

Key concepts and Terms

Hypothesis Testing: Null vs Alternate Hypothesis

Research Hypothesis: A verbose version of the hypothesis test.

Null Hypothesis: A hypothesis of no difference.

Alternate Hypothesis: A hypothesis of difference

Z-score: Is the difference between several means (sample means) and a standard mean (population mean) relative to the SEM (standard error of the mean) or a comparison of individual values to the mean relative to the STD (standard deviation).

Standard deviation: Difference between values and the mean squared divided by the population size, then take the square root.

p-value: it's a probability (1-CDF) that helps in hypothesis testing. A value calculated given the assumption that the Null hypothesis is true. Smaller p-values provide basis to reject the null hypothesis.

Type I Error: A judgement error; rejecting the null when in fact it should not be rejected. Probability of a false positive.

Type II Error: An acceptance error; failing to reject the null (accept the null in normal lingo) when in fact it should be rejected. Probability of a false negative.

Alpha: A pre-determined percentile that represents the percentage of the population that falls within the Null rejection zone. Alpha is the significance level that helps test that the sample drawn is indeed being compared to the right population. Prob (Type I error).

Beta: Prob (Type II error). It is $1 - \text{Power}$ and is inversely proportional to Alpha.

Power: The ability to find a difference that actually exists. The ability to get a true positive.

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One Tailed Test: Prone to Type I errors since the experimenter is already leaning in 1-direction.

Two Tailed Test: Prone to Type II errors since the experimenter is unsure of the direction of change.

Effect Size: A measure of the magnitude of the difference between means divided by the stdev.

Cohen's d: An effect-size measure.

Sample Size calculation/Power Analysis: Power analysis helps determine the best population mean to achieve the most power based on the sample size. Sample size analysis uses a pre-determined power value to determine the optimal sample size for the power.

Relationship between alpha, beta, effect size and n: Already discussed above.

Formulas:

Type I: False positive + True negative = 1

Type II: False negative + True positive = 1