STEP 1 · BIOSTATS · EP 01

Sensitivity & specificity

Goal: from any 2×2 table, calculate sensitivity and specificity, and say which group of patients each one describes.

Same table, every time

	Disease +	Disease –
Test +	a TP 90	b FP 90
Test –	c FN 10	d TN 810

Truth across the top, test down the side. Example: 1,000 tested; 100 have the disease (1 in 10).

Formulas

Sensitivity	a ÷ (a + c) = 90 ÷ 100 = 90%	sick column
Specificity	d ÷ (b + d) = 810 ÷ 900 = 90%	healthy column
PPV	a ÷ (a + b) = 90 ÷ 180 = 50%	test-positive row

SNOUT: highly Sensitive test, Negative result → **helps rule OUT**.
SPIN: highly Specific, Positive → **helps rule IN**.

Caveat: how far one result moves you also depends on the test's other number and on the pre-test probability.

⚠ EXAM TRAP

The trap

1 in 10 has the disease; the test is 90% sensitive and 90% specific. You test positive: is it a 90% chance you're sick? **No.** Top row: TP 90 and FP 90, so **90 ÷ 180 = 50%**. That's the positive predictive value. It lives in the **row**, not the column.

Bedside twist

A negative result on a rapid flu test doesn't rule flu out. If antivirals are indicated, don't withhold them for a negative rapid test; confirm with RT-PCR if flu is still suspected.

Highlight this

Sensitivity	sick column	a ÷ (a + c)
Specificity	healthy column	d ÷ (b + d)
PPV	test-positive row	a ÷ (a + b)

Practice question: answer

500 ICU adults with suspected septic shock; blood culture positive in 200; the assay is positive in 160 of them and negative in 270 of the 300 culture-negative patients. **Answer A, 80%.** Sensitivity = **160 ÷ 200**, using only the culture-positive column. The wrong options are other measures: specificity **270 ÷ 300 = 90%**, PPV **160 ÷ 190 = 84%**, NPV **270 ÷ 310 = 87%**, accuracy **430 ÷ 500 = 86%**.

Sources

1. Parikh R, et al. Understanding and using sensitivity, specificity and predictive values. Indian J Ophthalmol. 2008;56(1):45–50. PMC2636062
2. Pewsner D, et al. Ruling a diagnosis in or out with "SpPIn" and "SnNOut": a note of caution. BMJ. 2004;329:209–213. PMC487735
3. Šimundić AM. Measures of diagnostic accuracy: basic definitions. EJIFCC. 2009;19(4):203–211. PMC4975285
4. USMLE® Content Outline (2026), FSMB & NBME; Principles of testing and screening.

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