

# Final Report: Insights and Conclusions

## Key Insights from Data Analysis: -

### 1. High-Risk Behaviour Patterns Identified:

- Individuals who **smoke**, are **physically inactive** or have a **high Body Mass Index (BMI)** show significantly higher rates of heart disease.
- People with a history of **stroke**, **poor mental health** and **frequent physical distress** are more likely to suffer from cardiovascular issues.

### 2. Socioeconomic Disparities Observed:

- **Low-income individuals** and those with less access to healthcare resources showed a higher prevalence of heart disease.
- **Age** plays a major role — the risk increases notably with age, especially above 45 years.

### 3. Feature Correlations:

- Strong correlation found between heart disease and features like **blood pressure**, **diabetes** and **cholesterol levels**.
- **Lifestyle indicators** (exercise, alcohol use) also influence risk but less strongly than physiological indicators.

### 4. Modeling Outcomes:

- **Random Forest** and **Logistic Regression** models were used.
- Evaluation metrics such as **Accuracy**, **ROC-AUC** and **Confusion Matrix** indicated reasonable performance in detecting at-risk individuals.
- These models proved useful in distinguishing between healthy and high-risk individuals based on simple survey inputs.

## Conclusions: -

- **Healthcare analytics** is a powerful tool in identifying patterns that can **predict chronic illnesses** like heart disease using behavioural and demographic data.
- The **BRFSS 2015 dataset** provides a rich source of information for extracting such patterns, despite challenges like data imbalance and missing values.

- The project successfully demonstrated that:
  - Predictive modelling can identify at-risk groups with a fair degree of accuracy.
  - Simple health and lifestyle indicators can serve as early warning signs.
- These insights can guide **preventive healthcare programs**, influence **policy-making**, and help design **targeted interventions** for high-risk populations.
- With further enhancements (like deep learning or more granular data), this system can evolve into a **clinical decision support tool** for real-time risk assessment in cardiology.