Test of Hypothesis Examples Error Type I and Type II

Example 1: The Alpha-Fetoprotein (AFP) Test has both Type I and Type II error possibilities. This test screens the mother's blood during pregnancy for AFP and determines risk. Abnormally high or low levels may indicate Down syndrome.

Ho: patient is healthy
Ha: patient is unhealthy

Error Type I (False positive) is: Test wrongly indicates that patient has a Down syndrome, which means that pregnancy must be aborted for no reason.

Error Type II (False negative) is: Test is negative and the child will be born with multiple anomalies.

Example 2: The head of the Cartel is trying to uncover the mole from within his crew.

Ho: The henchman was not an undercover Miami Dade Police Officer
Ha: The henchman was an undercover Miami Dade Police Officer

Error Type 1: (False Positive)

The head of the Cartel ended up murdering the henchman that was not an undercover Miami Dade Police Officer. Although the henchman was innocent, he was killed preventing him from ever flipping and giving the government information.

Error Type 2: (False Negative)

The head of the cartel interviews a henchman that was an undercover Miami Dade Police Officer, but fails to unveil his true identity. Consequently, he continues to allow exposure of his operation to the undercover Miami Dade Police Officer, and further reveals the ins and outs of his operation, that will eventually bring him to his demise.

Example 3: Airplane mechanic inspects plane for any irregularities or malfunction.

Ho: Plane seems to meet all standards of FAA and is ok-ed to fly.
Ha: Plane seems to NOT meet all standards of FAA and is AOG (airplane on the ground).

Error Type 1 : (False- Positive) - Airplane Reverse Thruster is visually fine and operable but while check testing light indicator states it is not, it is replaced even though thruster was fine and operable, thus avoiding any accident or problem.

Error Type 2 : (False- Negative) - Airplane Reverse Thruster seems visually to be malfunctioning but check testing light indicator states it is Fine & Operable, it is NOT replaced. At landing a pilot reports a malfunction with the thruster and cannot reduce speed at landing, plane is involved in accident and many innocent lives are lost.

Example 4: The mechanic inspects the brake pads for the minimum allowable thickness.

Ho: Vehicles breaks meet the standard for the minimum allowable thickness.
Ha: Vehicles brakes do not meet the standard for the minimum allowable thickness.

Error Type 1: (False Positive) the breaks are fine, but the check indicates you need to replace the brake pads; therefore any possible problems with breaks are avoided even though the breaks were not worn.

Error Type 2: (False Negative) the brake pads are worn to beyond the minimum allowable thickness, but the mechanic does not find anything wrong with them and does not replace them. Consequently the driver of the vehicle gets into an accident because she was unable to break effectively and gets into a fatal accident.

Example 5:

During a boxing match, two contenders bump heads. The referee checks the concussion on one of the boxers.

Ho: The boxer is fine and able to continue boxing
Ha: The boxer is injured and must call the bout

Error Type 1: The boxer is fine and not seriously injured but the referee finds the concussion too severe and stops the fight.

Error Type 2: The boxer is seriously injured and the concussion is detrimental to his health, but the referee does not find the concussion severe, and allows the fight to continue. Due to the severity of the cut, the boxer faints in mid fight and goes into a coma.

Example 6:

A police officer pulls over an individual that was driving recklessly. The police office is trying to determine if the individual should be arrested for driving under the influence of alcohol.

Ho: The individual is not driving under the influence of alcohol.

Ha: The individual is driving under the influence alcohol.

Type I Error (False Positive): The police officer determines that the individual should be arrested and is driving under the influence of alcohol when the individual is not driving under the influence of alcohol.

Type II Error (False Negative): The police officer determines that the individual should not be arrested and is not driving under the influence of alcohol when the individual is under the influence of alcohol. Consequently the driver of the vehicle gets into a fatal car accident because he or she was driving under the influence of alcohol.

Example 7:

Suppose you want to know the average height of pine trees in two different places in Everglades National Park to analyze which soil on more fertile. Negative results will lead to addition of fertilizers and other chemical products to help in the growth of plants.

Ho: There's no significant difference in the average height of pine trees. (from 2 sites)
Ha: There's is a significant difference in the average height of the trees. (from 2 sites)

Type I Error:

We fail to reject Ho and state that there's no significant difference between the average height of pine trees in the 2 sites in the Everglades; when in fact there is. This will leave behind the addition to fertilizers and within a short time the affected area will be deforested and species will die.

Type II Error:

We reject Ho and state that there's a significant difference between the average height of pine trees in the 2 sites in the Everglades; when in fact there was no difference between the average heights of pine trees. This will initialize the addition of fertilizers to help in the growth process when they are not needed. Now the use of chemicals has affected the pine trees such that the species is dying anyways.