**MRSA Surveillance Analysis Overview**

Methicillin-resistant staphylococcus aureus (MRSA) is one of the leading hospital-acquired infections while progressively becoming more resistant to first-line antibiotics. With MRSA becoming a threat to public health, tracking and surveillance is a crucial procedure in preventing an outbreak. The U.S Center for Disease Control and Prevention (CDC) has implemented a tool that allows users to analyze and visualize data for Healthcare-Associated Infections (HAIs), including Candida bloodstream infections, Clostridioides difficile infections, and Staphylococcus aureus infections. However, while the dataset provided is extensive, the visual platform that allows users to perform analysis is lacking in accessibility to the available data. This tutorial will provide an overview of the resigned visual platform that allows users more access to the available data and an improved understanding in MRSA surveillance.

With the visual and analytical platform, we hope to provide insight into two research questions: 1). How has the rate of methicillin resistance Staphylococcus aureus infections evolved over the past decade? 2). Are there demographic or geographic factors influencing the rate in Staphylococcus aureus infections? To accomplish these aims, we utilized the data set provided by the CDC that tracks MRSA cases and their metadata from 2005 to 2020. The data will be transformed and visualized in a stream-line process using R. Ultimately, a developed ShinyApp application will allow users to easily select and visualize the variable of interest without having to perform any coding themselves. This product hopes to provide an insight to understanding the trends and influencing factors in MRSA infections.

The R code utilized common R packages such as ggplot, dplyr, tidyverse, etc… to transform and visualize the provided dataset. The dataset is further transformed to retain important variables that can be visualized while empty rows are omitted. Crucially, ShinyApp is included in the code to create a visualization platform/user interface that allows users to select the year of all recorded MRSA cases from an input slider. Additionally, a drop-down menu is implemented to for users to select the variable they want to visualize such as the age of the patients, epidemic classification of MRSA, and patients’ syndromes. The server end of the ShinyApp was designed specifically to remain functional even if the dataset is changed in the future. This way, when new data are entered, as surveillance data will be, the application will still be functional and sustainable for future use.

From the analysis, there is a correlation between the age group and the risk associated with MRSA infections. This can be attributed to many factors including the compromised immune system within older age groups. Additionally, older age groups are more likely to visit hospitals, which is the most common setting in MRSA infections. We also identified a decline in US 100 and US 300 epidemic class of MRSA while other strains are becoming more prevalent. This trend indicates an evolutionary progression of MRSA, with mutation that might result in resistance against antibiotics. Effectively, this finding highlights the need for new intervention against the increasingly persistent MRSA infections.

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