

Preparing for the Next Influenza Season

Interim Report & Analytical Insights by Charlie Rhodes

Section 1: 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.

Section 2: Hypothesis

- Hypothesis: If we allocate more government funds to hospitals in states with budget deficits during influenza season, then fewer people will die from the flu.

Section 3: Data Overview

- Dataset 1 – Population Data by Geography: This data shows the total number of people by gender and age in each county from each state. The data provided by the US Census Bureau covers the period between 2009 - 2017.
- Dataset 2 – US Influenza Deaths: This data shows total counts of Influenza-related deaths by location and age from each month in each state within the United States. This data is released by Center for Disease Control (CDC) and covers the period between 2009 - 2017.
- Dataset 3 – Health Expenditure by State: This data presents aggregate healthcare costs for each state in the United States. This data is released by Centers for Medicare & Medicaid Services (CMS) and covers the period between 1991 – 2014.

Section 4: Data Limitations

- Dataset 1 – Population Data by Geography: Census data can be incomplete due to certain eligible participants being unwilling to submit complete and accurate information via a questionnaire, logistical limitations of reaching all households and citizens. This data may also be lagging on up-to-date information as it is only collected in intervals.
- Dataset 2 – US Influenza Deaths: There is potential for error as certain records and low death counts were omitted for privacy reasons, as well as there being possibility that deaths were wrongfully attributed or not attributed to the flu, as well as many chances for administrative human errors before the summation of data.
- Dataset 3 – Health Expenditure by State: This dataset only contains funding as recent as 2014, which is less up-to-date than ideal. There also exists possibility of certain elements of this funding being irrelevant to flu specific spending, which could paint a somewhat inaccurate picture.

Section 5: Descriptive Analysis

Descriptive Variables	2014 Flu Death Rate	2014 Hospital Funding Per Capita
Mean	0.1292%	16665
Standard Deviation	0.3073%	2514
Variance	0.0009441%	6317946
Correlation Coefficient	0.458778	

There was a moderate correlation between the rate of flu deaths per person and the rate of hospital funding per capita for all states in 2014. This indicates that states that receive more funding, relative to their populations, will see fewer deaths from the flu.

Section 6: Results and Insights

- Null Hypothesis: If we allocate more government funds to hospitals in states with budget deficits during influenza season, then there will not be fewer people dying from the flu.
- Alternative Hypothesis: If we allocate more government funds to hospitals in states with budget deficits during influenza season, then fewer people will die from the flu.
- Test: A one-tailed test was conducted to determine whether the government funding had the expected effect on flu deaths.

T-Test:

Descriptive Variables	Variable 1	Variable 2
Mean	0.00129175	16664.549
Variance	9.4412E-06	6317946.41
Observations	51	51
Hypothesized Mean Difference	0.0013	
df	50	
t Stat	-47.346806	
P(T<=t) one-tail	1.6752E-43	
t Critical one-tail	1.67590503	
P(T<=t) two-tail	3.3504E-43	
t Critical two-tail	2.00855911	

- Result: With a 95% confidence interval, we can reject our null hypothesis, therefore we can say that it's true that if we allocate more government funds to hospitals in states with budget deficits during influenza season, then fewer people will die from the flu.

Section 7: Remaining Analysis and Next Steps

- Based on our findings, we can determine which states should be the highest priority for receiving additional funds to combat the Influenza season.
- Continue relevant analysis to adjust plans as needed.
- Continue to meet with all stakeholders to discuss these and future plans.

Section 8: Appendix

Hypothesis selection: I thought about what was most in our control. Funding. With that, I considered whether the funding itself (or a lack thereof) could be a root cause of increased flu deaths.

Influenza Deaths Data profile:

VARIABLE	Time component	Data structure	Data Type	Data Description
State	Time-invariant	Structured	Qualitative	Nominal
State Code	Time-invariant	Structured	Qualitative	Ordinal
Year	Time-invariant	Structured	Qualitative	Ordinal
Month	Time-invariant	Structured	Qualitative	Ordinal
Month Code	Time-invariant	Structured	Qualitative	Ordinal
Ten-Year Age Groups	Time-variant	Structured	Qualitative	Ordinal
Ten-Year Age Groups Code	Time-variant	Structured	Qualitative	Ordinal
Deaths	Time-variant	Structured	Quantitative	Discrete

US Census Data Profile:

VARIABLE	Time component	Data structure	Data Type	Data Description
County	Time-invariant	Structured	Qualitative	Nominal
Year	Time-invariant	Structured	Qualitative	Ordinal
Total Population (and each male/female category)	Time-variant	Structured	Quantitative	Discrete
Each Age Range	Time-variant	Structured	Qualitative	Ordinal

Data Map used for the combination of datasets 1 and 2:

Data Set 1: Influenza Deaths	Example	Data Set 2: US Census	Example
		County	Summit County, Colorado
State	Colorado	State	Colorado
State Code	8		
Year	2009	Year	2009
Month	Nov., 2009		
Month Code	2009/11		
Ten-Year Age Groups	< 1 year		
Ten-Year Age Groups Code	1		
Deaths	8		
		Total population	26246
		Male Total population	14931
		Female Total population	11315
		Under 5 years	1863
		5 to 9 years	1050
		10 to 14 years	1365
		15 to 19 years	1102
		20 to 24 years	2520
		25 to 29 years	3412
		30 to 34 years	2887
		35 to 39 years	2152
		40 to 44 years	2126
		45 to 49 years	1916
		50 to 54 years	1968
		55 to 59 years	1207
		60 to 64 years	1286
		65 to 69 years	604
		70 to 74 years	420
		75 to 79 years	289
		80 to 84 years	52
		85 years and over	26