Chapter 8 Hypothesis Testing with Two Samples

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2022-10-23

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1 Questions

1.1 What is the sample size requirement for t tests?

2 Comparison of Two Means

- in Chapter 7, we talked about hypothesis test to compare the unknown mean of a single population to some fixed, known value, μ_0
- Often, we want to compare the means of two separate populations, where *both* means are unknown
- First step: determine whether the two samples are paired or independent.

3 Paired Samples

3.1 Definition

- for each observation in the first group, there is a corresponding observation in the second group
  - Self-pairing: measurements are taken on a single subject at two distinct time points (before and after)
  - Matched pairing: match two individuals with similar demographics/characteristics and compare their differences in response

3.2 Procedure

3.2.1 Parameters

- data: use the differences $d_i = b_i - a_i$ as the data
- Mean: the average of $d_i = \bar{x}_d$
- Sample standard deviation of $d_i = s_d$
- Standard error: $s_d/\sqrt{n}$
- Assumption: $\bar{x}_d \sim N\left(\mu_d, \sigma_d/\sqrt{n}\right)$

3.2.2

3.3 Confidence Intervals

3.4 R Code

3.5 One-sided Paired t-test Example

4 Independent Samples

4.1 Equal, Known Variances

4.2 Equal, Unknown Variances

4.3 Unequal Variance (Welch t-test)