

MATH 1070 - Chapter 22 Notes
Inference About Population Proportion

Example: Say we are interested in the true proportion of Democrats in SLC. We may survey a simple random sample of the population and compute the proportion of people amongst those surveyed who claim to be Democrats. This is a **statistic** from a sample. How do we go from this to a statement about the true population proportion of Democrats in SLC?

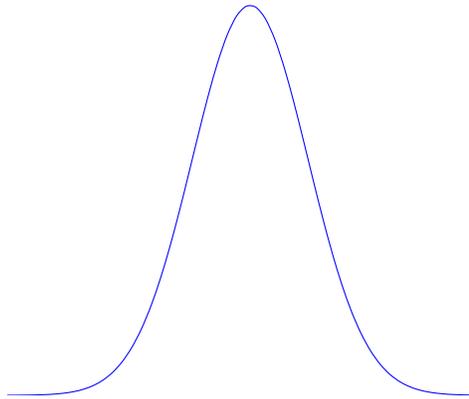
Definitions:

- (1) The proportion of a population that has an outcome of interest (?success?) is p .
- (2) The proportion of successes in a sample is measured by the **sample proportion**.

1. SAMPLING DISTRIBUTION

Now, lets consider the sampling distribution of a sample proportion:

Now, lets us look at the distribution.



1.1. **Standard Error:** Since the population proportion p is unknown, the standard deviation of the sample proportion will need to be estimated by substituting \hat{p} for p .

2. CONFIDENCE INTERVAL

Large sample Confidence Interval:

Important Note: Use this interval only when the counts of successes and failures in the sample are each at least 15.

Example: A certain soft drink manufacturer wants to estimate the proportion of people who consume their brand of soft drink on a regular basis. A random sample of 100 people yielded 18 who reported consuming their brand of soft drink on a regular basis. Compute a 95% confidence interval ($z^* = 1.960$) to estimate the proportion of interest.

3. SAMPLE SIZE FOR DESIRED MARGIN OF ERROR

The level C confidence interval for a population proportion p will have margin of error approximately equal to a specified value m when sample size is:

Note: The margin of error will be less than or equal to m if you take the guess p^* to be 0.5.

Example: Suppose a certain soft drink manufacturer wants to estimate the proportion of people that drink their brand of soft drink on a regular basis using a 99% confidence interval, and we are instructed to do so such that the margin of error does not exceed 1 percent (0.01).

What sample size will be required to enable us to create such an interval?

4. HYPOTHESIS TEST FOR PROPORTIONS

Null:

One-sided alternatives

Two-sided alternatives

Test Statistic:

p -values for Testing Proportions:

Example: (Study on parental attitudes about kids' discipline) A nation wide random telephone survey of 1250 adults. 474 respondents had children under 18 living at home. The reported margin of error is 5%. The study found a majority of parents reported not to have physically disciplined their child (spanked) in the previous year. Test the null hypothesis that parents are equally likely to physically discipline or not physically discipline their child.