

Introduction to Hypothesis Testing

I. What is Hypothesis Testing?

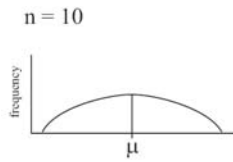
- Is the pattern of data in the sample likely to be found in the population?
- Or, is this pattern likely to be **Sampling Error?**
- If 95% sure (5% doubt) the pattern is not just Sampling Error, then pattern is **Statistically Significant.**

II. What is Sampling Error

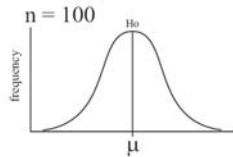
- Every sample randomly drawn from a Population is different from the population...
- Differences can be small or large

- Sample Size influences the likelihood of differences

- Small Samples:
Large differences are more likely



- Large Samples:
Large differences are less likely, though possible.



III. Hypothesis Testing is Decision Making

- Decide if pattern of sample results is different from a Chance Pattern (Sampling Error).

- State Decision in terms of the Null & Research Hypothesis

Null Hypothesis – No Significant Pattern

(H_0): Sample Pattern = Chance Pattern

Alternate Hypothesis – Significant Pattern Exists

(H_a): Sample Pattern \neq Chance Pattern

- Decide: Reject H_0 or Reject H_a

IV. Making the Decision

1. Quantify the pattern of data in sample

- Inferential Statistics – t , r , X^2 , F

- Type of Stat depends on data (e.g. continuous vs. discrete)

2. Quantify Sampling Error

- The **Critical Value** – weakest pattern of data still considered significant.
- Depends on
 - Size of the sample: n
 - How sure you need to be: α or p
 - 95% sure = 5% doubt (α or $p = .05$)
 - α or $p = .05$ means that 5 time out of hundred the pattern would occur by chance
 - .05 is the largest acceptable level in most sciences.
- Every Inferential Statistic has its own **Table of Critical Values**

3. Compare Sample Stat to Critical Value

- If Sample Stat \geq Critical Value @ $p = .05$, Then Reject H_0 – Pattern is Statistically Significant
- If Sample Stat $<$ Critical Value @ $p = .05$, Then Reject H_a – Pattern is Not Statistically Significant

Note: Decisions are based on likelihood

- We don't know if H_0 is true or false
- Never Accept H_0 or H_a
 - Only Reject or Fail to Reject
- Hypotheses are never Proven
 - We only find statistical support for Hypotheses
