DIGITAL EGYPT PIONEERS INITIATIVE FINAL PROJECT

URBAN AIR QUALITY IMPACT ON HEART HEALTH

DATA ANALYTICS SPECIALIST TRACK

Supervisor: Abdullah Kamal

Team: Julie Nader Fathy Attia Hania Essam AbdelHalim Mostafa

AGENDA

01 Objectives

02 Problem Statement

03 Motives

04 Cleaning & Preprocessing

05 Exploratory Data Analysis

06 Dashboard & Insights

07 Conclusion

08 Future Work

OBJECTIVES

Using various data sources, including air conditions levels and health records, the analysis aims to uncover patterns that link poor air quality to cardiovascular conditions.

This project analyzes the relationship between urban air quality and its effects on human health, specifically focusing on heart diseases.
We utilize advanced data analytics techniques to provide insights that could inform public health policies and urban planning strategies aimed to reduce health risks in cities.

Problem Statement

Poor air quality in urban areas has been identified as a significant environmental and public health issue.

Air quality

Increase rates of heart disease

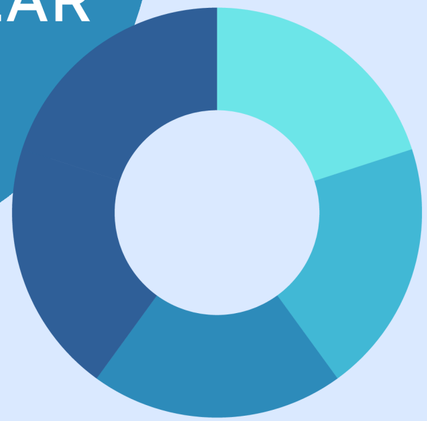
However, there is a need for data-driven analysis to quantify these effects and guide targeted interventions.

Motives

INCREASING AWARENESS OF THE HARMFUL EFFECTS OF POOR AIR QUALITY ON PUBLIC HEALTH

EXPLORE HOW URBAN ENVIRONMENTS CONTRIBUTE TO HEALTH RISKS

UNDERSTAND THE ENVIRONMENTAL FACTORS THAT WORSEN THE CARDIOVASCULAR DISEASES



WHY ARE THESE INSIGHTS USEFUL?

HELP REDUCE HEALTH RISKS THROUGH DATA-DRIVEN DECISIONS AND PUBLIC POLICY CHANGES.

PROTECTING AT-RISK POPULATIONS AND IMPROVING OVERALL HEALTH OUTCOMES.

INFORM STRATEGIES THAT AIM TO REDUCE THE PUBLIC HEALTH BURDEN OF AIR POLLUTION

Cleaning & Preprocessing

We utilize **Python** for efficient data processing. Initially, we load two datasets "**Urban Air Quality**" and "**Heart Data**" using the **pandas library**, which allows for seamless handling and manipulation of CSV files.

1 - Importing Data

2 - Data Refinement

3 - Data Merging

4 - Post-Merge Data Refinement

Here's a clear structure of our data

01 Demographic

- Sex
- Age
- Gender

02 Weather Conditions

- Temperature
- Temperature Variations
- Humidity
- Heat Index
- UV Index
- UV radiations
- Solar Radiations

03 Medial Diagnoses

- **Conditions:**

Heart disease presence
Thalassemia (3 groups)

- **Measures :**

Cholesterol
Fasting Blood Sugar
Resting ECG
Chest pain type (4 groups)

- **Exercise related measures:**

Max Heart Rate
Exercised induced Angina

- **Symptoms and Test Results:**

Chest pain type (4 groups)
Oldpeak : ST depression , helps in understanding severity of heart disease

Let’s explore our visualization and insights!

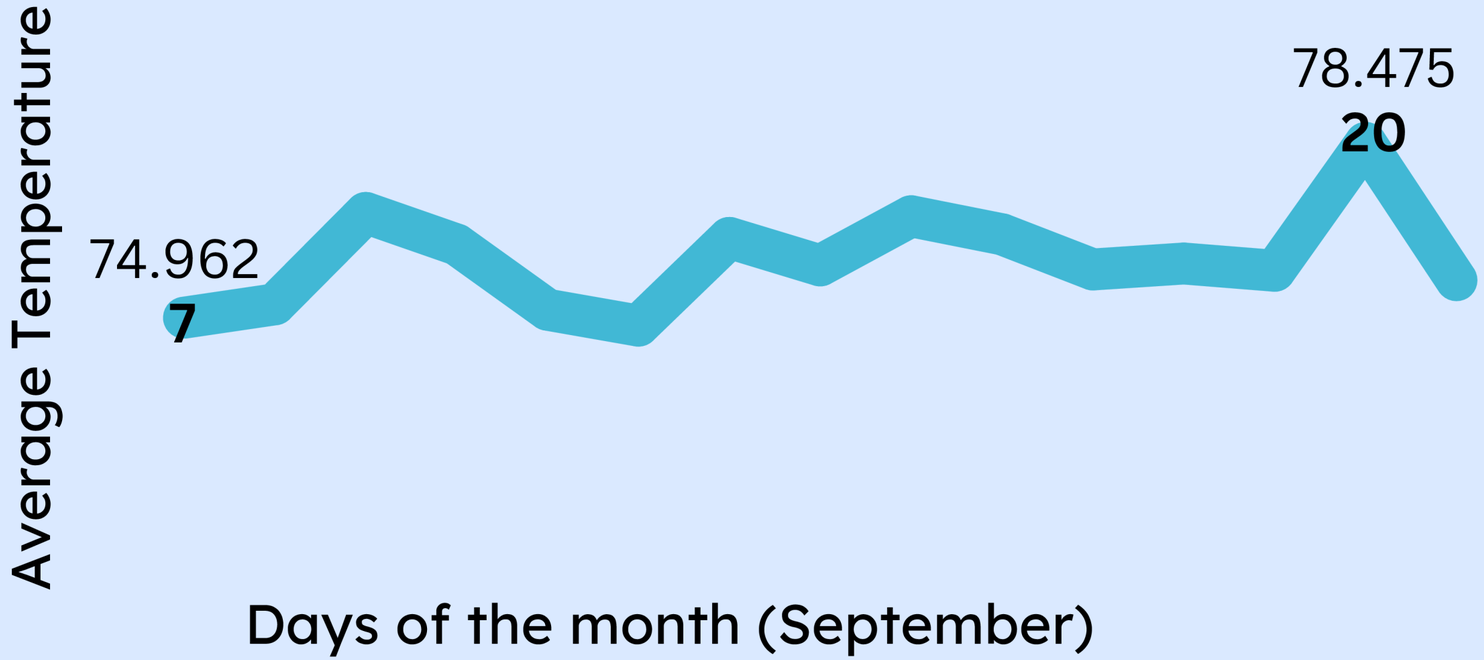
EXPLORATORY DATA ANALYSIS

Use descriptive statistics to summarize the data

To gain a better understanding of the data through statistical summaries and visualizations.

Column Name	Mean	Median	Standard Deviation
Temperature	76.11	75.22	8.71
Heat Index	80.19	78.56	6.050
Sever risk	12.92	10.08	8.834
Resting blood sugar	141.234	137	29.28
Maximum heart rate	142.754	146.5	35.98

AVERAGE TEMPERATURE VARIATIONS PER DAYS



The line chart illustrates the fluctuation in daily average temperatures over a specific period. The values range from approximately 74.962°F to 78.475°F, showing slight but consistent variations.

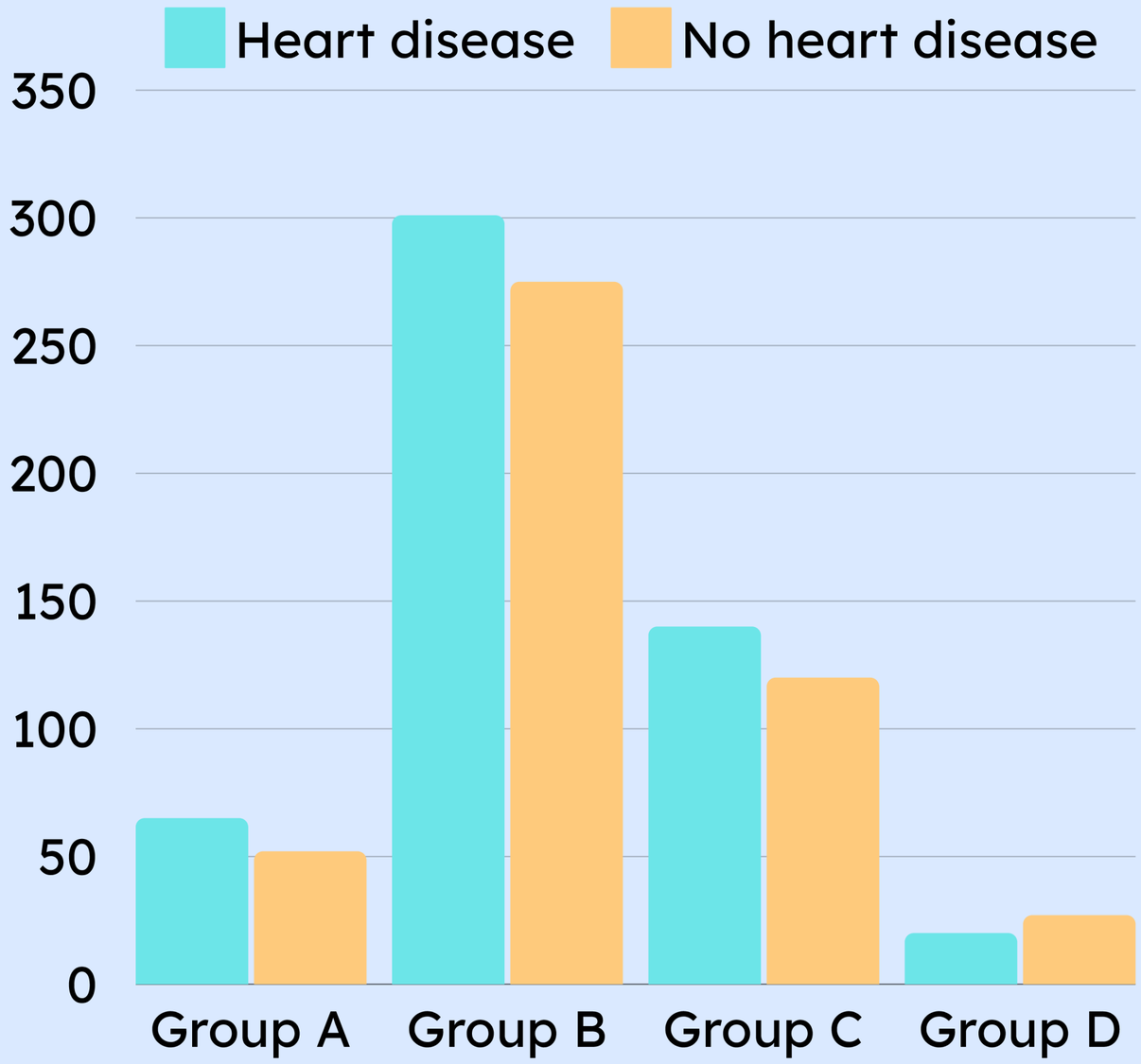
HEART DISEASE PRESENTS

The pie chart shows that 533,264 individuals have heart disease, while 480,766 do not.

HEALTH RISK SCORE VS HEART DISEASE PRESENCE

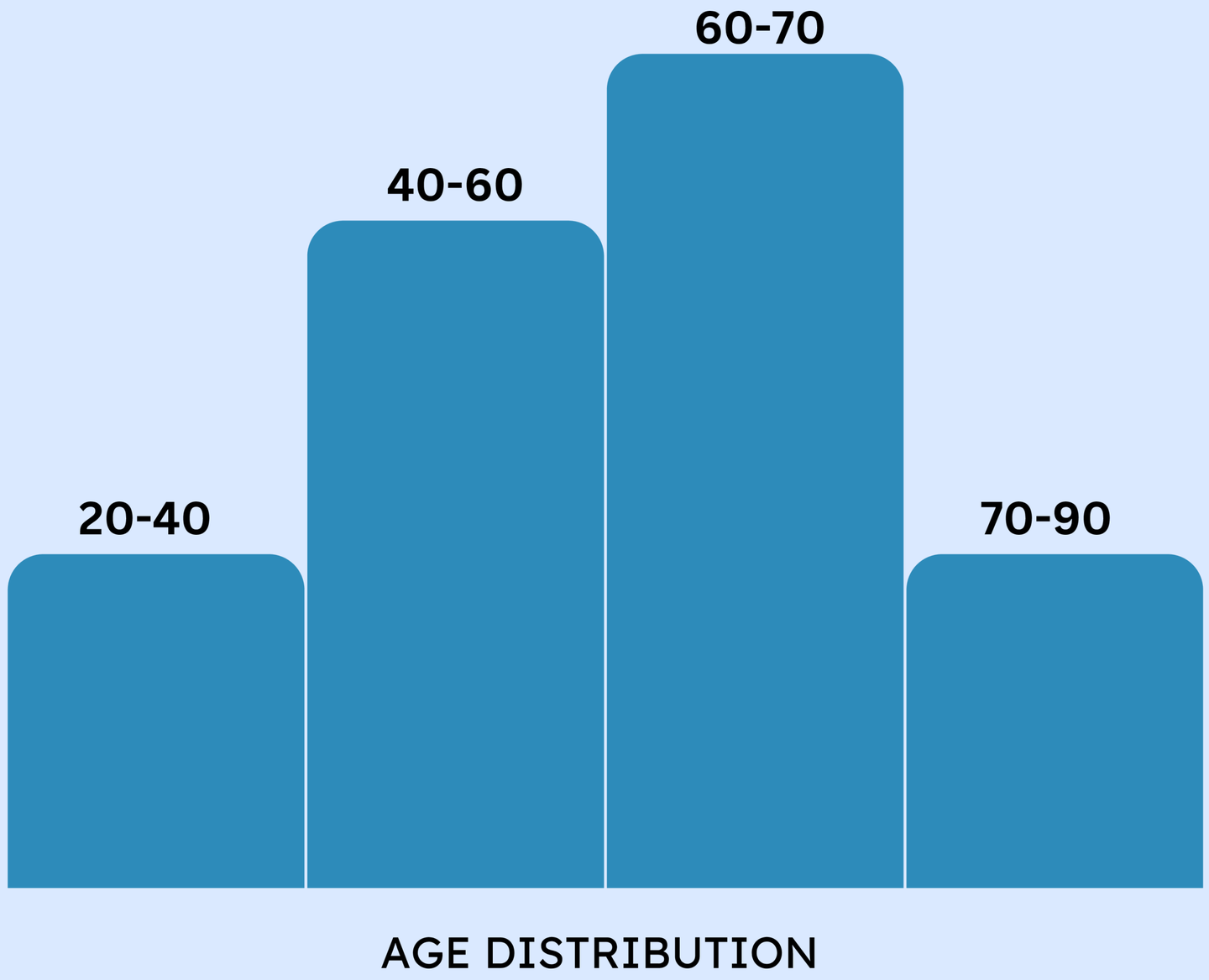
This bar chart categorizes individuals into four groups based on their health risk scores and examines how many within each group have heart disease

As the health risk score increases, the number of people with heart disease tends to decrease after peaking in Group B. This suggests that individuals with moderate health risk scores are more likely to heart disease, while the very high scores may relate to other health issues beyond heart disease.



AGE DISTRIBUTION AMONG DATASET

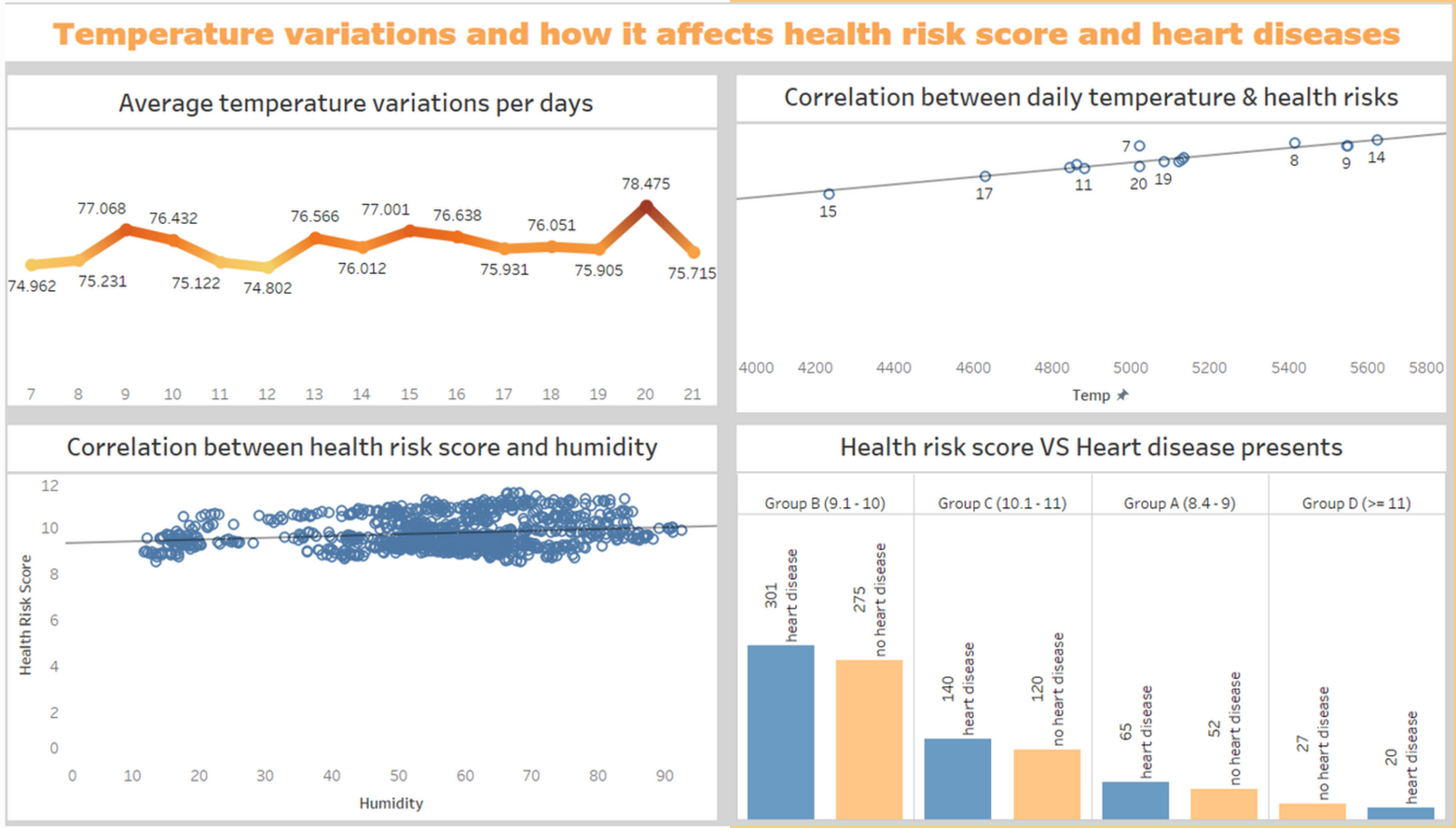
The bar chart displays the distribution of individuals across various age groups. The most common age group is between 60 and 70 years, indicating a higher number of older individuals in the dataset. Ages 70 and above show a gradual decrease in population representation.



CHEST PAIN TYPE VS UV INDEX

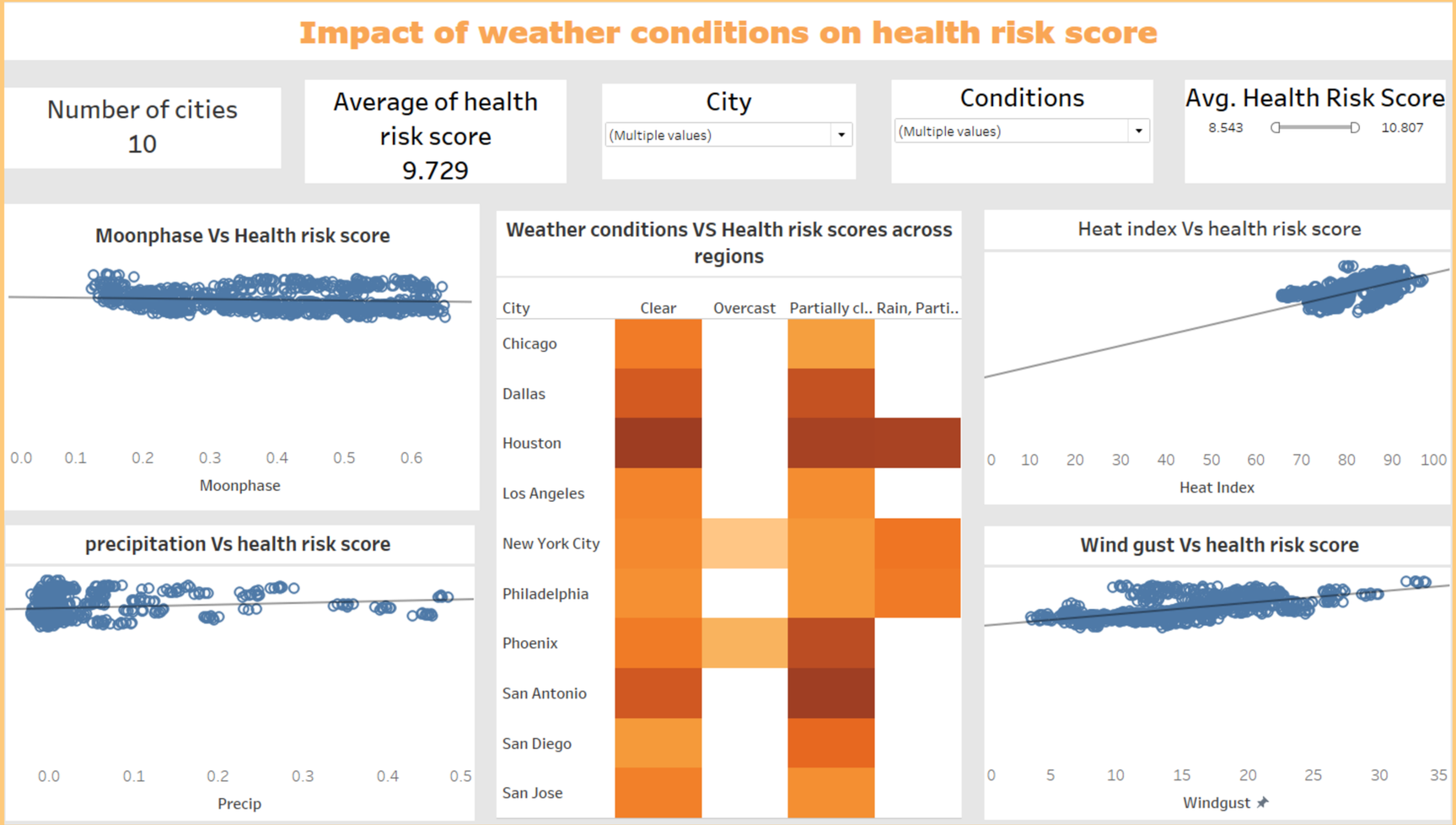
This treemap visualizes the relationship between various chest pain types and the UV index. Atypical angina and asymptomatic cases are shown with lower values, while typical angina and non-anginal pain dominate the chart. This suggests a variation in chest pain types depending on the UV index exposure.

- Higher humidity appears to correlate with increased health risks.
- Moderate health risk scores (Groups B and C) show a significant number of people with heart diseases, indicating that moderate levels of risk factors might be the most dangerous.



- Temperature fluctuations have a noticeable impact, with slight increases in temperature leading to elevated health risk scores.

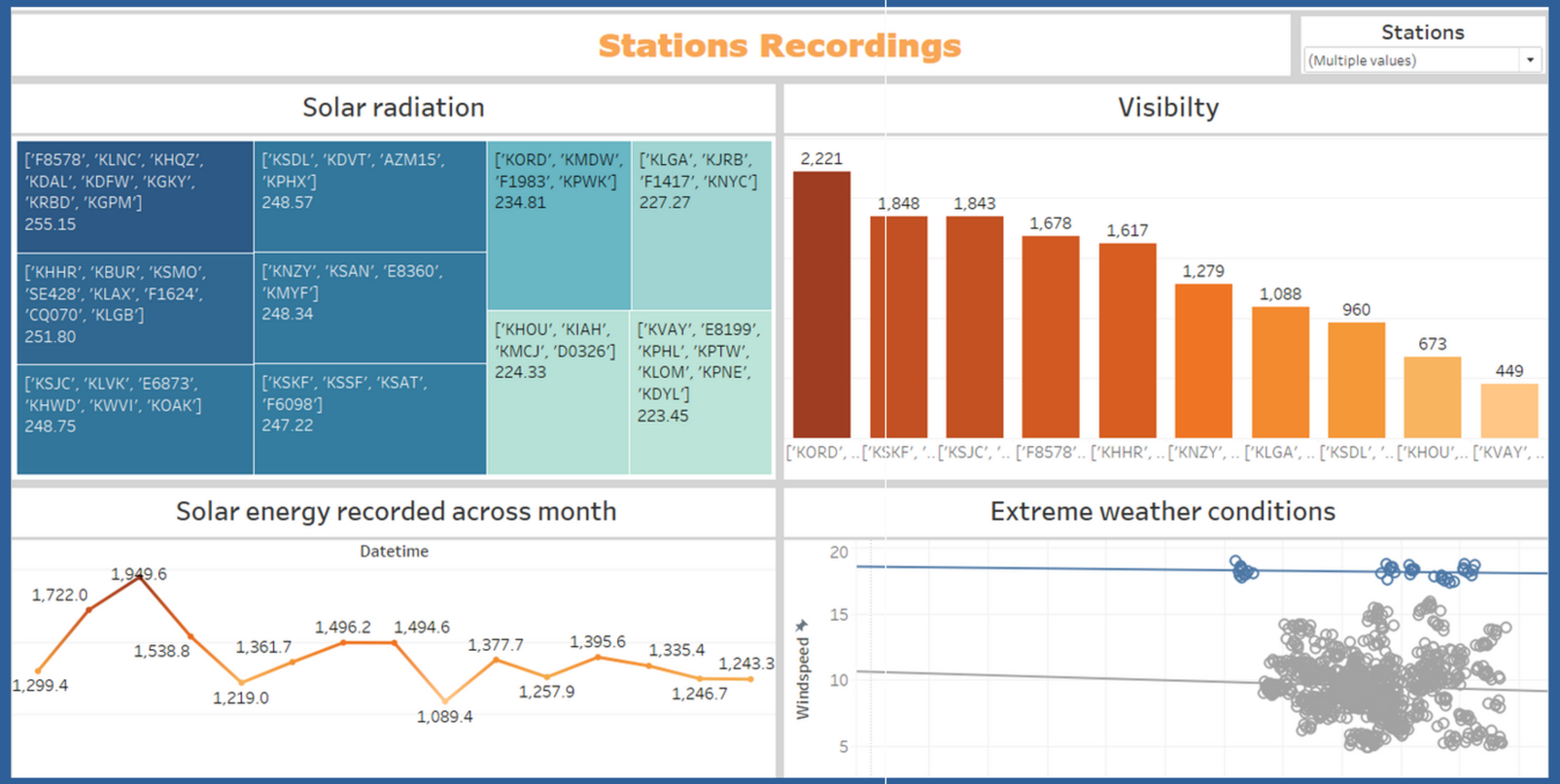
Further emphasizing the need for monitoring environmental conditions to prevent heat-related health issues.



Environmental factors like heat index, wind gusts, and precipitation can significantly influence health, especially for those with pre-existing conditions. Moon phases, while less scientifically substantiated, are sometimes linked to mood and sleep disturbances.

1.Solar radiation varies significantly across different stations, with some areas experiencing much higher levels, potentially leading to more extreme heat-related conditions.

2.Visibility recordings reveal that certain stations have much lower visibility, suggesting different weather conditions that could impact both health and safety

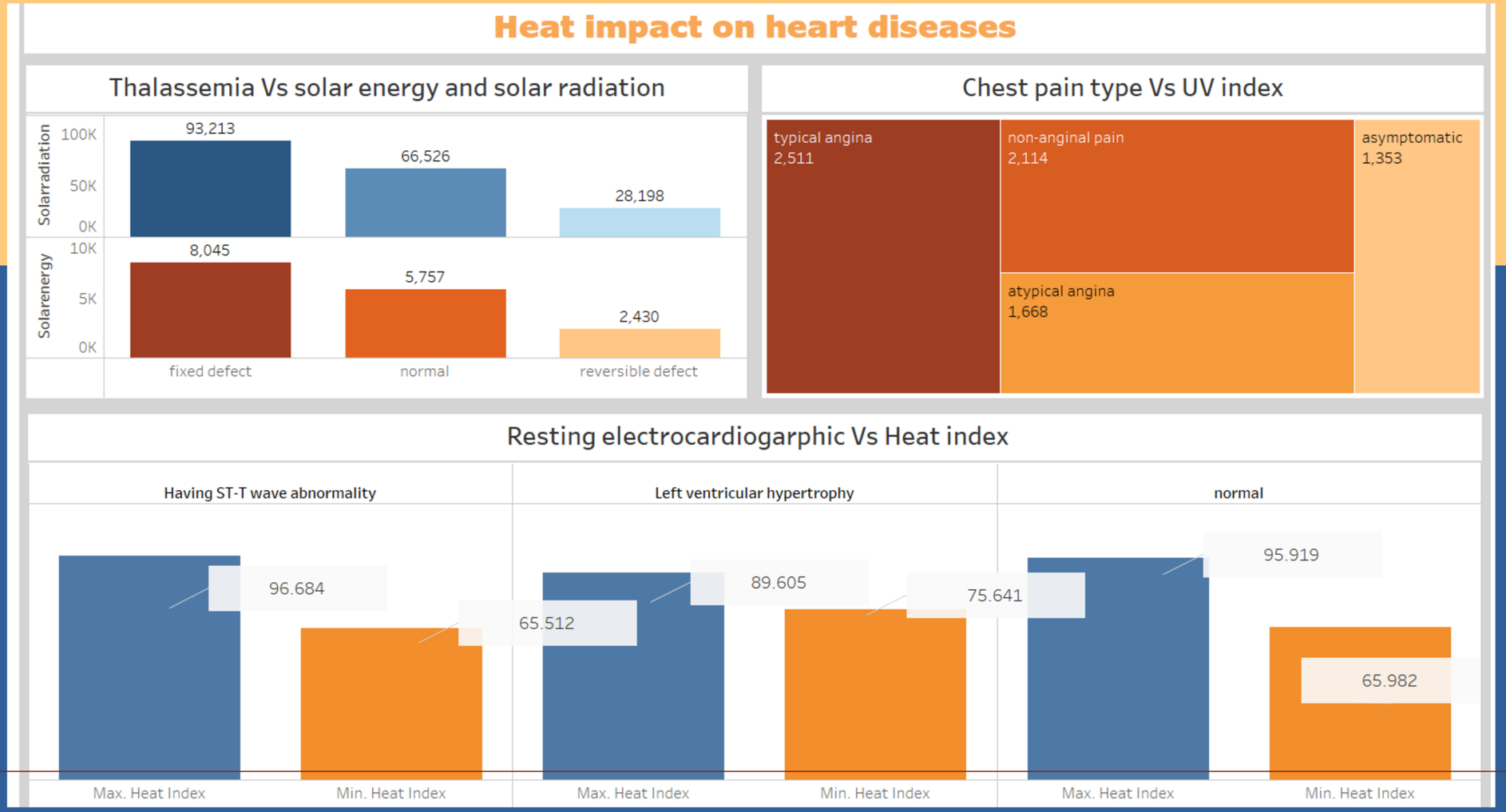


3.Solar energy fluctuations over the month suggest varying weather patterns, with spikes in solar energy potentially corresponding to warmer days, contributing to higher health risks.

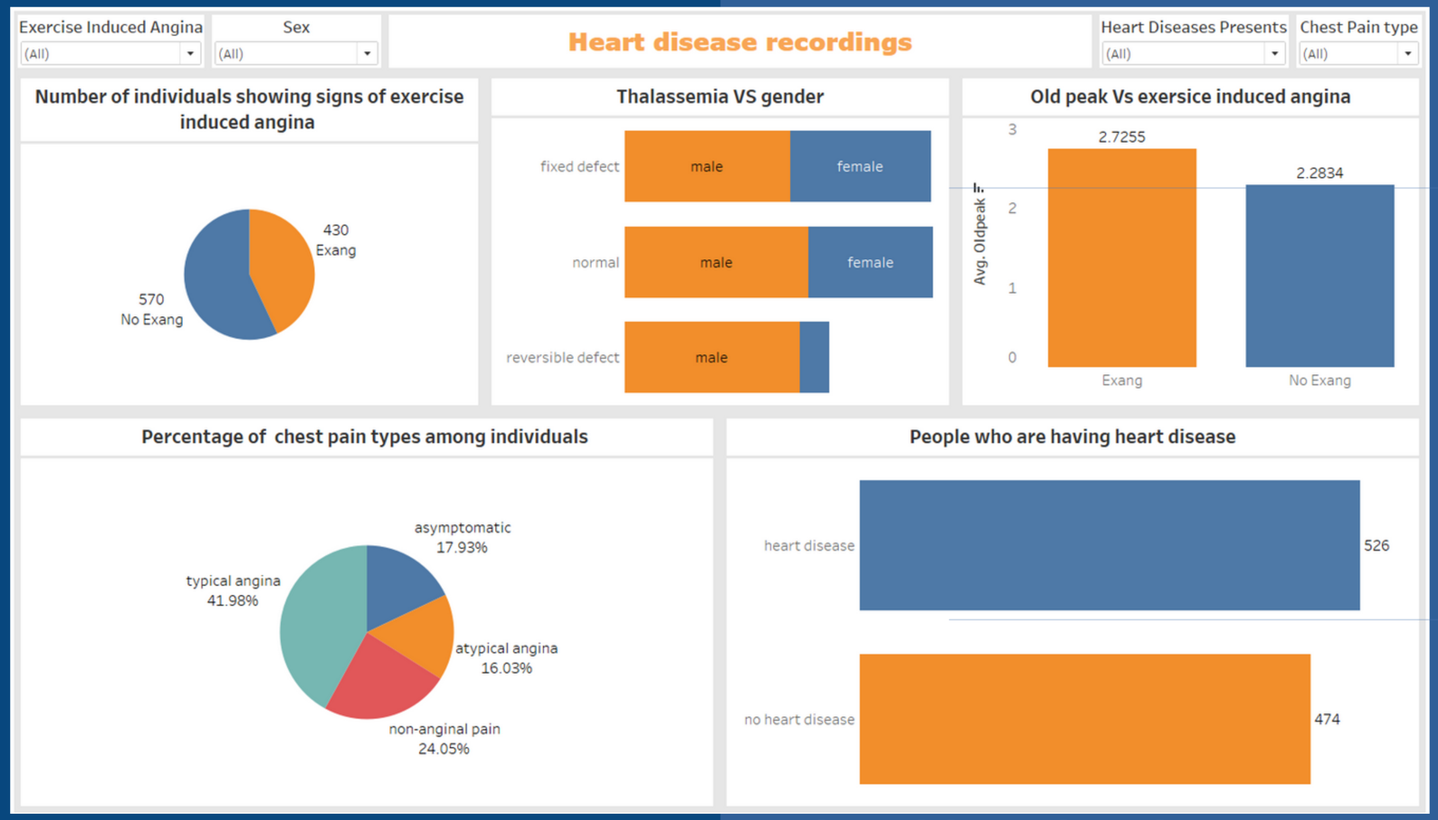
4.Extreme weather conditions show that, despite rising temperatures wind speeds remain constant,
which could amplify heat stress in populations during heat waves

- Increased solar irradiation appears to be strongly associated with fixed thalassemia defects, whereas other conditions like reversible defects show lower correlations.
- The heat index seems to play a critical role in worsening electrocardiographic abnormalities, particularly with conditions like left ventricular hypertrophy.

This analysis provides valuable insights into how exposure to heat and solar conditions might influence the risk or presence of various heart diseases.



This dashboard effectively visualizes key indicators for heart disease, helping medical professionals assess risk factors like angina, chest pain types, and old peak values for better heart health management.



1-A significant proportion of individuals show signs of exercise-induced angina, indicating a higher risk of heart problems for these individuals.

2-The old peak value tends to be higher for individuals with both exercise-induced angina and heart disease, suggesting that those with higher old peak values are more likely to suffer from serious heart conditions.

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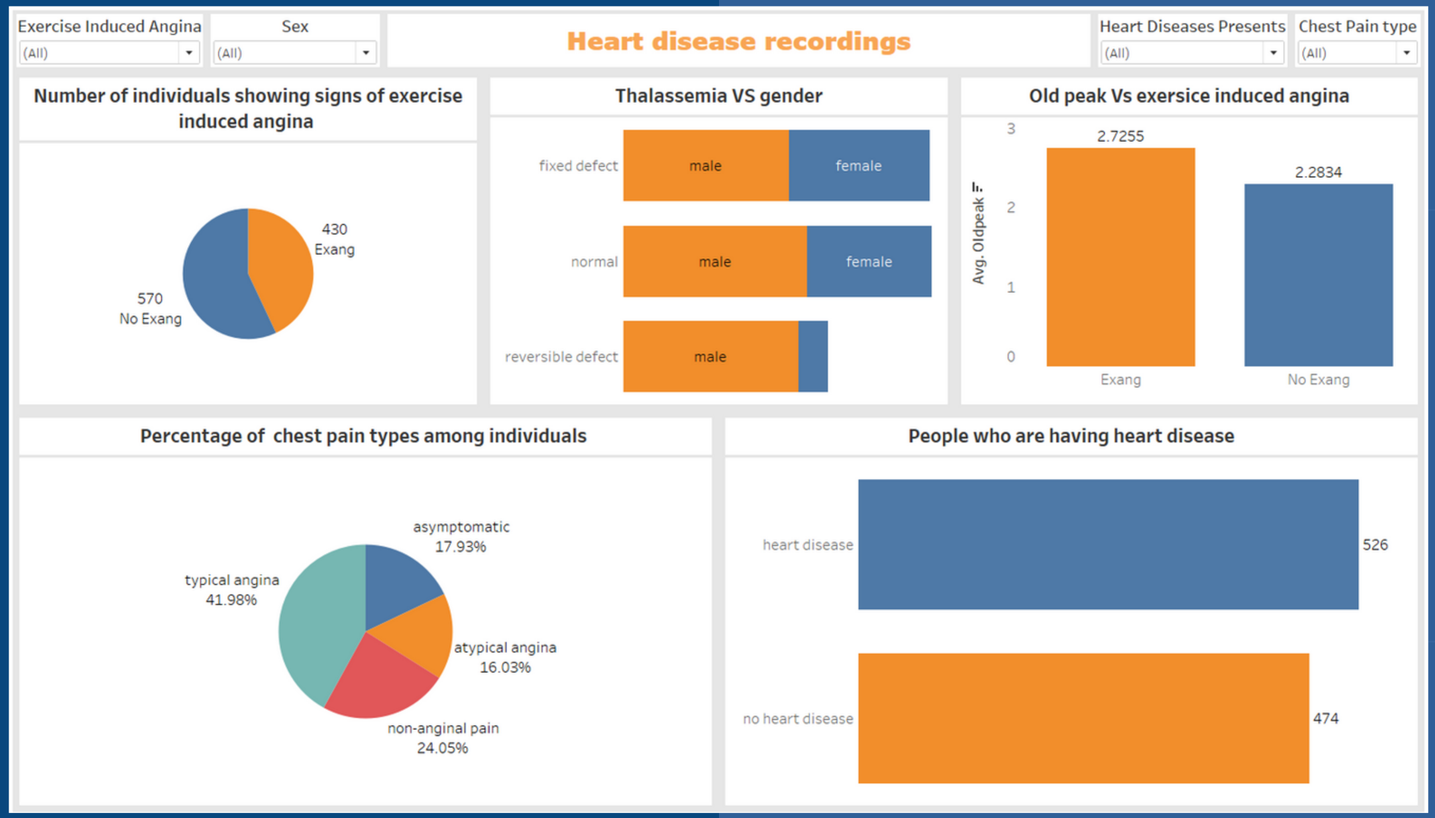


3-Typical angina is the most common type of chest pain, but a large number of individuals experience non-anginal and atypical angina, highlight the ways heart disease can present.

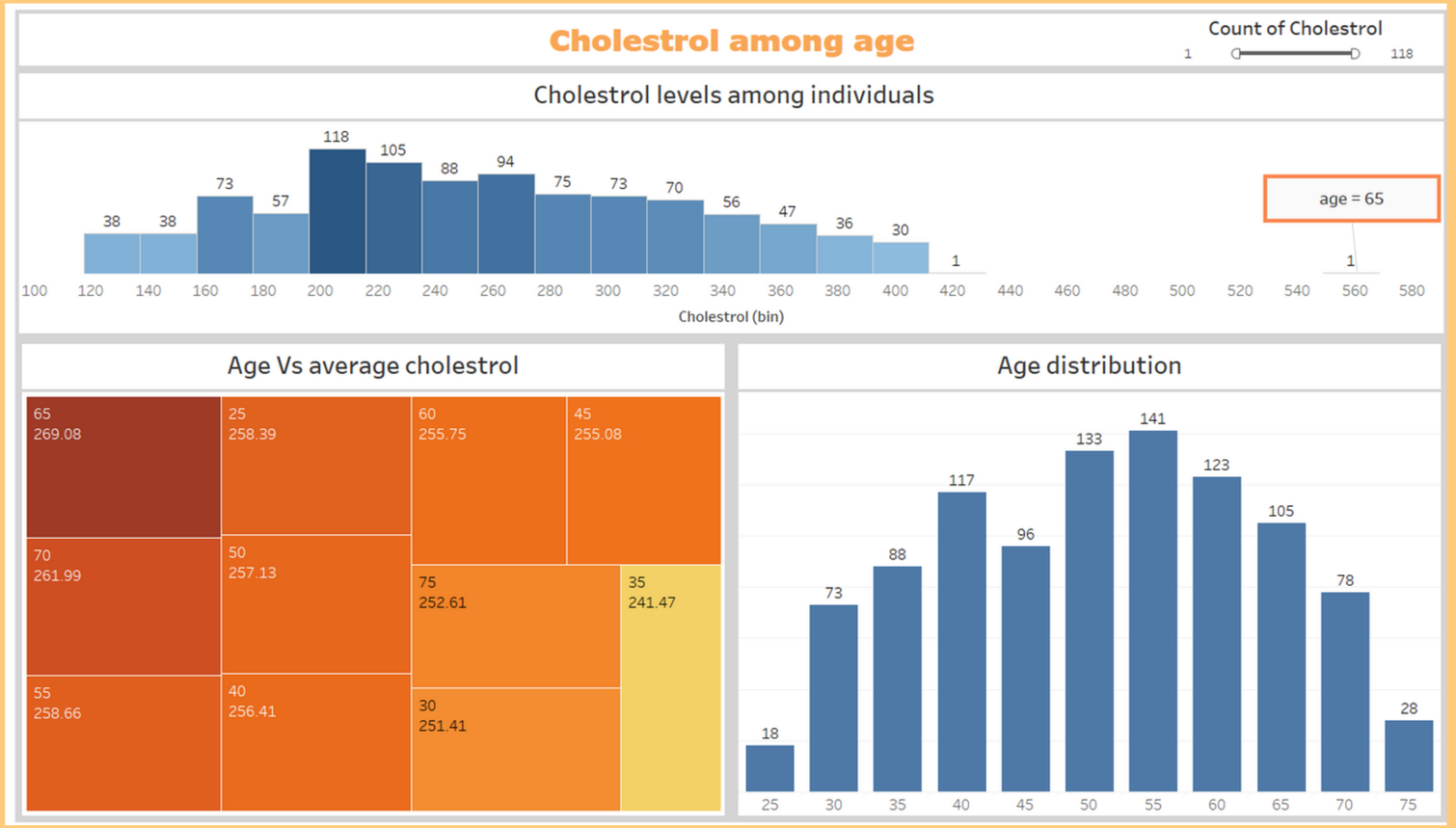
4-The average old peak value indicates a moderate risk level across the population for heart-related issues, with a slight emphasis on those with existing heart conditions

This dashboard serves as a comprehensive overview of how cholesterol levels relate to age, which is crucial for identifying at-risk age groups for cardiovascular conditions.

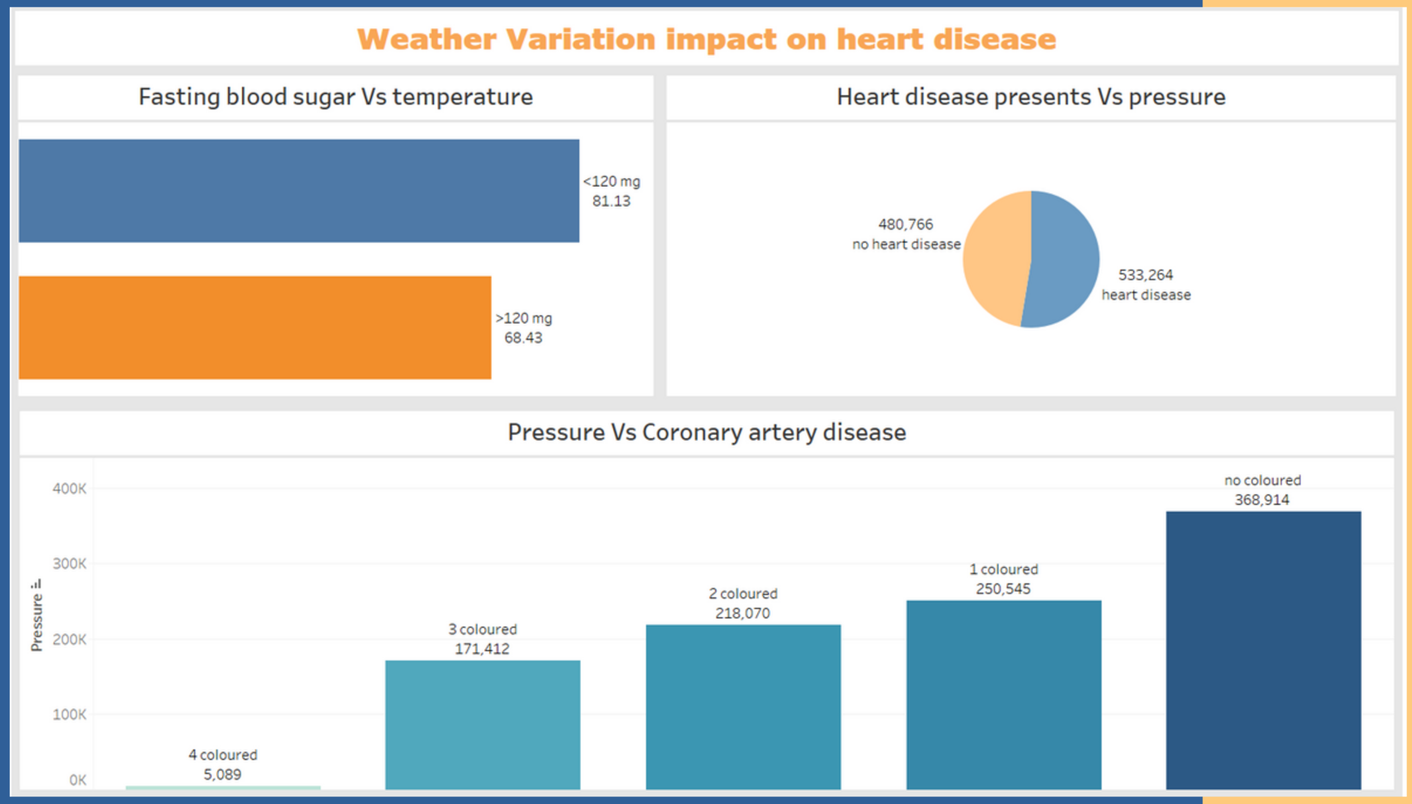
- **Higher cholesterol levels tend to be more common among older age groups.**

- **Individuals aged 65 exhibit the highest average cholesterol, suggesting a potential correlation between aging and cholesterol elevation.**

- **A considerable variation in cholesterol levels can be observed across different ages, emphasizing the importance of monitoring cholesterol as individuals age.**



This dashboard effectively illustrates the relationship between weather variations, heart disease, and coronary artery disease, providing key insights for healthcare professionals and researchers



- Weather, particularly pressure variations, shows a potential correlation with both heart disease and coronary artery disease.

- Individuals with higher fasting blood sugar levels tend to experience different weather conditions, possibly affecting heart health.

- A significant number of individuals with coronary artery disease are affected by higher pressure levels, suggesting the importance of monitoring both pressure and coronary artery disease symptoms together.

Conclusion

- Link between Air Pollution and Heart Diseases
- At-Risk Populations
- Cost of Inaction
- Global and Local Impacts
- Call to Action

Further Work and Insights

01 Monitoring and Technological Innovation

02 Assessing Policy Impact

03 Collaboration Across Disciplines

04 Public Health Campaigns

05 Predictive Analytics for Air Quality Management

06 Global Cooperation and Data Sharing

Any Questions?

Thank you!

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Julie Nader Fathy Attia

julienader096@gmail.com

02

Hania Essam AbdelHalim

hania.essam2002@gmail.com