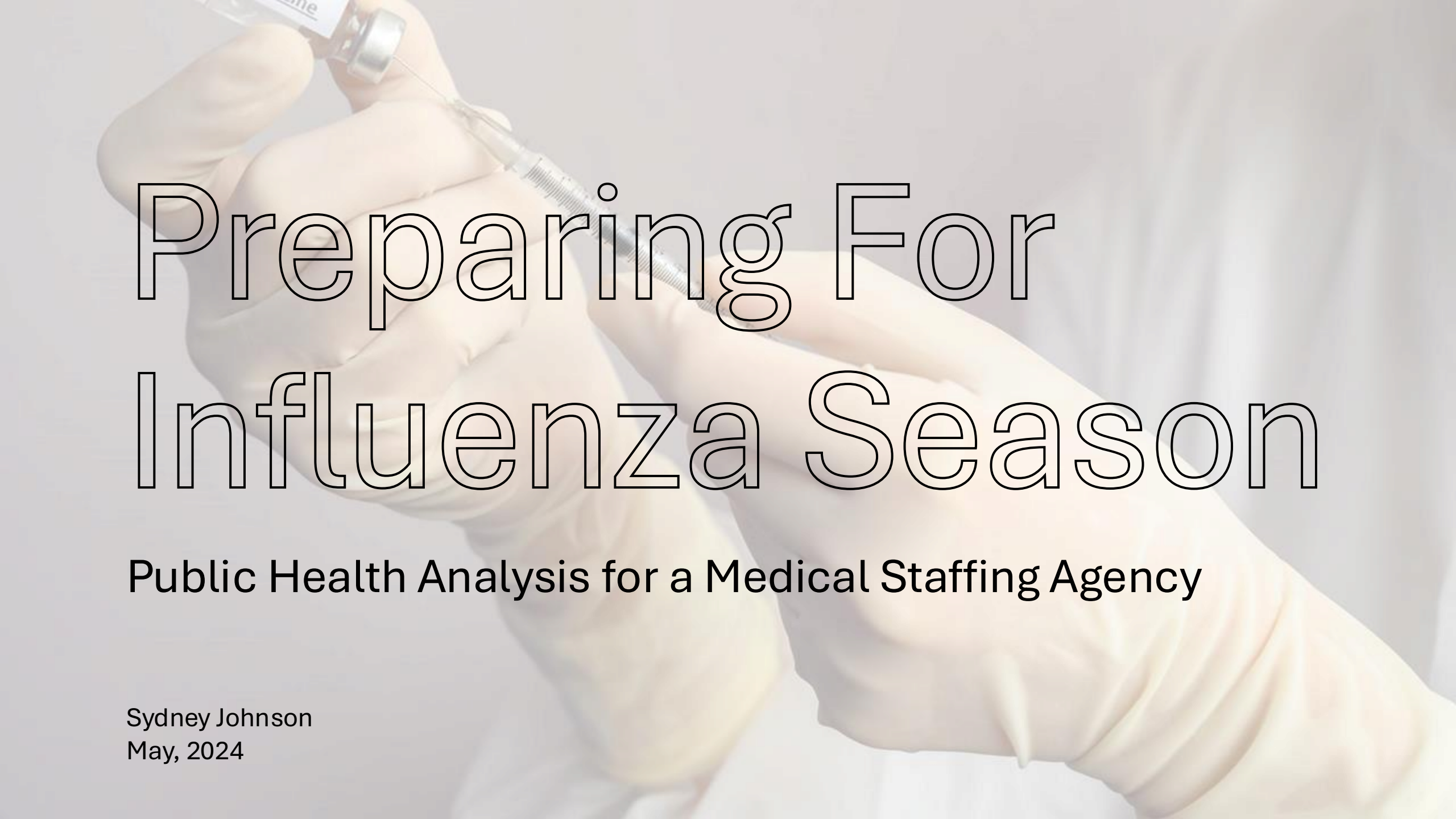


# Preparing For Influenza Season

## Public Health Analysis for a Medical Staffing Agency

Sydney Johnson
May, 2024

# Overview

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.

# Purpose and Objective

The purpose of this project was to examine public health and census data to help a medical staffing agency efficiently provide temporary workers to clinics and hospitals for the upcoming flu season.

I worked on this project from early March to late May 2024.

This project is part of my curriculum for the Career Foundry Data Analytics Bootcamp.

# Tools, Skills, Methodologies

The data was analyzed and integrated in Excel and visualizations and storyboards were created in Tableau

# Designing Research Project

- To most efficiently allocate medical staff to different parts of the country, we need to consider how demographic factors might influence the mortality rate of influenza patients. If we know what states have the most high-risk individuals, we can prioritize sending medical staff there.
- Research Hypothesis:
  - Older people have less resilient immune systems. If you're older, then the risk of dying from the flu is larger.

# Data Sources

- I utilized two datasets for my analysis:
  - Influenza Deaths by Geography:
    - This data from the CDC shows the number of people that died of influenza each year in every US state from 2009 to 2017, grouped by age range
  - Population data by geography, time, age, and gender:
    - This data from the US Census Bureau shows the estimated population in each US county from 2009 to 2017, grouped by age range

- Data Limitations:
  - To protect the privacy of individuals, the Influenza Deaths data sheet suppressed all values <10. Any state that had fewer than 10 deaths per age range in a year is presented as having 0 deaths.

# My analysis fell into two categories:

STATISTICAL HYPOTHESIS TESTING

VISUALIZING THE STATES IN WHICH INFLUENZA DEATHS ARE HAPPENING DISPROPORTIONATELY TO POPULATION

# Statistical Hypothesis Testing

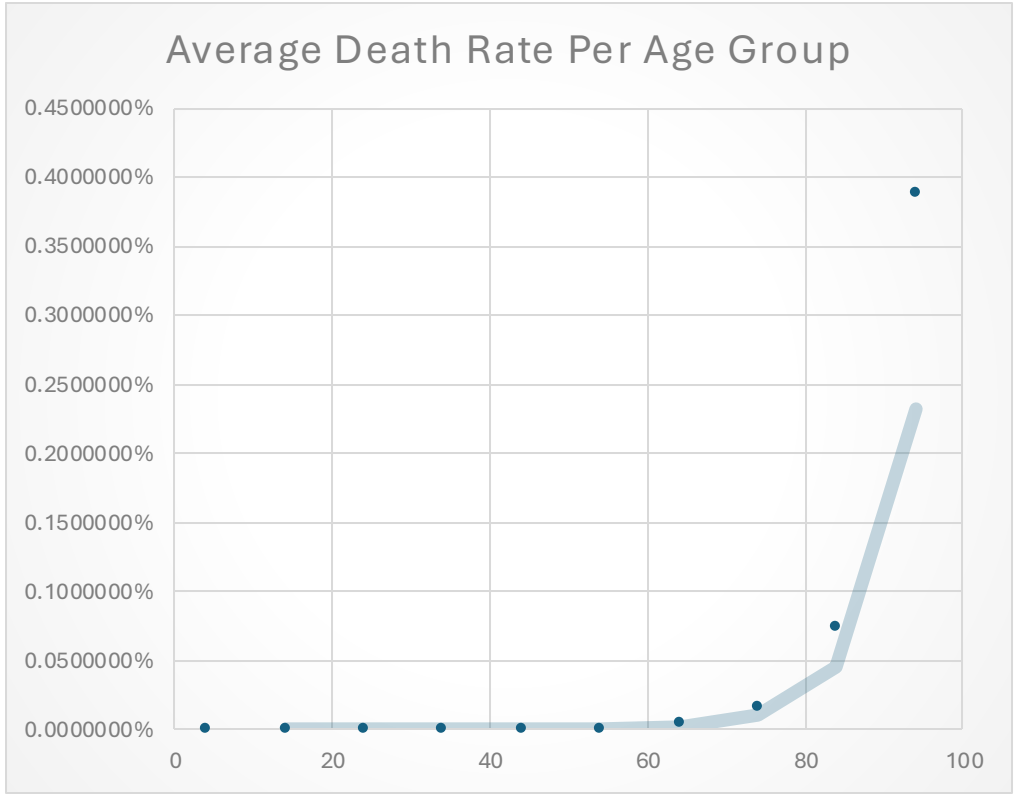
- My hypothesis states that age is significant factor when considering influenza mortality, with older individuals at higher risk of dying than younger individuals
- A descriptive analysis of my data seems to back up my hypothesis

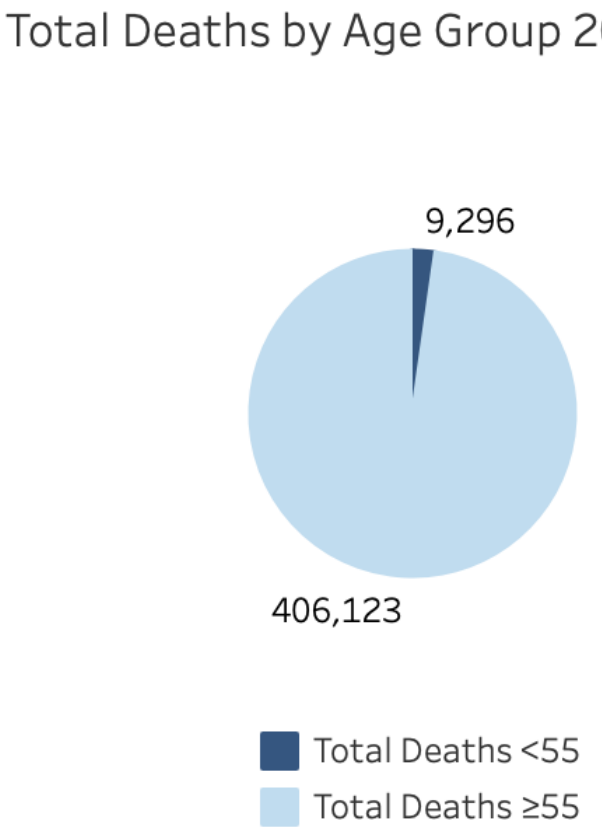
| | Mean | Standard Deviation |
|---|---|---|
| **Normalized Deaths Under 5** | 0.0000% | 0.0000% |
| **Normalized Deaths 5-14** | 0.0000% | 0.0000% |
| **Normalized Deaths 15-24** | 0.0000% | 0.0000% |
| **Normalized Deaths 25-34** | 0.0000% | 0.0001% |
| **Normalized Deaths 35-44** | 0.0001% | 0.0004% |
| **Normalized Deaths 45-54** | 0.0009% | 0.0015% |
| **Normalized Deaths 55-64** | 0.0045% | 0.0055% |
| **Normalized Deaths 65-74** | 0.0170% | 0.0167% |
| **Normalized Deaths 75-84** | 0.0749% | 0.0511% |
| **Normalized Deaths 85+** | 0.3886% | 0.1766% |

**Table 1**: The averages and standard deviations of the percentage of the population of a given age range that died of influenza between 2009 and 2017

# One Tailed t-test

- Null hypothesis: People 55 years and older are less than or equally likely to die from influenza than people younger than 55
- Alternative hypothesis: People 55 years and older are more likely to die of influenza than people younger than 55
- Significance level: 0.05
- P-value: 1.26376850832249E-170
- The P-value of this test is much smaller than our significance level of 0.05. Therefore, we can reject the null hypothesis that people 55 years and older are less than or equally likely to die from influenza than people younger than 55.

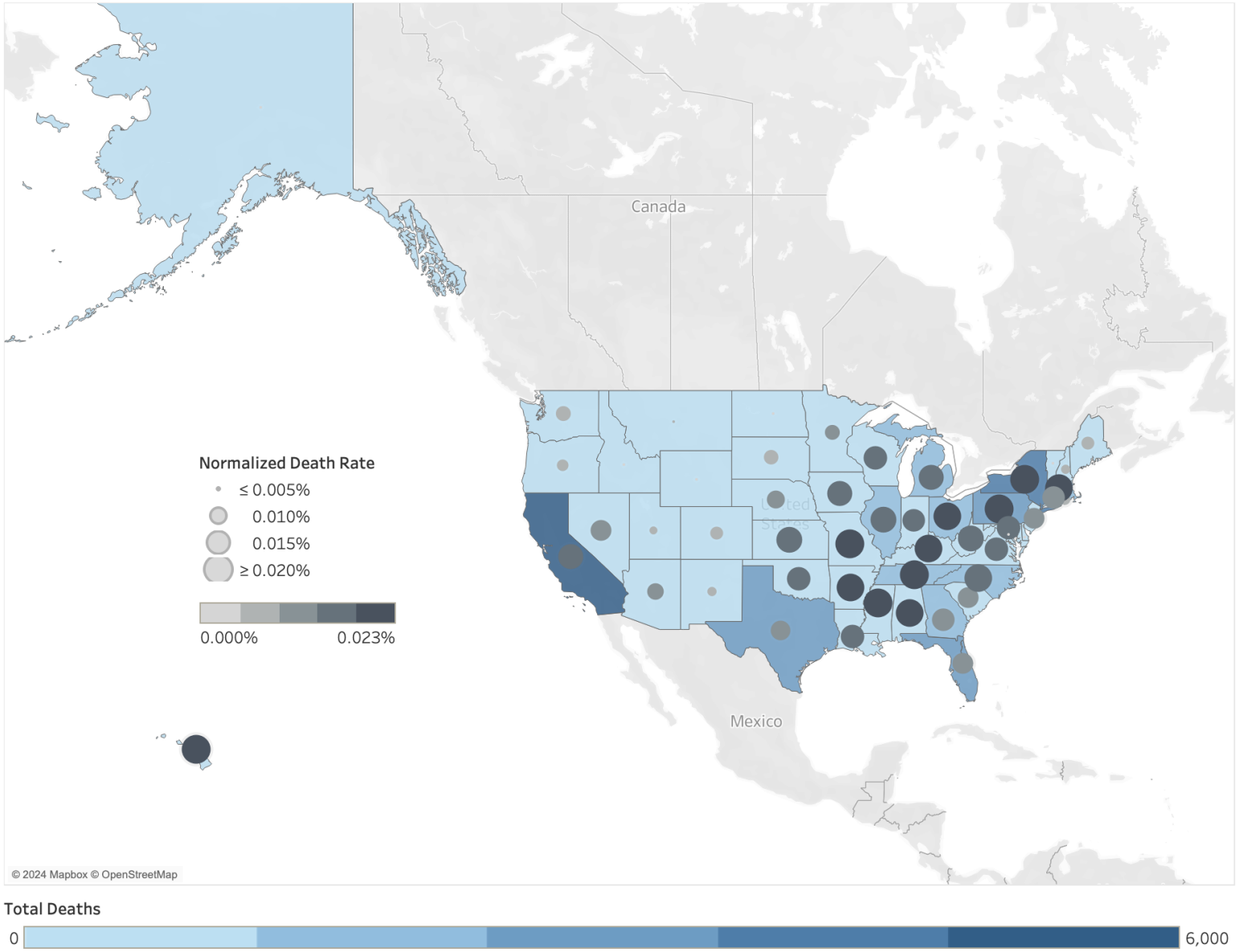





# Visualizing Death Rates in Tableau

- The statistical testing proved that emphasis needs to be put on older individuals when it comes to providing influenza healthcare
- The question remains, where in the US should medical staffing be prioritized?

## Total and Per Capita Influenza Deaths by State (2009-2017)




- This map shows the difference between the total deaths by state and the normalized death rate
- States with higher populations like California and New York have the highest total deaths
- States in the Midwest and East Coast, as well as Hawaii, have disproportionately high death rates

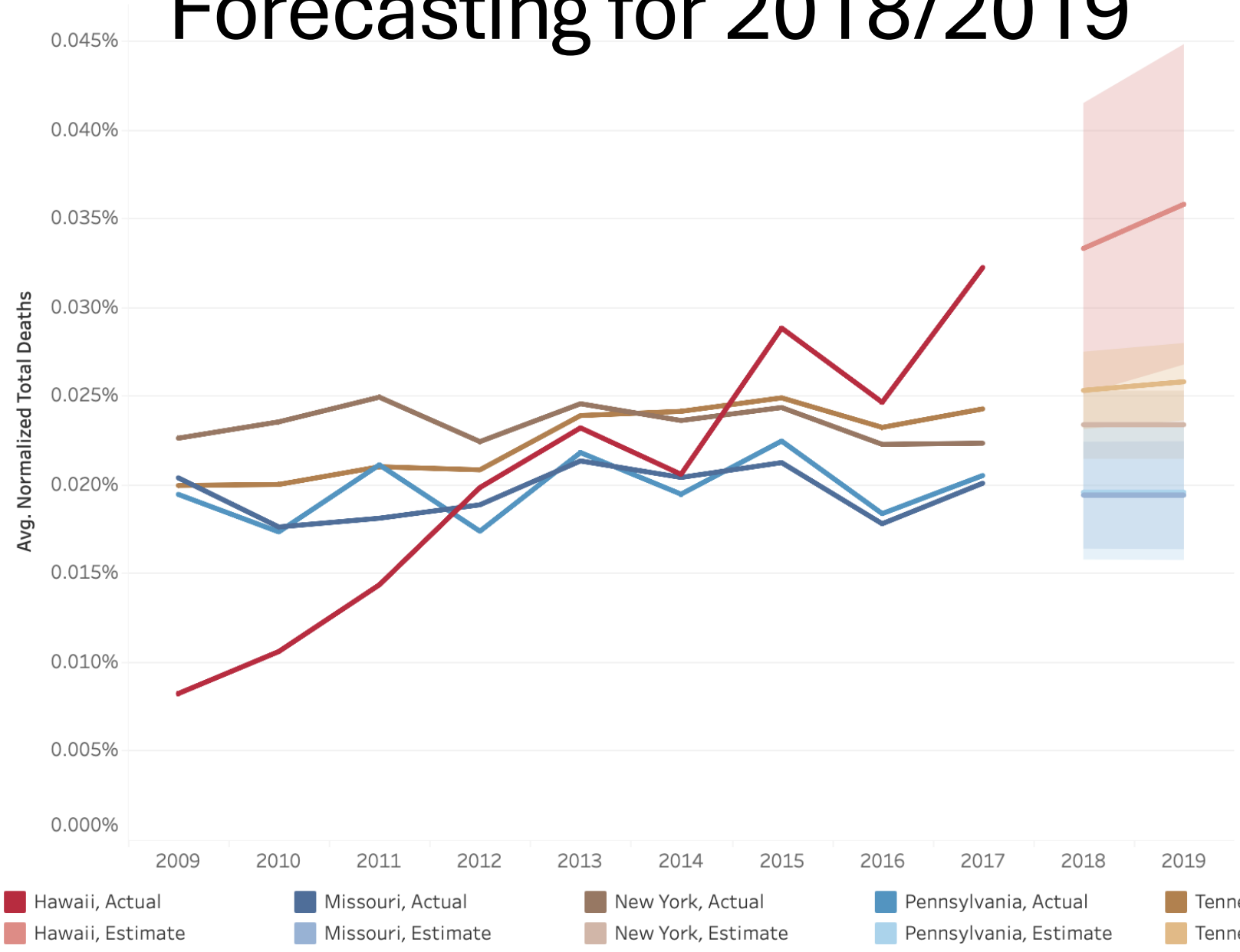
### Top 5 States by Total Deaths

| | |
|---|---|
| California | 54,002 |
| New York | 40,875 |
| Texas | 26,759 |
| Pennsylvania | 22,334 |
| Florida | 22,129 |

### Top 5 States by Normalized Deaths

| | |
|---|---|
| New York | 0.210% |
| Tennessee | 0.202% |
| Hawaii | 0.182% |
| Pennsylvania | 0.178% |
| Missouri | 0.176% |

# Forecasting for 2018/2019




Based on this data, it's clear that in order to most effectively disperse the temporary hospital staffing, population, density, and time all have to be considered as factors.

The states to the left (Hawaii, Missouri, New York, Pennsylvania, and Tennessee) are all in need of extra help during the upcoming flu season.

Generally, states with very low population densities (Alaska, Montana, Wyoming, Utah, etc.) are not in need of extra resources during flu season. Those staffing resources should instead be focused on states in the midwest and east.


# Conclusion

This data brought me to two conclusions. Firstly, that older individuals are at a significantly higher risk of dying of the influenza virus than younger individuals. Secondly, that there are five key states in which influenza mortality is a significantly larger issue than it should be for the population size, the most urgent of which is Hawaii. I was also able to identify several states (namely the most sparsely populated) which definitively do not need extra staffing support for flu season.

# Retrospective

This analysis highlights the strong connection between influenza mortality, age, and geography. The data shows that individuals under 55 have a very low risk of dying from influenza. However, the dataset lacked information on preexisting conditions, co-morbidities, or immunocompromising factors—variables that likely contribute significantly to influenza-related deaths in younger populations. Future research could explore the role of specific risk factors, such as vaccination rates and healthcare access, in shaping influenza mortality among younger individuals.

A key insight emerged when normalizing influenza mortality data using state population figures. Without this adjustment, the data misleadingly suggests that the most populous states experience the highest mortality. While this is technically true, it does not provide a complete picture of where the virus poses the greatest risk. Normalization reveals a more accurate ranking of states by influenza death rate, offering a clearer view of the virus's impact. For example, California records the highest number of influenza deaths overall, yet when adjusted for population, it does not rank among the top five states in terms of mortality rate. Conversely, New York, with its dense urban environment—especially in New York City—exhibits both a high population and a disproportionately high influenza mortality rate, a pattern reminiscent of the COVID-19 pandemic.

One of the most concerning findings is the rising influenza death rate in Hawaii. In 2009, Hawaii had a relatively low mortality rate of approximately 0.008%. However, since 2014, it has experienced the highest influenza death rate among U.S. states, climbing to 0.025% and continuing to rise. This trend underscores an urgent need for increased medical resources and healthcare interventions to mitigate the growing impact of influenza on the Hawaiian population.