Two Proportion Confidence Interval

Shape	When the large counts rule is met, the sampling distribution of $p^1 - p^2$ is approximately normal
Center	The mean of the sampling distribution is $p^1 - p^2$
Spread	The standard deviation of the sampling distribution of $p^1 - p^2$ is the square root of the sum of $(p^1)(1-p^1)$ divided by n^1 and $(p^2)(1-p^2)$ divided by n^2 as long as each sample is no more than 10% of its population.
Conditions	Random (both samples must be random), 10% (both samples less than 10% of respective population), Large Counts (for both samples individually)
Calculator	2-PropZInterval
Interpretation	We are __% confident that the interval from __ to __ captures the true difference of [p^1] and [p^2]
Point Estimate Formula	$p^1 - p^2$
Critical Value Formula (Z*)	invNorm(__%/2 + 0.5)
Standard Deviation Formula	the square root of the sum of $(p^1)(1-p^1)$ divided by n^1 and $(p^2)(1-p^2)$ divided by n^2
Confidence Interval Formula	Point Estimate +/- Critical Value * Standard Deviation

Two Proportion Significance Test

Null Hypothesis	$p^1 - p^2$ = Hypothesized Value
Alternative Hypothesis	$p^1 - p^2$ ≠ Hypothesized Value
Conditions	Random (both), 10% (both), Large Counts (both)
Pooled Sample Proportion	$x^1 + x^2$ / $n^1 + n^2$ (successes / size)
Statistic	$p^1 - p^2$
Parameter	Hypothesized Value (often 0)
Standard Deviation	The square root of the sum of $(p^c)(1-p^c)$ divided by n^1 and $(p^c)(1-p^c)$ divided by n^2
Test Statistic Formula	Statistic - Parameter / Standard Deviation

Two Proportion Significance Test (cont)

Calculator	2PropZTest
Areas of Error	Not a random sample = can't generalize results, cause and effect vs correlation
IMPORTANT	If experimental units are randomly selected, check the 10%, otherwise technically not necessary
Ideal for Conclusions about Populations	Data from Two Independent Random Samples

Two Mean Confidence Interval

Shape	When the population distributions are normal, the sampling distribution of $x^1 - x^2$ is approximately normal. Also normal, if both sample sizes are greater than 30 by CLT
Center	$\mu^1 - \mu^2$
Spread	If both samples are less than 10% of respective populations, the formula for standard deviation is the square root of the sum of $\sigma 1^2 / n^1$ and $\sigma 2^2 / n^2$
Conditions	Random (both samples are independent and random or from two groups in a randomized experiment), 10% (both), and Normal/Large (population distributions are normal or sample size greater than 30)
Calculator	2SampTInt
Interpretation of a Confidence Level	If we take many samples of size _ of _ and of _ of _ and find the __% confidence interval for each sample, __% of the confidence intervals will capture the difference in the mean number of ____.
Interpretation of Confidence Interval	We are __% confident that the interval from __ to __ captures the true difference in the __

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Two Mean Confidence Interval (cont)

State	We want to estimate $\mu^1 - \mu^2$ at the __% confidence level where μ^1 is __ and μ^2 is __
Point Estimate Formula	$x^1 - x^2$
Critical Value Formula (t*)	invT(p/2 + 0.5, smaller n df)
Standard Deviation/Error Formula	The square root of the sum of $\sigma1^2 / n^1$ and $\sigma2^2 / n^2$
Confidence Interval Formula	Point Estimate +/- Critical Value * Standard Deviation

Two Mean Significance Test

Null Hypothesis	$\mu^1 - \mu^2$ = Hypothesized Value
Alternative Hypothesis	$\mu^1 - \mu^2$ ≠ Hypothesized Value
Conditions	Random (both), 10% (both), Normal/Large (both)(no strong skew, outliers, or greater than 30)
Statistic	$x^1 - x^2$
Parameter	$\mu^1 - \mu^2$
Standard Deviation	The square root of the sum of $s1^2 / n^1$ and $s2^2 / n^2$
Test Statistic Formula (T)	Statistic - Parameter / Standard Deviation
Calculator	2SampTTest
Interpretation of p-value	Assuming the null hypothesis is true, there is a __ probability of getting a difference in ___ just by the chance involved in random assignment/variability

Paired Data vs Two Samples

Paired Data	Two Samples
Subjects were paired and the split at random into the two treatment groups or each subject received both treatments in a random order	Experimental groups were formed using randomized design or two independent random samples were taken from the population

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