

PROJECT BASED LEARNING REPORT

on

“ HEALTH CARE DASHBOARD USING POWER BI ”

Submitted in the partial fulfillment of the requirement for the

Project based learning (PBL) in the subject

ESSENTIALS OF DATA SCIENCE

in

Electronics & Communication Engineering

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CERTIFICATE

Certified that the Project Based Learning report entitled, “**HEALTHCARE DASHBOARDUSING POWER BI** ” is work done by

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Problem Statement:-

Create comprehensive dashboard that visualizes Healthcare data , Blood report, disease history , etc using power BI's interesting features.

SOLUTION:-

What is Healthcare data Dashboard?

A healthcare data dashboard is a visual representation of key metrics, trends, and insights derived from healthcare-related data. It provides stakeholders such as healthcare providers, administrators, policymakers, and researchers with a centralized platform to monitor and analyze various aspects of healthcare delivery and outcomes.

Key features of a healthcare data dashboard typically include:

1. **Data Visualization:** Utilizes charts, graphs, maps, and other visual elements to represent healthcare data in an intuitive and easy-to-understand format.
2. **Key Performance Indicators (KPIs):** Highlights important metrics such as patient outcomes, hospital performance, disease prevalence, and resource utilization.
3. **Interactivity:** Allows users to interact with the data by applying filters, selecting specific time periods, or drilling down into detailed information for deeper analysis.
4. **Real-Time Monitoring:** Provides up-to-date information on healthcare metrics, enabling stakeholders to make timely decisions and interventions.
5. **Customization:** Allows users to customize the dashboard layout, choose which metrics to display, and create personalized views based on their roles and responsibilities.
6. **Alerts and Notifications:** Notifies users of important events or trends that require immediate attention, such as sudden increases in readmission rates or decreases in patient satisfaction scores.
7. **Data Integration:** Integrates data from multiple sources such as electronic health records (EHRs), patient surveys, billing systems, and public health databases to provide a comprehensive view of healthcare performance.

Overall, a healthcare data dashboard serves as a powerful tool for monitoring, analyzing, and optimizing various aspects of healthcare delivery, ultimately leading to improved patient outcomes, cost savings, and operational efficiency.

What is Power BI (Business Intelligence)?

Power BI (business intelligence) is a technology-driven business intelligence tool provided by Microsoft for analyzing and visualizing raw data to present actionable information. It combines business analytics, data visualization, and best practices that help an organization to make data-driven decisions.

Here are some key features and components of Power BI:

Data Connectivity: Power BI can connect to a wide range of data sources, including databases, cloud services, Excel files, and streaming data. It supports both structured and unstructured data, allowing users to import, transform, and combine data from multiple sources.

Data Modeling: Power BI includes tools for data modeling and shaping, allowing users to create relationships between data tables, define calculated columns and measures, and perform data transformations such as filtering, sorting, and grouping.

Visualization: One of the key features of Power BI is its rich set of visualization options. Users can create interactive and customizable charts, graphs, maps, tables, and other visualizations to explore and present data in meaningful ways. Power BI also supports custom visualizations developed by the community.

Dashboarding: Power BI allows users to create interactive dashboards by combining multiple visualizations and reports into a single canvas. Dashboards provide a consolidated view of key metrics and KPIs, enabling users to monitor performance and track progress towards goals in real-time.

Sharing and Collaboration: Power BI enables users to share reports and dashboards with others within their organization or externally. Users can collaborate on shared content, annotate visualizations, and discuss insights using built-in commenting and collaboration features.

Mobile Access: Power BI offers mobile apps for iOS, Android, and Windows devices, allowing users to access their reports and dashboards on the go. The mobile apps provide a responsive and touch-friendly interface optimized for mobile devices.

Overall, Power BI empowers organizations to leverage their data effectively, gain insights into business performance, and drive data-driven decision-making across all levels of the organization. It provides a flexible and scalable platform for building modern analytics solutions that meet the evolving needs of businesses in today's data-driven world.

What are different types of tools we used in power BI?

Microsoft Power BI connects data sources and provides BI reports and dashboards to users. It can connect with just an Excel spreadsheet or bring together cloud-based and on-premises data warehouses.

With applications such as an Excel workbook and Power BI Desktop file connected to online or on-premises data sources, Power BI users must manually refresh or set up a refresh schedule to ensure Power BI reports and dashboards use the most current data available.

Power BI consists of a collection of apps and can be used on a desktop, as a software as a service (SaaS) product or on a mobile device. Power BI Desktop is the on-premises version, Power BI service is the cloud-based SaaS offering and mobile Power BI runs on mobile devices.

The **Power BI** interface in the image appears to include various tools and options for data analysis and visualization. Let's break down some of the key components:

1. **Menu Bar:** Located at the top, it provides access to different functionalities such as file handling, data modeling, and report creation.
2. **Data Tools:**
 - **Data Source:** Used for connecting to data sources (e.g., databases, Excel files).
 - **Transform Data:** Allows data cleaning, shaping, and transformation.
 - **Modeling:** Used for creating relationships between tables and defining measures.
 - **View:** Provides options for managing visuals and layouts.
3. **Visualizations:**
 - **Fields Pane:** Displays available fields and measures.
 - **Visualizations Pane:** Allows users to drag and drop fields to create charts, graphs, and tables.
 - **Filters:** Used for data filtering.
4. **Report View:**
 - **Canvas:** Where visualizations are placed.
 - **Pages:** Allows multiple report pages.
 - **Visualizations:** Icons for different chart types (e.g., bar chart, pie chart).
5. **Help and Feedback:**
 - **Question Mark Icon:** Provides access to help documentation.
 - **Feedback Icon:** Allows users to provide feedback to Microsoft.

Excel Datasheet Visualization:-

Creating a healthcare data dashboard in Excel involves several steps, including data entry, data analysis, and visualization. Here's a basic guide to help you get started:



Data Entry:

- Start by entering your Health data into Excel. Typically, you'll have columns for items such as admission number, patient name, age, date of entry etc.
- Ensure your data is organized in a tabular format with clear headers.

Data Analysis:

- Utilize Excel functions to analyze your patient data. Common functions include SUM, COUNT, DATEDIF, IF etc.
- Calculate any necessary metrics such as AGE, STAY duration, Duration of intensive stay etc.

Dashboard Layout:

Here's a detailed layout for a healthcare data dashboard:

1. Header Section:

- Title: "Healthcare Analytics Dashboard"
- Logo: Logo of the healthcare organization or relevant branding.
- Date Range Selector: Dropdown or date range selector to choose the time period for data analysis.

2. Overview Section:

- Summary KPIs:
 - Total Number of Patients
 - Average Length of Stay
 - Overall Patient Satisfaction Score
 - Total Hospital Admissions
- Trend Charts:
 - Line chart showing the trend of patient admissions over time.
 - Bar chart displaying the distribution of patients by age group.

3. Patient Demographics:

- Pie Chart: Distribution of patients by gender.
- Bar Chart: Distribution of patients by age group.
- Geographic Map: Heatmap or bubble map showing patient distribution by location.

4. Treatment Outcomes:

- Readmission Rate:
 - Line chart displaying the trend of readmission rates over time.
 - KPI card showing the current readmission rate.

This layout provides a comprehensive view of healthcare data, covering patient demographics, treatment outcomes, hospital performance, and disease prevalence, while also offering interactivity and customization options for users to explore the data further.

Interactivity (Optional):

- If you want to make your dashboard interactive, consider adding slicers, drop-down lists, or other controls that allow users to filter and explore the data dynamically.
- You can use Excel's built-in features like Data Validation to create drop-down lists, or utilize macros for more advanced interactivity.

Final Touches:

- Proofread your dashboard to ensure all data and labels are accurate.
- Test any interactive features to ensure they function correctly.
- Make any final adjustments to improve the overall presentation and usability of your dashboard.
- By following these steps, you can create an effective sales dashboard in Excel that provides valuable insights into your sales performance.

Comprehensive Database:-

A healthcare database dashboard is a visualization tool that provides users with information derived from healthcare databases. These databases contain a wealth of information, including patient records, treatment histories, medical diagnoses, prescription details, and more. The dashboard aggregates and presents this data in a user-friendly interface, enabling healthcare administrators, and researchers to make informed decisions and improve patient care.



Here's a breakdown of what a healthcare database dashboard might include:

1. Patient Information:

- **Demographics:** Visualizations showing patient demographics such as age, gender, ethnicity, and geographic location.
- **Patient Profiles:** Individual patient profiles with key information like medical history, current treatments, and care plans.

2. Treatment and Medical Records:

- **Treatment History:** Charts or tables displaying patients' treatment histories, including medications, surgeries, and other interventions.
- **Medical Diagnoses:** Visualizations showing the prevalence of various medical conditions and diagnoses within the patient population.

3. Clinical Performance:

- **Clinical Outcomes:** Metrics indicating treatment outcomes such as readmission rates, mortality rates, and complication rates.
- **Quality Indicators:** Key performance indicators (KPIs) related to clinical quality measures, adherence to best practices, and patient safety.

4. Resource Utilization:

- **Bed Occupancy:** Visualizations showing the utilization of hospital beds over time, including occupancy rates and availability.
- **Resource Allocation:** Insights into the allocation of resources such as staffing levels, equipment usage, and facility utilization.

5. Financial Metrics:

- **Billing and Claims Data:** Summaries of billing and claims data, including reimbursements, revenue, and accounts receivable.
- **Cost Analysis:** Visualizations showing costs associated with different procedures, treatments, and patient populations.

6. Regulatory Compliance:

- **Compliance Tracking:** Tools for monitoring compliance with regulatory requirements such as HIPAA (Health Insurance Portability and Accountability Act) and other privacy regulations.
- **Audit Trails:** Logs and reports documenting changes to patient records, access permissions, and other critical data.

7. Customization and Interactivity:

- Filters and Drill-Downs: Interactive filters and drill-down capabilities for exploring specific subsets of data or diving deeper into individual patient records.
- Customizable Dashboards: Options for users to customize their dashboard views, save preferences, and create personalized reports.

8. Data Security and Privacy:

- Access Controls: Role-based access controls to ensure that users only see data relevant to their roles and permissions.
- Data Encryption: Measures to encrypt sensitive data at rest and in transit to protect patient privacy and comply with data security regulations.

A healthcare database dashboard provides a comprehensive view of healthcare data, enabling stakeholders to monitor performance, identify trends, and drive improvements in patient care, operational efficiency, and financial outcomes.

Use of Healthcare data Dashboard in Essential of data science:-

Healthcare data dashboards play a crucial role in the field of data science, especially in the context of improving patient outcomes, optimizing resource allocation, and enhancing operational efficiency within healthcare organizations. Here's how healthcare data dashboards contribute to the essentials of data science:

1. Data Collection and Integration:

- Healthcare data dashboards collect and integrate data from various sources, including electronic health records (EHRs), medical devices, patient surveys, and administrative systems. This process involves data cleaning, transformation, and normalization to ensure consistency and accuracy.

2. Data Exploration and Visualization:

- Data science relies heavily on data exploration and visualization techniques to gain insights from complex datasets. Healthcare data dashboards provide interactive visualizations that allow data scientists to explore patterns, trends, and correlations within healthcare data easily. These visualizations help identify factors influencing patient outcomes, disease prevalence, and hospital performance.

3. Predictive Analytics and Machine Learning:

- Healthcare data dashboards serve as a platform for implementing predictive analytics and machine learning models. Data scientists can leverage historical healthcare data to develop models for predicting patient readmissions, identifying at-risk populations, optimizing treatment plans, and forecasting resource needs. These predictive models enable proactive interventions and personalized healthcare delivery.

4. Performance Monitoring and Optimization:

- Data science aims to improve processes and outcomes through continuous monitoring and optimization. Healthcare data dashboards provide real-time monitoring of key performance indicators (KPIs) such as patient satisfaction scores, readmission rates, average length of stay, and resource

utilization metrics. Data scientists use statistical analysis and data visualization techniques to identify performance bottlenecks, inefficiencies, and areas for improvement.

5. Decision Support and Evidence-Based Medicine:

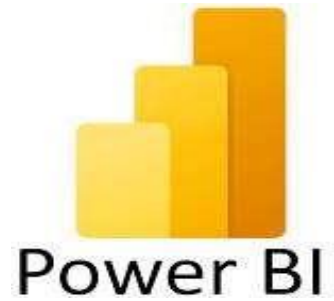
- Data science contributes to evidence-based medicine by synthesizing large volumes of healthcare data to support clinical decision-making. Healthcare data dashboards present evidence-based recommendations, clinical guidelines, and best practices to healthcare providers at the point of care. Data scientists collaborate with clinicians to develop decision support tools that integrate patient data, medical literature, and predictive analytics to guide treatment decisions and improve patient outcomes.

6. Data Security and Privacy:

- Data science involves ensuring the security and privacy of healthcare data to comply with regulatory requirements and protect patient confidentiality. Healthcare data dashboards implement robust data security measures, encryption techniques, and access controls to safeguard sensitive information. Data scientists work closely with cybersecurity experts and compliance officers to mitigate data breaches and ensure regulatory compliance.

In essence, healthcare data dashboards serve as a critical tool in the data science toolkit, enabling data scientists to leverage advanced analytics, machine learning, and visualization techniques to extract actionable insights from healthcare data and drive improvements in patient care delivery and healthcare outcomes.

Use of power BI in Healthcare Dashboard:-



Power BI is a powerful tool for creating healthcare dashboards due to its flexibility, scalability, and ease of use. Here are some specific ways Power BI is utilized in healthcare dashboard development:

1. Data Integration: Power BI allows healthcare organizations to integrate data from disparate sources such as electronic health records (EHRs), hospital information systems (HIS), billing systems, and external databases. It supports connectivity to a wide range of data sources, enabling seamless data integration and consolidation.

2. Data Modeling and Transformation: With Power BI's built-in data modeling capabilities, healthcare professionals can cleanse, transform, and shape raw data into meaningful insights. Power Query Editor enables data cleaning, transformation, and enrichment, while DAX (Data Analysis Expressions) provides a powerful language for defining calculated columns, measures, and complex calculations.

3. Visualization: Power BI offers a rich set of visualization options, including bar charts, line charts, scatter plots, maps, and more. Healthcare organizations can create interactive and visually appealing dashboards to represent key healthcare metrics such as patient demographics, treatment outcomes, hospital performance, and disease prevalence. Power BI's intuitive drag-and-drop interface makes it easy to customize visualizations and design compelling dashboards.

4. Interactivity and Drill-Down: Power BI enables users to interact with dashboards dynamically, applying filters, slicers, and drill-downs to explore data at different levels of granularity. Healthcare professionals can drill down from high-level summaries to detailed patient records, diagnoses, and treatment histories, facilitating in-depth analysis and decision-making.

5. Real-Time Analytics: Power BI supports real-time data streaming and refresh capabilities, allowing healthcare organizations to monitor key metrics and performance indicators in real-time. This feature is particularly valuable for tracking patient admissions, bed occupancy, emergency department wait times, and other time-sensitive metrics, enabling proactive interventions and resource allocation.

6. Collaboration and Sharing: Power BI enables seamless collaboration and sharing of healthcare dashboards across teams and departments. Healthcare professionals can publish dashboards to Power BI Service, where they can be accessed, shared, and viewed by authorized users on any device. Power BI's sharing features support secure sharing and distribution of sensitive healthcare data while maintaining data privacy and compliance with regulatory requirements.

6. Predictive Analytics and Machine Learning Integration: Power BI integrates with Azure Machine Learning and other machine learning platforms, allowing healthcare organizations to incorporate predictive analytics and machine learning models into their dashboards. This enables predictive forecasting, risk stratification, and personalized healthcare recommendation

Steps involved

Data Collection:

In the first stage of the process, data is gathered from various sources such as databases, spreadsheets, and online sources. This could include sales data, customer information, or any other relevant data sources. The data collection process is crucial as it ensures that all necessary data is available for analysis.

Data Processing:

Once the data is collected, it needs to be cleaned and preprocessed to ensure that it is ready for analysis. This involves removing any duplicate or irrelevant data, correcting errors, and formatting the data in a way that is suitable for analysis. Data processing is essential to ensure that the analysis is based on accurate and reliable data.

Data Modeling:

In this stage, relationships between different data sets are defined. This involves identifying key variables and understanding how they are related to each other. Data modeling helps to uncover patterns and trends in the data, which can be used to make informed decisions.

Visualization:

After the data has been processed and modeled, it is visualized using charts, graphs, and tables. Visualization helps to make the data more accessible and easier to understand. It also allows for trends and patterns to be identified more easily, helping to inform decision-making.

Analysis:

The visualizations are then analyzed to extract insights from the data. This involves interpreting the visualizations and identifying key trends, patterns, and outliers. Data analysis is crucial as it helps to uncover insights that can be used to make informed decisions and drive business growth.

Report Publishing:

Finally, the Power BI report is shared with stakeholders or published for broader access. This allows stakeholders to access the insights and make informed decisions based on the data. Report publishing is crucial as it ensures that the insights gained from the analysis are effectively communicated and used to drive business growth.

In conclusion, the data analysis process involves several stages, including data collection, processing, modeling, visualization, analysis, and report publishing. Each stage is crucial in ensuring that the data is effectively analyzed and used to drive informed decision-making. By following these steps, organizations can unlock the full potential of their data and drive business growth.

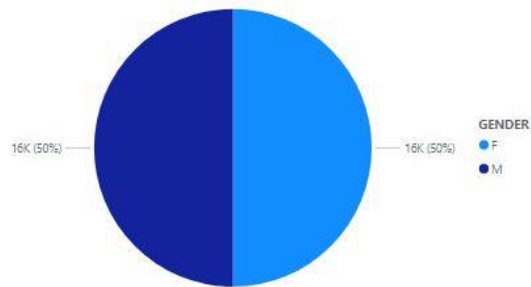
FUNCTIONS INVOLVED

1. Multi-row Graph: A multi-row graph is a type of graph that displays multiple data series or categories in rows, typically with each row representing a different category. This type of graph is useful for comparing data across different categories or groups.
2. Table: A table is a visual representation of data in rows and columns. Each row typically represents a record or data point, while each column represents a different attribute or variable. Tables are useful for displaying data in a structured format and can be easily understood at a glance.
3. Pie Chart: A pie chart is a circular statistical graphic that is divided into slices to illustrate numerical proportions. The size of each slice represents the proportion of the data it represents. Pie charts are useful for showing the relative sizes of different categories or groups within a dataset.
4. Tabular Graph: A tabular graph is a type of graph that displays data in a tabular format, similar to a table. However, unlike a traditional table, a tabular graph may include additional visual elements such as color coding or icons to represent different data points or categories. Tabular graphs are useful for displaying complex data sets in a more visually appealing and easy-to-understand format.

These visualizations can be created using various data visualization tools, including Power BI, Excel, and Tableau, among others. Each visualization type has its strengths and weaknesses, so it's important to choose the right type of visualization based on the data you are working with and the insights you want to convey.

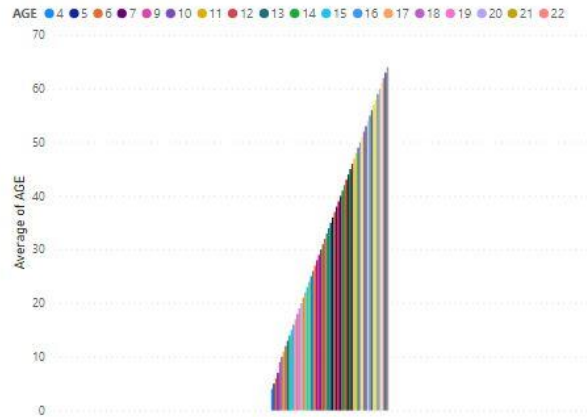
GRAPHS:

Count of GENDER total for GENDER by GENDER



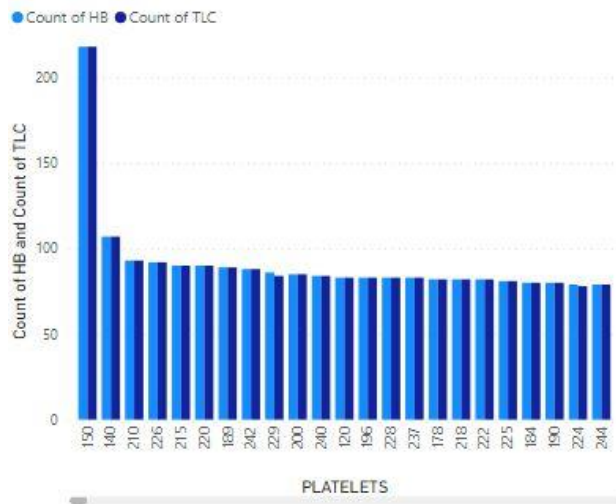
Graph 1:

Average of AGE by AGE

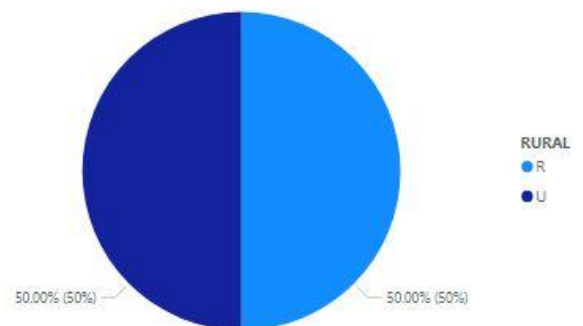


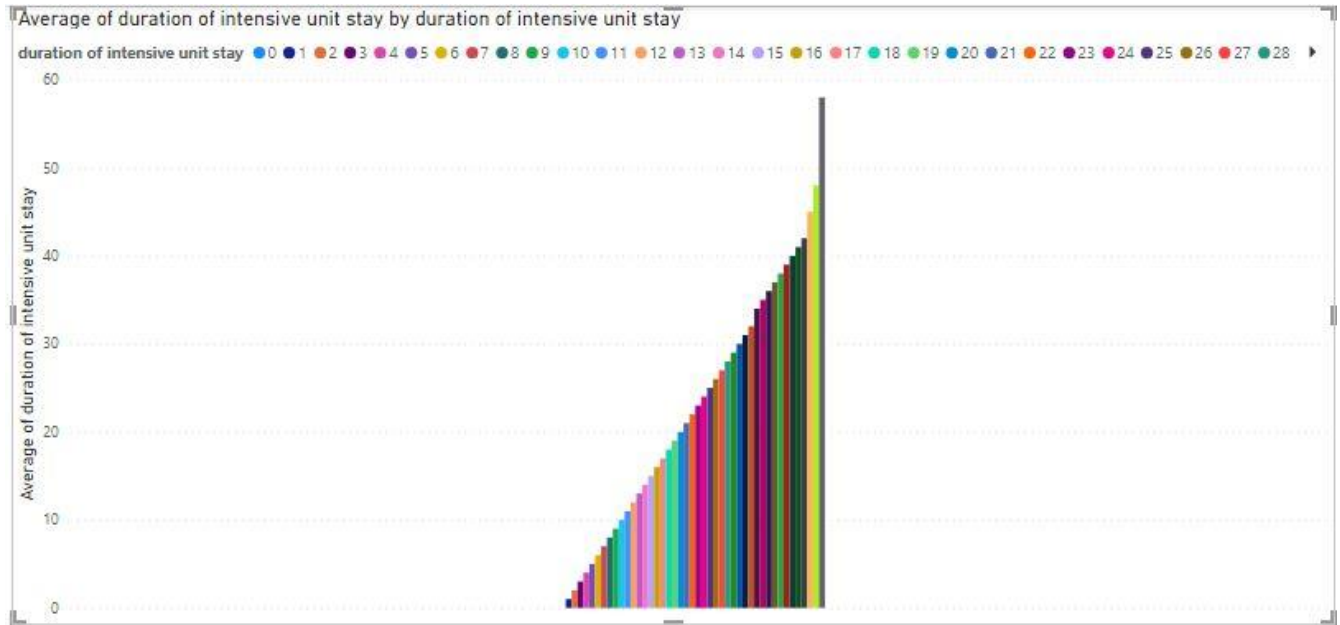
Graph 2:

Count of HB and Count of TLC by PLATELETS

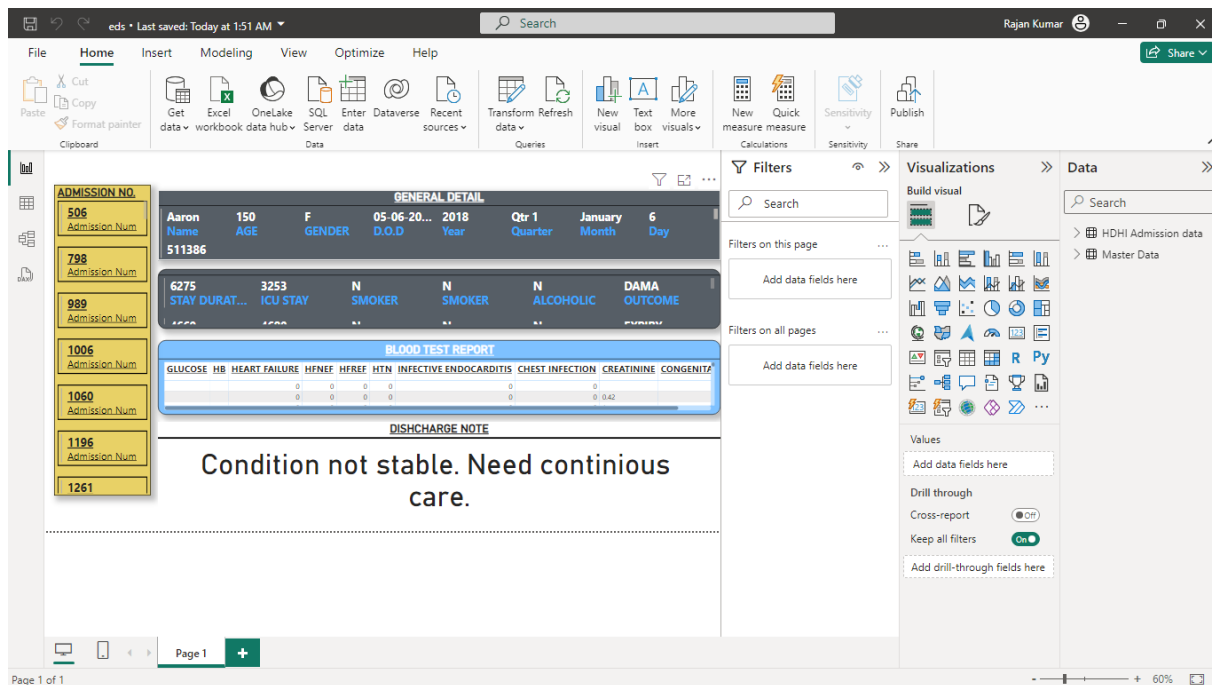


%GT Count of RURAL by RURAL





HEALTHCARE DASHBOARD:



Result with Analysis:-

For the final project in the Healthcare Data Dashboard Development course, students were tasked with developing an interactive healthcare data dashboard using Power BI. The project involved integrating real-world healthcare datasets, designing visually appealing visualizations, and incorporating interactive features for user exploration.

Key Features of the Dashboard:

- **Patient Demographics:** The dashboard includes interactive charts showcasing patient demographics such as age distribution, gender distribution, and geographic location.
- **Treatment Outcomes:** Visualizations display treatment outcomes metrics such as readmission rates, mortality rates, and average length of stay, allowing users to compare trends over time and across different patient cohorts.
- **Hospital Performance:** KPIs and trend lines are utilized to monitor hospital performance metrics such as bed occupancy rates, patient satisfaction scores, and emergency department wait times.
- **Disease Prevalence:** Treemaps and bar charts visualize disease prevalence by category and geographic region, providing insights into prevalent health conditions and regional variations.

Analysis of Insights:

- **Identifying High-Risk Patient Cohorts:** By analyzing readmission rates and mortality rates across different patient demographics, healthcare providers can identify high-risk patient cohorts requiring targeted interventions and care management strategies.
- **Improving Hospital Efficiency:** Monitoring bed occupancy rates and emergency department wait times enables hospital administrators to optimize resource allocation, reduce wait times, and improve overall operational efficiency.
- **Enhancing Patient Satisfaction:** Understanding patient satisfaction scores and identifying areas of improvement can help healthcare organizations prioritize initiatives to enhance patient experience and satisfaction levels.
- **Monitoring Disease Trends:** Tracking disease prevalence trends over time and across regions allows public health officials to identify emerging health threats, allocate resources for prevention and treatment, and implement targeted public health interventions.

Future Directions:

- **Predictive Analytics:** Integrating predictive analytics models to forecast patient readmissions, disease outbreaks, and resource needs based on historical data and trends.
- **Enhanced Interactivity:** Incorporating advanced interactive features such as drill-through capabilities, dynamic filtering, and personalized user dashboards to further enhance user experience and exploration.
- **Continuous Improvement:** Regularly updating and refining the dashboard based on user feedback, changing healthcare landscape, and emerging data trends to ensure its relevance and effectiveness in supporting healthcare decision-making.

Through the dashboard project, students gained hands-on experience in designing, developing, and analyzing healthcare data dashboards, applying the knowledge and skills acquired throughout the course to address real-world healthcare challenges and drive actionable insights for improved patient

care and organizational performance.

Project Conclusion:-

The Healthcare Data Dashboard Development project provided students with practical experience in creating impactful solutions for healthcare challenges. They demonstrated proficiency in Power BI and data analytics, generating valuable insights for healthcare stakeholders.

Achievements:

1. Hands-on Experience: Students effectively transformed real-world healthcare data into informative dashboards.
2. Clear Visualization: They employed best practices in data visualization to create visually appealing and understandable dashboards.
3. In-depth Analysis: By utilizing statistical analysis and KPIs, students uncovered meaningful trends and areas for improvement in patient care and hospital operations.
4. Effective Communication: They communicated insights effectively, translating data into actionable recommendations for stakeholders.

This project has equipped students with valuable skills to contribute to data-driven decision-making in healthcare, facilitating better patient outcomes and operational efficiency.

