Questions on Type I and Type II Errors: Vartanian

All of these questions assume that you know the relationship between variables in the population. Generally, you would not know this. For each of the examples below, indicate if an error was made from your sample results. Also indicate the type of error made.

1. In the population you know that there is a relationship between experience and level of income. However, in the sample you have used, the statistical analysis indicates that you cannot reject the null hypothesis at the 5% level. You therefore fail to reject the null hypothesis.

2. In the population there is no relationship between a particular treatment for depression and depression. However, in the sample you are able to reject your null hypothesis at the 5% level of significance.

3. In the population you know that there is no relationship between gender and math ability. In your sample, there is a relationship, significant at the 5% level. You therefore reject your null hypothesis.

4. In the population you know that there is a relationship between income and the number of children in the household. In a sample, you reject the null hypothesis of no relationship between income and the number of children.

5. In the population you know that there is no relationship between alcohol consumption and hours of sleep. In a sample or 1000 individuals, you fail to reject the null hypothesis that states that there is no relationship between alcohol and hours of sleep.

6. In the population, you know that there is a relationship between the number of times you vacuum your carpet and mental disorders. In a sample of 1 million households, you fail to reject the null hypothesis of no relationship between carpet cleaning and mental disorders.

Answers

1. Because you know in the population that there is a relationship, you know that the only type of error that is possible is a type II error.   You have an insignificant result from your sample, and therefore you have made an error – a type II error.

2. Because you know in the population that there is no relationship between the variables, the only type of error you could have made is a type I error.   You have a significant relationship in the sample, so you made a type I error.

3. There is no relationship in the population so the only type of error you could have made is a type I error. Because the population and sample results do not match, you have made a type I error.

4. Because the population shows there is a relationship you could only have made a type II error. In this case, there is no error because you have rejected the null hypothesis.

5. Because the population shows no relationship, the only type of error you could have made is a type I error. However, the sample also shows no relationship between the variables so no error was made.

6. Because the population shows that there is a relationship between the variables, you could have only made a type II error. In the sample, you have failed to reject the null, which is incorrect.   You have made a type II error.

Type I and Type II Errors: Vartanian

All of the following questions assume that you are able to know the true relationship between variables in the population. In reality, you are very unlikely to know population relationship. For each item, indicate whether a mistake has been made or not. If an error was made, indicate the type of error.

1. You have taken a sample of students from schools in an inner city. You have found a significant relationship between student smoking and student gender, and you reject the null hypothesis. You know that in the population there is a relationship between gender and smoking.
2. In the population, you know that there is no relationship between teenage out-of-wedlock births and adult welfare receipt. In a sample of 50 teenagers you find a relationship between out-of-wedlock teenage births and adult welfare receipt. You are able to reject the null hypothesis at the .05 level.
3. You use a sample of dog owners and fail to reject the null hypothesis at the 5% level that there is no relationship between owning a dog and miles walked per week by the owner. In the population, there is a relationship between owning a dog and miles walked per week by the owner.
4. In the population, there is a relationship between being Asian-American and wanting to be informed of having a terminal illness. In your sample, you are able to reject the null hypothesis at the .05 level that there is a relationship between these two variables.
5. In your sample, you find a relationship between maximum state welfare payments and length of time spent on welfare. You are able to reject the null hypothesis at the 5% level. In the population, there is no relationship between maximum state welfare payments and time spent on welfare.
6. You take a random sample of 1,000 U.S. households and find a relationship between depression and the amount of sunlight in the home. You are able to reject the null hypothesis at the .05 level. In the population, there is not a relationship between depression and the amount of sunlight in the home.

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Answers:

1. None
2. Type I
3. Type II
4. None
5. Type I
6. Type I