

Hypothesis Testing Terminology

- Null Hypothesis – Statement about the probability model generating the data, e.g. the data are from a normal distribution with mean 0, the data are from a hypergeometric distribution, the data in the two-way table are from a multinomial distribution with independence between row and column probabilities. This is the hypothesis we are interested in rejecting.
- Test statistic – We use the test statistic to see if the data observed are in agreement with the model. The test statistic is typically a simple statistic computed from the data and large values (positive, negative, or both) indicate unlikely outcomes, or rare events.
- Null distribution – Under the assumption of the null hypothesis, the test statistic has a probability distribution called the null distribution. We use this distribution to compute the chance of observing a test statistic as rare as ours.
- p -value – The chance of observing a test statistic as extreme as ours (or more extreme), computed using the null distribution of the test statistic.
- observed significance level – another name for the p -value.
- α or significance level – a probability which is fixed in advance of making the hypothesis test. If the observed p -value is smaller than the significance level then the null hypothesis is rejected. This level is set in advance to keep the size of the observed significance level from influencing the decision to reject. For example, if you set $\alpha = 0.01$ and the p -value is 0.012 then the null hypothesis is not rejected, even though it is quite close to 0.01.
- statistical significant – when the p -value is below $\alpha = 5\%$,
- highly statistical significant – when the p -value is below $\alpha = 1\%$
These are commonly accepted levels at which the hypothesis would be rejected.
- Rejection – when we reject a null hypothesis, we are not proving it wrong. We say that the data do not support the null hypothesis; that the chance of observing data like ours is so small that we no longer think the null hypothesis is true.
- Alternative Hypothesis – An alternative to the null hypothesis. If the experiment that gives rise to the data is well designed then we are willing to accept the data, but if there are flaws in the design then the small p -value may result even when the null hypothesis is true. There are similarities between confidence intervals and hypothesis tests – we will discuss later.