**Connecting Windsor-Essex: Broadband**

**Hypothesis Testing**

1. **Hypotheses:**

* **The null hypothesis (H0)** states that there is no significant difference in download Mbps between different levels of latency. In other words, the mean download Mbps is the same across all levels of latency.
* **The alternative hypothesis (Ha)** states that there is a significant difference in download Mbps between different levels of latency, suggesting that the mean download Mbps differs across at least one level of latency.

1. **Assumptions**: There are three main assumptions for conducting a one-way ANOVA, which is the chosen test statistic for this hypothesis test:
2. **Independence**: The samples used for each level of latency are independent, meaning that the download Mbps measurements for one level of latency do not influence the measurements for another level of latency.
3. **Normality:** The download Mbps data for each level of latency follows a normal distribution, which means that the data points are symmetrically distributed around the mean and the majority of the data falls within a certain range.

c) **Homoscedasticity:** The variances of download Mbps are equal across different levels of latency, which means that the variability in download Mbps is consistent across all levels of latency.

1. **Test Statistic:** The one-way Analysis of Variance (ANOVA) is a commonly used test statistic for comparing the means of three or more groups. It calculates the ratio of the between-group variability to the within-group variability, and the resulting F statistic is used to determine if there are significant differences in means across the groups.
2. **Decision Rule:** The significance level, denoted as α, is predetermined and commonly set at 0.05 (5%). If the p-value obtained from the ANOVA test is less than the significance level (i.e., p-value < α), then we reject the null hypothesis and conclude that there is a significant difference in download Mbps between different levels of latency. Conversely, if the p-value is greater than the significance level (i.e., p-value ≥ α), we fail to reject the null hypothesis and do not conclude a significant difference.
3. **Interpretation of Results:** If the null hypothesis is rejected, it indicates that there is a statistically significant difference in download Mbps between different levels of latency. In other words, there is evidence to suggest that latency has an effect on download Mbps. However, it is important to consider the effect size, which measures the magnitude of the difference, practical significance, and the context of the study in drawing conclusions. Additionally, if the null hypothesis is rejected, further post-hoc tests (e.g., Tukey's Honestly Significant Difference) can be conducted to determine which specific levels of latency have significantly different download Mbps.

In conclusion, the hypothesis test for the relationship between the independent variable latency and the dependent variable download Mbps involves conducting a one-way ANOVA, assuming independence, normality, and homoscedasticity, and interpreting the results based on the predetermined significance level and considering other relevant factors.