

Visualizing and Predicting Heart Diseases with an Interactive Dash Board

Introduction:

Heart disease (heart disease) is a group of diseases related to cardiovascular diseases, manifested by a violation of the normal functioning of the heart. May be caused by damage to the epicardium, pericardium, myocardium, endocardium, valvular apparatus of the heart, heart vessels. According to the National Heart, Lung, and Blood Institute in Framingham (USA), the most important factors in the development of cardiovascular disease in humans are obesity, sedentary lifestyle, and smoking.

In this project we are trying to analyze the heart disease related data and be able to extract some insights from the data using Business Intelligence tools. To Extract the Insights from the data and put the data in the form of visualizations, Dashboards and Story we employed Tableau tool.

Project Flow:

To accomplish this, we have to complete all the activities listed below,

- Define Problem / Problem Understanding
 - o Specify the business problem
 - o Business requirements
 - o Literature Survey
 - o Social or Business Impact.
- Data Collection & Extraction from Database
 - o Collect the dataset,
 - o Storing Data in DB
 - o Perform SQL Operations
 - o Connect DB with Tableau
- Data Preparation
 - o Prepare the Data for Visualization

- Data Visualizations
 - o No of Unique Visualizations
- Dashboard
 - o Responsive and Design of Dashboard
- Story
 - o No of Scenes of Story
- Performance Testing
 - o Amount of Data Rendered to DB ‘
 - o Utilization of Data Filters
 - o No of Calculation Fields
 - o No of Visualizations/ Graphs
- Web Integration
 - o Dashboard and Story embed with UI With Flask
- Project Demonstration & Documentation
 - o Record explanation Video for project end to end solution
 - o Project Documentation-Step by step project development procedure

- **Define Problem / Problem Understanding:**

Problem Statement: Heart diseases are a leading cause of death globally, and early detection is crucial for effective prevention and treatment. The problem at hand is the lack of easily accessible and comprehensive tools for visualizing and predicting heart diseases. Existing methods and platforms often fall short in delivering user-friendly interfaces that allow individuals and healthcare practitioners to analyze and understand heart health data effectively. Many people remain unaware of their specific risk factors, impeding early intervention and preventive measures. This information gap limits timely decision-making in healthcare. To address this, the development of an interactive dashboard for visualizing and predicting heart diseases is essential, ensuring that data-driven insights are readily available, empowering individuals to manage their health, and aiding healthcare professionals in making informed decisions.

Business requirements:

The health care industry produces a huge amount of data. This data is not always made use to the full extent and is often underutilized. Using this huge amount of data, a disease can be detected, predicted, or even cured. The business requirements for analyzing the Heart Disease in world include identifying patterns and comparing factors of heart disease, creating interactive dashboards and reports, identifying areas for improvement, making data-driven decisions, comparing to the current situation and creating forecasting models for future performance. The ultimate goal is to gain insights and improve performance through data visualization techniques.

Literature Survey:

A literature survey is essential for gaining insights into existing research, methodologies, and best practices. It provides a foundation for informed decision-making and ensures that the project builds upon previous knowledge and avoids redundancy.

The literature survey for "Visualizing and Predicting Heart Diseases with an Interactive Dashboard" reviews heart disease prediction models, risk factors, data sources, visualization techniques, interactive healthcare dashboards, user interface design, machine learning in healthcare, challenges, validation, and recent advancements. It informs the project's development by integrating prior research and established principles into the interactive healthcare dashboard.

Social or Business Impact:

Social Impact: Analyzing heart disease has profound social impacts, ranging from individual-level health outcomes to community empowerment and public health initiatives. By promoting awareness, prevention, equitable healthcare access, and

research advancements, heart disease analysis plays a crucial role in improving the well-being of individuals and society as a whole.

Business Model/Impact: Analyzing heart disease has substantial business impacts across various sectors, including healthcare, medical technology, pharmaceuticals, digital health, insurance, research, workplace wellness, and consumer products. It creates market opportunities, drives innovation, and influences policy and advocacy efforts in the fight against heart disease.

- **Data Collection & Extraction from Database:**

Downloading the dataset: Downloaded the data set to make visualizations.

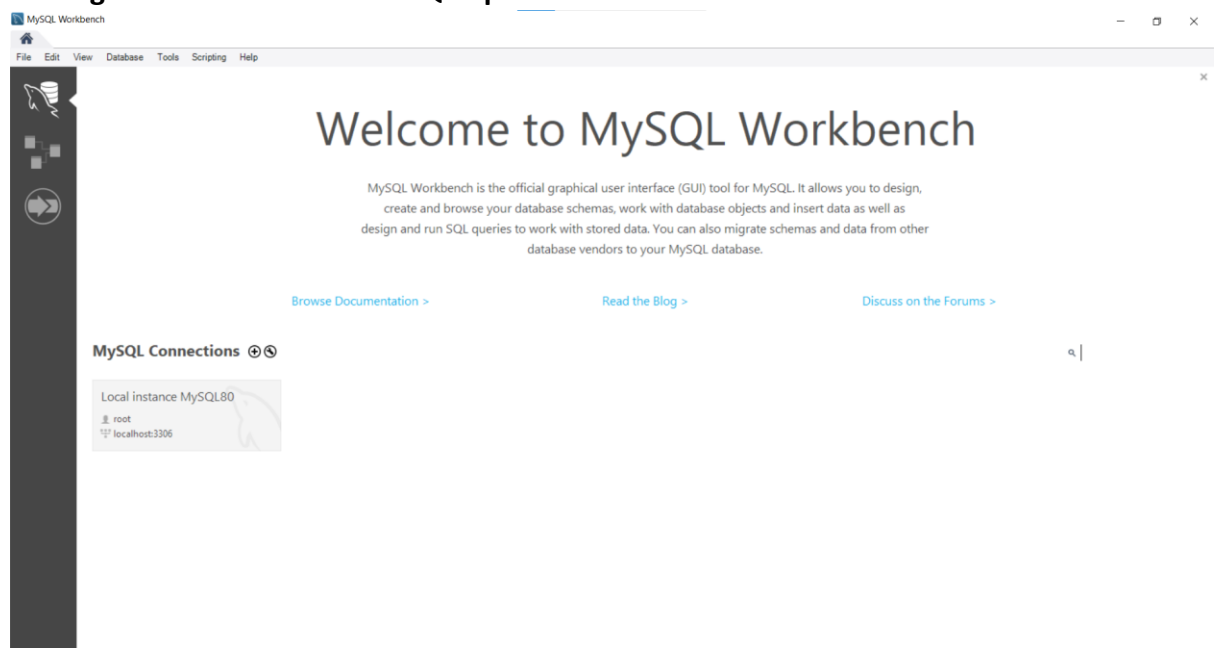
Understand the data: Data contains all the meta information regarding the columns described in the CSV files.

Column Description of the Dataset:

1. Heart Disease- target trait.
2. BMI – A value that allows you to assess the degree of correspondence between a person's mass and his height, and thereby indirectly judge whether the mass is insufficient, normal or excessive. It is important in determining the indications for the need for treatment.
3. Smoking: It is a major risk factor for cardiovascular disease. When smoke from a cigarette is inhaled, the reaction of the cardiovascular system immediately follows: within one minute, the heart rate begins to rise, increasing by 30% within ten minutes of smoking. The bad habit also increases blood pressure, fibrinogen and platelet levels, making blood clots more likely.
4. Alcohol Drinking - alcohol causes not only temporary disturbances in the functioning of the heart, but also permanent ones. Heart pain after alcohol is not the only health problem associated with alcohol consumption.
5. Stroke - Ischemic stroke occurs 4 times more often than haemorrhagic. One of the leading causes of this suffering is heart disease, which impairs its functioning, as a result of which the blood flow in the arteries is disturbed and the blood supply to the brain is reduced. Another cause of stroke in heart disease is thromboembolism, when clots form in the cavities of the heart (most often with heart failure) - blood clots.
6. Physical Health - how many days in a month did you feel poor physical health.
7. Mental Health - how many days in a month did you feel poor mental health.
8. DiffWalking - difficulty climbing stairs.
9. Sex - gender of a person.

10. Age Category - age category of the subjects.
11. Race- Race is a complex social construct that categorizes people into distinct groups based on certain physical and genetic characteristics
12. Diabetic – Person suffering from Diabetes
13. Physical Activity - adults who reported doing physical activity or exercise during the past 30 days other than their regular job
14. GenHealth - well-being.
15. Sleep Time - number of hours of sleep.
16. Asthma- Asthma is a chronic respiratory condition due to breathing Issue
17. Kidney Disease – Disease related to Kidney
18. Skin Cancer – People suffering from Skin Cancer.

Storing Data in DB & Perform SQL Operations:



MySQL Workbench

Local instance MySQL80 x

File Edit View Query Database Server Tools Scripting Help

Navigator

Filter objects

SCHEMAS

heart

Tables

heart_new2

Views

Stored Procedures

Functions

supermarket

superstore

sys

SQL File 2*

SQL File 3*

1 use heart;

2 select * from heart_new2;

3

4

Result Grid

Filter Rows

Export

Wrap Cell Contents

Fetch rows

heart_new2

HeartDisease BMI Smoking AlcoholDrinking Stroke PhysicalHealth MentalHealth DiffWalking Sex AgeCategory Race Diabet

No 16.6 Yes No No 3 30 No Female 55-59 White Yes

No 20.34 No No Yes 0 0 No Female 80 or older White No

No 26.58 Yes No No 20 30 No Male 65-69 White Yes

No 24.21 No No No 0 0 No Female 75-79 White No

No 23.71 No No No 28 0 Yes Female 40-44 White No

Yes 28.87 Yes No No 6 0 Yes Female 75-79 Black No

No 21.63 No No No 15 0 No Female 70-74 White No

No 31.64 Yes No No 5 0 Yes Female 80 or older White Yes

No 26.45 No No No 0 0 No Female 80 or older White Yes

No 40.69 No No No 0 0 Yes Male 65-69 White No

Schema: heart

Administration Schemas

Information

Object Info Session

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Read Only Context Help Snippets

Output

Action Output

Time Action Message Duration / Fetch

1 20:35:49 select * from heart_new2 4500 row(s) returned 0.047 sec / 0.062 sec

Connect DB with Tableau:

Tableau - Heart

File Data Server Window Help

Connections

localhost MySQL

Database

heart

Table

heart_new2

New Custom SQL

New Union

New Table Extension

heart_new2 (heart)

Connection

Live Extract

Filters

0 Add

heart_new2

Need more data?

Drag tables here to relate them. [Learn more](#)

heart_new2 19 fields 4500 rows 100 rows

Name

heart_new2

Fields

Type Field Name Physical Table Remote Fie...

Heart Disease heart_new2 HeartDisease

BMI heart_new2 BMI

Smoking heart_new2 Smoking

Heart Disease BMI Smoking Alcohol Drinking Stroke Physical Health Mental Health

No 16.6000 Yes No No 3 30

No 20.3400 No No Yes 0 0

No 26.5800 Yes No No 20 30

No 24.2100 No No No 0 0

No 23.7100 No No No 28 0

Yes 28.8700 Yes No No 6 0

Data Source

vs HeartDisease Asthma vs HeartDisease Race vs Mental Health Impact of smoking,Alcohol,diff w... BMI vs Gen Health Age vs BMI Other Disease vs Heart Disease Motion Chart Mental Health vs Physical Health Sheet 14

- **Data Preparation:**

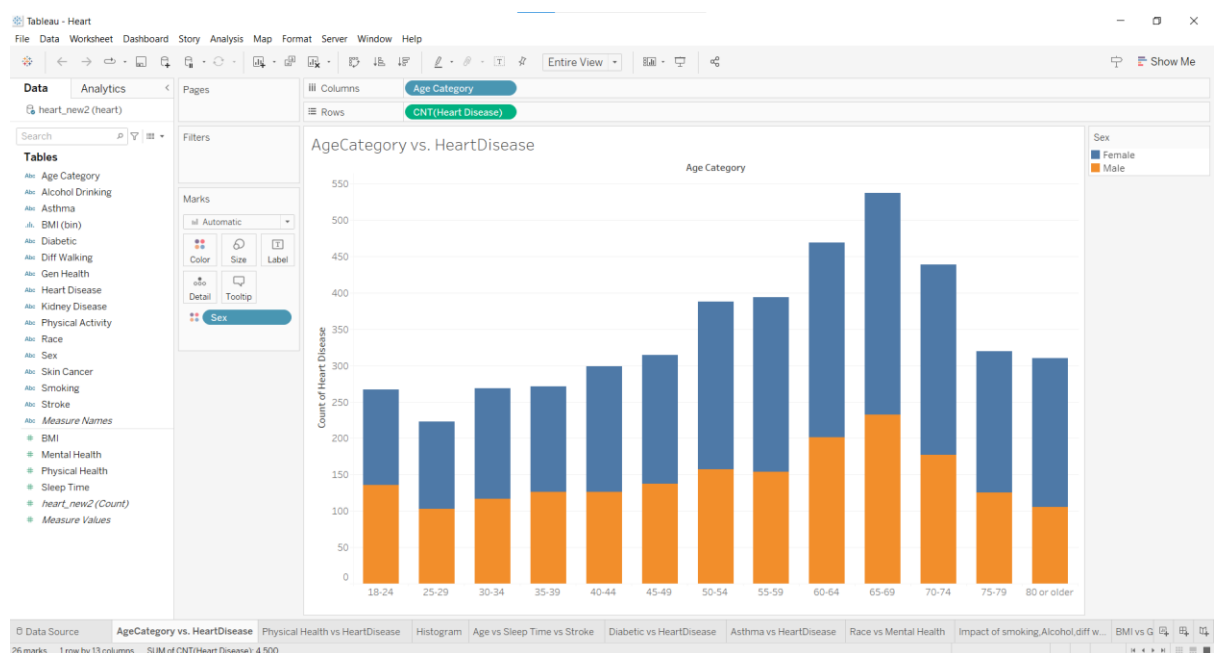
Prepare the Data for Visualization:

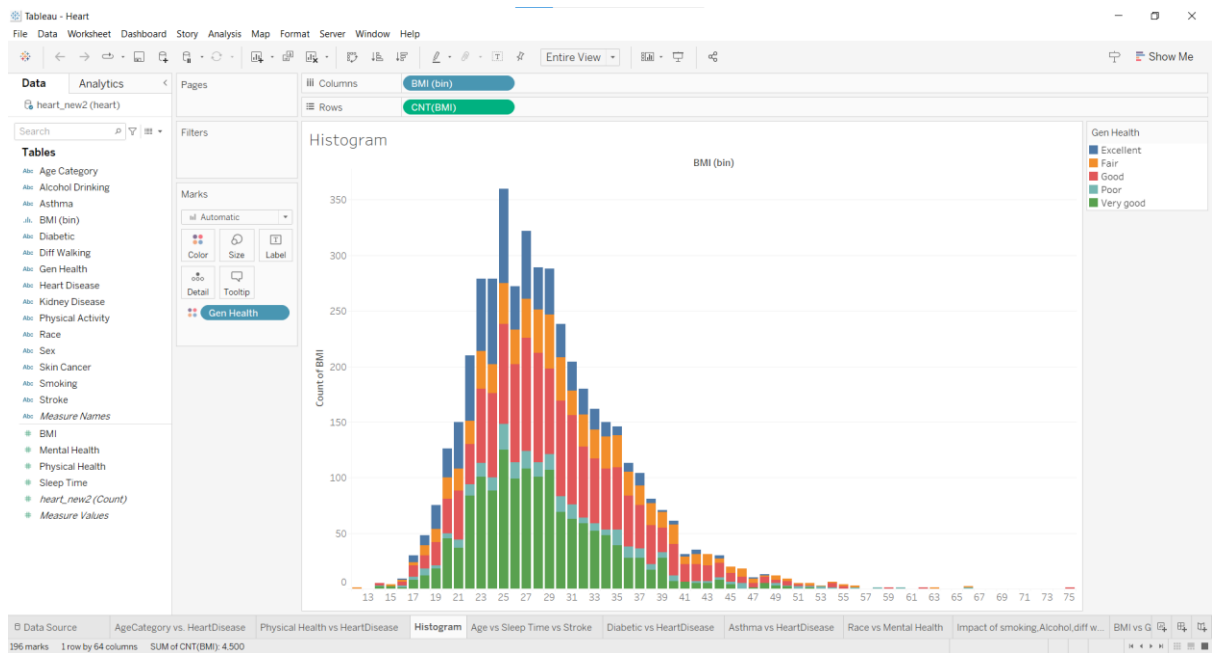
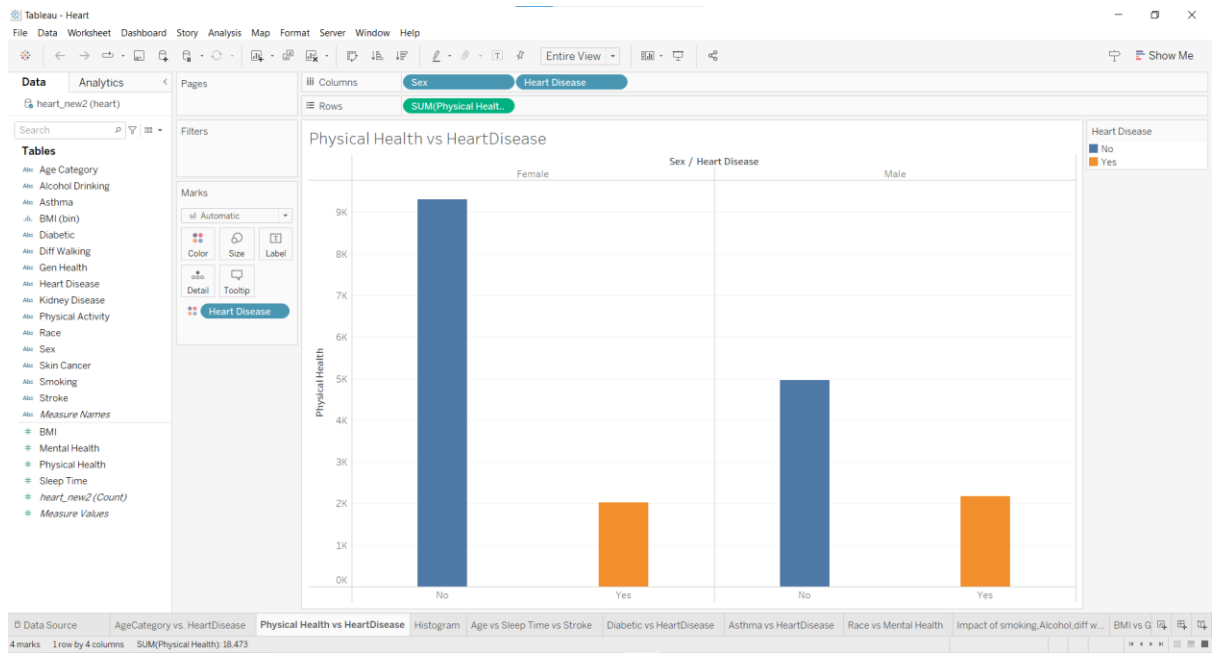
Preparing the data for visualization involves cleaning the data to remove irrelevant or missing data, transforming the data into a format that can be easily visualized, exploring the data to identify patterns and trends, filtering the data to focus on specific subsets of data, preparing the data for visualization software, and ensuring the data is accurate and complete. This process helps to make the data easily understandable and ready for creating visualizations to gain insights into the performance and efficiency. Since the data is already cleaned we can move to visualization.

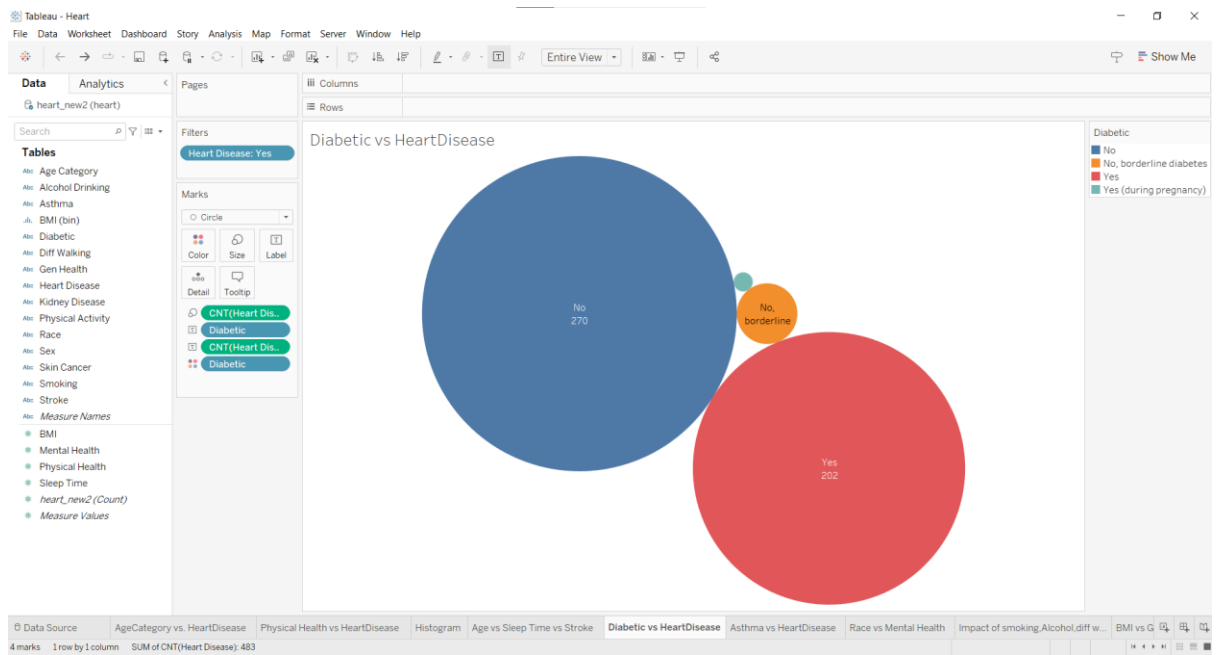
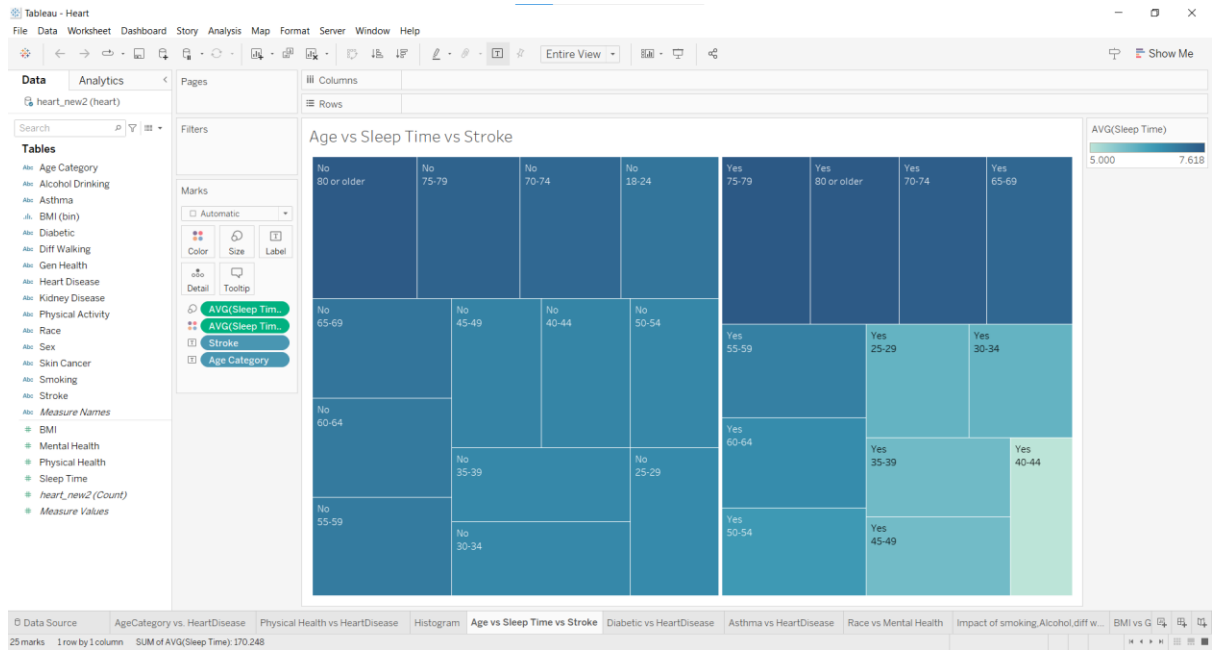
- **Data Visualization:**

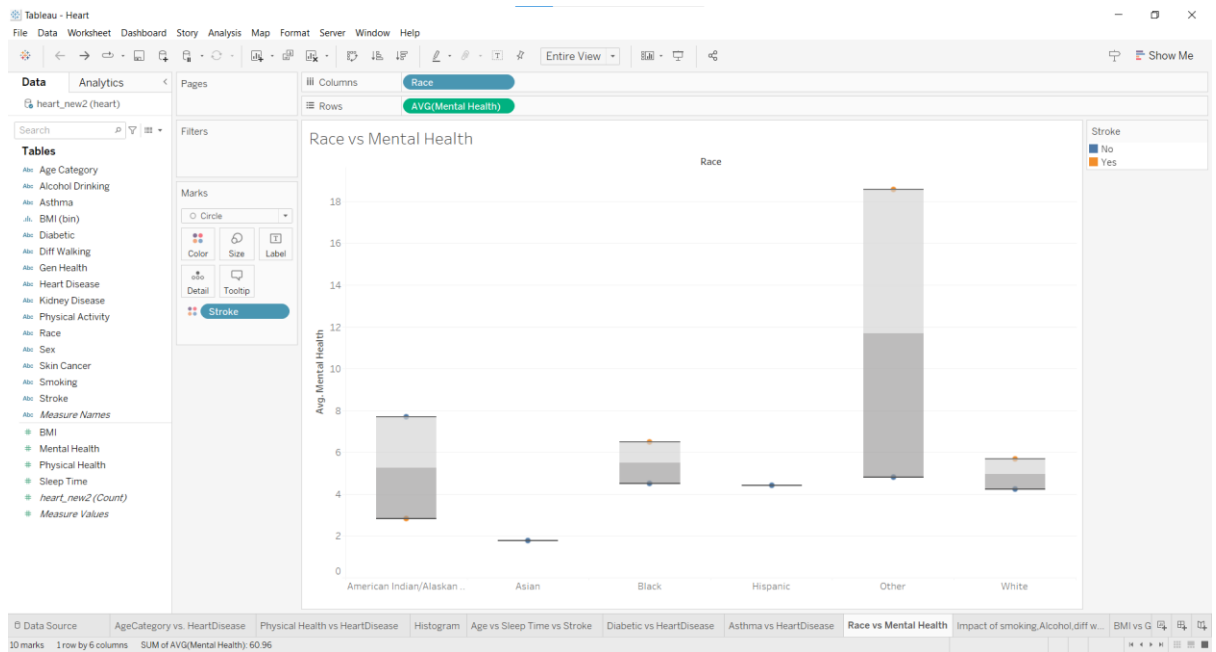
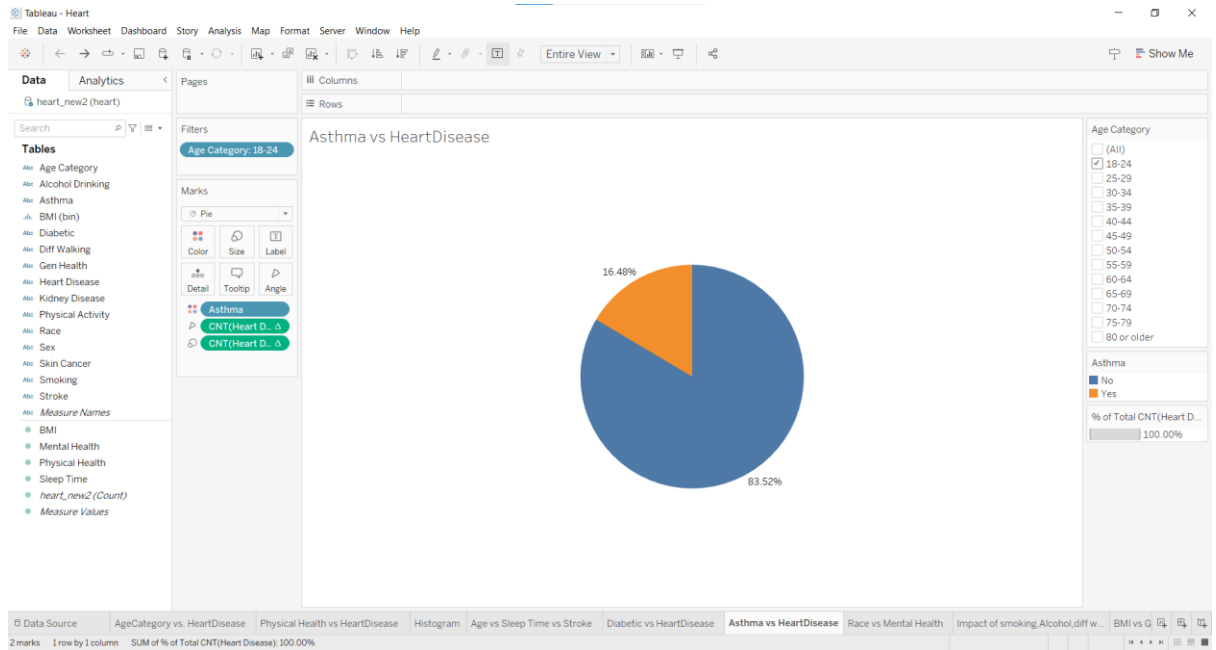
Data visualization is the process of creating graphical representations of data to help people understand and explore the information. The goal of data visualization is to make complex data sets more accessible, intuitive, and easier to interpret. By using visual elements such as charts, graphs, and maps, data visualizations can help people quickly identify patterns, trends, and outliers in the data.

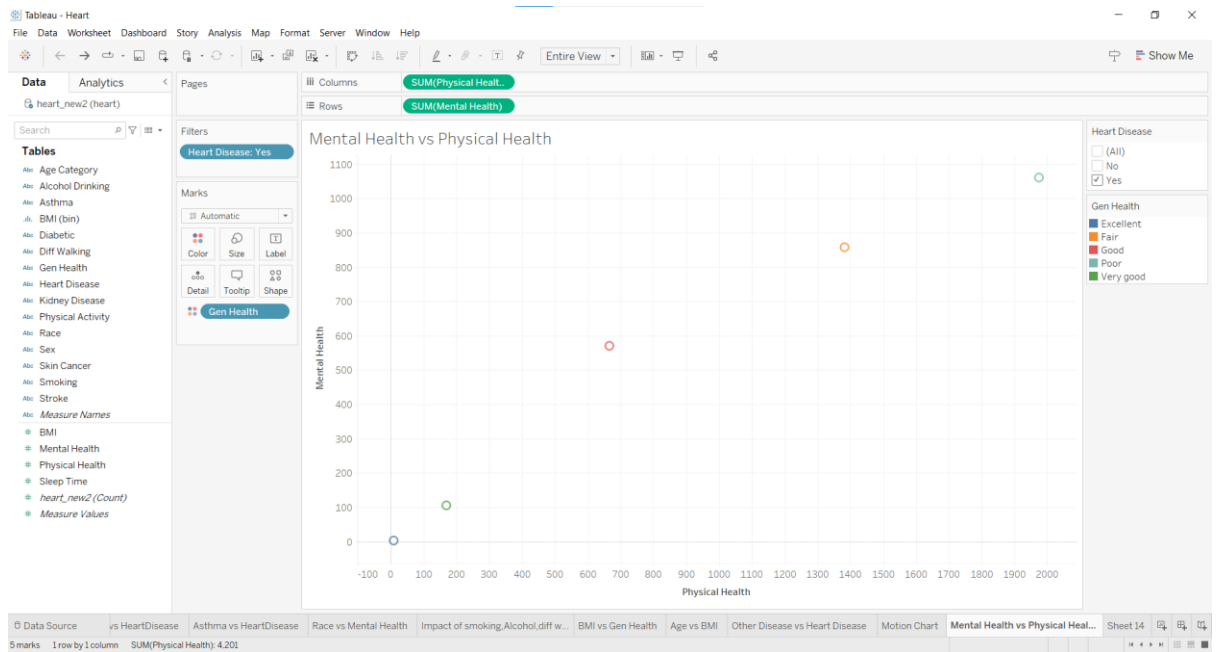
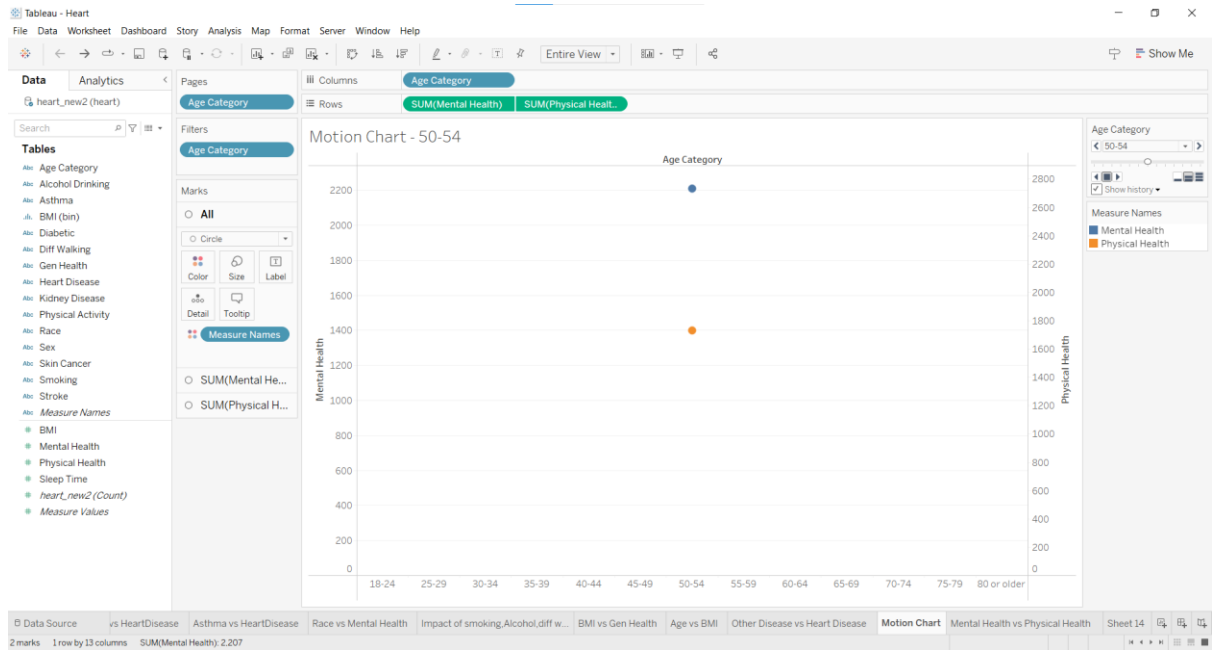
No of Unique Visualizations: 13







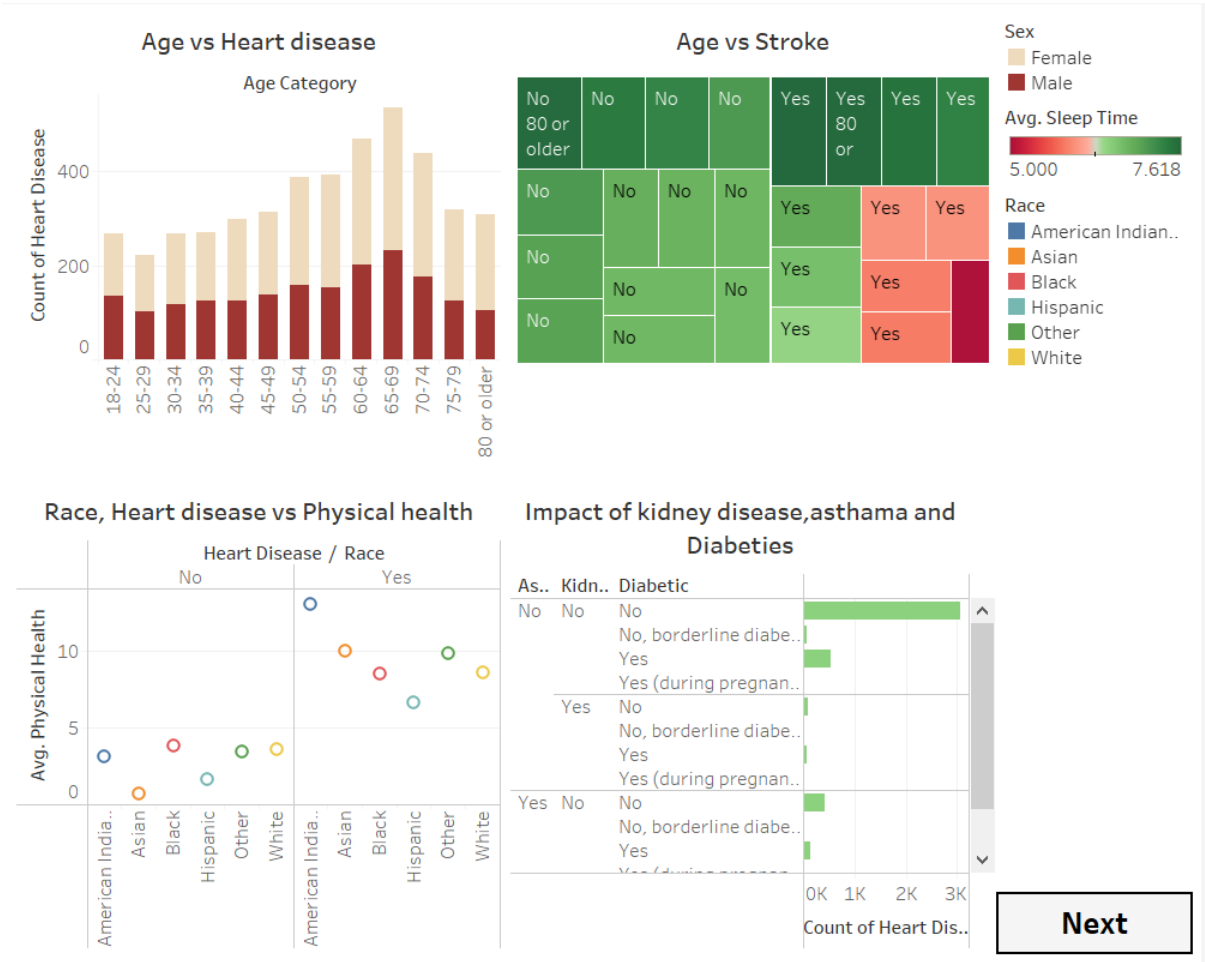


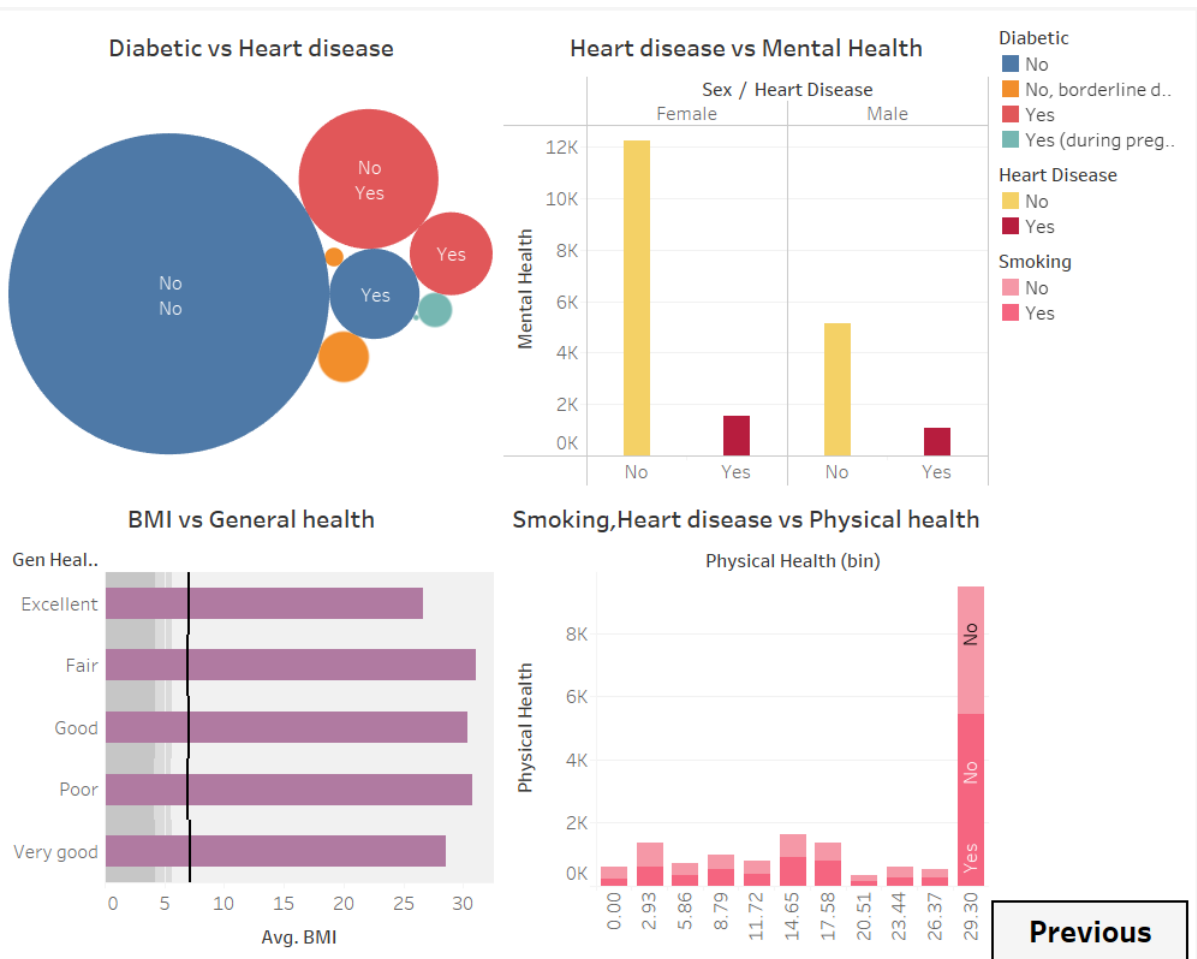


- Dashboard:**

A dashboard is a graphical user interface (GUI) that displays information and data in an organized, easy-to-read format. Dashboards are often used to provide real-time monitoring and analysis of data and are typically designed for a specific purpose or use case. Dashboards can be used in a variety of settings, such as business, finance, manufacturing, healthcare, and many other industries. They can be used to track key performance indicators (KPIs), monitor performance metrics, and display data in the form of charts, graphs, and tables.

Responsive and Design of Dashboard:



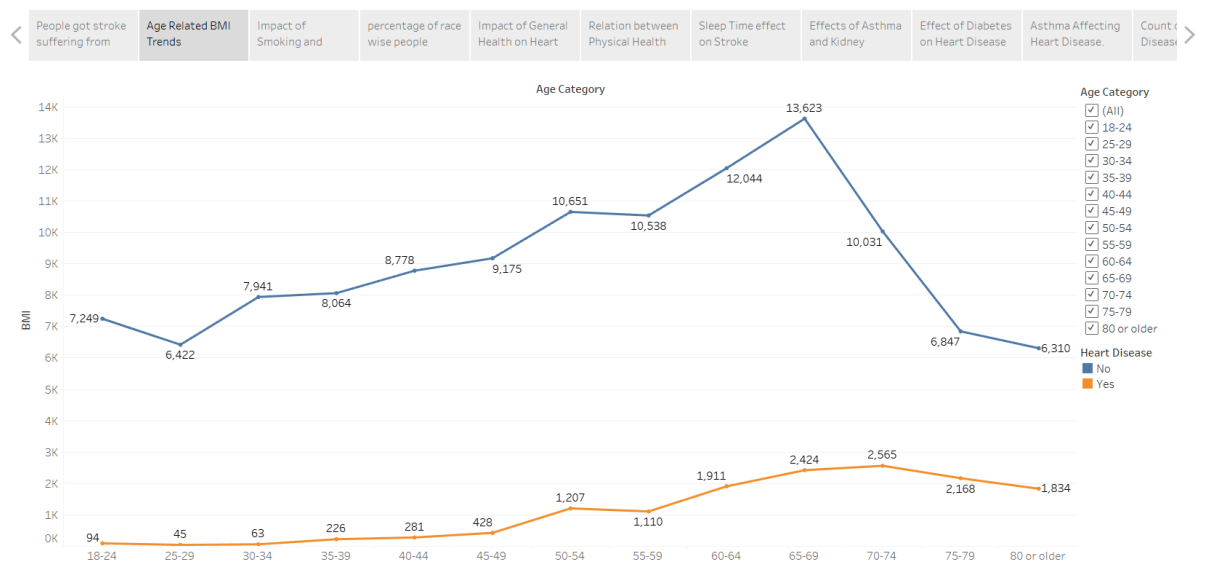


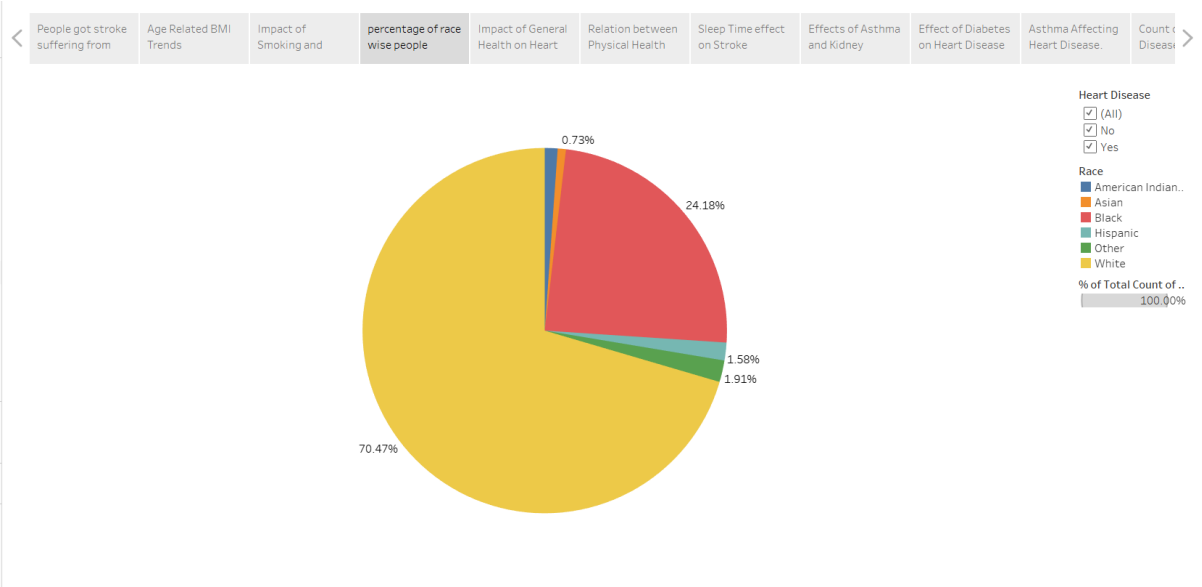
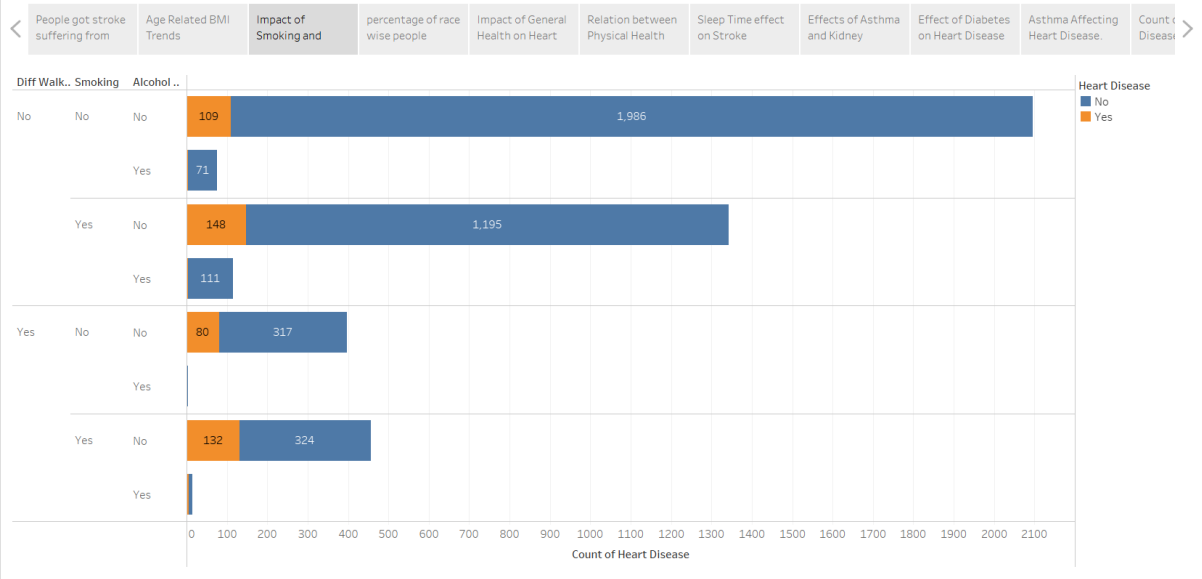
- **Story**

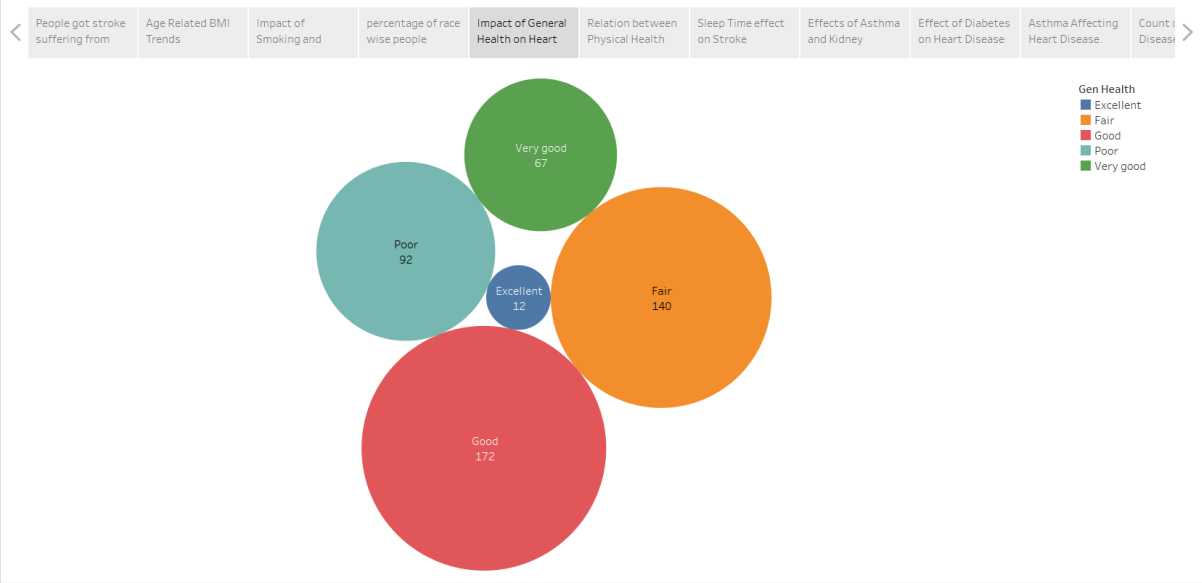
A data story is a way of presenting data and analysis in a narrative format, intending to make the information more engaging and easier to understand. A data story typically includes a clear introduction that sets the stage and explains the context for the data, a body that presents the data and analysis logically and systematically, and a conclusion that summarizes the key findings and highlights their implications. Data stories can be told using a variety of mediums, such as reports, presentations, interactive visualizations, and videos.

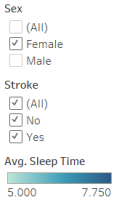
No of Scenes of Story: 11

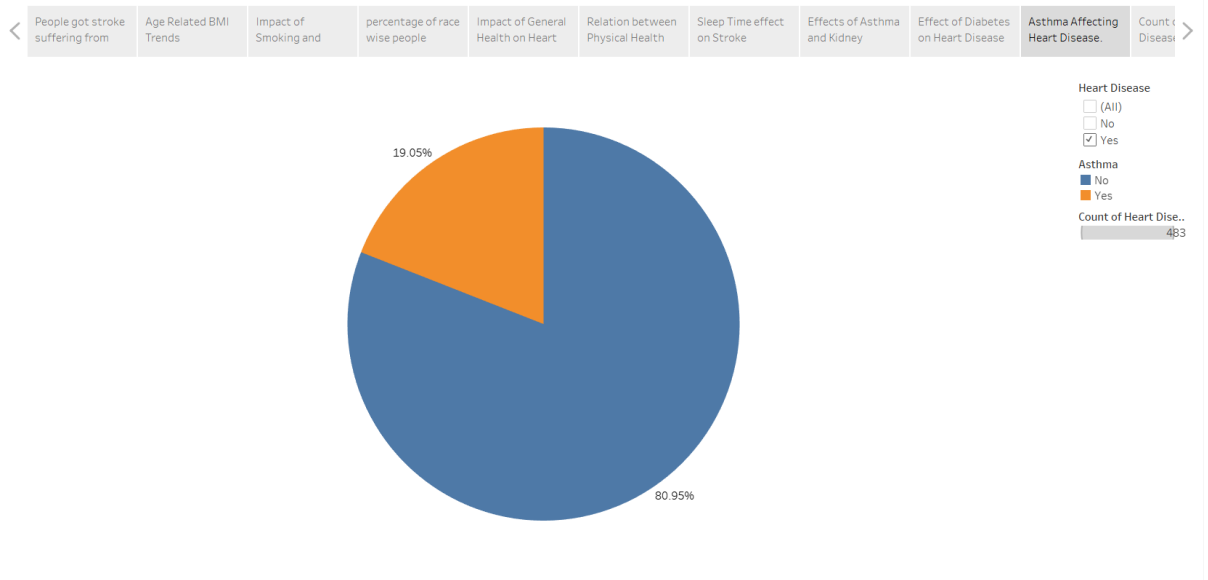
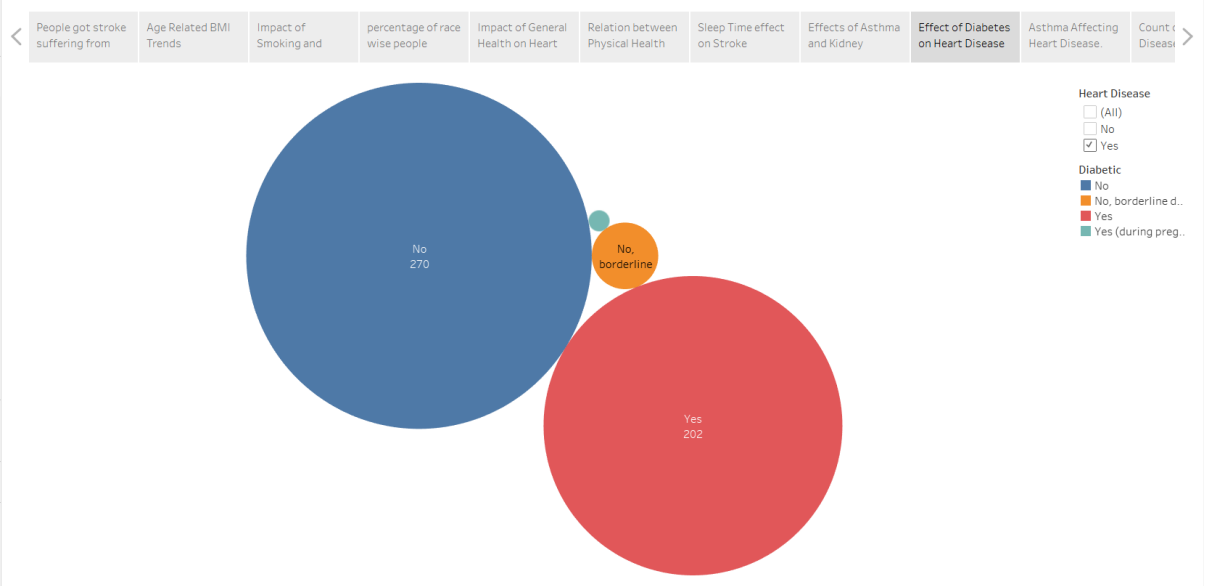
Heart Diseases Visualisation & Prediction Story

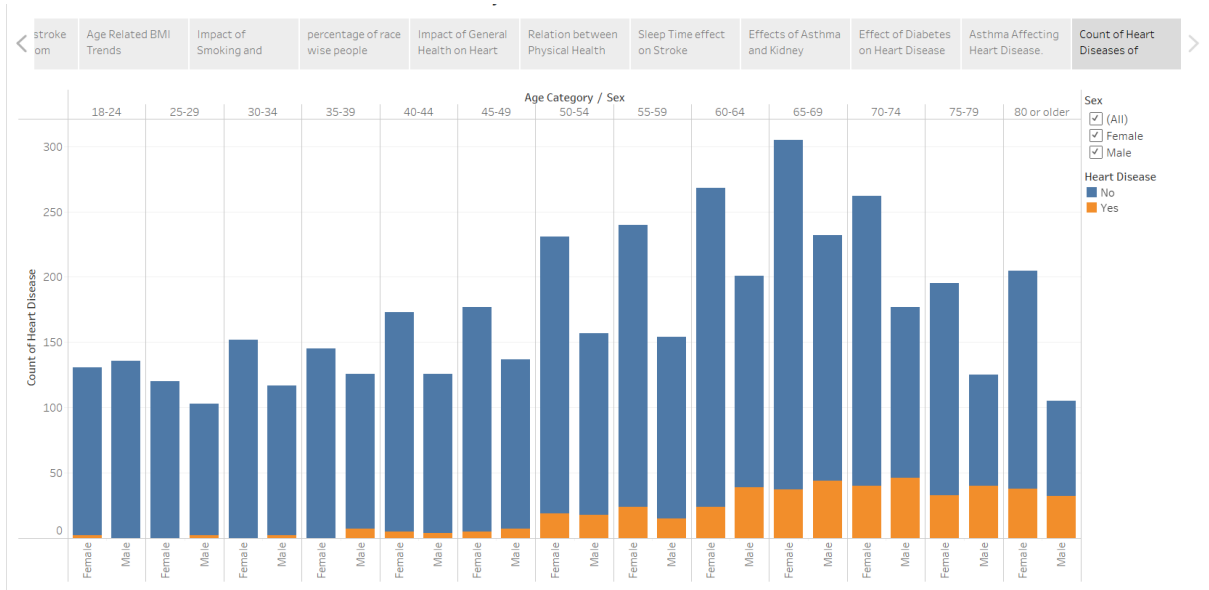






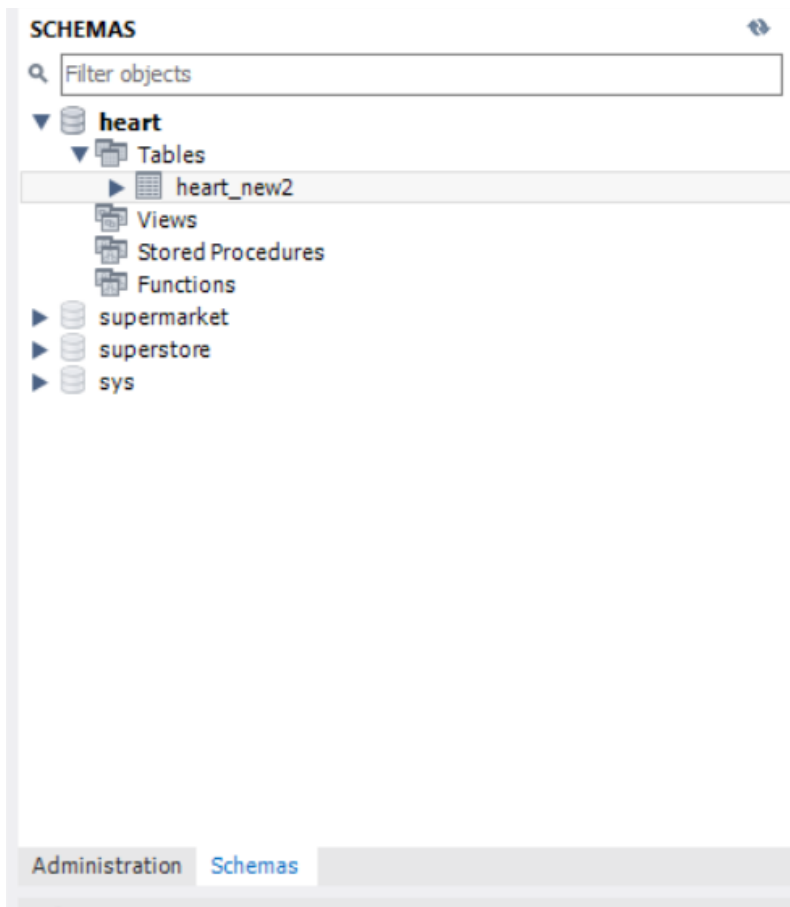


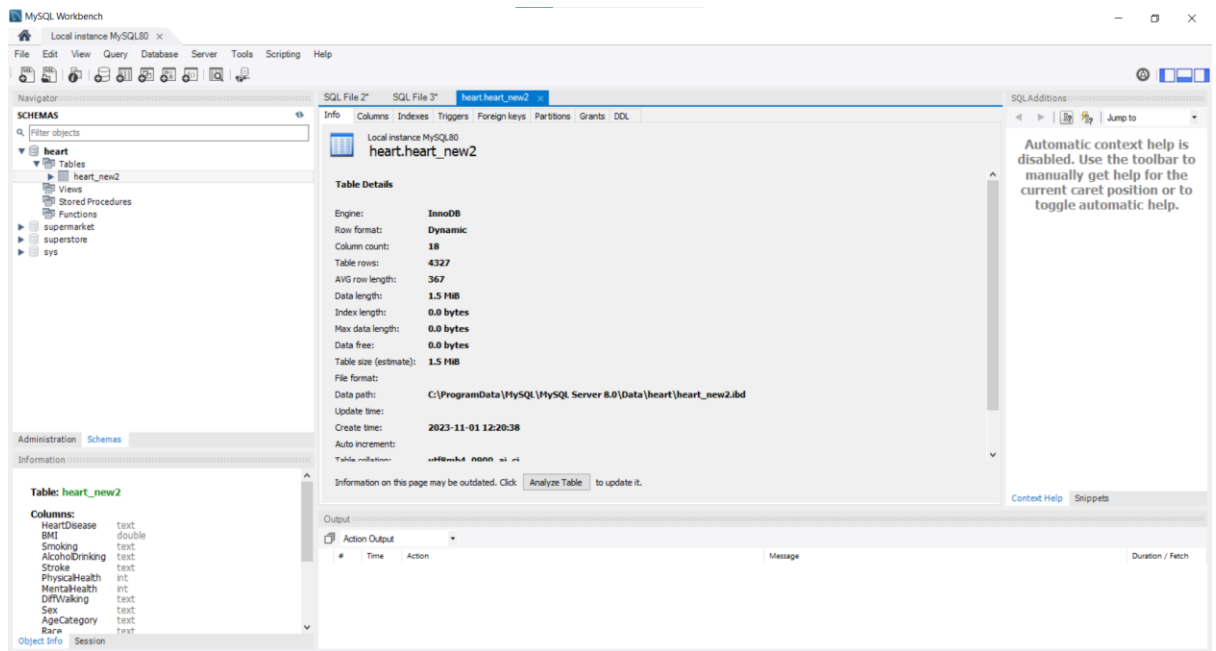




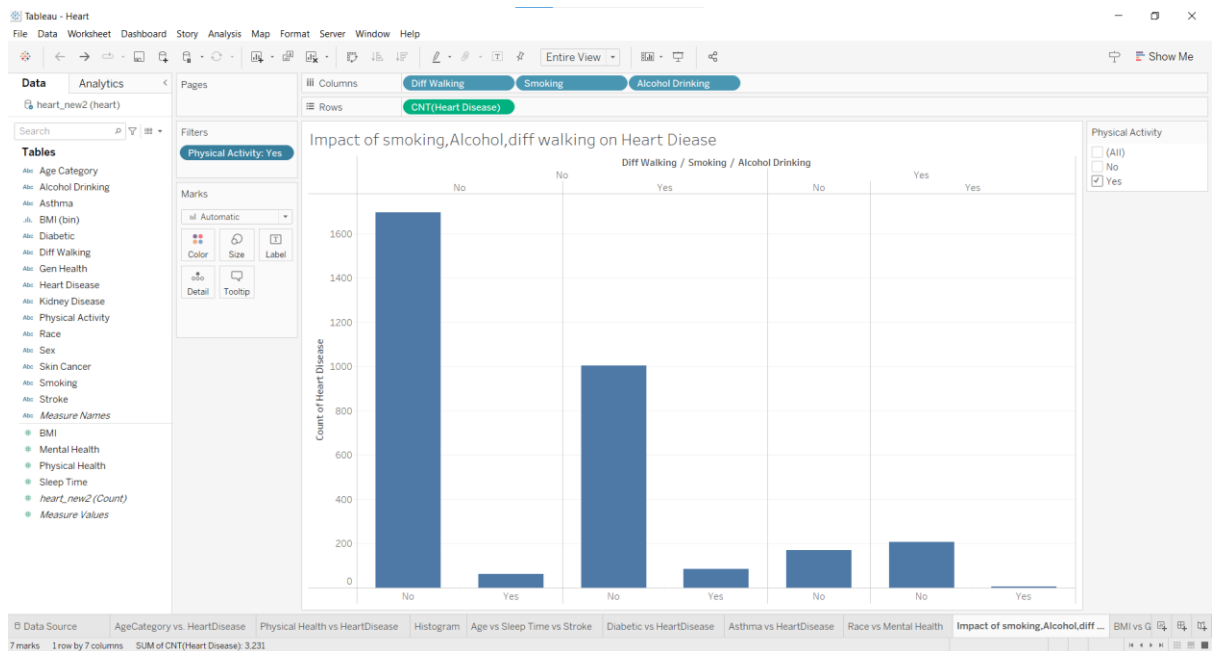
- **Performance Testing**

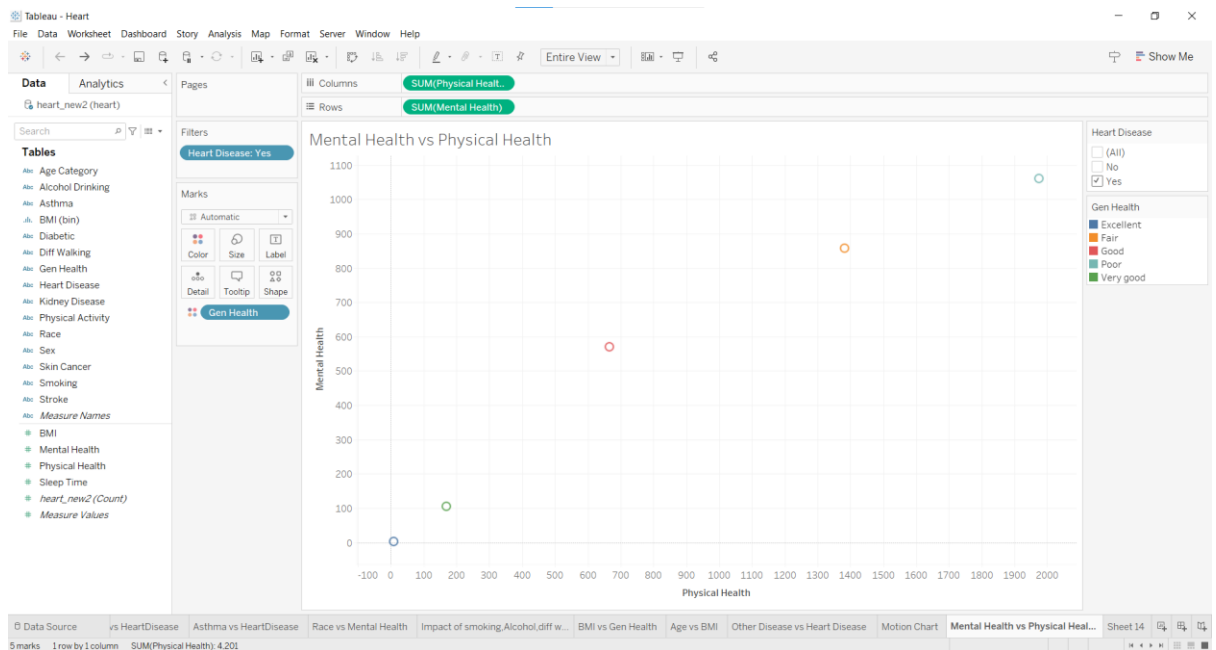
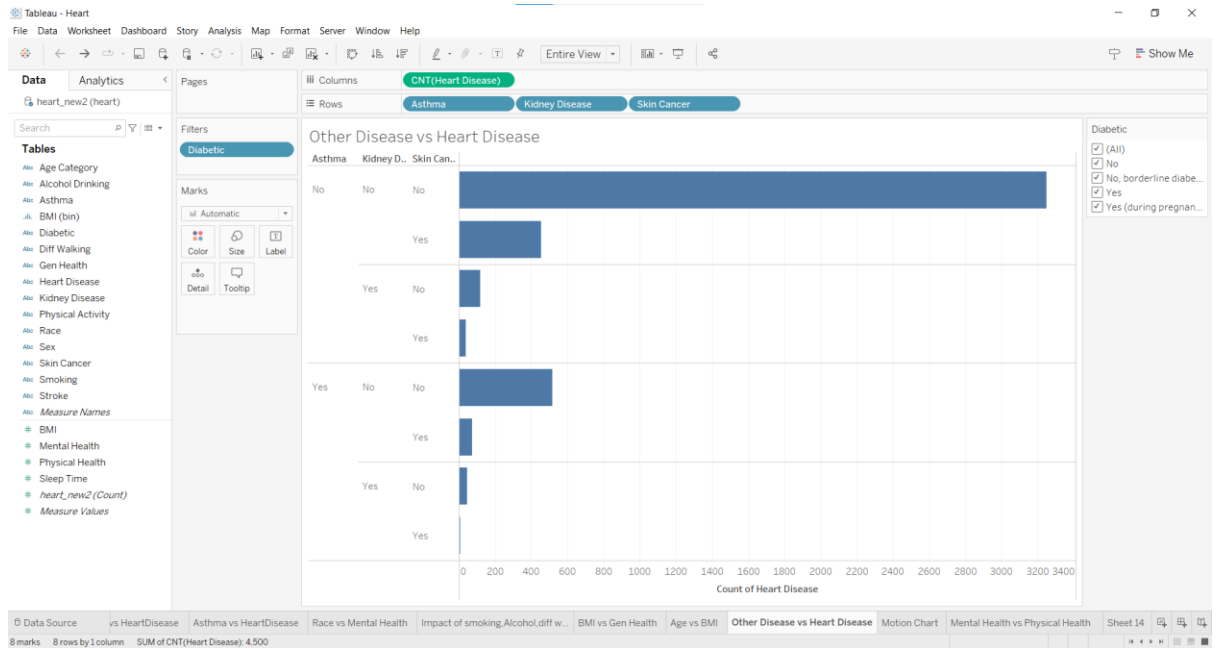
Amount of Data Rendered to DB:

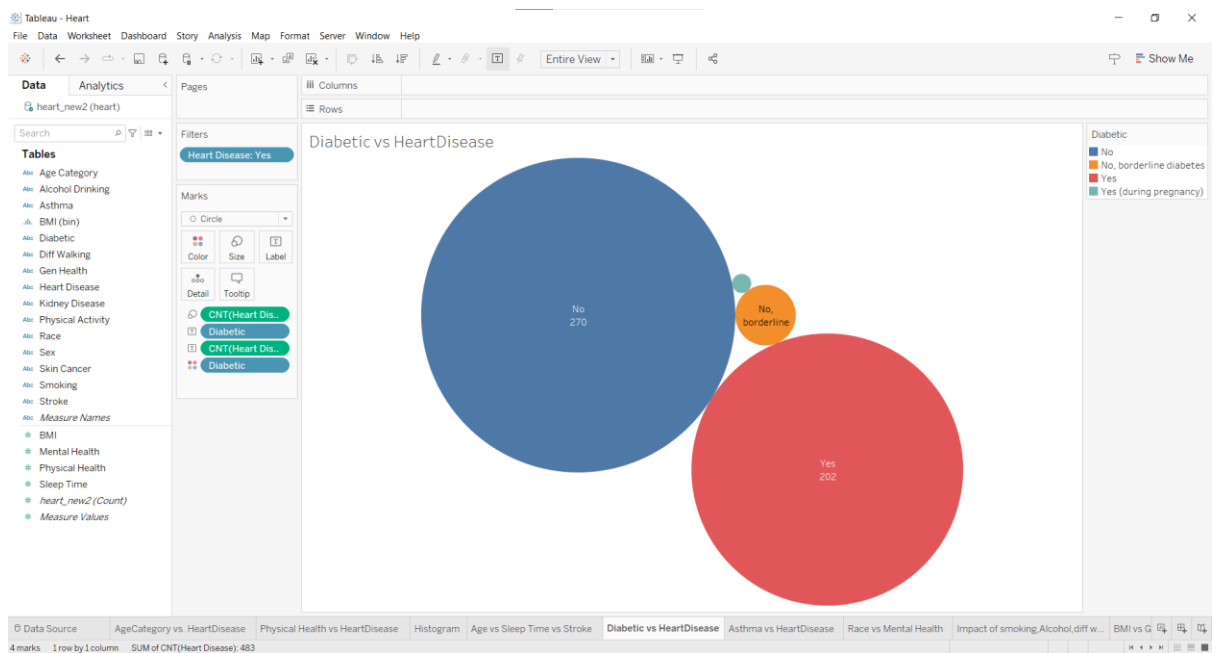
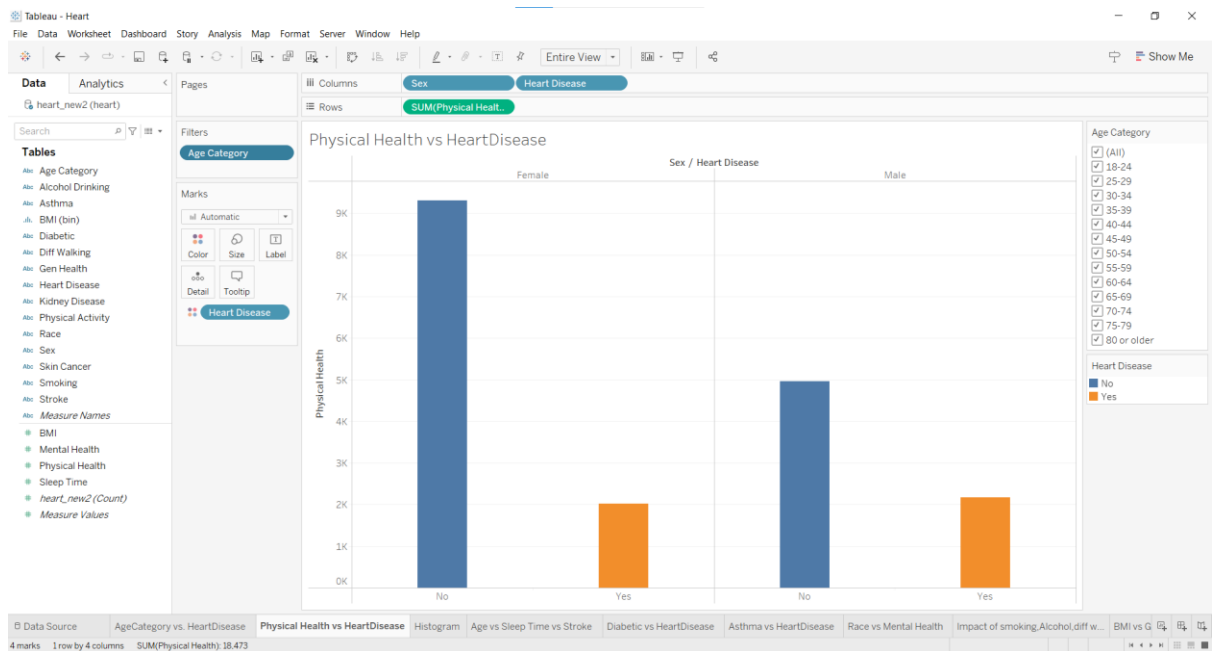




Utilization of Data Filters:







No of Calculation Fields:

In this analysis we have not created any new column using calculation filed as data found in dataset was clean and sufficient for analysis.

No of Visualizations/ Graphs:

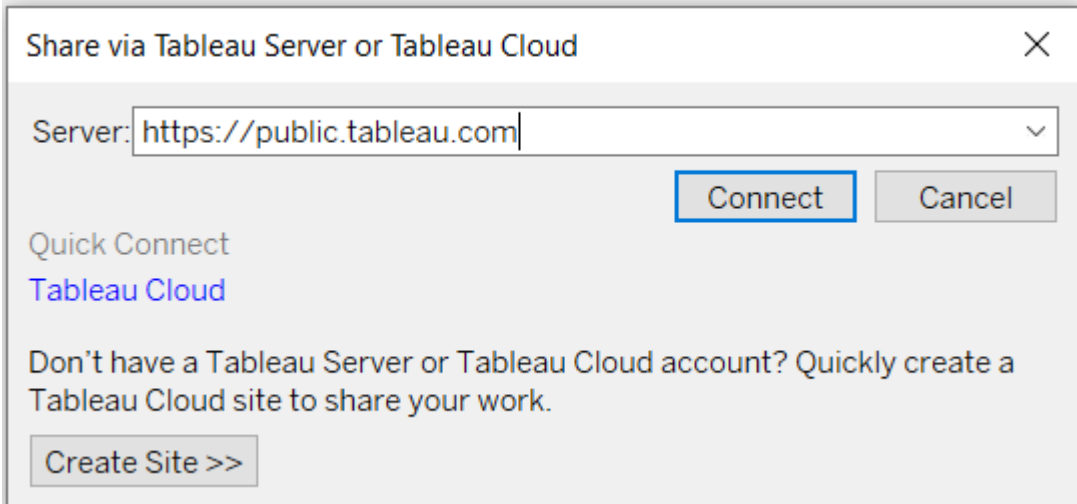
1. Age Category vs. Heart Disease
2. Physical Health vs Heart Disease
3. Histogram
4. Age vs Sleep Time vs Stroke
5. Diabetic vs Heart Disease
6. Asthma vs Heart Disease
7. Race vs Mental Health
8. Impact of smoking, Alcohol, diff walking on Heart Disease
9. BMI vs Gen Health
10. Age vs BMI
11. Other Disease vs Heart Disease
12. Motion Chart
13. Mental Health vs Physical Health

- **Web integration:**

Publishing helps us to track and monitor key performance metrics and to communicate results and progress. help a publisher stay informed, make better decisions, and communicate their performance to others.

Publishing dashboard and reports to tableau public:

Step 1: Go to Dashboard/story, click on the share button on the top ribbon



Share via Tableau Server or Tableau Cloud

Server:

Quick Connect
Tableau Cloud

Don't have a Tableau Server or Tableau Cloud account? Quickly create a Tableau Cloud site to share your work.

Give the server address of your tableau public account and click on connect.

Step 2: Once you click on connect it will ask you for the tableau public username and password



Email

Password

Sign In

 This site is SSL encrypted

[Forgot your password?](#)

[Don't have a profile yet?](#)

[Create one now for free](#)

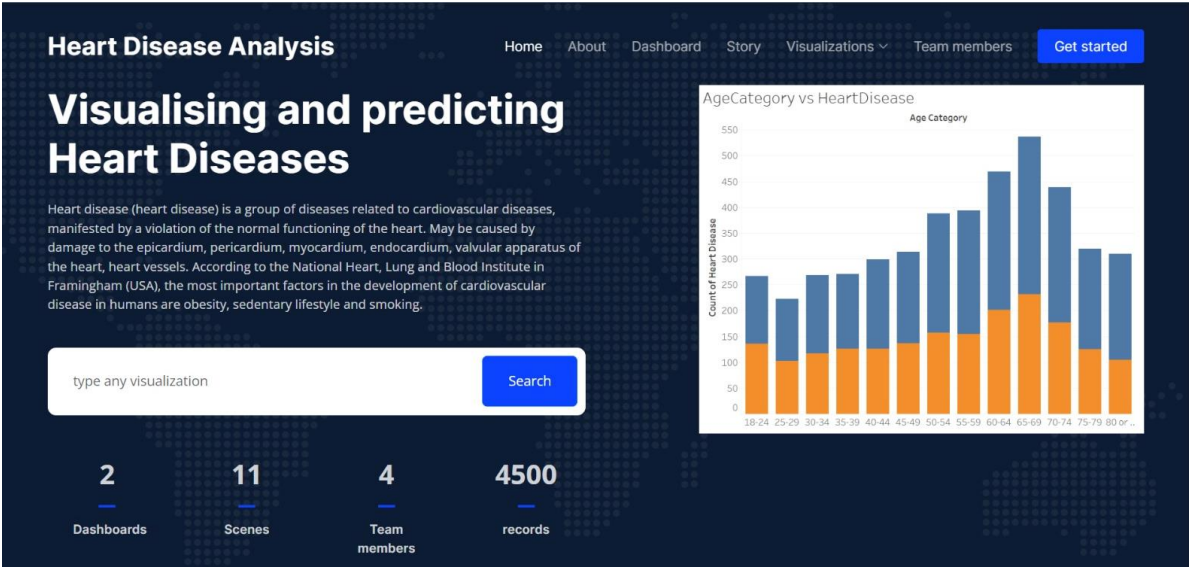
Once you login into your tableau public using the credentials, the particular visualization will be published into the tableau public

These are the dashboard and story links which we have Published:

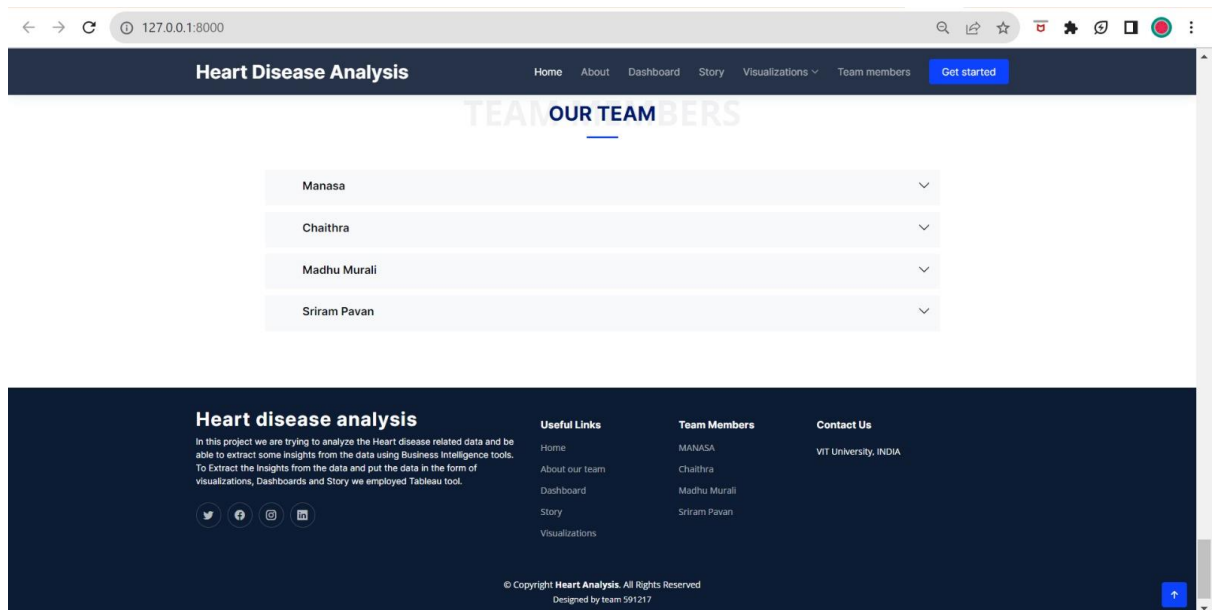
[Heart dashboard | Tableau Public](#)

[Heart Diseases Visualisation & Prediction Story | Tableau Public](#)

Embed Dashboard and Story with Flask:







Bootstrap Link: <http://127.0.0.1:8000/>