Stat Support Activity: Two-Population Proportion
Z-test statistic Calculations

1.

We want to compare the population percentage of people that identify as men and have at least one tattoo (π_1) and the population percentage of people that identify as women and have at least one tattoo (π_2). A random sample of 857 people that identify as men found that 146 of them had at least one tattoo. A random sample of 794 people that identify as women found that 137 of them had at least one tattoo. Calculate the Z-test statistic to compare the sample proportions.

a) Calculate sample proportion 1 ($\hat{p}_1$) for men with a tattoo.

$$\hat{p}_1 = \frac{x_1}{n_1} = \frac{amount\ in\ sample\ 1}{total\ sample\ 1}$$

b) Calculate sample proportion 2 ($\hat{p}_2$) for women with a tattoo.

$$\hat{p}_2 = \frac{x_2}{n_2} = \frac{amount\ in\ sample\ 2}{total\ sample\ 2}$$

c) Calculate the sample proportion difference $\hat{p}_1 - \hat{p}_2$ by subtracting the answers in part (a) and part (b).

d) Calculate p-pooled ($\bar{p}$) = $\frac{(x_1+x_2)}{(n_1+n_2)}$

e) Calculate the standard error using p-pooled and the following formula:

Standard Error = $\sqrt{\left(\frac{\bar{p}(1-\bar{p})}{n_1} + \frac{\bar{p}(1-\bar{p})}{n_2}\right)}$ =

f) Calculate the two-population Z-test statistic by dividing the answers to part (c) and part (e).

Z – test statistic = $\frac{(\hat{p}_1-\hat{p}_2)}{\sqrt{\left(\frac{\bar{p}(1-\bar{p})}{n_1}+\frac{\bar{p}(1-\bar{p})}{n_2}\right)}} = \frac{sample\ proportion\ difference}{standard\ error}$

g) Z – test statistic sentence: The sample proportion for men with at least one tattoo was _____ standard errors *(above or below)* the sample proportion for women with at least one tattoo. *(Note: Use "above" if Z – test stat is positive. Use "below" if Z – test stat is negative.)*

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2.

A random sample of 135 women that smoke (population 1) found that 38 were able to get pregnant in the allotted amount of time. A random sample of 543 women that do not smoke (population 2) found that 206 were able to get pregnant in the allotted amount of time.

a) Calculate sample proportion 1 $(\hat{p}_1)$ of smoking women that were able to get pregnant.

$$\hat{p}_1 = \frac{x_1}{n_1} = \frac{amount\ in\ sample\ 1}{total\ sample\ 1}$$

b) Calculate sample proportion 2 $(\hat{p}_2)$ of non-smoking women that were able to get pregnant.

$$\hat{p}_2 = \frac{x_2}{n_2} = \frac{amount\ in\ sample\ 2}{total\ sample\ 2}$$

c) Calculate the sample proportion difference $\hat{p}_1 - \hat{p}_2$ by subtracting the answers in part (a) and part (b).

d) Calculate p-pooled $(\bar{p})$ = $\frac{(x_1+x_2)}{(n_1+n_2)}$

e) Calculate the standard error using p-pooled and the following formula:

Standard Error = $\sqrt{\left(\frac{\bar{p}(1-\bar{p})}{n_1} + \frac{\bar{p}(1-\bar{p})}{n_2}\right)}$ =

f) Calculate the two-population Z-test statistic by dividing the answers to part (c) and part (e).

Z – test statistic = $\frac{(\hat{p}_1-\hat{p}_2)}{\sqrt{\left(\frac{\bar{p}(1-\bar{p})}{n_1}+\frac{\bar{p}(1-\bar{p})}{n_2}\right)}} = \frac{sample\ proportion\ difference}{standard\ error}$

g) Z – test statistic sentence: The sample proportion of smoking women that were able to get pregnant was _____ standard errors *(above or below)* the sample proportion of non-smoking women that were able to get pregnant. *(Note: Use "above" if Z – test stat is positive. Use "below" if Z – test stat is negative.)*

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3. Population 1: Those that use Marijuana.
   Population 2: Those that do not use Marijuana.

	Uses Other Drugs	Total
Uses Marijuana	87	213
Does not use Marijuana	26	219

a) Calculate sample proportion 1 $(\hat{p}_1)$ of marijuana users that use other drugs.

$$\hat{p}_1 = \frac{x_1}{n_1} = \frac{amount\ in\ sample\ 1}{total\ sample\ 1}$$

b) Calculate sample proportion 2 $(\hat{p}_2)$ of non-marijuana users that use other drugs.

$$\hat{p}_2 = \frac{x_2}{n_2} = \frac{amount\ in\ sample\ 2}{total\ sample\ 2}$$

c) Calculate the sample proportion difference $\hat{p}_1 - \hat{p}_2$ by subtracting the answers in part (a) and part (b).

d) Calculate p-pooled $(\bar{p})$ = $\frac{(x_1+x_2)}{(n_1+n_2)}$

e) Calculate the standard error using p-pooled and the following formula:

Standard Error = $\sqrt{\left(\frac{\bar{p}(1-\bar{p})}{n_1} + \frac{\bar{p}(1-\bar{p})}{n_2}\right)}$ =

f) Calculate the two-population Z-test statistic by dividing the answers to part (c) and part (e).

Z – test statistic = $\frac{(\hat{p}_1-\hat{p}_2)}{\sqrt{\left(\frac{\bar{p}(1-\bar{p})}{n_1}+\frac{\bar{p}(1-\bar{p})}{n_2}\right)}} = \frac{sample\ proportion\ difference}{standard\ error}$

g) Z – test statistic sentence: The sample proportion of marijuana users that use other drugs was _____ standard errors *(above or below)* the sample proportion of non-marijuana users that use other drugs. *(Note: Use "above" if Z – test stat is positive. Use "below" if Z – test stat is negative.)*