# **OB Navigator Decision Support**

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## **Abstract**

The goal for this project is to predict the risk factors of the infant mortality in Indiana and provide constructive recommendations for the OB Navigator program. The infant mortality is strongly related to maternal health and social determinants and Indiana faces significant challenges in this area. Therefore, the motivation of this project is to decrease the infant mortality rate to the lowest among the Midwestern states by 2024. Using R, we identify the trends of infant mortality and explore the causes of infant death. We also create the interactive shiny app to visualize multiple datasets and provide specific recommendations for each county.

## **Business Problem**

The well-being of expecting mothers and their babies determine the health of the next generation in Indiana and is a crucial indicator for health in state level. The state government is rolling out OB Navigator program which delegates on home visiting to pregnant and new moms to provide support. The state government is also looking forward to more creative ideas that could help decrease state level infant mortality rate from 7.3 deaths per 1,000 live birth to a most 5. Infant mortality rate is affected by many internal factors related to mom’s health behavior and external features like social and economic indicators. Finding the correlation between these features and infant mortality is the most feasible way for the government to understand areas of improvement and further allocate resources and budget. The initial problem is defined by The Healthy Mom+Baby Datapalooza competition sponsored by the Indiana State Department of Health.

## **Analytics Problem**

To successfully develop a reliable decision support system for the health department of Indiana, it is necessary to build a predictive model for feature selection purpose. A predictive model with high accuracy could serve the purpose of accurately selecting the features that are correlated with infant mortality rate. With correctly selected features, visualization on these features supported by shiny app could help decision makers to select aspects to invest in for improvement. An optimization model is also necessary to generate goal for different features to reach.

## **Data**

After cleaning up the available dataset provided by MPH (Management Performance Hub) and performing EDA to better understand the case, we decided to analyze/predict this case by county and combined available datasets with external data sources to generate a new training dataset with features being considered relevant to target infant mortality rate.

## **Methodology Selection**

For this case, our team would first perform EDA to explore correlation relationship between defined features and target. Then we would try Ridge Regression, Support Vector Machine and Random Forest to determine which method we would use for predictive model. After important features being determined, we would explore linear expression between features and target. R would be an ideal Tool considering Caret and Gurobi Package, which would suit our needs to build predictive and optimization model.

## **Model Building**

The first step is to build a predictive model to determine the feature importance, we tried Ridge Regression, Support Vector Machine and Random Forest methods and finally used Random Forest for its better accuracy and stability. After determining the top 4 most important features, we explored linear regression relationship between those 4 features and target infant mortality numbers to prepare it for optimization model. Ideally, we intent to use Gurobi Package in R to build decision support system to provide optimal solution on OB Navigator Program procedure adjustment needed to make to reach target infant mortality rate. For this competition, due to data deficiency and uncertainty about decision variables setup method, we only considered optimizing top 4 feature levels to reach target. R would be an ideal Tool considering Caret and Gurobi Package, which would suit our needs to build predictive and optimization model.

## **GUI Design and Functionality**

The shiny app enables users to select a county that the users intend to investigate in. Then the users could select between the options of investigating the four most important features either with just its current values in this county shown in bar charts or comparing current value with goal values set by optimization model shown in bar charts. A recommendation button is also provided to show general recommendation for improvement.

## **Conclusions**

Using Statistical model and a more constructive data, government can create a solid model that can both predict future health related rate and do optimization to improve features that affect the target rate.

## **Link to Prototype**

https://doniponi.shinyapps.io/OBNavigator/

## **References**

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