



ACUMEN

**Quantify Case-Mix Creep Under the Patient
Driven Payment Model: Technical Methodology
Memo**

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OVERVIEW

This memo accompanies the Request for Information (RFI): Methodology for Quantifying and Addressing Case-Mix Creep Under the Patient Driven Payment Model in the Fiscal Year (FY) 2027 Skilled Nursing Facility (SNF) Prospective Payment System (PPS) Proposed Rule and describes our approach using a regression framework to quantify case-mix creep by categorizing case-mix index (CMI) changes into real changes and nominal changes. The background section briefly highlights the need to address case-mix creep detailed in the RFI. [Section 1](#) explains the study period and data sources. [Section 2](#) outlines the regression setup. [Section 3](#) demonstrates the calculation of the case-mix creep adjustment factor. Finally, [Section 4](#) includes the appendix, which contains tables referenced in the memo.

BACKGROUND

As the Patient Driven Payment Model (PDPM) continues to mature since its adoption in FY 2020, ongoing monitoring of case-mix trends is essential to ensure that payment rates continue to reflect actual changes in patient acuity rather than shifts in coding or documentation behaviors. Our monitoring reveals some evidence of increasing coding intensity over time. For example, reporting of the malnutrition item (I5600) increased from a rate of 5% of stays in FY 2018 to 47% of stays in FY 2024. Although only a small number of items demonstrate change of this magnitude, many others show smaller but meaningful shifts such as the swallowing disorder item (K0100), which increased from 4% to 21% of stays, and the depression item (D0160 or D0600), which increased from 4% to 19% of stays, between FY 2018 and FY 2024. Some items also show declines, such as fever (J1550A) that decreased from 2% to 1%.

More broadly, the PDPM CMI has been increasing at a rate that exceeds clinical expectation, while the median cost per day for SNF PPS stays, which reflects patient resource utilization, has been decreasing. We calculate provider costs by multiplying the facility’s charges on Medicare claims by the facility-specific cost-to-charge ratio (CCR) obtained from its Medicare Cost Report filed to the Healthcare Provider Cost Reporting Information System (HCRIS). Nursing costs are not available due to a lack of stay-specific charges. More information on the cost calculation methodology can be found in [Section 3.2 of the SNF PDPM Technical Report](#). [Table 1](#) presents trends in the median cost per day by PDPM case-mix adjusted component, demonstrating a decreasing trend from FY 2018 through FY 2024, with a sharp decrease at the onset of PDPM in FY 2020, across the Physical Therapy (PT), Occupational Therapy (OT), Speech-Language Pathology (SLP), and Non-therapy Ancillary (NTA) components. This divergence suggests a disconnect between reported acuity and observed resource utilization. To address this issue, we developed a regression framework to quantify the extent to which recent case-mix trends reflect nominal coding changes, commonly referred to as “case-mix creep.”

Table 1: Median Cost per Day by PDPM Component

PDPM Component	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
PT	\$67	\$67	\$56	\$53	\$51	\$51	\$51
OT	\$58	\$58	\$48	\$45	\$43	\$43	\$45
SLP	\$34	\$34	\$31	\$29	\$27	\$27	\$28
NTA	\$43	\$43	\$40	\$38	\$35	\$36	\$39

1 STUDY PERIOD AND DATA SOURCES

The study population includes fee-for-service (FFS) Medicare Part A beneficiaries from FY 2017 through FY 2024. However, as discussed in the FY 2023 SNF PPS final rule ([87 FR 47526](#) through [47528](#)), a portion of data from this time period was affected by the national COVID-19 Public Health Emergency (PHE). To minimize the impact of the COVID-19 PHE, we use a similar subset population used for the PDPM Parity Adjustment recalibration and exclude stays with either a COVID-19 diagnosis or stays using a COVID-19 PHE-related waiver authorized by section 1812(f) of the Act for stays starting between February 2020 and May 2023.

We rely on Medicare enrollment data, FFS claims, and the 5-day Minimum Data Set (MDS) assessments to obtain CMIs, capture the reporting of specific conditions and treatments, and construct viable proxies for PDPM payment items.

2 REGRESSION SETUP

The following formula represents the regression framework for each of the five PDPM components, namely PT, OT, SLP, NTA, and Nursing.

$$CMI = \beta_0 + \beta_1 X + \beta_2 T + \beta_3 Post_t + \varepsilon$$

The dependent variable is total observed case mix changes, as represented by *CMI*. It is a combination of real population health and utilization status (*X*), real time trends (*T*), and nominal changes (*Post_t*), thus can be predicted by those three parts in a stay-level regression.

We weight CMI by variable per diem (VPD) to reflect the per-diem structure of PDPM and resource use patterns over the course of a stay. We use the same set of CMIs for every year in the study window to allow consistent representation of case-mix group (CMG) distribution when estimating total observed case mix change. During our study period, Parity Adjustment reduced CMI through a two-year phase-in approach. To preserve temporal comparability and isolate underlying changes in CMG distribution, we rescaled CMI to remove this adjustment. The Parity Adjustment policy is addressed separately and its effect is carved out when calculating the case-mix creep adjustment factors for implementation as described in [section 3](#). Additionally, for consistency in CMG definition across the study period, for the pre-PDPM years, CMIs are assigned based on the estimated PDPM CMGs derived using the methodology in the [PDPM technical report](#). The results of the average observed CMIs for each component can be found in [Table 2](#).

To measure real population health and utilization status (*X*), representing underlying clinical or operationally meaningful information in the population or health system, we use patient demographics including age, sex, race, and dual status. We also utilize documented health conditions not affected by PDPM payment incentives such as non-payment MDS items and non-payment proxies from prior inpatient (IP) claims. Additionally, we include provider characteristic variables such as ownership, institution type, and rural or urban status of the provider. Lastly, we include time-varying covariates that represent healthcare system changes, such as the county-level Medicare Advantage (MA) penetration rate, which may influence the characteristics of patients who are paid under the SNF PPS. The list of variable categories included in *X* is shown in [Appendix 1](#).

To assess real time trends (*T*) not captured by real population health and utilization changes, we use a numeric time variable representing FY. We choose a simple linear time trend given it provides a clear and interpretable estimate of year-to-year change in true case mix, for which we employ residual diagnostics and confirmed its adequacy. The regression estimates of *T* are presented in [Table 2](#).

To estimate nominal coding changes introduced by PDPM ($Post_t$), we use a set of binary annual PDPM indicators that equal to “1” for each year after PDPM is implemented and “0” for all years prior to PDPM implementation. The nominal changes in CMI are estimated by constructing a counterfactual trend line, assuming no PDPM nominal changes, by forcing the annual PDPM indicators to be “0” for post-PDPM years. The regression estimates of $Post_t$ are presented in [Table 2](#).

Table 2: PDPM Component-Level Regression Results in FY 2024

PDPM Component	Average Observed CMI	Time Trend (T)	Nominal Change ($Post_t$)
PT	1.522	0.003	0.035
OT	1.521	0.002	0.023
SLP	1.814	0.006	0.372
NTA	1.296	0.005	0.093
Nursing	1.756	0.002	0.271

In the approach above, the data from the period prior to PDPM, FY 2017-2019, is used to estimate pre-existing trends for real conditions and treatments. This approach generally assumes that those pre-PDPM trends (i.e., real time trends) would have continued in FY 2020 and onward regardless of the implementation of PDPM. The estimated counterfactual trend from the model accounts for control variables which could also have affected the prevalence of a given condition or treatment in the post-PDPM period (i.e., real population health and utilization changes). Thus, this approach allows us to construct a counterfactual to appropriately evaluate the effect of coding incentives induced by PDPM when no control group is available since all stays in the study population are paid under SNF PPS.

3 ADJUSTMENT FACTOR CALCULATION

To eliminate nominal coding changes on Federal per diem rates in a given PDPM year, we derive case mix creep adjustment factors to modify the CMI currently used in the payment system to be equal to the target CMI where estimated nominal coding changes are removed. Specifically, we calculate the extent of this adjustment by comparing 1) the *average actual CMI* being used by PDPM, which reflects the Parity Adjustment made in FY 2023 and FY 2024, and 2) the *average target CMI* that removes nominal changes. The average target CMI is calculated from the counterfactual estimate of the regression model. We compute the ratio of *average target CMI* to *average actual CMI* to obtain the adjustment factor. When applied through a percentage change adjustment, we subtract 1 from the calculated adjustment factor for each component. [Table 3](#) includes the results of the average actual CMI, the average target CMI, the adjustment factor, and the percentage change.

Table 3: PDPM Component-Level Case-Mix Creep Adjustment Factors in FY 2024

PDPM Component	Average Actual CMI	Average Target CMI	Adjustment Factor	Percentage Change
PT	1.440	1.487	1.033	3.3%
OT	1.439	1.498	1.041	4.1%
SLP	1.714	1.441	0.841	-15.9%
NTA	1.227	1.204	0.981	-1.9%
Nursing	1.661	1.485	0.894	-10.6%

Once the component-level case-mix creep adjustment factors are derived above, we can implement them directly on CMIs for each component. Alternatively, we can derive a blanket system-wide CMI adjustment that combines component-level adjustments. To calculate the system-wide adjustment factor, we compare the difference between the total actual payment and the total target payment with the component-level adjustment factors applied. The sum of the PDPM payment differences across all five case-mix adjusted components as a proportion of actual PDPM aggregate case-mix payments is the system-wide CMI percentage change adjustment and as a proportion of actual PDPM aggregate payments, including the non-case-mix portion, is the total PDPM percentage change, which can be found in [Table 4](#).

Table 4: PDPM System-Wide Case-Mix Creep Percentage Changes in FY 2024

Aggregate	Percentage Change
Case-Mix Total	-4.3%
PDPM Total	-3.6%

4 APPENDIX

Appendix 1: Variables for Measuring Real Population Health and Utilization Changes (X)

PDPM Component	X: Real Population Health and Utilization Changes (Non-Payment Items)
PT	<ul style="list-style-type: none"> - Demographics: Age, Sex, Race, Dual Enrollment Status - Provider Characteristics: Ownership, Institution Type, Rural-Urban Status - Other Characteristics: Other MDS Non-Payment Items, MA Penetration Rate - PT Specific Non-Payment Equivalent: Medicare Severity Diagnosis Related Groups (MS-DRGs) in prior IP claims, PT Therapy Minutes per day in MDS
OT	<ul style="list-style-type: none"> - Demographics: Age, Sex, Race, Dual Enrollment Status - Provider Characteristics: Ownership, Institution Type, Rural-Urban Status - Other Characteristics: Other MDS Non-Payment Items, MA Penetration Rate - OT Specific Non-Payment Equivalent: MS-DRGs in prior IP claims, OT Therapy Minutes per day in MDS
SLP	<ul style="list-style-type: none"> - Demographics: Age, Sex, Race, Dual Enrollment Status - Provider Characteristics: Ownership, Institution Type, Rural-Urban Status - Other Characteristics: Other MDS Non-Payment Items, MA Penetration Rate - SLP Specific Non-Payment Equivalent: MS-DRG-based Acute Neurologic Clinical Category in prior IP claims, SLP comorbidities, Swallowing Disorder, and Mechanically Altered Diet in prior IP claims, SLP Therapy Minutes per day in MDS
NTA	<ul style="list-style-type: none"> - Demographics: Age, Sex, Race, Dual Enrollment Status - Provider Characteristics: Ownership, Institution Type, Rural-Urban Status - Other Characteristics: MS-DRGs in prior IP claims, Other MDS Non-Payment Items, MA Penetration Rate - NTA Specific Non-Payment Equivalent: NTA comorbidities in prior IP claims
Nursing	<ul style="list-style-type: none"> - Demographics: Age, Sex, Race, Dual Enrollment Status - Provider Characteristics: Ownership, Institution Type, Rural-Urban Status - Other Characteristics: MS-DRGs in prior IP claims, Other MDS Non-Payment Items, MA Penetration Rate - Nursing Specific Non-Payment Equivalent: Nursing conditions in prior IP claims