INFERENCE GUIDE

CONFIDENCE INTERVALS

Use **confidence intervals** to **estimate** a parameter with a particular **confidence level, C**.

IDENTIFY: Interval name, parameter, and C level

CHECK: Check that conditions for the procedure are met.

CALCULATE:

CI: point estimate $\pm$ critical value $\times$ *SE* of estimate

df = (if applicable)

(_____ , _____)

CONCLUDE:

We are C% confident that the interval (_ , _) contains the true [parameter]. (Put the parameter in *context.*)

We have evidence that [...], because [...]. OR
We do not have evidence that [...], because [...].

HYPOTHESIS TESTS

Use **hypothesis tests** to **test** H_0 versus H_A at a particular **significance level, α**.

IDENTIFY: Test name, parameter, hypotheses, and α

CHECK: Check that conditions for the procedure are met.

CALCULATE:

$$\textbf{standardized test statistic} = \frac{\textbf{point estimate} - \textbf{null value}}{\textbf{\textit{SE}} \textbf{ of estimate}}$$

df = (if applicable)

p-value =

CONCLUDE:

p-value ≤ α, so we reject H_0.
We have evidence that [H_A]. (Put H_A in *context.*)

OR

p-value > α, so we do NOT reject H_0.
We do NOT have evidence that [H_A]. (Put H_A in *context.*)

When the parameter is: **a single proportion *p***

IDENTIFY: **1-Sample Z-Interval** to estimate p, or
1-Sample Z-Test to test $H_0: p = p_0$

CHECK:

- Data come from a random sample or process
- If sampling without replacement, n ≤ 10% of N
- For CI: $n\hat{p} \geq 10$ and $n(1-\hat{p}) \geq 10$
  For Test: $np_0 \geq 10$ and $n(1-p_0) \geq 10$

CALCULATE:

point estimate: sample proportion $\hat{p}$

***SE* of estimate:** for CI: use $\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$; for Test: use $\sqrt{\frac{p_0(1-p_0)}{n}}$

When the parameter is: **a difference of proportions $p_1 - p_2$**

IDENTIFY: **2-Sample Z-Interval** to estimate $p_1 - p_2$, or
2-Sample Z-Test to test $H_0: p_1 = p_2$.

CHECK:

- Data come from 2 independent random samples or 2 randomly assigned treatments.
- If sampling w/o repl., $n_1 \leq$ 10% of N_1 and $n_2 \leq$ 10% of N_2
- For CI: $n_1\hat{p}_1 \geq 10$, $n_1(1-\hat{p}_1) \geq 10$,
  $n_2\hat{p}_2 \geq 10$, $n_2(1-\hat{p}_2) \geq 10$
  For Test: use $\hat{p}_c$, the pooled proportion, in place of $\hat{p}_1$ and $\hat{p}_2$ above

CALCULATE:

point estimate: difference of sample proportions $\hat{p}_1 - \hat{p}_2$

***SE* of estimate:**

CI: use $\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$; Test: use $\sqrt{\hat{p}_c\left(1-\hat{p}_c\right)\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}$

When the parameter is: **a single mean μ**

IDENTIFY: **1-Sample T-Interval** to estimate μ, or
1-Sample T-Test to test $H_0: \mu = \mu_0$

CHECK:

- Data come from a random sample or process
- If sampling without replacement, n ≤ 10% of N
- $n \geq 30$ OR population distribution is nearly normal OR sample data is free from strong skewness and outliers

CALCULATE:

point estimate: sample mean $\bar{x}$

***SE* of estimate:** $\frac{s}{\sqrt{n}}$

$df = n - 1$

When the parameter is: **a difference of means $\mu_1 - \mu_2$**

IDENTIFY: **2-Sample T-Interval** to estimate $\mu_1 - \mu_2$, or
2-Sample T-Test to test $H_0: \mu_1 = \mu_2$.

CHECK:

- Data come from 2 independent random samples or 2 randomly assigned treatments.
- If sampling w/o repl., $n_1 \leq$ 10% of N_1 and $n_2 \leq$ 10% of N_2
- $n_1 \geq 30$ and $n_2 \geq 30$ OR both population distributions nearly normal OR both sample data sets are free from strong skewness and outliers

CALCULATE:

point estimate: difference of sample means $\bar{x}_1 - \bar{x}_2$

***SE* of estimate:** $\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

df: use technology