

# Hospital Quality & Patient Outcomes Analysis

An Independent Data Analysis Using CMS Hospital Compare Data

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## 1. Executive Summary

This analysis examines hospital quality ratings across the United States using publicly available data from the Centers for Medicare & Medicaid Services (CMS). The dataset covers 5,422 hospitals, of which 2,869 (53%) have a published overall star rating. Key findings reveal that hospital ownership type, geographic location, and performance on readmission and mortality measures are all strongly associated with overall quality ratings. For-profit hospitals consistently underperform non-profit and VA hospitals, Midwest and Mountain states outperform Southern states, and mortality performance emerges as the strongest single differentiator between high and low-rated hospitals. Based on these findings, this report recommends targeted quality improvement initiatives in for-profit and government-owned hospitals, with a focus on reducing preventable readmissions and mortality rates.

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## 2. Background & Objective

The Centers for Medicare & Medicaid Services (CMS) publishes hospital performance data annually to promote transparency and help patients make informed healthcare decisions. Despite the availability of this data, patterns in hospital quality across ownership types and geographies remain underexplored in accessible formats for healthcare stakeholders.

This analysis was conducted to answer the following business question:

*"What hospital characteristics — including ownership type, location, and clinical performance metrics — are most strongly associated with higher overall star ratings?"*

The findings are intended to help healthcare administrators, policymakers, and patients understand the drivers of hospital quality and identify areas for targeted improvement.

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## 3. Data Sources & Methodology

### 3.1 Data Sources

Three datasets were obtained from the CMS Provider Data Catalog ([data.cms.gov](https://data.cms.gov)):

- Hospital General Information — 5,422 hospitals, 38 columns including ownership type, location, star rating, and group measure counts

- Complications & Deaths — 95,821 rows of hospital-level complication and mortality measure scores
- Unplanned Hospital Visits — 67,075 rows of readmission and unplanned visit measure scores

## 3.2 Methodology

Data cleaning steps included removing footnote columns, converting non-numeric values ('Not Available', 'Not Applicable') to null, and converting measure score and denominator columns to numeric types. The three datasets were merged on Facility ID. Analysis was conducted in Python using pandas, matplotlib, and seaborn. All visualizations represent hospital-level aggregates.

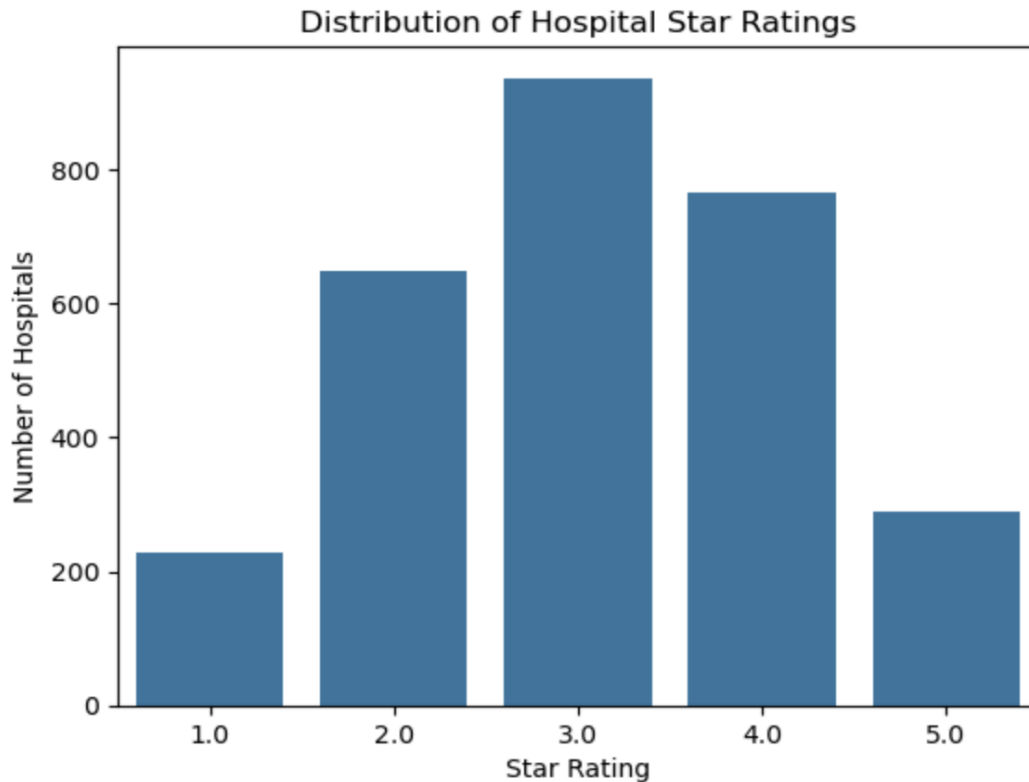
## 3.3 Limitations

- 2,553 hospitals (47%) do not have an overall star rating, typically smaller or specialty facilities that do not meet CMS minimum reporting thresholds. These were excluded from rating-based analysis.
  - Missing scores in Complications & Deaths (43,641 of 95,821 rows) and Unplanned Visits (31,716 of 67,075 rows) reflect hospitals that do not report specific measures.
  - This is a cross-sectional analysis — it captures a snapshot in time and does not account for year-over-year trends.
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# 4. Key Findings

## 4.1 Distribution of Hospital Star Ratings

The majority of rated hospitals cluster around 3 stars (~950 hospitals), forming a roughly bell-shaped distribution. Truly exceptional hospitals (5 stars, ~300) and critically underperforming hospitals (1 star, ~230) are comparatively rare. This suggests that most U.S. hospitals deliver average care, with meaningful quality differentiation at the extremes.

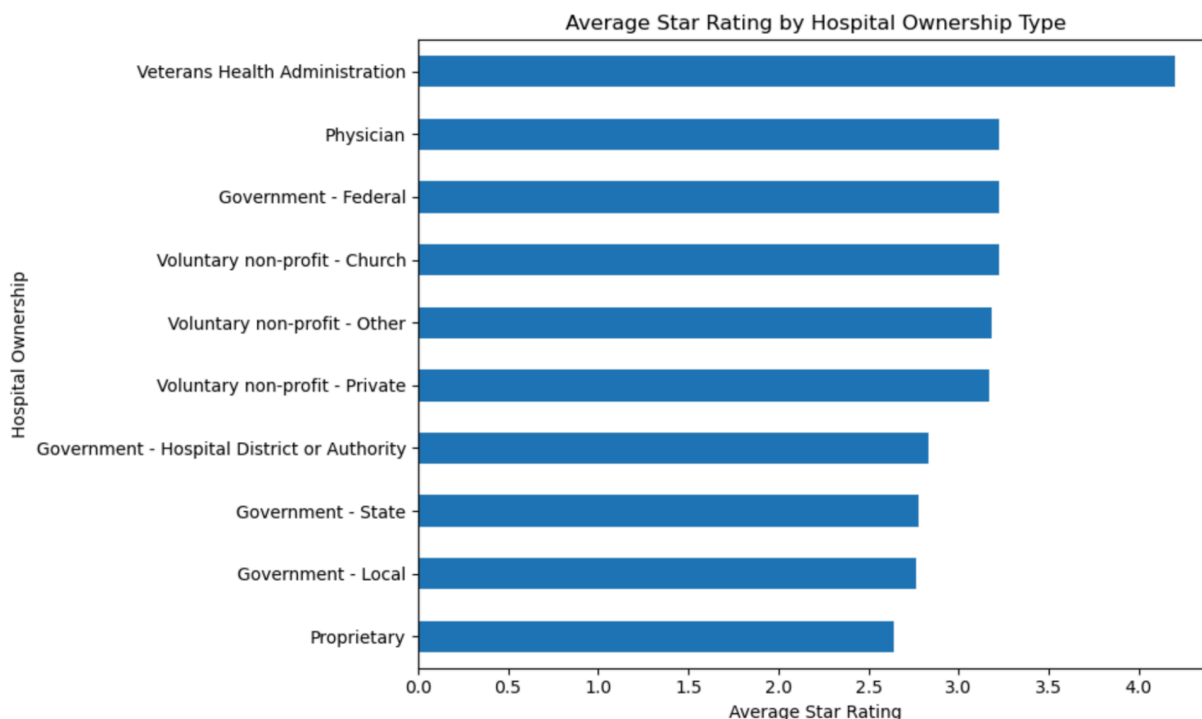


## 4.2 Ownership Type and Quality

Hospital ownership type shows a clear relationship with star ratings:

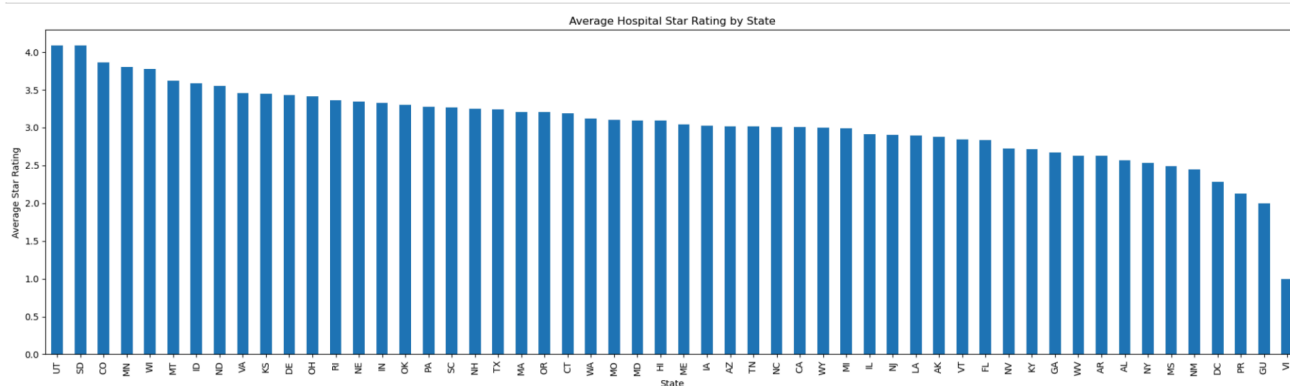
Ownership Type	Avg Star Rating	Performance
Veterans Health Administration	4.2	Highest
Physician-owned	3.3	Above Average
Voluntary Non-Profit (Church)	3.3	Above Average
Voluntary Non-Profit (Private)	3.2	Above Average
Government - State/Local	2.8	Below Average
Proprietary (For-Profit)	2.6	Lowest

The VHA's strong performance (4.2 stars) likely reflects its standardized care protocols and consistent funding. Proprietary hospitals' underperformance (2.6 stars) may reflect prioritization of cost efficiency over clinical quality outcomes.



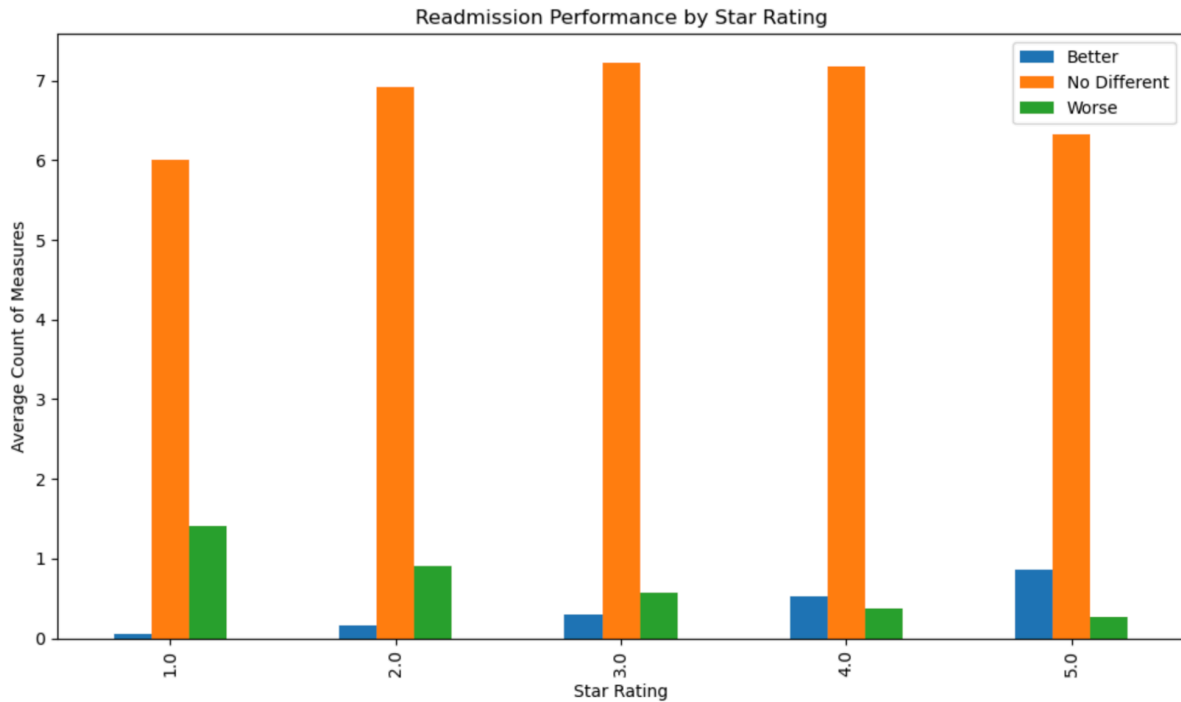
### 4.3 Geographic Variation

Significant geographic variation exists in hospital quality across states. Utah (4.1) and South Dakota (4.1) rank highest, while Mississippi, Alabama, and Arkansas cluster near the bottom (~2.5 stars). The U.S. territories of Guam and the Virgin Islands score lowest, likely due to limited hospital sample sizes and resource constraints. California, despite being the largest healthcare market, scores near the national average at approximately 3.0 stars.



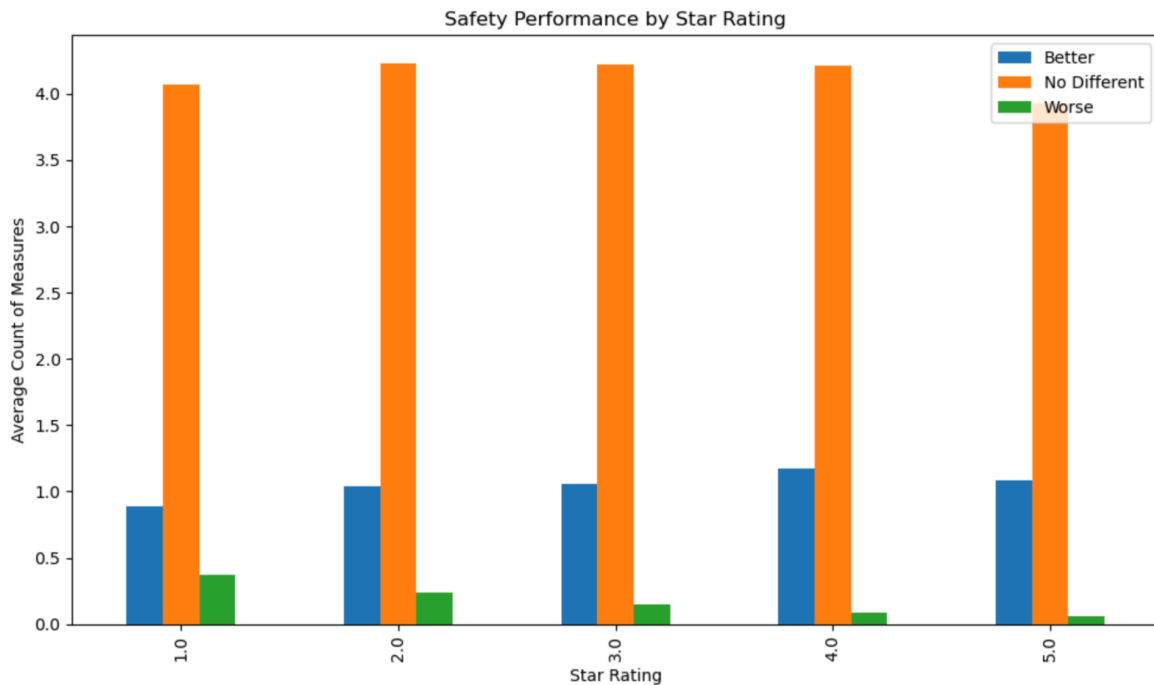
### 4.4 Readmission Performance vs. Star Rating

Hospitals with higher star ratings have measurably fewer readmission measures rated 'Worse than National' and progressively more rated 'Better than National.' One-star hospitals average nearly 1.4 'Worse' readmission measures vs. 0.25 for 5-star hospitals. This confirms that readmission reduction is a key driver of overall quality performance.



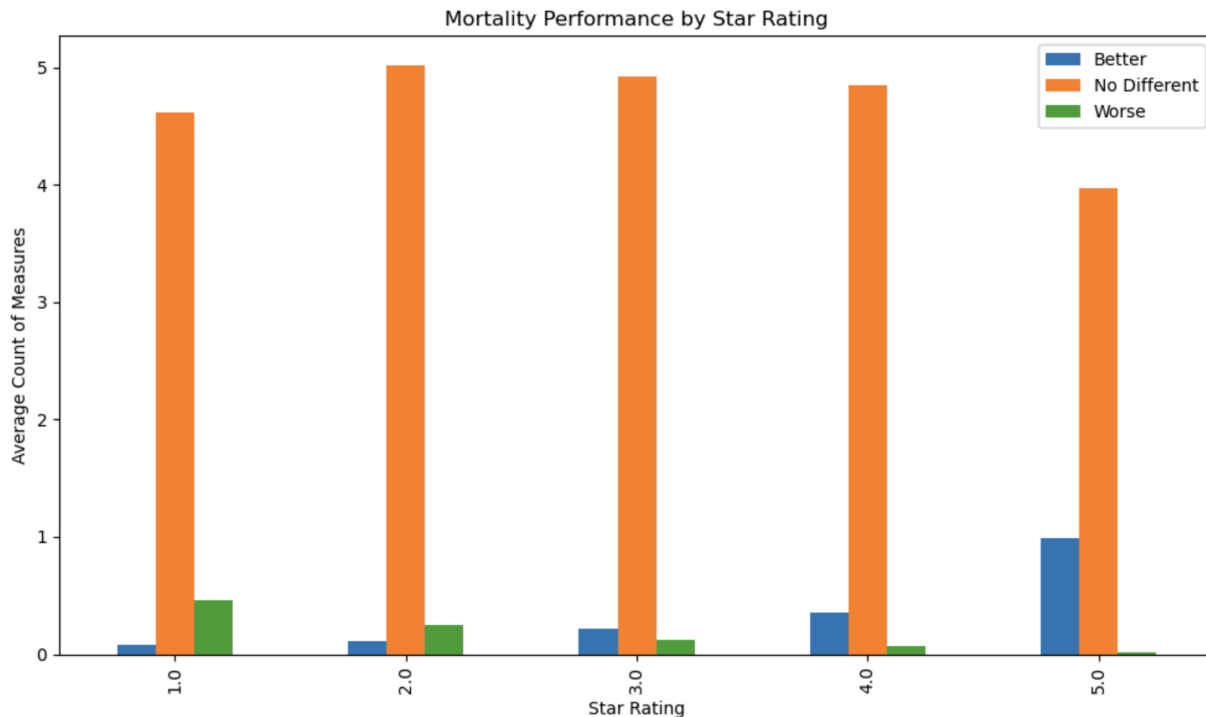
#### 4.5 Safety Performance vs. Star Rating

Safety measures show a consistent but less dramatic relationship with star ratings. The 'Worse than National' count drops from 0.38 (1-star) to 0.07 (5-star), while 'Better than National' counts remain relatively flat across all rating categories (~0.9-1.2). This suggests safety compliance is more of a baseline expectation than a key differentiator of top-performing hospitals.



## 4.6 Mortality Performance vs. Star Rating

Mortality measures show the strongest correlation with overall star ratings. Five-star hospitals average approximately 1.0 mortality measures rated 'Better than National,' compared to just 0.1 for 1-star hospitals. Conversely, 'Worse than National' mortality counts drop from 0.5 (1-star) to near zero (5-star). This is the most clinically significant finding: higher-rated hospitals are not simply more comfortable — they demonstrably save more lives.



## 5. Recommendations

Based on the findings above, the following recommendations are directed to healthcare administrators, policymakers, and CMS:

### 5.1 Target For-Profit Hospitals for Quality Improvement Programs

Proprietary hospitals consistently score lowest across all quality dimensions. CMS and state health departments should prioritize these facilities for quality improvement audits and provide incentive structures that reward clinical outcomes over cost minimization.

### 5.2 Invest in Readmission Reduction Initiatives

Given that readmission performance is strongly associated with overall star ratings, hospitals in the 1-2 star range should implement evidence-based readmission reduction programs, including improved discharge planning, post-discharge follow-up, and care coordination for high-risk patients.

### 5.3 Address Geographic Disparities

Southern states consistently underperform national averages. Regional initiatives targeting hospital funding equity, workforce development, and access to specialty care could meaningfully improve outcomes in these markets.

## 5.4 Expand Rating Coverage

With 47% of hospitals lacking an overall star rating, a significant portion of the U.S. hospital landscape remains opaque to patients and policymakers. CMS should explore pathways to extend rating eligibility to smaller and specialty hospitals to improve transparency.

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## 6. Appendix: Technical Notes

- Analysis conducted in Python 3.13 using pandas, matplotlib, and seaborn
- Data source: CMS Provider Data Catalog — [data.cms.gov/provider-data/topics/hospitals](https://data.cms.gov/provider-data/topics/hospitals)
- Datasets used: Hospital General Information, Complications & Deaths, Unplanned Hospital Visits (Hospital-level CSVs)
- Merge key: Facility ID (unique hospital identifier assigned by CMS)
- Star ratings range from 1 (lowest) to 5 (highest)
- All analysis code and cleaned datasets available in project GitHub repository

— End of Report —