ANALYSIS AND PREDICTION OF PERIPARTUM MATERNAL HEALTH RISK

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CONTENTS

BACKGROUND

- Health information was collected from South Asian hospitals, community clinics, and maternal health centers.
- Used a sensors-based risk monitoring system.
- Aim to reduce maternal and fetal mortality.

(Ahmed et al, 2021)

BACKGROUND

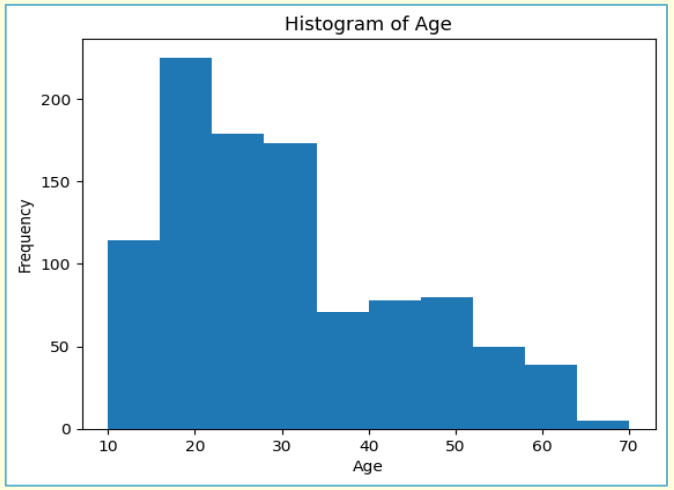
- Sample size (N): 1,014
- No null data
- Seven features:
  - Blood Sugar
  - Systolic Blood Pressure
  - Diastolic Blood Pressure
  - Body Temperature
  - Heart Rate
  - Age
  - Risk level

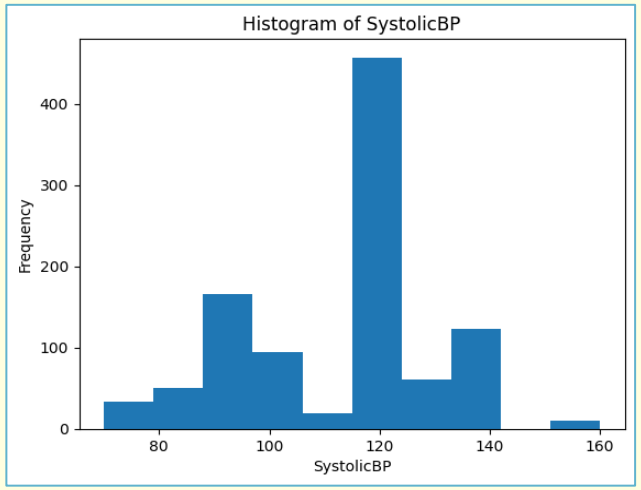
- Outputs (risk)
  - Low-risk
  - Medium-risk
  - High-risk

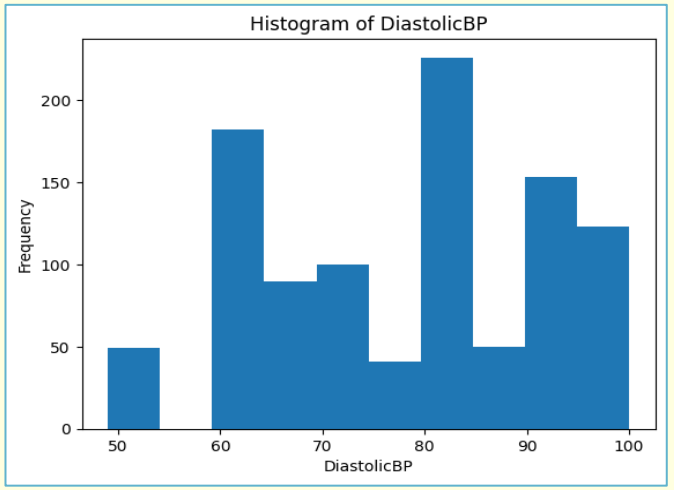
- Hypothesis: The higher the values of the features, the higher the risk category.

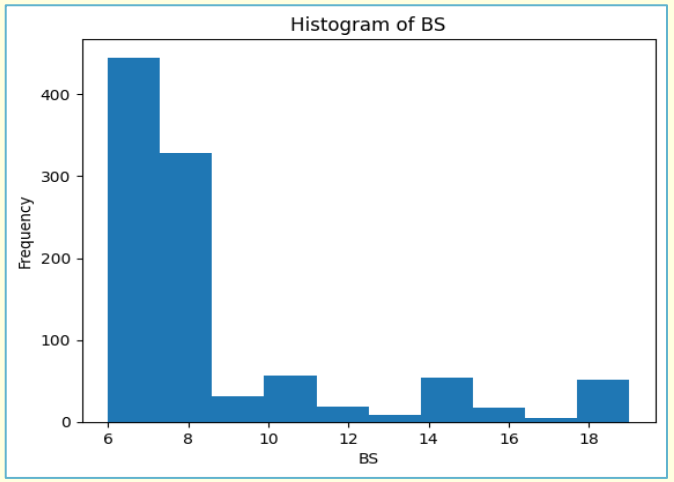
(Maternal Health Risk Data, n.d.)

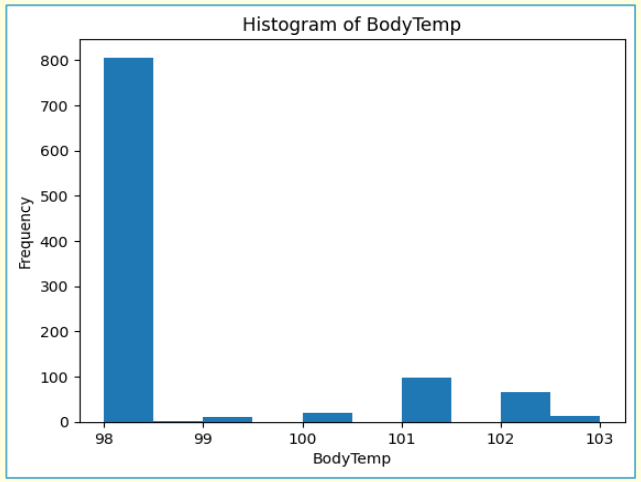
METHODS: EXPLORATORY DATA ANALYSIS

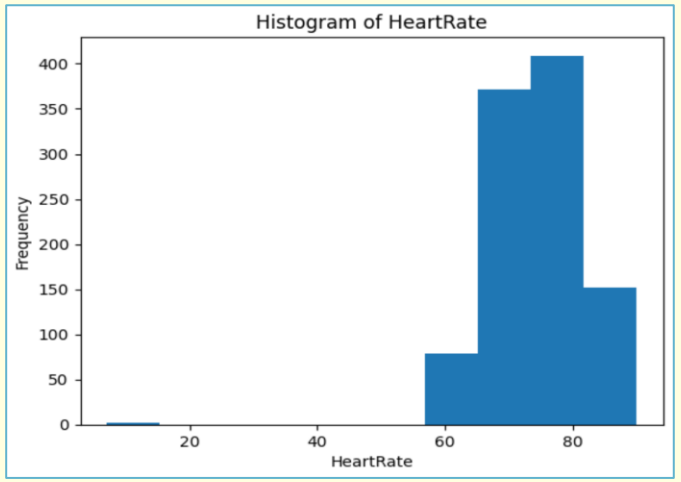












METHODS: DATA PREPROCESSING

- Converted the ordinal class labels to integers
  - Low-risk: 0
  - Mid-risk: 1
  - High-risk: 2
- Training data: 80% of the total data
- Test data: 20% of the total data

METHODS
FEATURE SELECTION

Features	Variation %
Blood Sugar	0.359
Systolic Blood Pressure	0.186
Age	0.159
Diastolic Blood Pressure	0.125
Heart Rate	0.103
Body Temperature	0.065

- Set threshold to 0.13
  - Utilizing the first three features for our model
- Minimal change in the accuracy of the algorithms

RESULTS
ORDINAL REGRESSION

Features	Coefficients (Standard Error)	P-values
Systolic Blood Pressure	0.0288 (0.004)	0.000
Diastolic Blood Pressure	-0.0014 (0.005)	0.777
Blood Sugar	0.2415 (0.021)	0.000
Body Temperature	0.2443 (0.033)	0.000
Heart Rate	0.252 (0.006)	0.000
Age	-0.0041 (0.004)	0.311

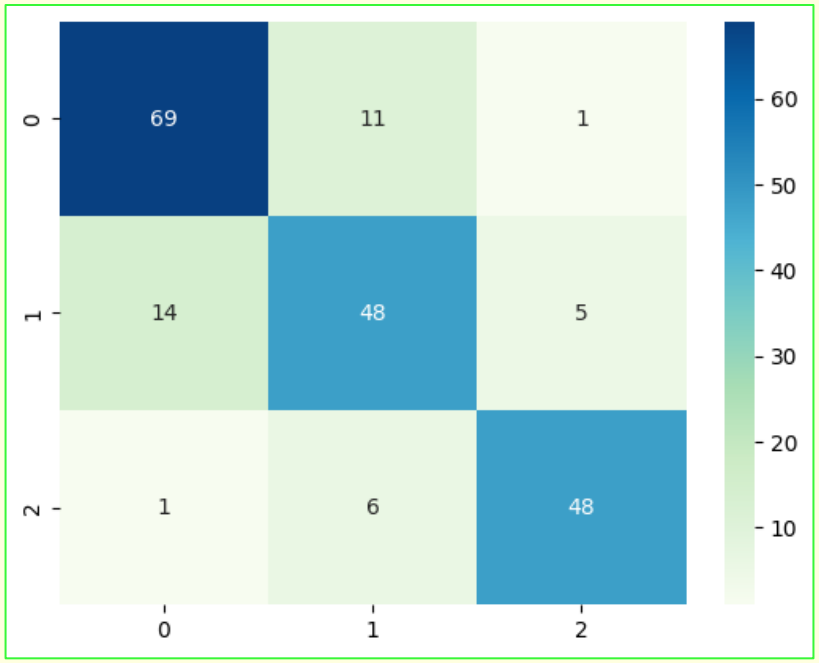
- Systolic BP, Blood Sugar, Body Temperature, and Heart Rate are all significant variables in this regression
- Accuracy of categorizing Test Data: 61%

RESULTS
TRAINING DATA

Classification Algorithm	Mean Cross-Validation Accuracy
Logistic Regression	53.9%
Support Vector Machine	64.3%
K-nearest Neighbors	72%
Decision Tree	72%
Random Forest	82.4%

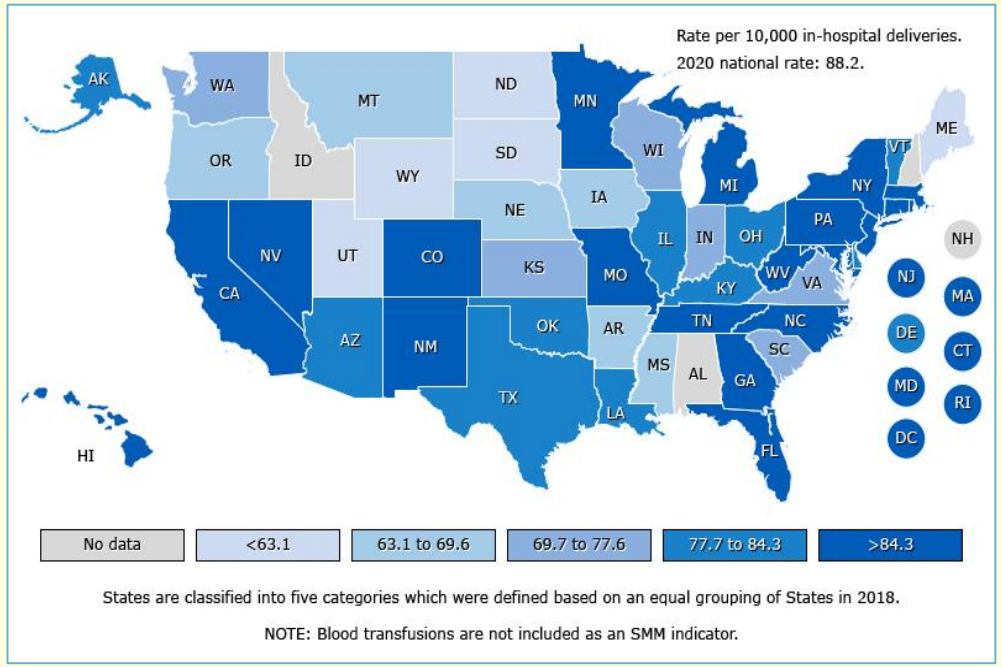
- Random Forest with Tuned Hyperparameters
  - Mean CV accuracy: 82.8%

TEST DATA



- Total Accuracy of Categorizing Test Data: 81.3%
  - F1 score: 81.2%
- True Low-Risk: 85.2%
- True Medium-Risk: 71.6%
- True High-Risk: 87.3%

CONCLUSION



- ROI
  - Assumptions:
    - 40% uptake of app
    - 10% of severe maternal morbidity due to inappropriate risk categorization
- Decrease SMM to 84.6 from 88.2, a decrease of 4%
  - 1270 people
- Drawbacks
  - Limited sample size may have affected accuracy

THANK YOU

REFERENCE

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