

# Screening Tests

	<b>Disease</b>		
<b>Test Result</b>	Present	Absent	
Positive	<i>a</i>	<i>b</i>	
Negative	<i>c</i>	<i>d</i>	

# Screening Tests

	<b>Disease</b>		
<b>Test Result</b>	Present	Absent	Total
Positive	$a$	$b$	$a + b$
Negative	$c$	$d$	$c + d$
Total	$a + c$	$b + d$	$n$

# Screening Tests 2

	Disease		
Test Result	Present	Absent	Total
Positive	<i>True Positive</i>	<u>False Positive</u>	$a + b$
Negative	<u>False Negative</u>	<i>True Negative</i>	$c + d$
Total	$a + c$	$b + d$	$n$

- **False Positives**
  - Test indicates a positive status when the true status is negative
- **False Negatives**
  - Test indicates a negative status when the true status is positive

# Results of a HIV screening test

	HIV Infection		
Screening test	YES	NO	Total
Positive	true positives (a)	false positives (b)	screened positives
Negative	false negatives (c)	true negatives (d)	screened negatives
Total	affected individuals	Unaffected individuals	total screened

# Results of a HIV screening test

	<b>HIV Infection</b>		
<b>Screening test</b>	<b>YES</b>	<b>NO</b>	<b>Total</b>
<b>Positive</b>	true positives (a)	<b>false positives</b> (b)	<b>screened positives</b>
<b>Negative</b>	<b>false negatives</b> (c)	true negatives (d)	<b>screened negatives</b>
<b>Total</b>	<b>affected individuals</b>	<b>Unaffected individuals</b>	<b>total screened</b>

# Questions about Screening Tests

- Given that a patient has the disease, what is the probability of a positive test results?
- Given that a patient does not have the disease, what is the probability of a negative test result?
- Given a positive screening test, what is the probability that the patient has the disease?
- Given a negative screening test, what is the probability that the patient does not have the disease?

# Sensitivity and Specificity

- Sensitivity of a test is the probability of a positive test result given the presence of the disease =  $a / (a + c)$
- Specificity of a test is the probability of a negative test result given the absence of the disease =  $d / (b + d)$

	<b>Disease</b>		
<b>Test Result</b>	Present	Absent	Total
Positive	<i>a</i>	<i>b</i>	<i>a + b</i>
Negative	<i>c</i>	<i>d</i>	<i>c + d</i>
Total	<i>a + c</i>	<i>b + d</i>	<i>n</i>

# Predictive Values

- Predictive value positive of a test is the probability that the subject has the disease given that the subject has a positive screening test =  $a/a+b$
- Predictive value negative of a test is the probability that a subject does not have the disease, given that the subject has a negative screening test =  $d/c+d$



# Sensitivity and Specificity

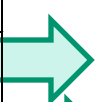
	Disease		
Test Result	Present	Absent	Total
Positive	$a$	$b$	$a + b$
Negative	$c$	$d$	$c + d$
Total	$a + c$	$b + d$	$n$

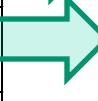
$$\text{Sen} = a/a+c$$

$$\text{Spec} = d/d+b$$

# PV + and PV-

	Disease		
Test Result	Present	Absent	Total
Positive	$a$	$b$	$a + b$
Negative	$c$	$d$	$c + d$
Total	$a + c$	$b + d$	$n$


$$PV_+ = a/a+b$$


$$PV_- = d/c+d$$

Given the following results of a screening test, please find the

- Sensitivity
- Specificity
- Predictive value positive
- Predictive value negative

	<b>Disease</b>		
<b>Screening Test</b>	<b>Yes</b>	<b>No</b>	<b>Total</b>
<b>Positive</b>	650	50	700
<b>Negative</b>	50	250	300
<b>Total</b>	700	300	1000