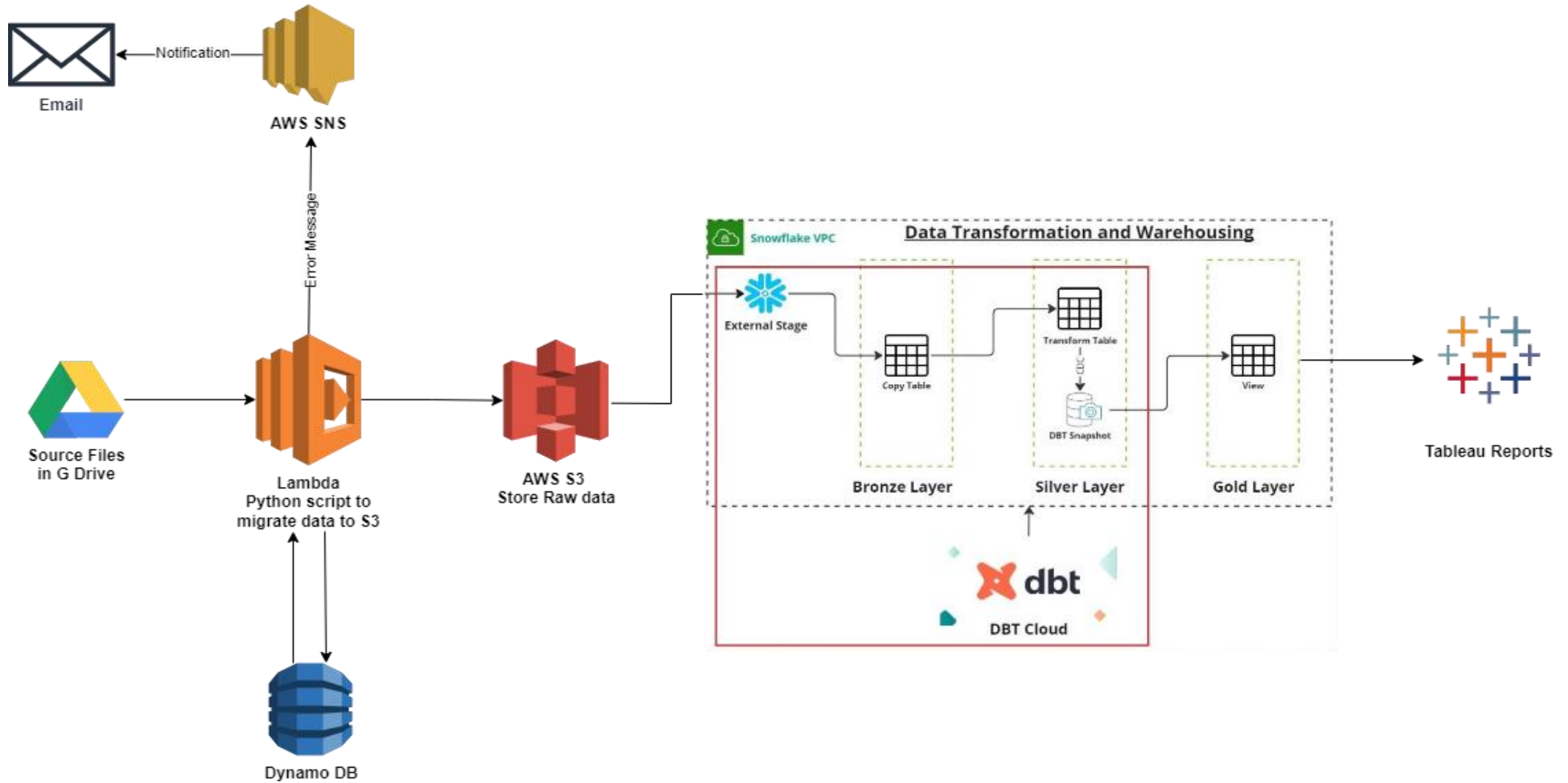# Healthcare Metrics Project

Metrics and Data Sources

| Data	PBJ_DAILY_NURSE_STAFFING	NH_PROVIDERINFO	NH_STATEUSAVERAGES
Metrics	Total hours worked by nurses per hospital, state, and month.	Average Nursing Hours Per Patient Day (HPPD) by State.	Readmission rates within 30 days by diagnosis category.
Key Fields	• **PROVNUM:** Hospital ID. • **State:** Hospital state. • **WorkDate:** Date of staffing record. • **Hrs_RNDON:** Total hours worked by Registered Nurses(RN) on duty. • **Hrs_Rnadmin:** Total hours worked by RN Administrators. • **Hrs_RN :** Total hours worked by all RNs. • **Hrs_LPNadmin:** Hours worked by Licensed Practical Nurse (LPN) administrators. • **Hrs_LPN:** Total hours worked by LPNs. • **Hrs_CNA:** Total hours worked by CNAs. • **Hrs_Natrn:** Total hours worked by Nursing Assistants in training. • **Hrs_MedAide:** Total hours worked by Medication Aides.	• **CMS Certification Number (CCN):** Hospital ID. • **State:** Hospital state. • **Adjusted Total Nurse Staffing Hours per Resident per Day:** Adjusted Total Nurse Staffing - Hours per Resident per Day (Aide+LPN+RN). • **Adjusted Weekend Total Nurse Staffing Hours per Resident per Day:** Adjusted Weekend Total Nurse Staffing – Hours per Resident per Day.	• **State:** Hospital state. • **Percentage of short stay residents who were rehospitalized after a nursing home admission** • **Percentage of short stay residents who had an outpatient emergency department visit** • **Number of hospitalizations per 1000 long-stay resident days** • **Number of outpatient emergency department visits per 1000 long-stay resident days**

Architecture

ELT Pipeline

Data Ingestion	Data Storage & Processing	Data Transformation	Data Visualization & Insights
• Stored all the healthcare CSV files in a **Google Drive**. • Created an **AWS Lambda** function that detects new or updated files in **G Drive**. • Used **DynamoDB** to tracks processed files and avoid duplicate processing. • Created **SNS** email notification for file transfer failures.	• Stored the raw data in **Amazon S3** before processing the data. • Created a **Stage** on top of **S3** bucket that automatically loads new data into Snowflake.	• Processes structured data in **Snowflake**. • Used **dbt (Data Build Tool)** to Clean, transform and aggregate the data in **Snowflake**. • Created Medallion architecture in **Snowflake** to store data.	• Created dashboards and reports in **Tableau**.

Total hours worked by nurses per hospital, state, and month.
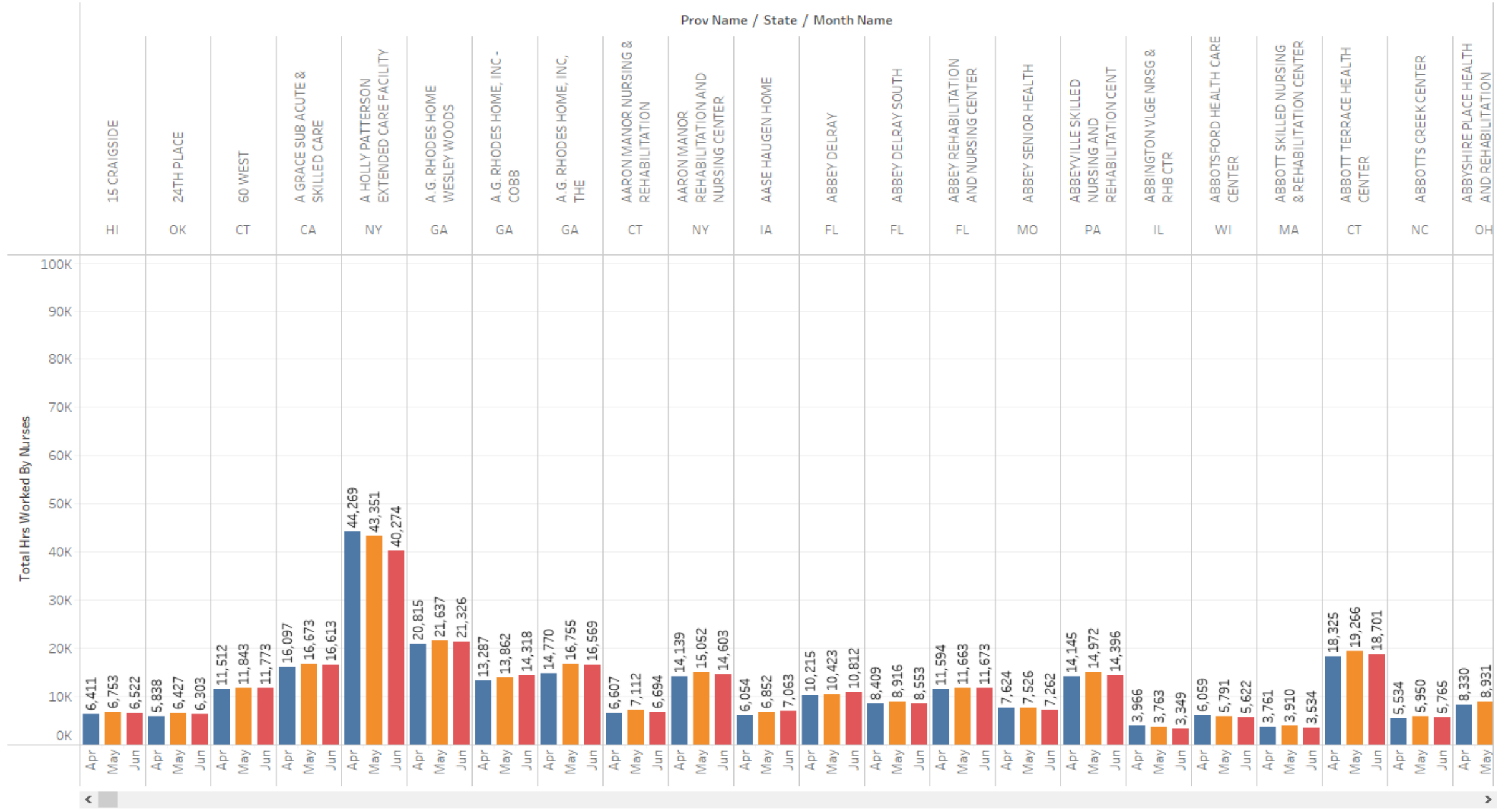
Total hours worked by nurses per hospital, state, and month.

Metrics Considered:

- Total Hours worked by nurses per day is calculated by doing a Sum of Total hours worked by Registered Nurses (RN) on duty, Registered Nurse Administrators, all Registered Nurses, Licensed Practical Nurse (LPN) administrators, Licensed Practical Nurses, Certified Nursing Assistants (CNAs), Nursing Assistants in training, Medication Aides.
- Grouping the above **Total Hours worked by Nurses** by Hospital, State and Month gives the Total Hours worked by nurses per hospital, state, and month.

Insights:

- The bar graph represents the **Total Hours worked by Nurses** by a Hospital in a State and for the months of April, May June.
- The trend in total hours represents that the Total Hours for each month in a hospital do not have a drastic difference.
- With the Total hours for each month in a hospital one can predict the increase or decrease in Staff hours and plan accordingly.
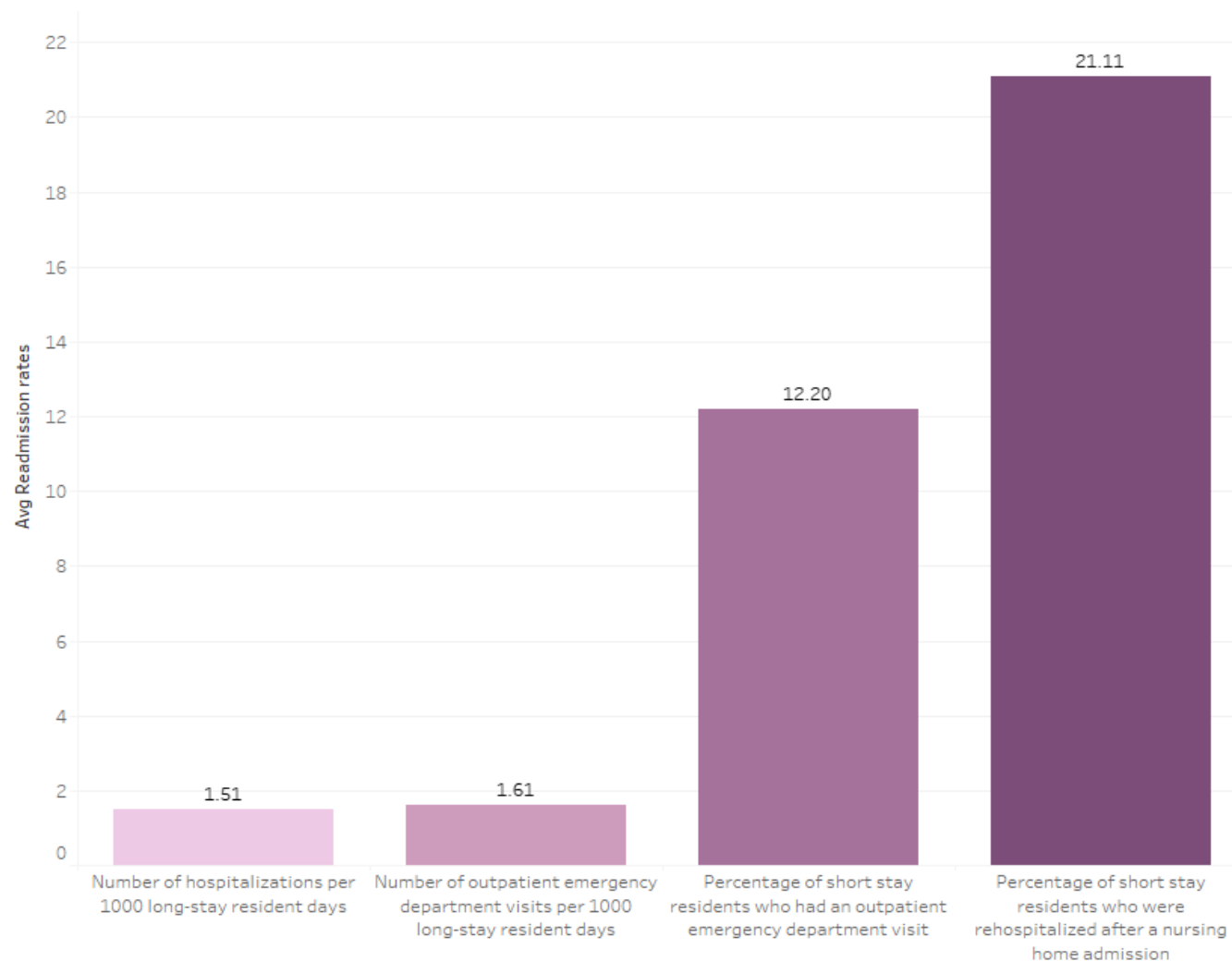
30-Day Readmission Rates by Diagnosis

Metrics Considered:
- **Avg of Readmission Rate:** Percentage of patients readmitted within 30 days.
- **Avg of Number of hospitalizations:** Number of hospitalization per 1000 long-stay residents.
- **Diagnosis Categories:** Identifies conditions with high readmission risk.

Insights:
- **High Readmission rate** signals severe conditions that necessitate improved post-discharge care.
- **Low Readmission rate** could indicate successful treatment or excessive reliance on outpatient care.
- **Trend Monitoring:** Aids in detecting high-risk conditions for focused interventions.

Readmission rates within 30 days by Diagnosis category

Avg Readmission rates

- 1.51 — Number of hospitalizations per 1000 long-stay resident days
- 1.61 — Number of outpatient emergency department visits per 1000 long-stay resident days
- 12.20 — Percentage of short stay residents who had an outpatient emergency department visit
- 21.11 — Percentage of short stay residents who were rehospitalized after a nursing home admission

Avg. Readmission rate
- Number of hospitalizations per 1000 long-stay resident d..
- Number of outpatient emergency department visits per 1..
- Percentage of short stay residents who had an outpatient ..
- Percentage of short stay residents who were rehospitaliz..

# Average Nursing Hours Per Patient Day (HPPD) by State

Metrics Considered:
- **HPPD (Nursing Hours Per Patient Day):** The total number of nursing hours allocated per patient each day.
- **Total Nursing Hours:** The cumulative nursing hours across all hospitals within a state.
- **Total Patient Days:** The overall count of reported patient stays.

Insights:
- **Higher HPPD (Darker Colors):** Indicates better staffing levels, observed in states like California and Alaska.
- **Lower HPPD (Lighter Colors):** Suggests potential nurse shortages and increased workload.
- **Regional Differences:** Certain states may require policy adjustments to enhance staffing levels.
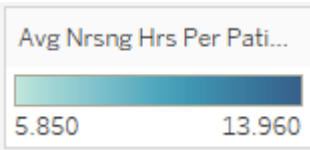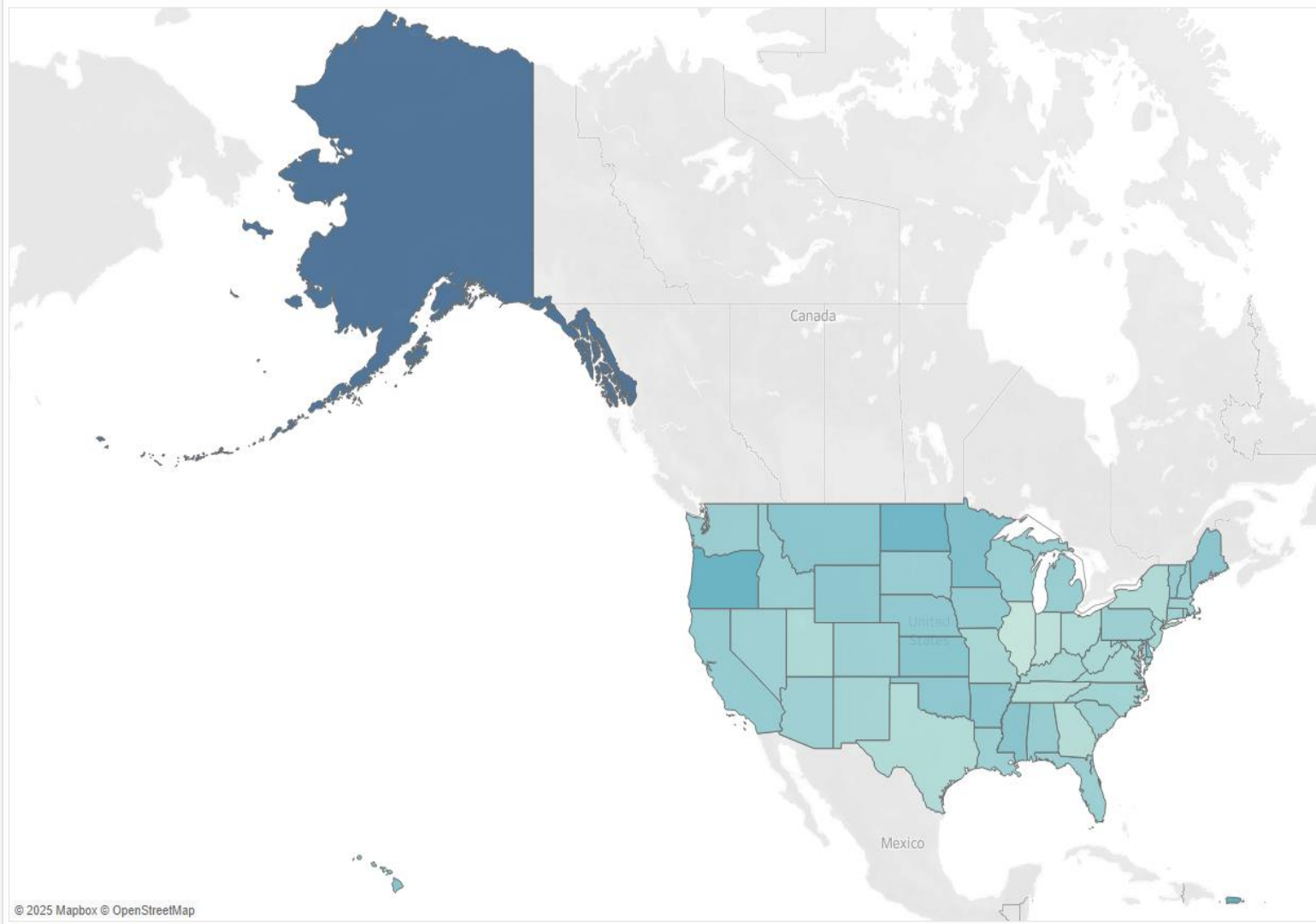
Key Insights & Findings

1 Relationship between Nurse Staffing & Hospital Occupancy rates?:

- Hospitals with more nurses per patient tend to have lower bed utilization rates, leading to smoother patient flow and less burnout.
- Facilities with insufficient staff face extended patient stays and increased readmission rates.

2 Hospitals having the Highest Overtime Hours?:

- Hospitals with a smaller permanent staff depend more on contract nurses, which increases overtime and operational expenses.
- Elevated overtime trends are common in densely populated and rural areas experiencing staffing shortages.

3 Average Staffing Levels by State & Hospital Type?:

- Urban hospitals maintain higher staffing ratios to accommodate complex cases and support teaching programs.
- Rural hospitals rely more heavily on contract staff, which affects the consistency of care and patient outcomes.
- Some states maintain higher levels of permanent staffing, while others depend on contract nurses for greater flexibility.

4 Trends in Patient Length of Stay overtime?:

- Longer stays may reflect greater severity, operational inefficiencies, or delays in discharge.
- Shorter stays can enhance efficiency but may raise the risk of readmissions if patients are discharged prematurely.
- Monitoring trends aids in optimizing staffing, bed management, and patient outcomes.

Thank You!