



PREPARING FOR INFLUENZA SEASON INTERIM REPORT

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*CAREER***FOUNDRY**

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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.

HYPOTHESIS:

1. If flu is brutal against vulnerable people, the mortality rate of the elderly (above 65 yo) and kids (below 5 yo) will be higher than other age groups.
2. If a state has high population, Deaths due to flu will increase.

DATA OVERVIEW & LIMITATIONS

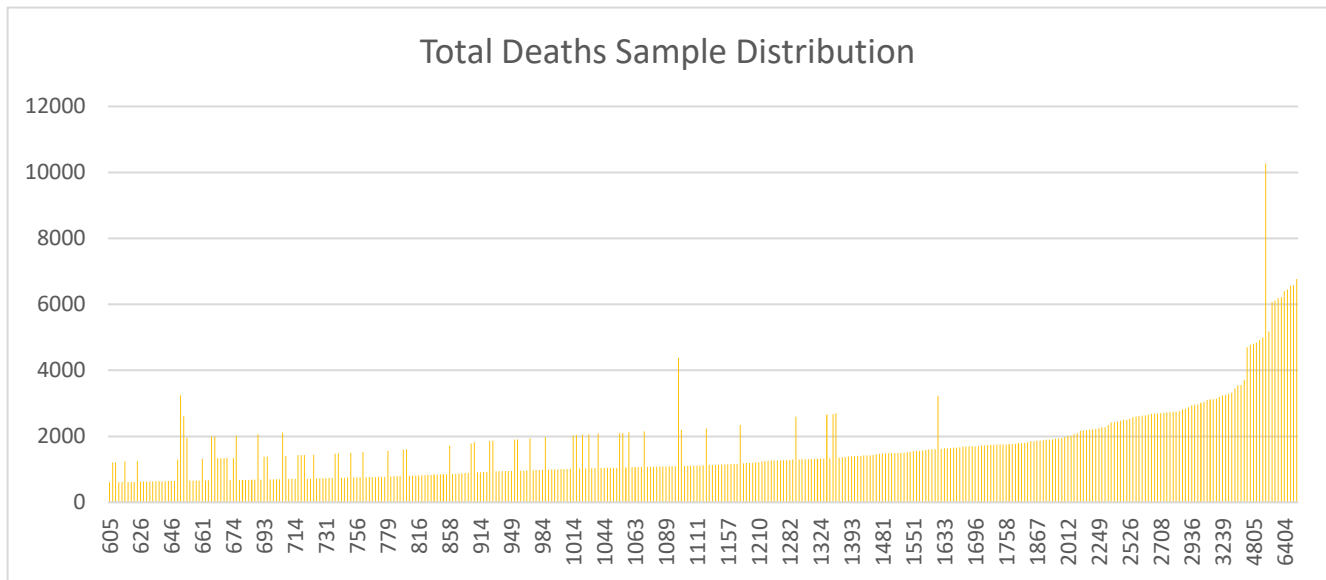
Data Source	Contents (Overview)	Key Limitations
Population & Mortality Data (US Census / NCHS)	Mortality counts and population data for all U.S. counties, based on official death certificates. Covers multiple decades.	<ul style="list-style-type: none"> • Suppressed small counts (≤ 9 deaths) • Missing demographic data (Hispanic origin, age) • Coding changes (ICD-9 vs ICD-10) • Manual entry errors • Data only available up to 2020
Influenza Lab Tests & Patient Visits (CDC FluView)	Influenza testing results, positive cases, and related healthcare visits. Data from a nationwide network of federal, state, and local partners, updated weekly.	<ul style="list-style-type: none"> • Preliminary/voluntary reporting • Inherent bias (only diagnosed patients reported) • Minimal manual errors in early hospital stages • Reporting lag of several days to a week

DESCRIPTIVE ANALYSIS:

Variable	Standard Deviation	Mean
Total Sum of Deaths	1090	1432
Sum of Deaths for 1-4 YO	14	108
Sum of Deaths for +75 YO	830	742
Total population	271399	146788
Population 1-4 YO	17412	9138
Population +75 YO	15248	9009

Data Sample distribution:

The data sample is left-skewed, as shown in the chart below. This indicates that most of the data values are concentrated on the higher end of the scale. In this type of distribution, the mean is typically less than the median due to the presence of a few significantly lower values that drag the average down.



Correlations

The moderate relation (0.48) between the total deaths above 75 years old and the total state population of the same age group represents that the number of deaths above 75 YO is relevant to the size of the population who are above 75 YO.

Similarly, The moderate relation (0.48) between the total death and the total state population of all age groups represents that the total deaths is relevant to the size of the population in the state.

In contrary to that, there is no clear relation between the total deaths under 5 and the population size for the same age.

RESULTS AND INSIGHTS:

HYPOTHESIS 1: IF A PERSON IS OF THE 75 OR OLDER, THEY HAVE A HIGHER CHANCE OF DYING FROM THE FLU THAN SOMEONE LESS THAN 75 YEARS OLD

Null Hypothesis: The flu death rate for people above 75 years or older is less than or equal to the flu death rate for people in any 10-year age category less than 75 years old.

Alternative Hypothesis: If a person is of the 75 or older, they have a higher chance of dying from the flu than someone less than 75 years old.

Test:

One-tailed test: testing to see if death rate for 75+ is higher or lower than death rate for less than 75 years old. Alpha value is (0.05).

Result:

The p-value for all 10-year age categories less than 75 years old is below the significance level, leading to the rejection of the null hypothesis and supporting the alternative hypothesis.

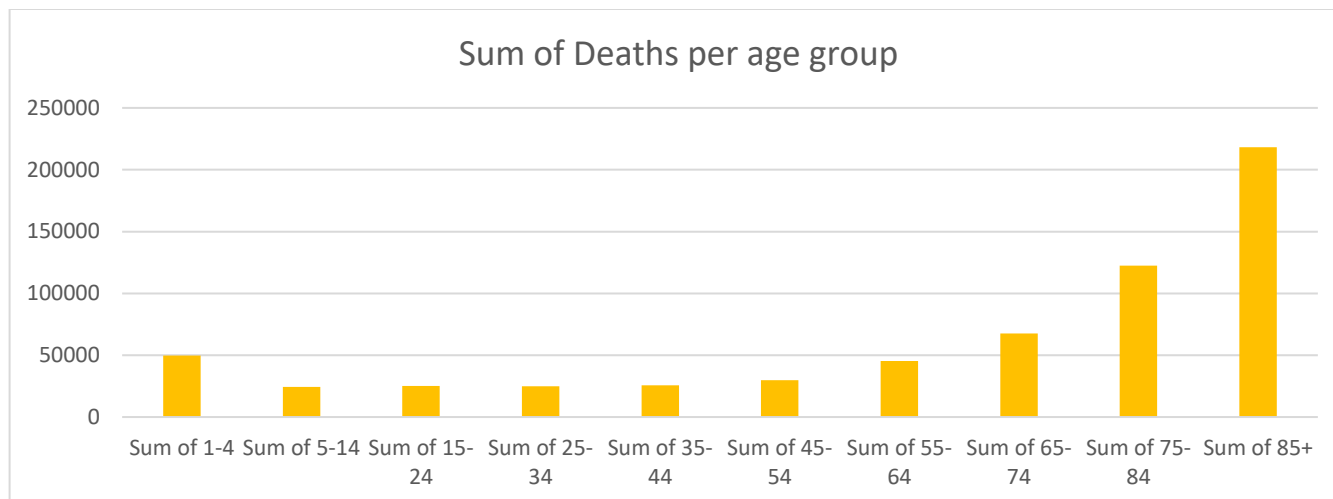
Interpretation:

This provides statistical evidence for the claim: "If a person is 75 or older, they have a higher chance of dying from the flu than someone younger than 75". In other words, as a result of flu, people above 75 years old have more probability to die comparing to other age groups.

Vesualization:

The below chart illustrates the deaths of influenza per age group. As shown in the chart, People above 75 years old are more likely to die from influenza compared to other age groups. This is due to many factors, including a weakened immune system associated with aging, the presence of multiple chronic health conditions such as heart disease or diabetes, reduced physiological reserves to recover from illness, and a generally slower immune response to infections and vaccines.

It is also visible from the chart that young age group 0-5 years old also shows an increase in number of death cases comparing to other age groups below 75 years old.



HYPOTHESIS 2: IF A STATE HAS HIGH POPULATION, DEATHS DUE TO FLU WILL INCREASE

Null Hypothesis: The total flu death/ population ratio in the above average population states is more than or equal to the total flu death/ population ratio in the below average population states.

Alternative Hypothesis: The total flu death/ population ratio in the above average population states is less than or equal to the total flu death/ population ratio in the below average population states.

Test:

Two-tailed test: testing to see if The total flu death/ population ratio in the above average population states is higher or lower than The total flu death/ population ratio in the below average population states. Alpha value is (0.05).

Result:

The p-value for the states with population above average is below the significance level.

Interpretation:

The above result leads to the rejection of the null hypothesis and supporting the alternative hypothesis. This provides statistical evidence for the claim.

NEXT STEPS

Based on the outcomes of the analysis discussed above, we will consider the following:

- Compile evidence to inform a national staffing plan, specifying the datasets needed to guide the timing and geographic allocation of medical personnel across the U.S.
- Determine whether influenza is seasonal or year-round. If seasonal, assess whether start and end months are consistent across states.
- Rank states by need using the size of vulnerable populations, classifying each state as low, medium, or high priority.
- Analyze the communities with high elderly population in order to prioritize them in the upcoming flu season.
- Correlate between the number of deaths and the population above 75 YO.
- Analyze reasons why the states that have death rates lower than average are better than the states that have death rates higher than average.
- We will investigate medical services, health culture, flu prescriptions in the states that have death rates lower than average to draw the lessons learnt.

APPENDIX:

<https://www.cdc.gov/fluview/overview/index.html?>

<https://www.cdc.gov/flu/>

<https://www.census.gov/topics/population.html>