



Comparison of Texas Hospitals

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Abstract

This is an analysis of Texas hospital ratings. As part of this analysis, I have compared hospital overall ratings in Texas to other states in the United States, as well as to the national average. Additionally, this analysis compares hospital overall ratings in Texas by county, as well as by hospital ownership type (government, private, etc.).

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Introduction

This document contains my analysis of Texas hospital ratings. I have a strong interest in medical and health data. Not only is this a highly impactful area of our lives, but the topic of medical care is also very measurable. In order to perform this analysis, I have utilized data sets from *The Centers for Medicare & Medicaid Services* and *The United States Census Bureau*.

As part of this analysis, I have compared hospital overall ratings in Texas to other states in the United States, as well as to the national average. Additionally, this analysis compares hospital overall ratings in Texas by county, as well as by hospital ownership type (government, private, etc.).

Please find below a list of the driving questions for this analysis:

1. What states in the United States have the best/worst average hospital overall ratings?
2. How does the average hospital overall rating in Texas compare to the national average?
3. What counties in Texas have the best/worst average hospital overall ratings?
4. Does there appear to be a correlation between a county's average hospital overall rating and that county's population in Texas?
5. What hospital ownership types have the highest average hospital overall rating in Texas?
6. How do the average hospital overall ratings by ownership type compare to the same ownership types in the national average?

Data

The U.S. Census Bureau data set used in this analysis ("Texas County Population Totals: 2010-2019") was last updated in July of 2019. This data documents the population of counties in the state of Texas for every year from 2010 to 2019. Some high-level statistics of this data set are included below.

Data Set Statistics ("Texas County Population Totals: 2010-2019")	
Number of rows	259
Number of columns	12

The Centers for Medicare & Medicaid Services data set used in this analysis ("Hospital General Information") is updated annually, and it was last updated in June of 2020. This public data set records overall hospital ratings for all hospitals that are registered with *Medicare*. Some high-level statistics of this data set are included below.

Data Set Statistics ("Hospital General Information")	
Number of rows	5315
Number of columns	29

The primary measure referenced in this analysis is the "hospital overall rating" in the "Hospital General Information" data set. This measure is defined by *The Centers for Medicare & Medicaid Services* as follows:

"The Overall Hospital Ratings are designed to assist patients, consumers, and others in comparing hospitals side-by-side. The Overall Hospital Ratings show the quality of care a hospital may provide compared to other hospitals based on the quality measures reported on Hospital Compare. The Overall Hospital Rating summarizes as many as 51

measures reported on Hospital Compare into a single rating. The measures come from the IQR, OQR, and other programs and encompass measures in seven measure groups: mortality, safety of care, readmission, patient experience, effectiveness of care, timeliness of care, and efficient use of medical imaging. The hospitals can receive between one and five stars, with five stars being the highest rating, and the more stars, the better the hospital performs on the quality measures. Most hospitals will display a three star rating.”

Full documentation of the data dictionary and data cleaning processes used in this analysis may be found in the Appendix of this report under the “Data dictionary” and “Data validation and cleaning process” sections, respectively.

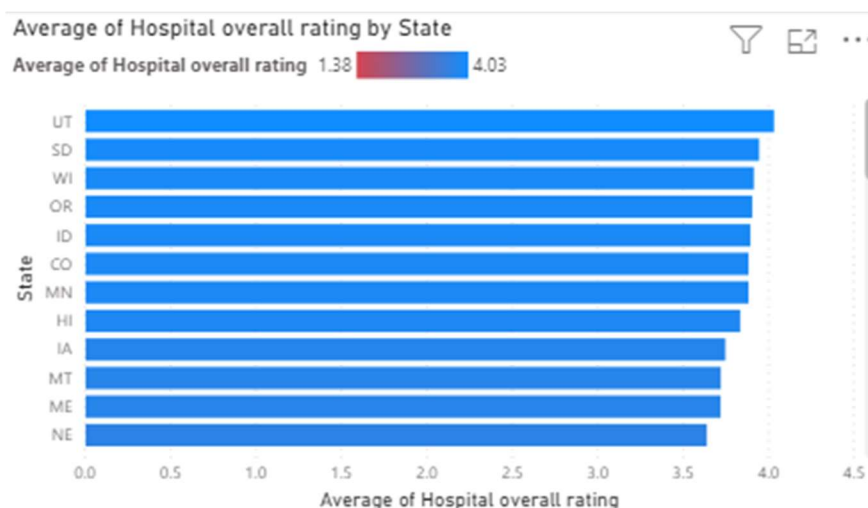
Analysis and Results

Please find details below regarding the analysis process and associated results for each of the driving questions of this analysis.

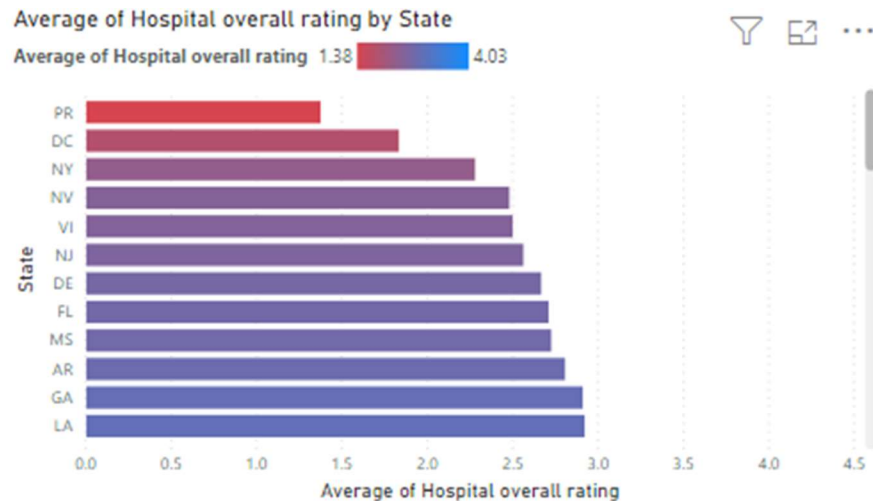
What states in the United States have the best/worst average hospital overall ratings?

In order to answer this question, I grouped the rows in the “Hospital General Information” data set by state. Then, I calculated the average overall hospital rating by state. At this point, I could then create a bar chart, and sort it from high/low to low/high in order to view the highest or lowest average overall hospital rating by state.

Please see the associated bar charts below, which show the states with the best and worst average overall hospital rating, respectively.



In the chart above, one can see that Utah, South Dakota, and Wisconsin are the top three states with the best average overall hospital rating.



In the above chart, one can see that Puerto Rico, District of Columbia (Washington D.C.), and New York are the three states with the worst average overall hospital rating.

How does the average hospital overall rating in Texas compare to the national average?

The analysis process for this question involved first creating a single bar chart showing the national average overall hospital rating. Then I created another single bar chart displaying the average overall hospital rating for the state of Texas.

Please see the associated visualizations below.



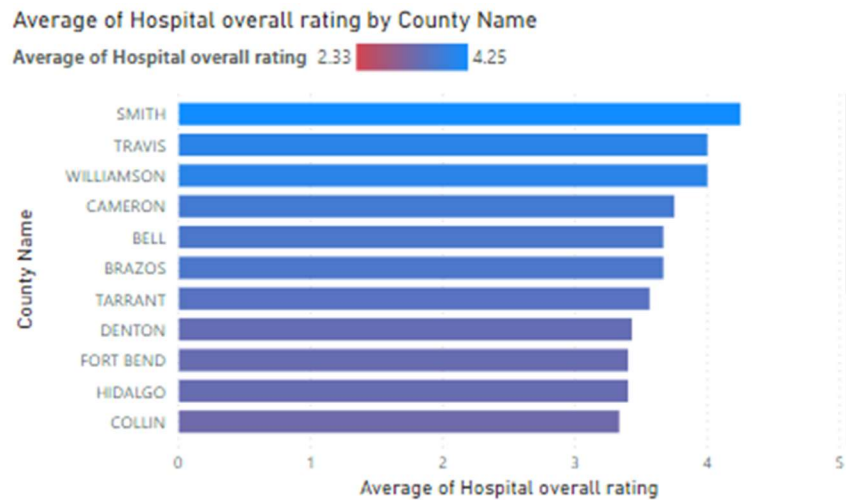
As one can see in the above visual, the state of Texas has a slightly higher average overall hospital rating when compared to the nation. The average overall hospital rating for the state of Texas is 3.35, while the same average at the national level is 3.22.

What counties in Texas have the best/worst average hospital overall ratings?

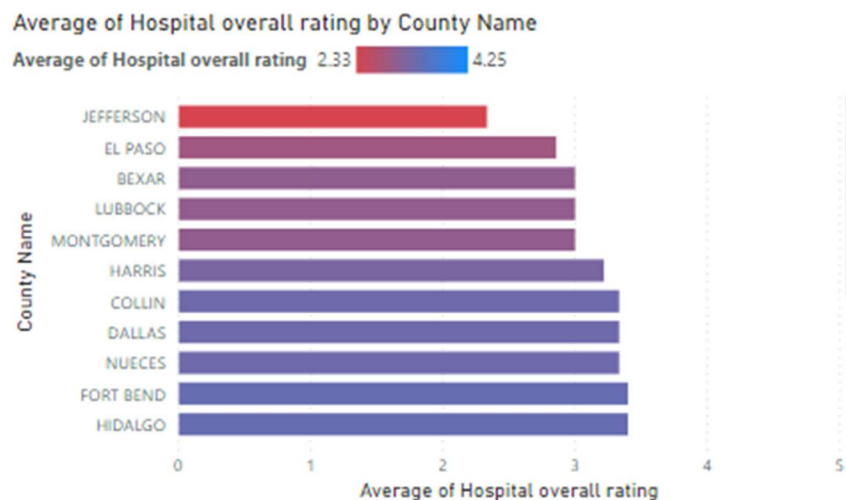
This question was answered in a similar way to the first driving question. First, I filtered all data in the “Hospital General Information” data set by state, so that I was only working with rows with a “State” value of Texas. After this, I grouped rows by county and calculated the average overall hospital rating for each. Finally, I created a bar chart to display this information.

I would like to note that I filtered the bar chart to only display a bar for counties that had at least three hospitals with a recorded overall rating. The reason for this is that counties with less than three hospitals may cause misleading information, as a county could appear to have a high average overall rating, even though there is only one hospital in the county.

Please see the associated bar chart below.



In the above chart, one can see that the Texas counties of “Smith,” “Travis,” and “Williamson” have the best average overall hospital rating.



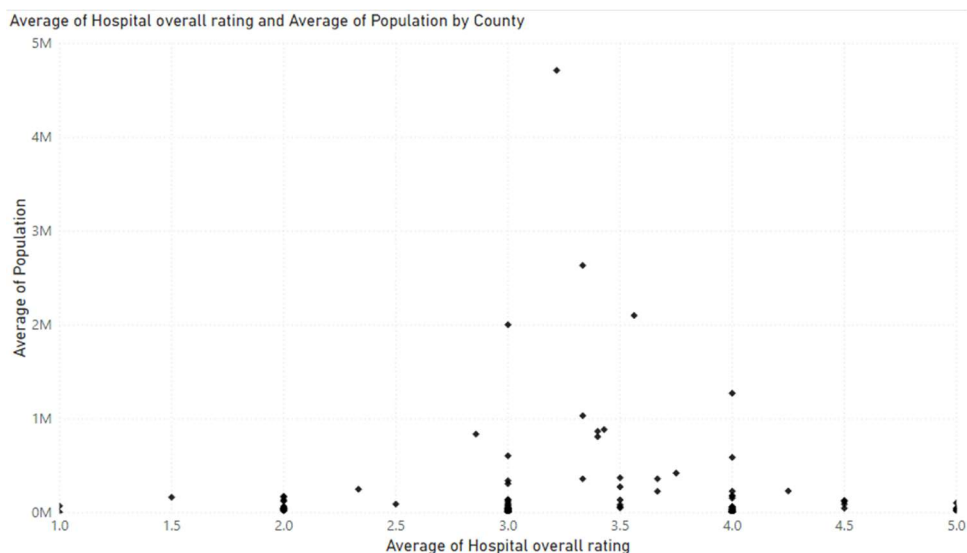
Conversely, the Texas counties of “Jefferson,” “El Paso,” and “Bexar” have the lowest average overall hospital rating.

Does there appear to be a correlation between a county's average hospital overall rating and that county's population in Texas?

In order to answer this question, I first filtered the “Hospital General Information” data set to only use rows in the state of Texas. I then grouped the rows by county, so that I could form a relationship between the grouped county and the county’s 2019 population in the “Texas County Population Totals: 2010-2019”

data set. Finally, I created a scatter chart that plots the average overall hospital rating of counties in Texas by their population in 2019.

Please see the resulting scatter chart below.

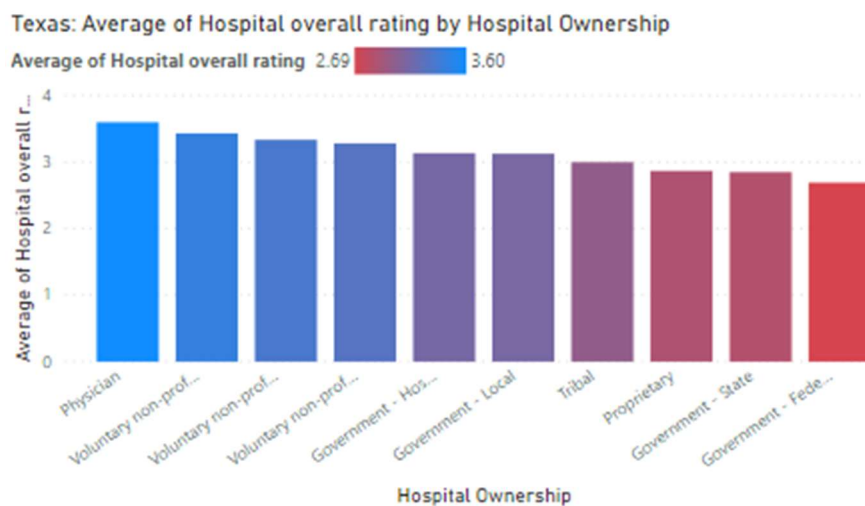


As one can see, there is a normal-shaped distribution in the above scatter chart.

What hospital ownership types have the highest average hospital overall rating in Texas?

To answer this question, I first filtered the rows in the “Hospital General Information” data set by the state of Texas. Next, I grouped the rows by hospital ownership type. Finally, I created a bar chart to display the average overall hospital rating by hospital ownership type.

Please see the associated bar chart below.

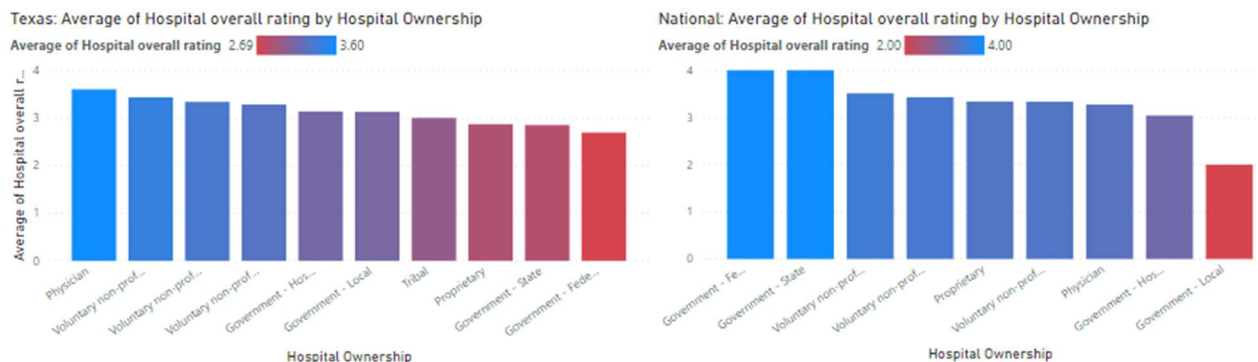


As can be seen in the chart above, physician-owned hospitals appear to have the highest average overall hospital rating in Texas. Meanwhile, federal government-owned hospitals appear to have the lowest average overall hospital rating in Texas.

How do the average hospital overall ratings by ownership type compare to the same ownership types in the national average?

Building off the previous question, I created the same chart at a national level. This enables a comparison of the average overall hospital ratings by ownership type in Texas to the same measures at a national level.

Please see both bar charts below.



In the charts above, one can see that federal government-owned hospitals appear to have the highest average overall hospital rating at a national level. On the other hand, local government-owned hospitals appear to have the lowest average overall hospital rating at a national level.

Discussion and Implications

Please find my interpretation of the results for each driving question below.

What states in the United States have the best/worst average hospital overall ratings?

This is a very high-level, general question that does not leave much room for interpretation. I believe the generated charts answer this question pretty well. One can see that Utah is the state with the highest average overall hospital rating, while Puerto Rico is the lowest.

There is some room to build upon the analysis of this question. For example, someone may be able to follow up on these results by conducting a more in-depth research and analysis into possible causes for why certain states are ranked higher than others.

How does the average hospital overall rating in Texas compare to the national average?

As shown in the results, the state of Texas has a slightly higher average overall hospital rating when compared to the nation. However, this is hardly enough of a margin to definitively claim that hospitals in Texas are better than those in the nation.

I believe that this is somewhat expected behavior. Due to Texas' large size and diversity, it makes sense to me that the average overall hospital rating in Texas closely resembles that of the nation.

What counties in Texas have the best/worst average hospital overall ratings?

Similar to the first question, this question does not leave much room for interpretation. One can see that "Smith" county has the highest average overall hospital rating, while "Jefferson" county has the lowest.

It would be interesting to follow up on this research and dig deeper into possible causes. For example, are there any variables that correlate with average overall hospital rating, such as the county's geographic location, county demographics, county GDP, etc.?

Does there appear to be a correlation between a county's average hospital overall rating and that county's population in Texas?

My interpretation is that, based on this analysis, there does not appear to be a correlation between a county's average hospital overall rating and that county's population. As can be seen in the resulting scatter chart, there is a normal distribution between hospital rating and county population.

What hospital ownership types have the highest average hospital overall rating in Texas?

As can be seen in the above results, physician-owned hospitals appear to have the highest average overall hospital rating in Texas. Federal government-owned hospitals appear to have the lowest average overall hospital rating in Texas. I believe this may be because Physicians who own their own hospital/clinic may be more likely to focus on the patient's experience when compared to bigger, organization-owned hospitals.

It is also interesting to see that non-profit hospitals are trending toward higher hospital overall ratings in Texas. Conversely, government-owned hospitals are trending toward the lower end of hospital overall ratings in Texas. I believe there is significant room for follow up research on this topic. For example, what variables may be impacting this? Are there certain statistics that non-profit hospitals in Texas are better performing in than government-owned hospitals?

How do the average hospital overall ratings by ownership type compare to the same ownership types in the national average?

These results are very interesting. While federal government-owned hospitals have the lowest average overall hospital rating in the state of Texas, this same ownership type has the highest average rating at the national level. Additionally, physician-owned hospitals have the highest average overall hospital rating in Texas, but they are at the lower end of ratings at the national level.

Honestly, I do not have a meaningful interpretation as to why there is such a large discrepancy in this comparison. I feel that this result warrants further investigation, research, and analysis into what may be

different about these hospital ownership types in the state of Texas when compared to hospitals at the national level.

Conclusion

This concludes my analysis of Texas hospital ratings. As discussed, this a highly impactful area of our lives, and medical/health data is very measurable. This analysis was performed by utilizing data sets from both *The Centers for Medicare & Medicaid Services* and *The United States Census Bureau*.

As part of this analysis, I have compared hospital overall ratings in Texas to other states in the United States, as well as to the national average. Additionally, this analysis has compared hospital overall ratings in Texas by county, as well as by hospital ownership type (government, private, etc.).

There were six driving questions in this analysis. Each of these questions have been answered, including my interpretation of each result. There are some areas in these results that may warrant further research and analysis. This is especially true around the topic of hospital ownership type (driving questions #5 and #6).

Appendix

Data dictionary

The following data dictionary documents the fields used for each data set in this analysis.

Texas County Population Totals: 2010-2019

Field Name	Data Type	Description
County	Text	County name
Population	Number	2019 population of the county.

Hospital General Information

Field Name	Data Type	Description
Facility ID	Number	Unique identifier for the hospital facility.
Facility Name	Text	Name of the hospital facility.
State	Text	State that the hospital facility is located in.
County Name	Text	County that the hospital facility is located in.
Hospital Ownership	Text	Type of ownership for the hospital facility.
Hospital overall rating	Number	Overall rating for the hospital facility.

Data validation and cleaning process

The following documents the data validation and cleaning process that was performed on these data sets.

Texas County Population Totals: 2010-2019

1. Imported data from Excel sheet.
2. Removed top rows that were not a part of the table.
3. Promoted the top remaining row to headers of the table.
4. Changed type of the population column to number data type.
5. Renamed 2019 population column to "Population."
6. Removed all columns except for "County" and "Population."
7. Replaced ", Texas" in all county names with an empty character ("").
8. Converted all county names to all uppercase.

Hospital General Information

1. Imported data from CSV file.
2. Promoted top row to headers of the table.
3. Changed "Hospital overall rating" column to number data type.
4. Removed all columns except for the following:
 - a. Facility ID

- b. Facility Name
- c. County Name
- d. State
- e. Hospital Ownership
- f. Hospital overall rating

References

- The Centers for Medicaid and Medicare Services*. "Hospital General Information." CMS.gov.
<https://data.cms.gov/provider-data/dataset/xubh-q36u> (first accessed September, 2020; last accessed November, 2020).
- United States Census Bureau*. "County Population Totals: 2010-2019." Census.gov.
<https://www.census.gov/data/datasets/time-series/demo/popest/2010s-counties-total.html>
(accessed September, 2020).