Provided below is some introduction to the lab which you can read through in your own time, but which will be covered in the lab session.

Lab 5: Making Statistical Decisions with Hypothesis Testing

1. **Hypothesis Tests for Comparing Two Mean**
2. **Hypothesis Tests for Chi-Squared Analysis of 2x2 Table**

Based on the textbook Statistical Thinking through Media Examples by Anthony Donoghue.

In the previous lab, we used confidence intervals to make statistical decisions about the value of a population parameter of interest e.g. weight.

In this lab, we will use hypothesis tests to make statistical decisions about the value of a population parameter. There is one key difference between this approach compared to a confidence interval. With a confidence interval, we begin with no assumptions regarding the value of the population parameter. We are simply trying to capture the value within an interval of plausible values. With hypothesis testing, we begin with an assumed value for the population parameter, called the null hypothesized value, or simply the ***null value***.

To conduct a hypothesis test we need a ***null hypothesis*** and an ***alternative hypothesis***.

- The null hypothesis is a statement regarding the currently accepted (or status quo) value for the population parameter.
- The alternative hypothesis is a statement rejecting the null hypothesis. The alternative is our research hypothesis.

Therefore, using statistical evidence (the data we collect) and some sample statistics we can make a decision about whether to *accept the null hypothesis* or *reject the null hypothesis in favor of the alternative*.

The commonly-used metric for making this decision is the ***p-value***, which is the *probability of getting the sample statistic we observed, or one more extreme (even further from the null value), given the null value is correct*. Given some significance level (usually 0.05) we can make the following conclusions:

- If p-value < significance level, we reject the null hypothesis.
- If p-value > significance level, we accept the null hypothesis.