Preparing for Influenza Season: 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.

Research Hypothesis

If the influenza patient is in the age group older than 65 years, then the probability of death is higher in comparison to younger age groups across all states..

Data overview

Summary of the population data by geography US Census data

This data shows the United States population counts by observing states for the years 2009-2017 with characteristics of *age* and *gender*.

Influenza Deaths data set

The data contains monthly death counts for influenza-related deaths in the United States from 2009 to 2017. Counts are broken into two categories: *state* and *age*.

Data limitations

Summary of the population data by geography US Census data

This is *administrative data collected manually* via surveys. We can assume that there is space for human-error data and non-response bias. Still, due to *strict measures to ensure reliability we can expect high accuracy.* The survey is done every 10 years, so we can expect a *potential time lag* – delay between the actual population count and the release of final data.

Influenza Laboratory Tests data set

As this data belongs to the *government's crucial statistics program*, it is quite similar to a census. This means that we can presume a complete and accurate count of deaths. There is one important consideration to keep in mind: death certificates only specify a single cause of death. This might *create some differences*, especially within vulnerable communities such as those affected by AIDS. Although the cause of death could be connected to AIDS, it is possible that their health decline began due to influenza.

Descriptive analysis

	Influenza Deaths 65<	Population 65<
Standard Deviation	976	888.187
Mean	946	838.637

Correlation: *Averege Mortality of People 65< Years* and *Average Mortality of People <65 Years*

Proposed Relationship: As the patient's age increase, the probability of death from influenza also rises. By calculating correlation coefficient -1, we found that these variables have strong relationship.

Results and insight

Hypothesis: The influenza mortality changes with the age group of the patient.

Null hypothesis: Influenza patients under 65 years old have same or higher mortality than influenza patients over 65 years old.

Alternative Hypothesis: Influenza patients over 65 years old have higher mortality than patients under 65 years old.

T-TEST: TWO-SAMPLE ASSUMING UNEQUAL VARIANCES

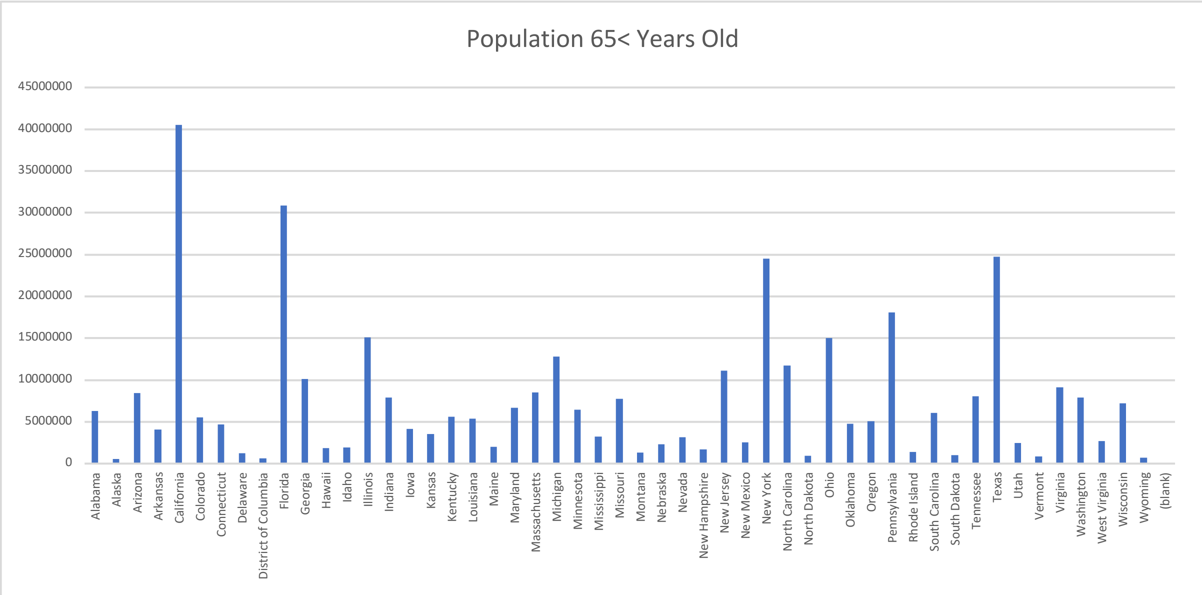
	Influenza Deaths <65	*Influenza Deaths 65<*
Mean	491,7117904	945,9694323
Variance	15771,15089	952371,4433
Observations	458	458
Hypothesized Mean Difference	0	
df	472	
t Stat	-9,880190477	
P(T<=t) one-tail	2,37105E-21	
t Critical one-tail	1,648088336	
P(T<=t) two-tail	4,7421E-21	
t Critical two-tail	1,965002676	

The P-value is significantly smaller than 0,5, the standard-level significance level. This means that we can reject the null hypothesis with 95% certainty.
The calculation confirms that there is a big difference in the mean mortality rates between individuals below 65 years old and those aged 65 and above.

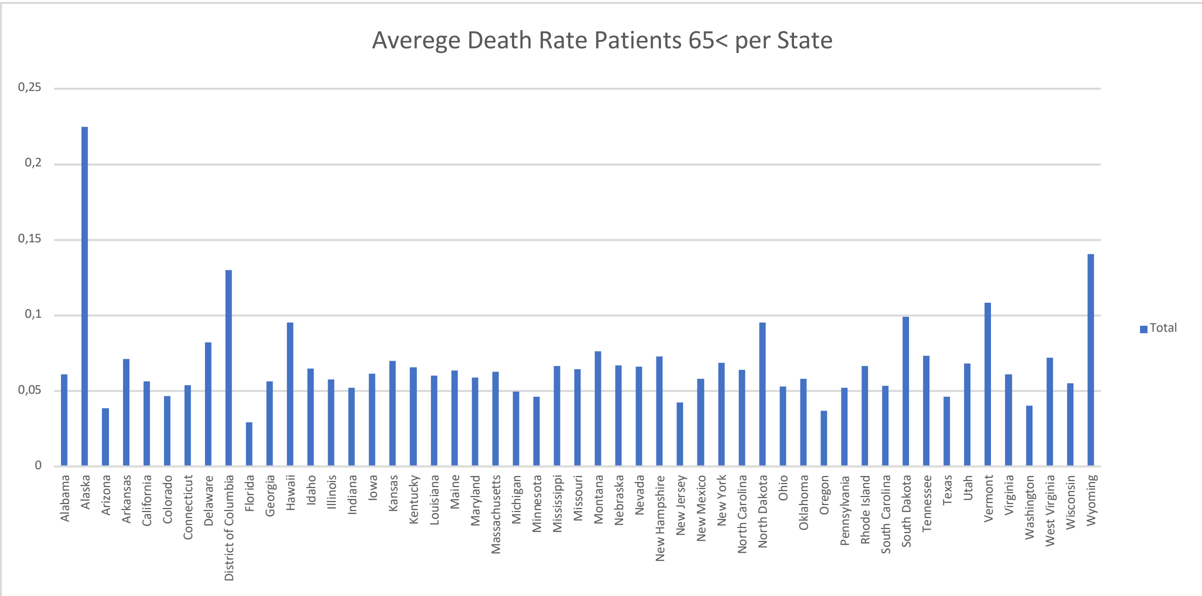
Remaining analysis and next steps

After rejecting the null hypothesis we can move forward and make business decissions based on the hypothesis and the data we have. Our objective is to determine when to send staff, and how many, to each state. There is couple of correlations we could look at. As we don't have any data about the workes, we will only focus on the data about the number of deaths and number of population in different age groups

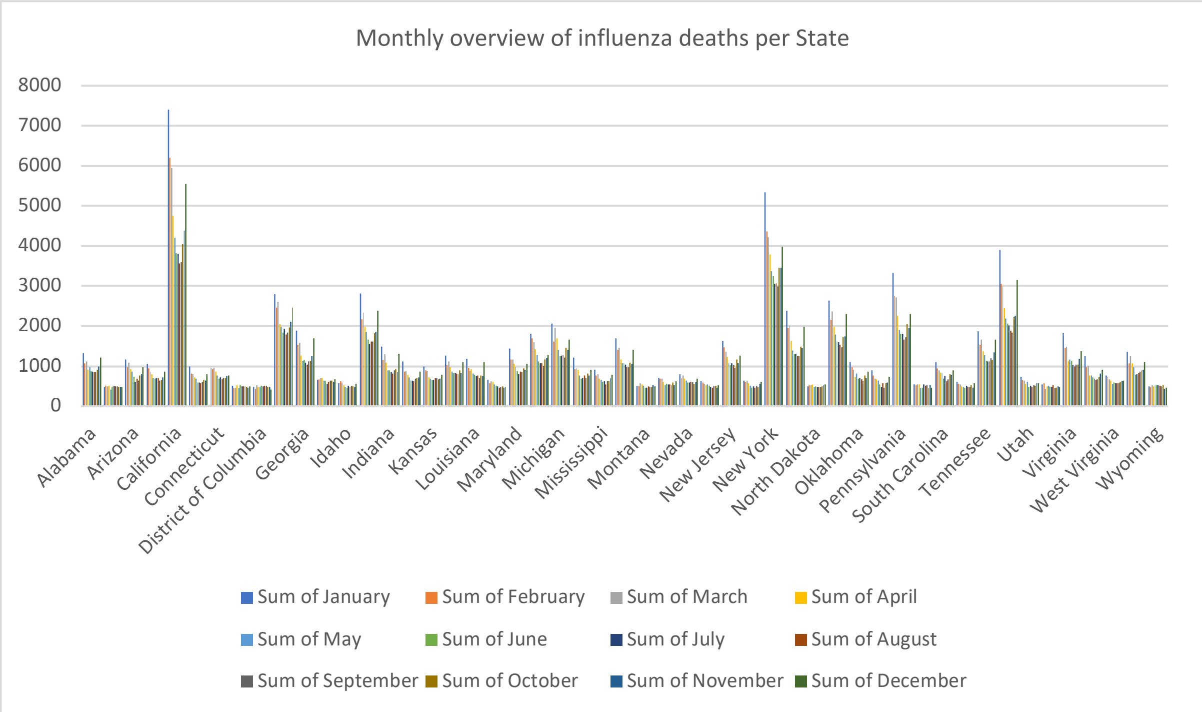
We could explore age groups per states. E.g. to find states with highest number of population over 65+.



We should explore the averege number of influenza deaths 65+ population. This will help us calculate how many seasonal workers is needed to help with treating influenza patients.
In the chart below, we can identify that Alaska has a strong index of people above 65 years old who died of influenza.



Further more, we can conduct deeper research into the influenza season in different contries and summirise these results in the hypothesis above.
Only a quick look in the chart below shows us that some states have stronger peaks then the other, indicating influnza seasons and the lack of it.



Next Steps

1. Based on the hypothesis create 3 plans for efficient distribution of medical staff across the states, with priority for states with high number of vulnerable patients and year-round/longer flu season
2. Present the plans to the stakeholders to discuss and choose one of the programs
3. Create detailed solution for the implementation of the chosen plan
4. Define how to track the data to access the success of the implemented solution
5. Implement the solution and track the data
6. Analyze the collected data and evaluate if the project success definition metrics has been achieved
7. Present results to stakeholders in a scheduled meeting

Appendix

U.S. Centres for Disease Control and Prevention (CDC): Access comprehensive information on influenza surveillance, prevention strategies, and healthcare guidelines from the CDC at www.cdc.gov.

U.S. Census Bureau: Obtain demographic data and age distributions for each state from the U.S. Census Bureau at www.census.gov.

National Institutes of Health (NIH): Stay updated on influenza research, including prevention, treatment, and epidemiology, by visiting the NIH website at www.nih.gov.