



maryland
health services
cost review commission

Patient Adversity Index (PAI) and Disparity Gap Overview

Center for Population-Based Methodologies (CPBM)

Road Map

- RRIP and Disparities Gap Overview
- Development of the Patient Adversity Index and Disparity Gap
- RY2025 Data Results
- Stakeholder Feedback on PAI and Disparity Gap Metric
- Timely Follow-Up and Within-Hospital Disparities
- Disparity Gap Reporting
- Next Steps
- Q&A

Webinar Focus

The focus of this webinar is on the methodology used for the disparity gap measures

- Primarily focused on readmissions, but similar methodology is used for QBR Timely follow-up (Medicare only for RY26)

Policy related questions, such as those listed here, are **NOT** the focus of this webinar and should be brought to the Performance Measurement Workgroup:

- Revenue % at-risk
- Performance standards (e.g., threshold to start earning rewards)
- Addition of attainment standards

Readmissions Reduction Incentive Program (RRIP)



Purpose

To incentivize hospitals to reduce avoidable readmissions by linking payment to:

- (1) improvements in readmissions rates, and
 - (2) attainment of relatively low readmission rates.
- **What is a readmission?** A readmission occurs when a patient is discharged from a hospital and is subsequently re-admitted to any hospital within 30 days of the discharge.
 - **Why focus on readmissions?** Preventable hospitals readmissions may result from complications from previous hospitalizations or inadequate care coordination following discharge and can lead to substandard outcomes for patients and unnecessary costs.



How it Works: Revenue-at-Risk

The program puts **2 percent** of inpatient hospital revenue at risk (maximum penalty/reward) + 0.5 percent max disparity gap reward for reducing disparities in readmissions



Federal Alignment

The RRIP is **similar to the Medicare Hospital Readmissions Reduction Program (HRRP)**, but has an all-payer focus.

The RRIP Disparities Component

The Readmissions Reduction Incentive Program includes a **within-hospital disparities readmissions measure**, making it the **only statewide program in the nation** with an **incentive for reducing disparities in all-payer readmission rates.**



HSCRC rewards hospitals with reductions in year-over-year overall readmission rate disparities related to race and socioeconomic status, with the goal of a 50% reduction in disparities over 8 years.



Rewards are scaled:

- Rewards begin at 0.25% IP revenue for hospitals on track for 50% reduction in the disparity gap measure over 8 years, beginning in 2018.
- Rewards are capped at 0.50% of IP revenue for hospitals on pace for a 75% or larger reduction in the disparity gap measure over the 8-year time period.

Development of the Patient Adversity Index and Disparity Gap

Overview of PAI and Disparity Gap Mechanisms

Patient Adversity Index (PAI)

PAI is formulated using a regression analysis that determines the statewide association between the following factors and readmissions:

- Medicaid Status
- Race (Black vs. Non-Black)
- Area Deprivation Index Percentile

Coefficients from the regression are used to calculate PAI for each discharge

PAI Scores for each discharge are available by hospital-level on CRISP

Disparity Gap

Within-hospital disparity gap is calculated by a second statistical model that incorporates PAI

The multilevel regression estimates the slope of PAI at each hospital after controlling for:

- Age
- Gender
- APR-DRG readmission risk
- Hospital Mean PAI

The Yearly Disparity Gap is equal to Risk-Adjusted Readmissions Rate (PAI = 1) – Risk-Adjusted Readmissions Rate (PAI = 0)

Disparity Gap Revenue Adjustment

Revenue adjustments are currently reward only

Scaled to begin at 0.25% of IP Revenue and capped at 0.5% of IP Revenue

Disparity Gap Change	RRIP % Inpatient Rev.
50% Reduction in Gap in 8 Years (-29.29% CY 2023)	0.25%
75% Reduction in Gap in 8 Years (-50% CY 2023)	0.50%

Patient Adversity Index (PAI)

The Connection between Risk Factors and Readmission Rates

Race, Medicaid Status, Area Deprivation Index

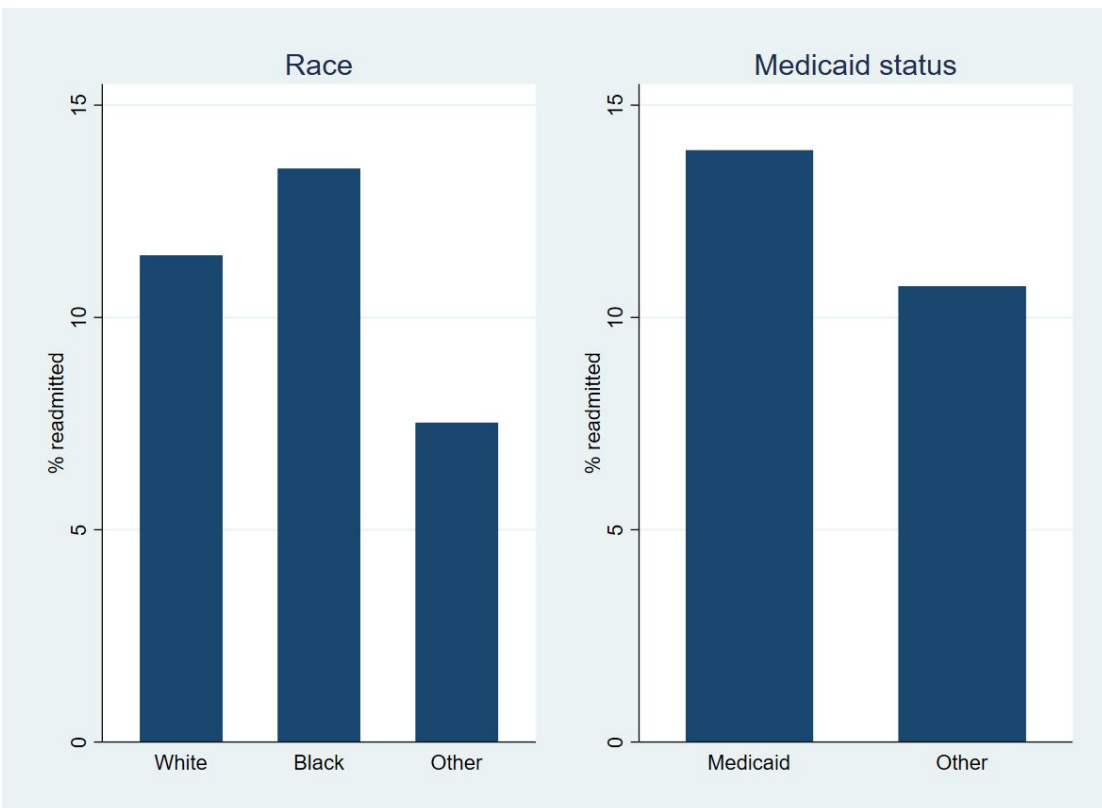
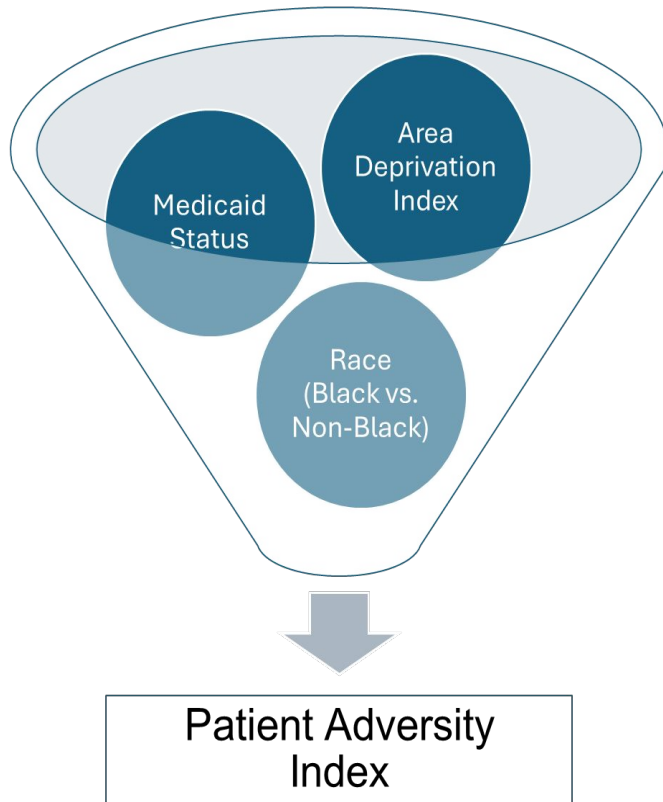


Table 2. Readmission Risk at Different Percentiles of ADI and Safety-Net Index*

Percentile	Marginal Effect† of Safety-Net Index (95% CI)	Marginal Effect† of ADI (95% CI)
10th	0.116 (0.105-0.127)	0.125 (0.118-0.132)
25th	0.121 (0.113-0.129)	0.128 (0.121-0.134)
50th	0.131 (0.126-0.135)	0.132 (0.127-0.138)
75th	0.141 (0.132-0.150)	0.137 (0.133-0.142)
90th	0.148 (0.134-0.161)	0.141 (0.136-0.145)

Jencks, S. F., Schuster, A., Dougherty, G. B., Gerovich, S., Brock, J. E., & Kind, A. J. (2019). Safety-Net Hospitals, Neighborhood Disadvantage, and Readmissions Under Maryland's All-Payer Program: An Observational Study. *Annals of internal medicine*, 171(2), 91-98.

Calculating the Patient Adversity Index (PAI)



- The Patient Adversity Index is based on a multivariate regression model that estimates the association of readmission with ADI, Medicaid, Black race
- Larger value = Higher adversity
- PAI Score is then normalized so that statewide mean is 0. Each 1-point change in the scale represents a change of one standard deviation.

Calculating the Patient Adversity Index (PAI)

Black	Medicaid	Constant	Coefficient
0	0	-2.25	0.08
0	1	-2.13	0.12
1	0	-2.10	0.15
1	1	-1.963	0.017

- The HSCRC provides a lookup table that contains PAI values for all unique combinations of race, Medicaid status and ADI national percentiles
- Locked RY2025 PAI Coefficients will be available soon for hospitals to derive PAI values and append to patient records without implementing the calculations used to derive PAI.

- Recode race to binary HSCRC values: (Black = 1; Non-Black = 0)
- Standardize ADI Values: $(\text{Patient ADI} - \text{Mean ADI}) / \text{Standard Deviation of ADI}$
- Calculate PAI: $\exp(\text{constant} + (\text{coefficient} * \text{ADI}))$
- Standardize PAI Scores: $(\text{Patient Pai} - \text{Mean PAI}) / \text{PAI Standard Deviation}$

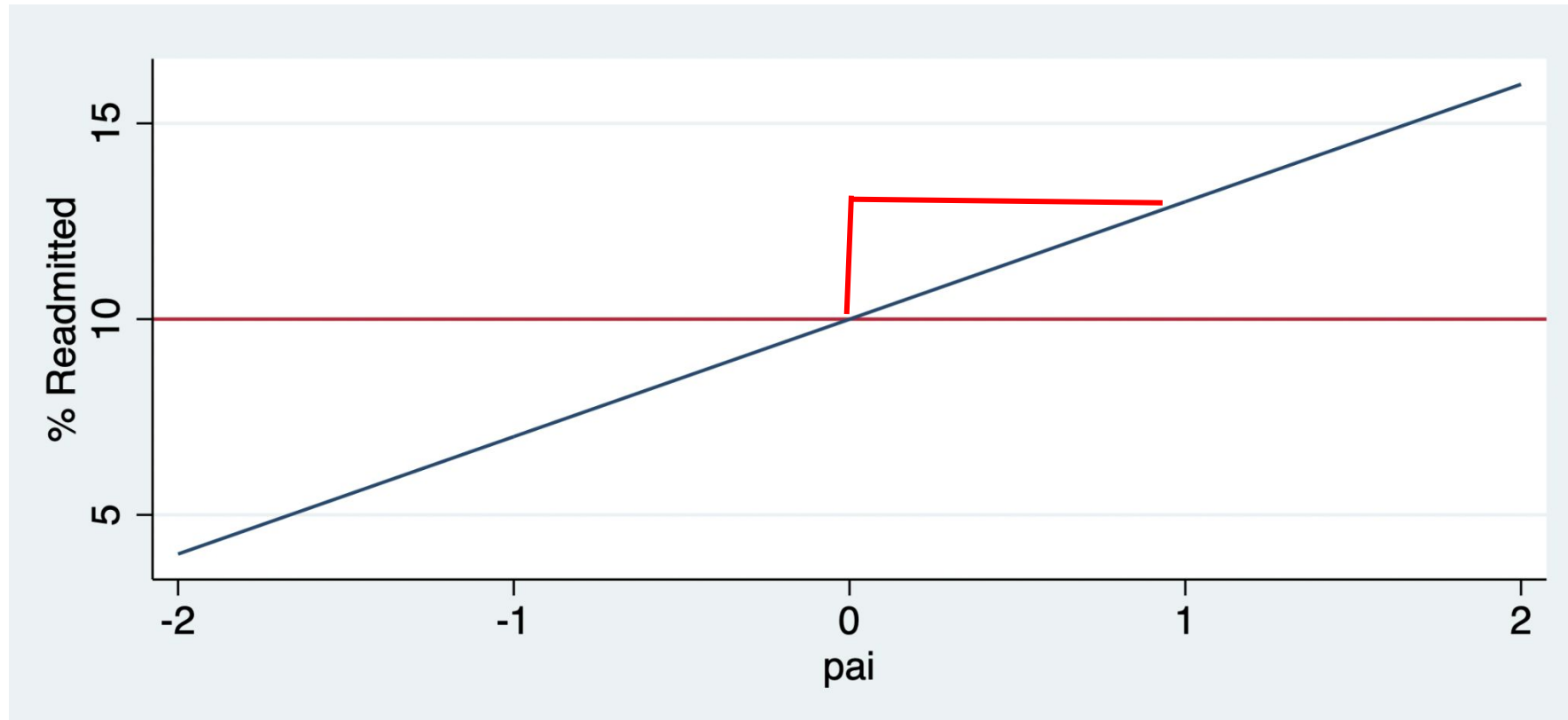
Disparity Gap

Calculating the Disparity Gap Improvement

- The Disparity Gap is calculated using a separate multilevel regression model that incorporates PAI
 - Adjusted for APR-DRG/SOI risk, age, gender, and hospital mean PAI value
 - Model smooths results to provide more accurate results for smaller hospitals/those with small populations at the extremes of PAI
 - The Disparity Gap for each hospital is calculated as the Risk-Adjusted Readmission Rate at hospital-centered PAI = 1 minus the Risk-Adjusted Readmission Rate at hospital-centered PAI = 0
 - The gap measure does not depend on a hospital's readmission rate at specific statewide values of PAI. Instead, it uses the slope estimated over the available PAI values at an individual hospital.
 - Hospital rewards are based on reduction (Percent Change, YTD) in disparity gap between 2018 and the performance period

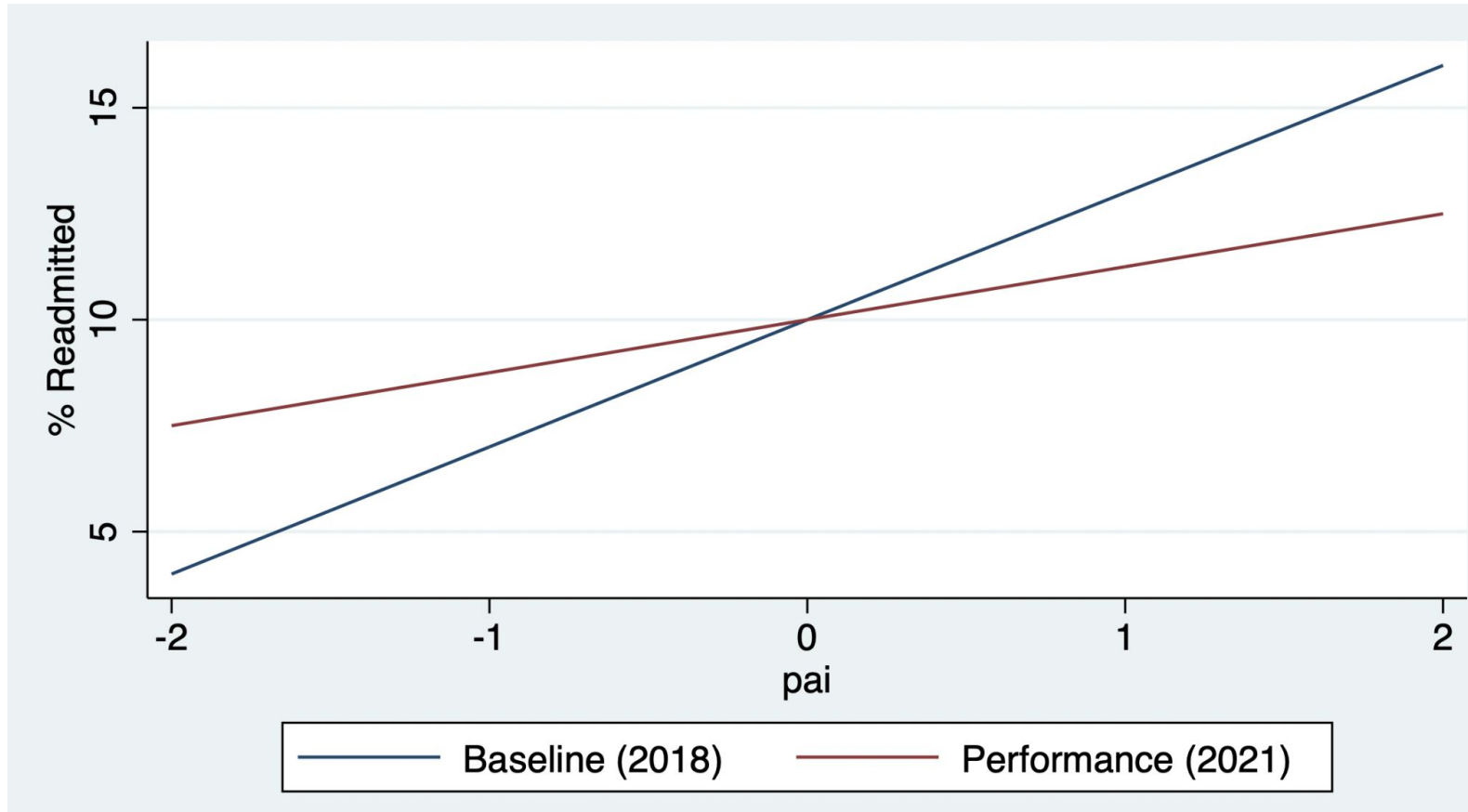
Disparity Gap Risk Adjustment Factors	
Effect	Estimate
Intercept	-2.4074
PAI_Z_HOSPMEAN	0.07767
PAI_Z_HOSPCENTD	0.1282
SOIRISK_CENTD	0.07195
AGE_YRS_CENTD	0.008588
SEX_CENTD	-0.07534

Understanding the Disparity Measure



We use a statistical model to estimate the slope of the line connecting readmission rates at various levels of PAI within a hospital. A flat slope means there is no disparity.

Understanding the Disparity Measure



A reduced slope over time indicates that a hospital is making progress in eliminating disparities. Flat horizontal line would indicate no disparity in readmissions with increasing PAI

Revenue Adjustment Scale Results

- Rewards from disparity gap improvement are restricted to hospitals that do not backslide (i.e., have higher readmission rate) on casemix adjusted, 30-day, all-cause readmission measure for the general population from the base period
 - Starting in RY 2026, hospitals also must submit a detailed report on interventions and outcomes to reduce disparities in order to qualify for the reward.

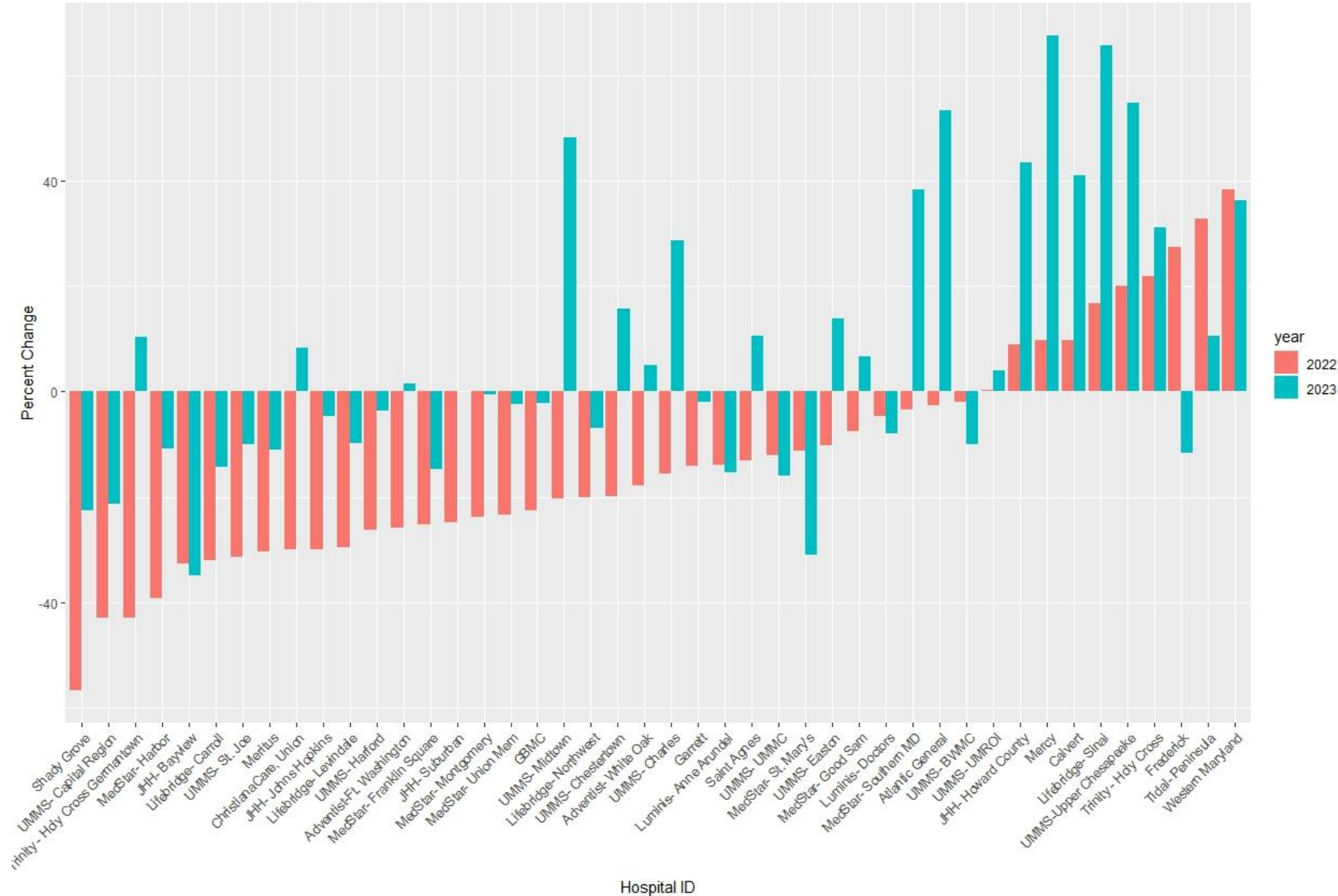
RY/CY Performance Period	# Hospitals Rewarded	Statewide PAI Revenue Adjustment
RY23/CY21	9	\$10,095,328.00
RY24/CY22	11	\$7,782,485
RY25/CY23 Estimated	2	\$1,766,965

RX2025 Data and Stakeholder Feedback

Results from CY2023 and CY2022

- Many hospitals performed worse on their disparity gap metric in CY23 than CY22
 - 13 Hospitals shifted from improvement (negative percent change) to decline (positive percent change)

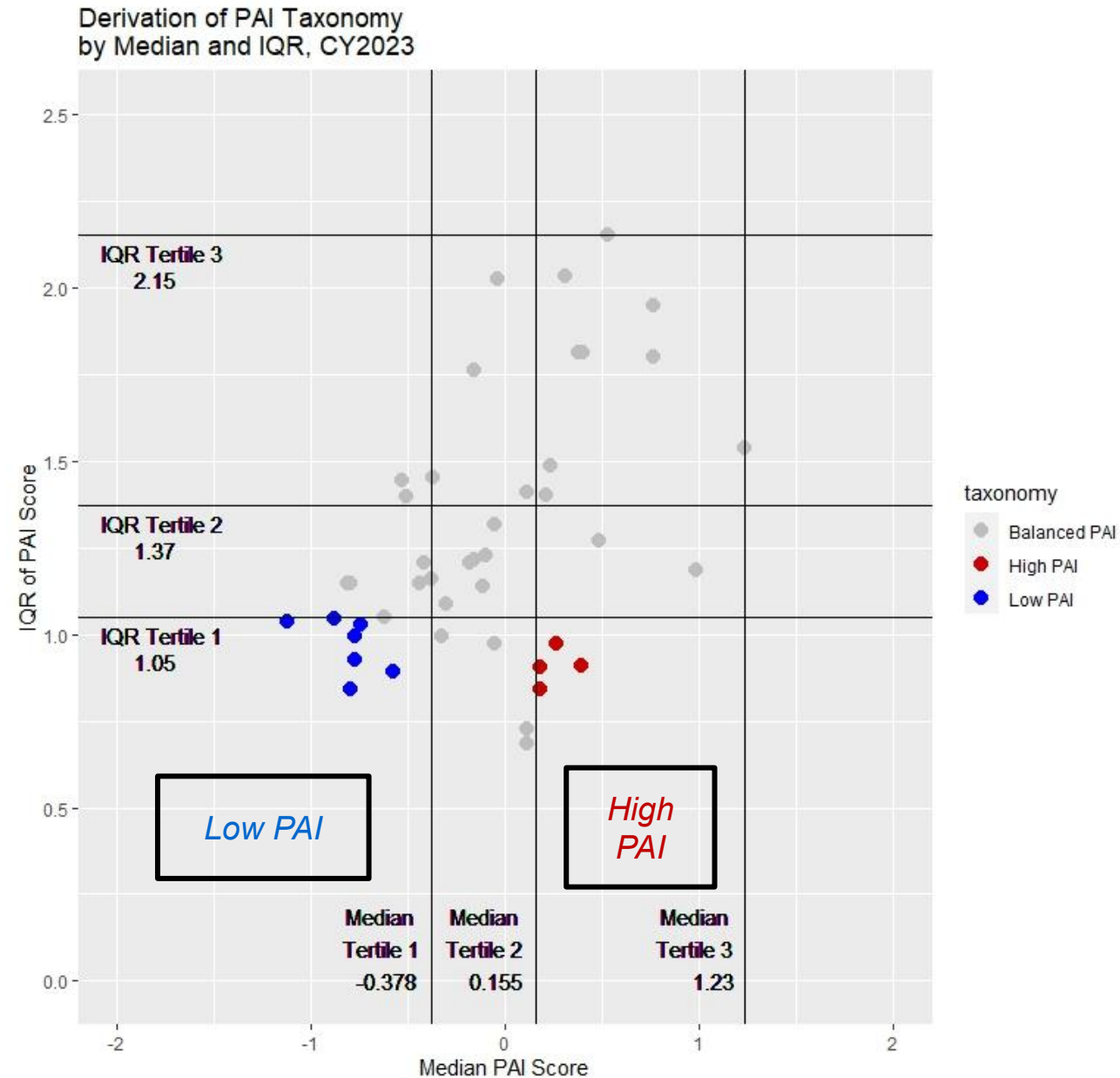
Difference in Percent Change in Disparity Gap, CY2022 vs CY2023, Compared to Baseline



CY2018 and CY2022 data used here is restated using “locked in” coefficients and do not necessarily match final RY24 results

Identifying PAI Clusters

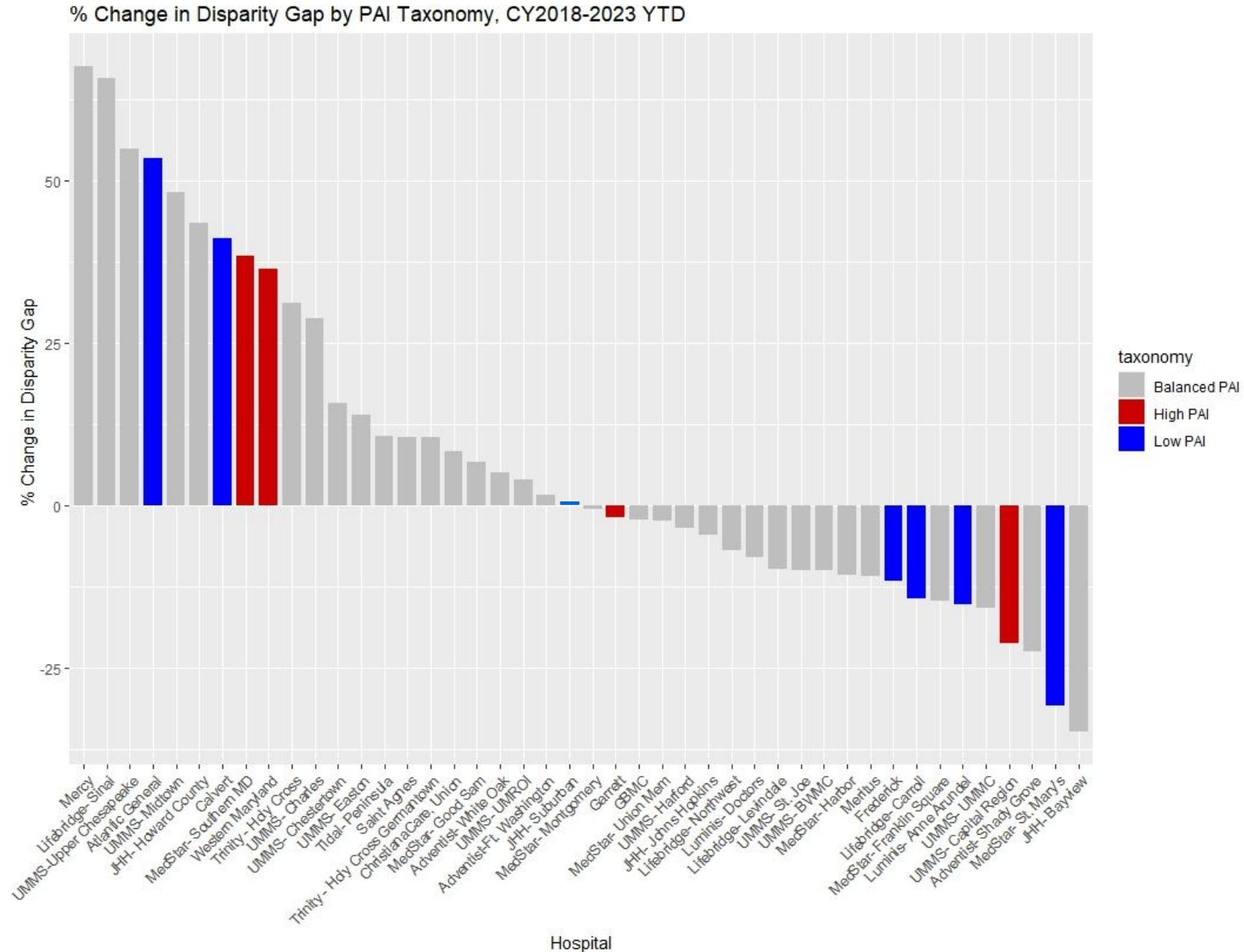
- ▶ Hospitals divided into three categories (“Low PAI”, “High PAI”, and “Balanced PAI”)
 - ▶ “Low PAI” and “High PAI” Hospital have minimal variation in PAI scores → Homogenous Patient Mix
 - ▶ Small volume of hospitals with predominantly low (n=7) and high (n=4) PAI patients



Stakeholder Feedback: Swings in Disparity Gap

“Hospitals with imbalanced mix of low- or high-PAI patients will experience swings in disparity gap over time due to small changes in readmission counts”- MedStar

- ▶ We found no correlation between PAI patient-mix and changes in disparity gap in existing data YTD



Limitations of Hospital Cluster Analysis

- Analysis of reported hospital data does not account for differences between the clusters that may drive disparity improvement
- We are assuming a roughly balanced picture of improvement across clusters signifies an unbiased model
 - What if hospitals in the clustered high-PAI group allocated more resources to addressing disparities?
- We can address this limitation with a simulation exercise

Simulation Process and Results

- In performance year, randomly select one hospital from each cluster and improve readmissions for highest quartile of PAI by 25%
- Performance for all other hospitals is identical to base year
- Re-run model 100x
- Evaluate the level of bias created by the model:
 - Estimate disparity for base and performance years for sampled hospitals in each cluster. Calculate mean improvement for each cluster.
 - Because we specified the readmission rate to improve by the same amount in each cluster, if improvement is significantly different between clusters, this would indicate the model is providing biased results
- The simulation produced similar improvement across the three clusters, indicating that hospitals have equal opportunity to improve regardless of PAI distribution

Next Steps With Simulation

- Stakeholders have asked if there is a way to understand how improving readmission rates for particular types of patients would change disparity performance
- Because the disparity model encompasses smoothing and some other complexities, simple arithmetic will not necessarily yield an accurate picture
- We are investigating how to extend the simulation platform in a way that allows hospitals to explore these questions in a hands-on way
- Stay tuned!

Readmission Disparity Gap: Time Periods, Coefficients, Etc

Base Period: CY 2018

Performance Period: CY23(RY25); CY24 (RY26)

Model Coefficients: CY 2021

APR-DRG Version: v40 (RY25); v41 (RY26)

ADI Version: 2020

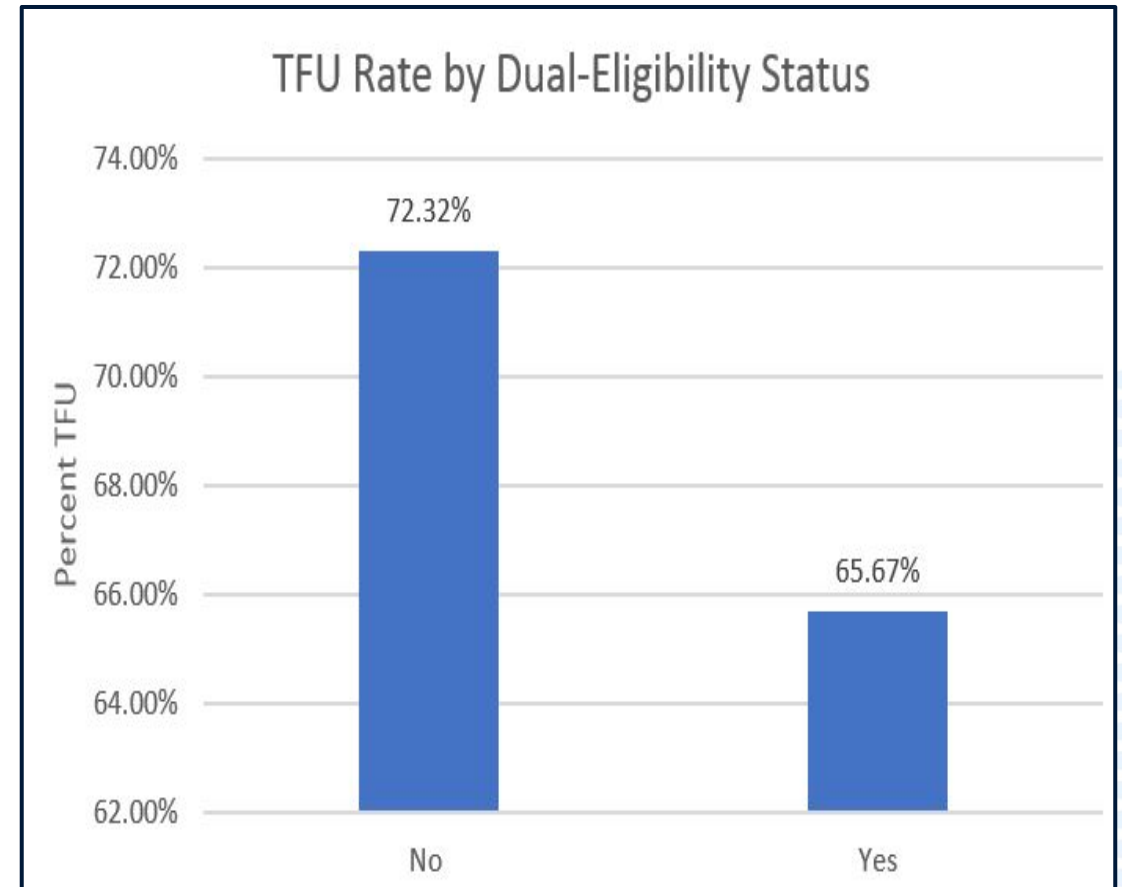
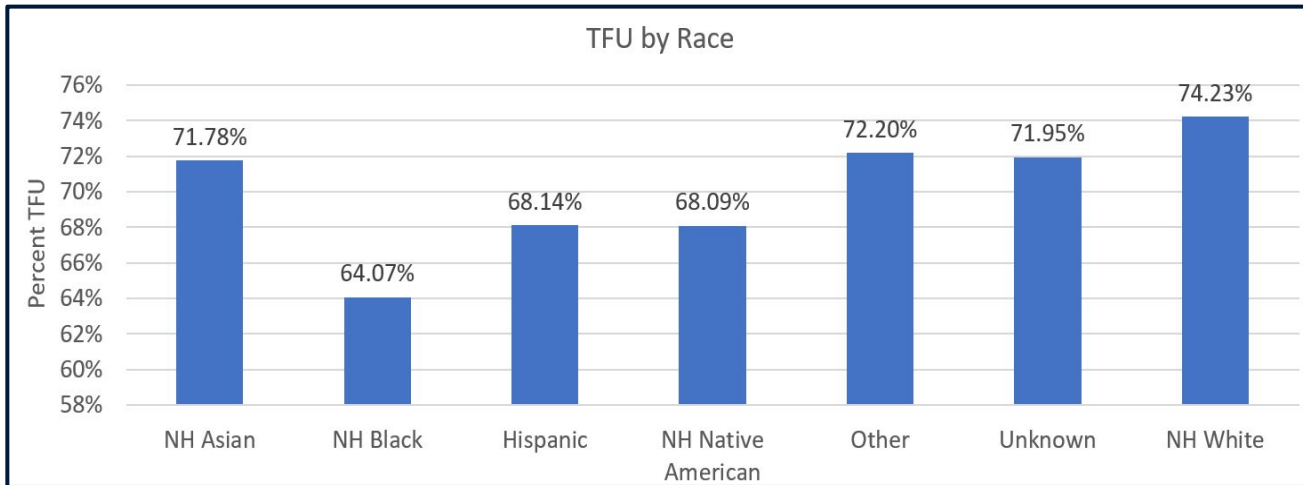
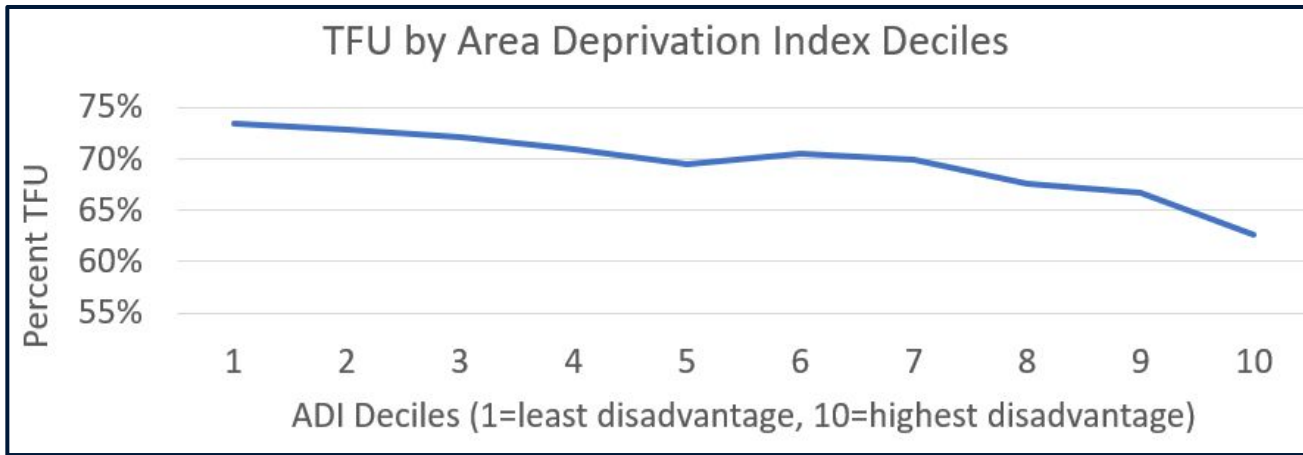
Risk-Adjustment Variables for Disparity Gap
Age
Sex
APR-DRG and SOI
Hospital Mean PAI

Timely Follow-Up and Within-Hospital Disparities

Timely Follow-up After Acute Exacerbations of Chronic Conditions

- NQF endorsed health plan measure that looks at percentage of ED, observation stays, and inpatient admissions for one of the following six conditions, where a follow-up was received within time frame recommended by clinical practice:
 - Hypertension (7 days)
 - Asthma (14 days)
 - Heart Failure (14 days)
 - CAD (14 days)
 - COPD (30 days)
 - Diabetes (30 days)
- 10 % of QBR Program ($\frac{1}{3}$ for Medicaid, $\frac{1}{3}$ for Medicare, $\frac{1}{3}$ for Medicare Disparities)
- Developed disparities measure because of the disparities uncovered in the Health Equity Subgroup (next slide)

Disparities in TFU by PAI factors



*dually eligible for Medicaid and Medicare

TFU Disparity Gap: Time Periods, Coefficients, Etc

Base Period: CY 2018

Performance Period: CY24 (RY26)

Model Coefficients: CY 2021

APR-DRG Version: v41 (RY26)

ADI Version: 2020

Risk-Adjustment Variables for Disparity Gap

Age

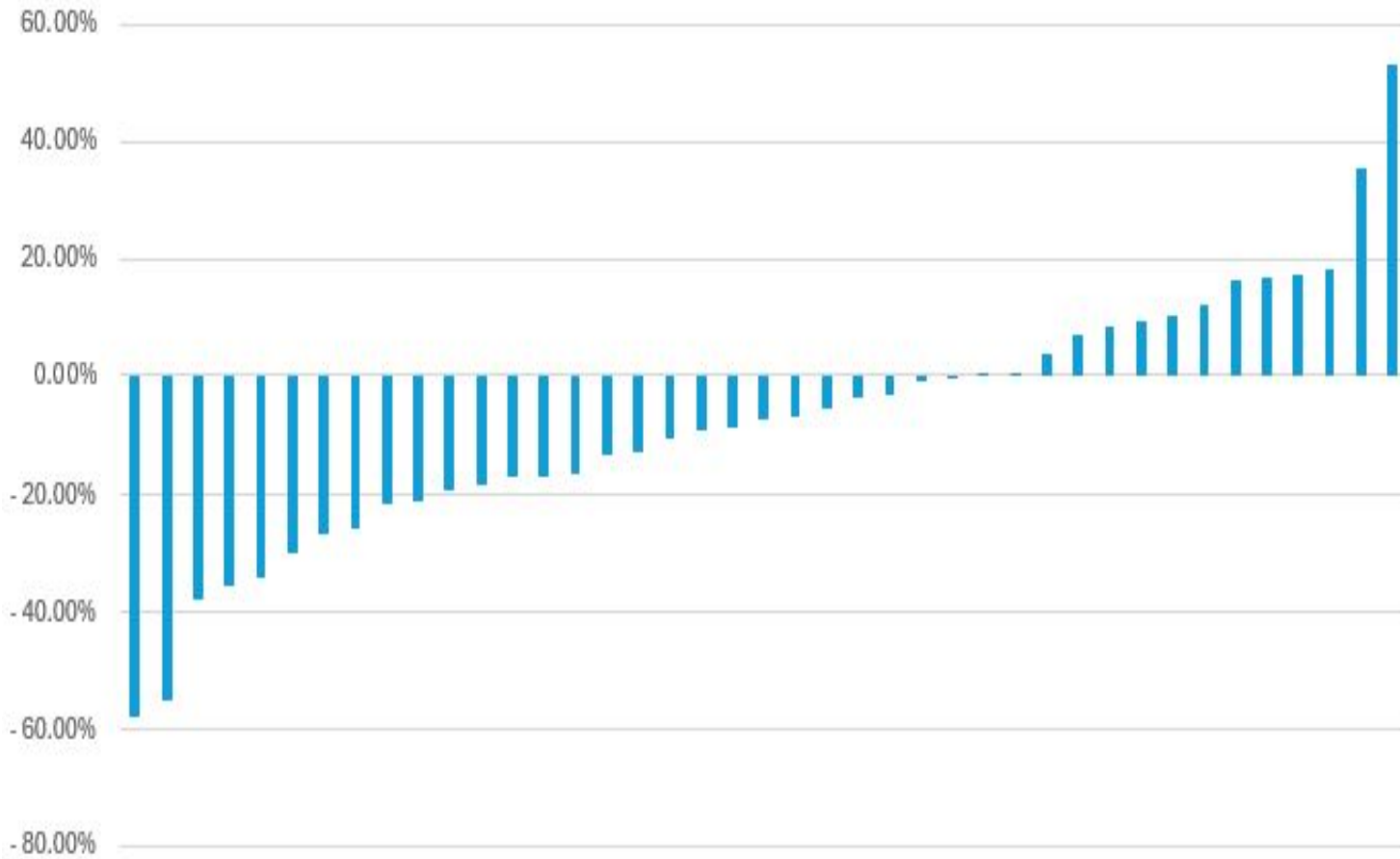
Sex

APR-DRG and SOI

Hospital Mean PAI

CY2018-CY2023 Modeling Results

% Change in TFU Disparity Gap by Hospital



Note: PAI score is specific to the outcome. (ie. a patient may have different PAI scores for TFU vs RRIP)

Disparity Gap Reporting

Disparity Gap Reporting

Reports on the PAI Metric and Disparity Gaps are released monthly on the CRISP CRS Portal (reports.crisphealth.org)

Your Dashboard ✕



All-Payer Population



Medicare Population



HSCRC Regulatory Reports



Public Health



Introduction



Favorites

The screenshot shows the CRISP CRS Portal interface. On the left is a sidebar with a 'Populations & Programs' menu. The main content area is divided into 'Reports' and 'Readmissions' sections. A red arrow points from the 'HSCRC Regulatory Reports' menu item in the sidebar to the 'Readmissions' section. Another red arrow points from the 'Readmissions' section to the 'Readmissions' menu item in the sidebar. The 'Readmissions' section contains a list of reports with icons for Excel, Clock, and Question Mark.

Report Name	Excel Icon	Clock Icon	Question Mark Icon
RY25 Readmissions Summary	Yes	Yes	Yes
RY25 Readmission Patient Level Details	No	No	No
RY25 Readmissions Patient Level Details - Base Period	No	No	No
RY25 RRIP - Patient Adversity Index and Disparity Gap Report	Yes	Yes	Yes
Excess Days in Acute Care Monitoring Patient Level Details	No	No	No
Excess Days in Acute Care Monitoring Report	Yes	Yes	Yes

- By clicking on the 'Excel' icon, you will access the most recent static summary file.
- By clicking on the 'Clock' icon, you will be able to access archived summary reports.
- By clicking on the 'Question Mark' icon, you will be able to access the User Guide.

Disparity Gap Reporting Details

RY2025 Readmissions Reduction Incentive Program (RRIP)	RY 25 Readmissions Reduction Incentive Program (RRIP)
Disparity Gap Workbook	Disparity Gap Workbook
BASE YEAR	CY2018
PERFORMANCE YEAR	CY2023 YTD Through December (Jan 2023- Dec 2023)
VERSION	APR-DRG Grouper version 40 base & performance period; ADI v. 2020 National percentiles
INCLUDED IN THIS EXCEL WORKBOOK:-	Description
2. PAI and Disparity Gap by Hospital	Provides average PAI and the current disparity gap metric compared to the 2018 disparity gap metric
3. Patient Sociodemographics by Hospital	Descriptive statistics for PAI components of patients seen at each hospital by year
3a. Medicaid	Readmission rates for Medicaid and non-Medicaid
3b. Race	Readmission rates for Blacks and non-Blacks
3c. ADI	Readmission rates by Area Deprivation Index

The Cover Sheet (Sheet 1 - Presented Above) provides an overview of the report

Sheet 2 provides average PAI and the current disparity gap metric compared to the 2018 disparity gap baseline, by hospital by year

Sheet 3 provides case-mix adjusted readmission rates for Medicaid and non-Medicaid beneficiaries, by hospital by year

Sheet 4 provides case-mix adjusted readmission rates for Black and non-Black patients, by hospital by year

Sheet 5 provides case-mix adjusted readmission rates by low vs. high Area Deprivation Index, by hospital by year

Patient-Level RRIP Detailed Reports

- RRIP Patient-Level Reports provide individual PAI Scores (as well as Race, ADI, and Medicaid Status) for each patient
- Locked PAI Coefficients are not currently available on Patient Level Detail Reports, however will be included soon

The screenshot displays a web application interface for RRIP (Readmission Risk Index) reports. On the left, a sidebar titled 'Populations & Programs' contains several menu items: 'All-Payer Population', 'Medicare Population', 'HSCRC Regulatory Reports' (highlighted in green), 'Public Health', 'Introduction', and 'Favorites'. The main content area is titled 'Reports' and lists various report categories: 'CDS-A Reports', 'Demographics Adjustment', 'Hospital Population Health Programs', 'Market Shift', 'Maryland Hospital Acquired Conditions (MHAC)', 'Potentially Avoidable Utilization (PAU)', 'Quality Based Reimbursement (QBR)', 'Quality Financial Impact Dashboard', and 'Readmissions' (highlighted in blue). A red arrow points from the 'Demographics Adjustment' report to the 'Readmissions' section. The 'Readmissions' section on the right lists several reports: 'RY25 Readmissions Summary', 'RY25 Readmission Patient Level Details', 'RY25 Readmissions Patient Level Details - Base Period', 'RY25 RRIP - Patient Adversity Index and Disparity Gap Report', 'Excess Days in Acute Care Monitoring Patient Level Details', and 'Excess Days in Acute Care Monitoring Report'. Each report entry includes a heart icon, a title, and icons for visualization, download, refresh, and help.



THANK YOU!

Questions?
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