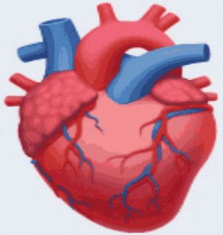
Cardiovascular Disease
The King of Death



Mahdee Abuelhawa

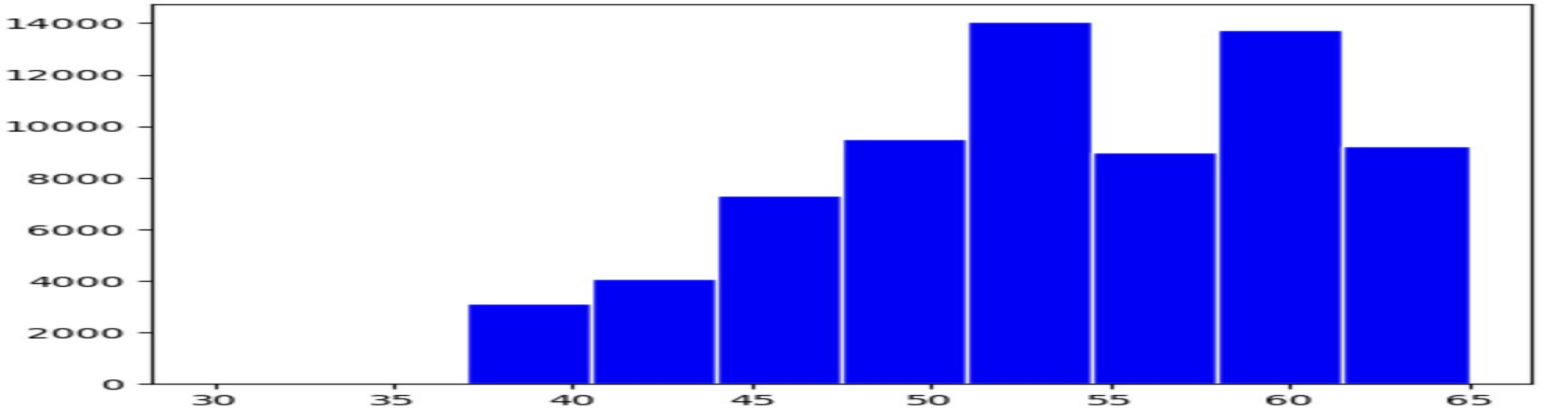
Cardiovascular Disease

- Cardiovascular disease (CVD) refers to a group of disorders affecting the heart and blood vessels, including conditions such as coronary artery disease, heart failure, and stroke, often caused by factors like high blood pressure, high cholesterol, and lifestyle choices.
- CVD is globally the leading cause of death, approximately taking the lives of nearly 18 million people every year and accounting for 32% of all deaths worldwide. According to data provided by the World Health Organization(WHO).
- Today we will be addressing what is the leading cause of cardiovascular disease based on our data and what can we do to mitigate the risk of CVD.

DataSet

- The Dataset we will be analyzing today consists of 70,000 data points consisting of 11 different variables.
- Variables:
  - Age
  - Height
  - Weight
  - Gender
  - Systolic Blood Pressure
  - Diastolic Blood Pressure
  - Cholesterol
  - Glucose
  - Smoking
  - Activity

Age

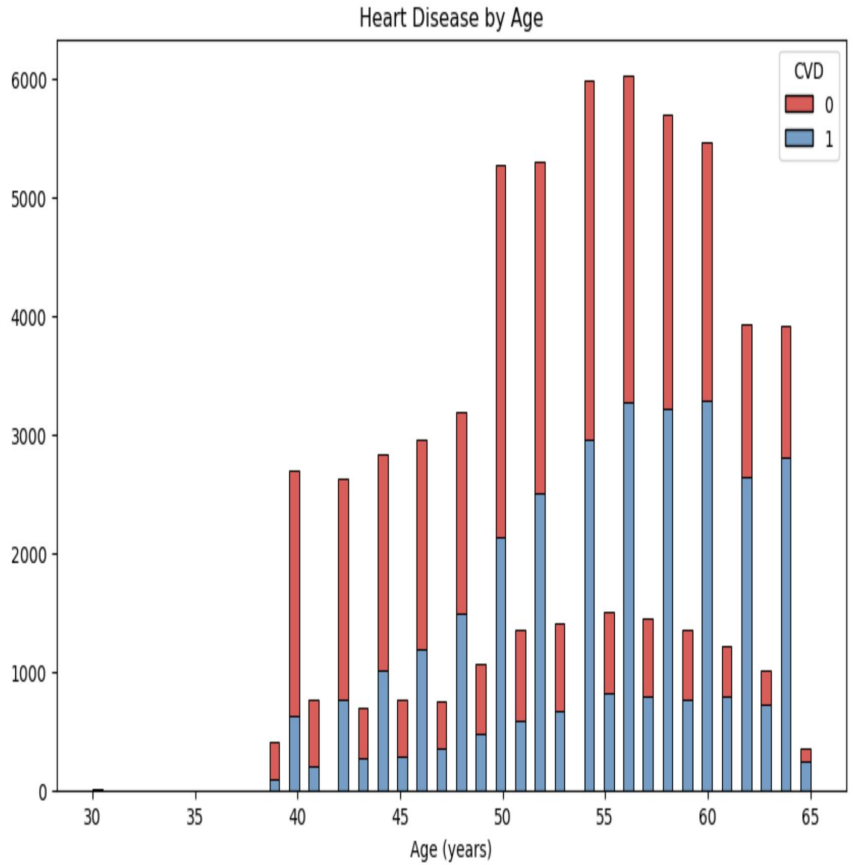


- The average age in this dataset was 53 years old. The Oldest age in this dataset was 65, while the youngest age in this dataset was 30 years old. 25% of the data consisted of ages below 48 years old, the median value is 54 years old, and 75% are below the age of 58 years old.

Age and CVD

- When analyzing this visual you can see a trend representing an increase in CVD as age increases.
- When comparing the percentages the youngest age group in the dataset consisted of 22% having CVD, while the oldest age group consisted of 68% having CVD.

	age_years	No CVD (%)	CVD (%)
0	30	100.000000	0.000000
1	39	77.750611	22.249389
2	40	76.888889	23.111111
3	41	72.845953	27.154047
4	42	70.693598	29.306402
5	43	61.159420	38.840580
6	44	64.187522	35.812478
7	45	61.822985	38.177015
8	46	59.898477	40.101523
9	47	53.713528	46.286472
10	48	53.193488	46.806512
11	49	55.618508	44.381492
12	50	59.388646	40.611354
13	51	56.379822	43.620178
14	52	52.838016	47.161984
15	53	52.807392	47.192608
16	54	50.684703	49.315297
17	55	45.594126	54.405874
18	56	45.763555	54.236445
19	57	45.041322	54.958678
20	58	43.493511	56.506489
21	59	43.247232	56.752768
22	60	39.780421	60.219579
23	61	35.053235	64.946765
24	62	32.832399	67.167601
25	63	28.641732	71.358268
26	64	28.392857	71.607143
27	65	31.250000	68.750000

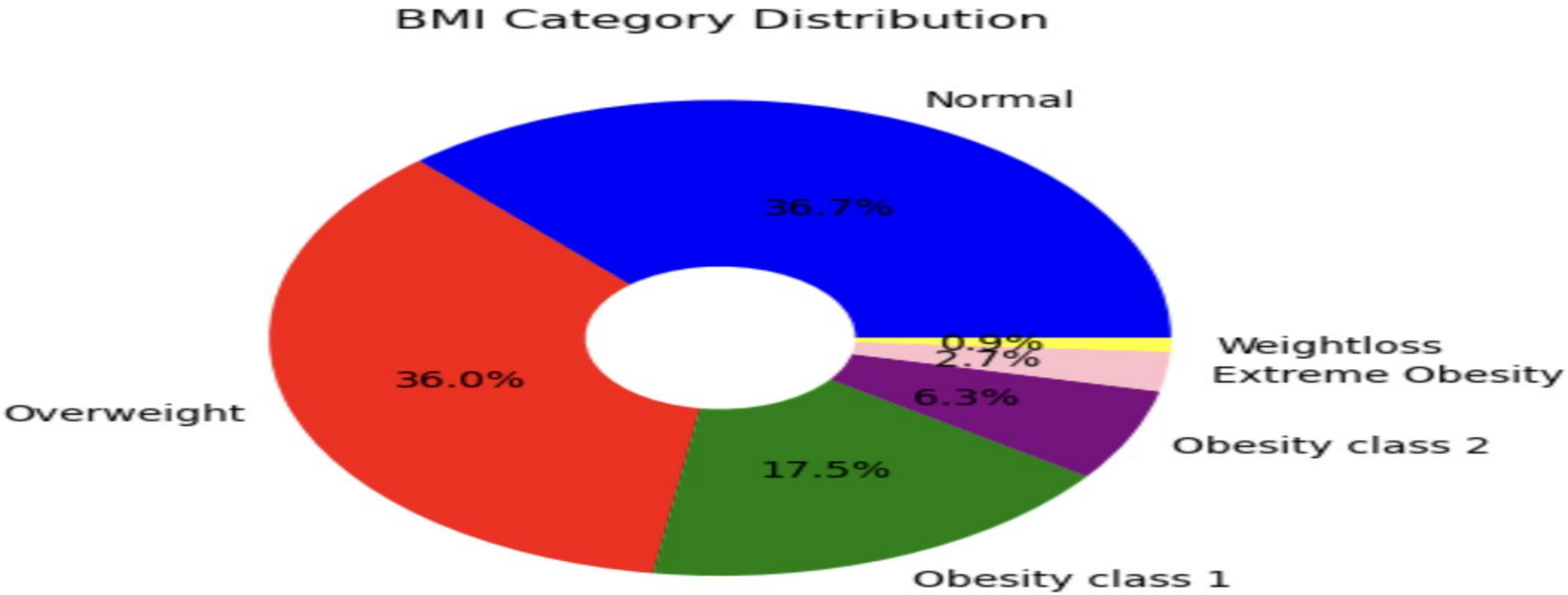


Height and Weight

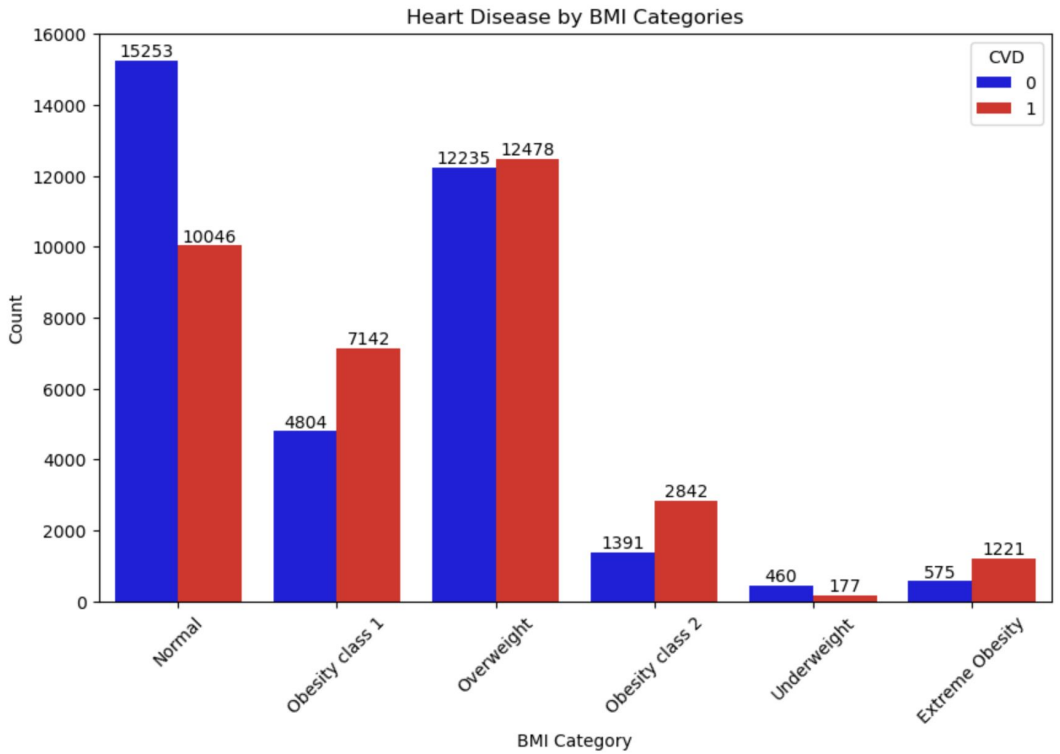
- In order to provide accuracy in determining the correlation between height and weight and CVD you need to calculate the Body Mass Index(BMI) of each patient.
- The purpose of Body Mass Index (BMI) is to provide a simple and quick method for assessing whether a person has a healthy body weight in relation to their height.
- BMI = weight/(height)^2(m)
- After calculating the BMI I was able to categorize the patients based on normal weight, weight loss, overweight, obesity class 1 , obesity class 2, and extreme obesity.

Classification	BMI Index
Underweight	< 18.5
Normal	18.5-25
Overweight	25-30
Obesity Class 1	30-35
Obesity Class 2	35-40
Extreme Obesity	>40

BMI


BMI Category Distribution
Normal
36.7%
0.9%
2.7%
Weightloss
Extreme Obesity
6.3%
Obesity class 2
17.5%
Obesity class 1
36.0%
Overweight

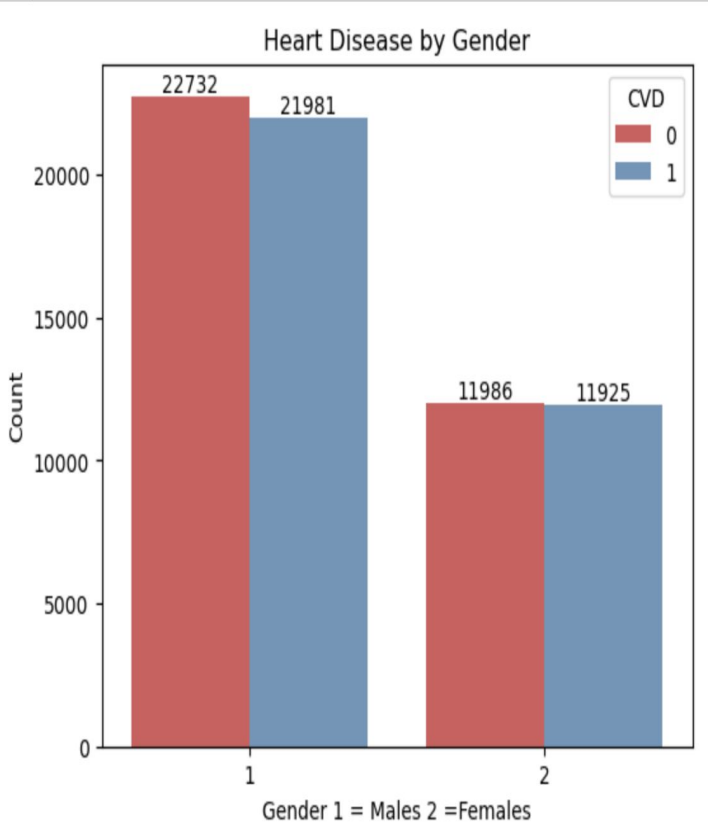
BMI



CVD	0	1
BMI_category		
Extreme Obesity	32.02	67.98
Normal	60.29	39.71
Obesity class 1	40.21	59.79
Obesity class 2	32.86	67.14
Overweight	49.51	50.49
Underweight	72.21	27.79

Gender

- This dataset consisted of 45,530 females and 24,470 males.
- 49.87% of the males in the dataset did have cardiovascular disease, while 49.67% of females have cardiovascular disease.
- Gender is certainly a factor that can contribute to cardiovascular disease, but as the data presents it is not a sole factor that would be able to determine cardiovascular disease.

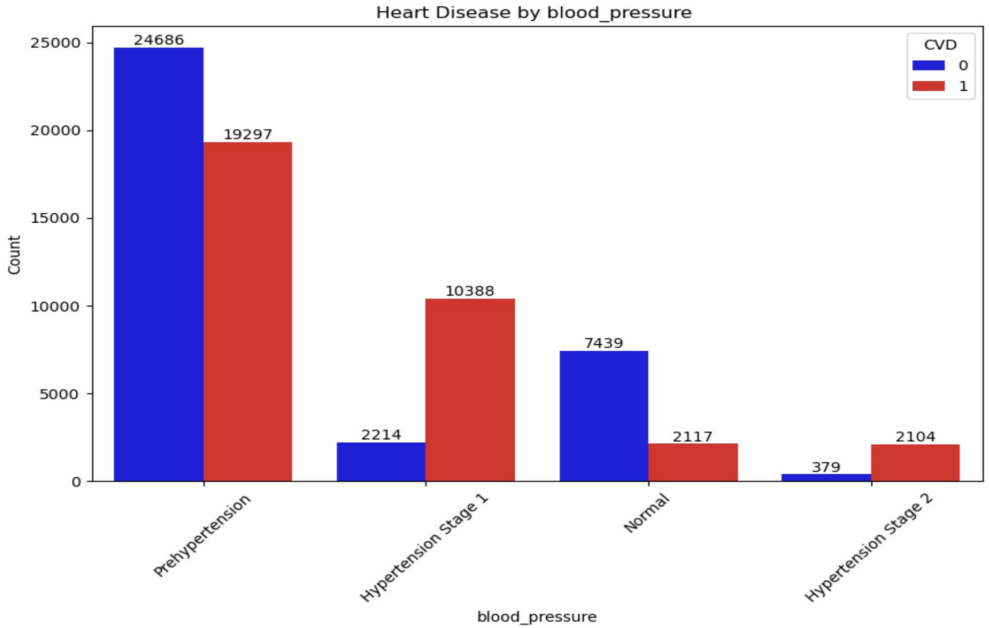


Blood Pressure

- Blood pressure is the force exerted by circulating blood against the walls of the body's arteries as the heart pumps it around the body.
- Blood pressure is calculated by dividing the systolic blood pressure divided by the diastolic blood pressure.
- In this dataset the average systolic pressure was 129.14 and the average diastolic 96.63. A normal/healthy blood pressure would be 120/80.

BP Classification	Values
Normal BP	<120/80
Prehypertension	120-129/<80
Stage 1 Hypertension	130-139/80-89
Stage 2 Hypertension	>140/>90
Hypertension Crisis	>180/>120

Blood Pressure



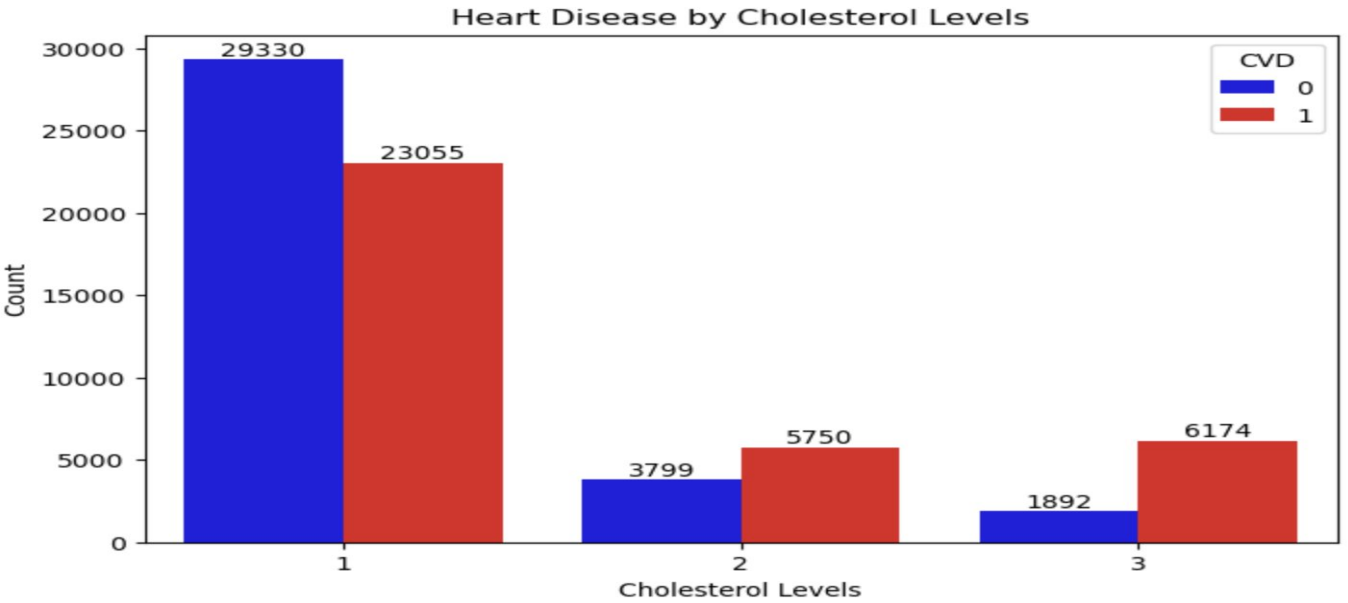
CVD	0	1
blood_pressure_category		
Hypertension Stage 1	17.57	82.43
Hypertension Stage 2	15.26	84.74
Normal	77.85	22.15
Prehypertension	56.13	43.87

Cholesterol

- Cholesterol levels help determine several important aspects of cardiovascular health and overall well-being. Cholesterol is a waxy, fat-like substance found in the cells of the body and the bloodstream.
- A total cholesterol level of less than 200 mg/dL is normal, 200 to 239 mg/dL is borderline high, and 240 mg/dL or greater is high
- This dataset classified cholesterol in 3 different ways. Normal Cholesterol levels(1), above normal cholesterol levels(2), and way above normal cholesterol levels(3).

Normal Cholesterol	51,501
Above Normal Cholesterol	9,271
Way Above Normal Cholesterol	7,852

Cholesterol



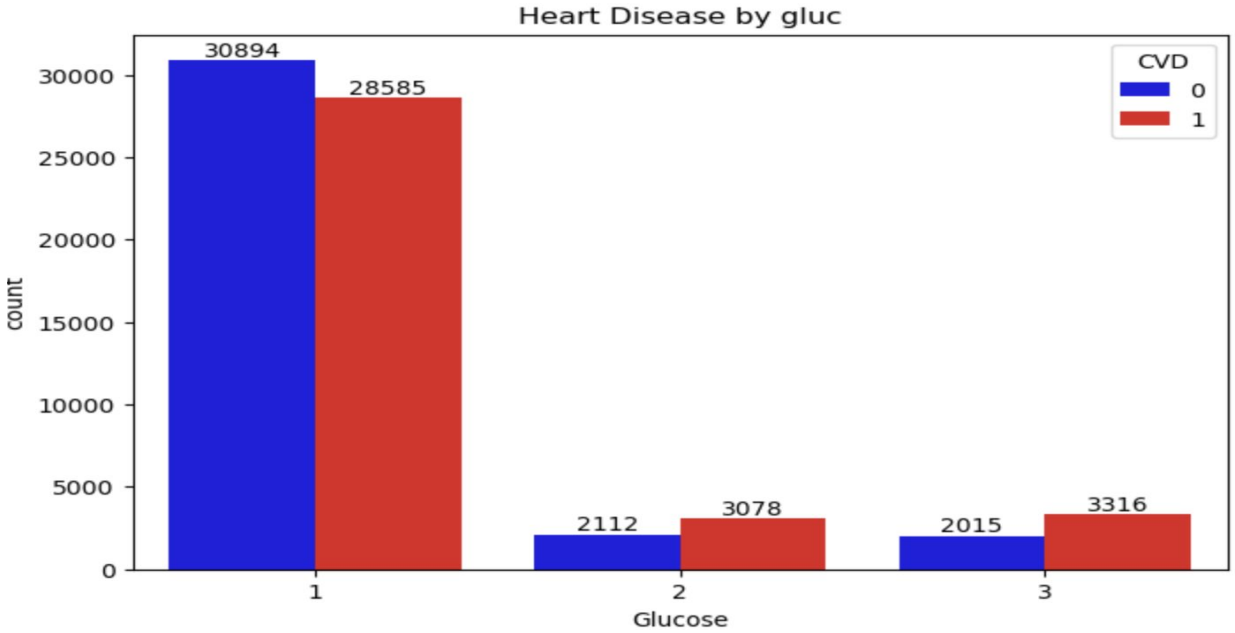
CVD	0	1
Cholesterol		
1	55.99	44.01
2	39.78	60.22
3	23.46	76.54

Glucose

- Glucose refers to the simple sugar that is a critical source of energy for the body's cells. Glucose plays a critical role in the development and progression of cardiovascular disease, and managing blood sugar levels is essential for reducing cardiovascular risk and promoting heart health.
- This dataset classifies glucose levels in three different categories; Normal Glucose levels(1), above normal glucose levels(2), and way above normal glucose levels(3).

Normal Glucose	<100mg/dL	58,366
Above Normal Glucose levels	100-125mg/dL	5,216
Way Above normal Glucose levels	>126mg/dL	5,042

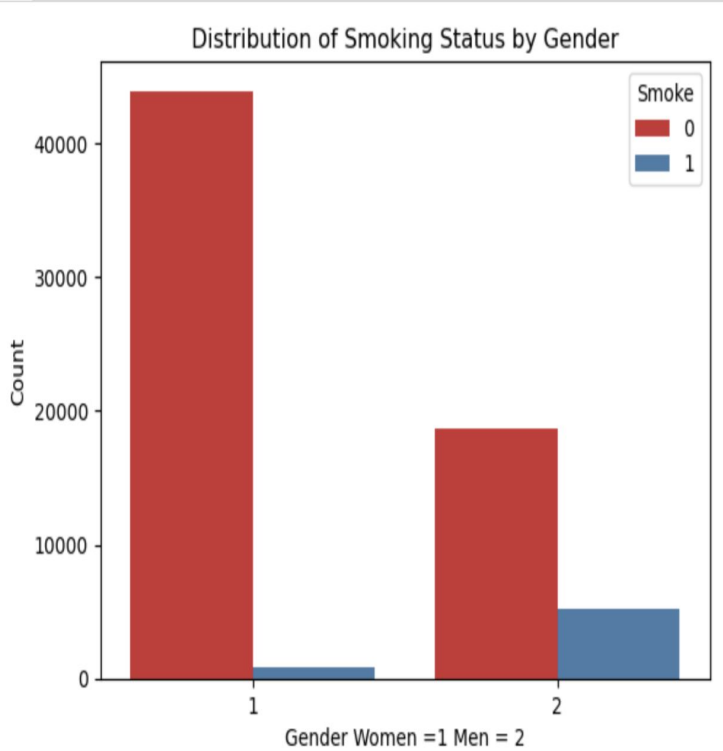
Glucose



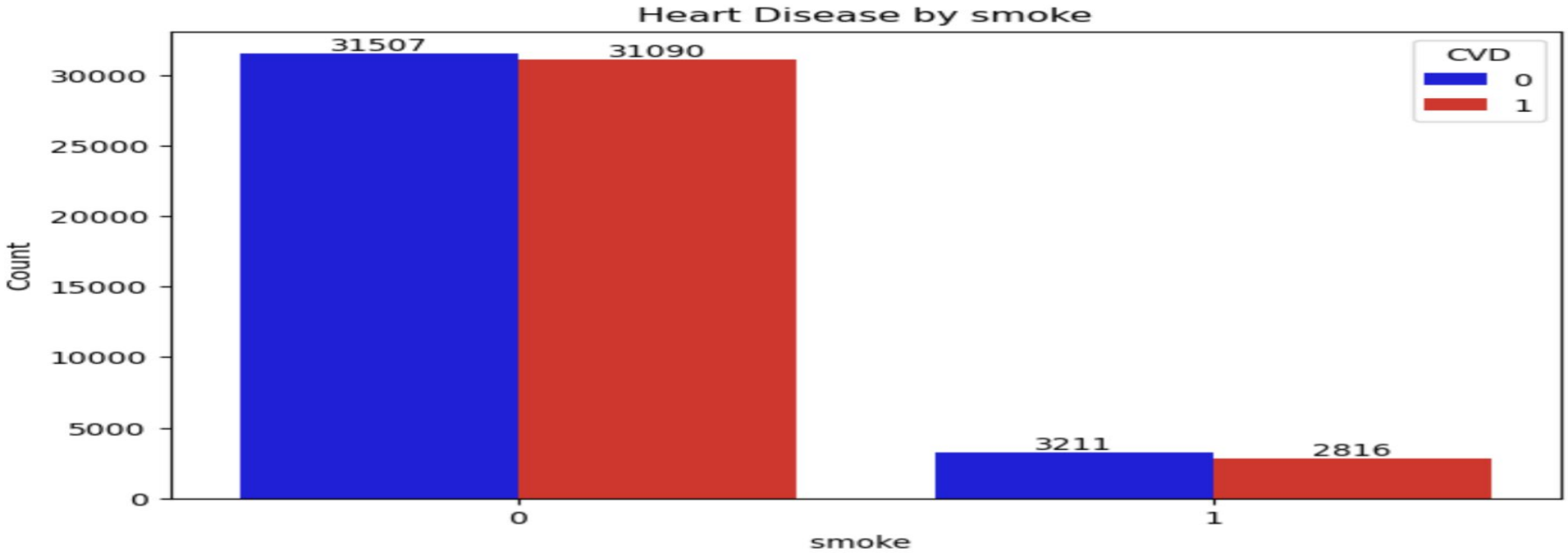
CVD	0	1
Glucose		
1	51.94	48.06
2	40.69	59.31
3	37.80	62.20

Smoking

- Smoking is included in CVD dataset because it is a significant risk factor for the development and progression of cardiovascular diseases. Smoking is a very commonly practiced globally and is often considered when discussing CVD disease.
- In this dataset 62,597 patients did not classify as smokers, while 6,027 did classify as smokers.
- 86% of the classified smokers were male and only 14% of the classified smokers were female.



Smoking

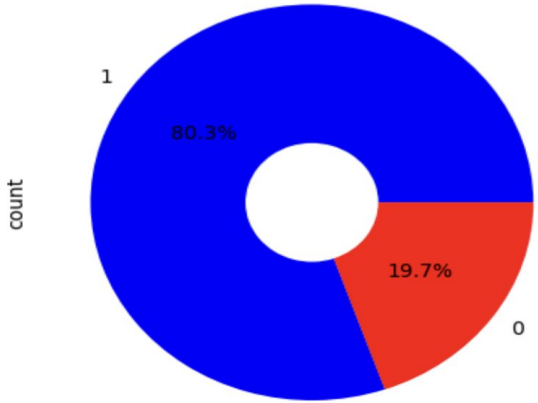


CVD	Smoke	0	1
0	0	50.333083	49.666917
1	1	53.276921	46.723079

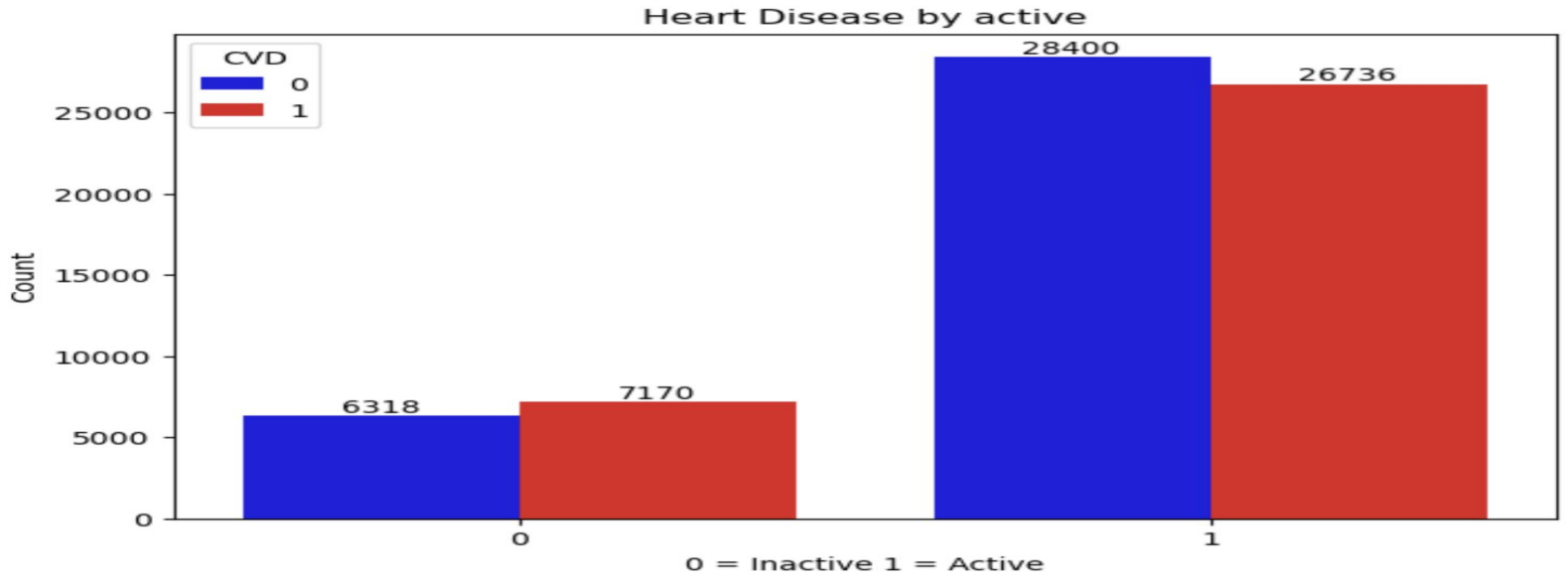
Physical Activity

- Physical Activity is a very vital factor when determining cardiovascular disease, because it can play a very essential role in reducing cardiovascular disease. Physical activity was subjective in this dataset either you did it or you didn't.

```
Active
1    55136
0    13488
Name: count, dtype: int64
```



Activity



	Active	No CVD (%)	CVD (%)
0	0	46.841637	53.158363
1	1	51.508996	48.491004

Comparing the Factors

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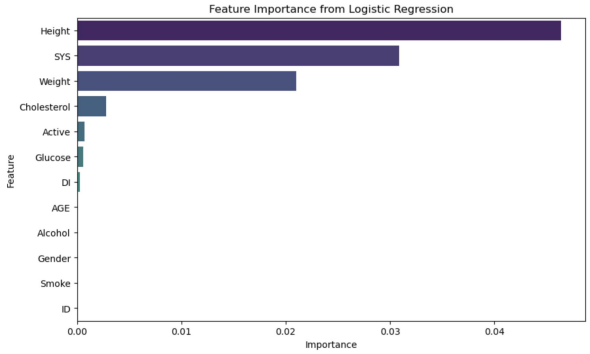
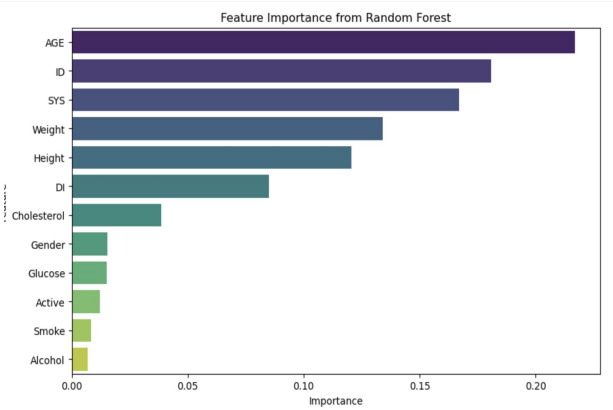
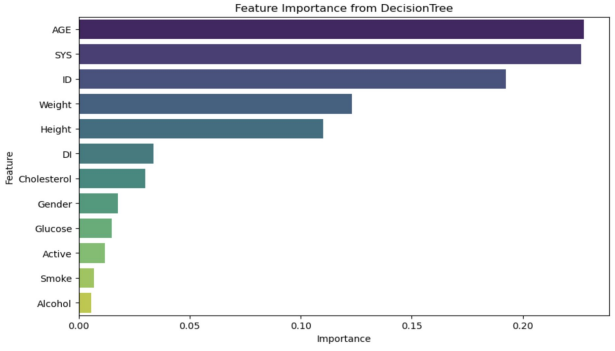
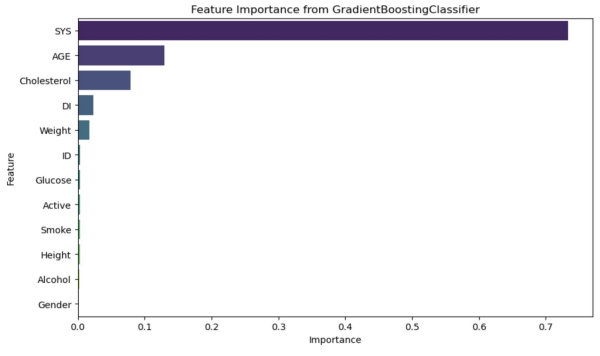
Blood Pressure and Age

- When comparing the numbers on the previous slide the two factors that correlated the most with CVD was blood pressure and age.
- This can also be seen by running a variety of predictive models like logistic regression model, random forest classifier, decision tree classifier, and the gradient boosting classifier.









Solutions

- As sad as it is there is no solution to aging.
- There is solutions to preventing cardiovascular disease, which can be seen through the observations in our dataset.
- We observed that the more involved you are in physical activity the lower your chances are of getting some sort of cardiovascular disease. The WHO recommends at least 150 minutes of moderate-intensity aerobic activity, or 75 minutes of vigorous-intensity aerobic activity per week.
- Along with being more physically active maintaining a healthy BMI is also vital to avoiding any cardiovascular disease. Patients whose BMI was normal weight and underweight presented a much lower chance of having cardiovascular disease.
- Even though there was not a huge difference between smokers and non-smokers there was still a increase of CVD in smokers than non-smokers.

Blood Pressure Solutions

- Blood pressure could fluctuate at times of measuring depending if you consumed something prior to measuring or depending on how are you feeling. It is best to consistently measure your blood pressure at times that limit any external factors so prior to eating, after resting, or at home when you are relaxing
- There are many ways to to improve blood pressure that were already mentioned like consistent exercise, quit smoking, and maintaining a healthy BMI.
- A healthy BMI can be maintained through a well-balanced diet and constantly monitoring your weight. This can be done by measuring your weight or body fat percentage.
- Reducing sodium, consuming more fruits,vegetables, whole grains, reducing alcohol and caffeine consumption are all dieting techniques to improve blood pressure.
- Techniques outside of dieting include reducing smoking, getting enough sleep, and monitoring blood pressure regularly.