MD Fardin

Data 710 – Basic Analytics

Professor Cohen

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Assignment 2

What is the relationship between education level and weight status among adults ages 18 and above in the United States?

**Introduction**

Weight health in the United States is a significant public health concern, with obesity rates reaching record highs in recent decades. According to [the Centers for Disease Control and Prevention (CDC)](https://www.cdc.gov/nchs/data/hestat/obesity-adult-17-18/obesity-adult.htm#:~:text=Results%20from%20the%202017%E2%80%932018,and%20another%2031.1%25%20are%20overweight.), nearly 42.5% of United States adults (aged 20 and over) were classified as obese in 2017-2018, a trend that has continued to rise. Factors contributing to this issue include education levels, lax lifestyles, high-calorie diets, and socioeconomic disparities that impact access to healthy foods and healthcare resources.

Obesity is linked to a range of serious health conditions, such as [type 2 diabetes, cardiovascular disease, and certain cancers](https://www.cdc.gov/obesity/php/about/index.html#:~:text=Obesity%20costs%20the%20US%20healthcare,and%20maintain%20a%20healthy%20weight.), making it a critical focus for health policy and interventions. Beyond individual health risks, the economic burden of obesity is substantial, costing the United States healthcare system over [$173 billion annually](https://www.cdc.gov/obesity/php/about/index.html#:~:text=Obesity%20costs%20the%20US%20healthcare,and%20maintain%20a%20healthy%20weight.). Public health initiatives focus on education, promoting physical activity, and improving access to nutritious foods, aiming to curb this epidemic and improve overall weight health in the country.

**Objective**

This study examines the association between education level and weight status among adults (Ages 18+) in the United States. [Research suggests](https://www.ncbi.nlm.nih.gov/books/NBK25526/#:~:text=Higher%20education%20provides%20explicit%20facts,a%20lack%20of%20appropriate%20data.) that socioeconomic factors, particularly education, significantly influence health behaviors and outcomes. Education level can impact an individual’s access to health-related resources, health literacy, and lifestyle choices, all of which may affect weight status. Higher levels of education are often associated with greater nutritional knowledge and more opportunities for physical activity, which can contribute to lower obesity rates. Conversely, lower educational attainment may correlate with a higher likelihood of being overweight or obese, potentially due to socioeconomic barriers that limit access to healthy lifestyle options.

By exploring the relationship between education and weight status, this study aims to illuminate broader social determinants of health in the United States. Specifically, this analysis utilizes Body Mass Index (BMI) indicators to assess weight status across varying education levels. [BMI](https://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm), a measure of body fat based on height and weight, is widely used as an indicator of body composition for adult men and women.

**Data**

This study utilizes data from the CDC’s National Health and Nutrition Examination Survey (NHANES) for the 08/2021–08/2023 cycle, which assesses the health and nutritional status of a representative sample of adults and children across the United States. NHANES data are collected through a combination of in-home interviews, physical examinations, and laboratory tests, providing a comprehensive view of various health indicators.

For this analysis, I focus on demographic and weight-related data from NHANES, specifically using the demographic dataset (capturing age, sex, education level, and pregnancy status) and the weight dataset (capturing weight and height data necessary for calculating Body Mass Index, or BMI). BMI serves as an established metric for categorizing weight status and allows for assessing relationships between education level and weight.

The original NHANES sample included 11,933 individuals. However, following data cleaning to ensure that only respondents with complete data on key variables were included, the final analytical sample was reduced to 7,603 individuals. This subset represents those who fully responded to the relevant questions on demographics and weight status.

**Analysis**

**Univariate Distribution of BMI Indicators:**

A univariate distribution analysis examines the distribution of a single variable, focusing on its rarity or frequency.

The distribution of participants across BMI Indicators was examined to understand the occurrence of different weight statuses within the sample. Results from the frequency analysis indicate a larger proportion of individuals in the overweight and obese categories, reflecting a trend consistent with national statistics on adult weight status in the United States. This distribution serves as a foundation for further analyses linking BMI to educational attainment and weight management efforts.

**Graph A: BMI Indicators among participants**:

A graph of a bar chart

Description automatically generated with medium confidence

**Univariate Distribution of Educational Level among Participants:**

An analysis of educational levels revealed that the sample encompassed a broad range of educational attainments, from "Less than high school" to "Postgraduate degrees." The frequency distribution indicated that most participants reported having at least a college degree. This diverse range of educational backgrounds makes the dataset well-suited for examining potential associations between education and weight status.

**Graph B: Distribution of Educational Level among Participants**

A graph of a graph of education level

Description automatically generated with medium confidence

**Descriptive Statistics of BMI and Weight:**

To assess overall trends in BMI and weight, summary statistics were generated for both variables. The average BMI of the sample was 28.89, placing it within the overweight range, with a notable spread across BMI categories. Similarly, weight statistics showed a wide distribution, with an average weight of 181.7 pounds across the sample.

**Bivariate Distribution: Relationship between BMI Indicator and Education Level:**

**Graph C: Relationship between BMI Indicator and Education Level**

A graph of different colored bars

Description automatically generated

A bivariate distribution analysis investigates the relationship between two variables. The analysis of BMI indicators across various levels of education revealed distinct patterns. Participants with less education, particularly those with "Less than 9th grade" or "9-11th grade" education levels, exhibited higher proportions of overweight and obesity classifications. Specifically, individuals with "Some college or AA degree" also had notable overweight and obesity proportions, though slightly lower than those in the high school or equivalent categories.

In contrast, participants who reported being "College graduate or above" had a higher proportion within the normal weight range, indicating an inverse relationship between education level and BMI classification. This suggests that higher educational attainment may be associated with healthier weight outcomes, potentially reflecting access to better health resources, higher health literacy, and lifestyle choices that are more conducive to maintaining a normal BMI.

These trends underscore the potential role of education level as a determinant in weight status, with those possessing higher levels of education demonstrating a stronger tendency toward healthy BMI categories. Additionally, individuals who reported "Don't know" or "Missing" for education level showed minimal representation across BMI categories, consistent with the distribution of missing data.

**Inferential Statistics: Correlation between Education Level and BMI:**

To further examine the association between education level and BMI, a Kruskal-Wallis rank sum test was conducted, chosen for its suitability with the non-normally distributed BMI data. The test produced a significant result (Kruskal-Wallis chi-squared = 140.23, df = 5, p-value < 2.2e-16), indicating substantial variation in BMI across different educational levels. The large chi-squared value and very small p-value (p < 0.05) affirm that BMI distributions differ significantly by education levels. This result aligns with the bivariate analysis findings, suggesting that higher education levels are associated with lower BMI values. Contributing factors may include greater health literacy, higher socioeconomic status, and healthier lifestyle choices often linked to higher education levels.

**Weight Loss Efforts across BMI Indicators:**

The analysis also investigated the relationship between BMI Indicators and weight loss efforts by examining participants who reported attempts to lose weight in the past year. A frequency analysis showed that weight loss attempts were most prevalent among those categorized as overweight and obese. Cross-tabulation between BMI indicator and weight loss attempts, along with the proportion of attempts within each BMI indicator, highlighted that individuals in the obese category were most likely to engage in weight loss efforts, followed by those in the overweight category. This pattern aligns with public health recommendations and may indicate awareness of weight-related health risks among these individuals.

**Graph D: Attempted Weight Loss in the Past Year**

A graph with red bars

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**Graph E: Weight Loss Efforts across BMI Categories**

A graph with blue and orange bars

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**Discussion**

This study provides insight into the association between education level and weight status, highlighting that lower educational levels are correlated with higher BMI Indicators. The frequency distribution of BMI indicators showed a predominance of individuals in the overweight and obese categories, aligning with national trends in the U.S. adult population. Participants with lower levels of education, particularly those who did not complete high school, showed the highest number of overweight and obesity.

The observed relationship between higher education and healthier BMI values suggests that education level may present advantages in maintaining a healthy weight. Higher educational levels are often associated with greater health literacy, more resources, and increased access to health-promoting information, all of which can support healthier lifestyle choices. Conversely, those with lower education may face challenges related to health literacy, limited access to affordable, nutritious food, and fewer opportunities for physical activity, which can contribute to weight gain.

The examination of weight loss efforts across BMI categories further suggests that individuals classified as overweight or obese are aware of the health risks associated with their weight status, as indicated by their greater likelihood of attempting weight loss.

**Limitations**

Several limitations should be acknowledged when interpreting these findings. First, the study relies on self-reported data for variables such as education level and weight loss attempts, which may introduce reporting bias or inaccuracies. Additionally, the analysis does not control potential confounding variables, such as income, employment status, or geographic region, all of which could influence weight status and potentially impact the observed associations. Finally, the sample may not fully represent the broader U.S. population due to the exclusion of respondents with missing data, which could limit the generalizability of the results.

While BMI is a widely used metric for assessing weight status, it has notable limitations in accurately reflecting an individual's health. BMI does not account for variations in body composition, such as muscle mass versus fat mass, which can lead to misclassification. For example, individuals with high muscle mass may be categorized as overweight or obese despite having low body fat. Additionally, BMI does not consider other key factors, such as fat distribution or metabolic health, which are critical for a more comprehensive understanding of weight status and overall health.

**Conclusion**

This study demonstrates a significant association between education level and BMI in the U.S. adult population, with higher education linked to healthier weight statuses. These results suggest that education may play a protective role in weight management, potentially through increased health literacy, access to resources, and informed lifestyle choices. Findings underscore the importance of integrating education-oriented approaches within public health strategies to address obesity, especially among populations with lower educational attainment.

Future research could explore the effects of specific educational programs on weight management and examine how education interacts with other socioeconomic factors in influencing BMI. By focusing on education as a key social determinant of health, policymakers and public health practitioners may be able to develop more effective interventions that reduce obesity rates and promote health equity across diverse populations in the United States.

**Works Cited**

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