

Memo

To: William Henderson
From: Sule Gerovich, Ian Huff
Date: 10/21/2024
Subject: Medicare fee for servicing benchmarking

I. Background

The Maryland Health Services Cost Review Commission (HSCRC) needs to set national benchmarks for hospitals in Maryland with which to compare the hospitals' performance on a range of quality and cost metrics. Mathematica previously developed and refined Medicare Fee-for-service (FFS) benchmarks for Maryland hospitals, which includes selecting benchmark counties, and developing a normalization approach that accounts for the differences in medical education cost, health status of beneficiaries, and other demographic variables (Hu et al, 2020). Hospitals are characterized by the Primary Service Area Plus (PSAP). We also presented the county-level, PSAP-level and state-level adjustment results using data from calendar year (CY) 2018.

In this report, we apply the same benchmarking normalization methodology to data from CY 2022 and summarize the adjusted Medicare total cost of care (TCOC) at the state level.

II. Data sources

Data for this project are claims from 100 percent of all Maryland Medicare FFS beneficiaries and 5 percent of all national Medicare FFS beneficiaries. We accessed the data through Medicare's Chronic Conditions Warehouse (CCW) Virtual Research Data Center (VRDC). The main outcome of interest is annual TCOC per capita. Other variables used for benchmark normalization included the following:

- Weighted mean household income. ZIP code-level total household median household income (DP03_0062E) from the 2018-2022 five-year estimates in the American Community Survey (ACS) is assigned to each beneficiary based on ZIP code and then aggregated to the county level using the number of eligible months in a year as the weight.
- Percentage deep poverty. The percentage of individuals below 50 percent of the poverty line in each ZIP code from the 2018-2022 ACS is assigned to each beneficiary based on the beneficiary's ZIP code and then aggregated to the county level.
- Hierarchical condition category (HCC). We used the HCC system to generate risk factors that reflect the presence of chronic health conditions; data from the system are publicly available and well validated for a variety of Medicare populations (Pope et al. 2011). The HCC algorithm provides an exhaustive aggregation of all International Classification of Disease (ICD) codes into a series of chronic condition categories that are subsequently ranked into hierarchies. We calculated the beneficiary-level HCC scores

using the latest CMS-HCC software V2217O1P, which is developed for ICD-10 codes valid in this project's period.

- Medical education (ME) cost. We calculated the cost of direct graduate medical expenses (DGME) and indirect medical education (IME) using data from Medicare cost reports and estimates of indirect medical education cost calculated in prior analysis (Gilman, 2018).

III. Methods

We applied the same methodology as the CY2018 benchmarking normalization. The full details can be found in the technical report for Medicare FFS benchmarking methodology (Hu et al, 2020). Briefly the normalization process required the following steps:

1. **Calculate Medicare TCOC without ME.** We calculated Medicare TCOC per beneficiary for all beneficiaries who are eligible for both Part A and Part B using claims for Maryland residents and using a 5% sample for benchmark counties.
2. **HCC adjustment.** We divided each county's TCOC adjusted for medical education by its own risk score and then multiplied the result by the straight average of HCC scores across all benchmark counties. To enable comparison across multiple years, we fixed the normalization quantify (average HCC scores across all benchmark counties) to be the CY 2018 average HCC.
3. **Regression adjustment.** We fit a regression model to predict HCC adjusted TCOC using demographic variables that include weighted mean household income and percent deep poverty. To enable comparison across multiple years, we applied the regression coefficients using CY2018 data to the CY2019 data. The regression coefficients can be found in the table below.

Table 1. Regression coefficients used for adjusting benchmark TCOC

Variable name	Coefficient	95 percent confidence interval
(Intercept)	7560.16608	(6748.30, 8271.63)
Percentage of deep poverty	181.71361	(120.63, 245.74)
Weighted mean household income	0.032346	(0.03, 0.04)
R-square	0.123	

Note: Regression coefficients were calculated using CY2018 data. They were recalculated after August 2020 due to an update in the input files.

1. **Recalculate the adjusted TCOC for Maryland hospitals and benchmarks.** We applied the regression coefficients to estimate the predicted TCOC based on demographic variables. For county-level adjustment, we used FIPS-level data. For PSAP-level adjustment, we used the FIPS-PSAP-level data. We calculate an observed-to-expected (O/E) ratio by dividing the ME and HCC adjusted TCOC by the predicted TCOC from the regression. We then calculate the regression adjusted TCOC as the O/E ratio multiplied by the average benchmark HCC adjusted TCOC. To enable comparison across multiple years, we fixed the normalization quantify (average HCC adjusted TCOC across all benchmark counties) from the CY2018 data.

IV. Results

State-level adjustment results

In CY 2022, before adjustment, the Maryland state average TCOC was \$14,142.64, and the national benchmark was \$13,024.93 (8.58 percent difference). After the medical education and HCC adjustment, the Maryland state average TCOC was \$13,518.53 and the United States benchmark was \$12,340.99 (9.54 percent difference). Additional regression adjustments reduced the Maryland state average TCOC to \$12,763.84 and the United States benchmark to \$11,682.29, resulting in 9.26 percent difference.

Table 2 compares the state-level summary for CY2022 to CY2018, aggregated from PSAP level results. Overall, Maryland has improved TCOC relative to the benchmarks across all four steps of adjustment with slower growth rates compared with the benchmarks. Before any adjustment, Maryland state average TCOC grew by 12.1 percent compared to a 13.2 percent growth rate in the benchmarks, a 1.0 percentage point improvement from CY2018 results. After medical education, HCC and regression adjustment, Maryland's growth rate was 6.2 percent compared to a benchmark growth rate of 5.6 percent in CY2022, a 0.7 percentage point deterioration from CY2018 results.

Table 2. State-level TCOC* before and after adjustments for CY2022, CY2021 and CY2018

CY	Group	TCOC before adjustment	TCOC after medical education adjustment	TCOC after medical education and HCC adjustment	TCOC after medical education, HCC, and regression adjustment
2022	MD	\$14,142.64	\$13,790.16	\$13,518.53	\$12,763.84
	Benchmark	\$13,024.93	\$12,784.39	\$12,340.99	\$11,682.29
	Difference (%)	8.58%	7.87%	9.54%	9.26%
2021	MD	\$13,619.58	\$13,263.00	\$13,840.85	\$13,604.34
	Benchmark	\$12,688.75	\$12,459.85	\$12,919.85	\$12,736.35
	Difference (%)	7.34%	6.45%	7.13%	6.82%
2018	MD	\$12,613.62	\$12,255.16	\$12,128.05	\$12,015.94
	Benchmark	\$11,507.66	\$11,296.26	\$11,079.13	\$11,065.71
	Difference (%)	9.61%	8.49%	9.47%	8.59%
2022 v.s. 2018	MD growth rate	12.1%	12.5%	11.5%	6.2%
	Benchmark growth rate	13.2%	13.2%	11.4%	5.6%
	Change in difference (%)	-1.0%	-0.6%	0.1%	0.7%

*Note: The state-level TCOC were weighted average of PSAP-level results using the number of Maryland beneficiaries as weights. Due to beneficiaries in unmappable zip codes, the state-level results aggregated from FIPS and PSAP level are slightly different.

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