HOSPITAL RESOURCE MANAGEMENT SYSTEM

Names: MAHIRWE Yvette

ID:26510

PROBLEM STATEMENT

This project proposes the development of a centralized, data-driven hospital resource management system to monitor, allocate, and optimize resources in real-time.

The system aims to enhance coordination, improve responsiveness, and ultimately boost the overall quality of healthcare services.

Improve responsiveness

Boost the overall quality of healthcare services.

PROJECT METHODOLOGY

Kaggle:

- Data sourcing
- Data cleaning and preprocessing
- Exploratory Data Analysis (EDA)

Power BI:

- Data Visualization
- Interactive features implementation (slicers)

GitHub:

- project documentation

Kaggle

```python
import os
import pandas as pd

# Find file automatically
data_path = ''
for dirname, _, filenames in os.walk('/kaggle/input/covid-19-hospital-capacity'):
    for filename in filenames:
        if filename.endswith('.csv'):
            data_path = os.path.join(dirname, filename)

# Load dataset
df = pd.read_csv(data_path)
print("Loaded:", data_path)
df.head()
```

```
Loaded: /kaggle/input/covid-19-hospital-capacity/COVID-19_Reported_Patient_Impact_and_Hospital_Capacity_by_State__RAW__20250802.csv
```

	state	critical_staffing_shortage_today_yes	critical_staffing_shortage_today_no	critical_staffing_shortage_today_not_reported	critical_staffing_shortage_anticipated_w
0	AK	1	5	12	
1	CA	5	115	217	
2	FL	3	39	162	
3	SC	11	8	47	
4	MN	0	0	128	

5 rows × 135 columns

```python
# Check for missing values
print(df.isnull().sum())

# Drop rows with missing key values (e.g., utilization metrics)
df.dropna(subset=['inpatient_bed_utilization', 'icu_bed_utilization'], inplace=True)

df = df[(df['fare_amount'] > 0) & (df['fare_amount'] < 1000)]

df = df[(df['pickup_latitude'].between(40, 42)) &
        (df['pickup_longitude'].between(-75, -72)) &
        (df['dropoff_latitude'].between(40, 42)) &
        (df['dropoff_longitude'].between(-75, -72))]

print("Shape after cleaning:", df.shape)
```

```
state                                                0
critical_staffing_shortage_today_yes                 0
critical_staffing_shortage_today_no                  0
critical_staffing_shortage_today_not_reported        0
critical_staffing_shortage_anticipated_within_week_yes    0
                                                    ..
staffed_pediatric_icu_bed_occupancy                  0
staffed_pediatric_icu_bed_occupancy_coverage         0
total_staffed_pediatric_icu_beds                     0
total_staffed_pediatric_icu_beds_coverage            0
date                                                 0
Length: 135, dtype: int64
```

```python
# Convert 'date' column to datetime
df['date'] = pd.to_datetime(df['date'])

# Extract temporal features
df['year'] = df['date'].dt.year
df['month'] = df['date'].dt.month
df['day'] = df['date'].dt.day
df['weekday'] = df['date'].dt.day_name()

# Optional: flag pandemic waves (example for March 2020, Jan 2021, etc.)
df['is_wave1'] = df['date'].between('2020-03-01', '2020-05-31').astype(int)
df['is_wave2'] = df['date'].between('2021-01-01', '2021-03-31').astype(int)

# Calculate bed occupancy rate (if columns exist)
if 'inpatient_beds_used_7_day_avg' in df.columns and 'total_beds_7_day_avg' in df.columns:
    df['bed_occupancy_rate'] = (
        df['inpatient_beds_used_7_day_avg'] / df['total_beds_7_day_avg']
    ).round(2)

# Show result
cols_to_display = ['date', 'year', 'month', 'weekday', 'is_wave1', 'is_wave2']
if 'bed_occupancy_rate' in df.columns:
    cols_to_display.append('bed_occupancy_rate')

print(df[cols_to_display].head())
```

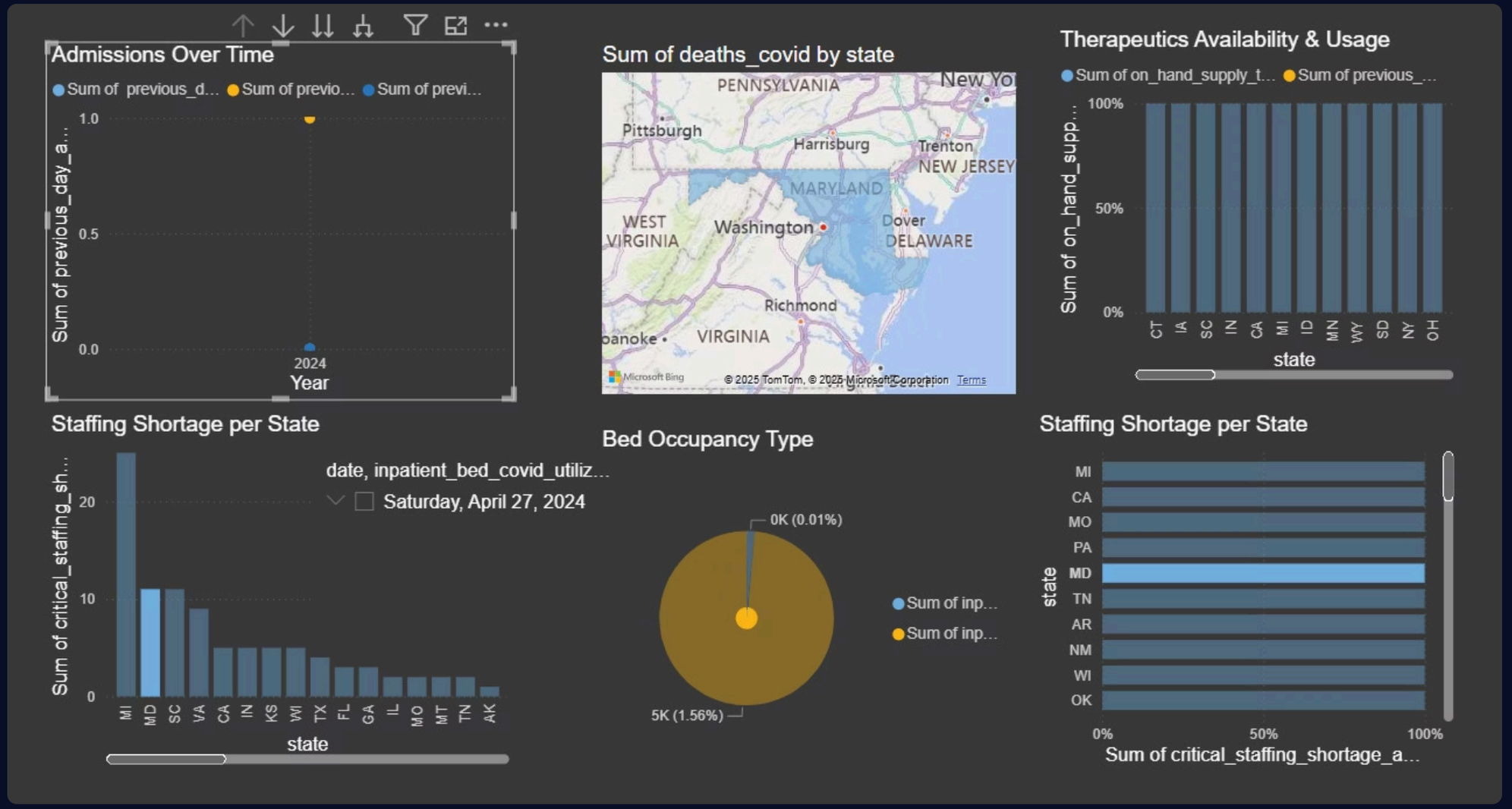
```
        date  year  month    weekday  is_wave1  is_wave2
0 2024-04-27  2024      4  Saturday         0         0
1 2024-04-27  2024      4  Saturday         0         0
2 2024-04-27  2024      4  Saturday         0         0
3 2024-04-27  2024      4  Saturday         0         0
4 2024-04-27  2024      4  Saturday         0         0
```

```python
# Export cleaned COVID-19 hospital dataset
df.to_csv('/kaggle/working/covid_cleaned_dataset.csv', index=False)
print("Cleaned dataset saved as covid_cleaned_dataset.csv")
```

```
Cleaned dataset saved as covid_cleaned_dataset.csv
```

+ Code + Markdown

Power BI



RESULTS

- Improved visibility into hospital resource usage (beds, staff, equipment)
- Data-driven decision-making

RECOMMENDATION

- **Integrate real-time data** from hospital systems for live monitoring of resource availability.
- **Expand the system** to cover more departments like pharmacy, ICU, and emergency units.
- **Automate alerts** to notify staff when resources are critically low or overutilized.
- **Conduct staff training** to ensure smooth adoption and usage of the system.
- **Regularly update** the dashboard based on feedback and evolving hospital needs.
- **Link with national health databases** for better planning and coordination across hospitals.

FUTURE WORK

- Develop a full web-based or mobile version of the system
- Integrate real-time hospital data feeds
- Apply predictive analytics for resource forecasting