

## 10.3 Comparing Two Independent Population Proportions

### Learning Objective:

In this section, you will:

- Apply hypothesis testing and calculate confidence intervals to real-world problems about two population proportions

When conducting a hypothesis test that compares two independent population proportions, the following characteristics should be present:

1. The two independent samples are simple random samples that are independent.
2. The number of successes is at least five, and the number of failures is at least five, for each of the samples.
3. Growing literature states that the population must be at least ten or 20 times the size of the sample. This keeps each population from being over-sampled and causing incorrect results.

Hypothesis testing of two population proportions from independent samples.

- Random Variable:  $\hat{p}_1 - \hat{p}_2$  = the difference between the two estimated proportions
- Distribution: Normal distribution
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**Example 1a:** Two types of medication for hives are being tested to determine if there is a difference in the proportions of adult patient reactions. Twenty out of a random sample of 200 adults given medication A still had hives 30 minutes after taking the medication. Twelve out of another random sample of 200 adults given medication B still had hives 30 minutes after taking the medication. Test at a 1% level of significance.

1. Null and Alternative Hypothesis
2. Calculator Work
3. Test Statistic and P-Value
4. Conclusion about the null hypothesis

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5. Final conclusion that addresses the original claim

**Example 1b:** Using the data from 1a, construct the corresponding confidence interval estimate for the difference between the proportions of adult patient reactions to medication A and medication B. What does the result suggest about the two proportion?

**Example 2:** Researchers conducted a study of smartphone use among adults. A cell phone company claimed that iPhone smartphones are more popular with whites (non-Hispanic) than with African Americans. The results of the survey indicate that of the 232 African American cell phone owners randomly sampled, 5% have an iPhone. Of the 1,343 white cell phone owners randomly sampled, 10% own an iPhone. Test at the 5% level of significance. Is the proportion of white iPhone owners greater than the proportion of African American iPhone owners?

1. Null and Alternative Hypothesis
2. Calculator Work
3. Test Statistic and P-Value
4. Conclusion about the null hypothesis

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5. Final conclusion that addresses the original claim
6. Test the above claim by constructing an appropriate confidence interval.

For more information and examples see online textbook OpenStax Introductory Statistics pages 579-584.

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