Statistical Methods 1, 2012

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Excercise 3

Consider this table

	Test +	Test -	Margin
True +			
True -			
Margin			

Facts given:

1. Relative frequence for truly +: 1/10000
2. Test – AND true + does not happen
3. Relative frequence for truly – AND test +: 1/1000
4. Individual tested +

For simplicity, consider a population of size 10000. Hence the count in the cell in the low right-hand corner is 10000.

Conclude:

From 1) The count in top right-hand margin is 1.

From 2) The count in cell (1,2) is 0. Hence the count in cell (1,1) is 1-0=1.

From 3) The count in cell (2,1) is 10.

Hence the remaining cell (2,2) is 10000-1-10=9989.

By summing up in the margins we obtain:

	Test +	Test -	Margin
True +	1	0	1
True -	10	9989	9999
Margin	11	9989	10000

From 4) we should consider the column test +, because this is the relevant subtable for the patient. We see that the probability for true + is 1/11.

The error the doctor did was to look at a different probability (common in real life, I'm afraid). Denote the event that a randomly selected individual is true + by A and that a randomly selected individual tests + by B. The relevant probability is Prob(A|B)= 1/11 because the patient has tested positive and now wants to know whether he/she is truly positive.