# Procedure for hypothesis test:

Hypothesis tests can be conducted using the *P*-value method or the critical value method, and confidence intervals could also be used.

In this activity, we consider the P-value method and Critical Value Method for testing claims about population parameters, such as population proportions or means or standard deviations.

The *P*-value method is extremely important because statistics software packages typically provide

*P*-values, so the *P*-value method is commonly used for professional reports and journal articles.

The critical value method is particularly important when technology is not available and limitations of tables make it difficult to find *P*-values.

This activity assumes you are comfortable with identifying the null and alternative hypothesis, which make up the first three steps of the flowchart.

If you need a review of these first three steps, click the button labelled Identifying H0 and H1 for a separate activity focused on these initial steps.

Let’s use the following example to review the procedure for Hypothesis tests using the *P*-value method and the Critical Value method.

Consider a study of 1228 randomly selected medical malpractice lawsuits.

Among those 1228 lawsuits, 856 were dropped or dismissed.

Test the claim that MOST medical malpractice lawsuits are dropped or dismissed.

Based on the study, we see that the sample size is n = 1228 and the sample proportion is 856/1228 which is equal to 0.697 or 69.7%.

The sample proportion of 0.697 does appear to support the claim that MOST of the lawsuits are dropped or dismissed.

The first step is to identify the claim and represent it in symbolic form. In this case, the claim is that MOST medical malpractice lawsuits are dropped or dismissed.

Because “most” means the majority or more than half, we can represent the original claim in symbolic form as *p* > 0.5. The next step is to give the symbolic form that must be true when the original claim is false.

In this case, the symbolic form that must be true when the original claim is false is: *p* ≤ 0.5.

We now consider which of the two expressions does not contain the condition of equality.

In this case, the first expression *p* > 0.5 *does not* contain the condition of equality, so it becomes the alternative hypothesis. The alternative hypothesis is expressed as follows: *H*1 : *p* > 0.5.

The null hypothesis is the statement of equality. So the null hypothesis is expressed as follows:

*H*0 : *p* = 0.5. The next step is to select the significance level based on the seriousness of a type I error.

A very common choice for the significance level is 0.05, and there is no information suggesting that a type I error is very serious, so we go with the significance level of 0.05.

We need to identify the statistic that is relevant to this test and determine its sampling distribution.

A summary of Parameters and Corresponding Test Statistics is available in the textbook (Table 8-2) and is shown in the next question. Now, it is time to test your knowledge. The claim in this example is made about the population proportion *p*, so the relevant statistic is the sample proportion, denoted by “p-hat”.

Hypothesis tests involving claims about population proportions are conducted by using the NORMAL distribution. We must therefore calculate the value of the Test Statistic *z* as shown in the top row of the table.

The test statistic for other parameters including mean and standard deviation and variance are also shown in the table.

Both the *P*-Value Method and Critical Value Method require that we calculate the value of the test statistic. For this example, the test statistic is calculated to be *z* = 13.81.

The final steps of the hypothesis test procedure depend on whether you are using the *P*-Value Method or Critical Value Method. Please select which method you would like to use.

Note that both methods yield the same conclusion. You have selected the *P* -Value Method.

This is a right-tailed test, because the alternative hypothesis is the claim that the population proportion *p* is GREATER THAN 0.5, so the *P*-value is the area to the right of *z* = 13.81.

It is recommended that you use technology to find the *P*-Value and the *P*-Value in this example

is 0.0000 when rounded to four decimal places. That is small! Note that there is a separate activity focused on Finding *P*-Values. That activity can be accessed by clicking the button “Finding *P*-Values”.

We now compare the *P* -value with the significance level. Remember, we reject the null hypothesis only if the *P*-value is less than or equal to the significance level.

In this case, the *P*-value is less than the significance level, because 0.0000 is less than 0.05, so we reject the null hypothesis. The final step is to restate the conclusion in simple, non-technical terms that address the original claim.

In this case, our conclusion is that there is sufficient evidence to support the original claim that most medical malpractice lawsuits are dropped or dismissed.

Now, it is time to test your knowledge. Let’s try another one. You have selected the Critical Value Method. This is a right-tailed test, because the alternative hypothesis is the claim that the population proportion p is GREATER THAN 0.5.

Claim that the population proportion *p* is GREATER THAN 0.5. Because this test is right-tailed, the critical value is located in the right region of the normal distribution.

Because the significance level is 0.05, the critical value is found by identifying the z score that separates an area of 0.05 in the right tail of the normal distribution.

Using technology or the normal distribution table, we find that the critical value is *z* = 1.645, and the critical region is the area to the right of *z* = 1.645. In this case, the test statistic of *z* = 13.81 does fall in the critical region, so we reject the null hypothesis.

The final step is to restate the conclusion in simple, non-technical terms that address the original claim. In this case, our conclusion is that there is sufficient evidence to support the original claim that most medical malpractice lawsuits are dropped or dismissed.

Now, it is time to test your knowledge. Let’s try another one. In this activity, we reviewed the

*P*-value method and Critical Value Method for testing claims about population parameters,

such as population proportions or means or standard deviations. If you would now like to review the specific procedure for the *P*-Value Method or Critical Value Method, click the button for the desired method.

Congratulations, you have mastered an important concept of Statistics!

Don’t be critical of the critical value method.