Influenza Season
Medical Staffing Analysis:
Interim Report

Project Overview

- **Motivation** : The United States has an influenza season where more people than usual suffer from the flu. Some people, particularly those in vulnerable populations, develop serious complications and end up in the hospital. Hospitals and clinics need additional staff to adequately treat these extra patients. The medical staffing agency provides this temporary staff.
- **Objective** : Determine when to send staff, and how many, to each state.
- **Scope**: The agency covers all hospitals in each of the 50 states of the United States, and the project will plan for the upcoming influenza season.

Hypothesis

- Vaccinations are intended to lower the probability of contracting influenza. If state vaccination rates are low, deaths due to influenza within that state will be higher.

Data Overview

Influenza vaccination rate percentage:

- This data shows the percentage of state population that received the flu vaccine each year, ranging from 2009-2017.

Influenza Deaths:

- This data shows how many reported deaths were due to influenza within the state each year, ranging from 2009-2017.

Data Limitations

Influenza Deaths:

- **Limitations & Bias:** Since this dataset is survey data, it is not a complete count of laboratory tests in the United States.
- **Collection Frequency:** Data is collected weekly; therefore, there is no time lag.
- **Errors:** Since data is collected through surveys, there will inevitably be some human entry error.

Influenza Vaccination Rate Percentage:

- **Limitations & Bias:** Since this dataset is survey data, it is not a complete count of vaccinated persons in the state population.

- **Collection Frequency**: Data is updated weekly; therefore, there is no time lag.
- **Errors:** Since data is collected through surveys, there will inevitably be some human entry error.

Descriptive Analysis

	Influenza Deaths by State	**Flu Vaccination Rate by State**
Average (Mean)	1,434	35.59%
Variance	1,186,056	16.89%
Standard Deviation	1,089	4.11%
Outlier Percentage	7%	< 1%

CORRELATION Analysis	
X_1	Vaccine rate
X_2	Influenza Deaths
Hypothesis	If state vaccination rates are low, cases of influenza deaths within that state will be higher.
Proposed Relationship	If X_1 is higher <-> Then X_2 is lower: Negative Relationship
Correlation Coefficient	-0.3
Correlation Strength	Low Moderate
Use Of This Correlation	Although the correlation is not incredibly strong, this is useful information providing insight into which states will more likely suffer from influenza complications due to low vaccine rates.

Results & Insights

- **Null Hypothesis:** Average influenza deaths of states with low vaccine rates is equal to or less than average influenza deaths of states with high vaccine rates.
- **Alternative Hypothesis:** Average influenza deaths of states with low vaccine rates is higher than average influenza deaths of states with high vaccine rates.

	States Vax Rate <35%	***State Vax Rate 35% or More***
Mean	1692.88	1212.08
Variance	1743027.97	605946.86
Observations	212	247.00
P(T<=t) one-tail	0.000002366694	

- After statistical analysis, it was shown that states with less than 35% vaccination rate have 480 more influenza deaths compared to states with vaccination rates of 35% or higher.

- The probability of this being strictly due to chance (shown by the p-value) is 0.0002367%.
- Testing for 95% confidence level, with a significance level of a = 0.05, p-value is far less.
- Meaning, we can safely reject the null hypothesis and conclude that the annual state deaths due to influenza is impacted by the overall vaccination rate.

Remaining Analysis & Next Steps

Within the context of how many medical workers should be sent to different states during peak flu season, it is important to include consideration of overall vaccination rates of the region. The results from the statistical testing show us that lower the state vaccination rates are, higher the possibility more patients with influenza will die. Hence, anticipating inevitable medical complications that come with lower vaccination rates, it is advisable to send more medical staff to such areas.

Next Steps:

- Temporal visualizations & Forecasting
- Statistical Visualizations
- Spatial Analysis
- Final Report Presentation: video presentation, in-person PowerPoint presentation, dynamic dashboard introduction for future use.

**** Note that any remaining work is on hold until all stakeholders have had a chance to discuss the results.***

Appendix

Project Requirements

- Provide information to support a staffing plan, detailing what data can help inform the timing and spatial distribution of medical personnel throughout the United States.
- Determine whether influenza occurs seasonally or throughout the entire year. If seasonal, does it start and end at the same time (month) in every state?
- Prioritize states with large vulnerable populations. Consider categorizing each state as low-, medium-, or high-need based on its vulnerable population count.
- Assess data limitations that may prevent you from conducting your desired analyses.

Data Sources

- Influenza Deaths: CDC
  https://wonder.cdc.gov/ucd-icd10.html
- State Vaccination Rates: CDC
  https://data.cdc.gov/Flu-Vaccinations/Influenza-Vaccination-Coverage-for-All-Ages-6-Mont/vh55-3he6