**ANALYSIS REPORT**

**Rationale:**

Impact of BMI on Renal Function:

* Urine flow is a vital physiological indicator of renal health and fluid homeostasis. Investigating its variation across different weight statuses provides insights into how body weight influences renal function.
* Individuals with higher body weight, especially those classified as overweight or obese, are more prone to developing metabolic syndrome. Metabolic conditions like insulin resistance and diabetic ketoacidosis may impact renal function and, consequently, urine flow.
* The hypothesis includes individuals across the entire weight spectrum, acknowledging that both excess weight and underweight status may have physiological implications on urine flow. This comprehensive approach ensures a holistic understanding of the relationship.
* Investigating the relationship between weight status and urine flow has potential public health implications. It can inform preventive measures and interventions aimed at preserving renal health in diverse populations.

Impact of Income on BMI:

* The socioeconomic health gradient, which posits that socioeconomic factor, including income, influence health outcomes. BMI serves as an indicator of health, and exploring its impact on income aligns with this gradient.
* Health-related expenses, influenced by BMI-related health conditions, may impact individuals' economic well-being. Understanding the interplay between BMI and income can shed light on the economic consequences of health disparities.
* Understanding how Income affects BMI has implications for policy development. Policies aimed at improving health outcomes may indirectly contribute to economic well-being, highlighting the intersectionality of health and socioeconomic factors.
* This hypothesis brings attention to the importance of individual health awareness and public health initiatives. Recognizing the potential impact of BMI on income underscores the broader societal implications of health behaviors.

**Study Aims:**

**1.** The Body Mass Index of an Individual has a direct impact on one’s renal function.

**2.** The Income of an Individual has an influence on the body mass index of the individual.

**Study Hypothesis:**

**Hypothesis 1:** Variation in Mean Urine Flow by Weight Status

**Null Hypothesis (H₀):**

There is no significant difference in mean urine flow among individuals with different weight statuses (underweight, normal weight, overweight, and obese).

**Alternative Hypothesis (H₁):**

There are significant variations in mean urine flow among individuals with different weight statuses (underweight, normal weight, overweight, and obese).

**Hypothesis 2:** Impact of Income on BMI

**Null Hypothesis (H₀):**

There is no significant association between Body Mass Index (BMI) and income levels among individuals.

**Alternative Hypothesis (H₁):**

There is a significant association between Body Mass Index (BMI) and income levels among individuals.

**Data Extraction:**

The used for the hypothesis testing is National Health and Nutrition Examination Survey (NHANES). The data cleaned by removing the duplicated data based on ID and null values in the columns so that data is free from empty/null values.

For the Sample, Simple Random Sampling (SRS) is done to avoid any bias in the testing. The BMI column is converted to Factors based on the range from 18.5 to 20 as underweight, 20-25 as Normal, 25-30 as overweight and 30+ as Obese. The Income column is converted to factors based on the quartile range from 2500 to 22500 as low and from 22500 to 87500 as medium and 87500 to 100000 as high.

**Analyses Plan:**

1. **Correlation Analysis:** To check the effect BMI on Urine Flow Rate and Income on BMI
2. **One Sample Z-Test:** To check the variation of mean of the sample compared to the population.
3. **Analysis Of Variance:** To Check the variation of mean within the sample.
4. **Post HOC Test:** To find the group with the variation if the ANOVA test fails to accept the Null Hypothesis.
5. **Regression Analysis:** Building Linear Regression Equation/Model to fit Urine Flow rate (Dependent) and BMI in the 1st Study and between BMI(Dependent) and Income in the second Study.