Understanding the Increase in Drug Overdose and Alcohol Driving Deaths

Dennis Campoverde-Lema
University of Minnesota

Samantha Parras
University of Texas, San Antonio

Jodie Chen
University of California, Los Angeles

Carnegie Mellon University
Statistics & Data Science

Background

Motivation

"In 2022, 8 million (2.9%) of Americans 12 and older struggled with both alcohol and drug use disorders simultaneously" ("Alcohol and Drug Abuse Statistics").

Main questions

Are there demographic and social factors that are predictors of drug overdose and alcohol-related incidents (e.g., driving accidents)?

Why is this important?

Use of drugs and alcohol has substantial financial consequences. Every year, excessive alcohol use costs 249 billion dollars in lost productivity, medical expenditures, and criminal justice costs. In contrast, illicit drug usage costs 193 billion dollars in lost productivity, criminality, and medical costs ("Health Data").

Hypothesis

The chances of drug overdoses and alcohol-related driving incidents can be predicted by demographic factors like age, gender, and race as well as social factors like substance use habits and socioeconomic status.

Data & Source

Sources

2024 County Health Rankings

Response Variables

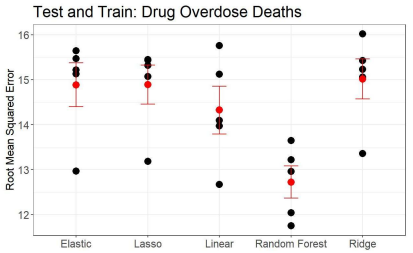
Drug Overdose Deaths: The amount of people who died from a drug overdose per 100,000.

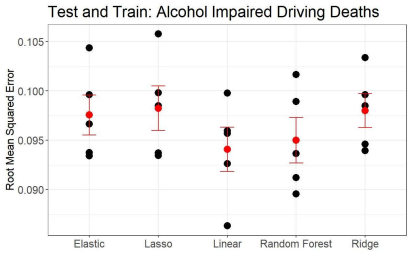
Alcohol Impaired Driving Deaths: The rate of driving fatalities that had alcohol involved.

QR Code For Our Report

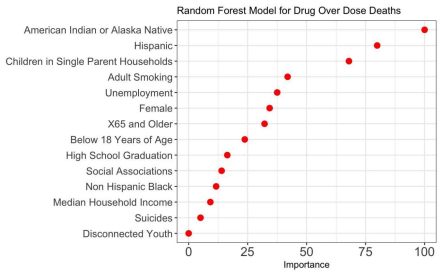
Methods

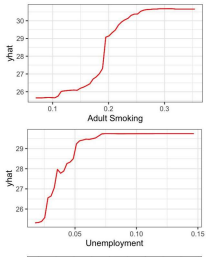
- Models we are looking into: elastic net, lasso, ridge, linear regression, and random forest
- Determined our statistical model by the lowest RMSE
- We cross validate by doing train-test splits for 5 folds
- Decided to look into random forest and linear regression

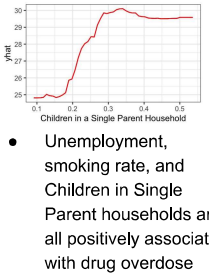




Results

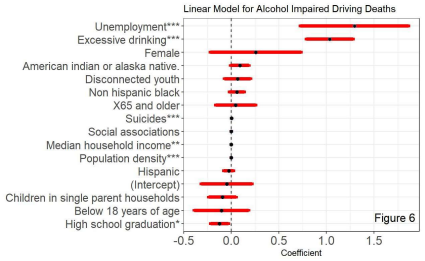




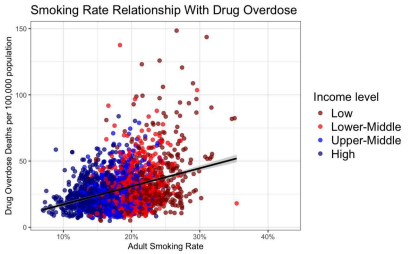


- Unemployment, smoking rate, and Children in Single Parent households are all positively associated with drug overdose

- Unemployment is positively associated with alcohol-impaired driving deaths
  - ➢ Conditioning on all other variables, each % increase in unemployment increases alcohol impaired driving deaths by 1.1%
- High school graduation rate is negatively associated with alcohol-impaired driving deaths
- The dashed line at zero indicates the threshold for no effect.



EDA / more results



The graph shows a link between higher adult smoking rates and increased drug overdose deaths per 100,000 people, with lower-income areas experiencing more smoking and overdose deaths than higher-income areas.

Discussions

Conclusions/summary

Our hypothesis is partially correct. There are social predictors of alcohol-impaired driving fatality and drug overdose, but our results do not provide enough evidence to support demographic predictors.

Limitations

There was a lot of missing data especially for drug overdose deaths.The data did not have drug overdose type. Additionally the homoscedasticity assumption for our linear model was not met.

Future work

We would want to impute missing data by using KNN or imputing the mean by state aggregates and find similar data set to impute data. Further research should be done on unemployment predictors because lower unemployment will result in fewer drug overdose and alcohol-related driving deaths.