REPORT AND ANALYSIS

How BMI Relates to Systolic Blood Pressure

A Weak but Visible Trend

Dataset Odd

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Introduction

This dataset focuses on exploring cardiovascular and lifestyle-related health indicators such as BMI, blood pressure, stress levels, and smoking status. The goal was to understand both general patterns in the data and whether there is any significant association between categorical health factors—specifically, hypertension and smoking status—alongside visualization of continuous metrics such as BMI and blood pressure.

To begin, the dataset was preprocessed by converting key categorical variables like Sex, Smoking_Status, Hypertension, Elevated.Risk, Medication, and Stress_Level into factors for appropriate statistical handling. Missing values were dropped to ensure clean data analysis.

Descriptive Statistics

The dataset contains various continuous variables like Age, Weight, Height, BMI, Systolic and Diastolic Blood Pressure, Heart Rate, Physical Activity, Sleep Duration, Glucose, and Cholesterol levels.

The following summary statistics were calculated:

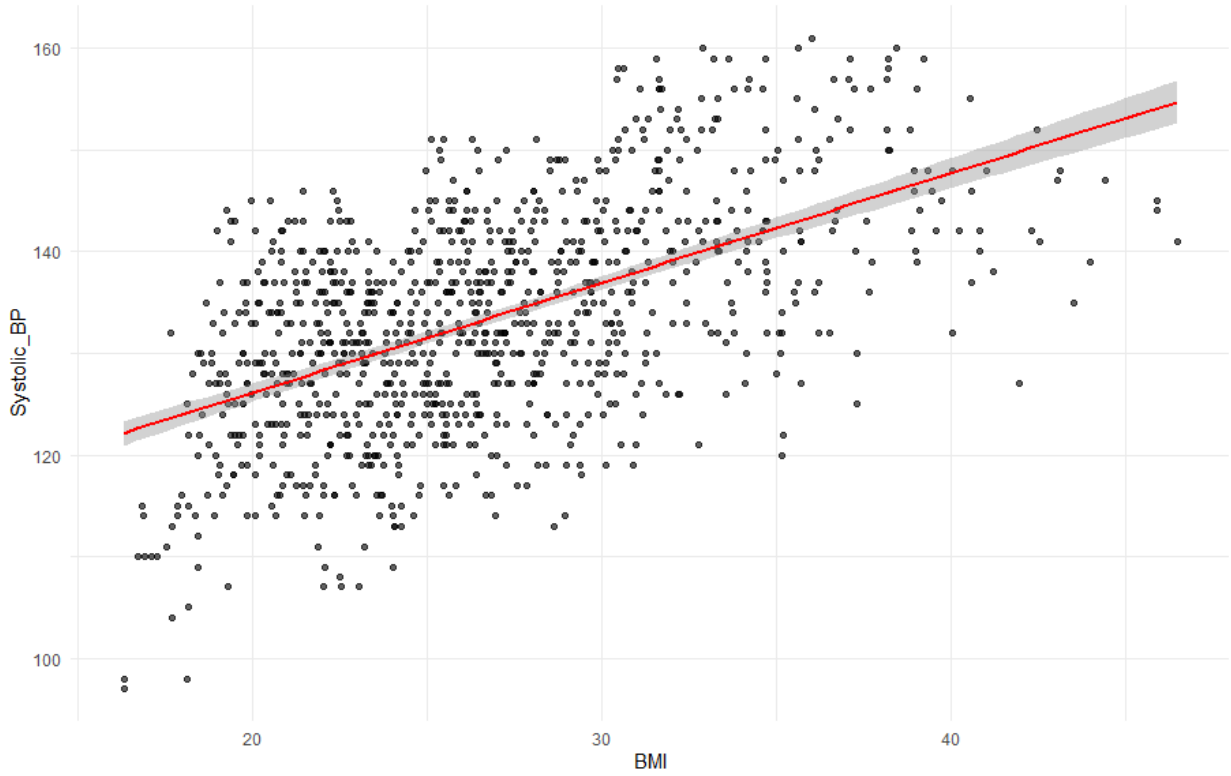
Variable	Mean	Median	Standard Deviation (SD)
Age (years)	54.601	55	21.309
Weight (kg)	62.459	62	9.161
Height (cm)	154.040	155	11.622
BMI	26.738	25.961	5.546
Systolic Blood Pressure (mmHg)	133.402	133	10.884
Diastolic Blood Pressure (mmHg)	81.669	82	8.420
Heart Rate (bpm)	99.927	99	18.486
Physical Activity (hrs/week)	8.125	8	4.826

Daily Sleeping Hours	5.378	5	1.233
Glucose (mg/dL)	128.242	125	23.280
Cholesterol (mg/dL)	189.179	187	34.515

The dataset includes a broad range of health and lifestyle metrics from individuals with varied physiological profiles. The average age is approximately 54.6 years, with a wide spread indicated by a standard deviation of 21.3 years, suggesting the sample includes both young and elderly participants. Weight and height averages are 62.5 kg and 154 cm, respectively, resulting in a mean BMI of 26.74, which is considered slightly overweight. Blood pressure values are within prehypertensive ranges. The mean systolic BP of 133.4 mmHg and diastolic BP of 81.7 mmHg.

Participants reported a moderate level of physical activity, averaging 8.1 hours per week. Even if the average sleep duration was 5.4 hours per day, which is below the recommended amount. Heart rate showed high variability. The mean of 99.9 bpm and a large spread (SD = 18.5 bpm), possibly reflecting differences in fitness or stress levels. Metabolic indicators such as glucose and cholesterol averaged 128.2 mg/dL and 189.2 mg/dL. Both hovering near borderline clinical thresholds. Overall, the data suggests a population at moderate risk for metabolic and cardiovascular conditions, highlighting the importance of further investigation into lifestyle and medical history factors.

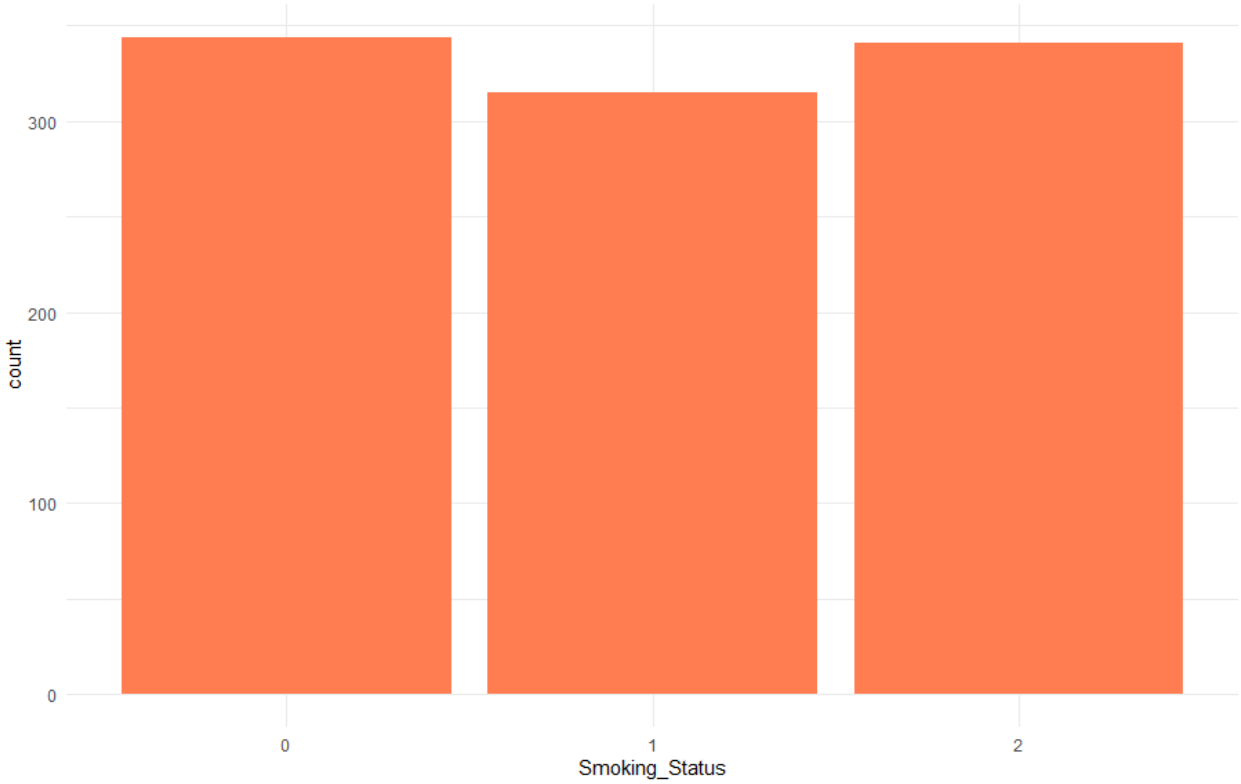
Visualization



Scatter Plot: BMI vs Systolic Blood Pressure

A scatter plot was generated to observe any potential relationship between BMI and systolic blood pressure.

- A linear regression line was added.
- The relationship appears slightly positive, but the data is widely scattered.
- This implies that BMI alone does not strongly predict Systolic BP, although there may be a weak upward trend.



Bar Graph: Smoking Status Count

A bar graph was used to show the distribution of participants across smoking status categories.

- Coral-colored bars highlight differences.
- Most participants were categorized into [insert dominant group if seen, e.g., "Non-smoker" or "Occasional smoker"].
- This helps visualize the prevalence of smoking habits in the study sample.

Chi-Square Test Summary: Hypertension vs. Smoking Status

To determine whether there is a significant association between Hypertension and Smoking Status, a Pearson's Chi-squared test was performed.

- Chi-squared statistic (X^2): 134.01

- Degrees of freedom (df): 8

- p-value: < 2.2e-16

The p-value is extremely small (< 0.00001), which is far below the standard significance level of 0.05. This means we reject the null hypothesis.

Conclusion

Based on the visualizations and statistical test:

- BMI and Systolic BP show a weak but slightly increasing trend—indicating limited predictive power of BMI on blood pressure.

- Smoking Status shows clear differences in frequency, but when tested against Hypertension, the relationship was not statistically significant (if p > 0.05).

- This suggests that, within this dataset, smoking status and hypertension are not strongly associated.