Healthcare Service Utilization & Expenditure Analysis

# Executive Summary

This report presents a comprehensive analysis of healthcare service utilization and expenditures, uncovering cost trends, utilization patterns, diagnosis trends, geographic disparities, provider behaviors, and predictive forecasts. Key insights were derived from a cleaned and standardized dataset with services spanning different counties, age groups, and providers.

# Conclusions by Task

## 1. Data Quality & Standardization

The data was cleaned successfully. Service dates were standardized, age categories verified, and gender labels unified, ensuring reliable analysis.

## 2. Expenditure Analysis

Lab tests and imaging drove the highest costs. Older patients and chronic conditions significantly contributed to total expenditure. High-cost diagnoses included inpatient and surgical procedures.

## 3. Utilization Patterns

Service demand peaked in Q1 and Q4, revealing seasonality. Females aged 25–45 and males 50+ were the most frequent service users. A small set of diagnoses accounted for the majority of visits.

## 4. Diagnosis Analysis

Common conditions included malaria, URIs, and hypertension. These were linked with frequent lab tests and prescriptions. Non-communicable diseases (NCDs) showed increasing trends over time.

## 5. Geographic Analysis

Urban counties had higher expenditures, though some rural counties had unexplained cost surges. Geographic disparities highlighted unequal service distribution.

## 6. Provider Analysis

A few providers dominated service volume. Outliers with unusually high average costs were identified, warranting further audit or intervention.

## 7. Predictive Analytics

Forecasting using SARIMA and Prophet predicted rising costs and utilization. Prophet performed best (MAPE < 10%), successfully modeling seasonality and trends for proactive planning.

# Strategic Insights & Recommendations

• Target high-cost services and outlier providers to control expenditure.  
• Increase access in underutilized counties with high disease burden.  
• Improve chronic disease prevention and management programs.  
• Integrate predictive dashboards for budgeting and resource planning.