# The Relationship Between Lifestyle Factors and Obesity Levels: An Analysis of Calorie Monitoring, Physical Activity, Alcohol Consumption, and Age

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## Abstract

This study explores the relationships between various factors and obesity levels, analyzing data from a comprehensive dataset of 2,111 individuals from Mexico, Peru, and Colombia. The dataset includes 17 attributes related to eating habits and physical condition, with records labeled under the class variable NObesity (Obesity Level). This classification encompasses Insufficient Weight, Normal Weight, Overweight Level I, Overweight Level II, Obesity Type I, Obesity Type II, and Obesity Type III. Notably, 77% of the data was generated synthetically using the Weka tool and the SMOTE filter, while the remaining 23% was collected directly from users via a web platform. Through statistical analyses like Chi-Squared tests and ANOVA, significant associations between these variables and obesity levels are identified. Visual representations provide further insights into these relationships, reinforcing the findings.

**Keywords:** Obesity, Calorie Monitoring, Physical Activity, Alcohol Consumption, Age Groups, Statistical Analysis, Chi-Squared Test, ANOVA.

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## Introduction

Obesity is a growing public health concern worldwide, associated with various health risks, including diabetes, cardiovascular diseases, and certain cancers (World Health Organization, 2021). Understanding the factors contributing to obesity is crucial for developing effective interventions. This study investigates the relationships between calorie monitoring, physical activity frequency, alcohol consumption, and age with obesity levels among individuals.
The research questions guiding this study are as follows:

1. What is the relationship between calorie monitoring and obesity levels?
2. How does the frequency of physical activity impact obesity levels?
3. How does alcohol consumption relate to obesity levels?
4. How does age impact obesity levels?

## Method

### Participants

The dataset used in this study consists of 2,111 individuals, with variables including gender, age, height, weight, calorie monitoring, frequency of physical activity, alcohol consumption, and obesity levels.

### Data Analysis

Data were analyzed using R programming. The following statistical methods were employed:

1. **Chi-Squared Test of Independence**: To assess the relationship between categorical variables (calorie monitoring and obesity levels; alcohol consumption and obesity levels).
2. **ANOVA**: To evaluate the impact of continuous variables (frequency of physical activity and age) on obesity levels.

### Variables

1. Calorie Monitoring (SCC): Binary (YES/NO)
2. Frequency of Physical Activity (FAF): Continuous (numerical)
3. Alcohol Consumption (CALC): Categorical (YES/NO)
4. Age: Continuous (numerical)
5. Obesity Level (NObeyesdad): Categorical (Normal/Overweight/Obese)

## Results

### Research Question 1: Calorie Monitoring and Obesity Levels

A Chi-squared test was conducted to evaluate the relationship between calorie monitoring and obesity levels. The results indicated a significant association ($X^2 = 123.02$, $p < 0.001$), leading to the rejection of the null hypothesis. This suggests that calorie monitoring is significantly associated with different obesity levels.

### Research Question 2: Frequency of Physical Activity and Obesity Levels

ANOVA was performed to assess the impact of physical activity frequency on obesity levels. The results showed a significant effect ($F(6, 2104) = 17.48$, $p < 0.001$), indicating that individuals engaging in more frequent physical activity tend to have lower obesity levels.

### Research Question 3: Alcohol Consumption and Obesity Levels

A Chi-squared test was also conducted for alcohol consumption and obesity levels, yielding a significant result ($X^2 = 338.58$, $p < 0.001$). This indicates a strong relationship between alcohol consumption and varying obesity levels.

### Research Question 4: Age and Obesity Levels

A Chi-squared test for age groups (young, middle-aged, old) and obesity levels revealed a significant association ($X^2 = 164.66$, $p < 0.001$). This suggests that age significantly influences obesity levels, with distinct patterns observed across different age groups.

## Discussion

The findings reveal statistically significant associations between obesity levels and the examined factors. Calorie monitoring and physical activity emerge as critical in obesity management, with their absence correlating with higher obesity rates. Alcohol consumption, a lifestyle factor, also shows a strong association, necessitating targeted public health messaging. Age groups exhibit distinct obesity patterns, suggesting tailored interventions for different age demographics.

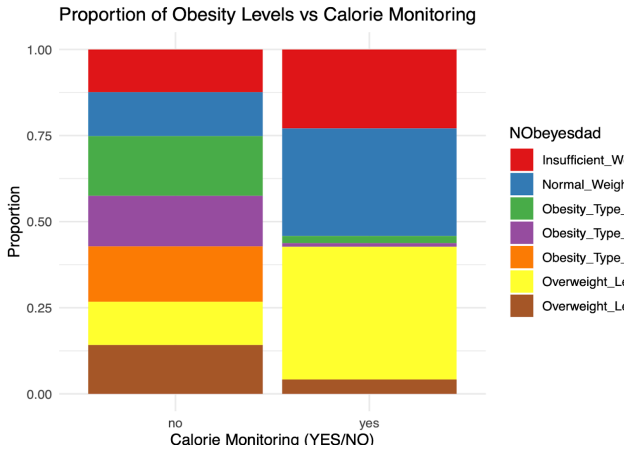


Figure 1 highlights the proportional differences in obesity levels among individuals who monitor calories versus those who do not. Individuals who actively monitor their calorie intake are more likely to maintain normal or lower weight levels. Conversely, a higher proportion of those who do not monitor calories are categorized as overweight or obese. This emphasizes the critical role of self-regulation in dietary habits.

*Figure 1: Bar Plot: Calorie Monitoring vs. Obesity Levels*

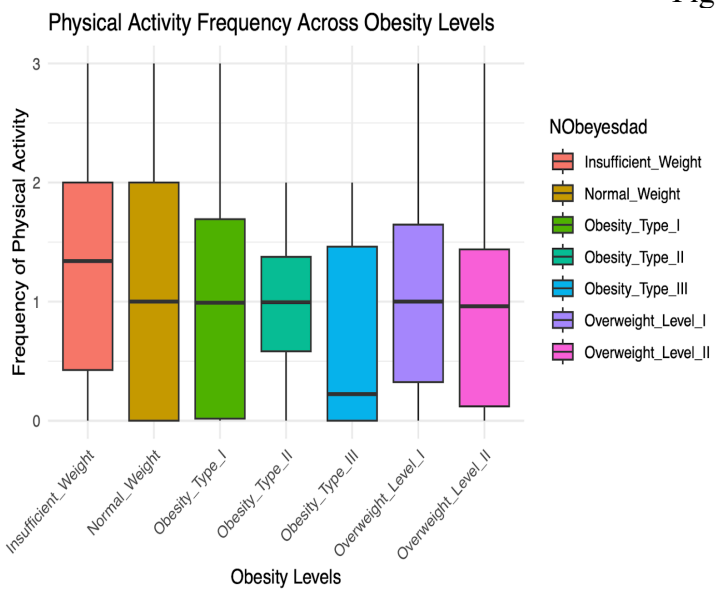


Figure 2 illustrates the variation in physical activity levels across different obesity categories. The plot shows that individuals with insufficient or normal weight tend to engage in physical activity more frequently. In contrast, those in obesity Type III exhibit significantly lower levels of activity. This trend underscores the need to promote physical activity as a cornerstone of weight management programs.

*Figure 2: Box Plot: Physical Activity Frequency Across Obesity*

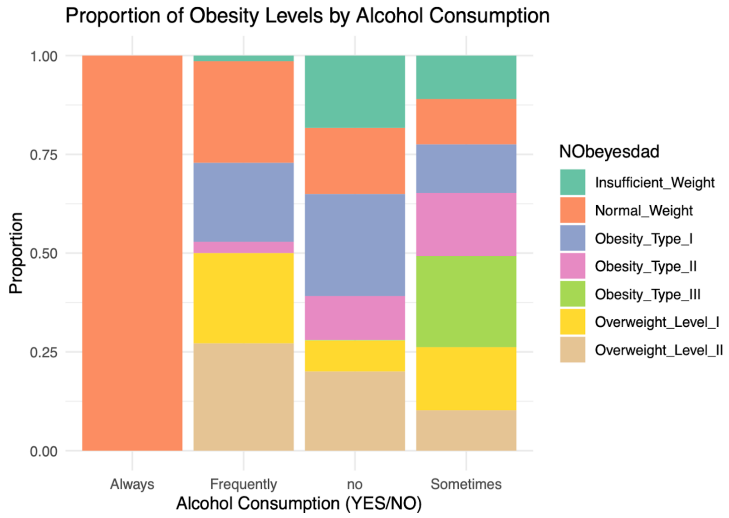


Figure 3 examines how alcohol consumption patterns correlate with obesity levels. The bar plot reveals that individuals who frequently consume alcohol are more likely to fall into higher obesity categories, such as Obesity Type II and III. This finding suggests that public health campaigns targeting alcohol consumption could have a positive impact on reducing obesity rates.

*Figure 3: Bar Plot: Alcohol Consumption vs. Obesity Levels*

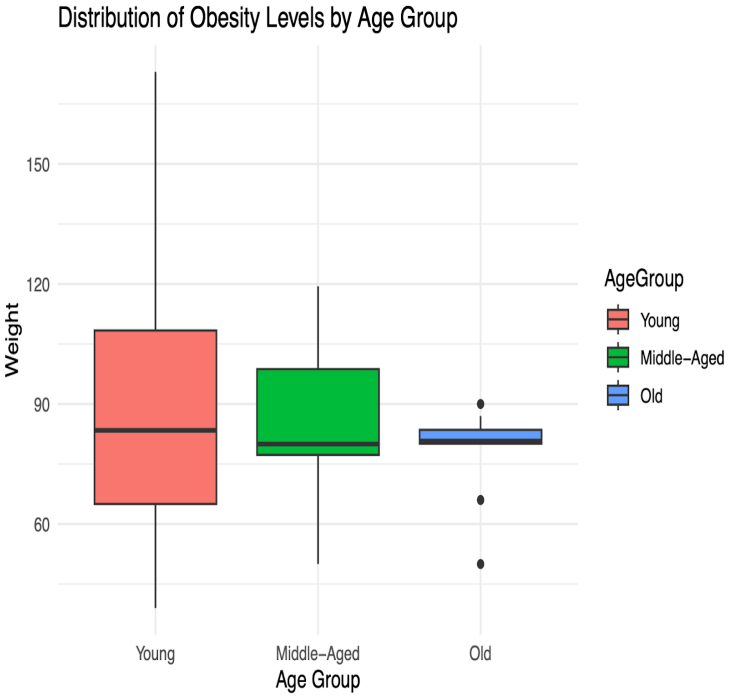


Figure 4 delves into the impact of age on obesity. Younger individuals (18-35) tend to have lower weights, whereas middle-aged and older groups exhibit progressively higher weight distributions. This age-based disparity suggests that interventions should consider the unique physiological and behavioral changes associated with aging.

*Figure 4: Box Plot: Distribution of Obesity Levels by Age Group*

Limitations of the study include the reliance on partially synthetic data, which may introduce biases, and the inability to account for confounding factors such as genetic predispositions or mental health variables. Additionally, no predictive model has been fitted to this dataset due to its synthetic nature. Future efforts will focus on optimizing the dataset for predictive modeling by

health policies and individual behavioral strategies. Future research should aim to include more diverse datasets and explore additional variables such as socioeconomic status and access to healthcare. The findings stress the importance of integrating calorie monitoring, increased physical activity, and moderate alcohol consumption into public health strategies. Additionally, age-specific interventions are recommended to address the unique challenges faced by different demographic groups.

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