**Performance Assessment**

SLM1 — TASK 1: DATA ANALYSIS

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D211 Advanced Data Acquisition

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# Part I: Purpose and Function

The purpose of the dashboard is to explore the readmission rates for the hospitals and try to uncover the root cause for said readmissions. For this assessment, both internal datasets and a publicly available dataset from the US. Census Bureau was used. Moreover, the datasets were joined, and a tableau dashboard was created to facilitate insights into the readmission rates.   
Our stakeholders encompass key figures within the organization, including the Senior Vice President of Hospital Operations (SVP), Vice President of Research (VP), and a Panel of Regional Vice Presidents (Regional VPs). By thoroughly analyzing the data and identifying the root cause, we can make informed decisions to reduce readmissions and potentially alleviate the financial burdens associated with them.

# Part II: Business Intelligence Tool

The business intelligence tool used was Tableau. Tableau serves as a valuable tool for presenting data insights to stakeholders due to its user-friendly interface, interactive dashboards, and dynamic visualizations, which make complex information easily understandable and accessible. Stakeholders can explore data from various angles in real-time, customize visualizations to their preferences, and collaborate effectively with others. Making the raw data in a format that is easily digestible for stakeholders is key to transforming data into actionable results (Leung, 2021).

# Part III: Data Cleaning Steps

In order to prepare the dataset for the analysis, some data cleaning steps needed to be performed. Firstly, detecting and treating null values is a key step before transferring creating the Tableau dashboard. This ensures that when the visualizations are made a complete picture can be presented to the stakeholders and no NULL values shown. Furthermore, treating duplicated values is also a step paramount to data analysis. If there exists duplicated values in the dataset then the information would be incorrect again depicting erroneous information that could be used by stakeholders for decision making. Several modules within the SciKit learn python package, such as the *sklearn.preprocessing* allow for such transformation of the dataset before finalization (scikit-learn developers, 2024).

# Part IV: Dashboard Creation Steps

In order to create the dashboard, several steps needed to be taken. Firstly, the appropriate database in PostgreSQL was created along with all the tables necessary. The tables created on the local server are shown in the picture below from pgAdmin:

A screenshot of a computer

Description automatically generatedAs shown in the figure above, the appropriate tables were created, namely *admission*, *complication*, *job*, *location*, *patient*, *servicesaddon* and *survey\_responses\_addon*. Next, the links were created between the tables as appropriate to produce the correct data connections. An entity relationship diagram (ERD) was then generated to verify these connections. A screenshot is A screenshot of a computer

Description automatically generatedshown below.

An external dataset was also used for the Tableau dashboard – census population dataset per state from the US Census Department was downloaded and saved for later use. This contained the latest population statistics for every state.

The first step in creating the dashboard is to import the necessary data sources. From the initial welcome screen, select “Microsoft Excel” as the first data source in order to import the population by state file from the US Census Department.

A screenshot of a computer

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Next, to add the PostgresSQL tables, add another data source but this time select the “PostgresSQL” option under “To a Server”. If it is not shown, click the “More” button to expand the options and choose there.

A screenshot of a computer

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In order to connect to the Postgres server on the LabsOnDemand environment, certain information must be entered to that Tableau can communicate with the local server. Using the information below, fill in the information in the Tableau dialog box in order to connect to the server. Note, for this dashboard, the Databaseis *medical\_data* and not *churn.*

A screenshot of a computer

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After successfully connecting the Postgres local server and uploading the Microsoft Excel populationbyState file, the connections should be similar to what is shown below.

A screenshot of a computer

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After connecting the data sources, the patient and location tables should be dragged to the center of the Tableau screen in order to create the custom join. The *patient* table was joined with the *location* table on the *location\_id* column using the Custom SQL Query command from within Tableau – the SQL query can be found in the text file called “Custom SQL Code”. Right clicking either patient or location shows a dropdown box where “Convert to Custom SQL” is shown. Copy and paste the code from the text file into the box that shows in order to create a join between the patient table and the location. The join will be created using the *location\_id* column that is found in both patient and location.

A screenshot of a computer

Description automatically generated

After the code is executed, one can proceed to the creation of the various sheets to finally make the dashboard. The first sheet will contain the number of readmissions versus the population of each state. In the upper section, place the readmissions and population vales by dragging from the panel on the left to the appropriate locations, as shown below. Convert the measures of these to “COUNT” and “SUM” respectively as shown in the image below. Place State in the Columns section.



Moreover, change the Marks section to display the variable changes by color for both as shown below.

A screenshot of a computer

Description automatically generated

The second sheet, named Readmission by State is created using the map feature of Tableau. On the left side, search for the latitude and longitude variable names and place them as shown below. This will create a map of all the states where there is data.

A green rectangle with white text

Description automatically generated

A map of the united states

Description automatically generated

On the left side “Marks” panel, the variable readmission should be placed three times along with State – the first instance shows colors based on the variable quantity (dark blue to light blue. The second instance of readmission is a calculation of the quantity of readmission for that state based on a percentage of the total number. This can be achieved by clicking the arrow next to the variable name and selecting Quick Table Calculation and selecting Percentage of Total.

A screenshot of a computer

Description automatically generated

The third worksheet to create before the dashboard is the Total Charges by State – only the Total Charges and State variable will be used. Add State to the Columns section and Total Charges to the Rows. Total Charges should be changed to an average calculation by right clicking and selecting “Average” under ‘Measure’ as shown below.

A screenshot of a graph

Description automatically generated

The final step is creating the actual dashboard using the previously created worksheets. On the bottom of the Tableau window there are three icons to create new features – choose the icon with the four quadrants, as shown below, to open a new dashboard.

A screenshot of a computer

Description automatically generated

The dashboard screen will look like the image below. The created worksheets will appear on the left panel. These can be dragged and dropped anywhere on the white space in order to create the dashboard with the existing worksheets. On the left side pane, simply click and drag the worksheet onto the white space and Tableau will place the worksheet. By dragging the mouse over the workspace, a gray section will appear indicating the potential layout of the selected worksheet. For this dashboard, the sheet with the map was selected first followed by Total Charges by State on the right and finally the Population versus Readmission by State on the lower portion of the dashboard.

A screenshot of a computer

Description automatically generated

A screenshot of a computer screen

Description automatically generated

Finally, export the dashboard and all the sheets as a “Packaged Workbook” – click on File on the upper menu and scroll down to “Export Packaged Workbook”.

A screenshot of a computer

Description automatically generated

This query retrieved all the information from the patient table, and also provide me with the zip code, city, state, and county for each patient by matching each patient's location identifier with the location identifier in the location table. The patient table had alias ‘p’ and the location table had alias ‘l’. An inner join was created with the location table on *location\_id.* This created a new table that was used in the creation of the dashboard.

In order to create the dashboard, both the census dataset and the newly created joined table was used. This allowed for population analysis as well as with the initial medical dataset. The dashboard created showed population vs readmissions per state as shown below.

In order to open the dashboard, double click the Tableau Packaged Workbook (.twbx) as it contains the workbook and all dependencies. Upon opening, it will ask for a user name and password for the database. The following information is needed:

*Server: localhost  
 Port: 5432*

*Database: medical\_data*

*Username: postgres*

*Password: Passw0rd! (zero)*

After this, the dashboard can be found by click the button as shown below:



Navigating the dashboard is simple – by click on the state in the map on the left, all the other pertinent information about that state will be updated on the other sections. For example, clicking on Florida on the map will update the bar graph on the right that shows the average total charges as well as updating the section on the bottom showing the population and readmissions for Florida.

A screenshot of a computer

Description automatically generated

# Part V: Results

The provided Tableau dashboard serves as an analytical tool for visualizing the relationship between hospital readmission rates and the population by state, presenting health care executives with actionable data. The map highlights the geographic spread of readmissions, while the bar chart allows for an at-a-glance comparison of these rates in relation to state populations, facilitating the identification of any disproportionate figures. Through its interactive capabilities, the dashboard permits a granular examination of the data, enabling the leadership to focus efforts on improving patient outcomes and pinpointing where to allocate resources effectively.

The dashboard is designed to meet the needs of hospital stakeholders by offering a clear view of readmission rates, total charges, and population data across various states. By visualizing key information such as the number of readmissions and the financial impact in each state, it helps hospital administrators and financial officers identify areas with higher readmissions and costs. This insight allows them to prioritize their efforts and resources to reduce readmissions and avoid penalties from CMS.

Moreover, the dashboard helps stakeholders make informed decisions by showing how each state compares in terms of readmission rates relative to its population. This makes it easier to tailor strategies for different regions and allocate resources where they are most needed, leading to better patient outcomes and ensuring compliance with CMS guidelines.

Such a resource is pivotal for detecting regional issues swiftly and monitoring the impact of health interventions over time. Hospital administrators can leverage this information to compare current performance to established benchmarks and other pertinent health care indicators. This empowers them to make well-informed choices about enhancing care quality and managing hospital resources adeptly, fostering an initiative-taking stance in health care administration. The data visualization provided by the dashboard lays the groundwork for informed and responsive decision-making in the complex landscape of health care services.

# Part VI: Limitations

One limitation of this analysis and dashboard is its reliance on the accuracy and completeness of the data. If the data from hospitals or states is incomplete, outdated, or inaccurate, the insights generated may be misleading, potentially resulting in poor decision-making. Additionally, the dashboard focuses mainly on quantitative metrics like readmission rates and costs, without taking into account qualitative factors such as patient demographics, social determinants of health, or varying healthcare practices across states, which can all influence readmissions.

Another limitation is the lack of insight into the effectiveness of readmission reduction strategies already in place. The dashboard doesn’t account for any ongoing interventions or the reasons behind high readmission rates, which might be influenced by factors like the complexity of patient cases, hospital resources, or regional healthcare infrastructure. Without these contextual elements, the data alone might not provide a full picture, limiting the effectiveness of strategic decisions based solely on the dashboard.

Works Cited

Leung, K. (2021, September). *How Tableau Helps Your Organization Achieve Greater Data Insights*. Retrieved March 2024, from Datacamp: Rader Analytics: https://www.datacamp.com/blog/how-tableau-helps-your-organization-achieve-greater-data-insights

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