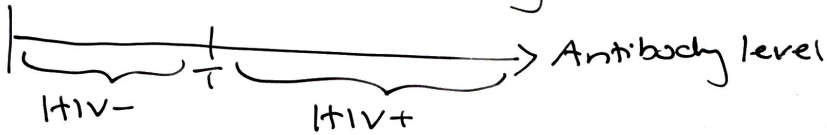


4/17/19

Section 3

Rene Gutierrez

Case Study: HIV Screening



T+: The test is positive

T-: The test is negative

H+: The person is HIV+

H-: The person is HIV-

 $P(T+ | H+) = 0.96$: Sensitivity $P(T- | H-) = 0.97$: Specificity $P(H+) = 0.004$: PrevalenceWe want $P(H+ | T+)$ and $P(H- | T-)$

		Truth		
		H+	H-	Total
Test	T+	384 (3)	2,988 (6)	3,372 (7)
	T-	16 (4)	96,612 (5)	96,628 (8)
Total		400 (1)	99,600 (2)	100,000 (9)

① By prevalence

$$(100,000 \cdot 0.004 = 400)$$

② Complement of prevalence

$$(100,000 - 400 = 99,600)$$

③ By sensitivity

$$(400 \cdot 0.96 = 384)$$

④ Complement of sensitivity

$$(400 - 384 = 16)$$

⑤ By specificity

$$(99,600 \cdot 0.97 = 96,612)$$

⑥ By complement of specificity

$$(99,600 - 96,612 = 2,988)$$

⑦ By (3) + (6)

$$(384 + 2,988 = 3,372)$$

⑧ By (4) + (5)

$$(16 + 96,612 = 96,628)$$

$$P(I+ | T+) = \frac{384/100,000}{3,372/100,000} \approx 11\%$$

$$P(I- | T-) = \frac{96,612}{96,628} \approx 99.98\%$$

False Positive rate: $P(I- | T+) = 89\%$

False Negative rate: $P(I+ | T-) = 0.02\%$

Truth Test	I++	I--
T+	ok	mistake
T-	mistake	ok

Q₁: Given a test what is the probability of I|V+?
Statistical Inference

Q₂: Given a test, how do you proceed?
Decision Theory

Think about this:

If it's raining, what is the probability that it's cloudy?

If it's cloudy, what is the probability that it's raining?