**TABULAR STRUCTURES**

**Patient Population & Infection Distribution:**

* What are the most common infection types across species? (Method- Frequency analysis, chi-square test)
* How frequently do different bacterial organisms appear in test results?(Method- Descriptive statistics, bar plots)

**Epidemiological Measures of MDRO:**

* What is the prevalence rate of MDRO infections at different time points? Method- Cross-sectional prevalence analysis
* How does the frequency of specific bacterial infections change over time?Method-Trend analysis, moving averages

**Antibiotic Resistance & AST Profiles:**

* What is the resistance profile of different bacteria across species? Resistance heatmaps, logistic regression
* How many cases of resistance (R), non-interpretable (NI), and no-resistance are observed? Cross-tabulation, hierarchical clustering
* Are there bacterial strains that are always resistant (R) to certain antibiotics? No there are none
* How do antibiotic prescription patterns correlate with MDRO emergence? Logistic regression, time-lagged correlation

**MDRO Impact on Hospitalization & Rehospitalization:**

* Do MDRO-positive INFECTIONS have longer hospital stays? Kaplan-Meier survival analysis, - CANNOT PERFORM TTEST FOR THE FEEDBACK PROVIDED SINCE R SAYS THERE IS NO VARIATION IN BTW THE PARAMETERS.
* What is the median time until re-hospitalization for MDRO vs. non-MDRO infections? Survival analysis- (Cox regression)- GOT INFLATED RESULTS(HAVE TO CHECK WITH ILYA)- ADD HOSPITALIZATION AND SUBSET BY SPECIES, AND SERVICE (VIOLIN PLOTS)- HISTOGRAMS(5 DAY CHUNKS)- got some weird results here one is a negative value and another is inflated.
* What are the risk factors associated with rehospitalization (species, infection type, MDRO status)? Logistic regression, hazard ratios

**Survival Analysis & Outcome Comparisons:**

* What is the difference in survival time between MDRO-positive and MDRO-negative cases? What are the competing risks for MDRO vs. non-MDRO patients (e.g., death, discharge, transfer)? Cox proportional hazards model,Competing risks survival analysis
* What factors (infection type, species, hospitalization duration) impact survival time?Multivariable Cox regression- REFERENCE- NO GROWTH AND THE INFECTION TYPE IS ESCAPEE PATHOGEN AND INCLUDE THE FIRST VARIABLE AS MDRO VS NON MDRO, sample type- decide the variables, aic, bic read about that

**AST Profile & Machine Learning-Based Clustering:**

* How do antibiotic resistance patterns change over time? Cox proportional hazards model?Time-series clustering, transition matrices
* Are some species more prone to developing antibiotic resistance? Logistic regression, survival curves
* Are there distinct clusters of MDRO cases based on antibiotic prescriptions? Are patients given incorrect antibiotics for MDRO?Confusion matrix, classification models, K, hierarchical clustering

**GRAPHICAL VISUALIZATIONS**

1. Patient Population & Infection Distribution

#### Q1: Most common infection types across species?

Graph: Grouped Bar Chart (Infection Type vs. Count, grouped by Species)

* Helps compare infection distribution across different species.
* Alternative: Stacked Bar Chart (shows proportion across species).

#### Q2: Frequency of different bacterial organisms in test results?

Graph: Histogram / Bar Chart (Organism vs. Frequency)

* Shows which bacterial species appear most frequently.
* Alternative: Pie Chart (to visualize percentage distributions).

### 2. Epidemiological Measures of MDRO

#### Q3: Incidence rate of MDRO infections over time?

Graph: Line Chart / Time-Series Plot

* X-axis: Time Period (weeks/months)
* Y-axis: Incidence Rate
* Alternative: Scatter Plot with trendline (to highlight significant changes).

#### Q4: Prevalence rate of MDRO infections at different time points?

#### Graph: Stacked Bar Chart (Time Period vs. Prevalence)

* Helps visualize proportions over time.

#### Q5: Change in frequency of specific bacterial infections over time?

Graph: Multiple Line Chart (One line per bacterial species)

* Tracks how different bacterial infections increase/decrease over time.
* Alternative: Heatmap (Time Period vs. Organism with color intensity for frequency).

### 3. Antibiotic Resistance & AST Profiles

#### Q6: Resistance profile of different bacteria across species?

Graph: Heatmap (Bacterial Species vs. Antibiotic Resistance)

* Color intensity shows resistance levels (R, S, I).

#### Q7: Cases of R, NI, and No-Resistance across antibiotics?

Graph: Stacked Bar Chart (Antibiotic vs. Number of Cases)

* Compares resistance (R), non-interpretable (NI), and no-resistance cases across antibiotics.

#### Q8: Correlation between antibiotic prescription patterns and MDRO emergence?

Graph: Scatter Plot with Regression Line

* X-axis: Antibiotic Usage Rate
* Y-axis: MDRO Cases

### 4. MDRO Impact on Hospitalization & Rehospitalization

#### Q9: Do MDRO-positive cases have longer hospital stays?

Graph: Box Plot (MDRO vs. Non-MDRO, showing hospital stay distribution)

* Highlights differences in median and variation.

#### Q10: Median time until return hospitalization for MDRO vs. non-MDRO cases?

Graph: Kaplan-Meier Survival Curve

* X-axis: Time (Days)
* Y-axis: Probability of Remaining Out of Hospital

#### Q11: Risk factors for rehospitalization?

Graph: Forest Plot (Logistic Regression Results)

* Shows odds ratios for different risk factors.

### 5. Survival Analysis & Outcome Comparisons

#### Q12: Survival time difference between MDRO and non-MDRO cases?

Graph: Kaplan-Meier Survival Curve (MDRO vs. Non-MDRO)

#### Q13: Competing risks for MDRO vs. non-MDRO patients?

Graph: Stacked Bar Chart (Death, Discharge, Transfer Rates for MDRO & Non-MDRO)

#### Q14: Factors impacting survival time?

Graph: Cox Regression Forest Plot

### 6. AST Profile & Machine Learning-Based Clustering

#### Q15: Changes in antibiotic resistance patterns over time?

Graph: Heatmap (Time vs. Resistance Rate by Species)

#### Q16: Are some species more prone to resistance?

Graph: Bar Chart (Species vs. Resistance Rate)

#### Q17: Clusters of MDRO cases based on prescriptions?

Graph: t-SNE or PCA Scatter Plot (for Clustering)

#### Q18: Incorrect antibiotics for MDRO cases?

Graph: Confusion Matrix