Heart Disease Analysis

C ASHUTOSH

21BCE7857

VISWAM DATLA

21BCE8492

Project Report Format

1. INTRODUCTION

1.1 Project Overview

The project "Visualizing and Predicting Heart Diseases using Tableau" aims to leverage the powerful data visualization capabilities of Tableau to enhance the understanding of heart health patterns and facilitate predictive analytics. By integrating diverse datasets related to patient demographics, medical history, and lifestyle factors, the project seeks to create insightful visualizations that can assist healthcare professionals and individuals in identifying potential risk factors and making informed decisions. The predictive element involves the implementation of machine learning algorithms to forecast the likelihood of heart diseases based on the gathered data. The user-friendly and interactive dashboards generated through Tableau will empower both healthcare providers and individuals to explore and comprehend complex health data intuitively. This project not only addresses the imperative need for early detection and prevention of heart diseases but also contributes to fostering a data-driven approach to healthcare, promoting overall well-being.

1.2 Purpose

The purpose of the "Visualizing and Predicting Heart Diseases using Tableau" project is to provide a comprehensive and accessible platform for understanding and anticipating heart health issues. By employing Tableau's robust data visualization tools, the project aims to present complex medical data in a clear and interpretable manner. This serves healthcare professionals by offering them a visual representation of key indicators and trends, aiding in quicker and more informed decision-making.

Additionally, the project targets individuals, empowering them to take an active role in their health by providing personalized insights and predictions regarding potential heart diseases. Through the integration of predictive analytics, the project strives to contribute to early detection and prevention strategies, ultimately enhancing overall cardiovascular health awareness and outcomes. The purpose is to bridge the gap between data and actionable insights, fostering a data-driven paradigm in the realm of heart disease management and prevention.

2. LITERATURE SURVEY

2.1 Existing Problem

The existing problem in the domain of heart disease management lies in the complexity and accessibility of health data. Currently, healthcare professionals encounter challenges in deciphering intricate medical information and identifying patterns indicative of potential heart issues. Traditional methods of data representation often lack the clarity and interactivity needed for efficient analysis. Similarly, individuals face difficulty in comprehending their own health data, hindering proactive engagement in preventive measures.

Moreover, the absence of predictive tools contributes to a reactive rather than a proactive approach to heart health. There is a gap in leveraging advanced analytics to forecast potential heart diseases based on diverse datasets, limiting the ability to implement preemptive strategies.

The "Visualizing and Predicting Heart Diseases using Tableau" project addresses these existing problems by providing a user-friendly and visually intuitive platform. By harnessing Tableau's capabilities, the project aims to simplify data interpretation for healthcare professionals and empower individuals to understand and act upon their health information. The incorporation of predictive analytics seeks to fill the void in proactive health management, contributing to early detection and prevention of heart diseases. This project addresses the existing challenges by fostering a more accessible, actionable, and data-driven approach to heart health.

2.2 References

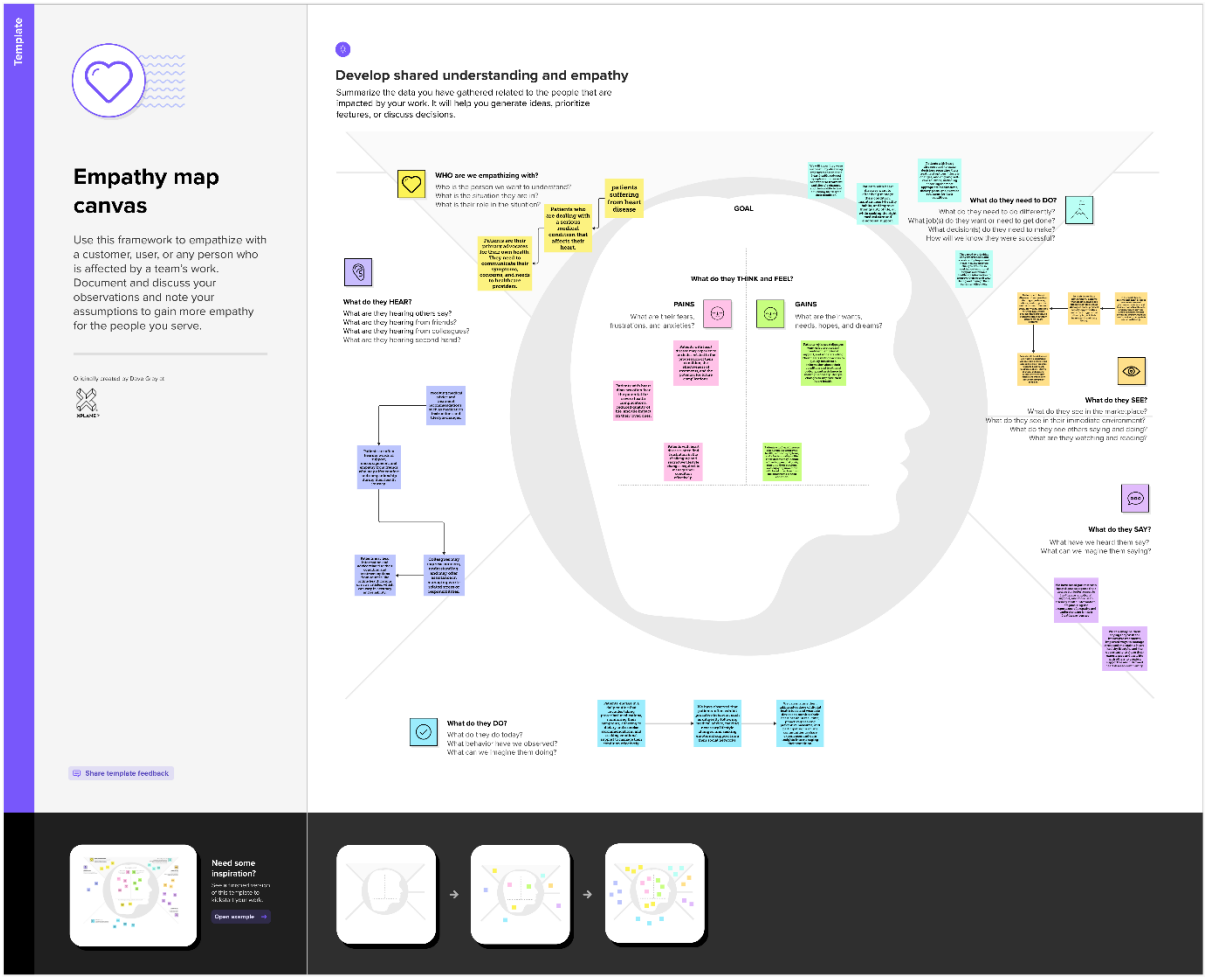
Link:Heart_new2.csv - Google Drive

2.3 Problem Statement Definition

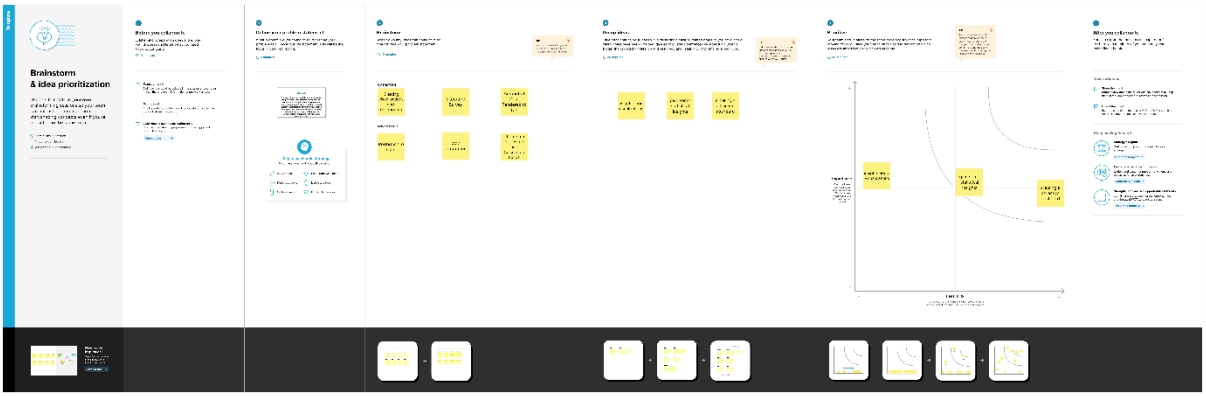
The problem at hand revolves around the inadequacy of current methods for comprehensively understanding and managing heart diseases. Healthcare professionals encounter difficulties in extracting meaningful insights from complex health data due to the lack of user-friendly visualization tools. Traditional data representations fall short in providing a clear, interactive, and efficient means of analysis, impeding timely and informed decision-making.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstormin



PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The current state of heart disease visualization and prediction lacks comprehensive and user-friendly tools, hindering effective prevention and management. There is a need for a robust system that integrates advanced visualization techniques with predictive models to empower healthcare professionals and patients in understanding, preventing, and managing heart diseases.
2.	Idea / Solution description	The solution for visualizing and predicting heart diseases integrates advanced data visualization techniques with predictive analytics to offer a comprehensive understanding of heart health. Key features include the utilization of large-scale datasets to

		identify patterns and correlations, enabling accurate predictions of potential heart diseases. The platform provides intuitive visualizations, allowing medical professionals to interpret complex data effortlessly. Additionally, it incorporates real-time monitoring tools for patients to track and manage their heart health proactively. The solution emphasizes user-friendly interfaces, ensuring accessibility for both healthcare professionals and patients. Through a combination of predictive modeling and interactive visualization, the platform aims to revolutionize heart disease management by facilitating early detection, personalized treatment plans, and improved patient outcomes.
3.	Novelty / Uniqueness	The novelty of the Visualizing and Predicting Heart Diseases solution lies in its pioneering approach to merging cutting-edge data visualization and predictive analytics. It stands out by leveraging sophisticated algorithms to analyze extensive datasets, unraveling intricate patterns indicative of heart diseases. The platform's uniqueness lies in its emphasis on providing not just predictive insights but translating them into intuitive visual representations. This ensures that medical professionals can easily interpret and act upon the data, leading to more informed decision-making. Real-time monitoring tools for patients add a distinctive dimension, fostering proactive health management. The solution's innovative interface makes it accessible to both healthcare providers and patients, underscoring its commitment to revolutionizing heart disease management through early detection, tailored treatment strategies, and ultimately, improved patient outcomes.
4.	Social Impact / Customer Satisfaction	The social impact of visualizing and predicting heart diseases is profound. By harnessing advanced technologies, healthcare systems can identify at-risk individuals early, allowing for timely intervention and personalized treatment plans. This not only enhances patient outcomes but also reduces the economic burden on individuals and healthcare providers. Moreover, the accessibility of predictive tools facilitates preventive measures and health education, empowering individuals to make informed lifestyle choices. Societal awareness increases, fostering a proactive approach to heart health. Ultimately, the integration of predictive analytics contributes to a healthier population, promoting overall well-being and reducing disparities in cardiovascular care.
5.	Business Model (Revenue Model)	Our business model focuses on leveraging advanced data analytics and visualization techniques to create a platform for Visualizing and Predicting Heart Diseases. By collaborating with healthcare providers, we aim to collect comprehensive patient data, integrate cutting-edge predictive models, and develop user-friendly interfaces. The platform will empower medical professionals to make informed decisions, enable early detection

		of potential heart issues, and facilitate personalized patient care. Revenue streams include licensing the platform to healthcare institutions, offering premium features, and potential partnerships with research organizations for further advancements in predictive analytics and heart disease prevention. Our model aligns innovation with healthcare excellence for a holistic impact.
6.	Scalability of the Solution	The scalability of the solution for visualizing and predicting heart diseases is crucial for its effectiveness in handling growing data volumes and user demands. As the dataset and user base expand, the system should seamlessly accommodate increased computational loads, ensuring real-time insights without compromising performance. Implementing scalable infrastructure, leveraging cloud computing, and optimizing algorithms for efficiency are paramount. This ensures the solution remains responsive and capable of handling diverse data sources, enabling healthcare professionals to visualize trends and make timely predictions, ultimately contributing to more effective prevention and management of heart diseases on a broader scale.

4. REQUIREMENT ANALYSIS

4.1 Functional Requirements

The functional requirements for the "Visualizing and Predicting Heart Diseases using Tableau" project encompass a range of features designed to address the identified problems and achieve the project's goals. These include:

1. Data Integration:
    - The system should allow seamless integration of diverse datasets, including patient demographics, medical history, and lifestyle factors.
    - Ensure compatibility with various data sources to enhance flexibility in data gathering.
2. Interactive Visualization:
    - Develop visually intuitive and interactive dashboards using Tableau to represent complex health data.
    - Enable zooming, filtering, and drill-down functionalities for detailed exploration of data points.

3. Predictive Analytics:
    - Implement machine learning algorithms to predict the likelihood of heart diseases based on integrated datasets.
    - Integrate the predictive model seamlessly into Tableau for real-time analysis.
4. User Authentication and Authorization:
    - Implement secure user authentication mechanisms to control access to sensitive health data.
    - Define user roles and permissions to ensure appropriate levels of access for healthcare professionals and individuals.
5. Personalized Insights:
    - Provide personalized health insights for individual users based on their specific health data.
    - Offer clear visualizations and explanations of the factors contributing to the predictive analysis.

4.2 Non – Functional Requirements

The non-functional requirements for the "Visualizing and Predicting Heart Diseases using Tableau" project define the aspects that are crucial for the system's performance, usability, and security. These include:

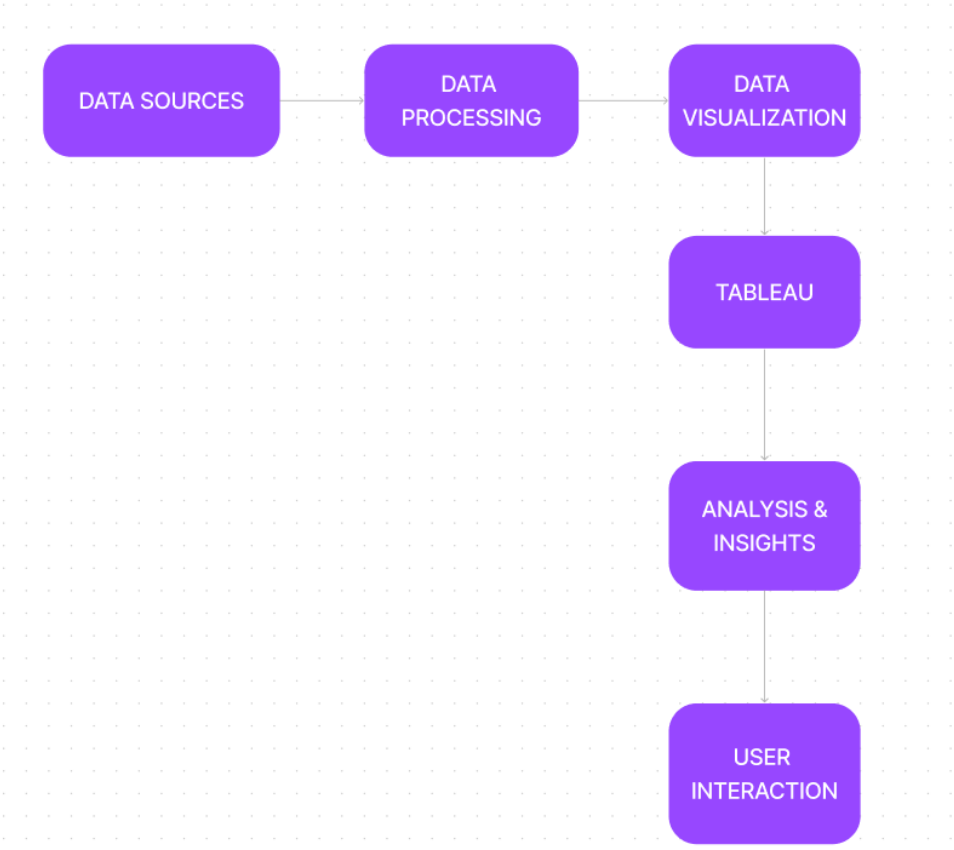
1. Performance:
    - Response Time: Ensure that the system provides real-time or near-real-time responses to user queries and interactions with the visualizations.
    - Scalability: The system should be scalable to handle an increasing volume of users and data without compromising performance.
2. Usability:
    - User Interface Design: Design an intuitive and user-friendly interface within Tableau for both healthcare professionals and individual users.
    - Accessibility: Ensure the system is accessible to users with different levels of technical expertise and any potential disabilities.
3. Reliability:
    - System Availability: Aim for high availability to ensure that the system is accessible to users whenever they need it.

- Fault Tolerance: Implement mechanisms to handle system failures gracefully and minimize downtime.

4. Security:
    - Data Encryption: Employ strong encryption protocols to secure the transmission and storage of sensitive health data.
    - Access Control: Implement robust access control mechanisms to restrict unauthorized access to health information.
    - Compliance: Ensure compliance with healthcare data protection regulations and standards.
5. Integration:
    - Interoperability: Ensure seamless integration with various data sources and electronic health record systems.
    - Compatibility: The system should be compatible with different web browsers and devices for a broader user base.

5. PROJECT DESIGN

Diagram



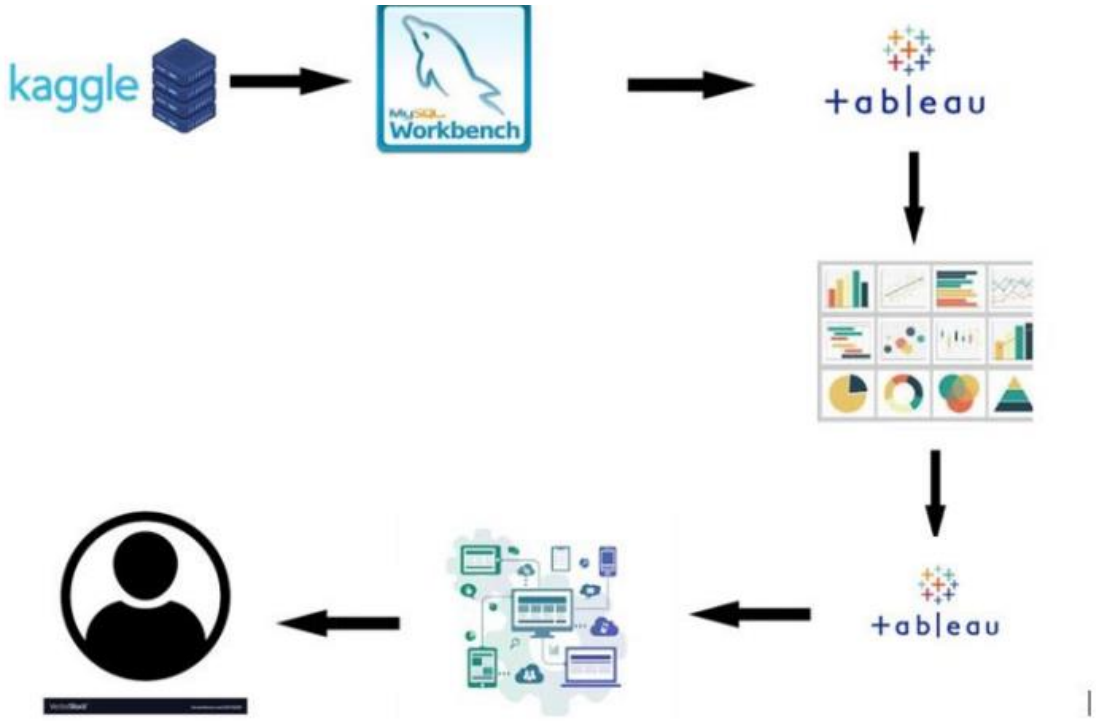
User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release

Patients	Early detection of heart disease	USN-1	As a patient It's been a bit overwhelming, to be honest. Trying to process everything and figure out what comes next	Live a healthy life	High	Sprint-1
Caregivers	Access to information and resources	USN-2	As a Caregiver, I will be relieved when the patient's condition improves	Improve the patient's quality of life	Low	Sprint-1
Medical Professionals	Diagnostic tools and technology	USN-3	As a Medical professional, I will be satisfaction when patients recover	Accurate diagnosis and treatment	High	Sprint-2
Researchers	Access to comprehensive datasets	USN-4	As a Researcher, I will be excitement when a breakthrough is achieved	Advance understanding of heart diseases	Low	Sprint-1
Government & Policymakers	Access to healthcare data and statistics	USN-5	As a Policymakers,it is my responsibility to take care of public health	Develop policies that promote heart health	Low	Sprint-1
	Dashboard					
Customer (Web user)	Accurate information about heart health	USN-6	As a Customer,Accurate information	Clear and easily understandable visualizations	high	Sprint-2

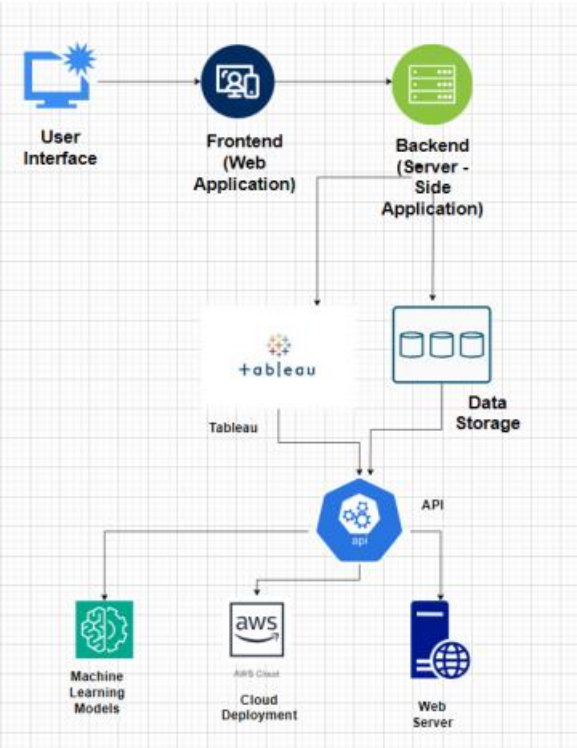
			about heart health	of heart health.		
Customer Care Executive	Access to customer data for effective support	USN-7	As a Customer Care Executive ,Clear communication tools for interacting with customers.	Efficient and secure customer data management tools.	high	Sprint-2

5.2 Solution Architecture



6. PROJECT PLANNING & SCHEDULING

6.1 Technical Architecture



6.2 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members

Sprint-1	Early detection of heart disease	USN-1	As a patient It's been a bit overwhelming, to be honest. Trying to process everything and figure out what comes next	3	High	Ashutosh
Sprint-1	Access to information and resources	USN-2	As a Caregiver, I will be relieved when the patient's condition improves	1	Low	Ashutosh
Sprint-2	Diagnostic tools and technology	USN-3	As a Medical professional, I will be satisfaction when patients recover	3	High	Viswam
Sprint-1	Access to comprehensive datasets	USN-4	As a Researcher, I will be excitement when a breakthrough is achieved	2	Medium	Ashutosh
Sprint-1	Access to healthcare data and statistics	USN-5	As a Policymakers,it is my responsibility to take care of public health	2	Medium	Viswam

	Dashboard					
Sprint-2	Accurate information about heart health	USN-6	As a Customer, Accurate information about heart health	3	High	Viswam
Sprint-2	Access to customer data for effective support	USN-7	As a Customer Care Executive ,Clear communication tools for interacting with customers .	3	High	Ashutosh

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	8	8 Days	21 Oct 2023	29 Oct 2023	5	27 Oct 2023
Sprint-2	9	6 Days	23 Nov 2023	29 Nov 2023	6	27 Oct 2023

Velocity:

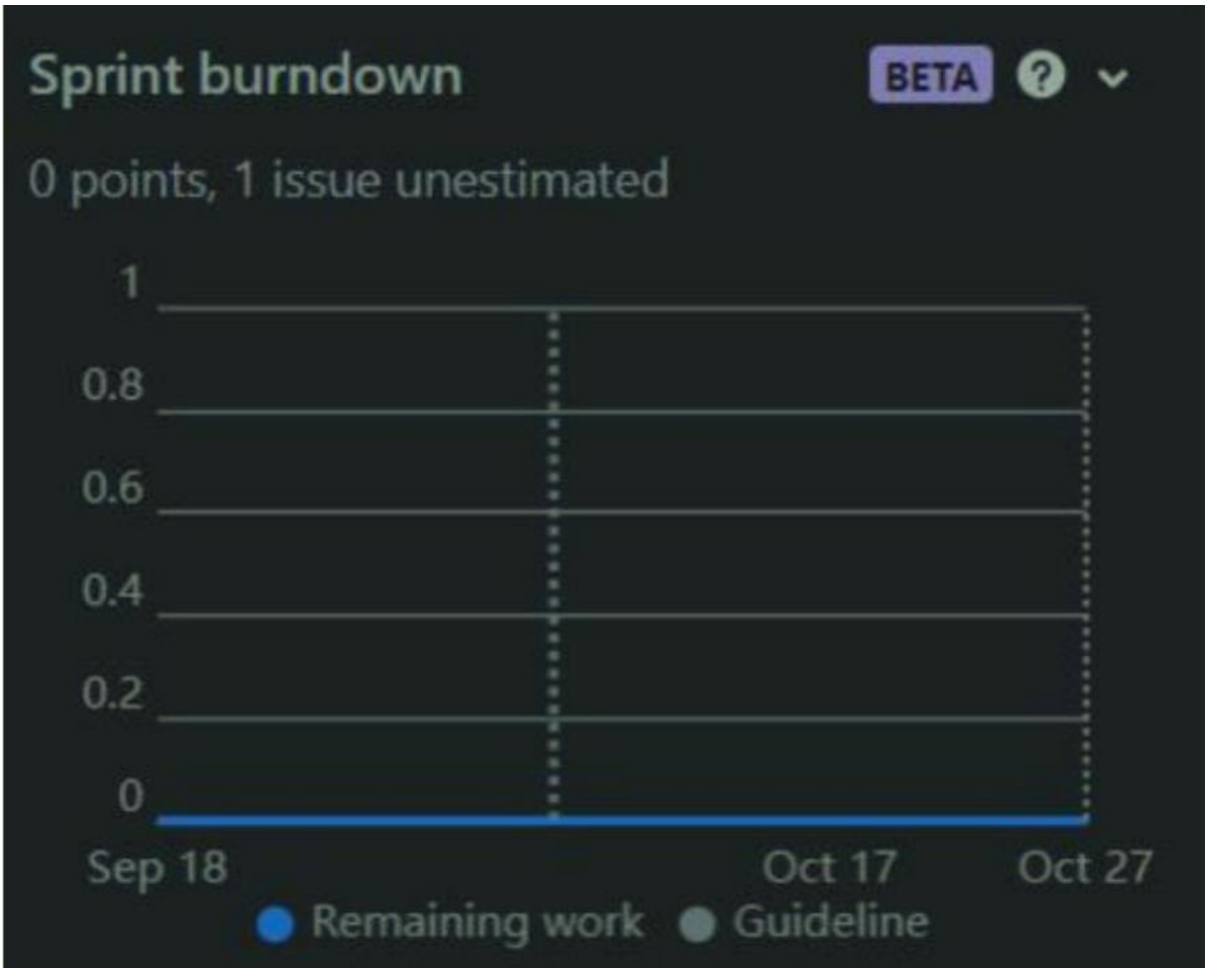
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let’s calculate the team’s average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

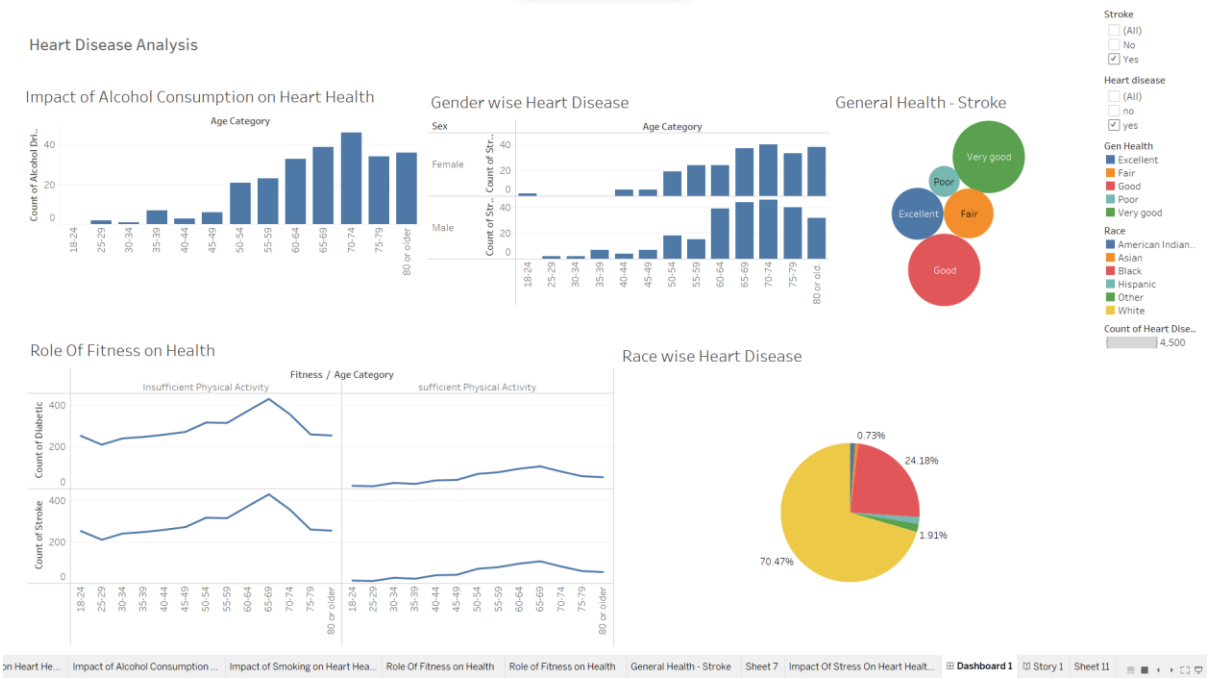
Sprint - 1 : 1
Sprint - 2 : 0.6

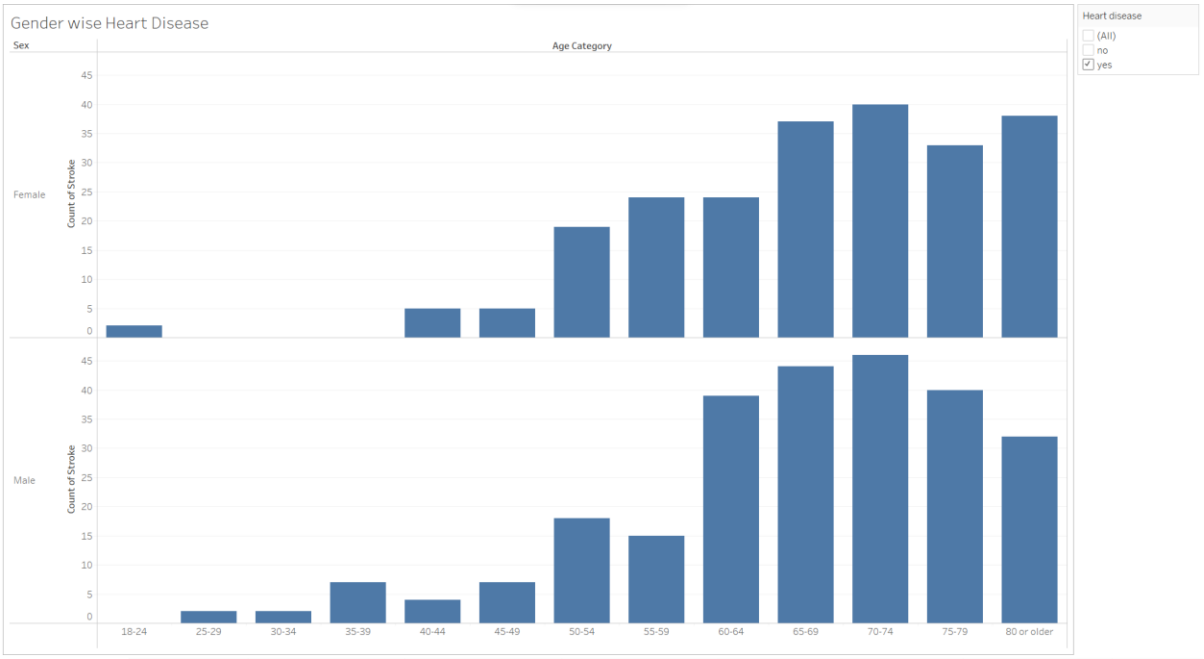
Burndown Chart:

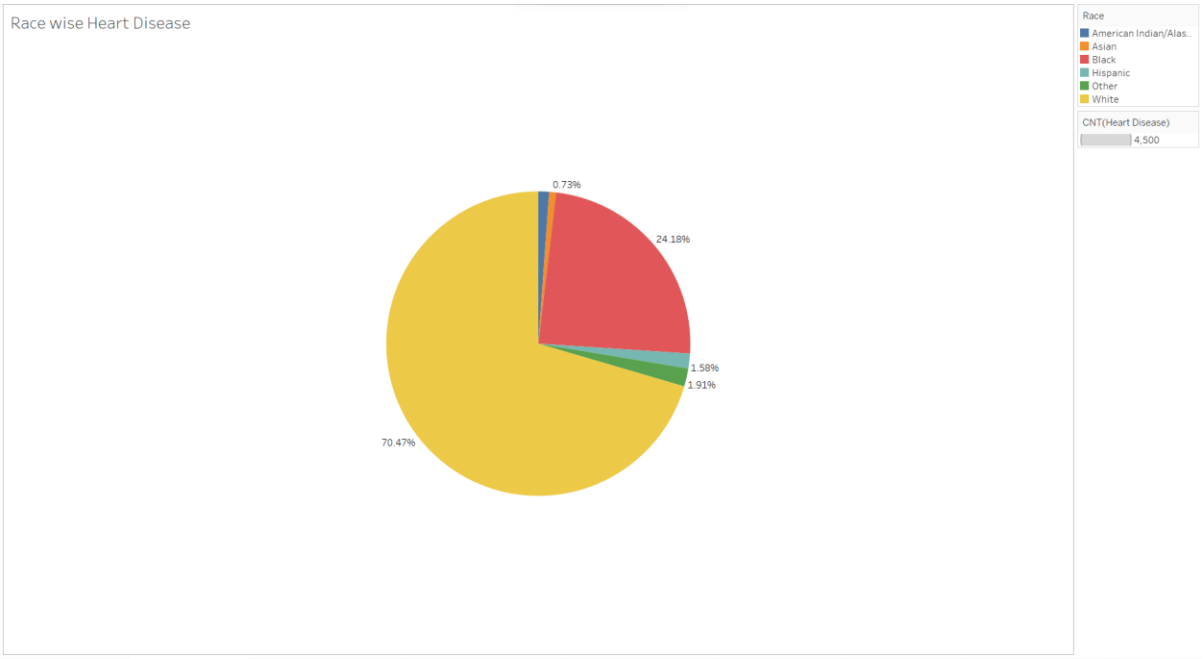
A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.



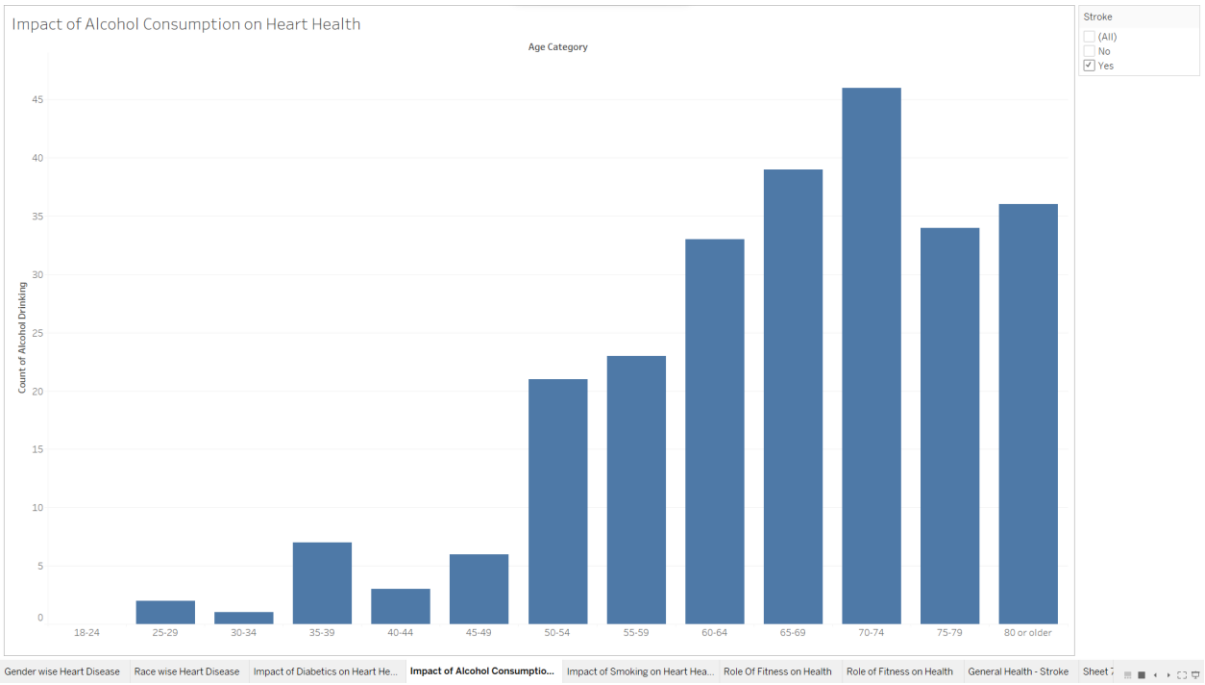
6. VISUALIZATIONS & ANALYSIS

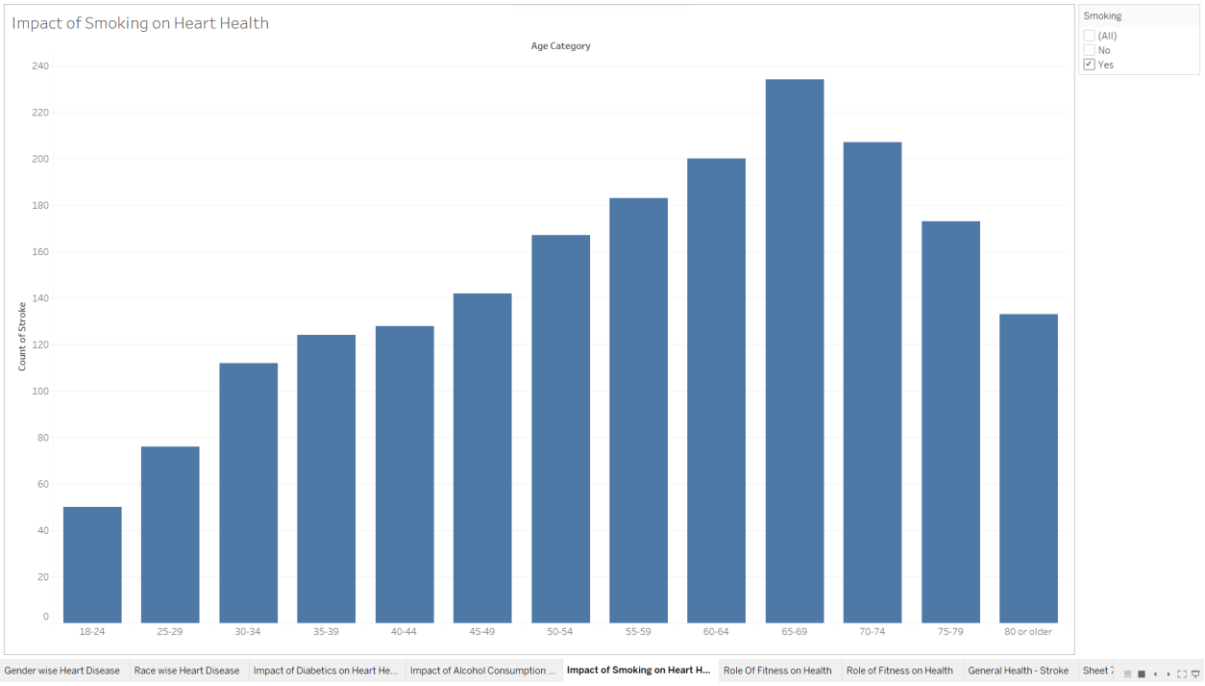


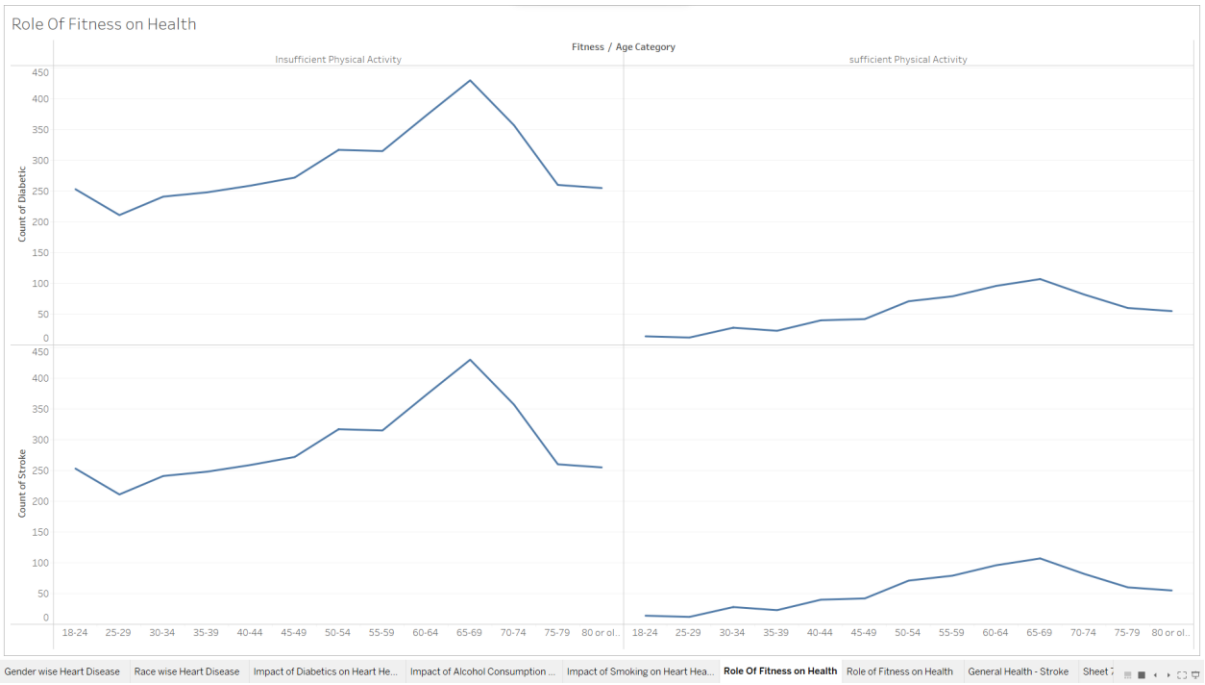

Gender wise Heart Disease
Sex
Age Category
Female
Male
Count of Stroke
18-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80 or older
Heart disease
(All)
no
yes

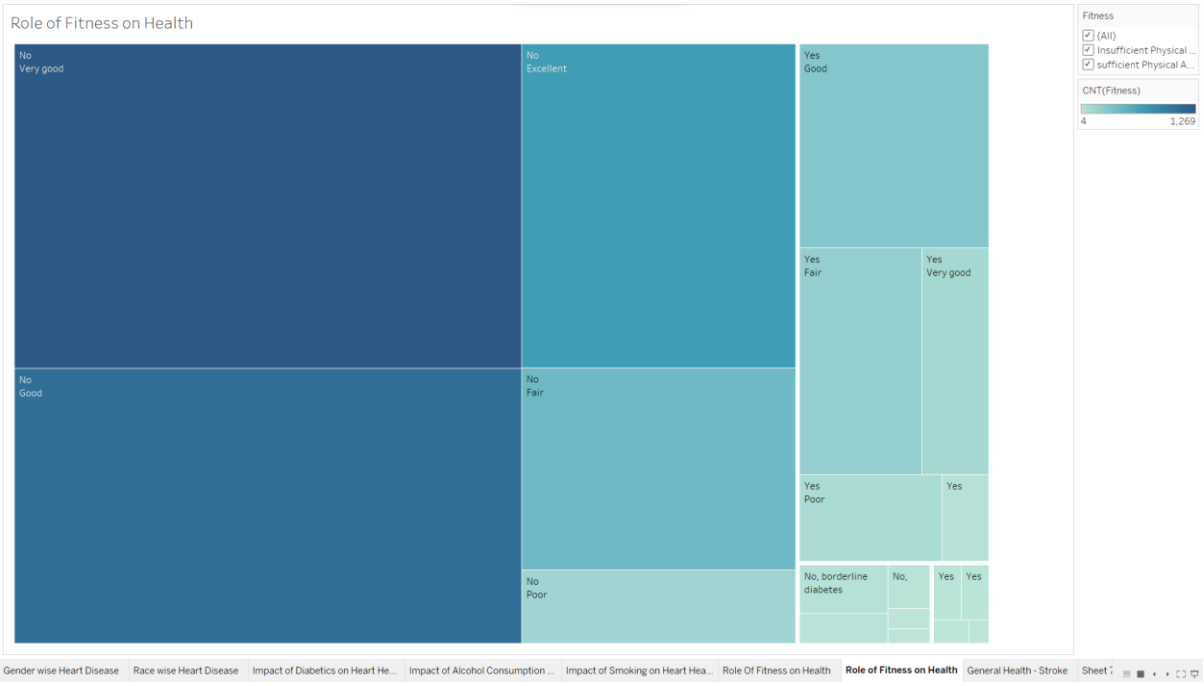

Race wise Heart Disease
Race
American Indian/Alas..
Asian
Black
Hispanic
Other
White
CNT(Heart Disease)
4,500
0.73%
24.18%
1.58%
1.91%
70.47%

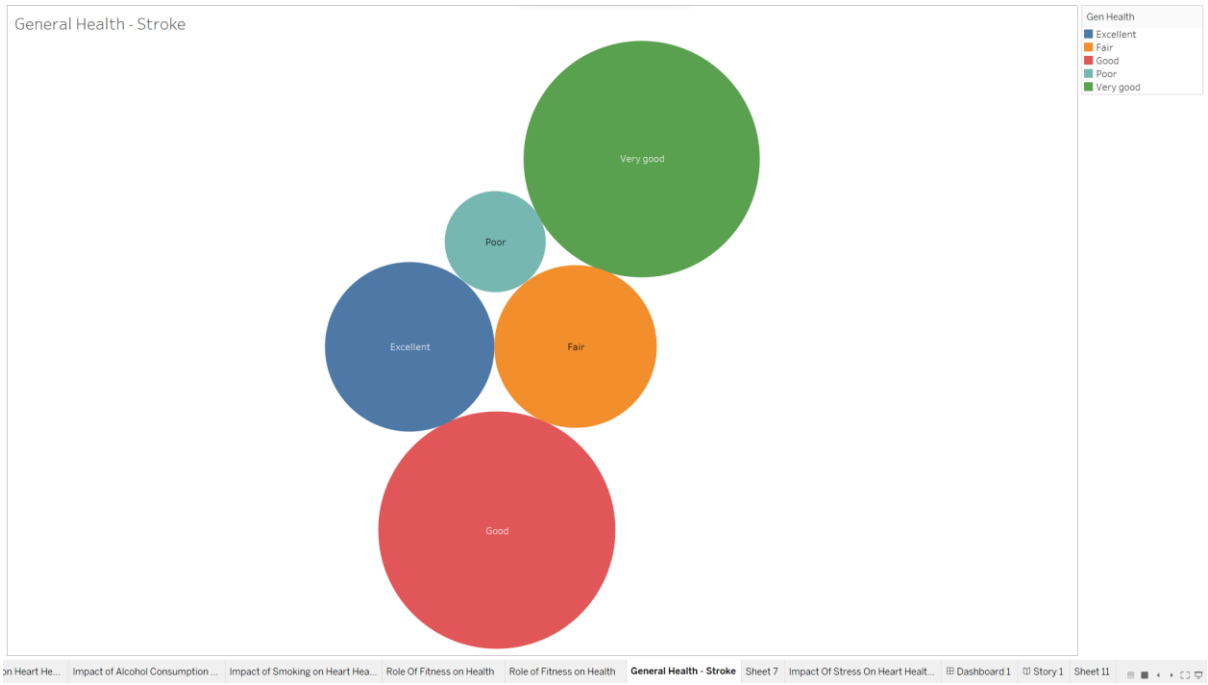

Impact of Diabetics on Heart Health
Diabetic
Count of Stroke
81.79%
17.37%
0.84%
No
Yes
Yes (during pregnancy)
Diabetic
(All)
No
No, borderline diabe...
Yes
Yes (during pregnan...
Diabetic
No
Yes
Yes (during pregnancy)
Gender wise Heart Disease
Race wise Heart Disease
Impact of Diabetics on Heart H...
Impact of Alcohol Consumption ...
Impact of Smoking on Heart Hea...
Role Of Fitness on Health
Role of Fitness on Health
General Health - Stroke
Sheet 7

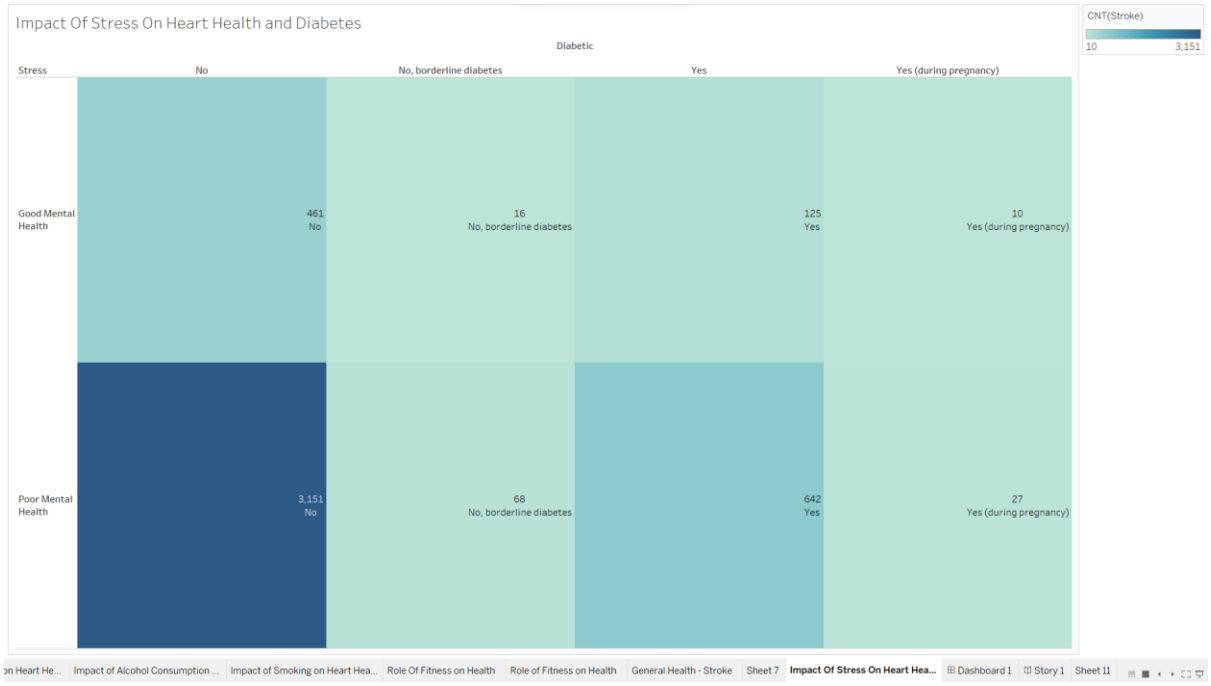

Impact of Alcohol Consumption on Heart Health
Age Category
Count of Alcohol Drinking
18-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80 or older
Stroke
(All)
No
Yes
Gender wise Heart Disease
Race wise Heart Disease
Impact of Diabetics on Heart He...
Impact of Alcohol Consumptio...
Impact of Smoking on Heart Hea...
Role Of Fitness on Health
Role of Fitness on Health
General Health - Stroke
Sheet 7


Impact of Smoking on Heart Health
Age Category
Count of Stroke
240
220
200
180
160
140
120
100
80
60
40
20
0
18-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80 or older
Smoking
(All)
No
Yes
Gender wise Heart Disease
Race wise Heart Disease
Impact of Diabetics on Heart He...
Impact of Alcohol Consumption ...
Impact of Smoking on Heart H...
Role Of Fitness on Health
Role of Fitness on Health
General Health - Stroke
Sheet 7


Role Of Fitness on Health
Fitness / Age Category
Insufficient Physical Activity
sufficient Physical Activity
Count of Diabetic
Count of Stroke
450
400
350
300
250
200
150
100
50
0
18-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80 or ol..
Gender wise Heart Disease
Race wise Heart Disease
Impact of Diabetics on Heart He...
Impact of Alcohol Consumption ...
Impact of Smoking on Heart Hea...
Role Of Fitness on Health
Role of Fitness on Health
General Health - Stroke
Sheet 7


Role of Fitness on Health
No
Very good
No
Excellent
Yes
Good
Yes
Fair
Yes
Very good
No
Good
No
Fair
Yes
Poor
Yes
No
Poor
No, borderline diabetes
No,
Yes
Yes
Fitness
(All)
Insufficient Physical ...
sufficient Physical A...
CNT(Fitness)
4
1,269
Gender wise Heart Disease
Race wise Heart Disease
Impact of Diabetics on Heart He...
Impact of Alcohol Consumption ...
Impact of Smoking on Heart Hea...
Role Of Fitness on Health
Role of Fitness on Health
General Health - Stroke
Sheet 7


General Health - Stroke
Very good
Poor
Excellent
Fair
Good
Gen Health
Excellent
Fair
Good
Poor
Very good
on Heart He...
Impact of Alcohol Consumption ...
Impact of Smoking on Heart Hea...
Role Of Fitness on Health
Role of Fitness on Health
General Health - Stroke
Sheet 7
Impact Of Stress On Heart Healt...
Dashboard 1
Story 1
Sheet 11



10. ADVANTAGES & DISADVANTAGES

Advantages:

1. Early Detection and Prevention: The predictive analytics component enables early identification of potential heart diseases, allowing for proactive intervention and preventive measures, potentially saving lives.
2. Visual Intuitiveness: Tableau's powerful visualization tools provide clear and interactive representations of complex health data, making it easier for healthcare professionals and individuals to comprehend and analyze.
3. User Empowerment: The project empowers individuals by providing them with personalized health insights, fostering a sense of responsibility and active participation in managing their heart health.
4. Data-Driven Decision Making: Healthcare professionals benefit from data-driven decision-making, as they can quickly interpret trends and patterns in patient data, leading to more informed and timely interventions.

5. Enhanced Communication: The visualizations generated by Tableau facilitate clearer communication between healthcare professionals and patients, improving the understanding of health conditions and treatment plans.
6. Scalability: The system is designed to scale, accommodating a growing volume of health data and an increasing number of users without compromising performance.
7. Integration with EHR: Integration with electronic health records provides a comprehensive view of a patient's health history, contributing to more informed diagnoses and treatment plans.

Disadvantages:

1. Data Privacy Concerns: The handling of sensitive health information poses inherent privacy concerns. Ensuring robust data encryption and adherence to regulatory standards is crucial to mitigate this risk.
2. Dependency on Data Quality: The accuracy and reliability of predictions heavily rely on the quality and completeness of the input data. Inaccuracies or missing data can lead to less reliable predictive outcomes.
3. Complex Implementation: Integrating predictive analytics and developing interactive dashboards can be technically challenging and time-consuming. Skilled personnel and significant development efforts are required.
4. User Training Requirements: Users, especially healthcare professionals, may require training to effectively use the Tableau-based interface and interpret the predictive analytics, adding an additional layer of complexity.
5. Costs: Implementing and maintaining the system, especially if it involves integration with existing healthcare systems, can incur significant costs in terms of software, hardware, and personnel.
6. Potential for Misinterpretation: While visualization aids understanding, there is a risk of misinterpretation of data, especially by individuals with limited health literacy. Proper user education and clear communication are essential to mitigate this risk.
7. Dependency on Internet Connectivity: The system's accessibility relies on internet connectivity, which may pose challenges in regions with limited connectivity, potentially limiting its reach.

11. CONCLUSION

In conclusion, the "Visualizing and Predicting Heart Diseases using Tableau" project represents a significant stride towards revolutionizing heart health management. By leveraging the strengths of Tableau's visualization tools and incorporating predictive analytics, the project addresses existing challenges in healthcare, both for professionals and individuals.

The advantages of early detection and prevention, visual intuitiveness, and user empowerment underscore the potential impact on improving health outcomes. The project not only facilitates data-driven decision-making for healthcare professionals but also empowers individuals to actively engage in their heart health journey through personalized insights.

.In essence, the project holds promise in contributing to a more proactive and personalized approach to heart disease management. The synergy between Tableau's visualization capabilities and predictive analytics opens avenues for enhanced communication, informed decision-making, and ultimately, improved cardiovascular health outcomes. As technology continues to play a pivotal role in healthcare, this project exemplifies a step forward in harnessing its potential for the betterment of individual and public health.

12. FUTURE SCOPE

The future scope of the "Visualizing and Predicting Heart Diseases using Tableau" project is promising and opens avenues for advancements in the field of cardiovascular health management. As technology continues to evolve, there is potential for further refinement and expansion of the predictive analytics models, enhancing their accuracy and reliability. The integration of emerging technologies, such as artificial intelligence and machine learning, could contribute to more sophisticated predictive capabilities. Additionally, ongoing developments in data privacy and security measures will be essential to address growing concerns and ensure the ethical handling of sensitive health information. Collaborations with healthcare institutions and organizations could further enrich the system by incorporating a broader range of datasets and fostering a collective approach to combating heart diseases. Moreover, continuous user feedback and iterative improvements will play a crucial role in refining the user interface and overall user experience. The future scope of the project extends beyond its initial implementation, paving the way for a dynamic and responsive system that aligns with the evolving landscape of healthcare technology and contributes to advancing heart health globally.

GIT – HUB & PROJECT DEMO LINK