Exploring Physiological Relationships between Age and Cholesterol Levels -Andria Grace

Analysis Plan

Background:

Review literature on the physiological relationship between age and cholesterol, emphasizing gaps in current knowledge and the importance of addressing this relationship for public health. Cardiovascular health is a paramount concern globally, with conditions like atherosclerosis posing significant threats. Central to cardiovascular health is the understanding of cholesterol dynamics, as imbalances can contribute to these conditions. The NHANES dataset provides a comprehensive source for investigating factors influencing cholesterol levels. This analysis focuses on the physiological relationship between age and cholesterol, prompted by existing research suggesting age-related variations in cholesterol metabolism.

Rationale/Unmet Need:

Despite existing research, there is still an unmet need to thoroughly explore the specific influence of age on cholesterol levels within the U.S. adult population. While general trends are acknowledged, a more nuanced understanding is essential for tailoring preventive strategies and interventions. This analysis seeks to bridge this gap by utilizing the NHANES dataset, offering a unique opportunity to delve into age-related patterns in cholesterol dynamics. The findings aim to address this unmet need, contributing insights that could refine risk assessment models and inform targeted interventions for improved cardiovascular health.

Study Aims

Primary Study Aim:

To investigate the relationship between age and cholesterol levels in the U.S. adult population using the NHANES dataset. The primary aim is to discern whether there is a statistically significant correlation between age and cholesterol, contributing to a deeper understanding of age-related variations in cardiovascular health.

Secondary Study Aims

Gender-Specific Patterns:

Explore whether the relationship between age and cholesterol differs significantly between genders. This secondary aim aims to uncover potential gender-specific trends in cholesterol dynamics associated with aging.

Racial Disparities:

Investigate whether age-related changes in cholesterol levels vary among different racial groups. This secondary aim seeks to identify potential racial disparities in the age-cholesterol relationship within the U.S. adult population.

Physiological Parameters:

Examine the impact of additional physiological parameters, such as blood pressure and BMI, on The relationship between age and cholesterol. This secondary aim aims to provide a more comprehensive understanding of the multifaceted influences on cholesterol dynamics associated with aging.

Study Hypotheses

Primary Outcome

Hypothesis:

There is a significant positive correlation between age and cholesterol levels in the U.S. population. As age increases, cholesterol levels are expected to show a statistically significant upward trend, indicating a potential age-related impact on cardiovascular health.

Secondary Outcome:

Hypothesis (Gender-Specific Patterns):

There is a significant difference in the correlation between age and cholesterol levels when stratified by gender. This hypothesis aims to explore whether the age-cholesterol relationship varies significantly between male and female participants.

Hypothesis (Racial Disparities):

There are significant differences in the correlation between age and cholesterol levels across different racial groups. This hypothesis seeks to identify potential racial disparities in how age influences cholesterol dynamics within the U.S. adult population.

Hypothesis (Physiological Parameters):

Additional physiological parameters, such as blood pressure and BMI, significantly moderate the relationship between age and cholesterol levels. This hypothesis aims to investigate the combined impact of age and other physiological factors on cholesterol dynamics.

Data Extraction and Analysis Plan

Study Cohort Definitions:

Inclusion Criteria:

Participants from the NHANES dataset aged 18 and above will be included in the study cohort. Inclusion will be irrespective of gender, ensuring a diverse representation.

Exclusion Criteria:

Participants under the age of 18 will be excluded from the analysis. Entries with missing or incomplete data on age and cholesterol levels will be excluded.

Stratification Criteria:

The cohort will be stratified by gender to assess potential gender-specific patterns in the age-cholesterol relationship. Stratification by race will be employed to investigate racial disparities in the age-cholesterol dynamic.

Subgroup Analysis (Physiological Parameters):

Subgroups will be created based on additional physiological parameters, such as blood pressure and BMI. This subgroup analysis aims to explore how these parameters may interact with age in influencing cholesterol levels.

Data Analysis

Analyses to Perform:

1. Descriptive Statistics of Baseline Parameters:

Compute descriptive statistics for baseline parameters, including age and cholesterol levels, within the overall study cohort. Stratify descriptive statistics by gender, race, and other relevant subgroups to identify potential variations.

2. Correlation Analysis:

Perform correlation analysis to quantify the strength and direction of the relationship between age and cholesterol levels in the entire study cohort. Conduct separate correlation analyses within each gender, race, and other relevant subgroups to assess subgroup-specific relationships.

3. Regression Analysis:

Implement linear regression models to assess the impact of age on cholesterol levels, adjusting for potential confounding variables. Conduct separate regression analyses within each gender, race, and other relevant subgroups to explore subgroup-specific relationships.

4. Stratified Analysis (Gender and Race):

Stratify the cohort by gender and race and conduct comparative analyses to explore potential gender-specific and racial disparities in the age-cholesterol relationship.

5. Subgroup Analysis (Physiological Parameters):

Stratify the cohort based on additional physiological parameters (blood pressure, BMI) and conduct subgroup analyses to investigate their potential moderation effects on the age-cholesterol relationship.

6. Comparison of Means:

Compare mean cholesterol levels between different age groups to identify potential age-related patterns.

7. Visualization:

Generate visual representations, such as scatter plots and regression lines, to illustrate the relationship between age and cholesterol levels.

8. Statistical Significance:

Set the significance level (alpha) to 0.05 for all analyses to determine statistical significance

Descriptive Statistics

Age: Compute the mean, standard deviation, minimum, and maximum values for age in the study cohort.

Cholesterol Levels: Calculate the mean, standard deviation, minimum, and maximum values for cholesterol levels.

Data Visualizations:

Generate a box plot for age to illustrate its distribution. Create a histogram for cholesterol levels to visualize their overall pattern.

Statistical Analysis

Hypothesis Testing

Age and Cholesterol Levels: Utilize appropriate statistical tests (e.g., t-tests or regression analysis) to test the hypotheses:

Null Hypothesis (H0): There is no significant difference between age and cholesterol levels.

Alternative Hypothesis (H1): There is a significant difference between age and cholesterol levels.

Descriptive Statistics for Blood Pressure:

Compute the mean, standard deviation, minimum, and maximum values for blood pressure.

Data Visualizations for Blood Pressure:

Generate box plots or histograms to visually represent the distribution of blood pressure.

Hypothesis Testing for Blood Pressure

Utilize suitable statistical tests to test the hypotheses:

Null Hypothesis (H0): There is no significant difference between age and blood pressure.

Alternative Hypothesis (H1): There is a significant difference between age and blood pressure.

Limitations and Considerations:

Acknowledge potential confounding factors such as lifestyle, diet, and genetic predispositions. Consider the need for stratification by age groups to explore age-related patterns more granularly. Recognize the limitations of cross-sectional data in establishing causal relationships.

Conclusion:

This analysis plan outlines a systematic approach to explore the physiological relationships between age and cholesterol levels. The combination of descriptive statistics, data visualizations, and hypothesis testing will provide a comprehensive understanding of how age may influence cholesterol levels and blood pressure in the study population.