

# Flu Season Staff Management: 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 average age of a state is higher, then they will experience higher hospital admissions.

## Data Overview

- 1) **Population Census Data** - sourced from the US Census Bureau (USCB)  
**Contents** – Each US states/counties population data between 2009 – 2017. Further broken down by total male and total female populations and age gaps in 5 year intervals.
- 2) **Influenza Death Rates** - Centers of Disease Control and Prevention (CDC)  
**Contents** – Death rates reported from influenza broken down into states, years and months.

## Data Limitations

As both sets of data come from government agencies, we can assume that they are reliable, substantial accounts of the facts. However, the data could be subject to erroneous information due to it being manually inputted. Issues such as typos and differences in how multiple people record the same data should be considered.

## Descriptive Analysis

Variable	Mean	Standard Deviation	Outliers %
Population over 65 years of age	894354	902960	6.5%
Influenza Deaths over 65 years	897	1027	4.3%
Population under 65 years of age	5689175	6065932	4.3%
Influenza Deaths under 65 years	85	156	6.7%

## **Correlation**

There is a very strong correlation (0.80) between a state's population of over 65's and total deaths from influenza within that state.

There is also a strong correlation (0.57) between over 65's and hospital admissions within that state.

## **Summary of Results & Insights**

**Statistical Hypothesis:** If the average age of a state is higher, they will experience more deaths linked to influenza like illness.

<b>Null hypothesis</b>	States with more over 65s do not experience higher deaths linked to influenza like illness
<b>Alternative hypothesis</b>	States with more over 65s experience higher deaths linked to influenza like illness
<b>One or two-tailed test</b>	This is a one-tailed as we are only interested in whether the average mean is higher for the over 65's group

To confirm one way or the other we are trying to determine if the correct hypothesis with a confidence level of over 95%.

The P-Value is a measure of strength of the evidence **against** the null hypothesis.

In this instance the P-Value is 9.55E-46 which works out to be a fraction of 0.01% so we can say with over 99.9% confidence that the null hypothesis can be rejected and that states with more over 65s will experience higher deaths and hospital visits linked to influenza.

## **Further Analysis and Next Steps**

The next steps in analysing the data would be to determine trends between different states and different times of year. This will mean we can come up with an informative plan on how many agency staff we will need to send but also where and when they are likely to be most needed.

It will be useful to analyse in more detail what percentage of deaths / hospital visits are taken up by the vulnerable group of over 65's between different states or whether there are other variables that we need to take into consideration. Levels of vaccinations would also be useful, however we only have data for children up to 3 years old and not how many are getting yearly flu jabs.

Once we are confident in the findings, we will prepare a visual presentation that clearly highlights the findings, insights and the best course of action going forward for the agency.

## **Appendix**

### **Glossary**

**Influenza:** a contagious viral infection, often causing fever and aches.

**Vulnerable populations:** patients likely to develop flu complications requiring additional care, as identified by the Centers for Disease Control and Prevention (CDC). These include adults over 65

years, children under 5 years, and pregnant women, as well as individuals with HIV/AIDs, cancer, heart disease, stroke, diabetes, asthma, and children with neurological disorders.

## Additional Context

A count of the historical influenza deaths gives an indication of the severity of flu in an area. Deaths can be prevented with flu shots and adequate medical staff. In the United States, each state has a different population composition, meaning that some states will have more vulnerable populations. You should pay particular attention to influenza deaths, vulnerable populations, and (optionally) flu-shot rates—particularly in vulnerable populations—to determine medical staffing needs.



