

Fact Sheet – Two Proportion Test (11.1)

This test is used to compare the proportion of one population that has a certain trait to the proportion of a second population that has a certain trait.

Example: The proportion of COS students who own an iPhone is the same as the proportion of students at Reedley College that own an iPhone.

Conditions

To test hypotheses regarding two population proportions, p_1 and p_2 , the following three conditions must be met.

- The two samples are independently obtained using simple random sampling or through a randomized experiment.
- $n\hat{p}_1(1-\hat{p}_1) \geq 10$ and $n\hat{p}_2(1-\hat{p}_2) \geq 10$
- $20n_1 \leq N_1$ and $20n_2 \leq N_2$

Hypothesis Test

Step 1

You must identify which population will be population 1.

The null hypothesis will be $p_1 = p_2$. H_1 will be either $p_1 < p_2$, $p_1 > p_2$, or $p_1 \neq p_2$.

Step 3

The test statistic is $z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p}) \cdot \frac{n_1 + n_2}{n_1 \cdot n_2}}}$, where $\hat{p} = \frac{x_1 + x_2}{n_1 + n_2}$.

Just write “Two Proportion Test”, rather than writing the test statistic.

Step 4

To compute the test statistic and P-value using StatCrunch ...

Stat > Proportions > Two sample > Summary

Enter number of successes and number of trials for each sample. Click Next.

Leave the value for p1-p2 as 0. Select the appropriate sign for H1. Click Calculate.

Two Proportion Test

In Class Examples

Using StatCrunch, perform all tests using the p-value approach.

Write up the test using the 5-step format.

- 1) Are college graduates less likely to be smokers? In a random sample of 70 college graduates, 15 were smokers. In a random sample of 144 adults with a high school diploma or less, 34 were smokers. At the 0.01 level of significance, test the claim that college graduates are less likely to be smokers than adults that did not attend college.
- 2) A student randomly selected 225 college students and asked them whether they ate breakfast that morning before coming to campus. There were 57 students that were at least 25 years old, of which 30 had breakfast that morning. Of the 168 students that were younger than 25, 82 had breakfast that morning. At the 0.05 level of significance, test the claim that there is no difference between the proportion of students aged 25 or older that eat breakfast and the proportion of students younger than 25 that eat breakfast.
- 3) A survey of 415 kindergarten children who lived in the suburbs revealed that 24 had been diagnosed with asthma. A survey of 638 inner-city kindergarten children revealed that 69 had been diagnosed with asthma. At the 0.01 level of significance, test the claim that inner-city children are more likely to have asthma than children who live in the suburbs.
- 4) Exercise is an important part of weight loss. Federal recommendations call for at least two-and-a-half hours of exercise per week. A survey of 78 men who were trying to lose weight showed that only 33 were meeting this Federal exercise recommendation. A survey of 139 women who were trying to lose weight revealed that only 51 were meeting this Federal exercise recommendation. At the 0.05 level, test the claim that men who are dieting are more likely to follow the Federal exercise recommendation than women who are trying to lose weight.
- 5) A random sample of 90 adults aged 18 – 24 showed that 13 had donated blood within the past year, while a random sample of 156 adults who were at least 25 years old had 18 people who had donated blood within the past year. At the 0.05 level of significance, test the claim that the proportion of blood donors is equal for these two age groups.
- 6) In a study of 1054 people who were 60 or older, New York City researchers found that 19 of the 459 women and 11 of the 595 men had lung cancer. At the 0.01 level of significance, test the claim that men over 60 are less likely to get lung cancer than women over 60.