Type I and Type II Errors

Homework: Read pages 491-497 and TAKE NOTES!

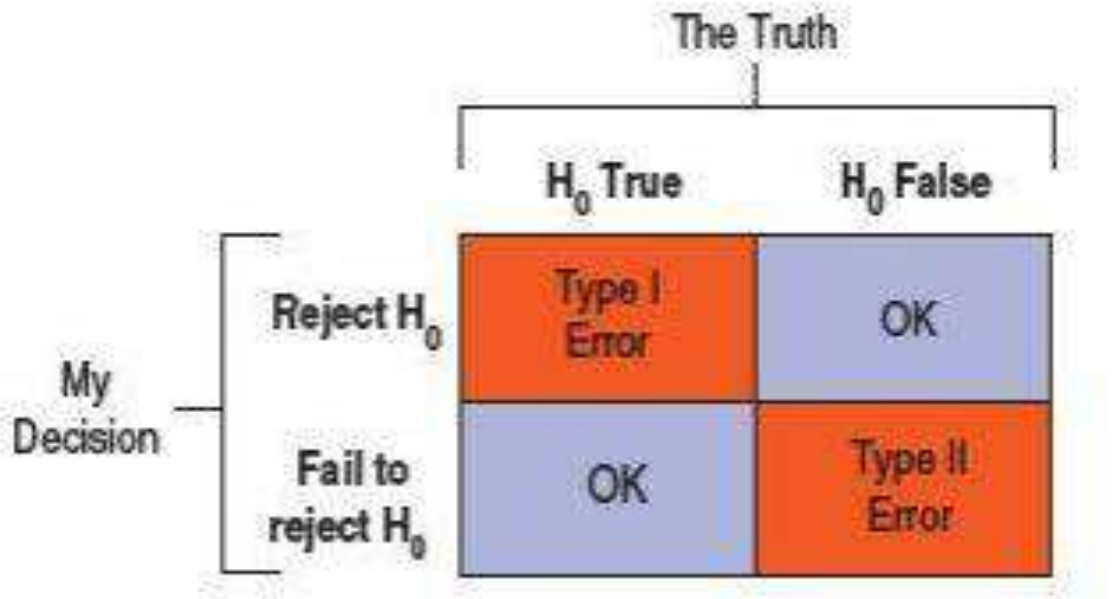
Complete # 19 and 22 on page 501

Sampling

- When you perform a statistical test, you're only taking ONE SAMPLE from a population – and there are tons of different samples you could potentially be collecting.
- You have to think about your sample in the context of ALL the potential samples you could have collected… fortunately this is made easy thanks to the sampling distributions of proportions.

Outcomes of a Statistical Test

- What are the four possible outcomes after completing a statistical test?
  - Null hypothesis is true and we reject the null hypothesis
  - Null hypothesis is false and we reject the null hypothesis
  - Null hypothesis is true and we fail to reject the null hypothesis
  - Null hypothesis is false and we fail to reject the null hypothesis



Scenario 1

- A lobbying group has a been advocating a particular ballot proposal. One week before the election, they are considering moving some of their advertising efforts to other issues. If the proposal has a support level of at least 55%, they will feel it's "safe" and move money to other campaigns.
  - p: proportion of people who support the proposal

    H_0: $p = .55$

    H_a: $p < .55$

  - If the lobbying group decides to gather data and formally conduct this test, describe type I and type II errors in the context of this scenario and the consequences of each.

Solution 1

- Type I error:
  - Stating that the evidence indicates the support level is less than 55% (and the proposal may be in jeopardy of failing) when that is not the case.
  - The lobbying group will have kept advertising dollars aimed at this proposal when they could have been spent elsewhere.

- Type II error:
  - Stating that the proposal appears to have a "safe" level of support when that is not the case.
  - The lobbying group would shift funds away from supporting this proposal even though it may still be in need of that support.

Scenario 2

- A potato chip producer and its main supplier agree that each shipment of potatoes must meet certain quality standards. If the producer determines that more than 8% of the potatoes in the shipment have "blemishes," the truck will be sent away to get another load of potatoes from the supplier. Otherwise, the entire truckload will be used to make potato chips. To make the decision, a supervisor will inspect a random sample of potatoes from the shipment.
    1. State the hypothesis that would be used in the test.
    2. Identify the Type I error and the consequence.
    3. Identify the type II error and the consequence.

Solution 2

1. H 0 : p = 0.08

   Ha : p > 0.08

where p is the actual proportion of potatoes with blemishes in a given truckload

2. A Type I error would occur if the producer concludes that the proportion of potatoes with blemishes is greater than 0.08 when the actual proportion is 0.08 (or less). •Consequence: The potato-chip producer sends the truckload of acceptable potatoes away, which may result in lost revenue for the supplier.

3. A Type II error would occur if the producer does not send the truck away when more than 8% of the potatoes in the shipment have blemishes. •Consequence: The producer uses the truckload of potatoes to make potato chips. More chips will be made with blemished potatoes, which may upset consumers.