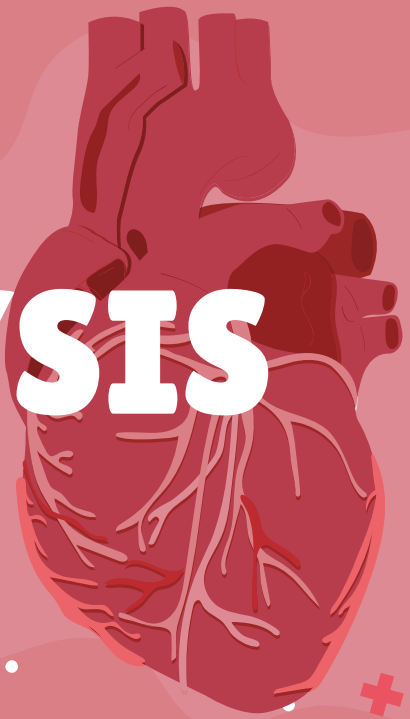
A FRAMINGHAM HEART ANALYSIS



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Introduction

- Heart disease is a major cause of death in the United States
- Identifying the main risk factors as they contribute to cardiovascular disease is a helpful preventive strategy
- The Framingham Heart Study began in 1948 for regular surveillance of clinical examinations and heart health outcomes of patients in Framingham, Massachusetts
- The dataset used in our study contains laboratory and clinical data on a subset of the Framingham Heart Study from 1956-1968
- We were interested in looking at a list of factors that contribute to overall poor heart health and circulatory issues

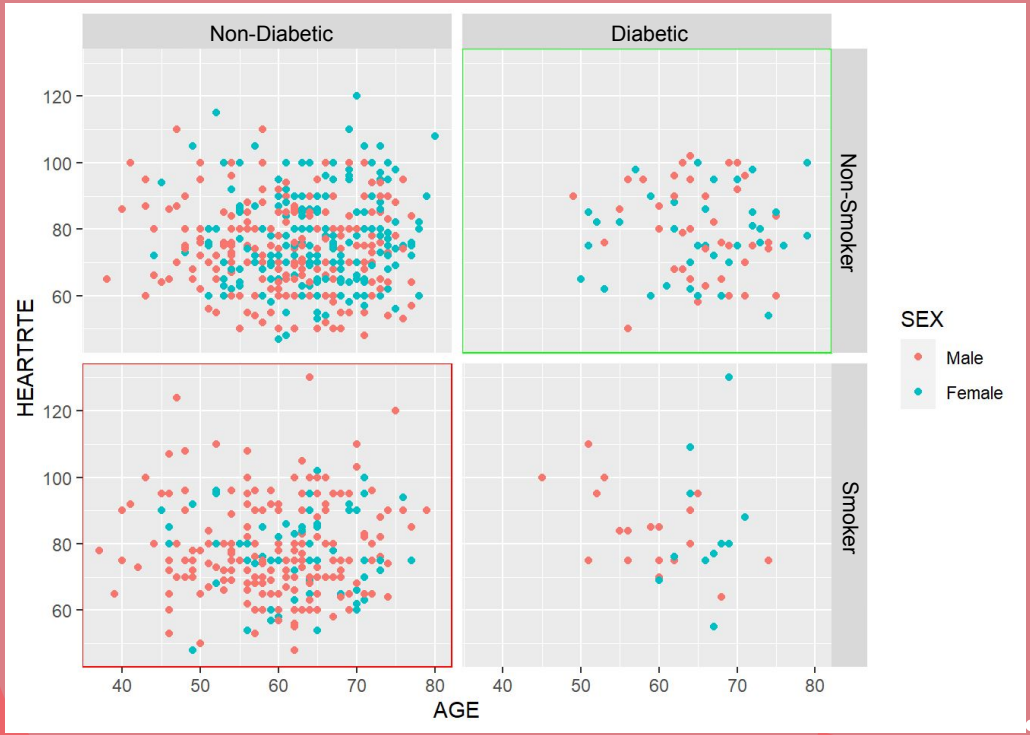
Hypothesis

Factors: Age, sex, smoking, cigarettes per day (if smoker), diabetes, systolic blood pressure, diastolic blood pressure, total cholesterol, use of blood pressure medication, hypertension, heart rate

Poor heart and circulatory health came in the form of diagnoses or occurrences of h**eart disease**, **heart attacks**, and **strokes**.

We predicted that age and sex would be significant because of their generality. Also, cholesterol and blood pressure medication would be big contributing factors because of how they affect the openness of blood passageways.

Demographics of Coronary Heart Disease "CHD"



Outcomes:

- Faceted by diabetes on the x-axis and smoking on the y-axis
- Highlighted boxes show that more non-diabetic smokers (red) had CHD than diabetic non-smokers (green)
- The red group was predominantly male

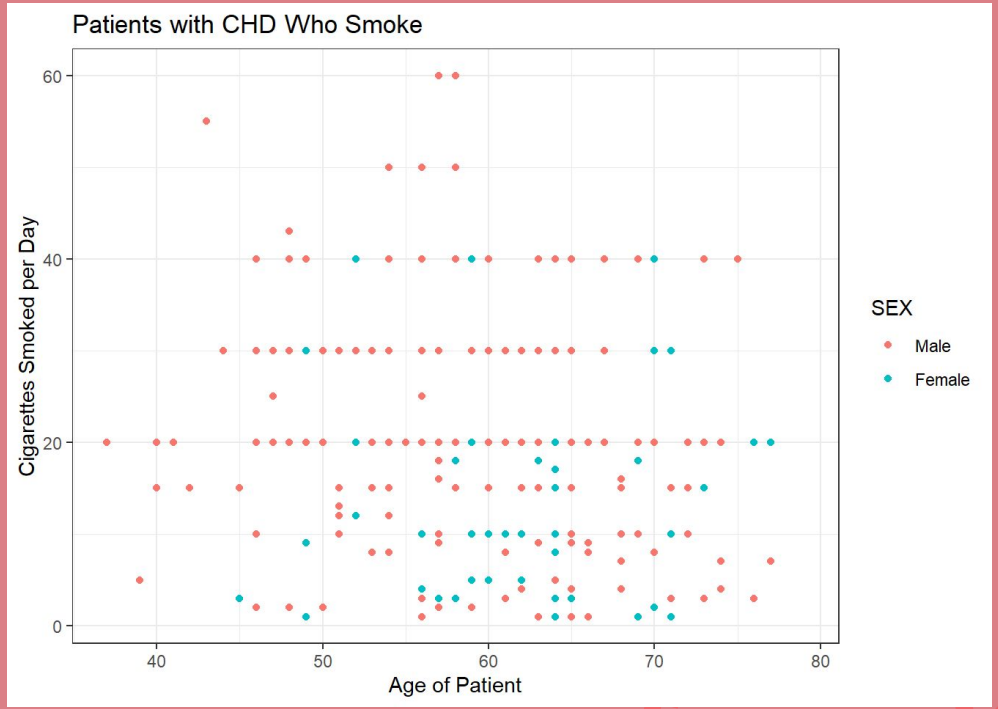
Smoking Frequency in CHD Patients

Outcomes:

- Smokers with CHD tend to be older (50+ years in age) and male
- Smokers with CHD who smoke many cigarettes per day also skew male
- This may affect perceptions that CHD is more likely to occur in men when it could be a result of social norms that cause men to smoke more

Significance:

- Counterintuitively, a logistic regression model run found that smoking actually had a very small decrease in the likelihood of CHD (-0.020543) and diabetes had a larger relative increase (0.125624), with p-values of < 2e-16.

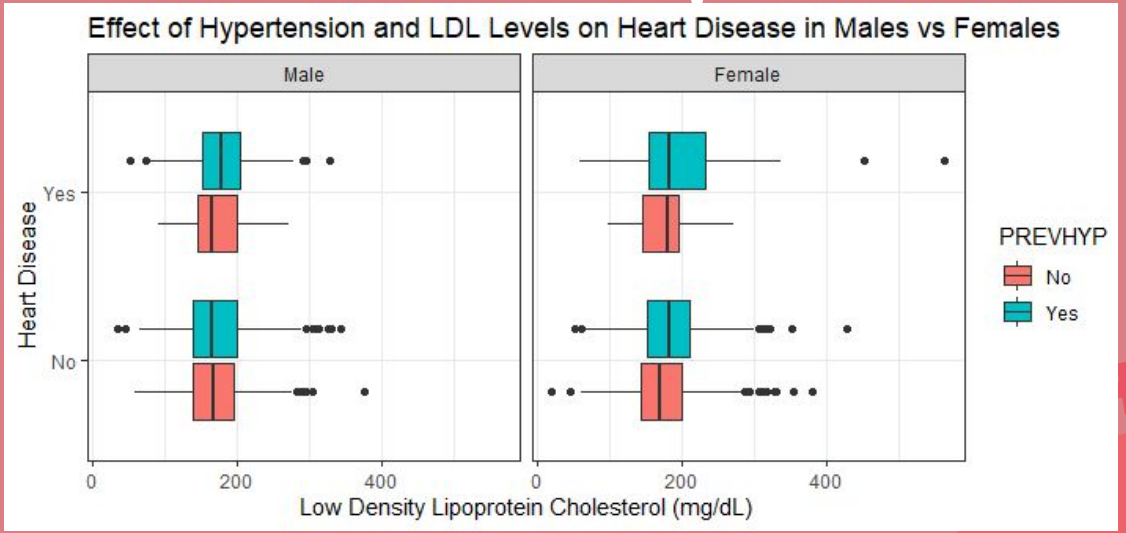


Hypertension & LDL Levels on CHD

Faceted by Sex

Outcomes:

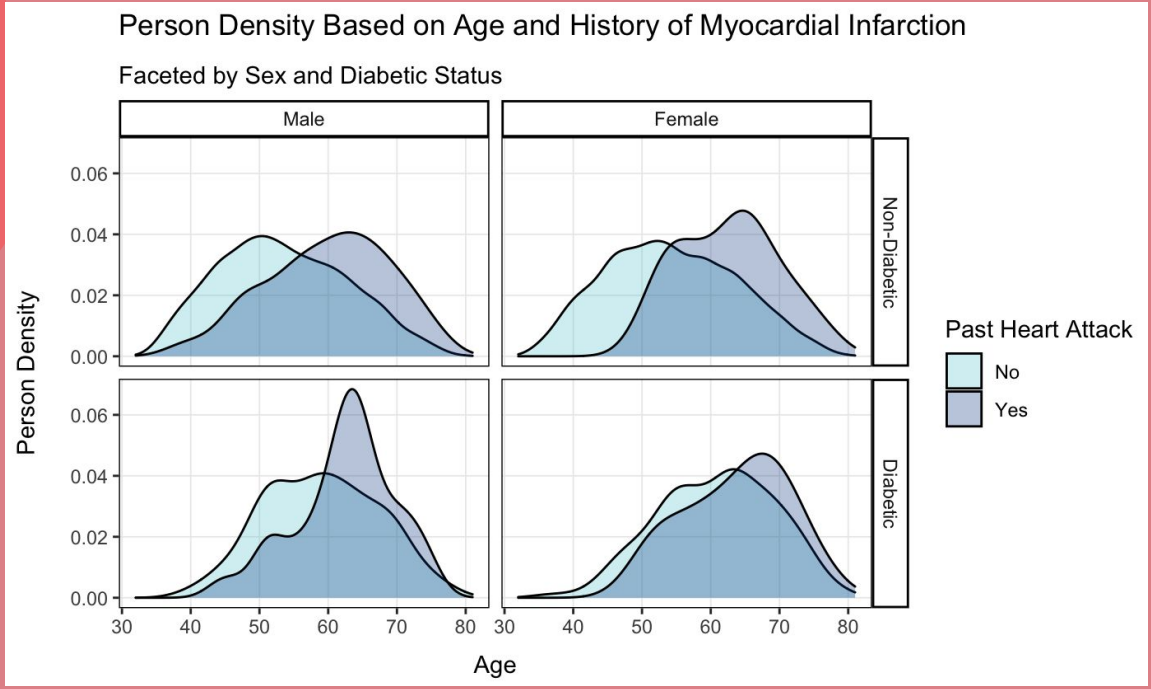
- In heart-healthy males, the low density lipoprotein cholesterol “LDL” distributions are similar regardless of hypertension
- In heart-healthy yet hypertensive females, the median LDL level is slightly higher compared to non-hypertensive individuals
- Females with hypertension and heart disease have lower median LDL levels but a greater interquartile range when compared to hypertensive males with heart disease



Significance:

- Based on our logistic regression model, hypertension increases the log odds of suffering from heart disease by a factor of 0.97 with a p-value of 3.84e-12. Every one unit increase in LDL level increases the log odds of suffering from heart disease by 0.004 with a p-value of 8.86e-4. If an individual is female, her log odds of suffering from heart disease decreases by 0.644 with a p-value of 8.49e-8.

Heart Attacks (Myocardial Infarctions)



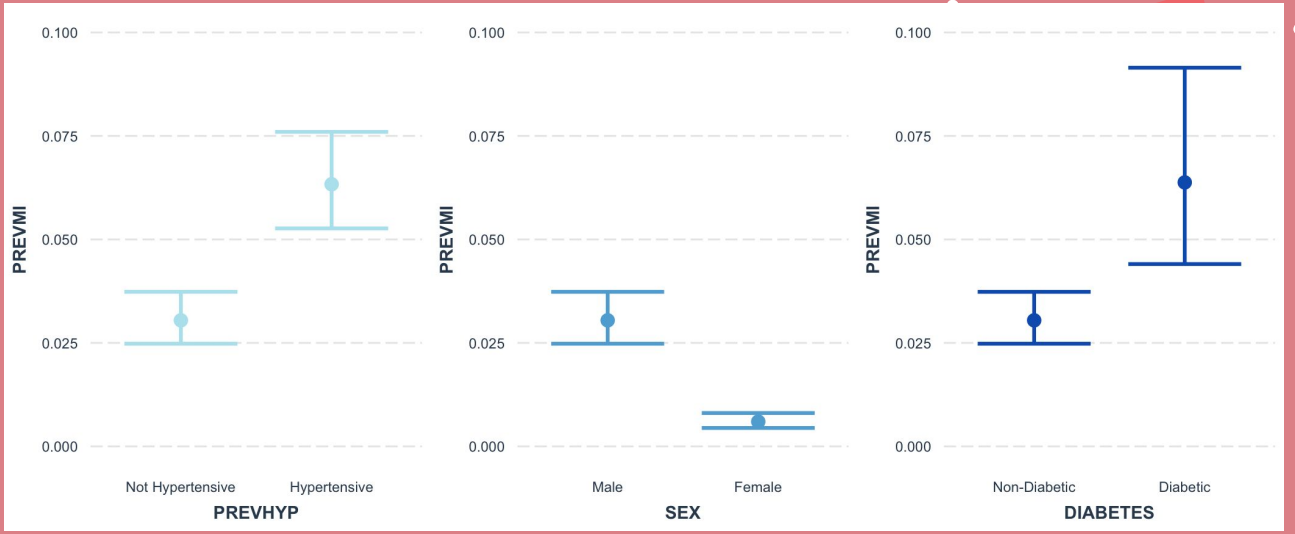
Outcomes:

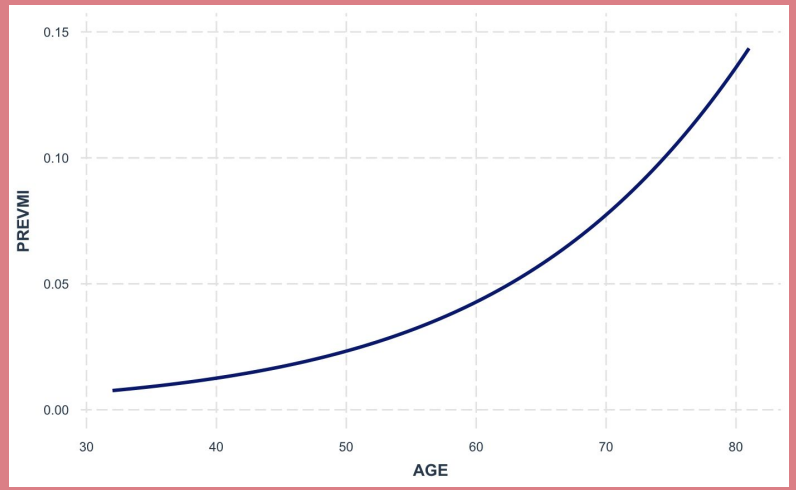
- People who've experienced a heart attack tended to older than their counterparts, implying that the chance of having a heart attack increases with age
- The person density changed significantly when a man was diagnosed with diabetes
- Males and females had extremely different person densities when both were diabetic, indicating a relationship

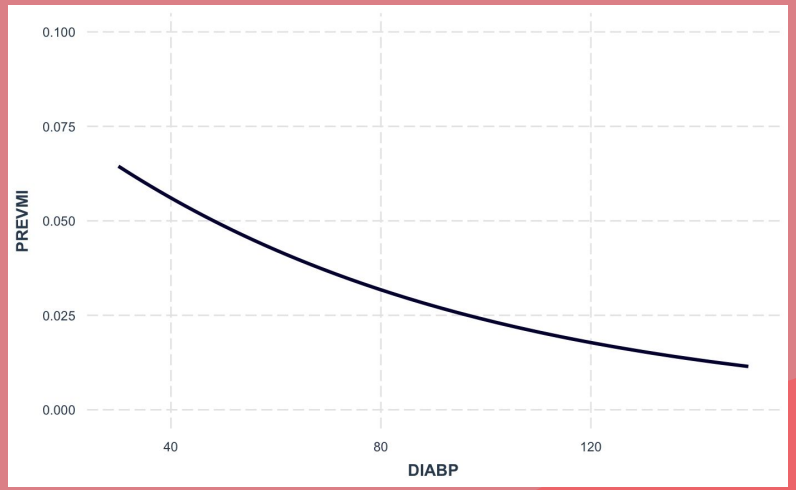
Probability of MI

- Y-axis describes probability of having a past heart attack
- X-axis is change in variables
- Note that age is the only graph with a different y-axis scale

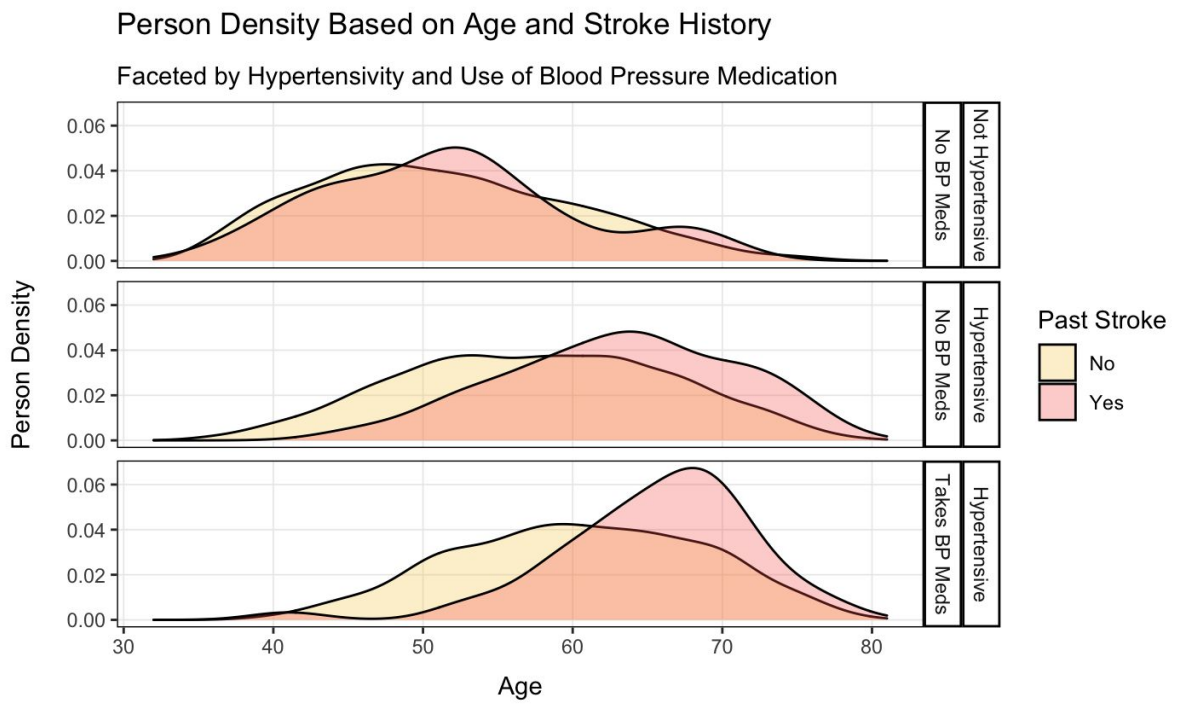
Top: Hypertension, Sex, Diabetes
Bottom: Age, Diastolic Blood Pressure







Factors That Indicate Past Stroke



Outcomes:

- Hypertension, blood pressure medication, and age were the most significant predictors
- Mean age tends to be higher for populations with history of a stroke

Significance:

- Each variable increased the chance of PREVSTRK by 1 to 2% and had a p-value < 0.005

Conclusion

Sex, age, diabetes, hypertension, and diastolic blood pressure were the most important contributors to poor heart health

- Men tend to be worse off than women
- Older ages negatively affects the heart and related conditions
- Diabetes increases the risk of heart problems because it can increase blood pressure and LDL (see slide 6) for extended periods of time, damaging artery walls
- A hypertension diagnosis means smaller passageways for blood flow, constricting heart performance
- Diastolic blood pressure measures pressure in the arteries when the heart isn't beating - better performance when the heart isn't active indicates better heart health