Stat Support Activity: Two-Population Proportion Confidence Interval Calculations

Notes: Two-Population Proportion Confidence Interval Formula

$$(\hat{p}_1 - \hat{p}_2) \pm \left(Z_c \times \sqrt{\left(\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2} \right)} \right)$$

1.

We want to compare the population percentage of people that identify as women and have at least one tattoo (π_1) and the population percentage of people that identify as men and have at least one tattoo (π_2). A random sample of 794 people that identify as women found that 137 of them had at least one tattoo. A random sample of 857 people that identify as men found that 146 of them had at least one tattoo. Use a 99% confidence level and the formulas to answer the following and create a confidence interval for the difference $(\pi_1 - \pi_2)$ between the population percentage of people that identify as women and have at least one tattoo (π_1) and the population percentage of people that identify as men and have at least one tattoo (π_2).

a) Calculate sample proportion 1 $(\hat{p}_1)$ for women 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 men 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) What is the critical value Z-score for 99% confidence level?

e) Calculate the standard error using the following formula:

Standard Error = $\sqrt{\left(\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2} \right)}$ =

f) Calculate the Margin of Error using the following formula and the answers to part (d) and part (e).

$$Z_c \times Standard\ Error$$

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g) Calculate the confidence Interval lower limit. Use the answers to part (c) and part (f).

$$(\hat{p}_1 - \hat{p}_2) - Margin\ of\ Error$$

h) Calculate the confidence Interval lower limit. Use the answers to part (c) and part (f).

$$(\hat{p}_1 - \hat{p}_2) + Margin\ of\ Error$$

2.

In March 2003, a research group asked 2400 randomly selected Americans whether they believe that the U.S. made the right or wrong decision to use military force in Iraq. Of the 2400 adults, 1862 said that they believed that the U.S. did make the correct decision. In February 2008, the question was asked again to 2180 randomly selected Americans and 684 of them said that the U.S. did make the correct decision. Use a 90% confidence level and the formulas below to create a two-population proportion confidence interval for the difference $(\pi_1 - \pi_2)$ to compare the population percentage of people that agree with war in 2008 (π_1) and the population percentage that agree with the war in 2003 (π_2).

a) Calculate sample proportion 1 $(\hat{p}_1)$ of people in 2008 that agree with war in Iraq.

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

b) Calculate sample proportion 2 $(\hat{p}_2)$ of people in 2003 that agree with war in Iraq.

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

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

d) What is the critical value Z-score for 90% confidence level?

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e) Calculate the standard error using the following formula:

Standard Error = $\sqrt{\left(\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}\right)}$ =

f) Calculate the Margin of Error using the following formula and the answers to part (d) and part (e).

$Z_c \times Standard\ Error$

g) Calculate the confidence Interval lower limit. Use the answers to part (c) and part (f).

$(\hat{p}_1 - \hat{p}_2) - Margin\ of\ Error$

h) Calculate the confidence Interval lower limit. Use the answers to part (c) and part (f).

$(\hat{p}_1 - \hat{p}_2) + Margin\ of\ Error$