1. Define Power BI and What are the key components of the Power BI ecosystem? Briefly explain:
   ● Power BI Desktop
   ● Power BI Service
   ● Power BI Mobile
   ● Power BI Gateway

Power BI is a Business Intelligence (BI) and data visualization tool developed by Microsoft that helps users:

- Connect to multiple data sources
- Transform and clean data
- Create interactive dashboards and reports
- Share insights across the organization

It converts raw data into meaningful visual insights to support data-driven decision making.

1. Power BI Desktop

Power BI Desktop is a Windows application used to create reports and data models.

2. Power BI Service (PowerBI.com)

Power BI Service is a cloud-based platform.

3. Power BI Mobile

Power BI Mobile is a mobile app available for:

AndroiD

iOS

Windows

4. Power BI Gateway

Power BI Gateway is used to connect on-premises data sources to Power BI Service.

2. **Compare the following Power BI visuals: ● Pie Chart vs Donut Chart ● Bar Chart vs Column Chart When would you prefer one over the other? Give one example for each pair.**

Pie Chart vs Donut Chart

Pie Chart

What it shows:

- Displays proportion of categories as slices of a circle.
- Each slice represents percentage contribution to total.

Example:
Suppose you are showing **market share of 4 brands**:

- Brand A – 40%
- Brand B – 30%
- Brand C – 20%
- Brand D – 10%

Pie chart works well because it clearly shows share of total.

Donut Chart

What it shows:

- Similar to Pie chart but with a hole in the center.
- Often used to display a total value in the center.

Best Used When:

- You want to show both percentage and total value.
- Slightly better visual space utilization.
- Modern dashboard look.

Example:

If you want to show:

- Total Sales = ₹10 Crores (in the center)

- Sales distribution by region around it

Donut chart is better because you can show total inside the center.

Bar Chart vs Column Chart

Both compare values across categories — difference is orientation.

Bar Chart (Horizontal)

What it shows:

- Horizontal bars.
- Categories on Y-axis.
- Values on X-axis.

Best Used When:

- Category names are long.
- Many categories.
- Easy comparison across categories.

Example:

Suppose you show:

- Sales by Product Name
  (Products have long names like “Premium Wireless Bluetooth Headphones”)

Bar chart is better because long names fit properly.

Column Chart (Vertical)

What it shows:

- Vertical bars.
- Categories on X-axis.
- Values on Y-axis.

Best Used When:

- Time-based data (months, years).
- Fewer categories.
- Showing trends over time.

Example:

Monthly Sales:

- Jan – ₹5L
- Feb – ₹6L
- Mar – ₹8L
- Apr – ₹7L

Column chart is better because time flows naturally left to right.

3 : Explain the significance of: ● Star schema vs Snowflake schema ● Primary key vs Foreign key in relationships (Power BI) Why is cardinality important?

Star Schema vs Snowflake Schema

Both are data modeling techniques used in Data Warehousing and Power BI.

Star Schema

Structure:

One central Fact table

Connected directly to multiple Dimension tables

Looks like a “star” shape

Example:

Fact_Sales

SalesID

ProductID

CustomerID

DateID

SalesAmount

Connected to:

Dim_Product
Dim_Customer
Dim_Date

Each dimension connects directly to fact table.

❄ **Snowflake Schema**

Structure:

Fact table connects to dimension tables
Dimension tables are further normalized into sub-dimensions
Example:

Fact_Sales → Dim_Product → Dim_Category

Here Product dimension is split into Category table.

Primary Key

- Unique identifier in a table
- No duplicates
- No null values

Example:
Dim_Customer
CustomerID (Primary Key)

Each customer appears only once.

Foreign Key

- A column that references the Primary Key of another table
- Creates relationship between tables

Example:
Fact_Sales
CustomerID (Foreign Key)

Many sales can belong to one customer.

Cardinality defines **how tables are related**.

Types in Power BI:

1 One-to-Many (1:*)*
2 Many-to-One (:1)
3 Many-to-Many (*:*)
4 One-to-One (1:1)

Why Cardinality Matters?

1. Affects Performance

2. Affects Filter Flow

3. Prevents Data Duplication

4. Differentiate between: ● Calculated column vs Measure Also, define Row context and Filter context with simple examples.

Calculated Column vs Measure

Calculated Column

A calculated column is a new column created using DAX that is calculated row by row and stored in the table.

Key Characteristics:

- Computed during data refresh
- Stored in the model (takes memory)
- Works in Row Context
- Can be used in slicers, filters, rows, columns

  Example: TotalAmount = Sales[Quantity] * Sales[Price]
  It calculates for each row:

Measure

A measure is a dynamic calculation that is computed at the time of visualization based on filter context.

Key Characteristics:

- Not stored in the table
- Calculated on the fly
- Works in Filter Context
- Used mainly in visual values

Example:

- Total Sales = SUM(Sales[TotalAmount])

This measure:

- Changes based on filters
- If you select Region = West → It shows only West sales
- If no filter → Shows total sales
-

Row Context

Row context means calculation happens one row at a time.

It automatically exists in:

- Calculated columns

- Iterators like SUMX, AVERAGEX

Simple Example:

If you create:

Profit = Sales[SalesAmount] - Sales[Cost]

Power BI calculates for:
Row 1 → Sales - Cost
Row 2 → Sales - Cost
Row 3 → Sales - Cost

It evaluates each row individually.

Filter Context

What is it?

Filter context means calculation is affected by:

- Slicers
- Filters
- Visual selections
- Report/page filters

Example:

Total Sales = SUM(Sales[SalesAmount])

If your report has:

- Region slicer = East

Then measure calculates:

SUM(SalesAmount WHERE Region = East)

The filter changes the result.

5. What is the difference between a report and a dashboard in Power BI?

What is a Report in Power BI?

A Report is a collection of multiple interactive visualizations (charts, tables, maps, etc.) created in Power BI Desktop.

Key Features:

- Can have multiple pages
- Built using datasets
- Highly interactive (filters, slicers, drill-through)
- Created mainly by analysts
- Saved as .pbix file (in Desktop)

What is a Dashboard in Power BI?

A Dashboard is a single-page view created in Power BI Service.

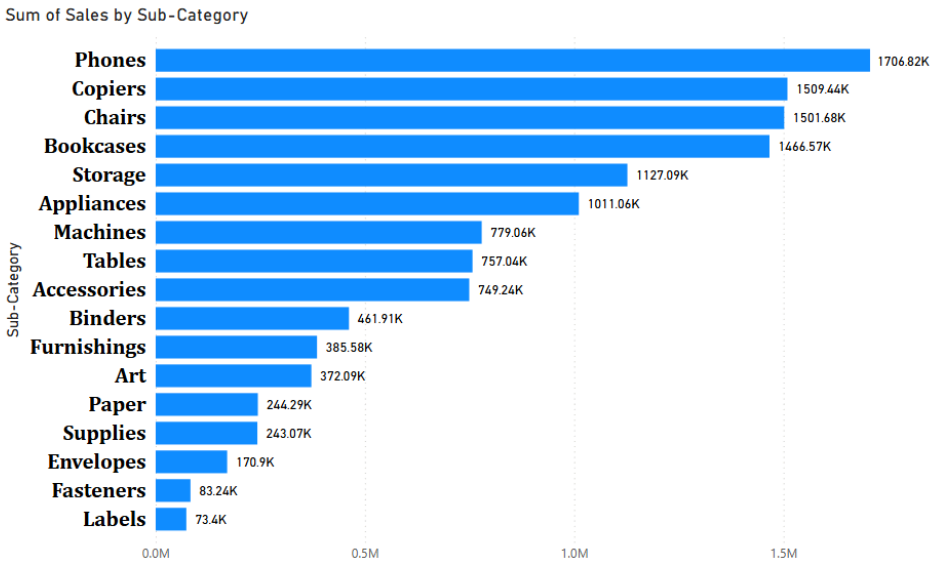
It displays pinned visuals from one or multiple reports.

Key Features:

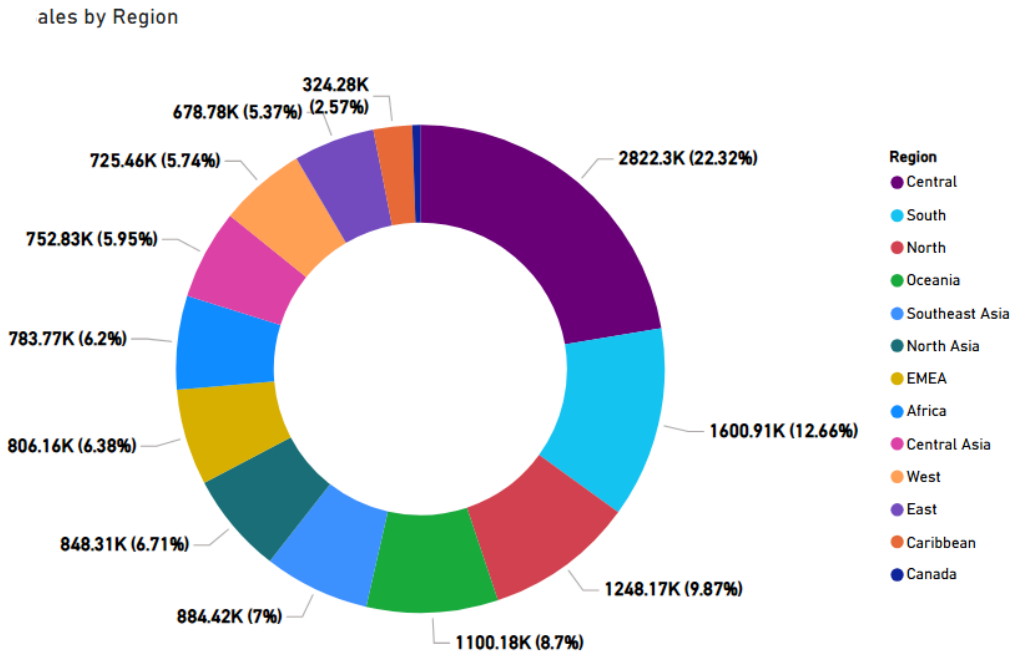
- Only one page
- Created in Power BI Service (not Desktop)
- Can combine visuals from multiple reports
- Used for high-level summary
- Good for executives & managers

6. Using the Sample Superstore dataset: ● Create a Clustered Bar Chart to display Total Sales by Sub-Category ● Create a Donut Chart for Sales % by Region Provide screenshots of both visuals.

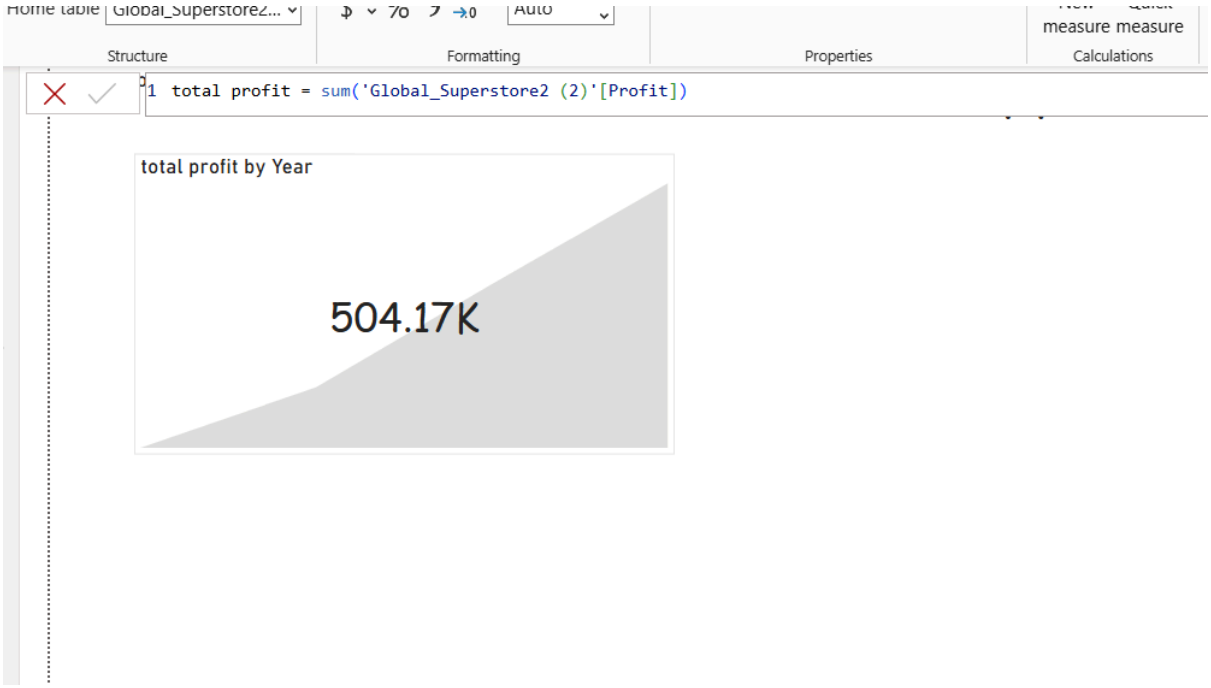
Total Sales By Sub Category

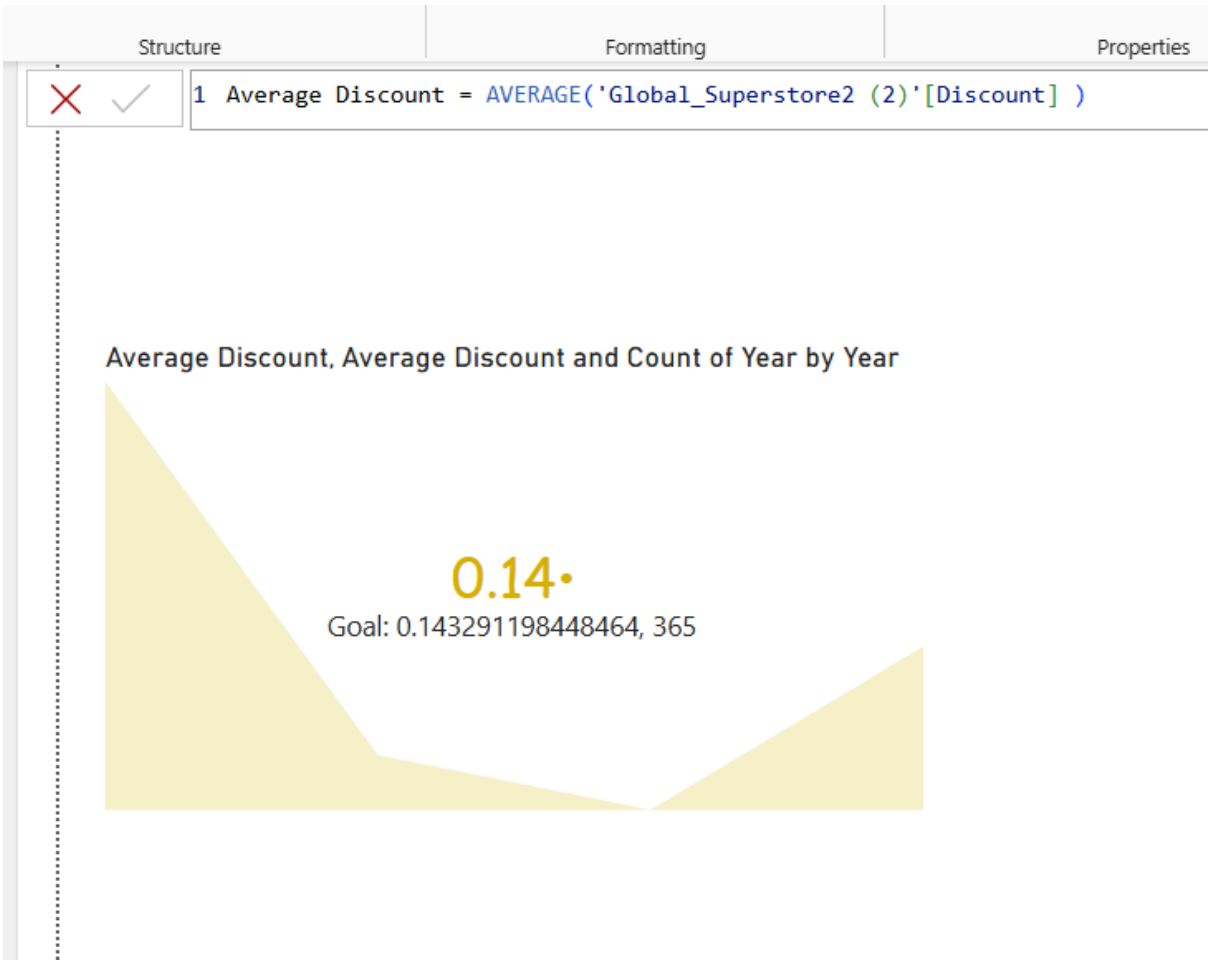


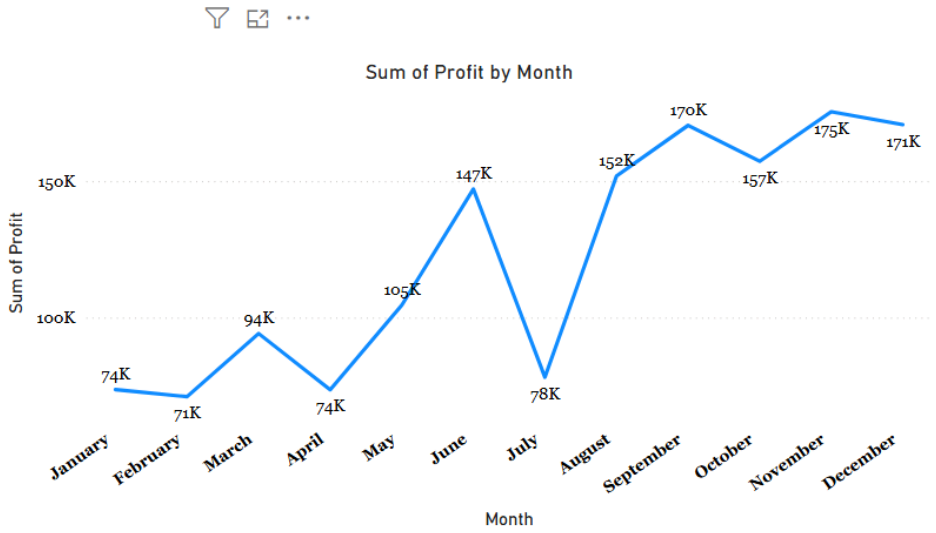
Sum of Sales by Region



7. Write and apply the following measures: ● Total Profit = SUM([Profit]) ● Average Discount = AVERAGE([Discount]) Display both in a KPI Card, and use a Line Chart to show profit trend over months. Add visuals and DAX formulas.


Home table
Global_Superstore2...
Auto
Structure
Formatting
Properties
New measure
Quick measure
Calculations
1 total profit = sum('Global_Superstore2 (2)'[Profit])
total profit by Year
504.17K


Structure
Formatting
Properties
1 Average Discount = AVERAGE('Global_Superstore2 (2)'[Discount])
Average Discount, Average Discount and Count of Year by Year
0.14
Goal: 0.143291198448464, 365



8. Implement a DAX measure that calculates the percentage of total sales by product category.

Product_category Sales_Amount Electronics 5000 Clothing 3000 Home Appliances 7000 Books 2000 Tables & Chairs 8000 Toy 1500 Sports Equipment 1200 Office Supplies 1000 Beauty Products 4400 Garden Supplies 1000 Jewelry 1800 Automative 2600

Product_category	Sum of Sales_Amount	Total Sales	% of total sales
Garden Supplies	1000	1000	0.03
Office Supplies	1000	1000	0.03
Sports & Equipment	1200	1200	0.03
Toy	1500	1500	0.04
Jewelry	1800	1800	0.05
Books	2000	2000	0.05
Automative	2600	2600	0.07
Clothing	3000	3000	0.08
Beauty Products	4400	4400	0.11
Electronics	5000	5000	0.13
Home Appliances	7000	7000	0.18
Tables & Chairs	8000	8000	0.21
Total	**38500**	**38500**	**1.00**

9. ● Create a DAX Measure for Total Profit
● Use it in a Waterfall Chart to analyze how different Sub-Categories contribute to overall profit
● Add a Slicer for Region to filter the visual
● Write brief business insights (4–5 lines) from the chart and provide 2–3 data-driven recommendations to improve profit.

Provide a steps, screenshot of the Waterfall chart and the DAX formula

1. Copiers and Phones are the highest profit-generating sub-categories, contributing significantly to overall profit.

2. Categories like Accessories, Storage, and Binders show steady positive contribution, indicating consistent demand.

3. Tables is the only major loss-making sub-category, negatively impacting total profitability.

4. SouthEast Asia area has maximum loss making sub categories in all these Regions.

5. The overall business remains strongly profitable despite losses in specific segments.

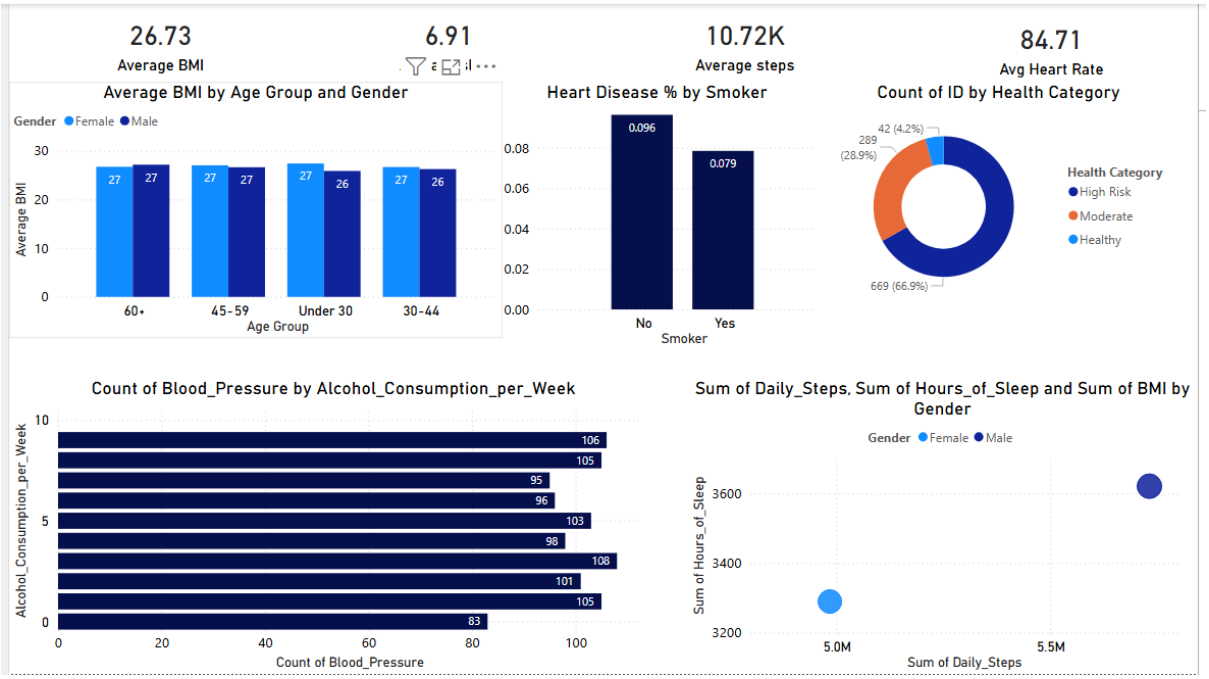
Data-Driven Recommendations :

1. Re-evaluate pricing and discount strategy for Tables, as it shows a significant negative profit impact (-64K).

2. Increase marketing and inventory focus on Copiers and Phones, since they drive the largest share of total profit.

3. Conduct cost analysis on low-margin categories to optimize procurement or supplier contracts.

10. Scenario: VitaTrack Wellness, a digital health company in FitZone, has collected data on users' daily habits and health vitals. The analytics team is tasked with drawing actionable insights from this data to improve lifestyle suggestions and prevent heart-related risks. Your Task: Using the provided dataset (includes Age, Gender, BMI, Steps, Calories, Sleep, Heart Rate, Blood Pressure, Smoking, Alcohol, Exercise, Diabetic & Heart Disease status):
Build a one-page Power BI dashboard that answers:
1. Are users maintaining a balanced lifestyle (Steps, Sleep, Calories)
2. What lifestyle patterns (Smoking, Alcohol, BMI, etc.) indicate heart disease risk?
3. Is there any visible relationship between Sleep and Physical Activity?
4. How does BMI vary across Age Groups and Genders?
5. What is the impact of smoking and alcohol on heart rate and blood pressure?
6. Segment people based on their health activity to suggest lifestyle changes



Majority Fall Under High Risk Category

- 66.9% of individuals are classified as High Risk
- Only 4.2% are Healthy

The population is heavily skewed toward poor health condition.

BMI Is Consistent Across Age Groups

- Average BMI across all age groups ≈ 26–27
- Both males and females show similar BMI patterns
- BMI remains slightly above normal range (25+ = overweight)

Overweight trend is consistent across all ages.

Heart Disease % by Smoking

- Non-smokers: 9.6%
- Smokers: 7.9%
  This is an unusual trend since smokers typically show higher heart disease rates.
  May indicate data imbalance or other stronger influencing factors.

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4 Blood Pressure & Alcohol Consumption

- Blood pressure case count increases around mid-level alcohol consumption (4–7 drinks/week)
- Lower counts at 0 consumption

Moderate-to-high alcohol intake may correlate with increased blood pressure cases.

Gender Comparison (Steps & Sleep)

- Males show:
  - Higher total daily steps
  - Higher total sleep hours
- Females show slightly lower totals

Activity levels and sleep patterns differ slightly by gender.

Overall Health Pattern

- Population is mostly overweight
- High proportion of high-risk individuals
- Alcohol consumption may influence blood pressure
- Gender differences exist in activity and sleep

Recommendations

1. Focus on BMI Reduction Programs

- Introduce weight management initiatives
- Promote balanced diet & physical activity

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2. Target High-Risk Population (66%)

- Early screening programs
- Preventive health campaigns
- Lifestyle modification plans

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3. Alcohol Awareness Programs

- Educate on safe weekly consumption limits
- Encourage moderation

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4. Improve Physical Activity

- Encourage step goals (e.g., 8K–10K daily)
- Workplace or community fitness programs

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5. Investigate Smoking Data

- Re-check heart disease vs smoker relationship
- Validate dataset for anomalies