

Lesson 57: Significance Tests on a Proportion

Daily Data Collection

All topics, claims, and alternates will be student generated

<p>Topic 1</p> <p>Claim from a student: $H_0: p =$</p> <p>Alternate: $H_a: p$</p> <p>Conclusion</p>	<p>Topic 2</p> <p>Claim from a student: $H_0: p =$</p> <p>Alternate: $H_a: p$</p> <p>Conclusion</p>
<p>Topic 3</p> <p>Claim from a student: $H_0: p =$</p> <p>Alternate: $H_a: p$</p> <p>Conclusion</p>	<p>Topic 4</p> <p>Claim from a student: $H_0: p =$</p> <p>Alternate: $H_a: p$</p> <p>Conclusion</p>

Example

The manager of a fast-food restaurant wants to reduce the proportion of drive-through customers who have to wait more than two minutes. The proportion of customers who had to wait at least two minutes was $p = 0.63$. To reduce this proportion, the manager assigns an additional employee to assist with the drive-through orders. During the next month, the manager will collect a random sample of drive-through times to test the following hypotheses:

H_0 :

H_a :

where $p =$

Suppose that the manager decided to carry out this test using a random sample of 250 orders and $\hat{p} = .6$. Is this result significant at the 0.10 level?

Describe a Type I error:

What is the probability of a type I error?

Describe a Type II error:

Which error type would be more serious?

Rules for Proportion Testing

Conditions:

Randomly selected sample – Look for the term SRS. Without random selection, we lose the ability to make inferences about the population.

Normal Distribution – We will be using Normal Curves to find probabilities, so we need the distribution to be Normal.

For Proportions: $np \geq 10$ and $n(1-p) \geq 10$ sometimes $1 - p = q$

Note: p is the null proportion, notation p_0

Independent Observations – In order to use our standard deviation formula, we need the sample size to be less than 10% of the population size, so $10n < N$. This is especially true when sampling without replacement.

Standard Deviation of the sample proportion:

$$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} \quad \text{Note: } p \text{ is the null proportion}$$

Proportions are always a Z-Test

Better to be last? On shows like American Idol, contestants often wonder if there is an advantage to performing last. To investigate this, a random sample of 600 fans is selected to view the audition tapes of 12 never-before-seen contestants. For each fan, the order of the 12 videos is randomly determined. Thus, if the order of performance doesn't matter, we would expect approximately 1/12 of the fans to prefer the last contestant they view. In this study, 59 of the 600 fans preferred the last contestant they viewed. Do these data provide convincing evidence that there is an advantage to going last?

Smoking According to the CDC website, 50% of high school students have never smoked a cigarette. Ben wonders whether this national result holds true in his large, urban high school. Ben surveys an SRS of 150 students from his school. He gets responses from all 150 students and 90 say that they have never smoked a cigarette. What should Ben conclude?