

12.4 Exercises

Basic Concepts

1. Why is comparing two population proportions particularly useful?
2. Give two examples of situations in which someone would be interested in comparing population proportions.
3. What assumptions are necessary to perform a hypothesis test for the difference between two population proportions?
4. Which sampling distribution is used in a two-sample test of hypothesis about population proportions? What are the characteristics of this sampling distribution?
5. What is the test statistic that is used when comparing two population proportions?
6. True or False: In order to use the specified test statistic, the hypothesized difference in the null hypothesis between the two population proportions must be zero.

Exercises

7. Determine the critical value(s) of the test statistic for each of the following tests for the comparison of two population proportions. Assume that the samples are large enough that the normality assumption is met.
 - a. Left-tailed test, $\alpha = 0.01$
 - b. Right-tailed test, $\alpha = 0.05$
 - c. Two-tailed test, $\alpha = 0.10$
8. Determine the critical value(s) of the test statistic for each of the following tests for the comparison of two population proportions. Assume that the samples are large enough that the normality assumption is met.
 - a. Left-tailed test, $\alpha = 0.025$
 - b. Right-tailed test, $\alpha = 0.02$
 - c. Two-tailed test, $\alpha = 0.04$
9. A fundraiser believes that individuals over the age of 40 are more likely to say “Yes” when asked to donate to a worthy cause than individuals who are between the ages of 25 and 40. To test this theory, she randomly selects 200 individuals who are between the ages of 25 and 40 and 190 individuals over the age of 40 and asks for donations to the same cause. Let Population 1 be individuals between 25-40 years old and Population 2 be individuals over 40 years old. The results of the survey are as follows.

Fund-Raiser Survey		
Age	Number Surveyed	# of “Yes” Responses
25-40 years	200	16
Over 40 years	190	21

- a. Are the sample sizes large enough such that a hypothesis test for the difference between two population proportions may be performed? If so, does the data substantiate the fund-raiser’s theory at $\alpha = 0.10$?

- b. Calculate the P -value for the test and interpret its meaning.
- c. Calculate a 95% confidence interval for the difference in the proportion of individuals who are between the ages of 25 and 40 and individuals who are over the age of 40 who would most likely donate to a worthy cause. Interpret the interval.
10. A poll is conducted to determine if US citizens think that there should be a national health care system in the U.S. The results of the poll were as follows: 69% of the 300 women surveyed and 64% of the 250 men surveyed think that there should be a national health care system in the U.S. Are the sample sizes large enough such that a hypothesis test for the difference between two population proportions may be performed? If so, is there sufficient evidence to conclude at $\alpha = 0.05$ that men and women feel differently about this issue? Let Population 1 be the women surveyed in the poll and Population 2 be the men surveyed in the poll.
11. A manufacturer is comparing shipments of machine parts from two suppliers. The parts from Supplier A are less expensive; however, the manufacturer is concerned that the parts may be of a lower quality than those from Supplier B. The manufacturer has decided that he will purchase his supplies from Supplier A unless he can show that the proportion of defective parts is significantly higher for Supplier A than for Supplier B. He randomly selects parts from each supplier and inspects them for defects. The results are as follows. Determine whether the sample sizes are large enough such that inferences about the difference between the population proportions can be made. If so, which supplier will the manufacturer choose at $\alpha = 0.05$? Explain. Let Population 1 be Supplier A parts and Population 2 be Supplier B parts.

Number of Defective Parts		
	Number Surveyed	Number of Defective Parts
Supplier A	550	11
Supplier B	700	13

12. Suppose you have recently become interested in photography and are shopping on Amazon for a digital single-lens reflex (DSLR) camera. You've narrowed your choice down to two cameras and are leaning towards purchasing the Nikon, unless the Canon has a significantly higher proportion of 5-Star ratings. Given the Amazon rating distributions for the two cameras, which will you choose at $\alpha = 0.05$? Explain. Let the Nikon D3500 reviews be Population 1 and the Canon Rebel T7 reviews be Population 2.

Amazon Ratings		
Stars	Nikon D3500 Number of Reviews	Canon Rebel T7 Number of Reviews
5-Star	354	266
4-Star	53	33
3-Star	12	10
2-Star	9	4
1-Star	14	9