Subject n°32

PROBABILITIES

Please do not write on the subject paper and don't forget to give back the examination paper at the end of the test.

The ELISA test was approved by the U.S. government in the mid-1980s to screen donated blood for the presence of the AIDS virus. The test works by detecting antibodies, substances that the body produces when the virus is present, but it makes some mistakes. ELISA was designed so that when a given blood sample is in fact contaminated with AIDS, the test gives a positive result (that is, ELISA reports that in its opinion this blood sample has AIDS in it) 99% of the time, whereas when the blood being tested is not contaminated with the virus ELISA will announce a negative result 94% of the time. The prevalence of AIDS in the population of people who donate blood is thought to be about 1%.

Suppose someone comes in, donates blood, and the ELISA test comes out positive.

1) Compute the probability that this person actually has AIDS given that the result of the test is positive.

(hint : you can examine a population of 10,000 people and fill in a double entry table)

What do you think of that probability ?

Does the Elisa test seem very efficient to you ?

2) In order to evaluate the efficiency of the test we need to focus on its rate of success.

In which two cases is the result of the test true to the real health of the person tested ?

What is therefore the rate of correct prediction ?

Does the Elisa test seem very efficient now ?

Do you have an explanation to the low probability you have found in question one ?

Source : http://www.stat.ucla.edu/cases/