Hypothesis Testing (A worked out example)

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Introduction

- This video aims to provide a worked out example of hypothesis testing for a single proportion
  - To preface, the key steps in any hypothesis are as follows:

1) State the null and alternative hypotheses
2) Find the null distribution (the distribution of possible outcomes that could occur if the null hypothesis were true)
3) Using the null distribution, locate the estimate observed in the sample data to find the p-value
4) Use the p-value to make a conclusion

Example

According to Wikipedia, babies born 15-weeks prematurely have a 70% survival rate. A recent study of babies born at Johns Hopkins University found that 31 of 39 (79.5%) babies born 15-weeks early survived. Does this study provide evidence that Wikipedia is wrong?

Step 1 - State the Hypotheses

In order to evaluate whether the sample data are incompatible with Wikipedia's claim, we begin by assuming that Wikipedia's claim is true:

$$H_0 : p = 0.7$$

$$H_A : p \neq 0.7$$

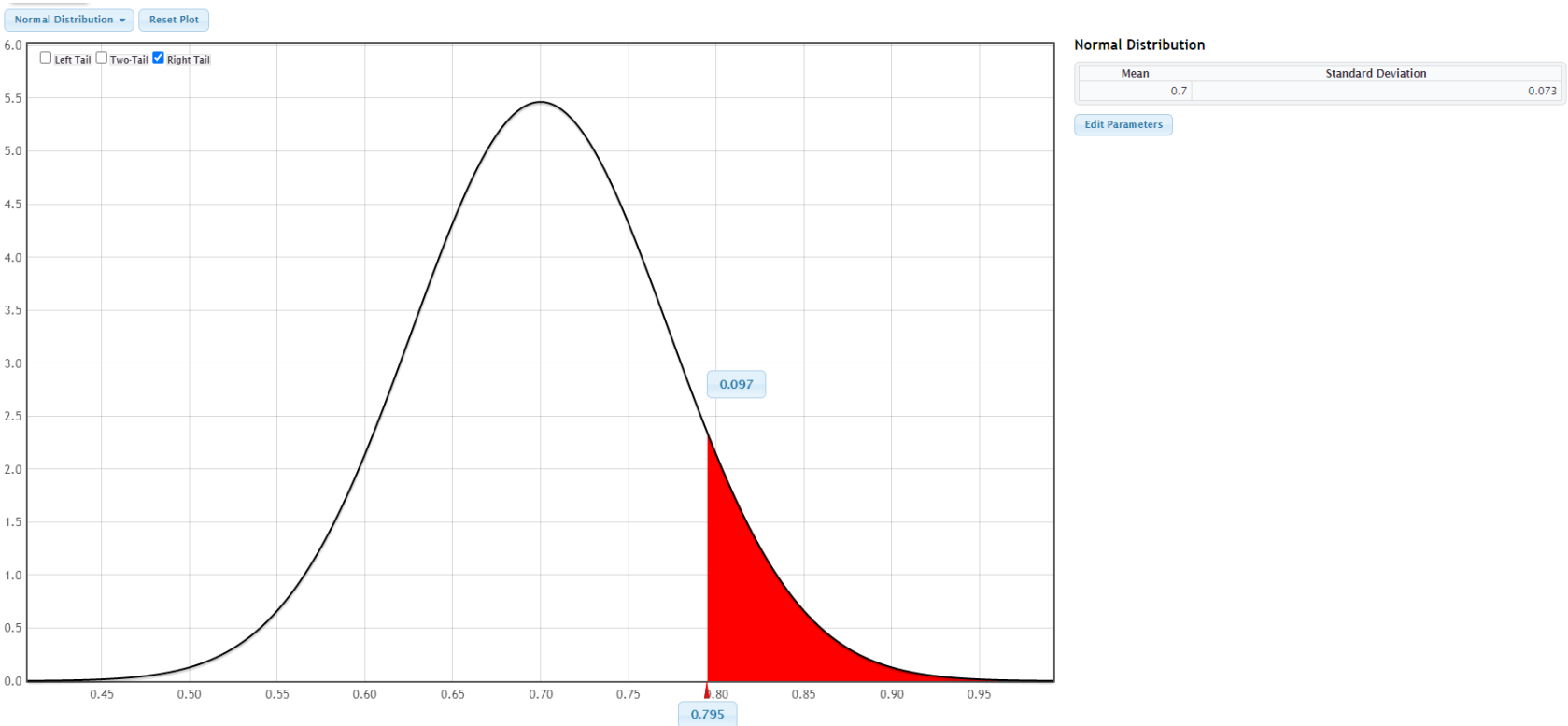
Step 2 - Find the Null Distribution

Central Limit theorem suggests we might use a Normal model to tell us which sample proportions we might expect to see if the $H_0 : p = 0.7$ is true:

$$\hat{p} \sim N\left(0.7, \sqrt{\frac{0.7(1-0.7)}{39}}\right)$$

In words, the expected value of our null model is 0.7 and the standard error is $\sqrt{\frac{0.7(1-0.7)}{39}} = 0.073$

Step 3 - Locate the Sample Estimate to find the *p*-value



Remember we need to double this area to get a two-sided *p*-value of 0.184

Step 4 - Make a Conclusion

Based upon the p-value of 0.184, there is a roughly 1 in 5 chance of seeing a sample proportion like this one (31 of 39) if Wikipedia's claim of 70% survival is correct. Therefore, we conclude these data do not provide sufficient evidence to disprove Wikipedia's claim