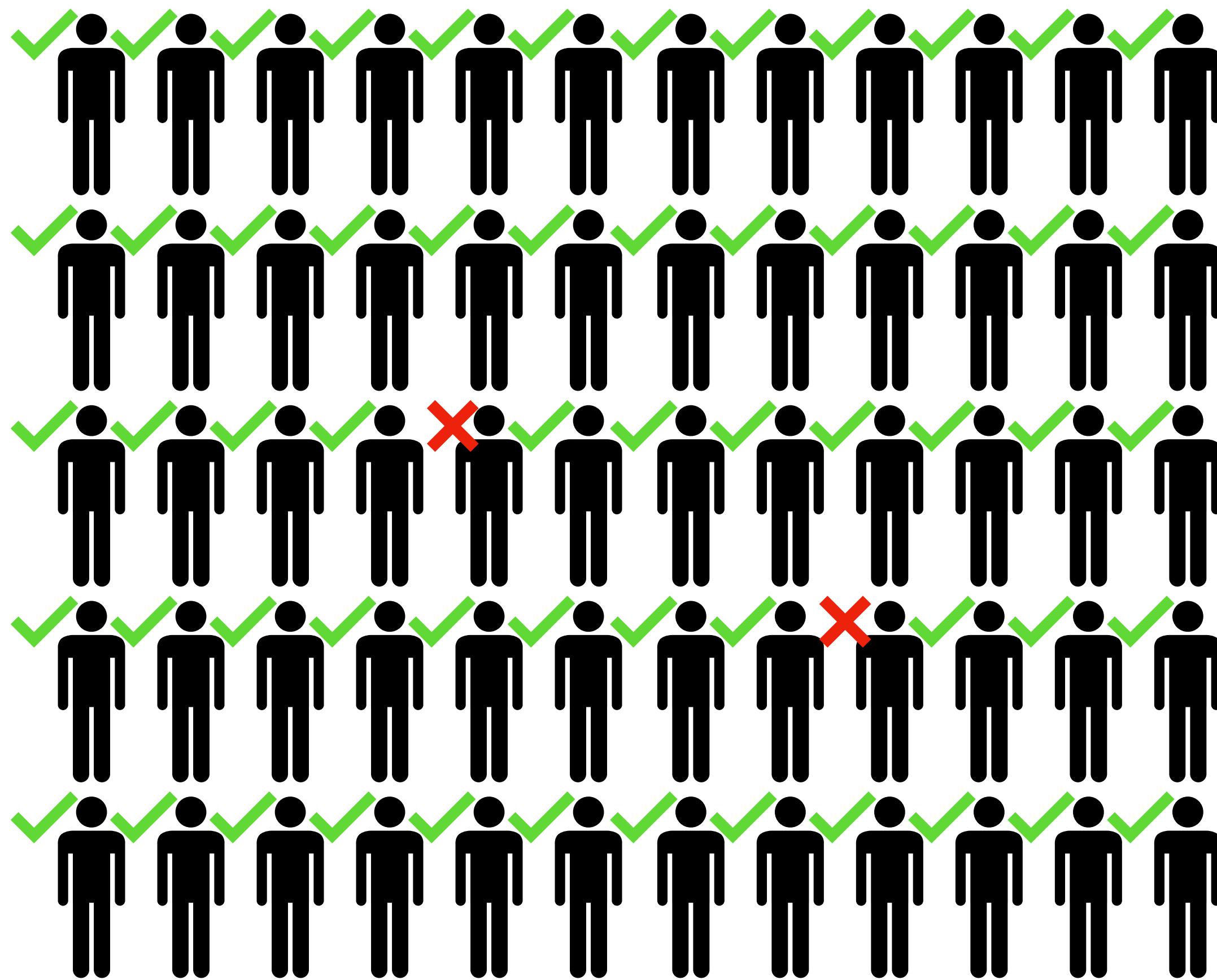


Mere dijagnostičke tačnosti

Nedelja 13 - Vežbe

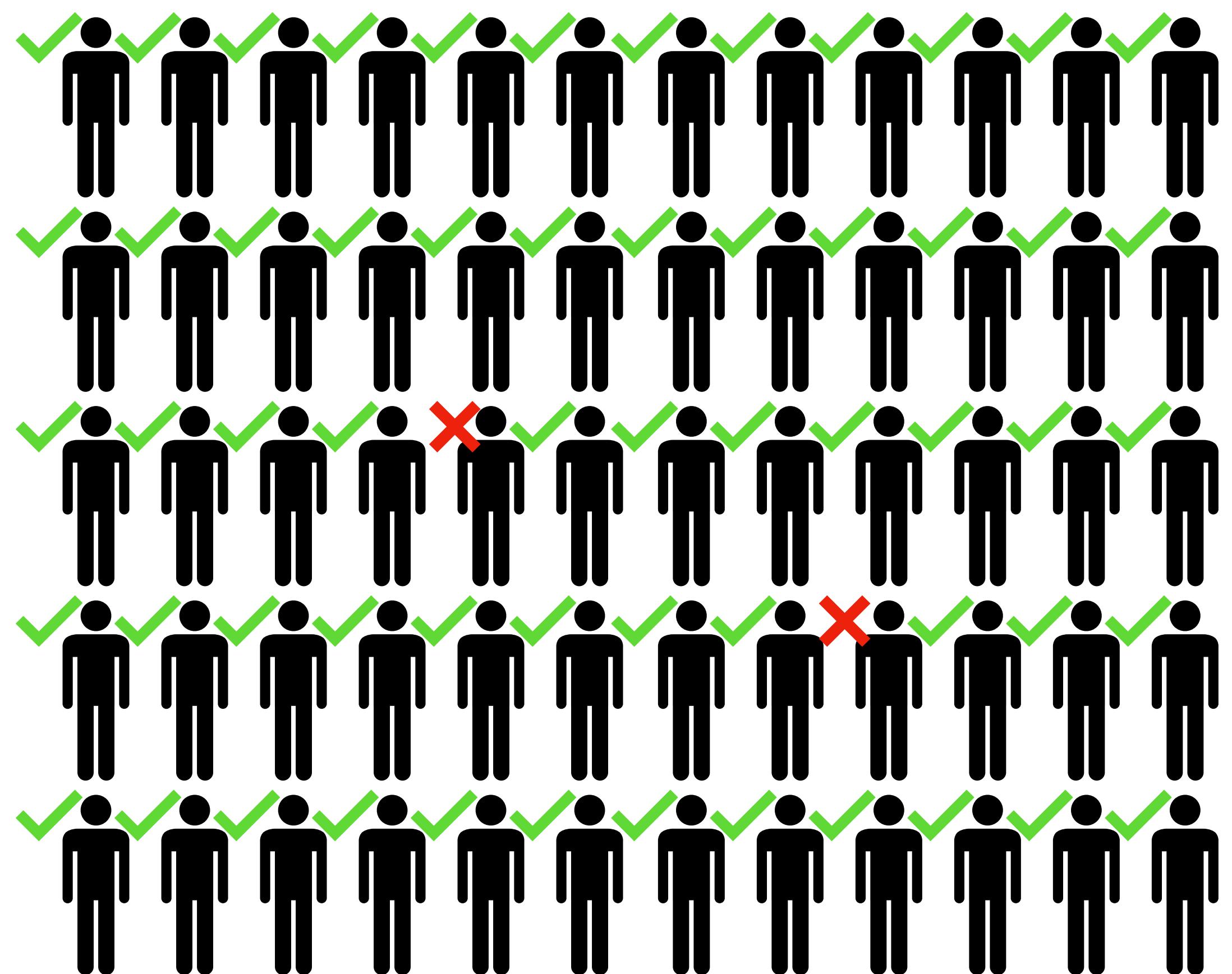
Dr Nikola N. Grubor

Paradoks Medicinskih Testova

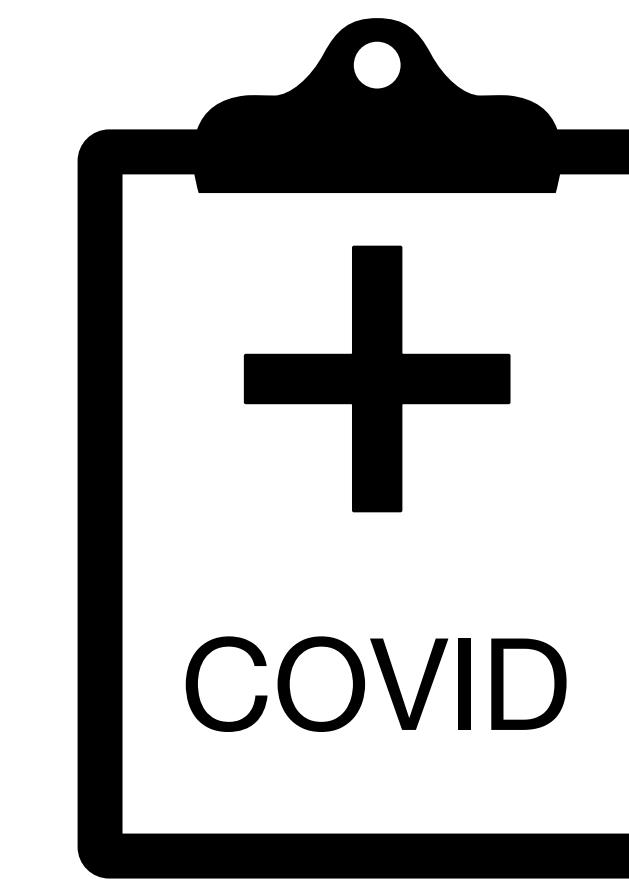


Paradoks Medicinskih Testova

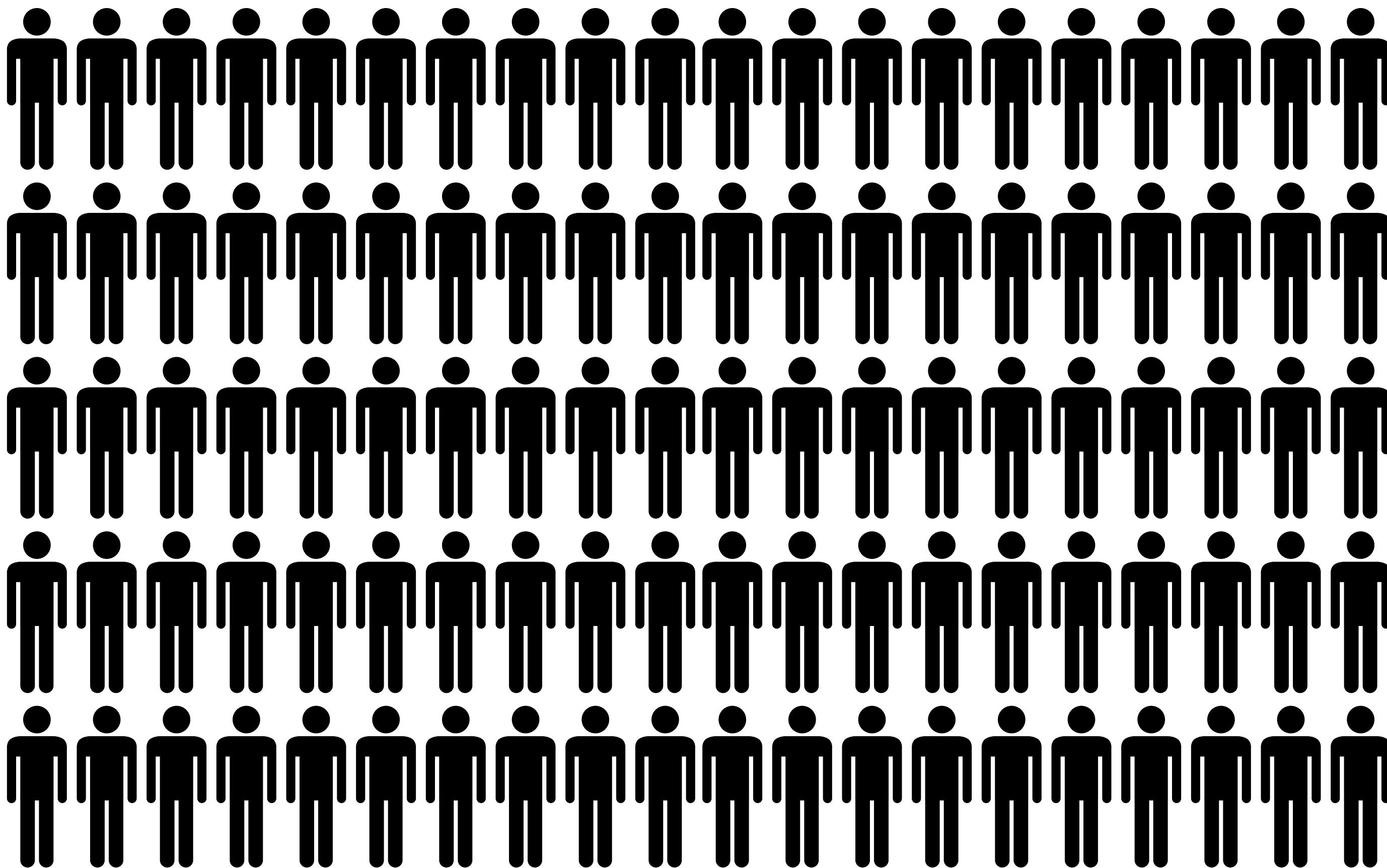
Preciznost ≠ Predviđanje



$P(\text{Bolest ako } +) = 0.09$

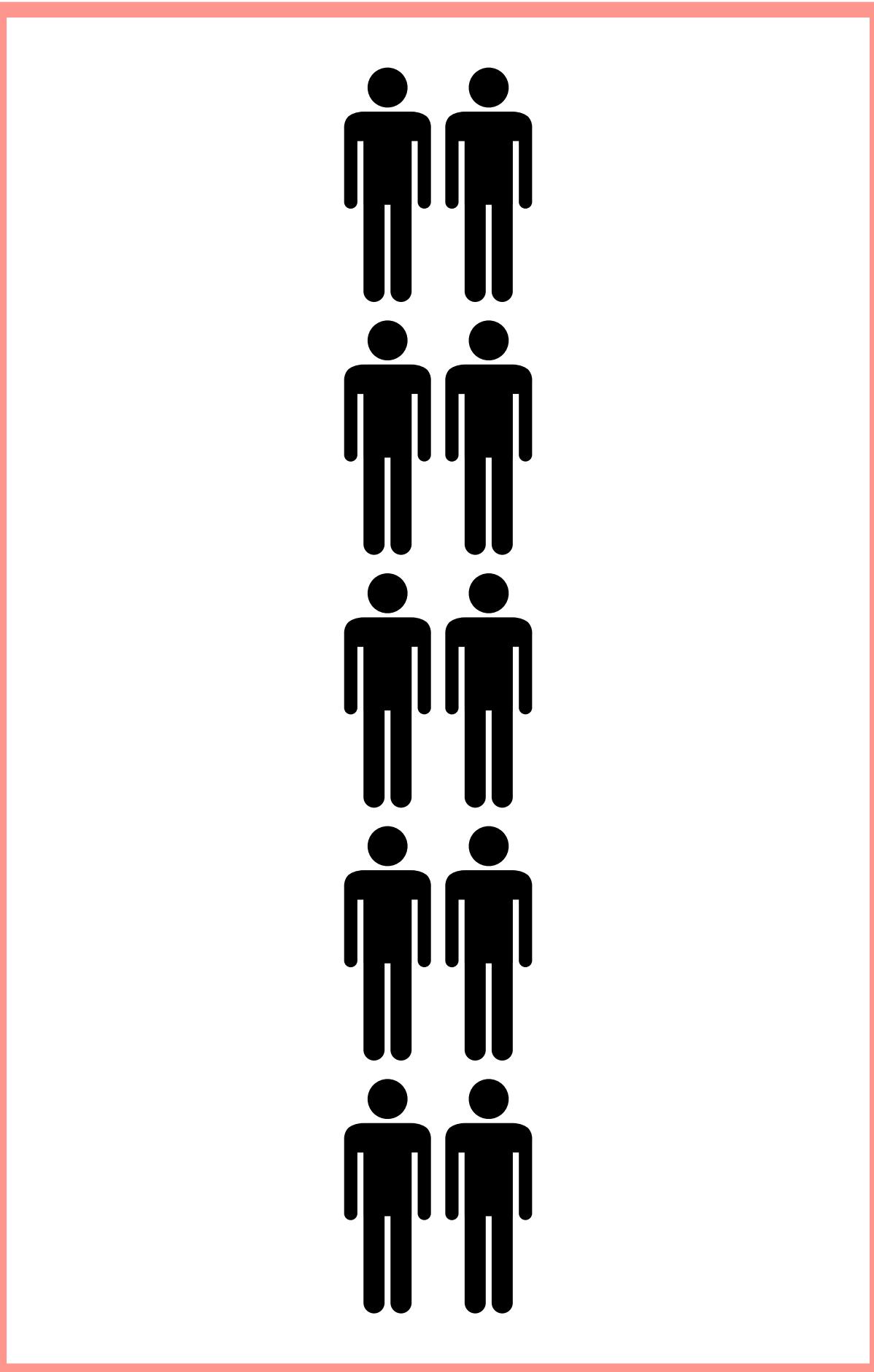


Uzorak od 100 žena

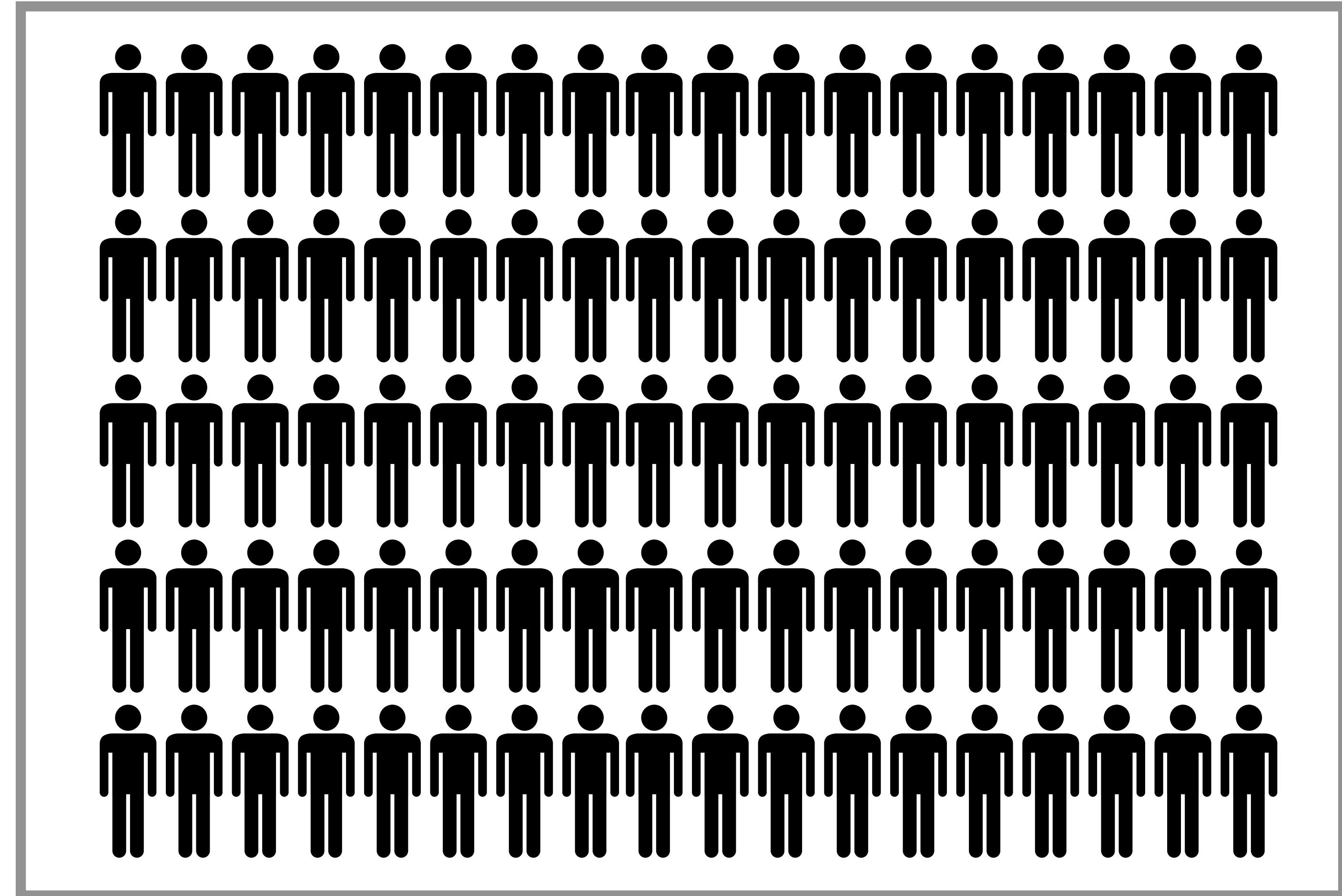


Uzorak od 100 žena

10% Ima rak dojke



90% Nema rak dojke

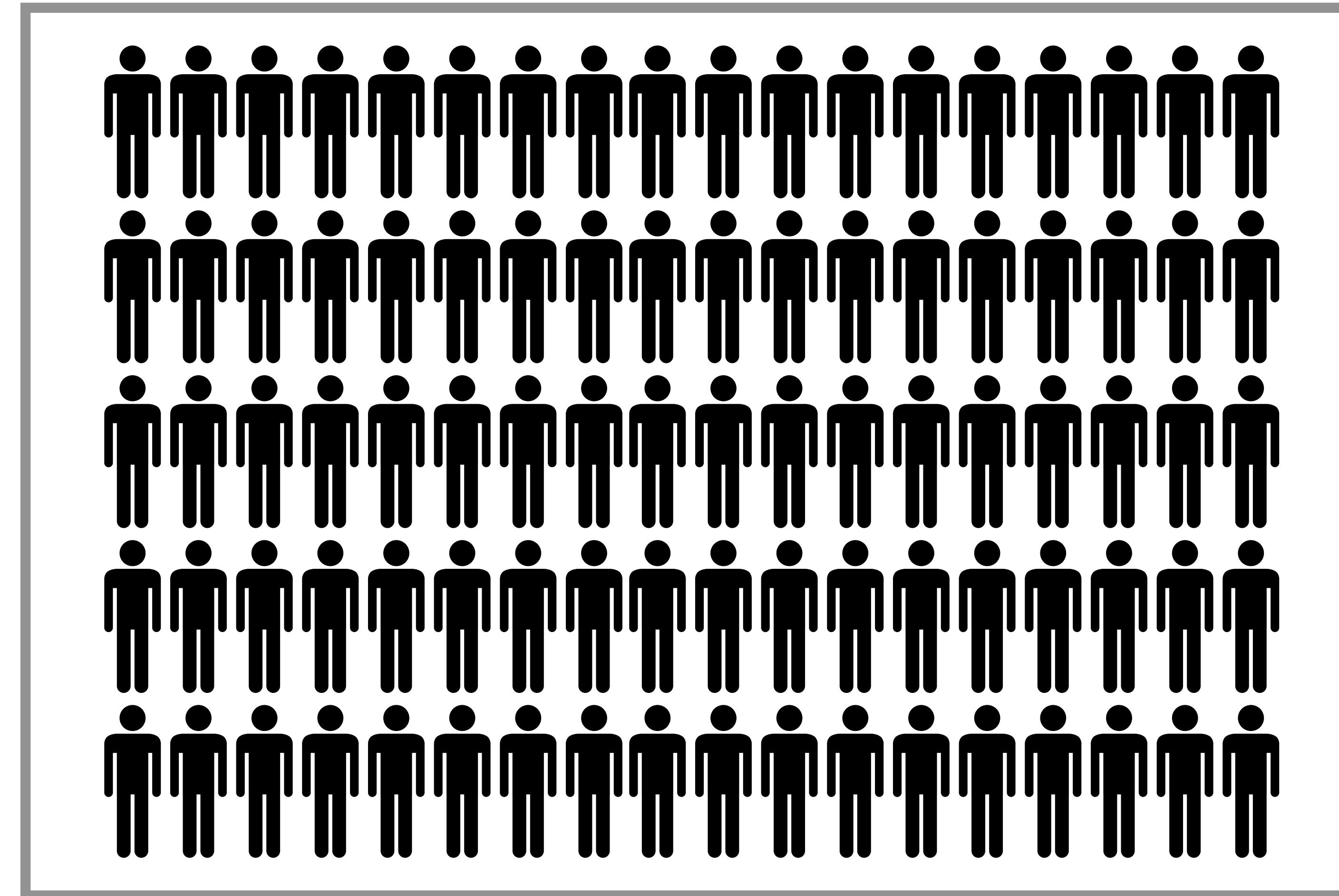


Uzorak od 100 žena

10% Ima rak dojke



90% Nema rak dojke



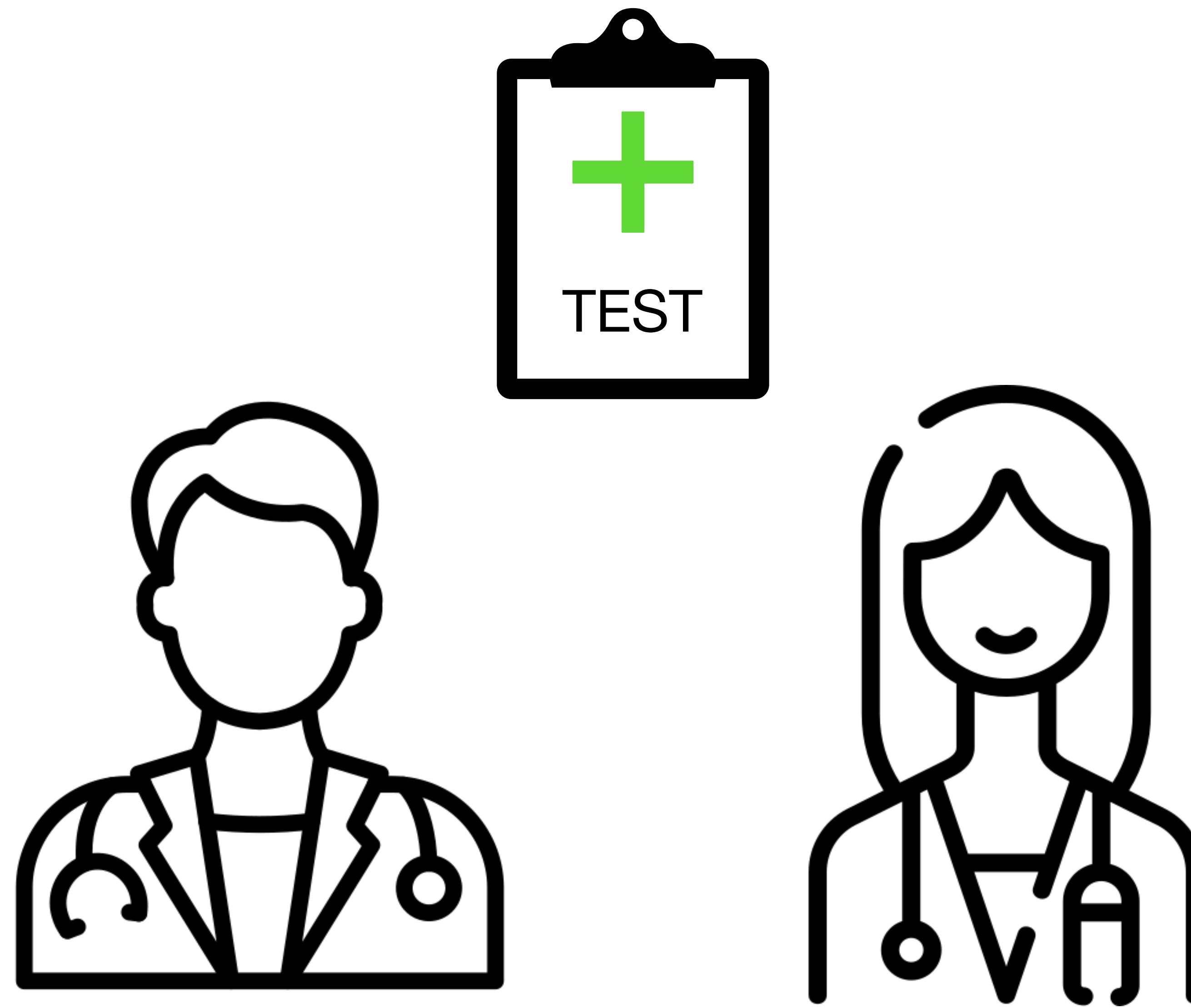
Uzorak od 100 žena

10% Ima rak dojke



90% Nema rak dojke





Uzorak od 100 žena

10% Ima rak dojke



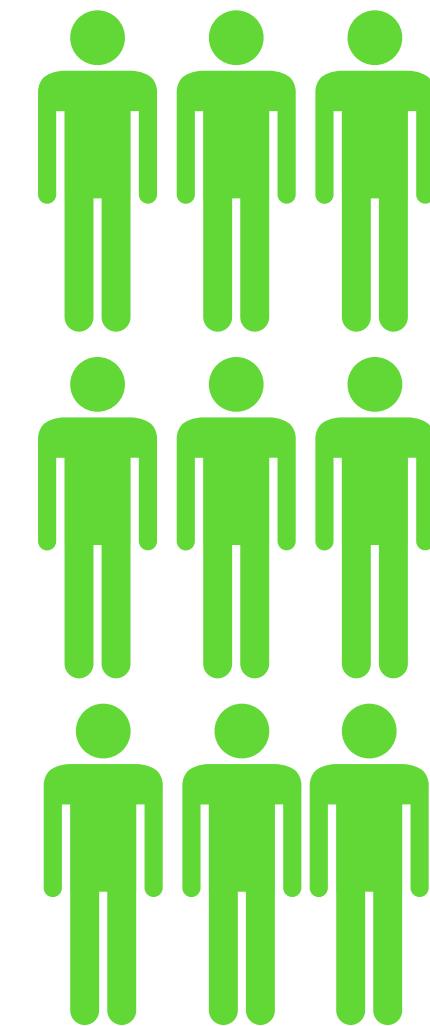
90% Nema rak dojke



Uzorak od 100 žena

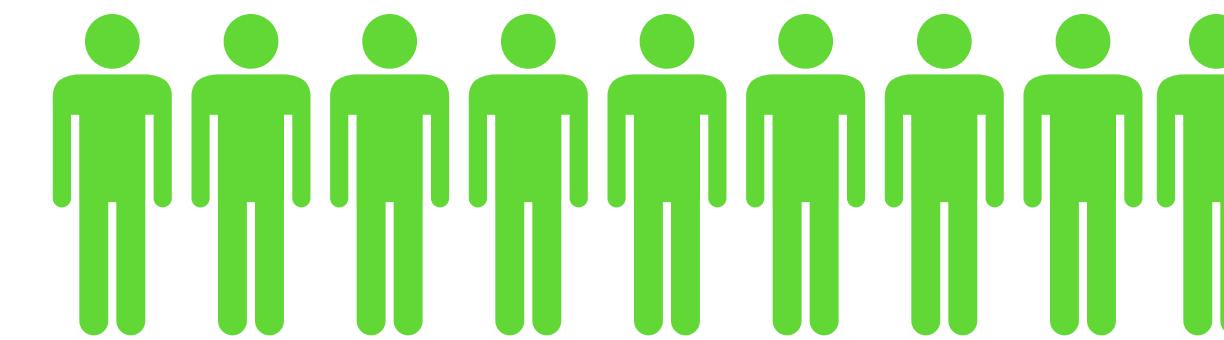
10% Ima rak dojke

9 Tačno pozitivnih



90% Nema rak dojke

9 Lažno pozitivnih

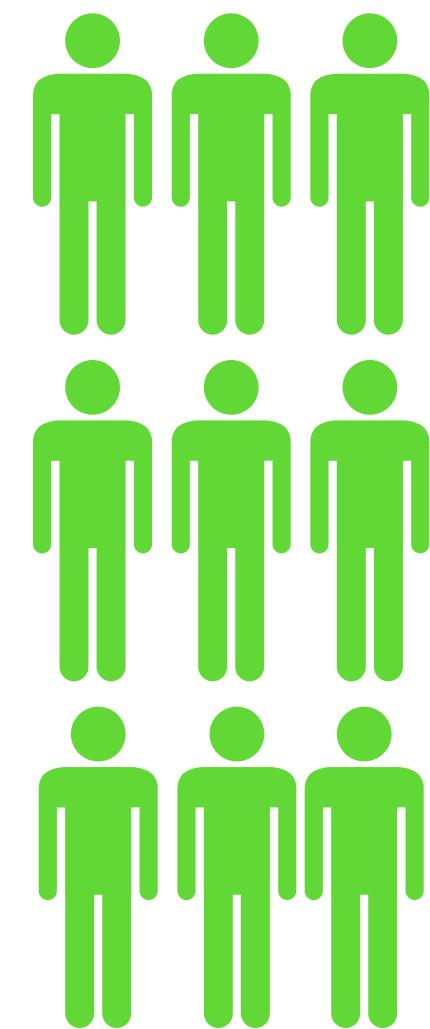


$$P(\text{Ima rak} \mid \text{pozitivan test}) \approx \frac{9}{9+9} = 0.5$$

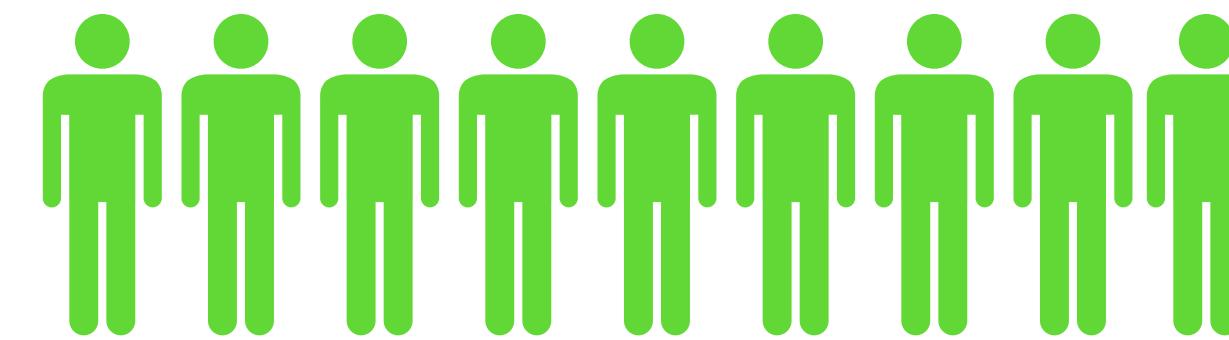
10% Ima rak dojke

90% Nema rak dojke

9 Tačno pozitivnih



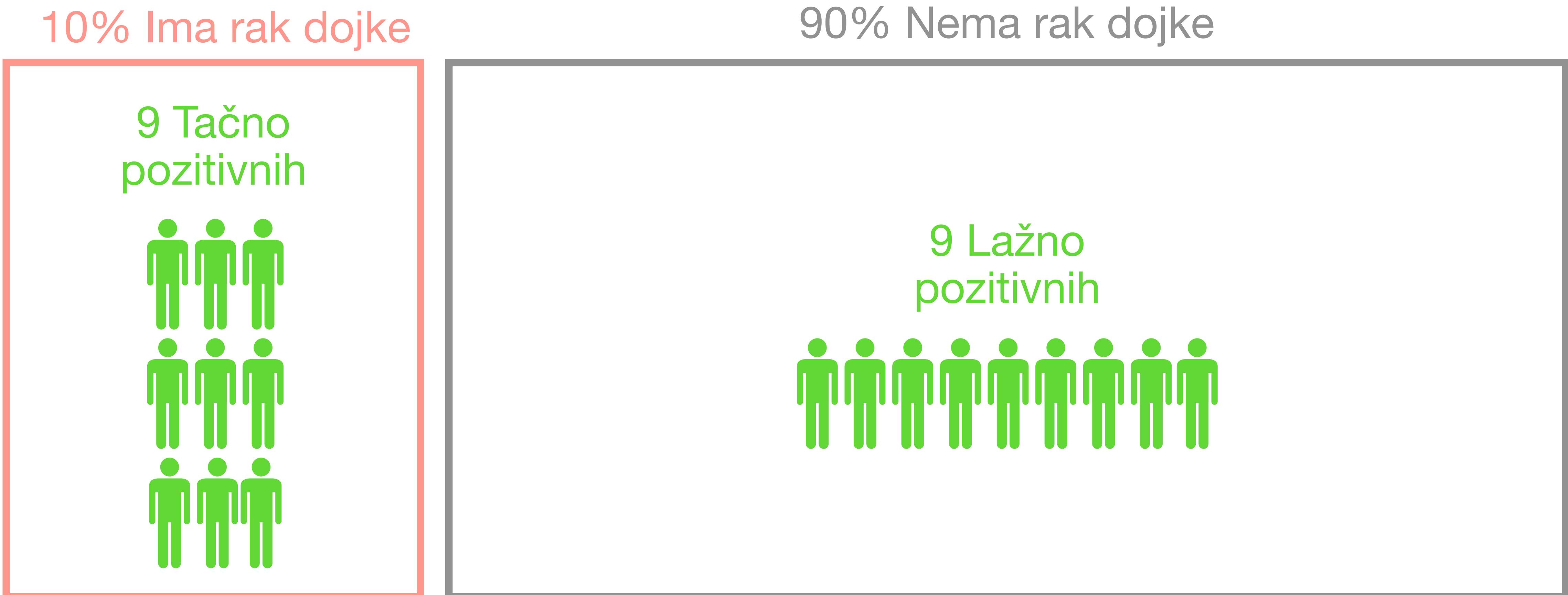
9 Lažno pozitivnih



$$P(\text{Ima rak} \mid \text{pozitivan test}) \approx \frac{9}{9+9} = 0.5$$

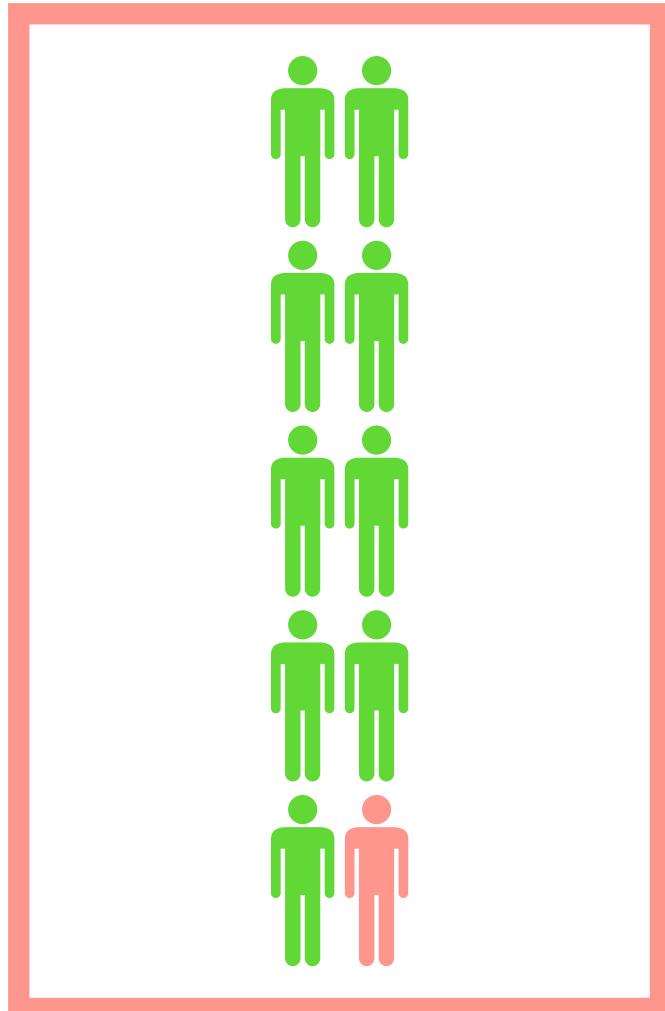
Pozitivna
Prediktivna =
Vrednost

$$\frac{TP}{TP + LP}$$



10% Ima rak

90% Nema rak dojke



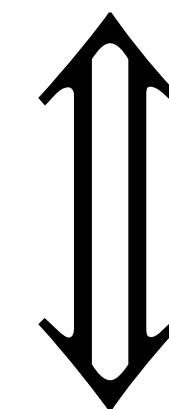
Preciznost Testa

Senzitivnost

Specifičnost

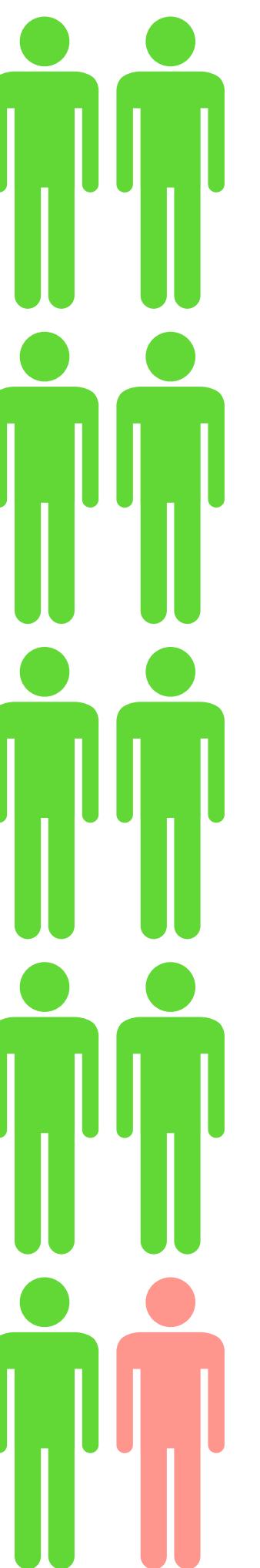
Senzitivnost

$$Sn = \frac{TP}{TP + LN} = \frac{9}{10} = 90\%$$



$$SLN = \frac{LN}{TP + LN} = 1 - Sn = 10\%$$

10% Ima rak dojke



9 Tačno pozitivnih
1 Lažno negativan

90%

9 Lažno pozitivnih



81 Tačno negativan

90% Nema rak dojke



Specifičnost

$$Sp = \frac{TN}{TN + LP} = \frac{81}{90} = 90\%$$



$$SLP = \frac{LP}{TN + LP} = 1 - Sp = 10\%$$

Senzitivnost = 90%

10% Ima rak dojke



Specifičnost = 90%

90% Nema rak dojke

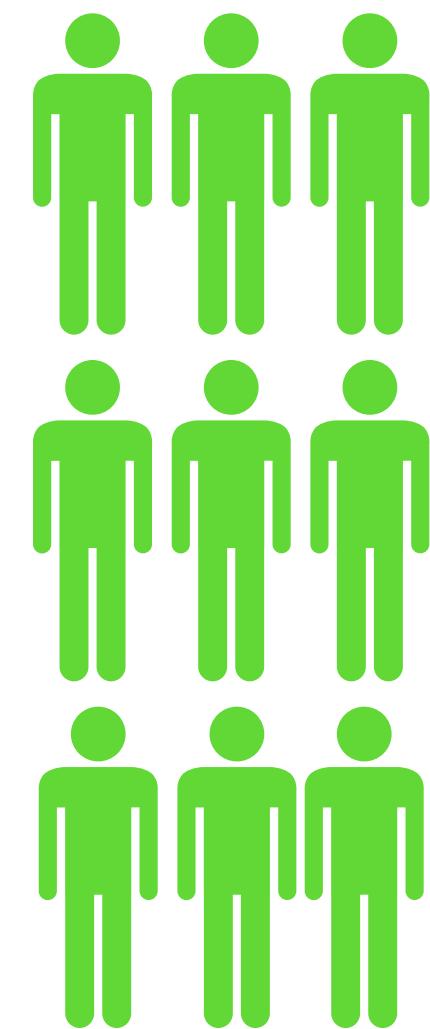


$$P(\text{Ima rak} \mid \text{pozitivan test}) \approx \frac{9}{9+9} = 0.5$$

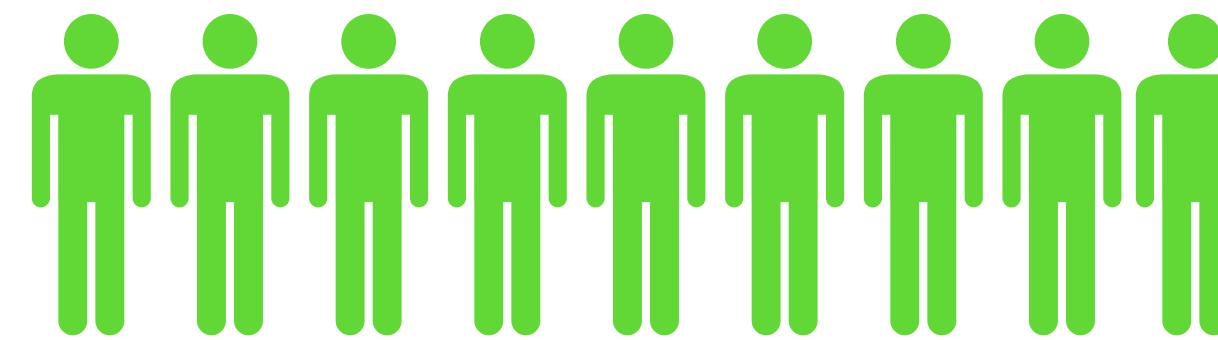
10% Ima rak dojke

90% Nema rak dojke

9 Tačno pozitivnih



9 Lažno pozitivnih



2006-2007



Ginekolozi



Gerd Gigerenzer

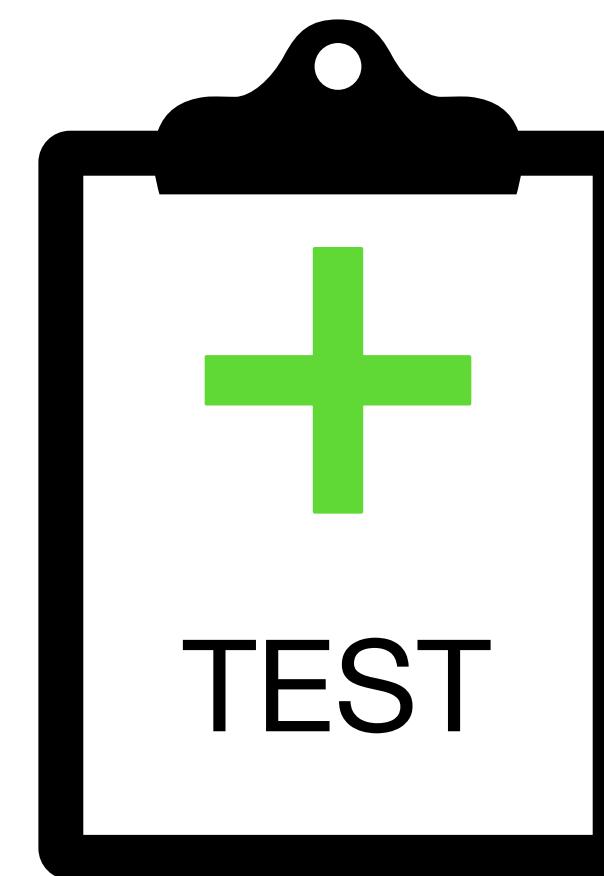
2006-2007

Žena od 50 godina, bez simptoma, učestvovala je u rutinskom mamografskom skriningu. Nakon pozitivnog rezultata želi da zna da li stvarno ima rak i koje su joj šanse?

Osim rezultata, ne znate ništa drugo o njoj.



Ginekolozi



Gerd Gigerenzer

2006-2007

Prevalenca: 1%

Senzitivnost: 90%

Specifičnost: 91%

Koliko žena sa pozitivnim rezultatom stvarno ima rak?

?

A) 9 od 10

C) 1 od 10

B) 8 od 10

D) 1 od 100



Ginekolozi

Žena od 50 godina, bez simptoma, učestvovala je u rutinskom mamografskom skriningu. Nakon pozitivnog rezultata želi da zna da li stvarno ima rak i koje su joj šanse?

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Osim rezultata, ne znate ništa drugo o njoj.

Test određuje da li imaš bolest.

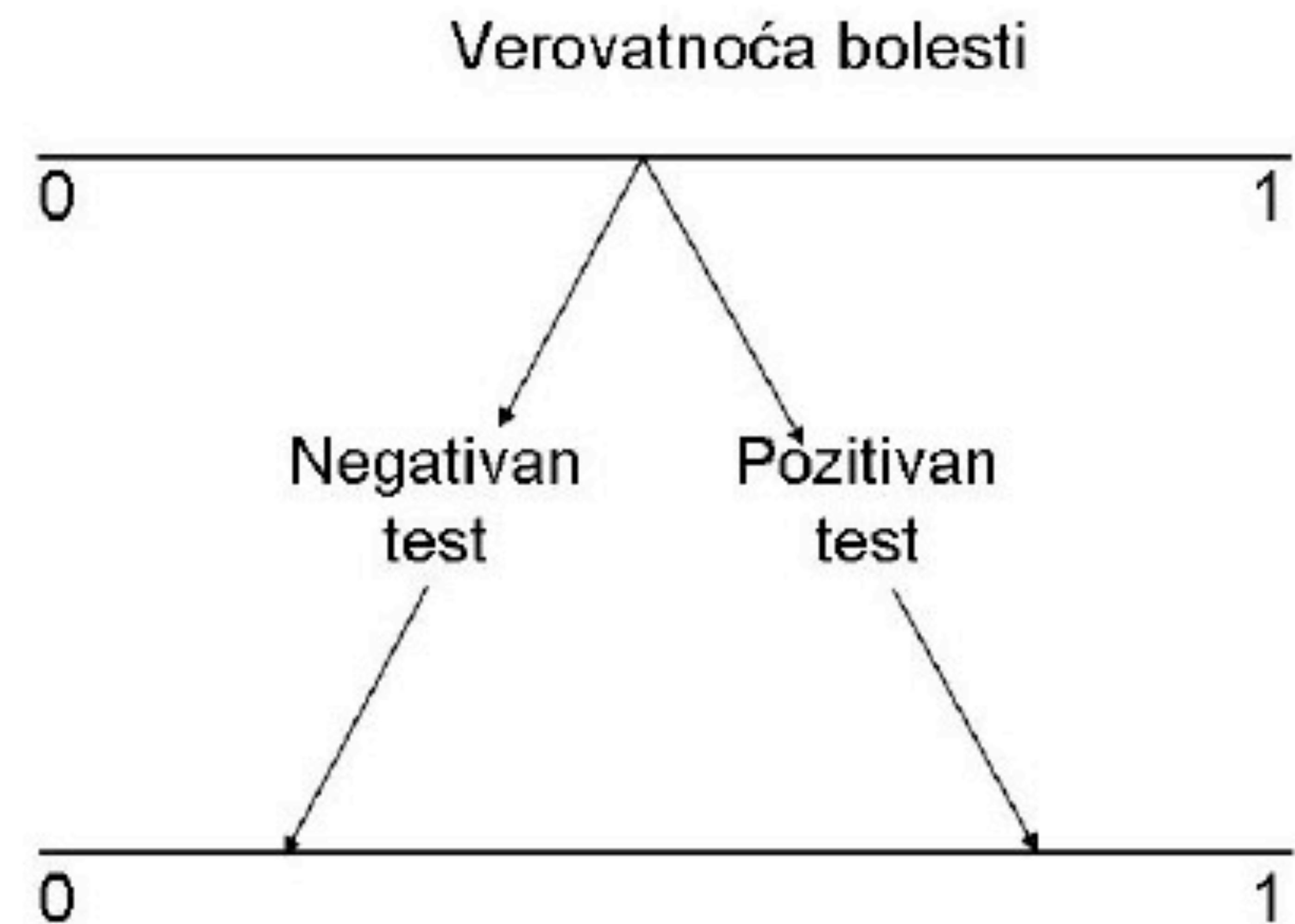
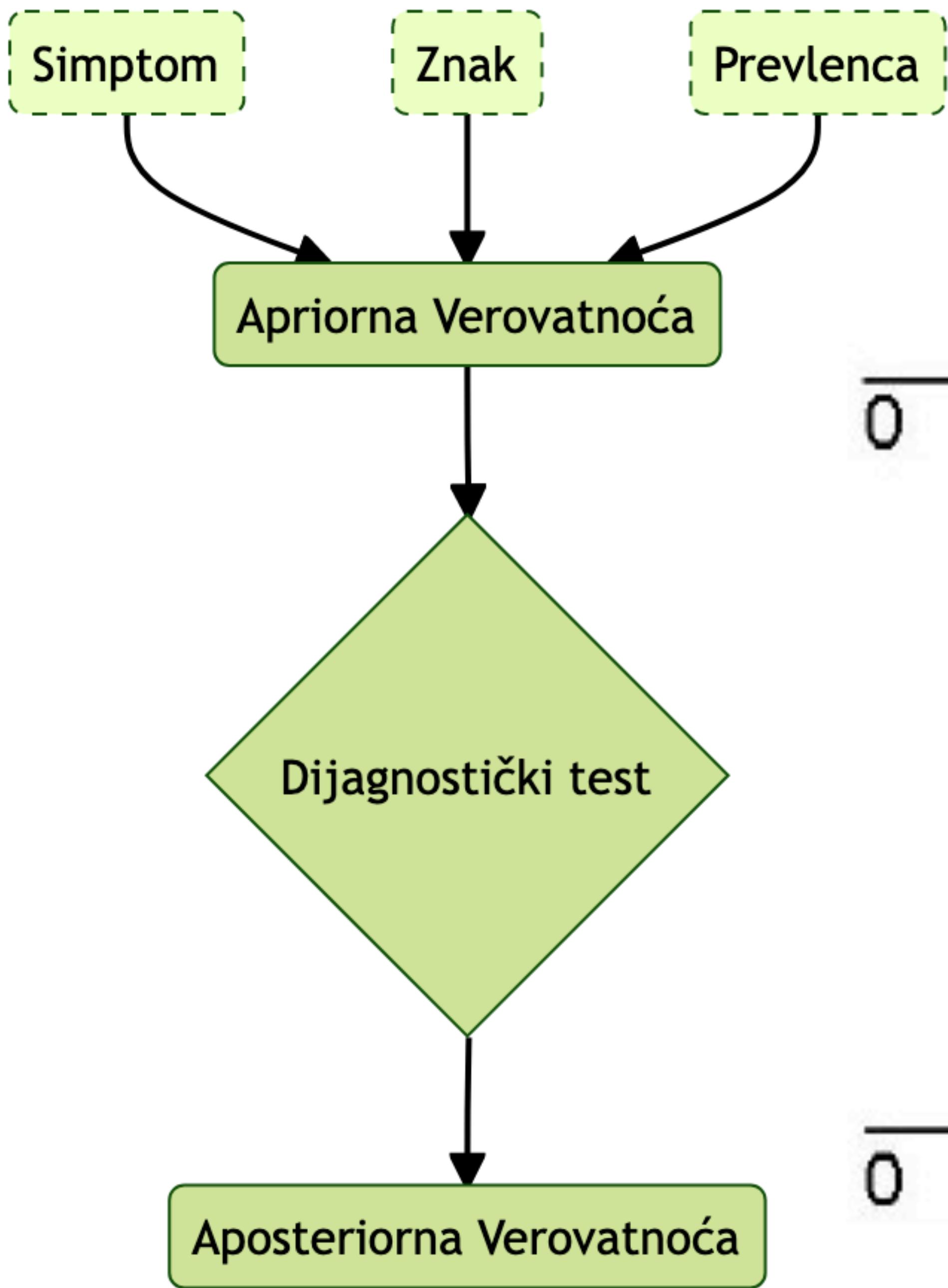
~~-Test određuje da li imaš bolest.~~

Test određuje verovatnoću da imaš bolest.

~~-Test određuje da li imaš bolest.~~

~~-Test određuje verovatnoću da imaš bolest.~~

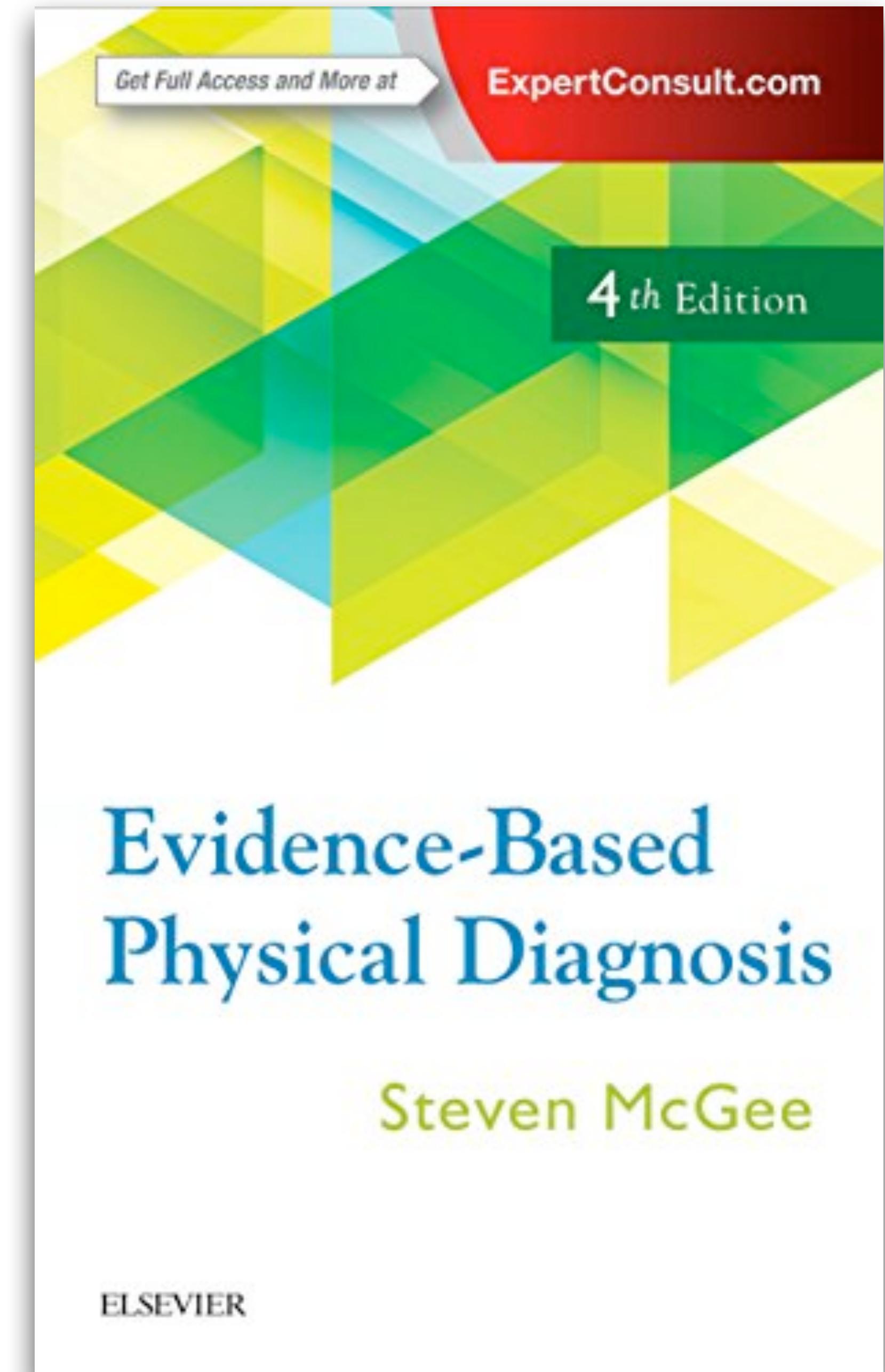
Test ažurira verovatnoću da imaš bolest.



Da li pacijent ima upalu pluća?

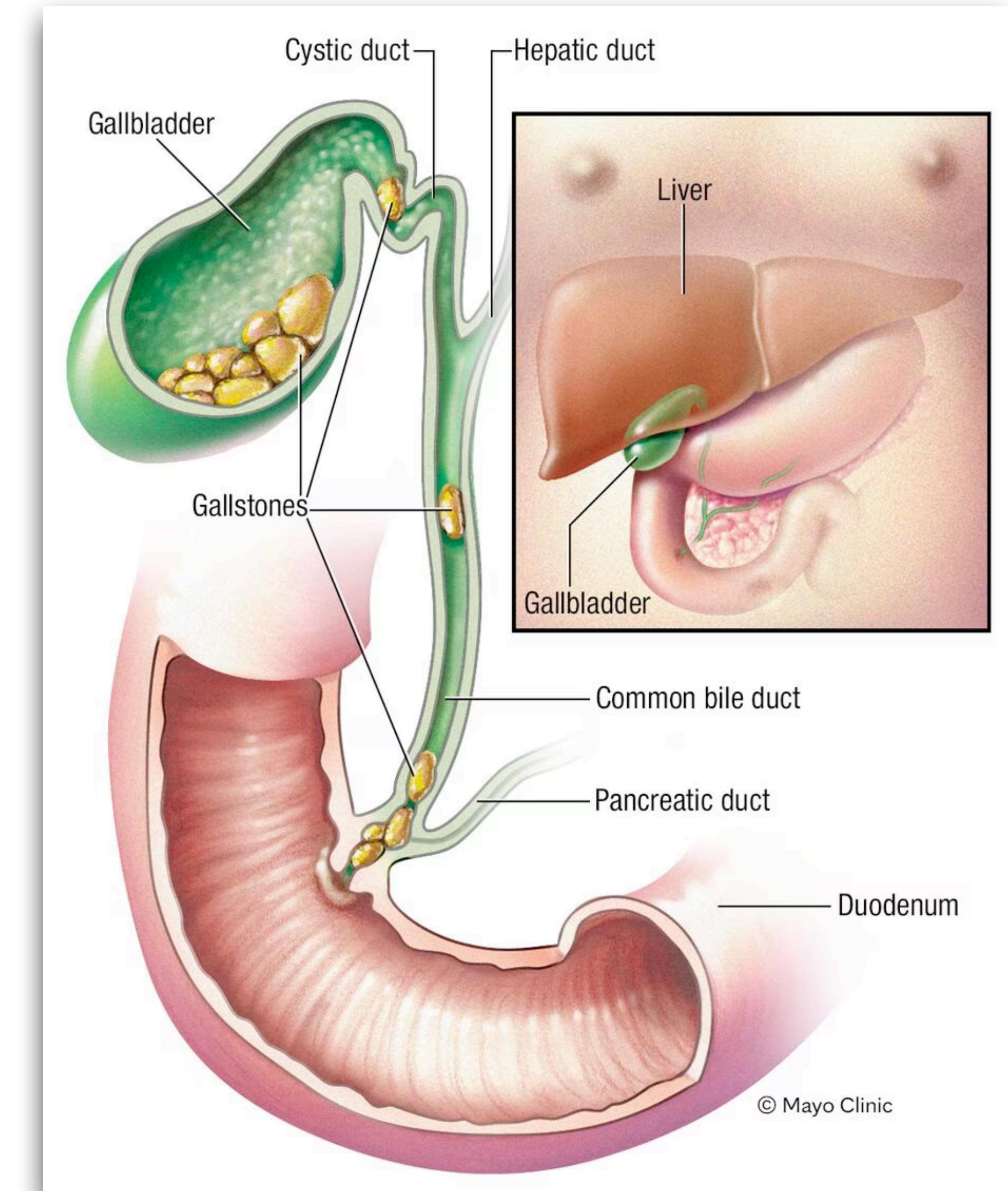
EBM BOX 32.1 PNEUMONIA

Cachexia	4 (1.7, 9.6)	0.9 (0.8, I)	3
Abnormal mental status	1.9 (1.2, 3)	0.9 (0.9, I)	14-38
Pulse >100/min	1.8 (1.6, 2.1)	0.8 (0.7, 0.9)	3-50
Temperature >37.8°C	2.2 (1.8, 2.8)	0.7 (0.7, 0.8)	3-51
Respiratory rate >28/min	2.7 (1.4, 5.1)	0.9 (0.8, 0.9)	9-38
Oxygen saturation <95%	3.1 (2.6, 3.7)	0.7 (0.5, 0.8)	11-13
All vital signs normal	0.3 (0.2, 0.5)	2.2 (1.4, 3.4)	7-50
Asymmetric chest expansion	44.1 (2.1, 905)	I (0.9, I)	10
Chest wall tenderness	1.2 (0.3, 5.3)	I (0.9, 1.1)	16
Percussion dullness	3 (1.7, 5.2)	0.9 (0.8, I)	3-38
Diminished breath sounds	2.2 (1.8, 2.7)	0.8 (0.8, 0.9)	5-41
Bronchial breath sounds	3.3 (2, 5.6)	0.9 (0.8, I)	14
Egophony	4.1 (2.1, 7.8)	0.9 (0.9, I)	3-38
Crackles	2.3 (1.4, 3.7)	0.8 (0.7, 0.9)	3-41
Wheezing	0.8 (0.7, 0.9)	I.1 (I, I.1)	5-38
0 or 1 finding	0.3 (0.2, 0.4)	—	7-35
2 or 3 findings	I (0.9, 1.2)	—	15-35
4 or 5 findings	8.2 (5.8, 11.5)	—	15-35



Primer: Cholelithiasis

Test	Sens	Spec
UZ	73% (>95%)*	91% (>95%)*
CT	55 - 80%	99%
EUS	97%	90%
MRCP	87%	92%



Primer: Tumor markeri za CRC

Test	Sens	Spec
CA 19-9	~30%	~92%
CEA	46%	89%
CA242	39%	88%
Kolonoskopija	75%	93%



NEPHROLITHIASIS

Types of stones and risk factors (*Nat Rev Dis Prim* 2016;2:16008)

- **Calcium** (Ca oxalate >Ca phosphate): **70–90% of kidney stones** (*NEJM* 2010;363:954)
Urine findings: ↑ Ca, ↑ oxalate (Ca-ox only), ↑ pH (Ca-phos only), ↓ citrate, ↓ volume
2° hypercalciuria: 1° hyperparathyroidism, distal RTA, sarcoid, Li use
2° hyperoxaluria: Crohn's, ileal disease w/ intact colon, gastric bypass, pancreatic insuffic.
Diet: ↑ animal protein, ↑ sucrose, ↑ Na, ↓ K, ↓ fluid, ↓ fruits/vegetables, ↑ vit. C, ↓ Ca
- **Uric acid:** 5–10% of kidney stones, radiolucent on plain film
Urine findings: ↑ uric acid, ↓ pH (eg, from chronic diarrhea)
- **Magnesium ammonium phosphate** (“struvite” or “triple phosphate”)
Chronic upper UTI w/ urea-splitting organisms (eg, *Proteus, Klebs*) → ↑ urine NH₃, pH >7
- **Cystine:** inherited defects of tubular amino acid reabsorption

Clinical manifestations

- Hematuria (absence does not exclude diagnosis), flank pain, N/V, dysuria, frequency
- Ureteral obstruction (stones >5 mm unlikely to pass spont.) → AKI if solitary kidney
- UTI: ↑ risk of infection proximal to stone; urinalysis of distal urine may be normal

Workup

- **Non-contrast CT** 97% Se, 96% Sp (ureteral dilation w/o stone suggests recent passage); U/S (Se 57%, Sp 98%) may serve as initial test in stable patient (*NEJM* 2014;371:1100)
- Strain urine for stone to analyze; U/A & UCx; electrolytes, BUN/Cr, Ca, PO₄, PTH
- 24-h urine × 2 (>6 wk after acute setting) for Ca, PO₄, oxalate, citrate, Na, Cr, pH, K, vol.

Acute treatment (*JAMA* 2020;323:1961)

POCKET
NOTEBOOK

POCKET MEDICINE

EIGHTH EDITION

Marc S. Sabatine



The Massachusetts General Hospital
Handbook of Internal Medicine

Wolters Kluwer

Urine findings: ↑ uric acid, ↓ pH (eg, from chronic diarrhea)

- **Magnesium ammonium phosphate** (“struvite” or “triple phosphate”)

Chronic upper UTI w/ urea-splitting organisms (eg, *Proteus*, *Klebs*) → ↑ urine NH₃, pH >7

- **Cystine**: inherited defects of tubular amino acid reabsorption

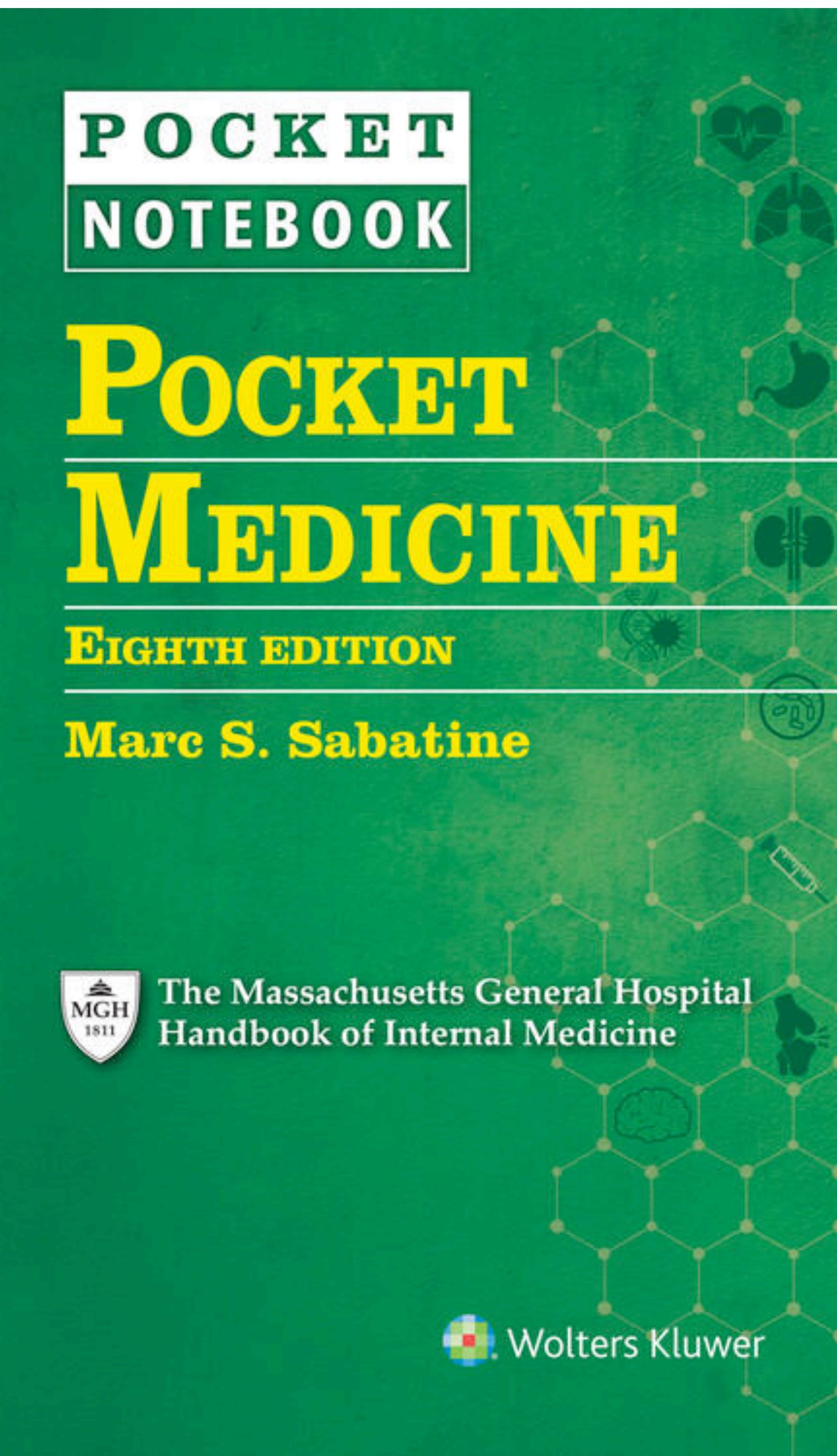
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Acute treatment (*JAMA* 2020;323:1961)



Oboljenje	Zlatni standard
Alzheimerova bolest	Klinički nalaz/autopsija
Karcinom dojke	Biopsija
Karcinom pluća	Biopsija
Duboka venska tromboza	Kontrastna venografija
Streptokokna angina	Bris ždrela i zasejavanje na podlogu

Tabela 1. Primeri oboljenja i njihovih zlatnih standarda

Tabela 3. Ultrazvučni nalaz stanja medijalnog meniskusa u odnosu na referentni standard

		Stanje medijalnog meniskusa na osnovu artroskopije (zlatni standard)		
		Povreda meniskusa	Bez povrede	Ukupno
Ultrazvučni nalazi stanja medijalnog meniskusa	Povreda meniskusa	75	1	76
	Bez povrede	1	11	12
Ukupno		76	12	88