The 2 Sample Z Test

Previously, we tested hypotheses about population averages (means) or percentages using the test statistic:

1 sample z test
z = (observed - expected)/SE

Now we'll try to test hypotheses that compare the averages (means) or percentages in *two* populations. If our samples from these populations are *independent*, we use the test statistic:

2 sample z test
z = (observed difference - expected difference)/ $SE_{difference}$
$$\frac{\left\lvert \bar{X}_1 - \bar{X}_2 \right\rvert - 0}{\sqrt{SE_1^2 + SE_2^2}}$$
**The formula above is for means. For proportions, just replace the sample means with the sample proportions.*

If our null hypothesis is that the two population averages or percentages are equal, the expected difference is 0, so the test statistic is just:

$$z = (\text{observed difference})/SE_{difference}$$

How do you compute the SE for the difference?

When comparing 2 population percentages (or averages), the null hypothesis is that the percentage of 1's (or averages) in the two populations is the same and can be estimated by pooling the 2 samples and taking an average. Based on this pooled percentage, the same SD is calculated for each population.

This formula does not apply if the 2 samples are dependent.

M5-07: 2 Sample Z Test

Part of the "Polling, Confidence Intervals, and the Normal Distribution" Learning Badge

Video Walkthrough: https://discovery.cs.illinois.edu/m5-07/

Puzzle (comparing 2 sample averages):

In a recent study, scientists wanted to know which was better for weight loss: a low carb "Keto" diet or a traditional low calorie diet.

The subjects were 120 obese volunteers. Half were randomly assigned to do the Keto diet for 6 weeks and half were randomly assigned to do a low calorie diet for 6 weeks. At the end of the study, the Keto group had lost 12.9% of their body weight and the low calorie group lost 6.7% of their body weight. Was this difference just due to chance or is this evidence that the Keto diet is better for weight loss? Perform a hypothesis test to answer the question.