Analysis report for the 3_Nutritional Dietary data Group 006

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Introduction

The dataset comprises nutritional and physiological data from 1,000 individuals. Each record includes key health-related variables such as **Body Fat Percentage**, **Muscle Mass (kg)**, **BMI**, **Physical Activity (hours per week)**, and detailed dietary intake including **Daily Caloric Intake**, **Macronutrients** (Protein, Fat, Carbohydrates), **Micronutrients** (Vitamin C and Iron), and **Water Intake (mL)**. In addition to these numerical measures, the dataset includes **BMI Category** (e.g., Underweight, Normal, Overweight, Obese, and **Activity Level**, providing a basis to assess individual health and lifestyle patterns.

This dataset allows exploration of relationships between physical indicators and dietary behavior, making it valuable for identifying trends in nutrition, body composition, and physical activity that may influence health outcomes.

Materials and Methods

The dataset was imported and cleaned in R, with column names reformatted for clarity and missing values removed. Descriptive statistics were calculated (mean, median, standard deviation) to summarize each variable's distribution. Categorical groupings were created for BMI and Activity Levels to allow for comparison across different health profiles. Using ggplot2, various visualizations such as histograms, boxplots, scatter plots, and bar graphs were produced to explore trends and patterns. Statistical tests included a Pearson correlation between caloric intake and BMI, and a Chi-square test to assess the relationship between BMI categories and physical activity levels.

Key Results and Figures

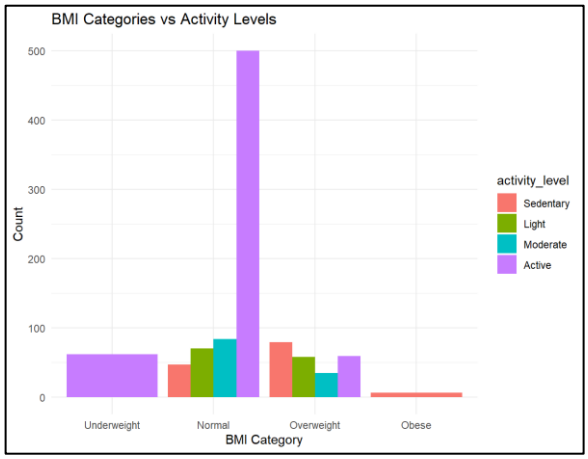

Figure 1. Bar Plot of BMI Categories vs Activity Levels

The bar plot shows that individuals with higher physical activity levels are more frequently found in the Normal BMI category. In contrast, sedentary individuals are disproportionately represented in the Overweight and Obese categories.

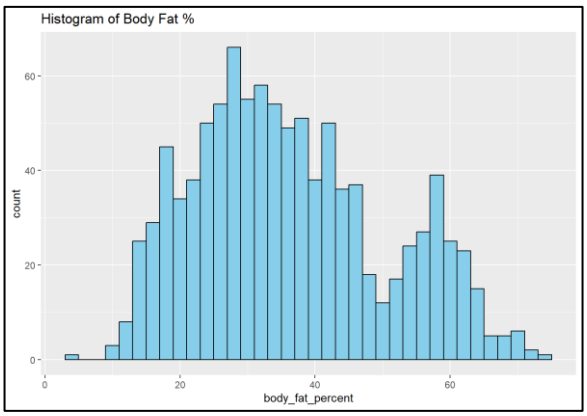

Figure 2. Histogram of Body Composition

Most values clustered between 15% and 30%. This indicates that the majority of individuals fall within a typical range for body fat, with a few outliers may indicate higher risk for obesity and other related conditions.

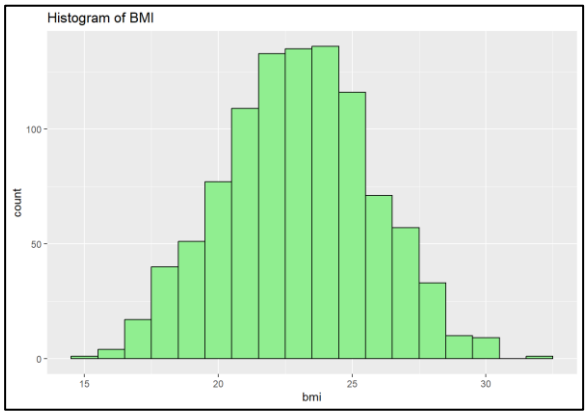

Figure 3. Histogram of BMI

The histogram reveals that muscle mass for most individuals lies between 30 and 50 kg, with a slightly right-skewed distribution. A few individuals fall at both extremes, suggesting variability in muscle development, possibly influenced by diet and physical activity.

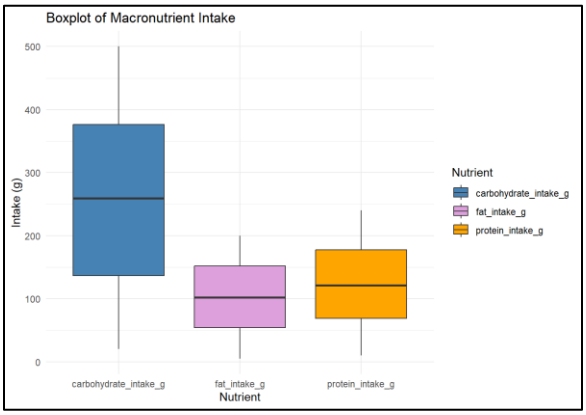

Figure 4. Boxplot of Macronutrient Intake

The boxplots show variation in nutrient intake across individuals. Carbohydrate intake displays the widest range and most outliers, suggesting diverse dietary habits. Protein and fat intakes are more consistently distributed, with fewer extreme values, reflecting more uniform consumption patterns.

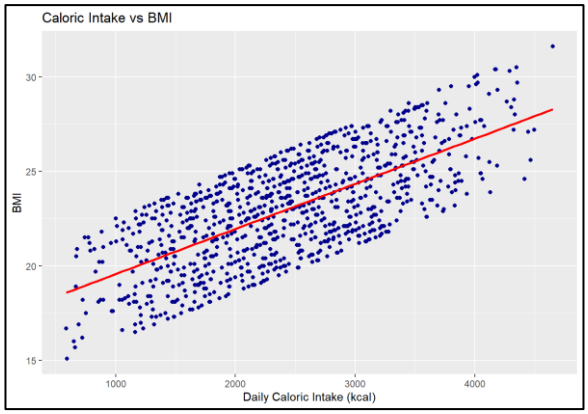

Figure 5. Caloric Intake vs BMI

The scatterplot illustrates a strong positive trend between daily caloric intake and BMI. As caloric intake increases, BMI also tends to rise, supporting the relationship between higher energy intake and body weight. This trend aligns with nutritional science and is statistically significant.

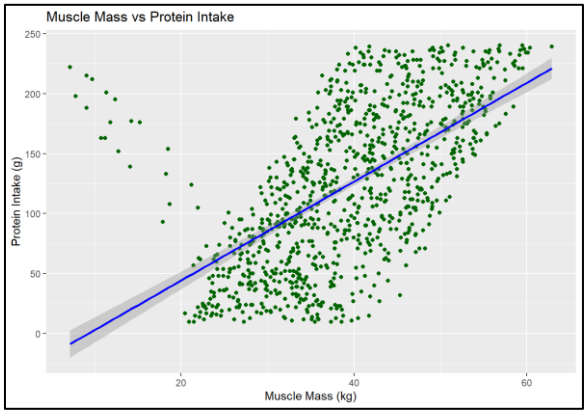

Figure 6. Muscle Mass vs Protein Intake

A moderate upward trend is seen, where individuals with higher protein intake tend to have greater muscle mass. While not a perfect linear relationship, it supports the expected biological link between dietary protein and muscle development.

Variables	Correlation (r)	95% CI	p-value	Interpretation
Daily Caloric Intake vs. BMI	0.702	[0.669, 0.732]	< 2.2e-16	Strong, **positive correlation**: higher caloric intake is associated with higher BMI.

Table 1. Pearson Correlation

Test	Chi-squared (χ^2)	df	p-value	Interpretation
BMI Category × Activity Level	269.93	9	< 2.2e-16	**Significant association** between BMI category and activity level.

Table 2. Chi-squeared Test

Interpretation

The results show clear links between physical activity, food intake, and body makeup. The chi-squared test showed that people who are more active usually have a normal BMI, while those who are less active are often overweight or obese. The Pearson correlation also showed a strong positive connection between how many calories a person eats and their BMI ($r = 0.702$, $p < 2.2e\text{-}16$), meaning that eating more calories is often linked to having a higher body weight. The graphs also supported these findings, showing that most people fall within normal ranges for body fat and muscle mass. They also showed that people's intake of nutrients like protein, fat, and carbs varies a lot.

Conclusion

This study shows how daily habits like exercise and eating affect a person's weight and body shape. People who are more physically active tend to have a healthier weight, and those who eat more calories usually have a higher BMI. These results highlight the need to encourage regular exercise and healthy eating to help prevent obesity and promote better health for everyone.