Impact of Adult Health-Related Practices on Juvenile Healthcare Outcomes

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Background

Motivation

Our research was done to identify intergenerational health impacts to better provide early intervention and improve childhood outcomes as well as improve healthcare education and policy.

Data Source

Our dataset is sourced from the **University of Wisconsin PHI 2024 County Health Rankings**. We specifically focused on smoking, physical inactivity, excessive drinking, insufficient sleep, food insecurity, uninsured, and STIs among adults. For juveniles we considered child mortality and low birthweight.

Methods

- We chose 3 models for predicting low birthweight: lasso regression, ridge regression, and linear regression.
- To evaluate model performance, we used 10-fold cross validation and chose the linear regression model as it had the lowest RMSE.

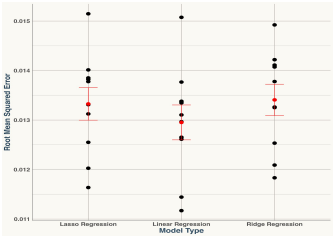

Figure 4. Model evaluation of lasso, ridge, and linear regression via 10-fold cross validation

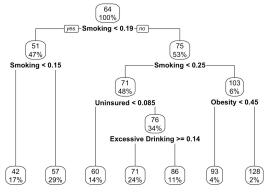

Figure 5. Decision tree of various predictors of child mortality

Exploratory Data Analysis

The scatterplots below are a glimpse of the relationship between a few adult behaviors with low birthweight and child mortality. Except for excessive drinking with child mortality, all four scatterplots demonstrate a moderately strong positive correlation. Figure 3 depicts the rate of low birthweight at the state-level with each circle representing a county. Counties with a higher percent of low birthweight births are also counties with higher percent of insufficient sleep.

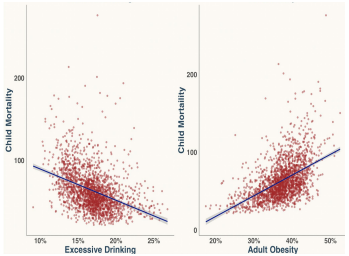

Figure 1. Relationship between child mortality and a sample of our predictor variables

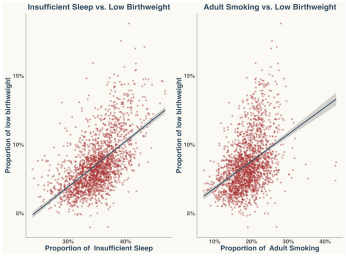

Figure 2. Relationship between low birthweight and a sample of our predictor variables

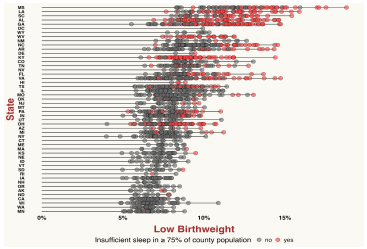

Figure 3. Percentage of low birthweight births by state, colored by the percentage of the county population reporting insufficient sleep

Results

The linear regression model determined that **insufficient sleep** and **excessive drinking** were the strongest predictors of low birthweight among the predictors below.

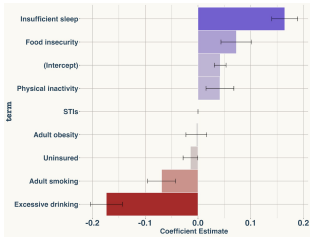

Figure 6. Coefficient estimates for predictors of low birthweight

From the decision tree, the variable importance score for predicting child mortality was highest for **adult smoking** while **insufficient sleep** had the lowest score.

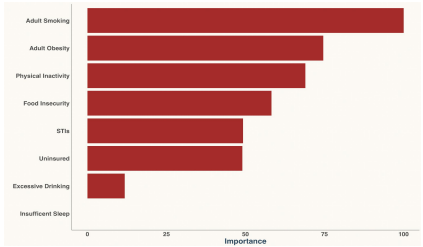

Figure 7. Variable importance plot for predictors of child mortality

Conclusions

- Linear regression outperformed regularized models like lasso and ridge regression.
- The variable importance plot pointed to smoking, obesity, and physical inactivity as the best predictors of child mortality.
- The linear regression model found that insufficient sleep and excessive drinking are the strongest predictors of low birthweight.

Limitations & Future Work

- Data specifically on parent health behaviors and child outcomes.
- Investigate why excessive drinking and child mortality have a strong negative correlation.
- Limitations within the project being that data may not be separated by important factors like gender.
- Explore variables including demographics, income, and gender.

References

Centers for Disease Control and Prevention. (2023, October 13). Smoking, pregnancy, and babies. *Centers for Disease Control and Prevention*. https://www.cdc.gov/tobacco/campaign/tips/diseases/pregnancy.html#:~:text=Smoking%.

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