Influenza Project

Preparing for influenza season in the US

Case Study 2

Project Overview

Context

The US 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.

Objective

A medical staffing agency provides this temporary staff. 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 patient is above 65 years they are more likely to die from influenza (regardless of the state they are living in or their gender).

Assumptions

- Vulnerable populations suffer the most-severe impacts from the flu and are the most likely to end up in the hospital.
- Flu shots decrease the chance of becoming infected with the flu.

Constraints

- The staffing agency has a limited number of nurses, physician assistants, and doctors on staff.
- There's no money to hire additional medical personnel

Data & Tools

Influenza deaths by geography, time, age, gender from the CDC
Population data by geography from the US Census Bureau

The analysis was conducted with Excel & Tableau
KL//Final_Data_Influenza_Project Tableau Storyboard

Influenza Deaths in the US 2009 -2017

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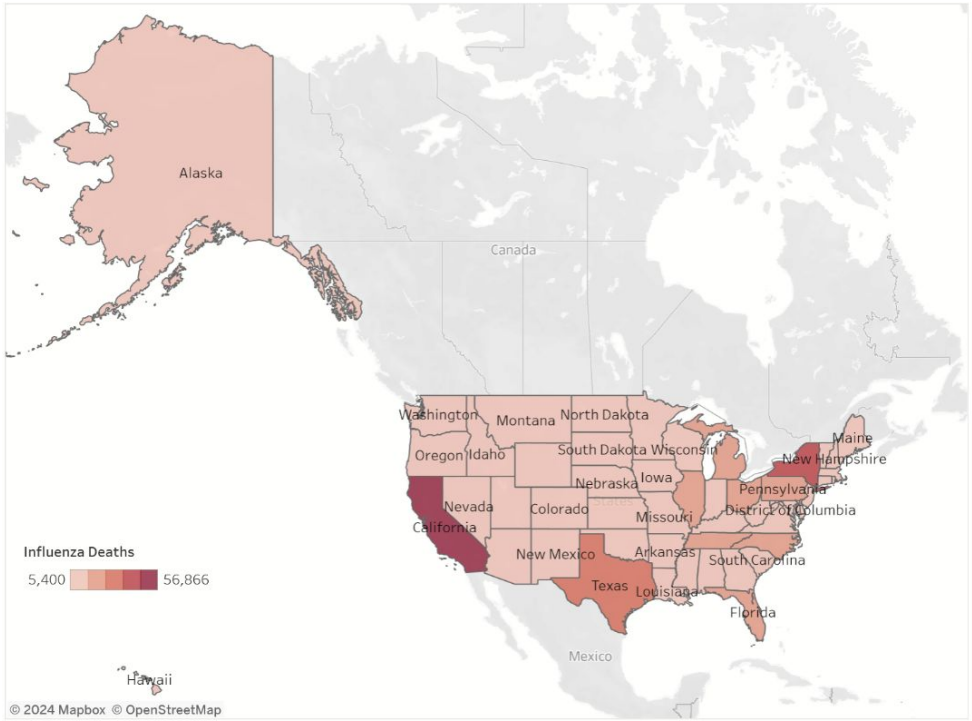
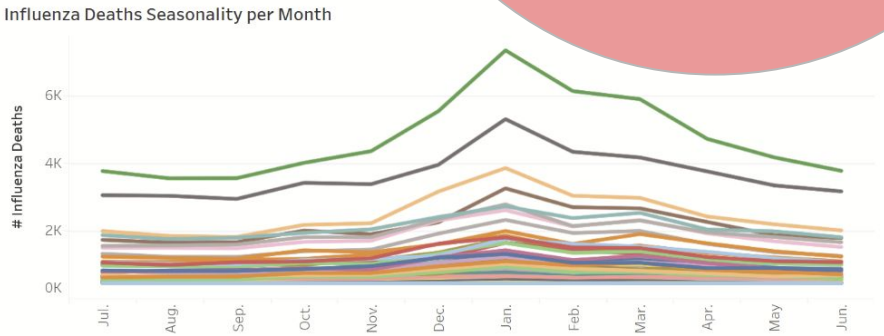
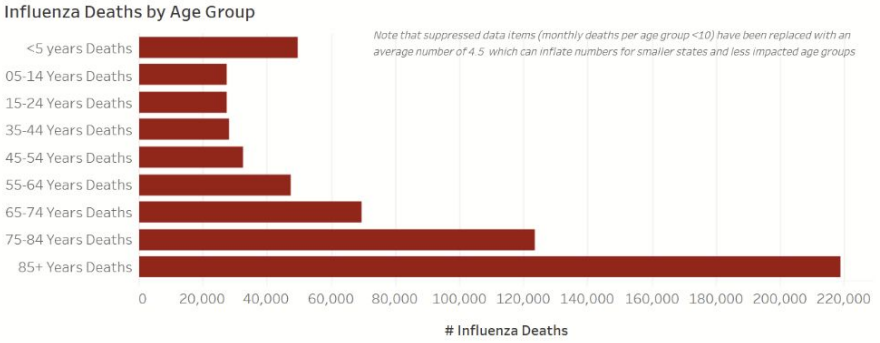
➢ ***California, Texas & New York*** *stand out in terms of total influenza deaths. The seasonality sees a* ***clear peak in the winter months****. 65+ to 85+ stand out as vulnerable age groups.*







Research Hypothesis Testing

➢ *Find more details regarding my statistical test setup in my interim report with results on gender & state segmentation*

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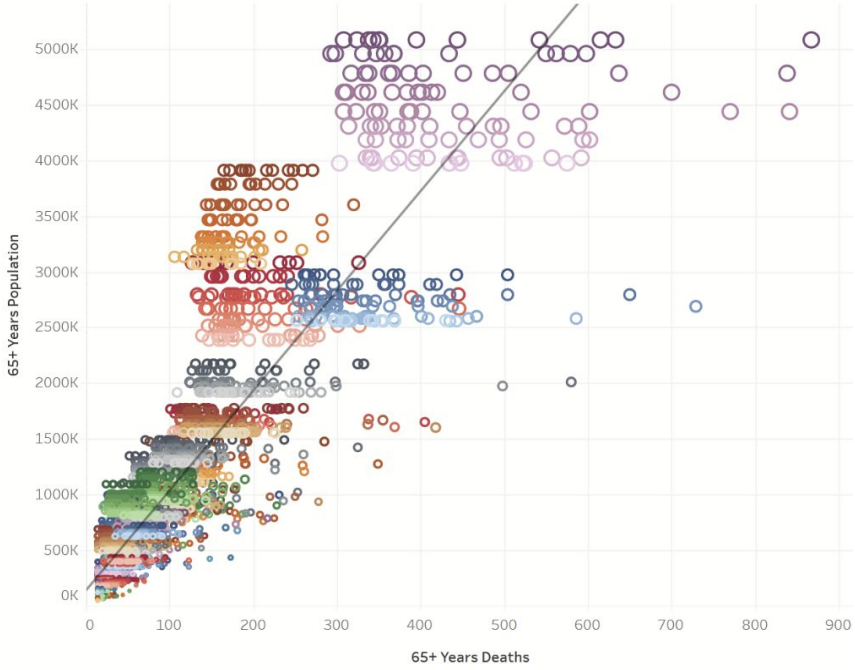
Bottom Left: The relation of 65+ and >65 influenza deaths per state per month.
Hypothesis ***'If the patient is above 65 years of age they are more likely to die from influenza'.***

Bottom Right: Strong positive correlation of influenza deaths among the 65+ age group per month per state.
Hypothesis ***'the bigger the 65+ age group in a state, the more influenza deaths among that age group can be expected'.***



Forecasting Influenza Season

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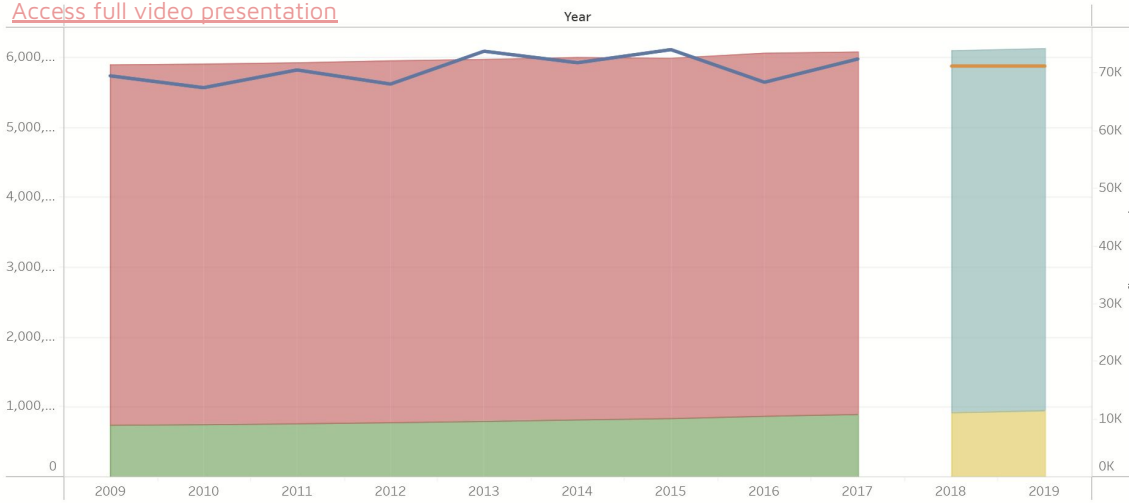
➢ *Based on the existing data for 2009-2017, the US-wide forecast shows an overall increase in population while Influenza deaths decline in regards to 2017*



State (Alle)

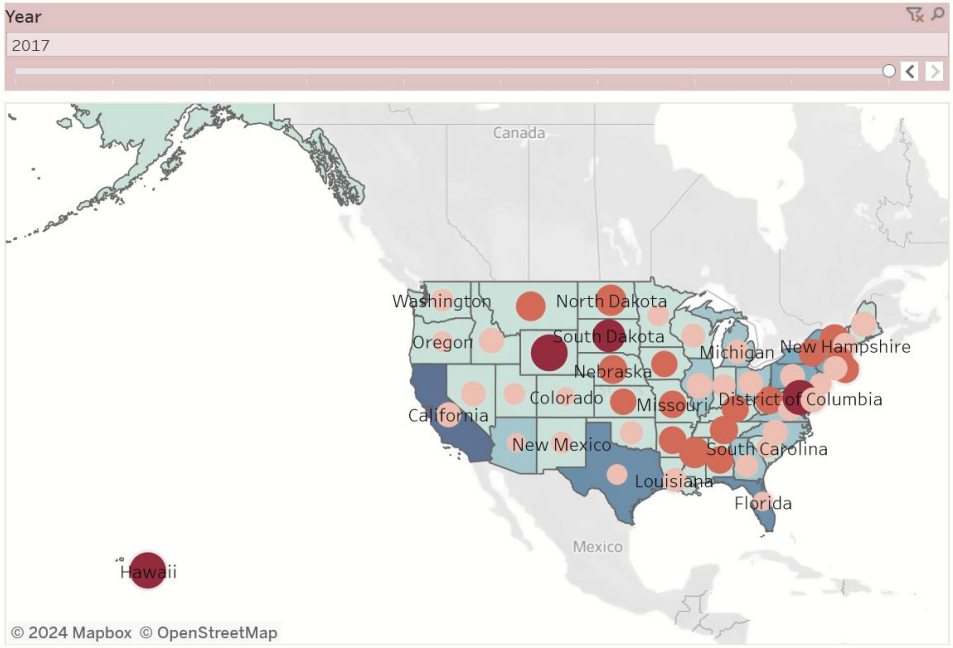
Region (Alle)

Population & Influenza Deaths
Actuals & Forecast

- Influenza Deaths total, Istwert
- Influenza Deaths total, Schätzung
- <65 Years Population , Istwert
- <65 Years Population , Schätzung
- 65+ Years Population , Istwert
- 65+ Years Population , Schätzung

2018 prognoses highlighted over previous years

Other Factors to consider



Prioritized List of states based on 65+ population

Death Ratios highlighted

State	
California	5,078,858
Florida	3,908,733
Texas	3,080,097
New York	2,971,517
Pennsylvania	2,171,552
Illinois	1,774,279
Ohio	1,767,047
Michigan	1,489,999
North Carolina	1,475,370
New Jersey	1,346,782
Georgia	1,200,044
Virginia	1,104,175
Arizona	1,092,768
Massachusetts	1,046,092
Washington	996,666
Tennessee	952,063
Indiana	937,893
Missouri	851,090
Maryland	836,474
Wisconsin	832,103
South Carolina	766,742
Alabama	721,493

While age is an influencing factor when anticipating cases of influenza, the overview of the 65+ population and their death ratio per state shows that there are also other factors at play. Looking at states with a high Influenza Death Ratio despite 'low' 65+ population might indicate opportunities for e.g. better flue prevention measures and or more need in medical ressources.

Influenza Season Summary & Recommendations

The Forecast of 65+ state population and influenza deaths gives an indication of where to send supporting medical staff throughout the US in 2018 (upcoming flu season). While there is a base line of influenza cases in the summer months, special attention should be given to the winter months (~November - ~March) with the peak of the influenza season in January.

This analysis cannot give a clear number of needed additional staff per state since it doesn't account for important factors like e.g.
- Not everyone who contracts the flu and goes to the hospital dies from influenza (hospitalisation to death ratios could help shed light on this)
- Prevention measures like e.g. vaccination campaigns might change from state to state and year to year.
- While the staff to patient ratio should be between 90% to 110% it still has to be taken into account that a patient on average will be hospitalised between 1 and 2 weeks (depending on the severity of the flu) and there will be shifts (no 24h care by the same member of staff).
However, considering a limited amount of medical staff available, this analysis can be used as a base to distribute staff according to a first priorisation.

My Project Reflections

During my hypothesis testing I was surprised to find that the t-score in my b. test (which looked at US states with a total population below the US average) was negative - which suggested that the average number of influenza deaths age <65 for the selected group of states was actually higher than for age 65+.

After further investigation, I realised that the issue with test b. probably had to do with the choices I made during the data cleaning. I had replaced the 'suppressed' values - which indicate statistics representing fewer than 10 people - in the influenza deaths dataset with an average of 4,5 (average between 0-9). I made the choice to go for the average (and not 0) because I wanted to make sure that enough resources would be allocated to meet the project objective (so rather too many than too little resources). This replacement, however especially affected younger age ranges (less people impacted) and smaller states (less people impacted). This is likely why selecting smaller states showed a higher average for younger age groups than for higher age groups.