



# Public Health

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وَبِقَوْلِ رَبِّيَ عَلِيمًا

# Practical in Validity

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\* بالامتحان الدكتوراة ما رح تحكيلنا مين screening و مين standard احنا لازم نعرف لحالنا و رح يكونو الأمثلة من الاشياء الي بتعطينا اياها و اشياء احنا familiar معها

معناتو ال surgeon هون شو؟ screening test



Q1. To assess the validity of surgeons in the diagnosis of acute appendicitis, by comparing the findings from histology with the clinical diagnosis, 300 patients were involved in the study. The surgeons were able to diagnose acute appendicitis in 132 cases, histology confirms the diagnosis in 120 cases, the surgeons were incorrectly excluded acute appendicitis in 48 patients and correctly exclude acute appendicitis in 120.

Standard test

grand total

True negative (d)  
by histology and doctors

ability of the test to measure what is intended or supposed to measure

- What is the validity of surgeons in the diagnosis of acute appendicitis?
- Calculate the misclassification rates.
- Calculate the repeatability of the surgeons in the diagnosis of acute appendicitis.
- Calculate the predictive values of the surgeons in the diagnosis of acute appendicitis.

False positive + False negative

agreement or reliability  
كل ما نعيد ال test يطالعنا نفس النتائج

what is the probability of the individuals to be having the disease among who are positive from the screening test  
من ال 132 الي طلعو حسب ال screening كم حذا فعليا معو المرض؟

as public health and other fields we always evaluate adults..in labs  
ما بطلع اي تحليل و يشوفو و يطبقو غير لما يعملو validity of the test

as doctors alot of cases of acute abdominal pain come and  
there is Alot of differential diagnosis so as doctors we need to  
recognize if it's acute appendicitis or not

the patient comes with acute abdominal pain in the right iliac fosa, tenderness so  
they evaluate the Ability of the doctor by clinical examination to say diagnos the  
patient with acute appendicitis then compare it with the surgical results and  
histological tests

132  $\rightsquigarrow$  positive by screening test, 120  $\rightsquigarrow$  totally positive by standards  
48  $\rightsquigarrow$  false negative by screening  
they are positive according to the standard.

اهم اشئ نعمل الجدول (هيو بالصفحة التحت) بالامتحان رح يعطونا ورقة و قلم و احنا لحالنا نعمل الtable  
الي تحت و احنا لحالنا نستنجو الدكتوروة ما رح تحكينا مين  
امين b..

...disease? Explain. ...rate of this test.

screening test	Disease		Total
	Positive	Negative	
Positive	95	70	165
Negative	5	730	735
Total	100	800	900

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مو شرط تحكيلنا شو ال sensitivity test وشو ال specificity ال ممكن تجبلنا السؤال indirect ..كم من المرضى deprived from the treatment او كم من المرضى اخدو unnecessary treatment

a. Validity:

the surgeon is able to truly diagnose appendicitis in only 60%

$$\text{Sensitivity} = \frac{72}{120} \times 100 = 60\%$$

False negative rate =  $\frac{48}{120} \times 100 = 40\%$   
 or  
 $100 - \text{Sensitivity} = 100 - 60 = 40\%$

and he missed 48 of the cases

$$\text{Specificity} = \frac{120}{180} \times 100 = 66.7\%$$

almost 13 of the cases don't have the disease but they are liable of having it

False positive rate =  $\frac{60}{180} \times 100 = 33.3\%$   
 $100 - \text{specificity} = 100 - 66.7 = 33.3\%$

هل قرى "a" واهل  
 قرى "b" ←

these 40% are wrongly told that they are normal soooo what are the consequences? they will be deprived from the treatment and this will cauz alot of consequences like rupture of the appendix or appendicular mass ..



in false positive tests it's difficult to **de-label** the patient that he is normal and it was a wrong positive test

C+D عي د

c. Repeatability =  $\frac{72+120}{300} \times 100 = 64\%$

d. predictive values

Positive predictive =  $\frac{72}{132} \times 100 = 54.5\%$

Surgeons were able to correctly diagnosis acute appendicitis in 54.5 % from all the cases they labeled them as acute appendicitis (132)

Negative predictive =  $\frac{120}{168} \times 100 = 71.4\%$

Surgeons were able to correctly exclude acute appendicitis in 71.4 % from all the cases they labeled them as not having acute appendicitis (168)

**interpretation:** ability of the surgeon to correctly diagnose or correctly exclude the individual

## Interpretation of the results:

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Surgeons were sensitive in the diagnosis of 60% of cases of acute appendicitis, and missed 40% , with all the implications of missing acute appendicitis , such as all the complications of acute appendicitis by delaying appropriate treatment.

Surgeons were specific in excluding acute appendicitis in 66.7% and incorrectly labelled normal individuals as acute appendicitis with all the implications of false positive such as the introduction of unnecessary treatment and etc....

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**Q2.** To assess the validity of a screening test in detecting cases of disease (X), the test was performed on 100 patients with the disease (X) and on 800 normal persons. Positive results were obtained in 95 out of the 100 diseased and in 70 out of the 800 normal persons. Calculate the sensitivity, specificity and overall misclassification rate of this test. Is this test useful in screening of fatal disease? Explain.

screening test	Disease		Total
	Positive	Negative	
Positive	95	70	165
Negative	5	730	735
Total	100	800	900



(a)

100  $\rightsquigarrow$  they have the disease according to the standard test.

out of the 100 only 95 the screening test was able to detect.

(d)

and out of the 800 negative according to the standard  $\rightsquigarrow$   
screening test detected 70 false positive test (b)

و رجعت الدكتورة حكت اهم اشئ نعرف نكتب الجدول صح

this means that the sensitivity is 95% so the test is highly sensitive and **can be used for fatal diseases**..we already said that in fatal diseases we need sensitive test cuz we don't want to miss and case

Sensitivity =  $\frac{95}{100} \times 100 = 95\%$

The test was able to correctly diagnose the disease in 95% of the diseased (highly sensitive)

Specificity =  $\frac{730}{800} \times 100 = 91.25\%$

The test was able to correctly exclude the disease in 91.25% of the non-diseased (highly Specific)

**This test is useful in screening for a fatal disease, because of high sensitivity, we do not want to miss any case.**

Q2. A medical student was asked to check the blood pressure of 800 factory workers. It is known that 75 of the workers are hypertensive.

كلفنا دكتور يقيس ضغط الدم ل 800 عامل بمصنع معين

Standard or confirmed cases with HTN

The student was able to identify 75% of the hypertensive but also labeled 14% of the normotensive as hypertensive.

he was able to diagnose hypertension for %75 of the stand 75 person  
فهمتو علي؟ يعني هو عرف %75 من عدد الحالات الي اصلا معروف انو معهم ضغط مو من ال 800

↳ False positive

- a. Prepare a 2x2 table to display the data
- b. How valid are the results of the medical student ?
- c. **What is the prevalence of hypertension in these workers according to the results of the medical student?**

prevalence rate is calculated by two ways:  
1- either already existing cases from the population  
75 from the 800 (لوجودها بكونه الجواب) prevalence of existing cases

2- or true positive + false positive:  $(56 + 102) / 800 * 1000$

75% of 75 = nearly ~~44~~ 56 <sup>الدكتورة مخربطة و كاتبه 65</sup>

14% of the normotensive = nearly ~~100~~ 102 <sup>الدكتورة مخربطة و كاتبه 105</sup>

$$\text{Sensitivity} = \frac{56}{75} \times 100 = 74.7 \text{ nearly } 75\%$$

$$\text{Specificity} = \frac{623}{725} \times 100 = 85.9\% \text{ nearly } 86\%$$

$$\text{False negative rate} = \frac{19}{75} \times 100 = \text{nearly } 25\%$$

$$\text{False positive rate} = \frac{102}{725} \times 100 = \text{nearly } 14\%$$

### Construct 2x2 table

screening test (medical student)	Disease		Total
	Positive	Negative	
hypertensive	56	102	158
Non hypertensive	19	623	642
Total	75	725	800

7777?  
Calculate:  
1. overall misclassification rate  
2. AGREEMENT RATE  
3. Positive predictive  
4. Negative predictive

1. Medical student was able to correctly diagnose hypertension in nearly 75 %, and he was able to correctly exclude hypertension in 86%.
2. He was incorrectly labelled 25 % as non-hypertensive, and 14 % as hypertensive, with all the consequences of misclassification.

Q3. To assess the ability of school doctors (SDs) to identify children with visual problem by visual examination compared to ophthalmologist doctor (ODs) visual examination, out of 1000 pupils involved in the study, SDs was able to identify 240 pupils with visual problems out of 300 pupils diagnosed by ODs, and SDs were able to exclude visual problems in 600 out of 700 labeled as normal vision by ODs. Calculate :

- Validity of SDs in vision examination.
- Misclassification rates
- Agreement rate.



school doctors	ophthalmologist doctor		Total
	visual problem	No visual problem	
visual problem	240	100 <i>false positive</i>	340
No visual problem	60	600	660
Total	300	700	I 1,000

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# Validity:

$$\text{Sensitivity} = \frac{240}{300} \times 100 = \underline{80\%}$$

as SD's they can correctly diagnose vision problem 80% of the cases that are diagnosed by OD's

$$\text{Specificity} = \frac{600}{700} \times 100 = \underline{85.7}$$

they can correctly exclude vision problem in almost 86% of the cases

$$\text{False positive} = \frac{100}{700} \times 100 = 14.28\% \text{ nearly } 14.3\% \text{ (100 - Specificity)}$$

$$\text{False Negative} = \frac{60}{300} \times 100 = 20\% \text{ (100 - Sensitivity)}$$

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$$\text{Overall Misclassification rate} = \frac{60+100}{1000} \times 100 = 16 \%$$

$$\text{Overall Agreement rate} = \frac{240+600}{1000} \times 100 = 84 \%$$

*→ they agreed in 84% of the cases*

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Q4. Two tests, **test -A** and **test -B** are available to diagnose a certain disease, these tests have the following characteristic:

we want to know which test is better to be used for diagnosis

**Test-A** was positive in **25%** of individuals who are **disease free** and was **negative** in **2%** of patients who are **diseased**.

**Test-B** was positive in **2%** of individuals who are **disease free** and was **negative** in **25%** of patients who are diseased.

What are the sensitivity and specificity of each test? Which one do you prefer for the screening of a relatively severe disease? **test A**

directly:  $100 - \text{false positive} = \text{specificity}$  ,  $100 - \text{false negative} = \text{sensitivity}$

$100 - 25 = 75$  specificity of test a ,  $100 - 2 = 98$  sensitivity of test a  $\rightarrow$  good for fatal diseases

Q5. You have a new glucose screening test. To see if it is effective, you compare its results to the gold standard of oral glucose tolerance test, out of 150 <sup>→ positive by standard</sup> diabetic, <sup>→ positive by screening (a) ... why it's not (a+b) cause 'out of 150' if this sentence isn't written we say (a+b)</sup> 50 test positive with your new screening test. Out of 120 <sup>↳ negative by standard</sup> non-diabetics, 20 have a <sup>↳ false positive (b)</sup> positive results by the screening test.

1. What is the percentage of patients **deprived from necessary treatment?** (False negative)
2. Assess the validity of the new glucose screening test?

new test	glucose tolerance test		Total
	diabetic	not diabetic	
diabetic	50	20	70
not diabetic	100 <sup>False negative</sup>	100	200
TOTAL	150	120	270



Q6. In a population of 4000, it is known that 20% of them are hypertensive. An investigator was asked to check the blood pressure of all individuals in the population, and he was able to correctly identify 20% of the hypertensive. Assume that false -ve are equal to false +ve.

800 are positive by standard (prevalence)  
 $\frac{800}{20} = 160$

- a. Display the data in a 2 x 2 table.
- b. Calculate the sensitivity, specificity and over all misclassification rates according to the investigator findings. What is the observed prevalence rate of hypertension?

Investigator	Population		Total
	HTN	No HTN	
HTN	160	640 <sup>False +</sup>	800
No HTN	640 <sup>False negative</sup>	2560	3200
Total	800	3200	4000

Thank you

