Interim Report: Preparing for the influenza Season

Project Overview

- **Motivation:** The United States, every year, is heavily affected by the influenza virus. Those who are considered high risk are more prone to sever complications, adverse reactions and even death. Due to this, hospitals are more than likely at full capacity and are in critical need of additional staffing. Thus, these medical staffing agencies wanting to be prepared for this up-and-coming influenza season.
- **Objective:** To determine Staffing needs during the upcoming Influenza season.
- **Scope:** The staffing agencies have coverage in hospitals and clinics in all 50 states. This analysis will provide resources to adequately fill these positions.

Research hypothesis

Hospitals with high patient volumes need higher amounts of staffing. Due to the increase in Influenza cases the need for additional staffing increases.

Data Overview

Influenza deaths by geography, time, age, and gender Data Set

This data encapsulates influenza related deaths in the United Statues spanning the years of 2009 to 2017. They are reported as by state and then by age bracket.

Population by Geography US Census Data Set

This data set includes information pertaining to populations per certain geographical locations during the years 2009-2017. They are noted as gender, age range and total population.

Counts of influenza laboratory test results by state (survey)

This data set reported on the influenza cases by state in comparison to total providers and other patient hospitalizations spanning form the years 2010-2017.

Data Limitations

Influenza deaths by geography, time, age, and gender Data Set

Cause of deaths on death certificates might not completely state influenza. For example, one might pass of Pulmonary embolism as a result of the influenza and PE would be the only Cause of death noted.

Population by Geography US Census Data Set

One of the limitations of the data set is the data set had 11% of its data missing. This will cause a skewed result in terms of accuracy of measurements taken. Also, another limitation is that this is a survey, not everyone participated in the survey making it not a whole record of the population.

Counts of influenza laboratory test results by state (survey)

This data set is a survey; meaning that only willing participants provided information to the survey, thus is not a true picture of all the influenza patients. Also, the number of providers is a vague description and does not give much insight on what profession or scope these providers had in patient care.

Descriptive Analysis

	Influenza Paitents	Number of Providers
Mean	366	36
Standard Deviation	639	30

Table 1 Central Measures of Tendency

The main scope hypothesis is looking at the number of providers in relation to the total number of influenzas patients. This aspect of analysis consisted of using these variables to conduct statistical analysis including central lines of tendencies (I.E. Mean, Standard Deviation, Outlier Percentage, and Correlation Coefficient). The results of this analysis are listed in table 1.

To explain these results further we first need to understand what they mean. The first row on the table demonstrates the average amount of influenzas patients per the amount of healthcare providers. So, for every 366 influenza patients there are 36 providers providing care. The next row is the standard deviation of the data sets. Simplistically, the standard deviation represents the how the variables differ from the average mentioned above. In the scope of statistics, it is standard to go two standard deviations above and below the given values. It is calculated by adding the first standard deviation. In our data sets the number of providers standard deviation would be 30+30=60. So, the first standard deviation of this variable would be 60.

The hypothesis suggests there to be an increase in healthcare providers as the influx of influenza patients increase. To these this hypothesis, a Correlation Coefficient analysis was administered. The result of this study is portrayed in Table 2.

As predicted, the variables do have a strong correlational relationship. Table 2 states that the analysis revealed as correlation coefficient of 0.6 (anything above 0.5 is considered a strong correlation). Thus, at this point in the analysis we have provided our hypothesis to be valid.

Variables	Ill paitents & Number of Healthcare Providers
Proposed Relationship	As the number of imfluenza paitents increase the number of healthcare providers increase.
Correlation Coefficient	0.6
Strength of Correlation	There is a strong correlation between Influzena paitents and the Number of Healthcare Providers according to the correlation Coefficient.

Table 2 Correlation between Ill patients and Number of Providers

Results and Insights

Due to the conclusive results of the Correlation Coefficient between influenza infected patients and the number of providers we can then conduct further testing of the hypothesis. To test our hypothesis, we conducted a T- Test (using unequal variances). We used the previous variable sets as our comparative and the results of this test negated our null hypothesis as shown in Table 3 our Null Hypothesis is "The increase in patient volume will decrease the need for healthcare providers." Subsequently our Alternative hypothesis is "The increase in patient volume will increase the need for healthcare providers." With this negation, our significances level of 0.05 and our P-Value being 1.4 we are able to invalidate our null hypothesis. With the P-Value being 1.4 we obtain a confidence level less than 95% proving our alternate hypothesis that with an increase in influenza patients there will be an increased need for healthcare providers.

	Influenza patients	Number of Providers
Mean	366	36
Variance	407,721	916
Observations	400	400.00
P-Value	1.35682E-22	
Significant Level	0.05	
Null Hypothesis	The increase in patient volume will decrease the need for providers.	
Alternative Hypothesis	The increase in patient volume will increase the need for providers.	
Conclusion	Since it has a α of 1.35682E-22, There is considered to be a significant difference between the influenza patients and the number of Healthcare Providers.	
Was the Null Hypothesis Rejected?	YES	
Next Steps Recommendations	With this is the next step should be how these values compare geographically to then make estimates for staffing needs.	

Table 3 T Test results

Remaining Analysis and Next Steps

Next steps are as follows:

- Compare these variables to those in at risk age brackets
- Compare these variables on a map to discern staffing per geographical area
- Create a visualization check list
- Create visualizations showing variable comparison
- Create Visualizations showing geographical and other variable data
- Compose a rough draft for presentation to discuss results with stakeholders
- Meet in person or record presentation for stakeholders including research finding, insights related to their companies' goals.

Appendix

Hypothesis Development

Outlined below are questions asked before constructing the hypothesis.

Clarifying Questions

- Which population is at highest risk for hospital administration or fatality?
- What are the regulatory staffing ratios for each state?
- What is the average amount of staff available during the influenza season?
- How many hospitals do they staff per state?
- What are the previous year's influenzas cases looked like?

Funneling Questions

- How many Drs (DO/MD/DNP), Mid-level providers (NP/PA), RN's and other HCPs (RRT, X-ray, STNA) are needed per patient?
- How long are staffing contracts?
- By state when does the influenza season start?
- Are there any other staffing agency involved in these care centers?
- What was the average time off work per hospital worker who contracted the flu?
- Did this time change between those vaccinated and non-vaccinated?

Privacy and Ethical Questions

- How do you handle HIPPA violations and other ethical violations?
- Are staff trained according to HIPPA and hospital guidelines before start of contract?
- What is the veracity of gathered medical data?
- Was HIPAA guidelines followed in gathering this information?

Other postulated hypothesis'

- At Risk Populations with the Influenza vaccine have a decreased risk of severe influenza cases.
- The States with high mortality rates will also have a decrease in vaccination rates.
- Increased staffing would decrease mortality rate

Data Profile

	Qualitative/quantitative	Qualitative: Nominal or ordinal Quantitative: Discrete or Continuious	Time Variant /Invariant	Structured/unstructured
State	Qualitative	Nominal	Invariant	Structured
State Code	Qualitative	ordinal	Invariant	Structured
Year	Qualitative	ordinal	Invariant	Structured
Month	Qualitative	ordinal	Invariant	Structured
Month Code	Qualitative	ordinal	Invariant	Structured
Ten year age groups	Qualitative	ordinal	Invariant	Structured
Ten year age groups Codes	Qualitative	ordinal	Invariant	Structured
Deaths	Quantitative	Discreate	variant	Structured

Table 4 ***Influenza deaths by geography, time, age, and gender Data Set***

	Qualitative/quantitative	Qualitative: Nominal or ordinal Quantitative: Discrete or Continuious	Time Variant /Invariant	Structured/unstructured
County	Qualitative	Nominal	Time - Invariant	Structured
Year	Qualitative	Ordinal	Time - Invariant	Structured
Total Population	Quantitative	Discrete	Time- Variant	Structured
Total Male Population	Quantitative	Discrete	Time- Variant	Structured
Total Female Populatio	Quantitative	Discrete	Time- Variant	Structured
Age range population	Quantitative	Discrete	Time- Variant	Structured

Table 5 Population by Geography US Census Data Set Geography US Census Data Set

	Qualitative/Quantitative	Qualitative: Nominal or ordinal Quantitative: Discrete or Continuous	Time Variant /Invariant	Structured/Unstructured
States	Qualitative	Nominal	Invariant	Structed
Year	Qualitative	Ordinal	variant	Structed
%ill	Quantitative	Discrete	variant	Structed
Ill Total	Quantitative	Discrete	variant	Structed
Number of Providers	Quantitative	Discrete	variant	Structed
Total Number of Patients	Quantitative	Discrete	variant	Structed

Table 6 ***Counts of influenza laboratory test results by state (survey)***