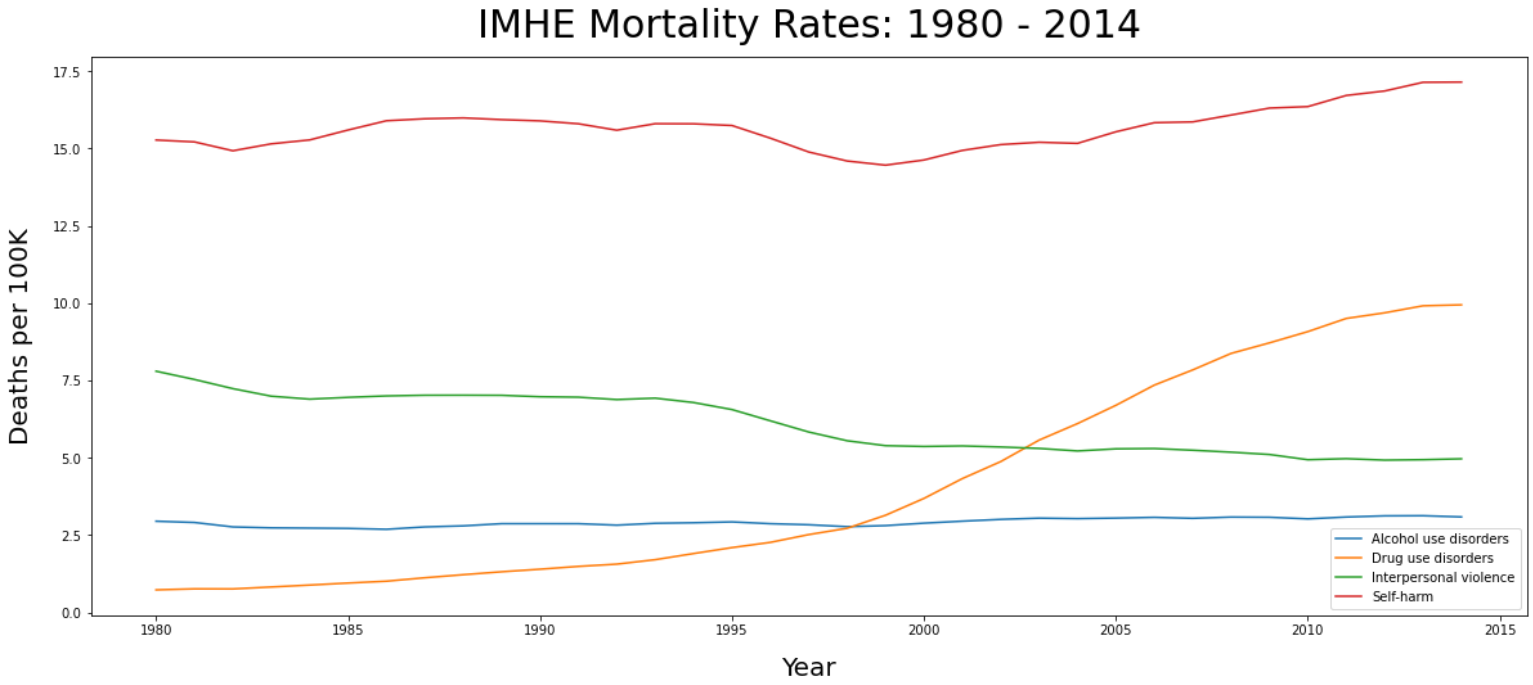
CAPSTONE

Alcohol Overuse/Abuse and Self-Harm Mortality

Kade Higgins

BUT FIRST … *WHY SO SERIOUS?*

- *Self-harm / Intentional Injury Mortality rate significantly higher than other mortality categories*
- *Has surpassed the mortality rate from Diabetes*
- *Just as preventable as other mortality causes*
- *Mortality burden is not equally distributed – some communities post exponentially higher self-injury mortality rates than others*



EXPLORATORY DATA ANALYSIS

THE GRAPH THAT SPARKED MY INTEREST

THE BURDEN OF BOOZE

- *WHO - As many as 3 million deaths globally per year attributed to harmful alcohol use*
- *Prevalence of heavy drinking/binge drinking has increased over time*
- *Harmful alcohol use prevalence is also not equally distributed*
- **Pro:** *LOTS of funding for alcohol related mortality*

PROBLEM STATEMENT

Deaths from self harm (i.e. suicide and other intentional injuries that result in death) far outpace other mortality categories in the IMHE dataset. Knowing that substance/alcohol abuse is a factor in many diseases and mental/behavioral health disorders, I will create supervised and unsupervised model(s) to that explore the relationships between mortality rate by self-harm and other variables such as sex, year, state, unemployment and the different levels of alcohol use/abuse.

METHODOLOGY

Find the Data

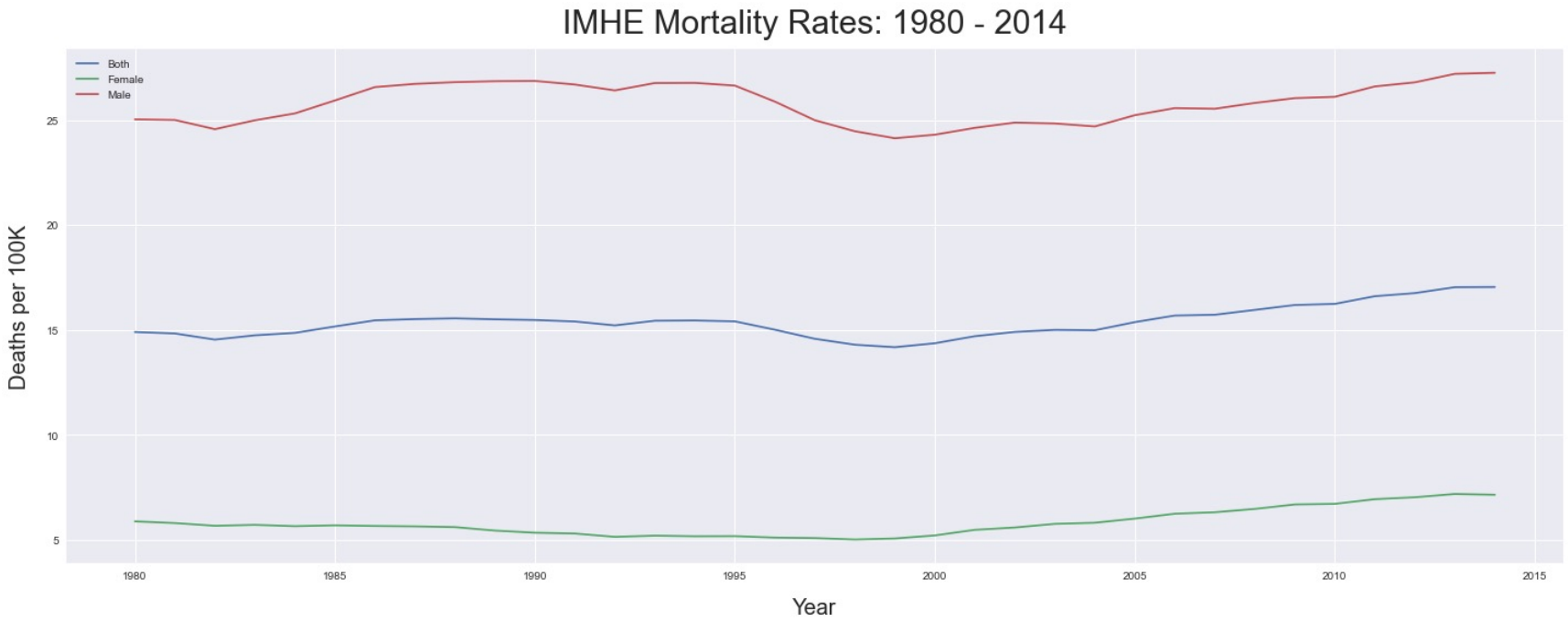
Clean

EDA & Visualization

Model – Univariate Regression

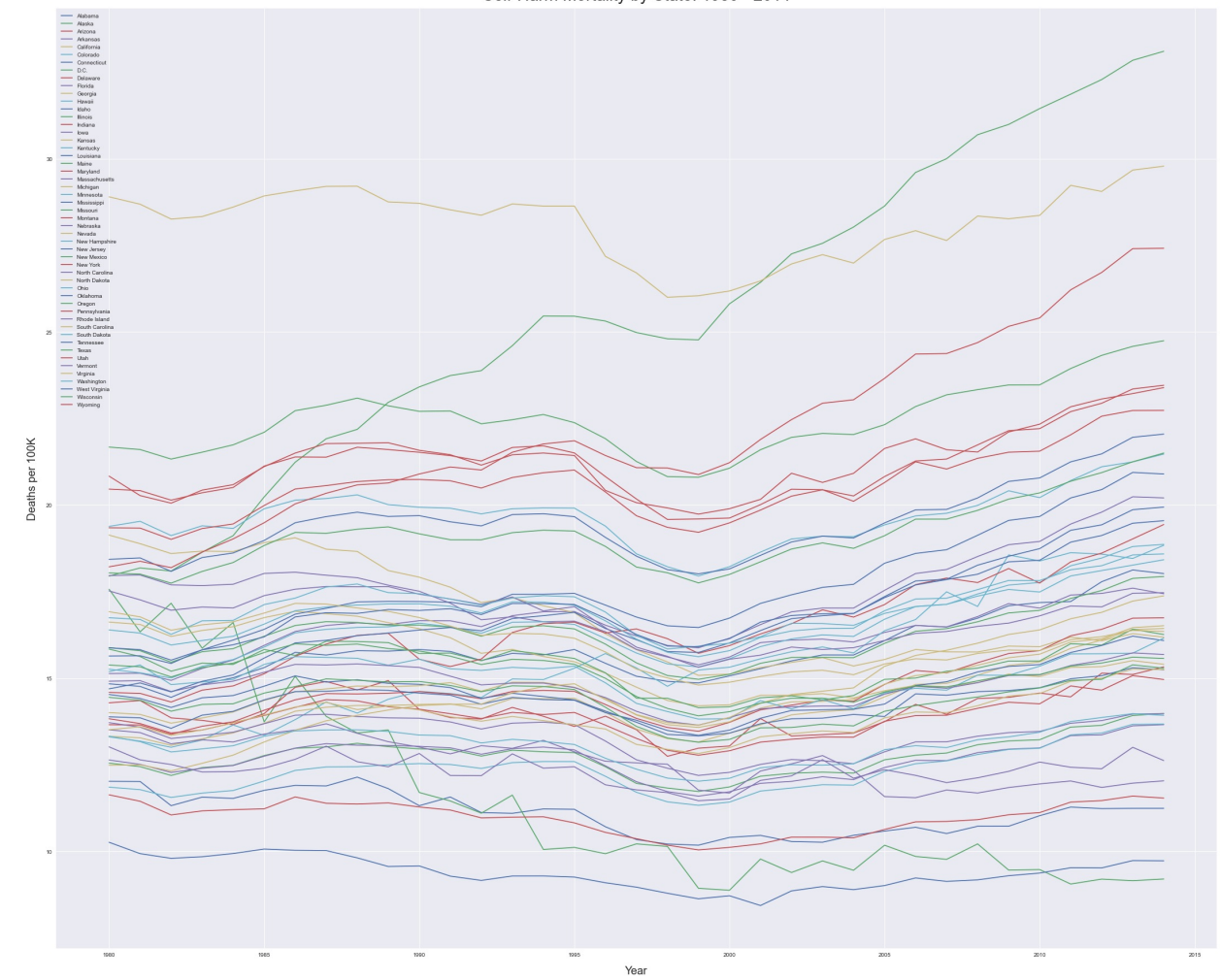
Model – Multivariate Regression

Unsupervised Learning – K-Means Clusters



SELF HARM MORTALITY

YEARLY AVERAGE BY SEX

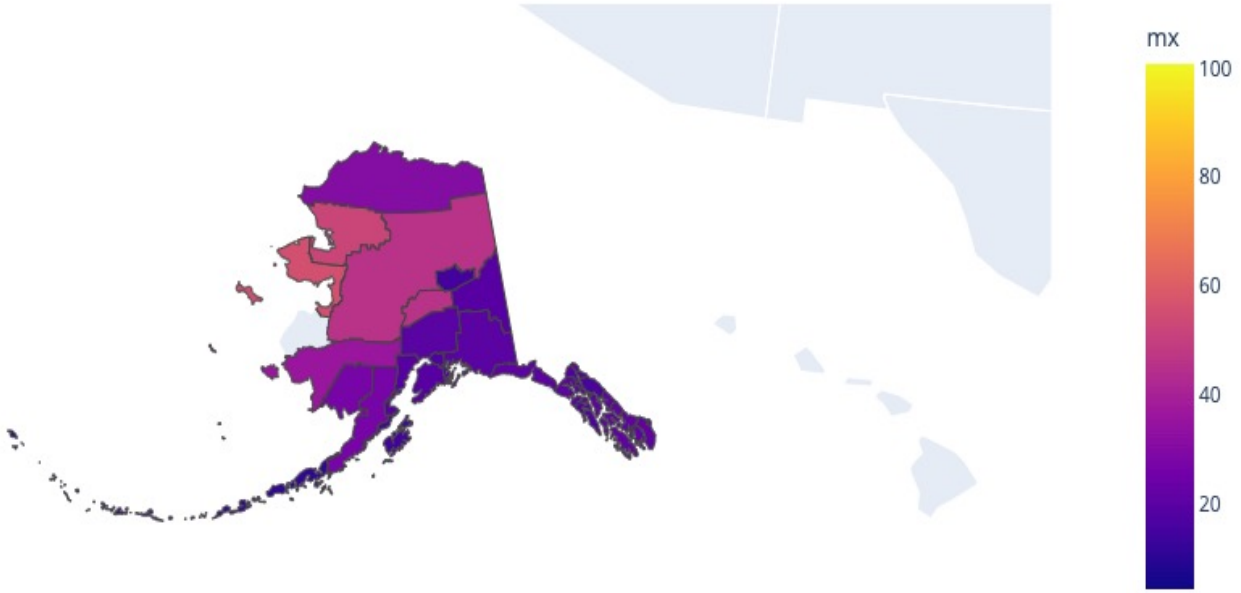


YEARLY AVERAGE SELF-HARM MORTALITY BY STATE

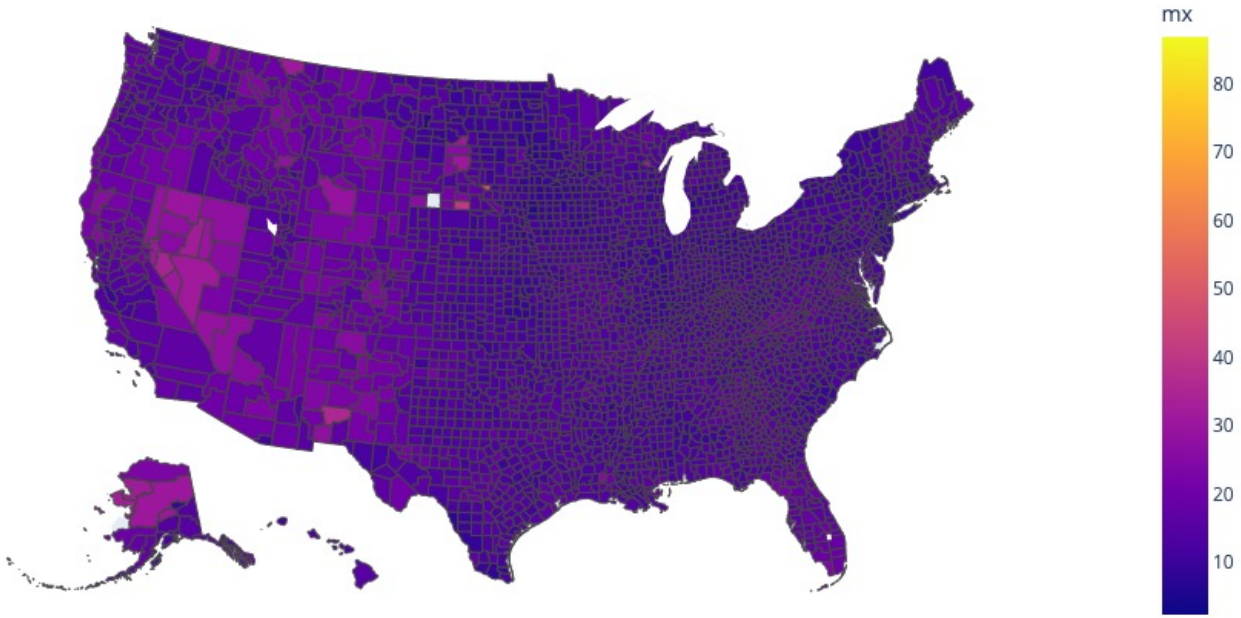
SELF-HARM MORTALITY

POINTS OF INTEREST

- *Average 15.66 per 100K between 1980 & 2014*
- *Max mortality rate **162 per 100K***
- *Female avg increased 5.89 – 7.16*
  - *Female max increased 16.71 to 36.15*
- *Male avg increased 25.02 – 27.24*
  - *Male max increased 86.81 to 162.27*
- *The highest mortality rates for both men and women are in the* **Kusilvak Census Area, Alaska** (county FIPS 02158)



SELF-HARM MORTALITY ALASKA, 1995



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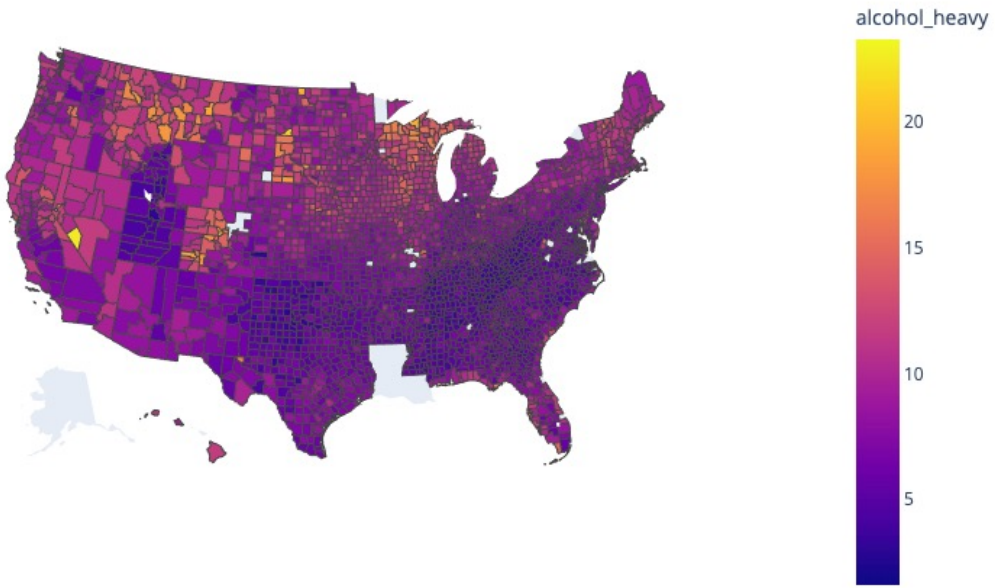
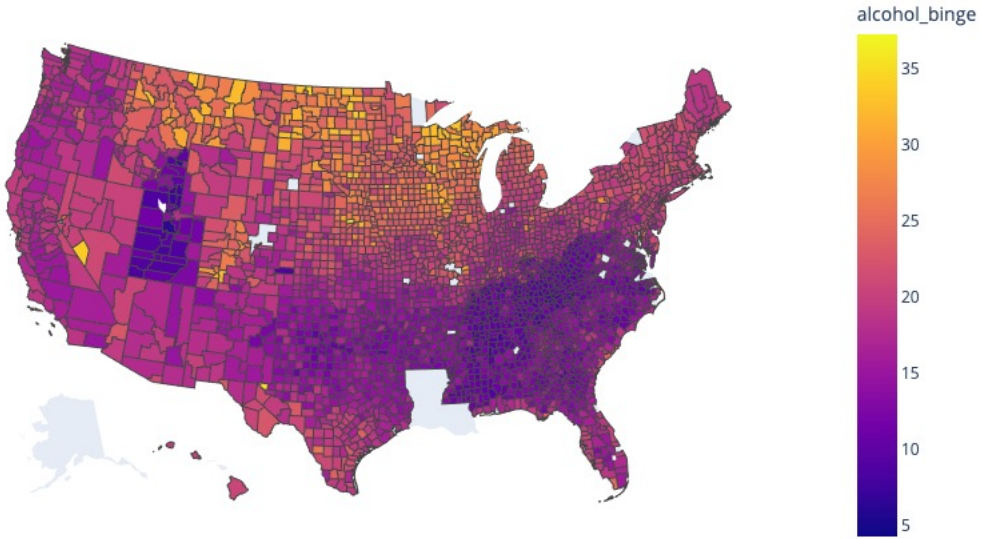
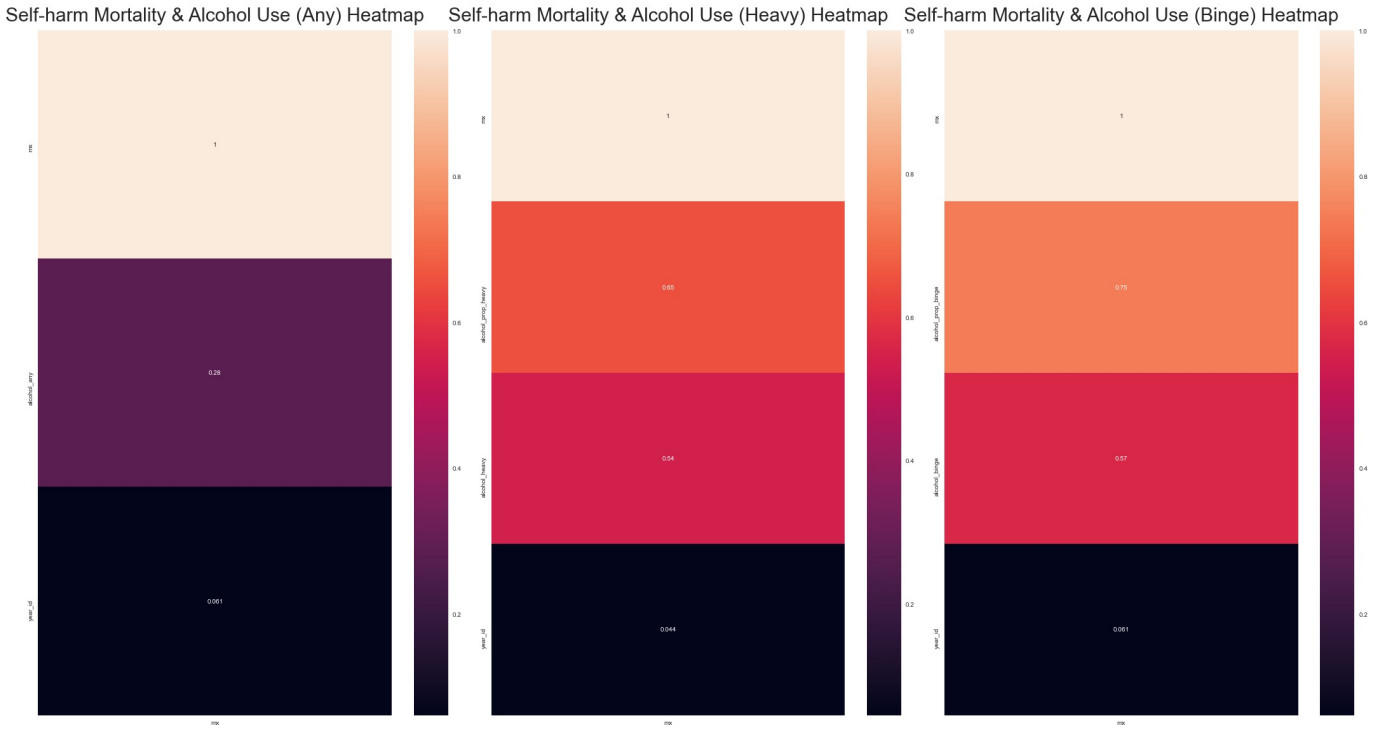


HEAVY DRINKING PREVALENCE

Binge Alcohol Use Prevalence by County



BINGE DRINKING PREVALENCE


Self-harm Mortality & Alcohol Use (Any) Heatmap
Self-harm Mortality & Alcohol Use (Heavy) Heatmap
Self-harm Mortality & Alcohol Use (Binge) Heatmap
mx
alcohol_any
alcohol_heavy
alcohol_binge
year_id
1
0.28
0.061
0.65
0.54
0.044
0.75
0.57
0.061
1.0
0.8
0.6
0.4
0.2

HEATMAP

UNIVARIATE REGRESSION

Mortality rate vs. Proportion of Binge Drinkers had strongest accuracy score

- RandomForest / Gboost tied
- *Test Accuracy:* ***0.73 Test***
- *RMSE:* ***32.16***

MULTIVARIATE REGRESSION

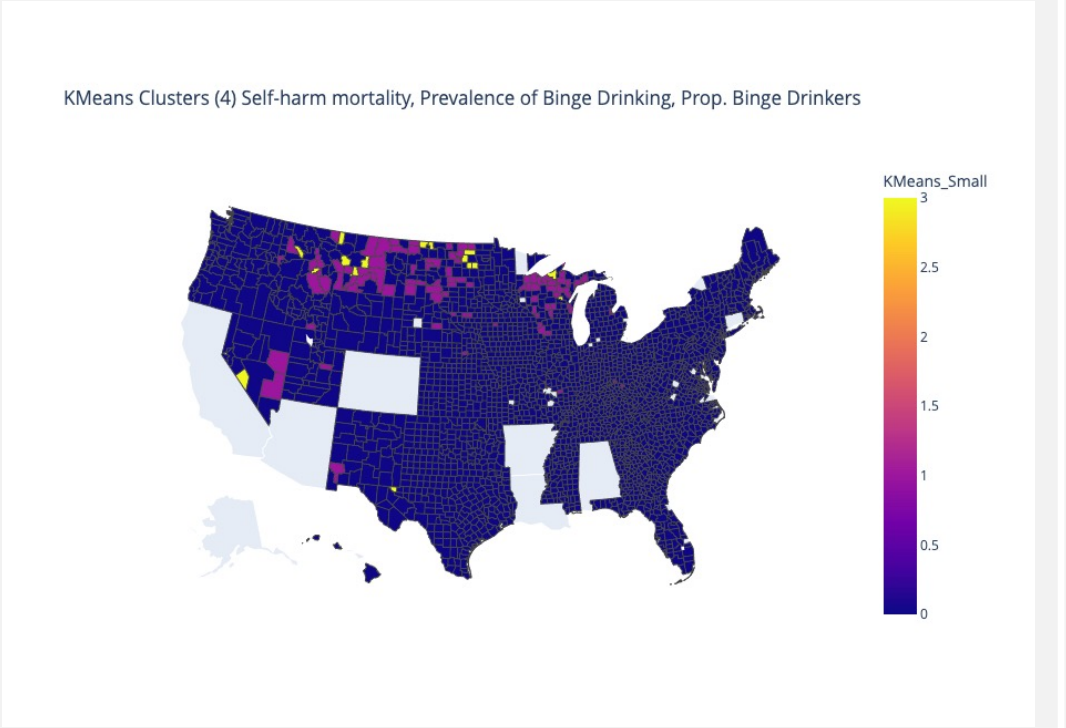
Including sex and state with proportion binge drinkers returns high accuracy, low RMSE

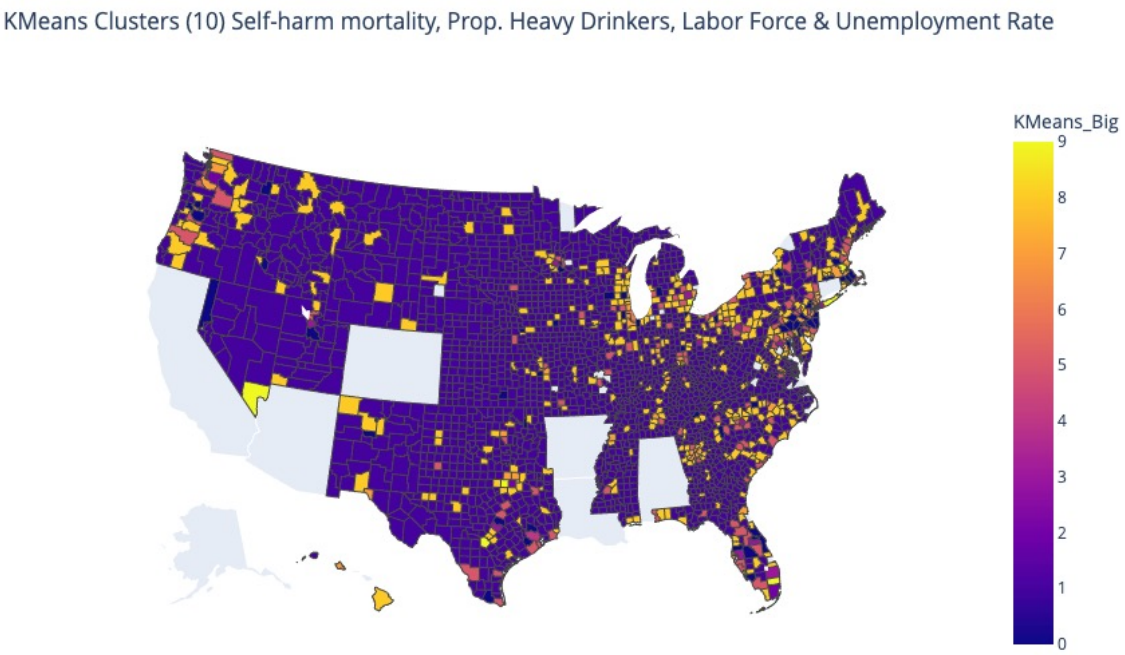
GradientBoostRegressor wins out, only barely

- If our univariate models represent our baseline (0.73), this improves
- *Test Accuracy:* ***0.87***
- *RMSE:* ***15.25***

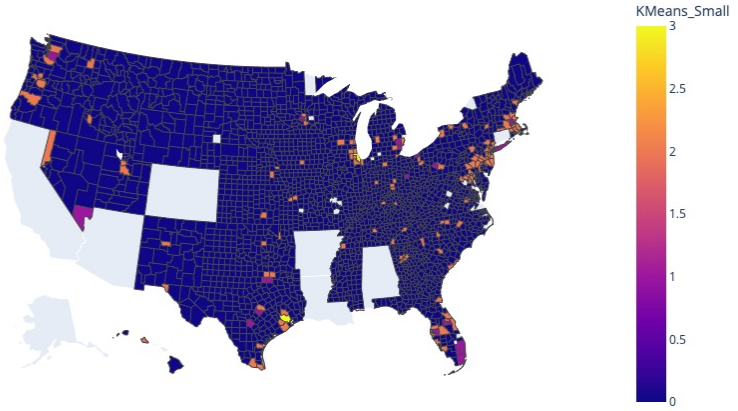
KMEANS

- Smaller Clusters were better (4)
- Heavy / Binge clusters with mortality rate produce silhouette scores ~0.51
- ***Including Labor Force and unemployment rate*** *saw SIL score ~0.875 @ 4 clusters, ~0.73 @ 10 clusters*
- *Unfortunately not all states were present across all variables – even with missing data, it is still worthwhile to identify clusters for targeted intervention*

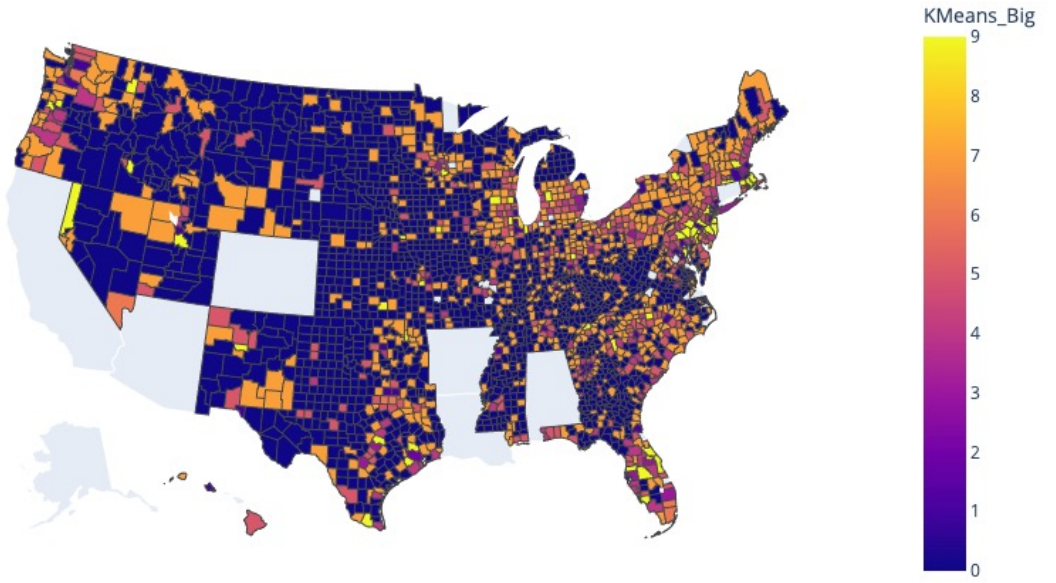




KMEANS HEAVY ALCOHOL USE & UNEMPLOYMENT



KMEANS BINGE USE & UNEMPLOYMENT



KMEANS BINGE USE & UNEMPLOYMENT

CONCLUSIONS

- **Multivariate Regression Models Outperform Single Variable Regression**
- If Univariate Models represent our Baseline
- **K-Means Creates Meaningful Pockets of Similarly Afflicted Counties**
  - *Those interested in optimizing and more efficiently using public health research dollars can use these clusters to engage in regionally targeted intervention that addresses two mortality causes at once*
- ***In the Future***
  - *Get more complete data, built out streamlit app, , examine relationships between sunlight and self-harm mortality*

HOTLINES

If you or someone you know is struggling

- ***National Suicide Prevention Lifeline:*** *800-273-8255*
- **Crisis Text Line:** *Text "Hello" to 741741*
- ***SAMHSA National Helpline (drug / alcohol abuse):***
- *1-800-662-4357*

THANK YOU FOR LISTENING

I'm happy to answer any questions

Kade Higgins