgia SNFs for quarters 2020Q2 through 2021Q1 reported in Supplemental Appendix Folder C-02_QI_PA.xls Columns C, G, H, and I). Within Table 6, all SNFs apart from SNF #3, experienced some level of QI relative to their baseline. Unfortunately, SNF #3 produced lower quality in 2020Q2 relative to their baseline. As a result, this SNF is assigned a zero for its quality improvement score.

Table 6: Measuring Quality Improvements for a Sample of GA SNFs in 2020Q2

Provider Name	(1) Quality Score (QS)	(2) Baseline Quality Score (BQS)	(3) Difference (1) - (2)	(4) Quality Improvement (QI) (3) if (3) > 0
GA SNF #1	13.29	8.11	5.19	5.19
GA SNF #2	29.32	29.03	0.29	0.29
GA SNF #3	64.00	72.81	-8.81	0
GA SNF #4	68.97	67.66	1.31	1.31
GA SNF #5	70.16	61.17	8.99	8.99
GA SNF #6	80.23	77.65	2.58	2.58

7. Avoiding Cyclical Strategic Behavior and Incentivizing Continuous Improvement

A potential incentive created by the QI formula is cyclical strategic behavior. For example, a forward-looking and bonus payment focused SNF could intentionally reduce its quality in a quarter knowing that it will not be penalized by the reduction with the intention to raise its quality in a subsequent quarter to cyclically gain bonus payments that it otherwise would not receive. To avoid such strategic behavior and incentivize continuous improvement, the formula for QI in a quarter can be modified to measure Continuous Quality Improvement (CQI) for SNF *i* observed in quarter *t* as:

$$\begin{aligned} CQI_{it} &= QS_{it} - BQS_i \; if \; QS_{it} - BQS_{it} > 0 \; and \; QS_{it} \geq Minimum \; QS_{it} \\ &= 0 \; if \;\; QS_{it} - BQS_{it} < 0 \text{ or } \; QS_{it} < Minimum \; QS_{it} \end{aligned} \tag{13}$$

where Minimum QS represents the maximum observed QS observed from an initial starting quarter through *t-1*. [3] Using this modified formula, once a SNF demonstrates a quality improvement, they will only receive additional bonus payments for subsequent quality improvements relative to this previously demonstrated quality level. An example of this process is illustrated in Table 7 (with calculations for all Georgia SNFs for quarters 2020Q2 through 2021Q1 reported in Supplemental Appendix Folder C-02_QI_PA.xls Column I and J). The table illustrates this process for 2020Q2 quality incentive payments assuming that quality scores for 2019Q4 are used as the minimum basis for assessing quality. For SNF #1 in the table, the observed QS in 2019Q4 was 6.08 establishing the minimum QS for bonus payment eligibility. Given that their QS in 2020Q2 is 13.29, they have exceeded the minimum QS required for eligibility implying that their QI score for 2020Q2 is used for their continuous quality improvement score. Given that their QS in 2020Q2 exceeds the currently observed minimum quality score, in the next available evaluation cycle, SNF #1 will need to have a QS that exceeds 13.29 to be eligible for bonus payments since max (6.08, 13.29) =13.29. For SNF #2, its quality improvement score is 0.29. However, it previously demonstrated a QS level of 32.88 in 2019Q4 set as their established minimum QS. Given that they have not demonstrated continuous quality improvement relative to their previous performance, they are ineligible for bonus payments in 2020Q2 based purely on continuous quality improvement scores. However, if they improve their QS beyond 32.99 in the next quarterly evaluation window, they will then be eligible for bonus payments through the continuous quality improvement mechanism, given that their minimum QS for the next quarter is max (32.99, 29.32) =32.88.

[3] This mechanism may require a periodic reset if factors beyond the control of the industry disproportionately impact Georgia SNFs, but not SNFs nationally. However, given that PRs are measured nationally, to such an extent that adverse events impact SNFs nationally, this should not impact the relative performance of SNFs within Georgia.

Table 7: Measuring Continuous Quality Improvements for a Sample of GA SNFs in 2020Q2

Provider Name	(1) Quality Score (QS)	(2) Baseline Quality Score (BQS)	(3) Difference (1) - (2)	(4) Quality Improvement (QI) (3) if (3)> 0	(5) Minimum QS	(6) Continuous Quality Improvement (CQI) (4) if (1) > (5)	(7) Performance Adjustment (PA)	(8) Performance Adjusted Continuous Quality Improvement (PACQI) (6) + (7)
GA SNF #1	13.29	8.11	5.19	5.19	6.08	5.19	0.00	5.19
GA SNF #2	29.32	29.03	0.29	0.29	32.88	0.00	0.00	0.00
GA SNF #3	64.00	72.81	-8.81	0.00	75.56	0.00	21.10	21.10
GA SNF #4	68.97	67.66	1.31	1.31	69.55	0.00	16.48	16.48
GA SNF #5	70.16	61.17	8.99	8.99	60.36	8.99	10.53	19.52
GA SNF #6	80.23	77.65	2.58	2.58	81.52	0.00	25.09	25.09

Notes: Minimum Quality Score is the observed quality score for 2019Q4. If evaluated in the observation period after 2020Q2, i.e., 2020Q4, the Minimum QS would consist of max (QS2020Q2, QS2019Q4) with subsequent periods adding an additional year to the maximization formula.

8. Assigning a Performance Adjusted for High Performers

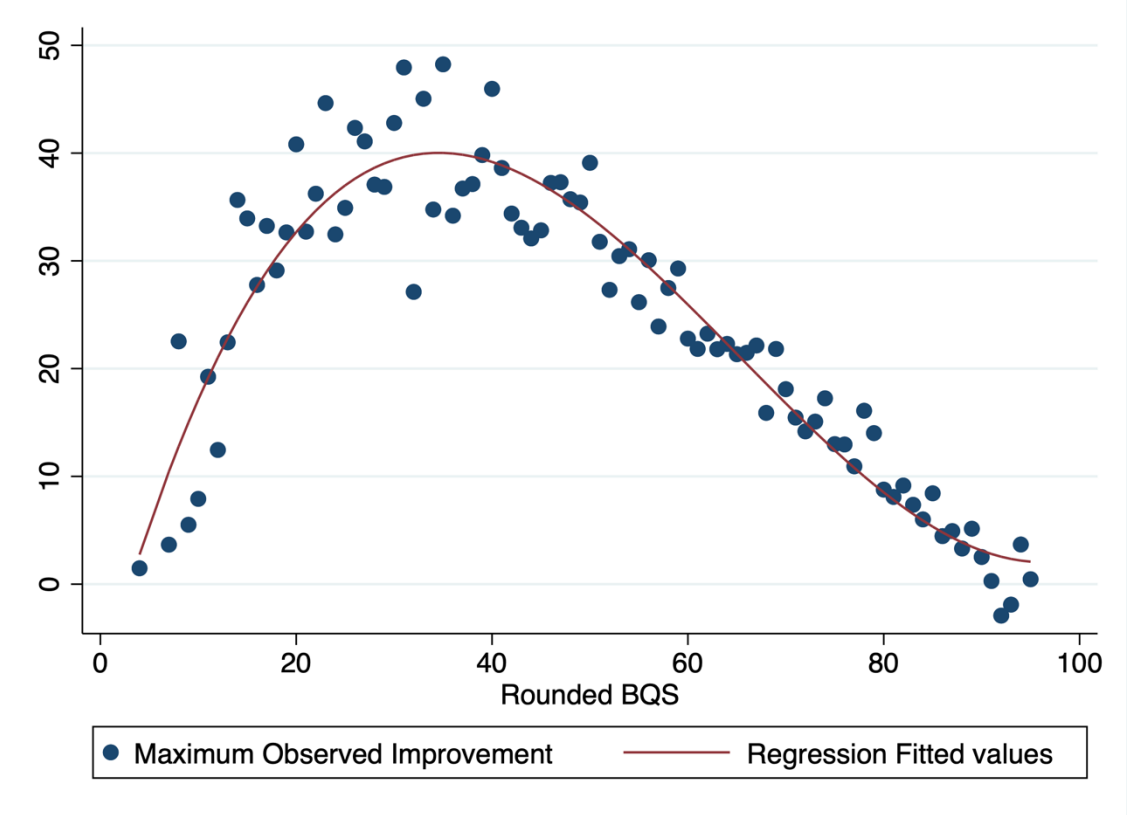
Within Table 7, SNF #1 will be awarded based on a quality improvement of 5.19 relative to a BQS of 8.11. In contrast, SNF #6's BQS of 77.65 suggests that they were providing drastically better quality of care. For SNF #6, given that their minimum quality baseline is set at 81.52, even though they have increased their QS by 2.58 improvement points, they receive 0 for their continuous quality improvement score and are provided with a much weaker incentive to improve their care. This example illustrates that the QI formula and CQI adjustment are designed to measure and reward continuous improvements in the quality of care provided by SNFs in the state of Georgia. However, SNFs who are already providing high quality of care have less room to improve their QS and may also face diminishing marginal improvements to quality as increased efforts among staff and administrators may produce a smaller return in quality for high performers.

Rather than speculate on the nature of potential returns in terms of quality improvements across the range of QSs, this relationship is empirically modeled to examine the theoretical maximum improvement achievable by SNFs based on their initial BQS level. Using the population of SNFs observed nationally in the fourth quarter of 2020, the SNF's unadjusted QI score was calculated (i.e., QS-BQS with no other adjustments) as well as each SNF's rounded BQS (rounding the BQS to the one's place). For each rounded BQS, the maximum observed unadjusted QI score was calculated. Since these estimates are using national data, each rounded BQS has many SNFs with comparable BQS levels and calculating the maximum observed unadjusted QI score provides an empirical estimate for the maximum improvement that can be expected from each group.[4]

[4] For example, 204 SNFs have a BQS of between 59.5 and 60.49 giving them a rounded BQS of 60. The highest unadjusted QI within this group is 22.78. Given that at least one SNF in the rounded BQS of 60 achieved a QI of 22.78, it is theoretically possible that any SNF within this group could improve their quality by 22.78 points.

Figure 1 reports the maximum observed unadjusted QI scores by rounded BQS. From the figure, it is evident that SNFs with the greatest ability to improve their QS are those in the BQS range of 20-40, with maximum unadjusted QI declining substantially after the peak at approximately 40 BQS. It is evident from the figure that higher performers are less likely to be able to improve their quality scores, with many maximum QI scores on the high end of the distribution falling below zero.

Figure 1: Maximum Observed Unadjusted Quality Scores by Rounded BQS and Cubic Regression Fitted Values



Below is a more formal estimate of this relationship between maximum observed unadjusted QI scores and rounded weighted BQS percentiles using regression analysis with linear, quadratic, and cubic polynomials:

$$Max\ QI\ Score = \beta_0 + \beta_1 BQS + \epsilon \quad (14)$$

$$Max\ QI\ Score = \beta_0 + \beta_1 BQS + \beta_2 BQS^2 + \epsilon \quad (15)$$

$$Max\ QI\ Score = \beta_0 + \beta_1 BQS + \beta_2 BQS^2 + \beta_3 BQS^3 + \epsilon \quad (16)$$

Below is also an estimated model that groups BQS into eight groups based on BQS ranges to examine whether thresholds of maximum QI achievement differed by initial BQS level.

$$Max\ QI\ Score = \beta_0 + BQS\ Level\ \beta + \epsilon \quad (17)$$

where BQS level is a vector containing eight categorical variables (for whether the BQS score is observed in the range of 0-19.99, 20-29.99, 30-39.99, …, and finally 80-100). Results for these models are presented in Table 8 and fitted values for the cubic polynomial regression are illustrated in Figure 1 (as the red line).

Results for estimated models (Table 8 columns 1-3) suggest that linear, quadratic, and cubic polynomial specifications each have statistically significant coefficients at the 1% level. The results suggest that the cubic polynomial maintains the best fit across the relevant range of values and that the ability to improve QI scores initially increases and then diminishes across the relevant range of rounded BQS levels. For estimates in conjunction with BQS groupings (Table 8 column 4) based on weighted percentile ranges, results suggest that those in the 0-19 range, those in the 20-30, 30-40, 40-50, and 50-60 rounded BQS ranges were estimated to be able to produce 17, 19, 15, and 8 higher QI scores than those in in the 0-19 range. Those in the 60-70 range demonstrated no statistically significant difference from the 0-20 group, and those in the 70-80, and 80-100 range were significantly less likely to produce the same levels of quality improvements as those in the 0-19 range.

Given these empirical estimates that demonstrate the diminished ability of high performing SNFs (i.e., SNFs with BQS>60) to achieve quality improvements, this report proposes the following Performance Adjustment (PA) to motivate high performers to both maintain high performance and continue to improve the quality of their care for SNF *i* observed in quarter *t:*

$$\begin{aligned} PA_{it} &= 44.676067 - 3.23741 \times \mathrm{BQS_{it}} + .06368 \times {BQS_{it}}^2 \\ &\quad -.000325 \times {BQS_{it}}^3\ if\ \mathrm{BQS_{it}} > 60\ and\ QS_{it} > 60 \\ &= 0\ \ otherwise \end{aligned} \quad (19)$$

This formula assigns a PA based on the gap between the maximum predicted improvement (44.67) and the predicted maximum observed achievement at the SNF's BQS. Using this formula, Table 9 reports expected PAs using several differing initial BQS Levels under the assumption that the SNF's QS for the quarter is above 60.[5]

[5] Given the structure of the cubic polynomial estimated to produce Equation 19, if a SNF exceeds 96 BQS, their PA should be held fixed at BQS 96 PA levels given the reduced values of the function. Estimates of the PA formula using maximum improvements for 2020Q4 or 2020Q2 produced comparable predicted values to those reported in Tables 8 and 9. Estimates for alternative models with BQS level suggest an improvement decline at BQS level of 70 suggesting that BQS level of 60 in equation 19 represents a conservative estimate.

Table 8: Regression Coefficient Estimates for the Relationship between Rounded BQS (RBQS) and Maximum Observed Unadjusted Quality Improvement in Fourth Quarter 2020

	(1)	(2)	(3)	(4)
Variable	Coeff. (se.)	Coeff. (se.)	Coeff. (se.)	Coeff. (se.)
RBQS	-0.30957***	1.17044***	3.23741***	
	(0.05921)	(0.16234)	(0.28454)	
RBQS Squared		-0.01468***	-0.06368***	
		(0.00144)	(0.00577)	
RBQS Cubed			0.00032***	
			(0.00003)	
20 to less than 30 BQS				17.37210***
				(3.55016)
30 to less than 40 BQS				19.43202***
				(3.86795)
40 to less than 50 BQS				14.64248***
				(3.38715)
50 to less than 60 BQS				8.49495**
				(3.56169)
60 to less than 70 BQS				0.45082
				(3.37770)
70 to less than 80 BQS				-6.76837**
				(3.39658)
80 to 100 BQS				-16.60800***
				(3.44309)
Constant	39.50582***	12.14034***	-9.20594**	20.54183***
	(3.82837)	(4.09196)	(4.02141)	(3.30399)

Notes: *** p<0.001, ** p<0.05

Table 9: Performance Adjustments for Those Who Maintain their Current Weighted Decile

Baseline Quality Score (BQS)	Performance Adjustment (PA)
<60	0
60	9.48
65	14.04
70	18.61
75	22.96
80	26.84
85	29.99
90	32.19
95	33.19

Notes: Calculated with Equation 19.

Table 7 column 7 reports actual PA calculations for a sample of Georgia SNFs assessed for the second quarter of 2020. PA calculations for all Georgia SNFs for quarters 2020Q2 through 2021Q1 are reported in Supplemental Appendix Folder C-02_QI_PA.xls Column K. Within the table only SNFs 3-6 would be potentially eligible based on BQS and current QS. SNF #3 is eligible for PA based on their BQS of 72.81. To the extent that performance this period (QS=64) reduces their BQS in the next period of observation, their PA will decline in a subsequent period. Should their QS in the next period decline below 60, they would no longer be eligible for a PA.

9. Measuring Performance Adjusted Continuous Quality Improvement

Combining the continuous quality improvement and performance adjustment mechanisms, the Performance Adjusted Continuous Quality Improvement (PACQI) was created which can be defined for SNF *i*, in quarter *t* as:

$$PACQI_{it} = CQI_{it} + PA_{it} \tag{20}$$

This formula rewards a SNF for both its continuous improvement in QS relative to their BQS and for their existing achievement and maintenance of quality. PACQI are reported for a sample of six Georgia SNFs in Table 7 column 8 and for all Georgia SNFs for quarters 2020Q2 through 2021Q1 are reported in Supplemental Appendix Folder C-02_QI_PA.xls Column L.

10. Determining Quality Improvement Maintenance Days

Supposing that SNF *i* delivered a total of *q* unique resident days for Medicaid residents in the quarter *t*, the total days under which quality was improved or maintained can be represented by:

$$\text{Quality Improvement Maintenance Days } (QIMD_{it}) = q_{it} \times PACQI_{it}$$

and the total number of QIMDs within the state of Georgia can be determined by:

$$TQIMD_t = \sum_{i=1}^{N} QIMD_{it}$$

QIMD and TQIMD values are illustrated for the sample of 6 Georgia SNFs in columns 5 and 6 of Table 10, respectively (and for all SNFs with valid measures in Supplemental Appendix Folder C-03_Bonus_Payments.xls Columns G and H).

11. Determining Quarterly Bonus Payments

Suppose that X dollars have been allocated to bonus payments for quality improvements in quarter *t*. The Payment Per QIMD (PPQIMD) can simply be calculated as:

$$PPQIMD_t = \frac{X}{\text{TQI}MD_t}$$

If $9 million has been allocated to SNFs for bonus payments within the quarter, the PPQIMD for 2020Q2 is $1.18 in Table 10 column (7) and which is also illustrated in Column I of Supplemental Appendix Folder C-03_Bonus_Payments.xls. Using these values, the Quarterly Quality Bonus Payment (QQBP) for a given SNF can be calculated as:

$$QQPB_{it} = QIMD_{it} \times PPQIMD_t$$

which is illustrated for the sample of six Georgia SNFs in 2020Q2 in Table 10 column 8 and for all Georgia SNFs in in Column J of Supplemental Appendix Folder C-03_Bonus_Payments.xls.

Table 10: Bonus Payment Calculations for 2020Q2 using Measured Performance Adjusted Continuous Quality Improvement

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Provider Name	Continuous Quality Improvement CQI2020Q2	Performance Adjustment PA2020Q2	Performance Adjusted Continuous Quality Improvement PACQI2020Q4	Quarterly Total Resident Days (q)	Quality Improvement Maintenance Days (QIMD)	Total QIMD	Payment Per QIMD	Quarterly Quality Bonus Payments
GA SNF #1	5.19	0.00	5.19	6713	34809.23	7626206.00	$ 1.18	$ 41,079.80
GA SNF #2	0.00	0.00	0.00	7932	0.00	7626206.00	$ 1.18	$ -
GA SNF #3	0.00	21.10	21.10	2533	53449.68	7626206.00	$ 1.18	$ 63,078.17
GA SNF #4	0.00	16.48	16.48	5715	94205.78	7626206.00	$ 1.18	$ 111,176.13
GA SNF #5	8.99	10.53	19.52	5086	99273.48	7626206.00	$ 1.18	$ 117,156.73
GA SNF #6	0.00	25.09	25.09	5113	128280.34	7626206.00	$ 1.18	$ 151,388.92

Notes: Assumes $9 million allocated for the quarter for quality incentive payments

12. Comparison of Performance Adjusted Continuous Quality Improvement Method with the Proposed Method Developed by the Georgia Department of Community Health (DCH)

DCH developed an independent proposed methodology for the bonus payment program, as outlined by the "(Tentative) Georgia SNF Medicaid Supplemental Payment Incentive Program Overview." In the following sections, Technical Report 1describes the methodology used in the existing SNF quality incentive payment program and contrasts this method to the method described in this Technical Report.

13. Overview of Current Methodology

The existing methodology includes four self-reported quality measures that originate from the MDS. These measures include:

- Percentage of long-stay residents with a urinary tract infection (Measure 407)
- Percentage of long-stay residents who received an antipsychotic medication (Measure 419)
- Percentage of long-stay residents who received an antianxiety or hypnotic medication (Measure 452)
- Percentage of high-risk long-stay residents with pressure ulcers (Measure 453)

Quality improvements and bonus payments under the current methodology are evaluated separately for each of the four quality measures. To determine the improvement in quality within a SNF, the existing methodology calculates the change in the measure's four-quarter percentage. Using only Georgia SNFs with quality improvements, the change in percentage score is converted to deciles (of improvement).

To determine how bonus payments will be allocated for a specific MDS-based quality measure, the existing formula calculates a Total Distribution Index (TDI):

$$TDI = \sum_{D=1}^{10} 10\ D \times 10 \times (\#\ SNFs_D)$$

Where D represents the Decile of the percentage point change in the MDS-based measure's score and # SNFs represent the total count of SNFs calculated in the Decile.

Using the TDI, the payment for a SNF in Decile D if $X has been allocated to quality improvement on the specific MDS-based measure is calculated as:

$$Payment = \frac{D \times X}{TDI}$$

14. Contrasting the Methodologies: Included Variables

The existing method includes four MDS-based self-reported measures of quality from the *Care Compare* website. Three of these measures (407 Urinary Tract Infections, 419 Antipsychotic Medication, and 453 Pressure Ulcers) were validated in Technical Report 1 for having a statistically significant relationship in the appropriate direction with externally valid measures (health inspection scores and claims-based measures of emergency department visits and hospitalizations). In contrast, Measure 452 for antianxiety or hypnotic medication was found in Technical Report 1 to have a statistically significant relationship with hospitalizations and emergency department visits using national data, no statistically significant relationship with claims-based measures using the sample of Georgia SNFs, as well as a negative and statistically significant relationship with health inspection quality using the sample of Georgia SNFs.

The proposed methodology of Technical Report 2 contrasts with the existing method by replacing Measure 452 for antianxiety/hypnotics with two other MDS-based measures, i.e., Measure 401: percentage of long-stay residents that have a need for help with daily activities that has increased and Measure 404: percentage of long-stay residents that lose too much weight.

In addition, the proposed method discussed in Technical Report 2 includes two claims-based risk-adjusted measures that are calculated by CMS using residential characteristics and claims data. Given that these measures are calculated by CMS rather than self-reported by SNFs, they are less subject to potential manipulation by an unscrupulous SNF attempting to gain incentive payments through false reporting of MDS-based measures. Since the existing proposed method does not include these claims-based measures, the method proposed in this report places much more emphasis on claims-based measures with 67% of the QS composed of claims-based risk-adjusted measures. These measures include Measure 551: long-stay hospitalizations per 1,000 resident days and Measure 552: emergency department visits per 1,000 resident days.[6]

[6] A potential drawback of this approach is missing values in the claims-based QM data. CMS uses an imputation rule to assign QM ratings for these measures when the SNF has inadequate sample sizes. Imputed values are not reported as part of *Care Compare*. This suggests that to include SNFs with low resident counts, program administrators for the Georgia Quality Improvement Program will need to either obtain and validate the imputed values or calculate equivalent metrics using Medicaid claims data.

15. Contrasting the Methodologies: Performance Improvement Measurement

The existing method places independent emphasis on each included MDS-based measure and evaluates improvement for the SNF by evaluating the decile of the percentage change within the state. The proposed method of Technical Report 2 instead measures quality by constructing one composite QS, implying that a SNF cannot, for better or worse, strategically target one area of improvement while neglecting other aspects of care. To improve their QS, a SNF must either target multiple areas or target specific areas while maintaining quality in others.

Further, the method proposed in this report constructs a QS based on the overall percentile performance of each SNF relative to the nation. This means that a SNF that maintains its current percentage score on a quality measure could demonstrate a quality reduction (or improvement) relative to the rest of the nation if nationally, SNF performance on the measure is trending up (or down). This makes the proposed method of Technical Report 2 less subject to trends impacting the entire industry (such as the COVID-19 Pandemic) and benchmarks Georgia SNF performance in comparison to the entire nation rather than only SNFs within Georgia.

16. Contrasting the Methodologies: Potential for Cyclical Strategic Behavior

In the public notice (dated August 12, 2021) for the Supplemental Quality Incentive Payments to Eligible Nursing Facilities, the Department indicates that each year, the base year will be adjusted to reflect improvement against the prior year with CY2021 payment paid out based on improvements against CY2020, CY2022 paid out against improvements relative to CY2021, etc. with only facilities demonstrating improvement eligible for incentive payments. As noted in Section 7, this may lead to cyclical strategic behavior by some SNFs attempting to gain unwarranted bonus payments.

In contrast, the proposed method of Technical Report 2 establishes a minimum improvement necessary based on observed previous performance. This implies that a SNF attempting to strategically obtain bonus payments through cyclically reducing and improving measured quality will not obtain bonus payments.

17. Contrasting the Methodologies: Performance Adjustment Mechanism

The existing method rewards performance improvement on each measure relative to the baseline which incentivizes improvements on measures among low performers but does not contain a mechanism for rewarding high performers for maintaining or improving their quality of care.

For example, the distribution of scores for Measure 453 for the percentage of residents with pressure ulcers using the existing method (using GA SNF QIP FY22 AFY22 Final.xlsx), 63% (43 out of 68) of GA SNFs in the bottom 20% of overall performance in 2020Q2 have some measured improvement in 2021Q2. In contrast, 81% (55 out of 68) of those in the top 20% have no measurable improvement.

The proposed method of Technical Report 2 suggests a mechanism by which SNFs who are already performing at an established high level (60% or higher in BQS nationally) are rewarded for their quality efforts and are further incentivized with higher bonus payments to improve their performance further.

18. Contrasting the Methodologies: Adjustment for Number of Patients

The existing method provides lump-sum payments independent of the number of resident days provided during the evaluation period. As a result, this method will likely disproportionally reward smaller SNFs with the same level of quality improvement as larger SNFs even though a larger SNF may be improving care for a much larger number of residents. For example, examining the distribution of bonus payments for quality improvement in pressure ulcers using the existing method (observed in GA SNF QIP FY22 AFY22 Final.xlsx), the maximum observed bonus payment for improvement in 2021Q2 for the measure is $132,506.49 provided to each of the 11 SNFs in the highest decile. Within this group, the smallest SNF has 44 beds and reduced the reported percentage of residents with pressure ulcers by 8.89% whereas the largest SNF has 160 beds and reported a reduction in the percentage of residents with pressure ulcers by 7.93%. Assuming full occupancy across the year (with the same residents), this implies that the smaller SNF reduced the number of residents with pressure ulcers by 4 ($4 \approx 44 \times .0889$) whereas the larger SNF reduced the total number of residents with pressure ulcers by 13 ($13 \approx 160 \times .0793$). By providing the same lump sum payment to each SNF, the existing method implicitly values the care of Georgia residents differently based on the size of the SNF that provides them with care. In this case, the existing method values the absence of pressure ulcers at $33,126.62 for residents at the small SNF and at only $10,192.81 for residents of the large SNF. In contrast, the proposed method of Technical Report 2 adjusts reimbursement for the number of days provided within the SNF as well as the observed quality improvement implying that improvements are rewarded consistently regardless of the size of the SNF.

19. Conclusion

This report documents a proposed method for constructing a composite quality of care index based on seven quality measures that are publicly reported by CMS on the website Care Compare. Two of these measures are claims-based (long-stay risk-adjusted hospitalizations per 1,000 resident days (Measure 551) and long-stay risk-adjusted emergency department visits per 1,000 resident days (Measure 552) and are constructed for each quarter using a rolling calendar year. Five of these measures are constructed as 4-quarter moving averages (percentage of long-stay residents that have a need for help with daily activities that has increased (Measure 401), percentage of long-stay residents who lose too much weight (Measure 404), percentage of long-stay residents who have a urinary tract infection (Measure 407), percentage of long-stay residents who received an antipsychotic medication (Measure 419), percentage of long-stay residents who have pressure ulcers (Measure 453) using data that is self-reported by SNFs. However, the five included self-reported measures were selected based on their statistically significant and directionally consistent relationship with both claims-based measures and contemporaneous health inspection scores.

To standardize each measure and make measures directly comparable to one another, the proposed method converts the SNF's score on each measure to a national percentile ranking. This helps to

isolate the quality of care that is within the SNF's control from broader national trends that are impacting the entire industry and are outside of the SNF's control. It also forces SNFs within the state to compete against SNFs nationally with respect to quality. The proposed method constructs a quality score as a weighted average of each quality measure's percentile ranking within the quarter. Using a weighted moving average of the previous quarter's quality scores as a baseline quality score, the proposed method constructs quality improvement as the difference between the baseline score and the current score while considering previous quality score performance to establish bonus payment eligibility thereby ensuring continuous quality improvements and mitigating strategic behavior. The proposed method also recognizes that high performers will not be able to improve their quality scores at the same rate as low performers. To both reward and incentivize their continued efforts at providing high-quality care, the proposed method provides a performance adjustment mechanism that allocates points to SNFs with high quality scores. Considering both the performance adjustment mechanism and quality improvement mechanism, the proposed method allocates bonus payments for each quarter based on the number of resident days to which high quality of care was maintained or improved for the Medicaid residents of the SNF.

Given that several of the quality measures included in the composite quality index are self-reported and could be the subject of strategic behavior, the program should regularly monitor the relationship between these measures and claims-based/inspection quality measures. Further, the program should regularly test for evidence of declining quality in non-targeted dimensions. Evidence of a weakening statistical relationship or the emergence of a relationship between non-self-reported measures and excluded (self-reported) quality measures could require modification to the set of included quality measures and/or weights used in the construction of the quality score.