

Comparison of 2 Population Means

- Goal: To compare 2 populations/treatments wrt a numeric outcome
- Sampling Design: Independent Samples (Parallel Groups) vs Paired Samples (Crossover Design)
- Data Structure: Normal vs Non-normal
- Sample Sizes: Large ($n_1, n_2 > 20$) vs Small

Independent Samples

- Units in the two samples are different
- Sample sizes may or may not be equal
- Large-sample inference based on Normal Distribution (Central Limit Theorem)
- Small-sample inference depends on distribution of individual outcomes (Normal vs non-Normal)

Parameters/Estimates (Independent Samples)

- Parameter: $\mu_1 - \mu_2$
- Estimator: $\bar{x}_1 - \bar{x}_2$
- Estimated standard error: $\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$
- Shape of sampling distribution:
 - Normal if data are normal
 - Approximately normal if $n_1, n_2 > 20$
 - Non-normal otherwise (typically)