

Student Name: Liyanze Liu
Student Number: 1009172324

Research Question

The research question explored through the analysis focuses on comparing occupancy rates in emergency versus transitional housing programs, particularly during the COVID-19 pandemic. It aims to understand how different types of programs accommodate users, reflecting on the pandemic's impact on housing needs. The approach includes data preparation, calculating occupancy rates, statistical comparison using t-tests, and visualizing the findings to highlight operational challenges and inform better program design during health crises.

Research Steps

Step 1: Importing Libraries

Importing necessary tools: `'pandas'` for data handling, `'scipy.stats'` for statistical analysis, and `'matplotlib.pyplot'` for visualizing data.

These libraries lay the groundwork for all the data analysis tasks that follow.

Step 2: Loading and Previewing Data

Data is loaded from an Excel file named "INF2178_A1_data.xlsx" using `'pandas'`, and the first few rows are previewed with the `'head()'` function.

This step gives a quick look at what the data looks like and what's in it.

Step 3: Data Preprocessing

Specific columns are selected focusing on relevant data fields such as capacity type, program model, service user count, etc.

This initial filtering narrows down the data to the parts that will be analyzed.

Step 4: Filtering Room and Bed Capacity Data

Data based on room and bed capacities are separately filtered to focus on these two different types of capacities for specialized analysis.

Step 5: Handling Missing Values

The filtered data undergo a process to check and handle missing values, including counting missing values and dropping rows with missing information. This ensures the quality of the data for further analysis.

Step 6: Calculating Occupancy Rates and Statistical Testing

Occupancy rates for rooms and beds are calculated. Then, using t-tests, these rates are compared between emergency and transitional program models to explore potential differences.

Step 7: Visualizing Analysis Results

The average occupancy rates for different program models are calculated and visualized using bar graphs. This visual representation helps to clearly show how room and bed usages vary across program models.

Summary

This process outlines steps in a data analysis project: starting with data import and preprocessing, moving on to filtering the data of interest, handling missing values, calculating key metrics like occupancy rates, conducting statistical tests to explore differences between groups, and finally, presenting analysis results through visualization. This approach not only demonstrates how to progressively delve into data analysis but also highlights the importance of applying statistical methods to validate hypotheses and the effectiveness of visual tools in communicating findings.

Analysis of Occupancy Rates for Different Room Program Models

A statistical t-test was conducted to compare the occupancy rates between emergency room programs and transitional room programs. The t-statistic was extremely high, with a p-value near zero (Figure 1), indicating a significant statistical difference in occupancy rates between the two types of programs. In simple terms, this means that the difference in occupancy rates between rooms in emergency programs and those in transitional programs is not just by chance. There is a real, fundamental difference between them.

T-Statistic: 31.71080126309493
P-Value: 4.4252019739840735e-150

Figure 1

Then, the average occupancy rates of both program models were displayed using a bar chart (Figure 2). Although the rates were relatively similar, the occupancy rate for emergency room programs was slightly higher than for transitional room programs. This visual representation complements the statistical analysis, indicating that although both types of programs are highly utilized, emergency room programs seem to have a higher occupancy rate.

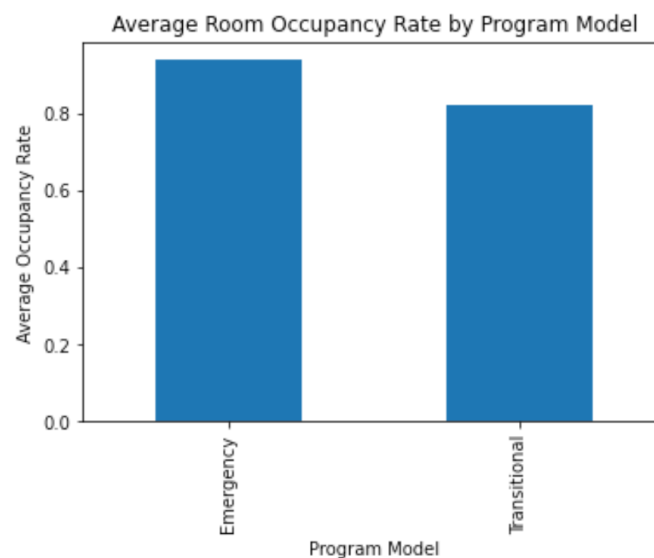


Figure 2

Combining these insights, we can conclude that there is a significant difference in occupancy rates between emergency room programs and transitional room programs during the pandemic, with emergency room programs having a higher average occupancy rate. This could be due to various reasons, such as an increased demand for immediate shelter during the crisis or because emergency room programs are inherently more short-term, thus having a higher turnover rate.

Overall, this analysis is crucial for room management authorities and policymakers, as it highlights which areas have a more urgent need for rooms and can inform decisions on resource allocation and planning funding to more effectively support those in need during emergencies.

Analysis of Occupancy Rates for Different Bed Program Models

The code output indicates a statistically significant difference in bed occupancy rates between emergency and transitional programs, as demonstrated by a high t-statistic and a very low p-value (Figure 3). This suggests that the likelihood of these differences occurring by chance is very small, indicating a real difference in the way beds are utilized in emergency versus transitional programs.

T-Statistic: 36.78483679745313
P-Value: 7.273950955976339e-283

Figure 3

However, when we examine the bar chart showing average bed occupancy rates (Figure 4), we find that the rates for emergency and transitional programs are very similar, with no visually significant difference between them. This means that, despite statistical significance, the actual difference in average occupancy rates may not be substantial.

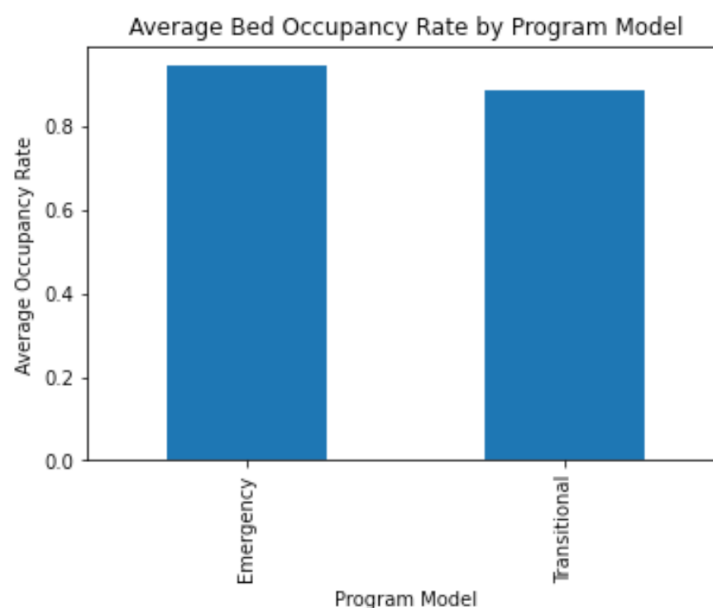


Figure 4

In essence, while statistical tests indicate a significant difference, the actual impact of the difference in bed occupancy rates might be relatively minor. This could imply that both emergency and transitional programs are equally strained or equally successful in managing bed capacity, which is an important consideration for service providers and policymakers.

Conclusion

Based on the data and visuals we've looked at, it's clear that there's a statistically significant difference in how full emergency and transitional housing programs were during the COVID-19 pandemic. The math behind it, with those high t-statistics and super low p-values, tells us that this isn't just a fluke. It points to a real difference in how these two types of housing were used.

But, when we take a closer look at the average occupancy rates for both rooms and beds through the bar charts, the difference isn't as big as you might think. Both emergency and transitional housing seem to be used pretty much the same amount. This tells us that even though the numbers say there's a difference, in the real world, it doesn't make a huge impact on how these programs are running.

So, what we're seeing is that, statistically, emergency and transitional housing programs fill up differently, but in practice, they're both being used quite similarly. This is super important for the folks running housing programs and for those providing support services. Understanding this helps them know that both types of housing are equally necessary and can guide how they distribute resources, allocate funds, and make policies to make sure shelter services are as effective as possible during health emergencies like the pandemic.