Preparing for Influenza Season

Interim Report

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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.

Hypotheses

Patients with age above 65 if infected with Influenza flu have a high risk level of death if not well treated and managed.

Hypotheses (H1) If a patient with age above 65 is infected with Influenza flu they more die from the infection.

Data Overview

Influenza Deaths Data Set: This dataset comprises monthly counts of deaths attributed to influenza in the United States spanning the years 2009 to 2017. The counts are categorised by state and 10-year age groups**.**

Population Census Data Set: This dataset from the Census presents population statistics for the United States spanning the years 2009 to 2017. The counts are categorized by age, gender, month, and year.

Data Limitation:

Limitations of Influenza Deaths Data Set

- the influenza data set contained suppressed values for any death count that was less than 10.
- The influenza data set was collected via manual survey method, the survey introduces the potential for human error

Limitations of Population Census Data Set

- Census data set are estimates and may not be completely accurate
- Census data set was collected from surveys; data might be missing or surveys also introduce bias into data set.

Descriptive analysis

A descriptive analysis to assess the data quality, calculating the mean, standard deviation, and percentage of outliers to evaluate the spread of the data.

	Influenza Death 65+	Population Census 65+	non-vulnerable Influenza death (5 - 64)	non-vulnerable Population Census (5 - 64)
Mean	896	810,475	387,914	4,715,713
Standard Deviation	977	888,804	457,946	5,049,070
Outliers Count	18	29	18	18
Outlier Percentage	4%	6%	4%	4%

Variables	Correlation Coefficient	Strength of the correlation
Influenza Death 65+ Population Census 65+	0.95	Very Strongly correlated
non-vulnerable Influenza death (5 - 64) non-vulnerable Population Census (5 - 64)	0.99	Very Strongly correlated

A correlation coefficient of 0.95 suggests a very strong relationship between the Influenza Mortality in the 65+ Years age group and the Total Influenza Mortality.

Results and Insight

Null Hypothesis Ho: There is no difference in the Influenza flu Mortality rate between Vulnerable population (65 Year Above) and Non Vulnerable population (5 - 64 years) Age grouping.

Alternative Hypothesis Ha: The patient with age 65 above if infected with influenza flu have significant higher risk mortality.

t-Test: Two-Sample Assuming Unequal Variances		
	Mortality Vulnerable Popolution Census 65 Above	
Mean	810474.5232	4715713.33
Variance	7.89973E+11	2.54931E+13
Observations	456	456
Hypothesized M	0	
df	483	
t Stat	-16.26641505	
P(T<=t) one-tail	4.62654E-48	
t Critical one-tail	1.648014525	
P(T<=t) two-tail	9.25309E-48	
t Critical two-tail	1.964887641	

t-Test: Two-Sample Assuming Unequal Variances		
	Influenza Death non-vulnerable (5 - 64 years)	
Mean	895.4539474	385.3004386
Variance	955142.7363	15682.25459
Observations	456	456
Hypothesized M	0	
df	470	
t Stat	11.05637666	
P(T<=t) one-tail	1.02148E-25	
t Critical one-tail	1.648102128	
P(T<=t) two-tail	2.04296E-25	
t Critical two-tail	1.965024172	

The P(T<=t) one-tail value is 1.02148086405311E-25, the P-value is below the significance level of 0.05, which means we can reject the null hypothesis with a 95% confidence level. The interpretation is that there is a significant difference in the influenza flu mortality rates of the two age group, the influenza flu mortality rate in the Vulnerable Population (65 above) and is significant higher than the Non Vulnerable population (5 - 64 years)

Results of test:

We have proven that Vulnerable Population (65 above) have a higher chance of dying from the influenza flu than Non Vulnerable population (5 - 64 years).

Suggestion and Next Steps

- Conduct further analysis of the US Population to determine the state and region with higher Vulnerable Population (65 above) for adequate frontline staffing
- Conduct an investigation to determine underlying risk factor for the high mortality rate for aged group 65 above
- Create a plan that prioritizes the vaccination of Vulnerable Population (65 above)