**Statistical Question:**

Is there a correlation between a country's fertility rate and its yearly population change? Do countries with higher fertility rates tend to experience higher population growth?

**Hypotheses:**

Null Hypothesis (H0): There is no correlation between a country's fertility rate and its yearly population change.

Alternative Hypothesis (H1): Countries with higher fertility rates tend to experience higher yearly population changes.

The statistical and hypothetical question at the core of this analysis was whether there is a correlation between a country's fertility rate and its yearly population change. The null hypothesis (H0) posited no correlation, while the alternative hypothesis (H1) suggested that countries with higher fertility rates tend to experience higher yearly population changes.

Conducting exploratory data analysis (EDA) on a dataset comprising various demographic variables, including MedianAge, Fert.Rate, Migrants(net), Density(P/Km²), NetChange, YearlyChange, and Population2023, revealed valuable insights. Key descriptive characteristics were computed for each variable, helping to understand their distributions and central tendencies. Histograms provided visual representations, while probability mass functions (PMFs) and cumulative distribution functions (CDFs) highlighted the probability of observing specific values.

The EDA uncovered correlations, such as a significant positive correlation between fertility rate and net population change (Pearson Correlation Coefficient: 0.27, p-value: 0.0000), which supported the alternative hypothesis. A linear regression analysis further indicated that an increase in fertility rate led to an estimated increase in net population change.

Despite the informative findings, there were areas that might have benefited from more in-depth exploration. The assumption of normality in residuals for the regression analysis might not hold entirely due to non-normality test results. Additionally, the low R-squared values in some regression analyses indicated that other variables could contribute to the observed outcomes, potentially missing from the dataset.

One challenge faced was the presence of missing or "N.A." values in the dataset. Although efforts were made to handle these missing values by converting them to NaN and subsequently dropping them, imputation techniques could have been considered for more robust analysis.

In hindsight, including variables related to economic, social, or cultural factors could have enhanced the analysis. These variables might offer deeper insights into the observed relationships and help explain the nuances behind demographic changes. The reliance on certain assumptions, such as normality in residuals, could have led to misleading interpretations if not critically evaluated.

Overall, while the analysis provided valuable insights into the relationships between fertility rate, population change, and other demographic variables, there remains room for further investigation, especially considering additional variables and refining assumptions. The challenges faced during the analysis highlighted the complexity of real-world data analysis and the need for a comprehensive and thoughtful approach.