Description

Scientists begin their research with a hypothesis that a relationship of some kind exists between variables. The null hypothesis is the opposite stating that no such relationship exists. Null hypothesis may seem unexciting, but it is a very important aspect of research. In this article, we discuss what null hypothesis is, how to make use of it, and why you should use it to improve your statistical analyses.

What is the Null Hypothesis?

The null hypothesis can be tested using statistical analysis and is often written as H_0 (read as "H-naught"). Once you determine how likely the sample relationship would be if the H_0 were true, you can run your analysis. Researchers use a significance test to determine the likelihood that the results supporting the H_0 are not due to chance.

The null hypothesis is not the same as an alternative hypothesis. An alternative hypothesis states, that there is a relationship between two variables, while H_0 posits the opposite. Let us consider the following example.

A researcher wants to discover the relationship between exercise frequency and appetite. She asks:

> Q: Does increased exercise frequency lead to increased appetite?
>
> Alternative hypothesis: Increased exercise frequency leads to increased appetite.
>
> H_0 assumes that there is no relationship between the two variables: Increased exercise frequency does not lead to increased appetite.

Let us look at another example of how to state the null hypothesis:

> Q: Does insufficient sleep lead to an increased risk of heart attack among men over age 50?
>
> H_0: The amount of sleep men over age 50 get does not increase their risk of heart attack.

Why is Null Hypothesis Important?

Many scientists often neglect null hypothesis in their testing. As shown in the above examples, H_0 is often assumed to be the opposite of the hypothesis being tested. However, it is good practice to include H_0 and ensure it is carefully worded. To understand why, let us return to our previous example. In this case,

Alternative hypothesis: Getting too little sleep leads to an increased risk of heart attack among men over age 50.

H_0: The amount of sleep men over age 50 get **has no effect** on their risk of heart attack.

Note that this H_0 is different than the one in our first example. What if we were to conduct this experiment and find that neither H_0 nor the alternative hypothesis was supported? The experiment would be considered invalid. Take our original H_0 in this case, “the amount of sleep men over age 50 get, does not increase their risk of heart attack”. If this H_0 is found to be untrue, and so is the alternative, we can still consider a third hypothesis. Perhaps getting insufficient sleep actually decreases the risk of a heart attack among men over age 50. Because we have tested H_0, we have more information that we would not have if we had neglected it.

Do I Really Need to Test It?

The biggest problem with the null hypothesis is that many scientists see accepting it as a failure of the experiment. They consider that they have not proven anything of value. However, as we have learned from the replication crisis, negative results are just as important as positive ones. While they may seem less appealing to publishers, they can tell the scientific community important information about correlations that do or do not exist. In this way, they can drive science forward and prevent the wastage of resources.

Do you test for the null hypothesis? Why or why not? Let us know your thoughts in the comments below.

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