

Risiko und Likelihood

Das Laborresultat als Mass für die
Wahrscheinlichkeit einer Diagnose

Procalcitonin and C-Reactive Protein as Diagnostic Markers of Severe Bacterial Infections in Febrile Infants and Children in the Emergency Department

TABLE 1. Final Diagnosis of Patients With Severe Bacterial Infections (n = 94)

	No. of Patients	%
Pyelonephritis	50	53.2
Pneumonia	24	25.5
Meningitis	7	7.5
Occult bacteremia	6	6.4
Sepsis	3	3.2
Osteomyelitis	2	2.1
Septic arthritis	2	2.1

CRP

TABLE 2. Clinical Characteristics and Laboratory Findings of Patients With SBI and Non-SBI

Variable	SBI (n = 94)	23%	Non-SBI (n = 314)	P
Age (mo)	8 (2–20)		9 (2–16)	NS
Sex (F/M)	52/42		153/161	NS
Fever duration (h)				NS
<8	14		31	
8–24	31		67	
>24	49		216	
Max temperature (°C)	39.2 ± 0.8		39.0 ± 0.8	0.004
Yale Score (n)				0.0001
<10	46		225	
10–16	40		82	
>16	8		7	
PCT (ng/mL)	1.9 (0.5–10.7)		0.2 (0.1–0.5)	0.0001
CRP (mg/L)	68.5 (39.0–120.0)	82 mg/L	13 (3–31)	0.0001
WBC (mm ³)	15,850 (12,040–20,250)		10,770 (7,050–14,960)	0.0001
ANC (mm ³)	9,522 (6,830–14,154)		5,119 (3,108–8,295)	0.0001

Data are median and interquartile range except for temperature values which are mean ± SD.

NS indicates nonsignificant.

TABLE 2. Clinical Characteristics and Laboratory Findings of Patients With SBI and Non-SBI

From: Andreola: *Pediatr Infect Dis J*, Volume 26(8). August 2007.672-677

Frage

Bei einer Vortest-Wahrscheinlichkeit von 23%
und einem CRP von 82 mg/l
erwarten Sie eine schwere bakterielle Infektion
mit einer Wahrscheinlichkeit von:

<30% 50% 70% >90%

CRP

TABLE 3. Sensitivity, Specificity, Positive and Negative Likelihood Ratio Values of PCT, CRP, WBC, ANC, and Yale Observation Score for SBI Prediction

	Sensitivity (% [95% CI])	Specificity (% [95% CI])	Likelihood Ratio+	Likelihood Ratio–
PCT				
>0.5 ng/mL	73.4 (63.3–82.0)	76.4 (71.3–81.0)	3.10	0.35
>1 ng/mL	63.8 (53.3–73.5)	89.8 (85.9–92.9)	6.24	0.40
>2 ng/mL	47.9 (37.5–58.4)	96.5 (93.8–98.2)	13.62	0.54
CRP				
>20 mg/L	88.3 (80.0–94.0)	60.8 (55.2–66.3)	2.25	0.19
>40 mg/L	71.3 (61.0–80.1)	81.2 (76.4–85.4)	3.79	0.35
>80 mg/L	46.0 (36.4–57.4)	94.6 (91.5–96.8)	8.65	0.56
WBC				
>15,000/mm ³	51.6 (41.0–62.1)	75.5 (70.3–80.2)	2.11	0.64
ANC				
>10,000/mm ³	29.9 (20.5–40.6)	78.4 (73.3–82.9)	1.38	0.89
Yale Observation Score				
YOS >10	38.3 (28.5–48.9)	67.8 (62.4–73.0)	1.19	0.91

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ROC

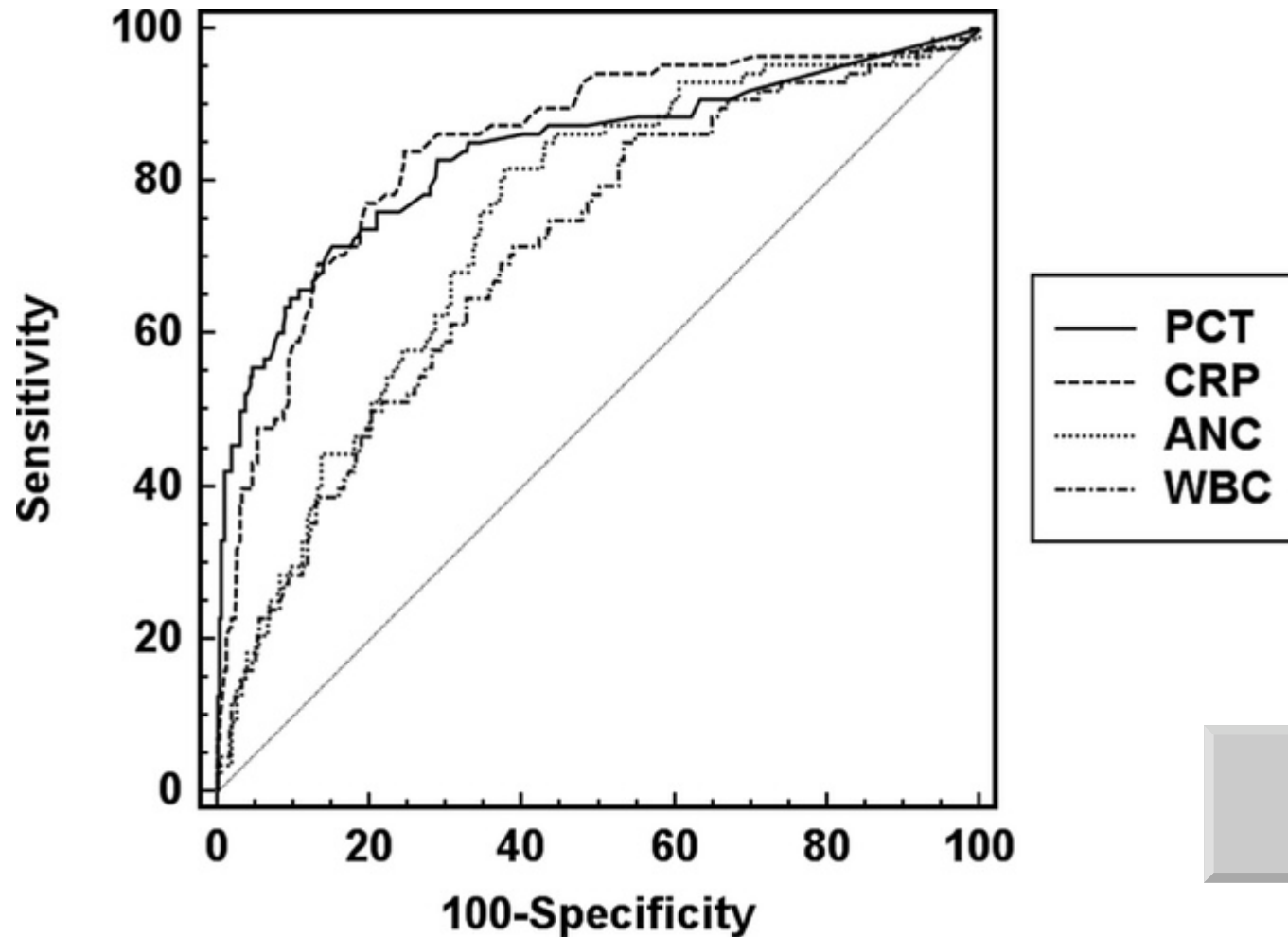
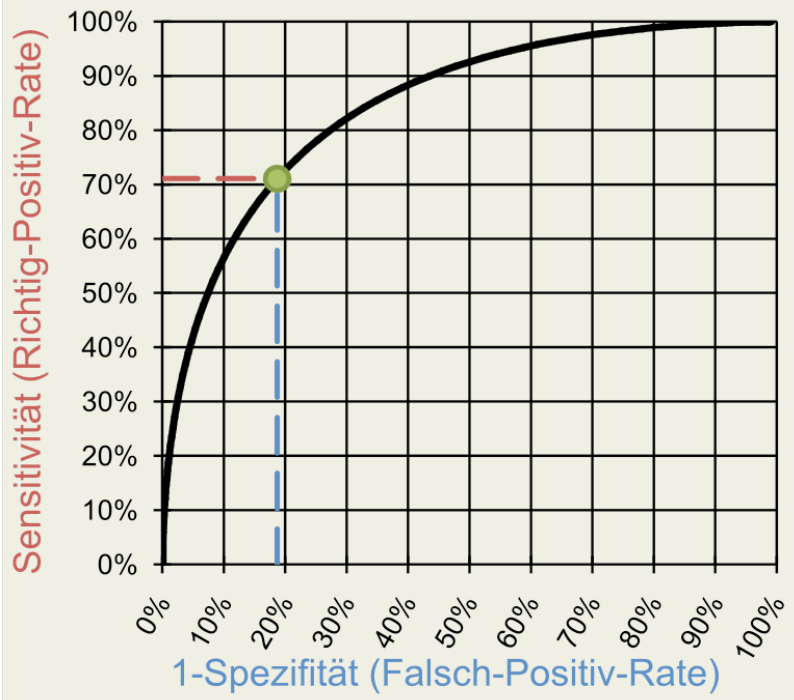


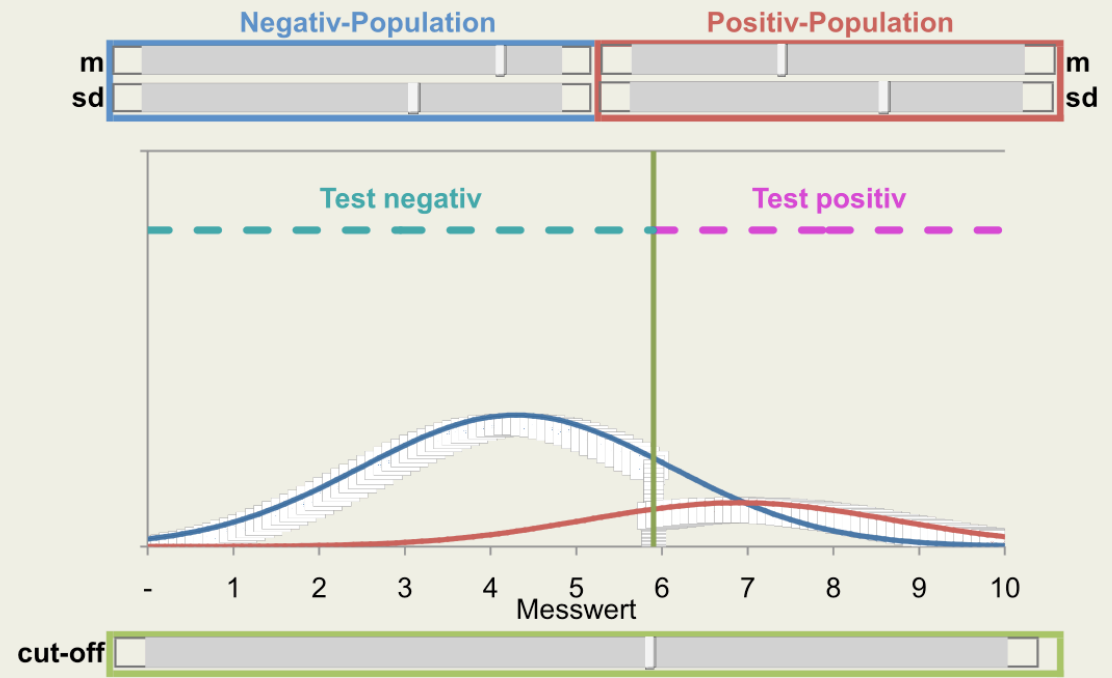
FIGURE 2. ROC for PCT, CRP, WBC count, and ANC for prediction of SBI.

From: Andreola: *Pediatr Infect Dis J*, Volume 26(8).August 2007.672-677

Receiver Operating Characteristics (ROC)



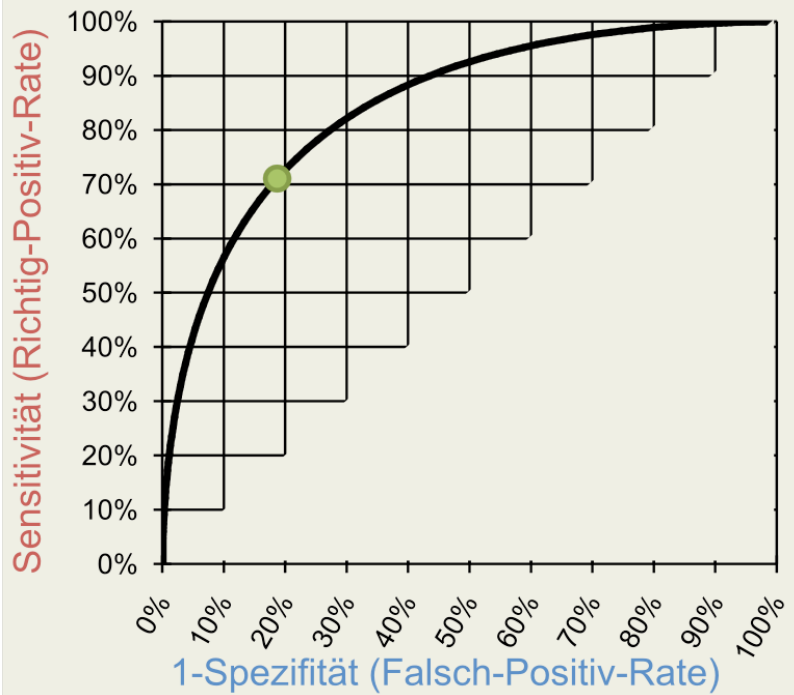
Diagnostischer Test



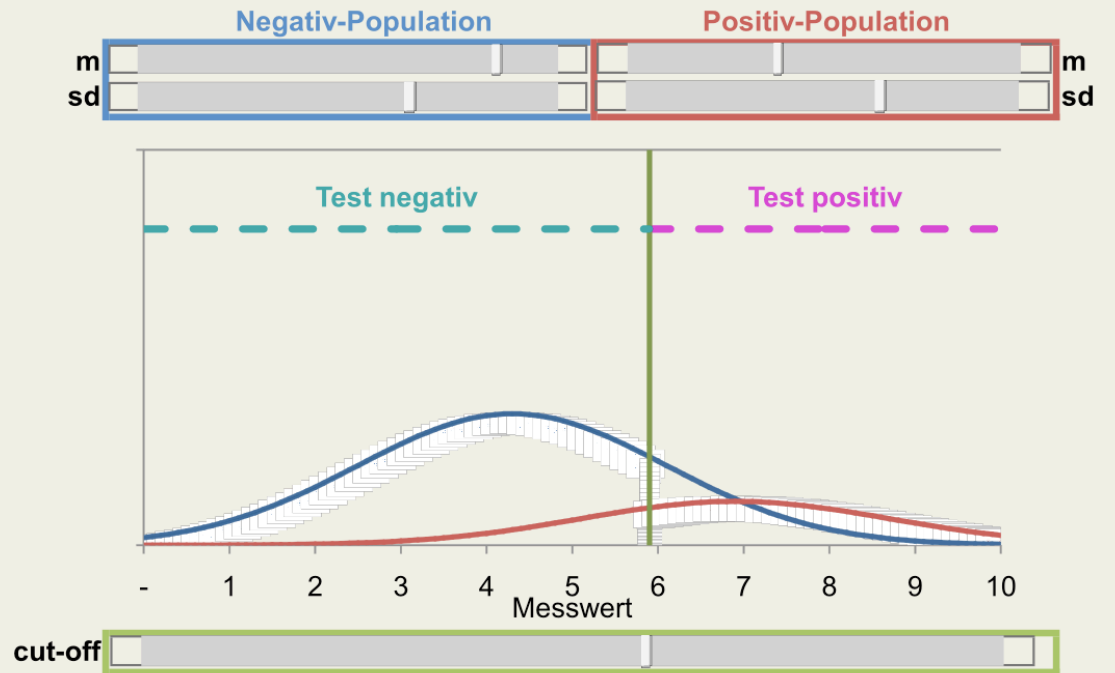
qualitativ

Sensitivität 71.1% Test-Positive / Positiv-Population
Spezifität 81.3% Test-Negative / Negativ-Population

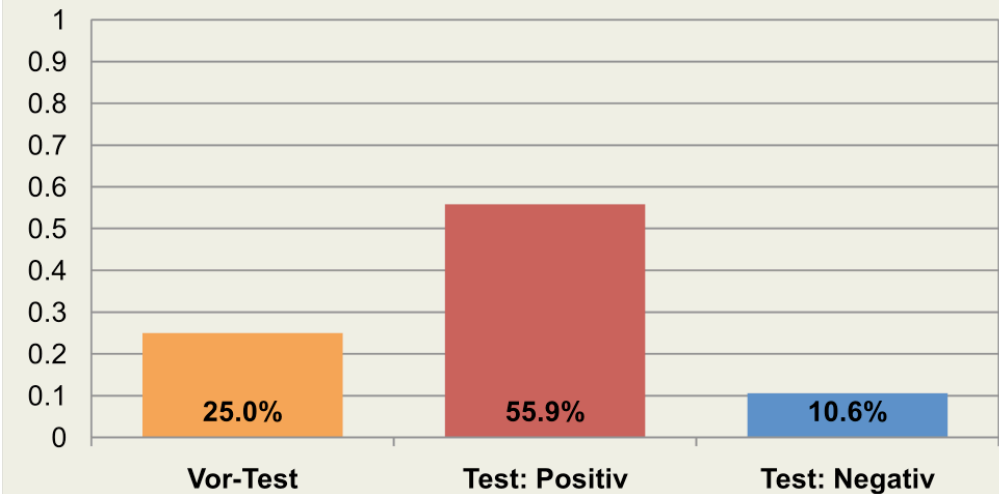
Receiver Operating Characteristics (ROC)



Diagnostischer Test



Wahrscheinlichkeiten

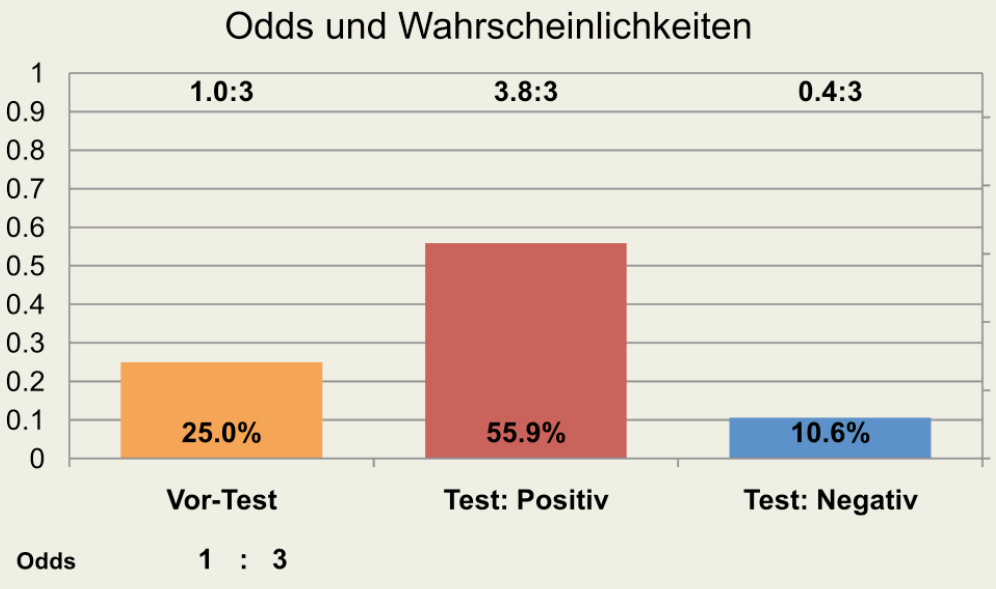
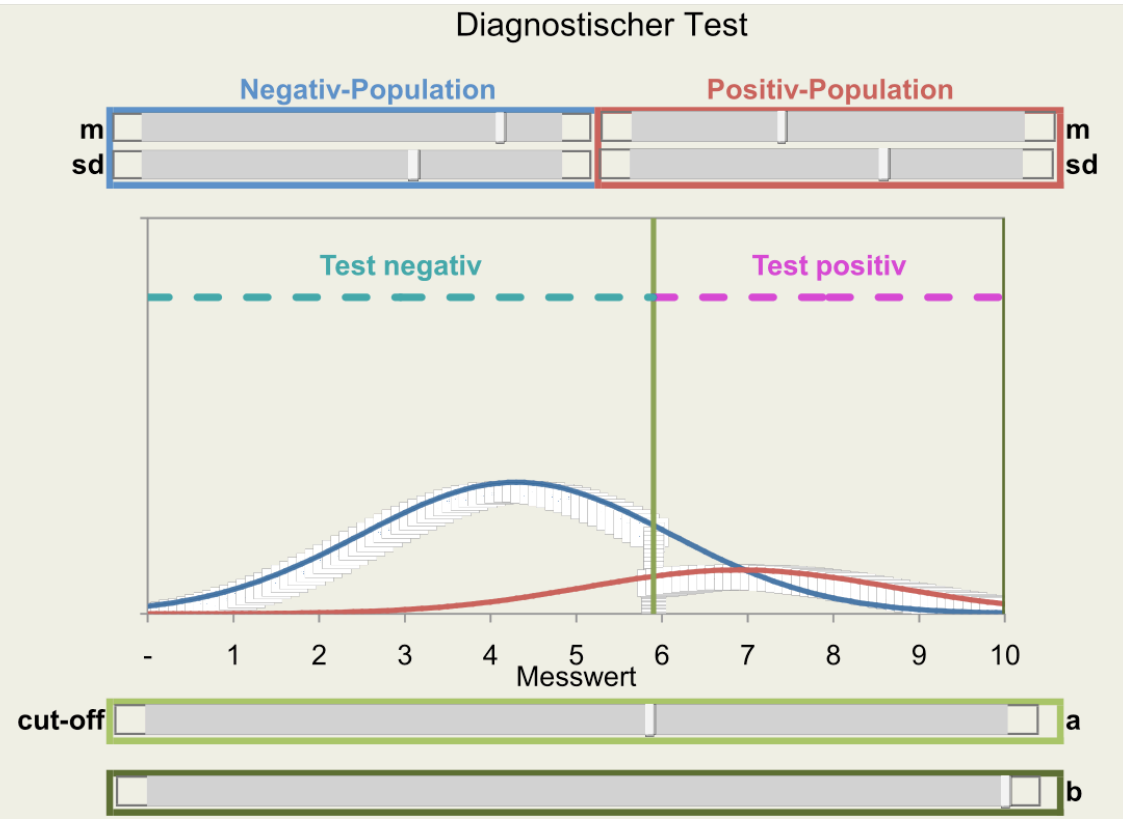
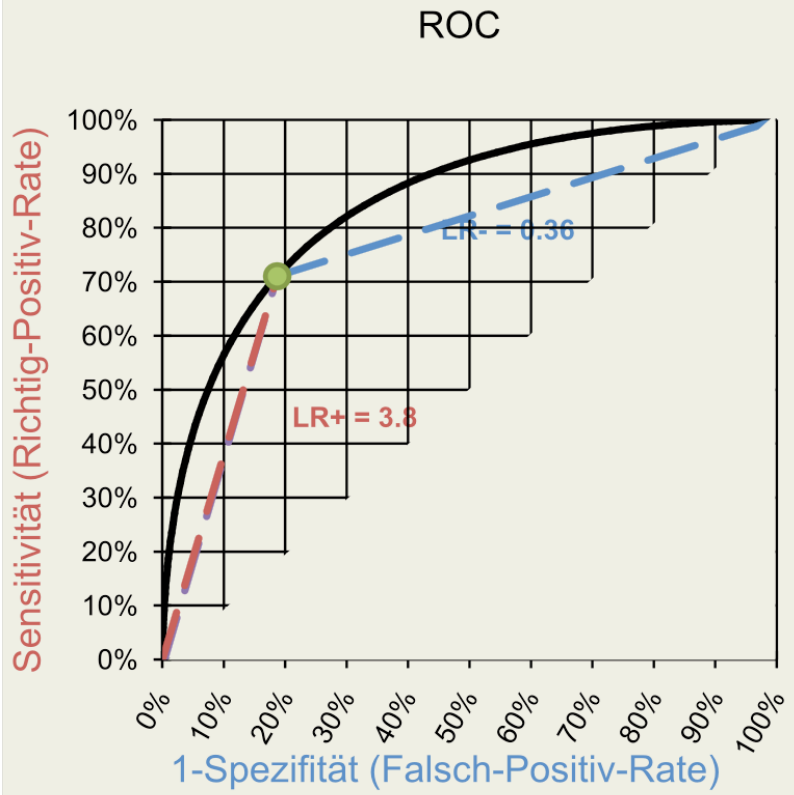


qualitativ

Sensitivität	71.1%
Spezifität	81.3%
PPV	55.9% Richtig Positive / Test-Positiven
NPV	89.4% Richtig Negative / Test-Negativen
1-NPV	10.6% Falsch Negative / Test-Negativen

Odds

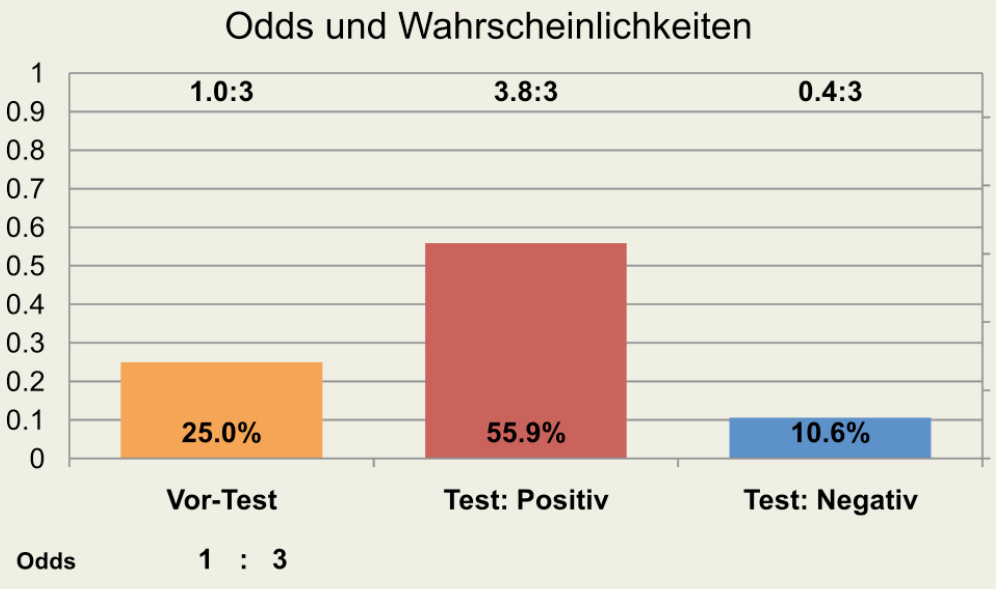
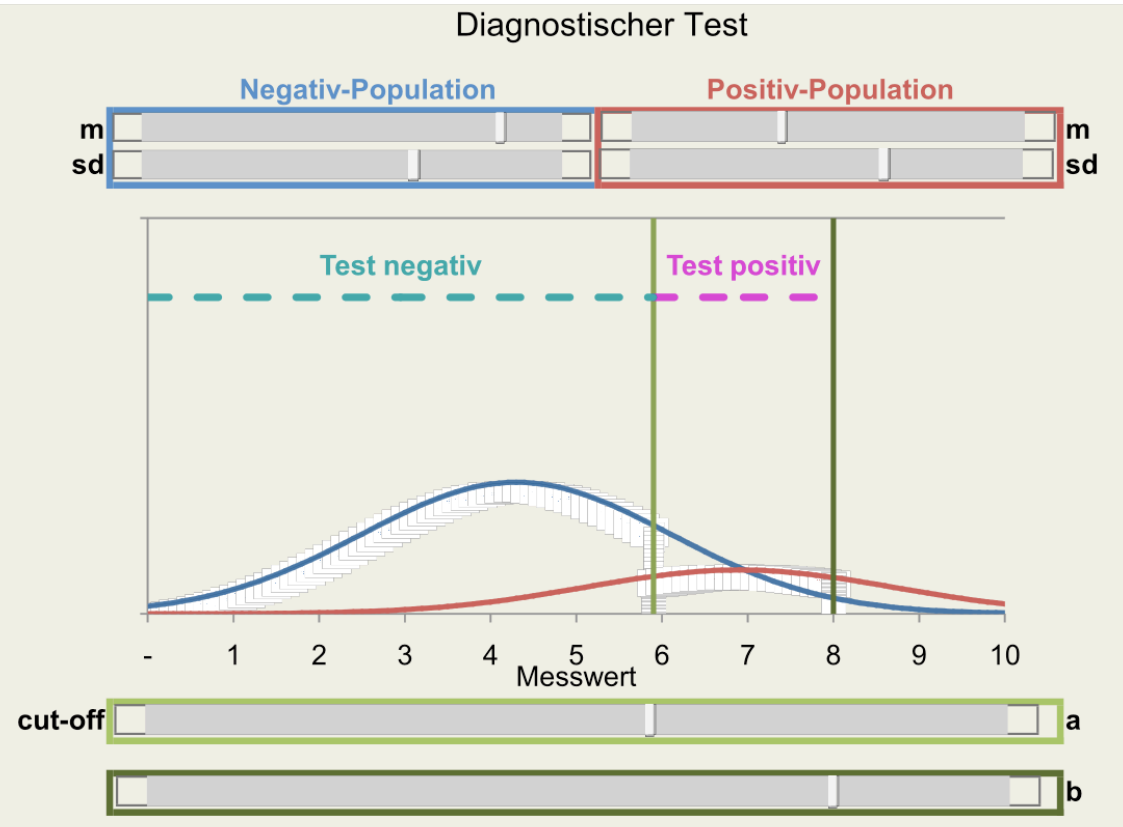
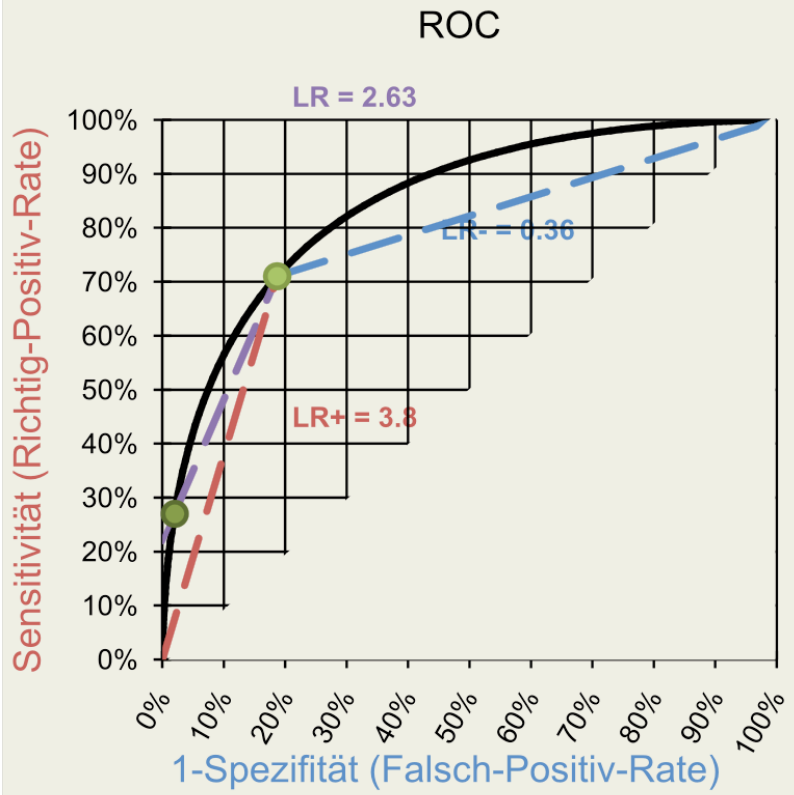
1 : 3



qualitativ

Sensitivität	71.1%
Spezifität	81.3%
PPV	55.9%
NPV	89.4%
$Se / (1-Sp)$	LR+ 3.8
$(1-Se) / Sp$	LR- 0.36
Odds	3.8 : 3
P	55.9%
Odds	0.4 : 3
P	10.6%

Bayes' Theorem: $LR * \text{Vortest-Odds} = \text{Nachttest-Odds}$

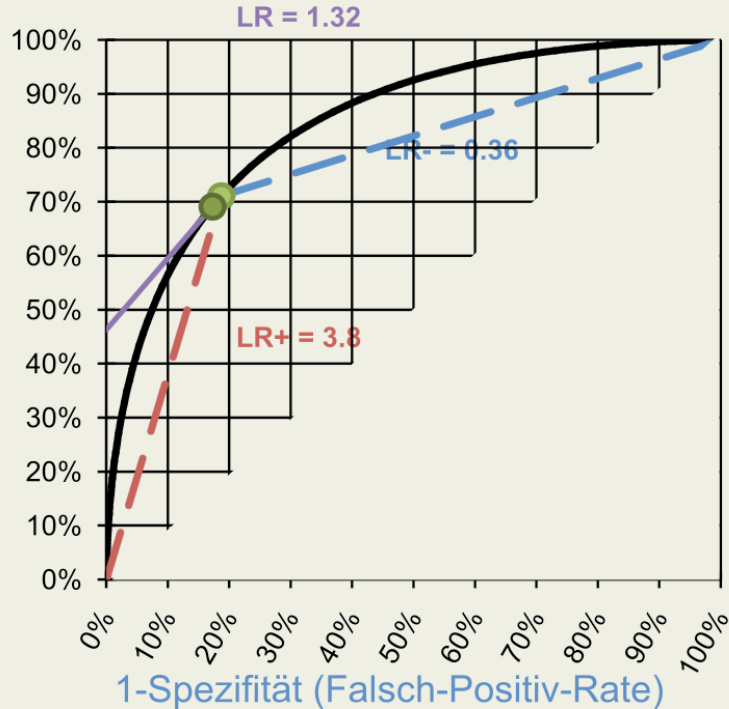


	qualitativ		
	a	b	
Sensitivität	71.1%	27.1%	$Se(a) - Se(b) = 44.0\%$
Spezifität	81.3%	98.0%	$Sp(b) - Sp(a) = 16.7\%$
			$(Se(a) - Se(b)) / (Sp(b) - Sp(a)) = LR = 2.63$
PPV	55.9%		
NPV	89.4%		
$Se / (1 - Sp)$	LR+	3.8	Odds 3.8 : 3, P 55.9%
$(1 - Se) / Sp$	LR-	0.36	Odds 0.4 : 3, P 10.6%
		2.63	

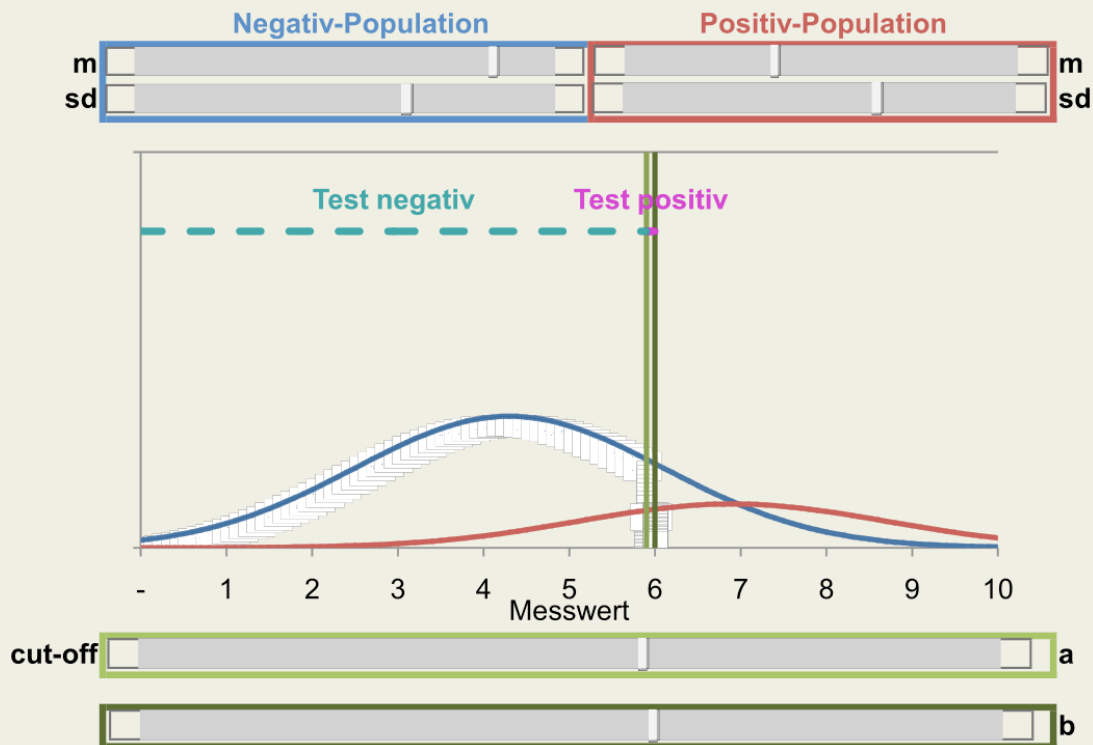
Bayes' Theorem: $LR * \text{Vortest-Odds} = \text{Nachttest-Odds}$

Sensitivität (Richtig-Positiv-Rate)

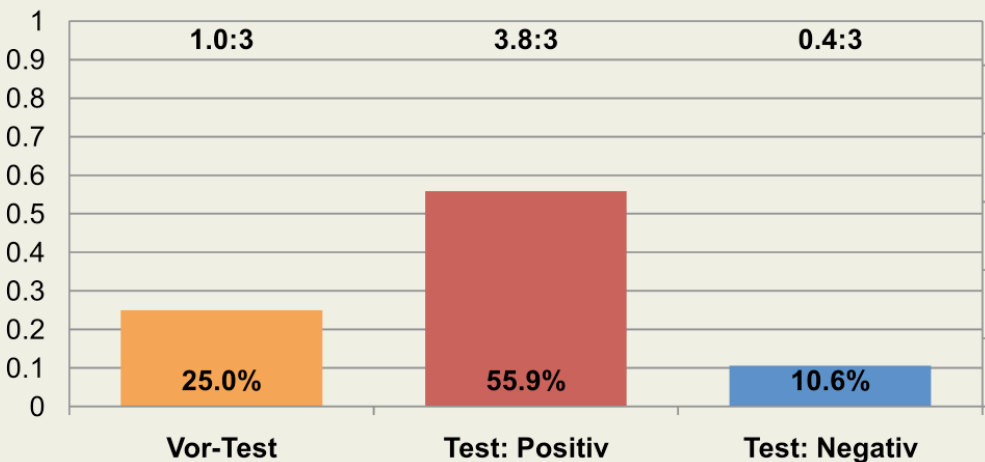
ROC



Diagnostischer Test



Odds und Wahrscheinlichkeiten



Odds 1 : 3

qualitativ

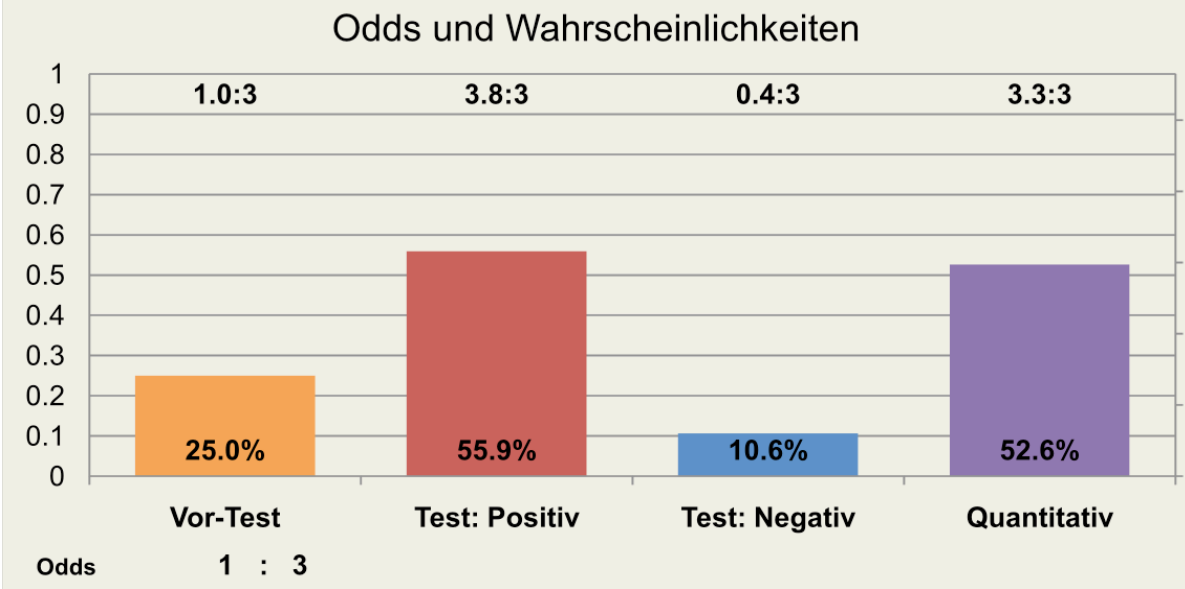
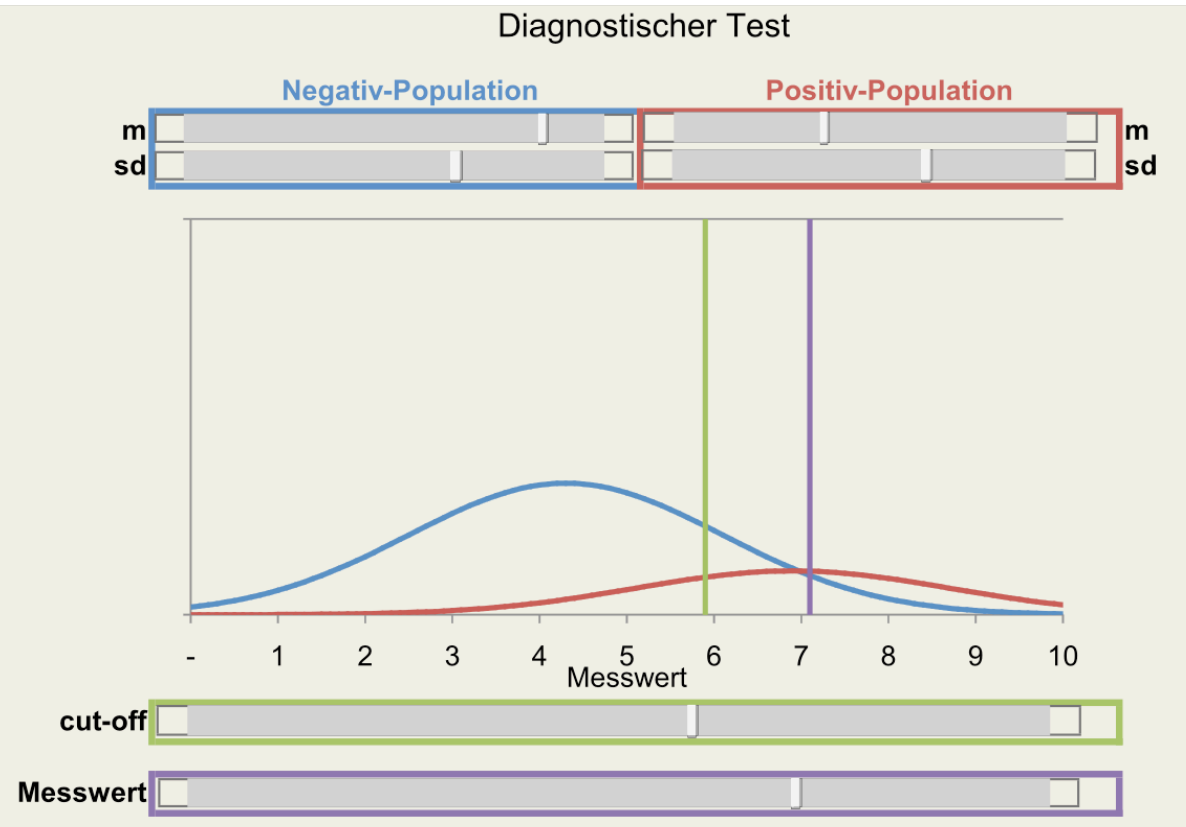
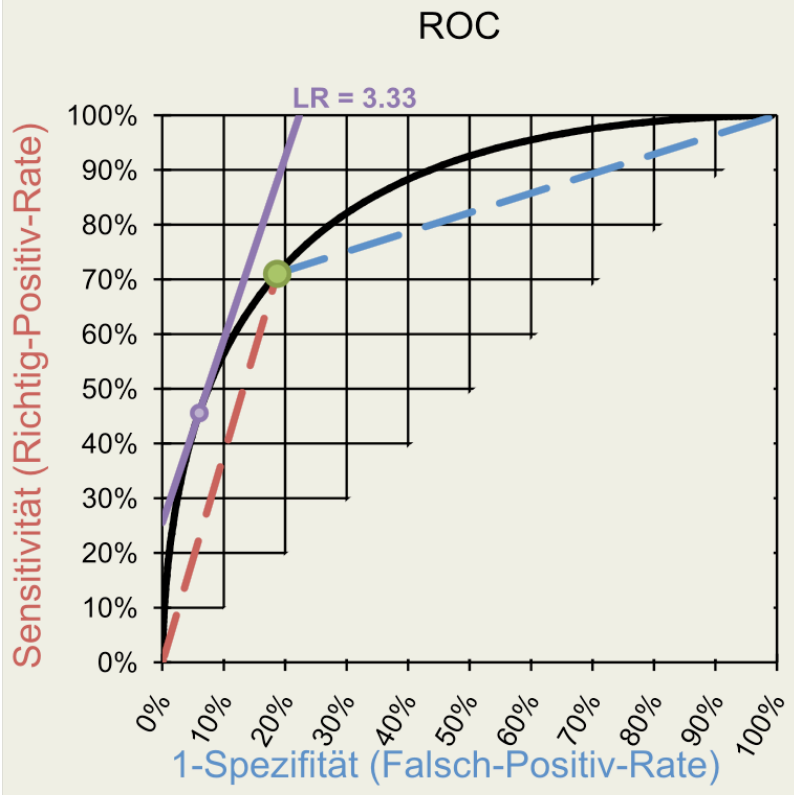
	a	b	
Sensitivität	71.1%	69.1%	Se(a)-Se(b) = 1.9%
Spezifität	81.3%	82.8%	Sp(b)-Sp(a) = 1.5%
			(Se(a)-Se(b)) / (Sp(b)-Sp(a)) = LR = 1.32

PPV 55.9%

NPV 89.4%

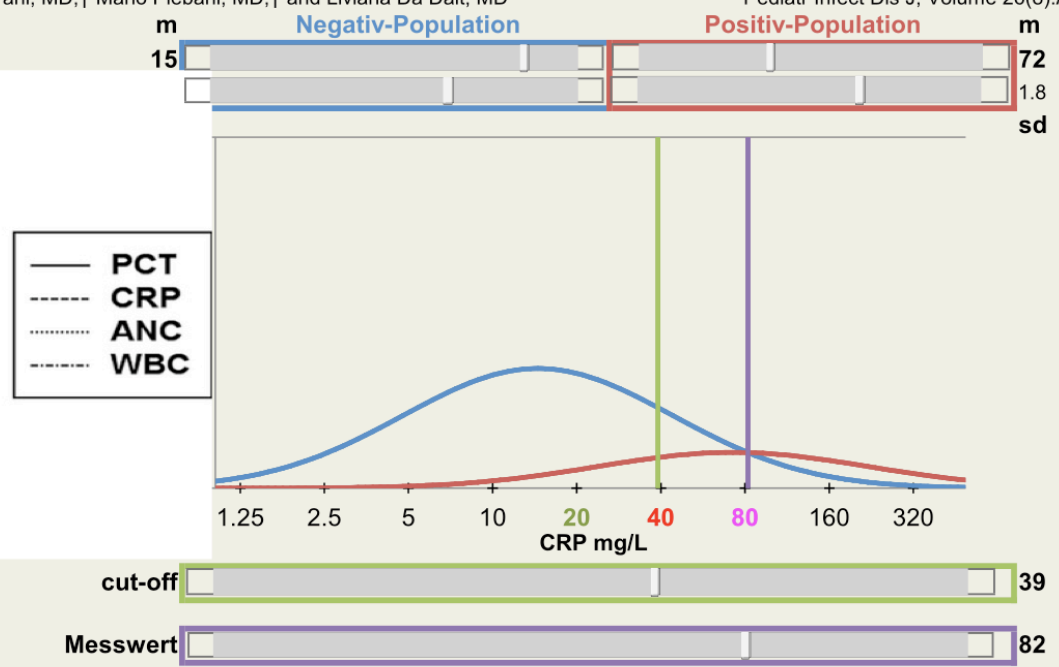
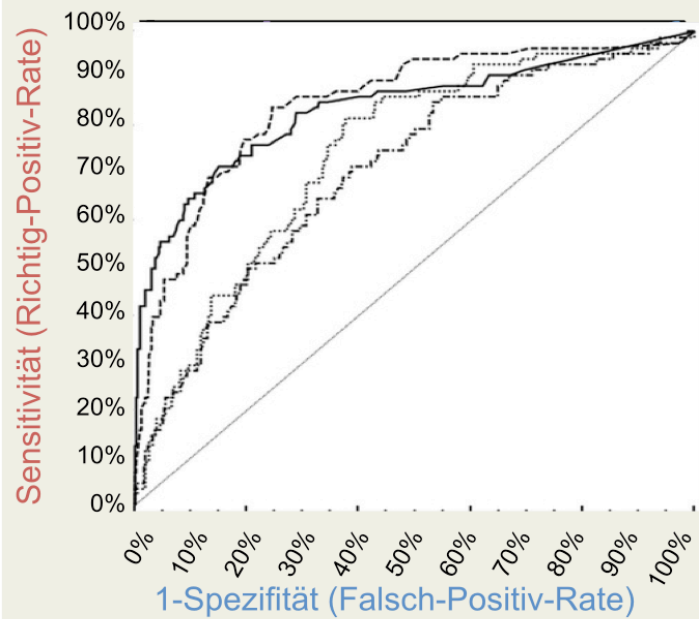
	LR+	Odds	P
Se / (1-Sp)	3.8	3.8 : 3	55.9%
(1-Se) / Sp	0.36	0.4 : 3	10.6%

Bayes' Theorem: LR * Vortest-Odds = Nachtest-Odds



	qualitativ	quantitativ
Sensitivität	71.1%	
Spezifität	81.3%	
PPV	55.9%	
NPV	89.4%	
LR+	3.8	
LRq		3.33
LR-	0.36	
	Odds	P
	3.8 : 3	55.9%
	3.3 : 3	52.6%
	0.4 : 3	10.6%

LR * Vortest-Odds = Nachtest-Odds



Odds und Wahrscheinlichkeiten

Variable	SBI (n = 94)	Non-SBI (n = 314)
Age (mo)	8 (2–20)	9 (2–16)
Sex (F/M)	52/42	153/161
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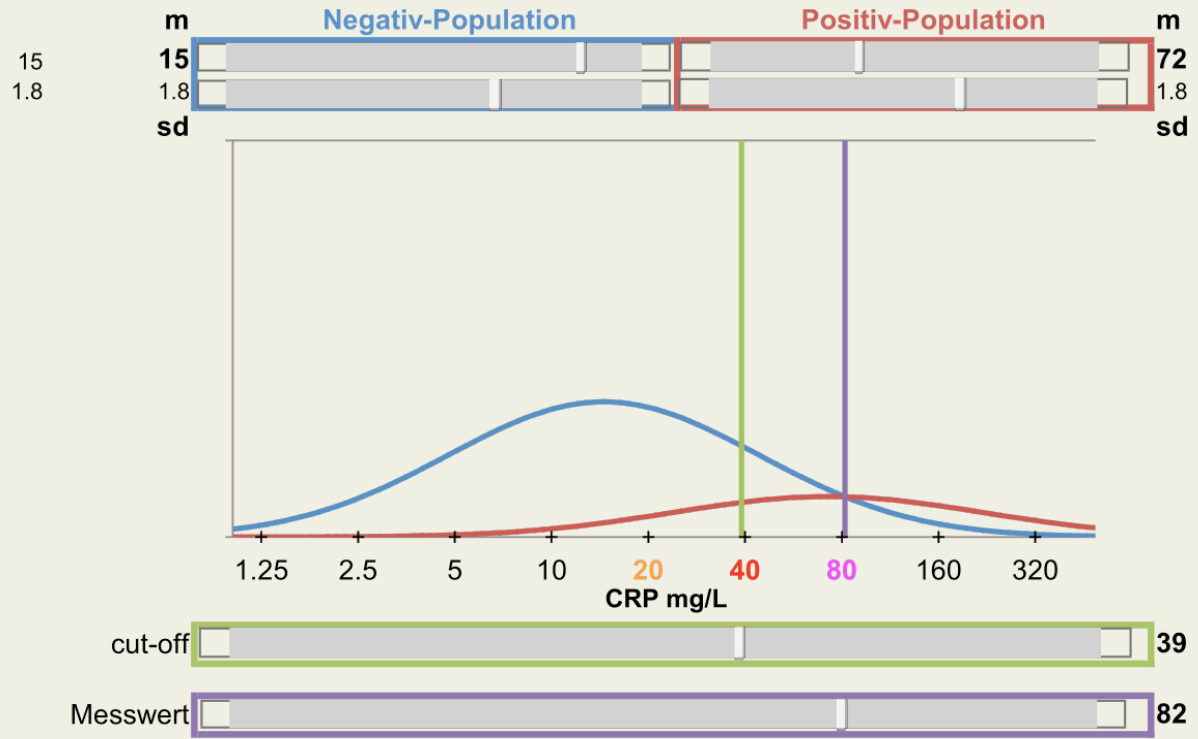
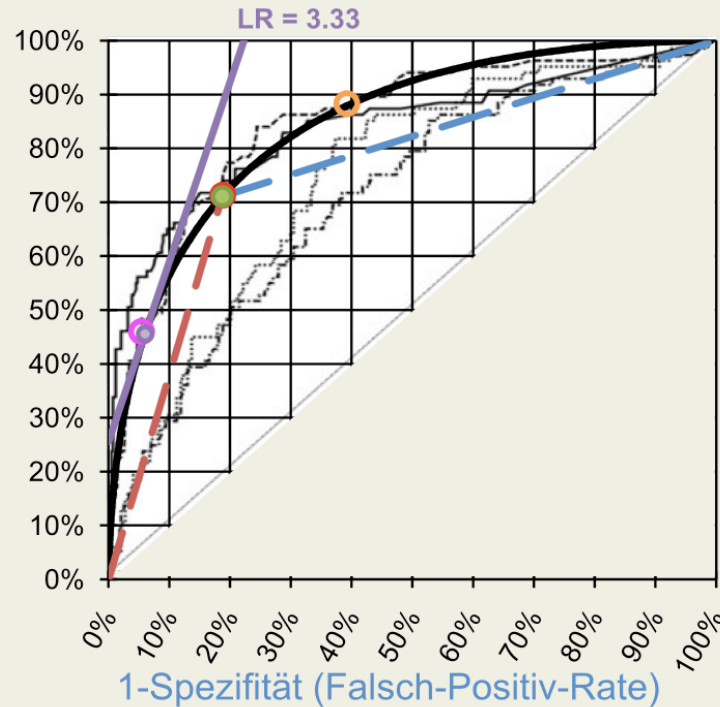
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>20 mg/L	88.3 (80.0–94.0)	60.8 (55.2–66.3)
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ANC		
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Yale Observation Score		
YOS >10	38.3 (28.5–48.9)	67.8 (62.4–73.0)

Odds 94 : 314

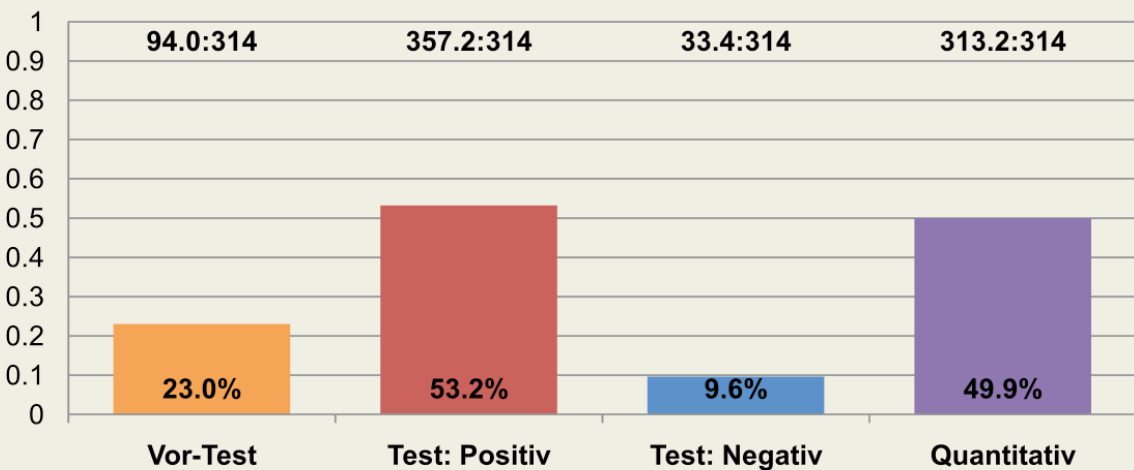
qualitativ quantitativ

Sensitivität (Richtig-Positiv-Rate)

ROC



Odds und Wahrscheinlichkeiten

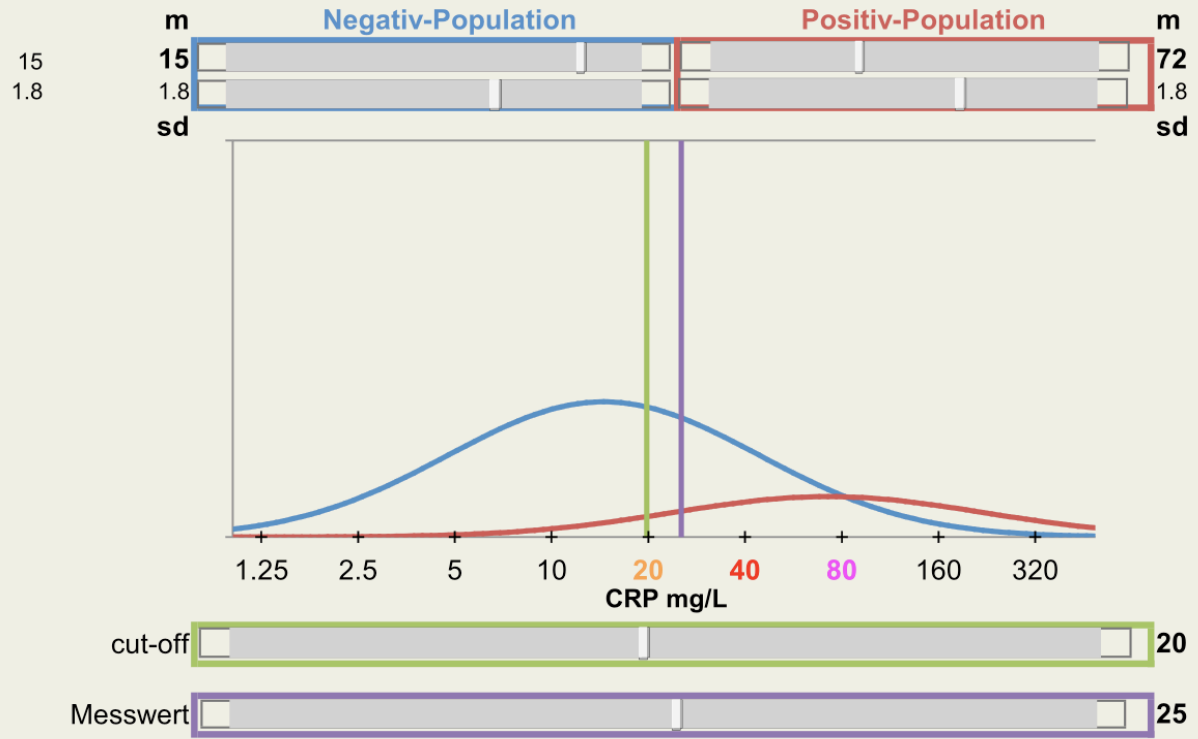
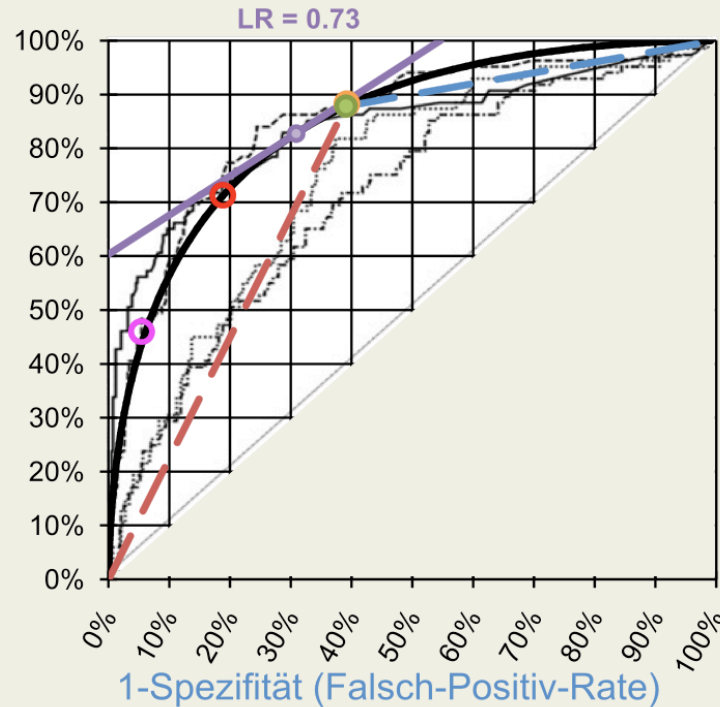


	qualitativ	quantitativ	CRP		
			20 mg/L	40 mg/L	80 mg/L
Sensitivität	71%		88%	71%	46%
Spezifität	81%		61%	81%	95%
PPV	53%				
NPV	90%				
LR+	3.8		2.3	3.8	8.7
LRq		3.3			
LR-	0.36		0.19	0.35	0.54

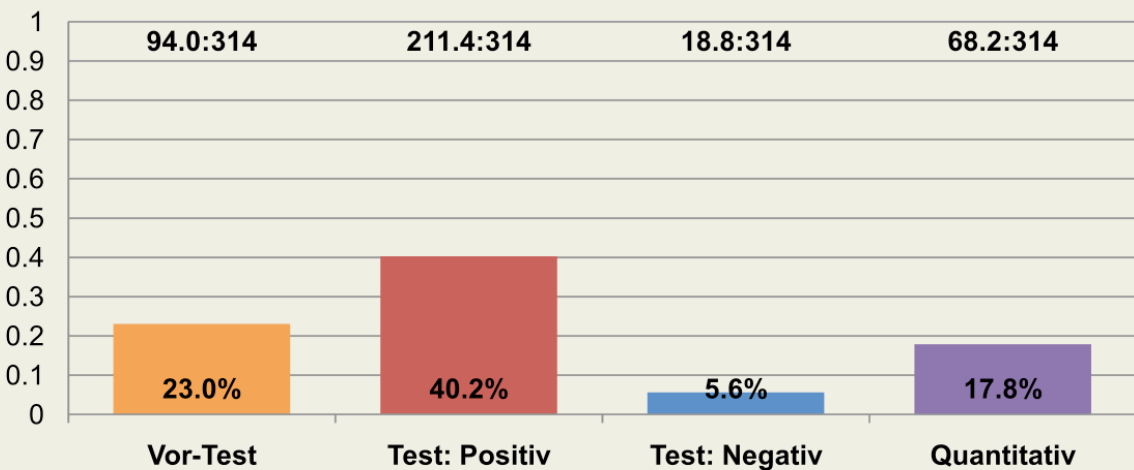
Odds 94 : 314
94 : 314

Sensitivität (Richtig-Positiv-Rate)

ROC



Odds und Wahrscheinlichkeiten

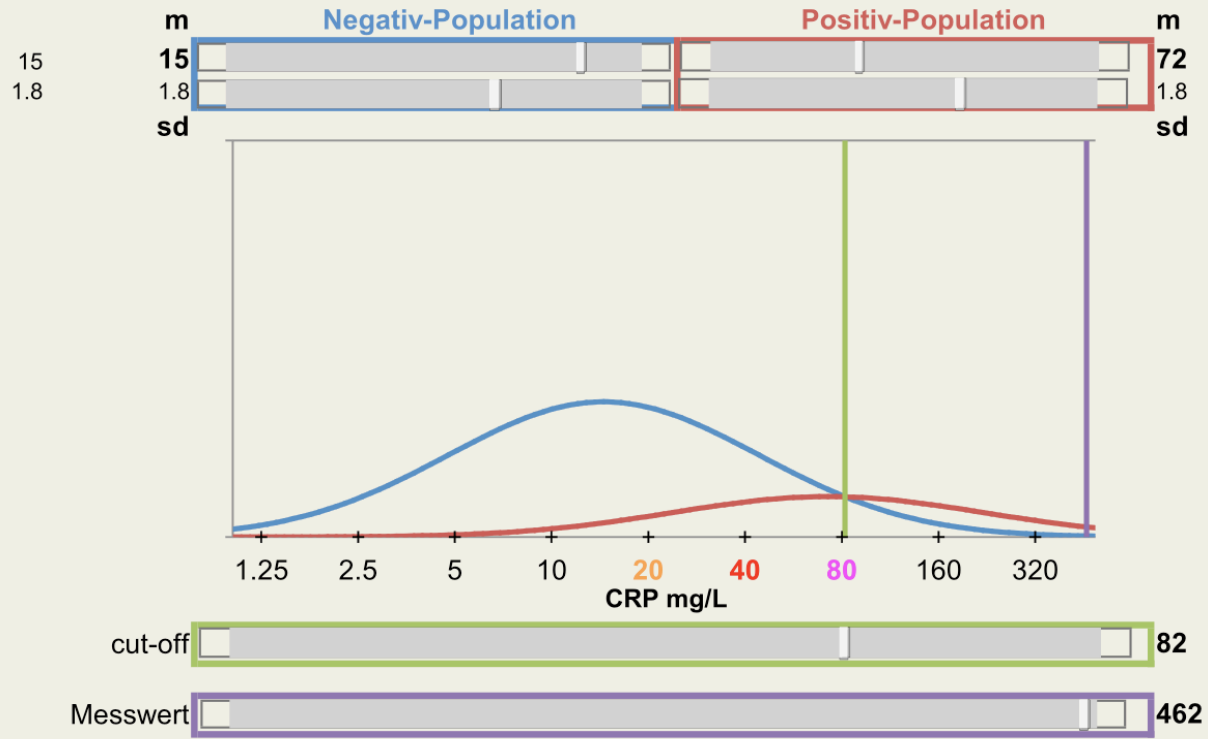
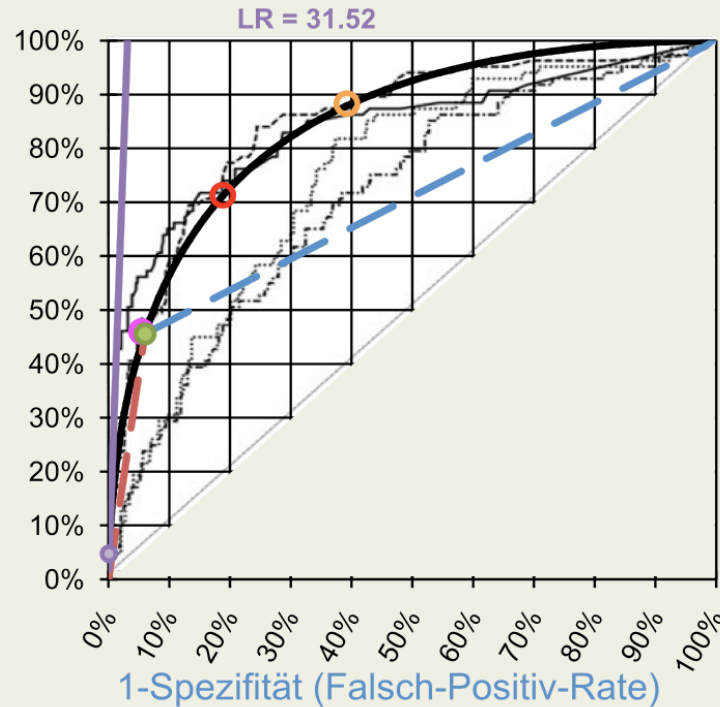


Odds 94 : 314
 94 : 314

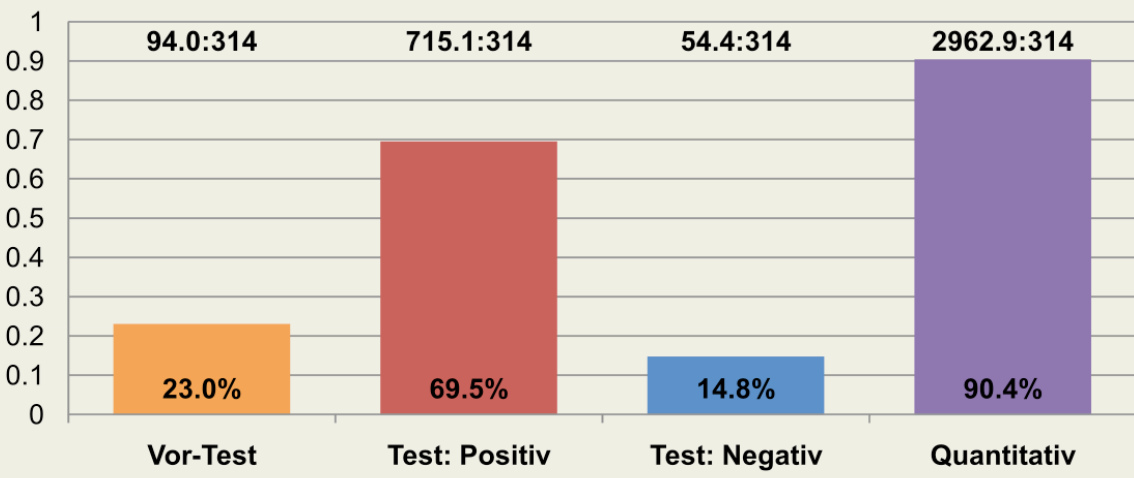
	qualitativ	quantitativ	CRP			
			20 mg/L	40 mg/L	80 mg/L	
Sensitivität	88%		39.2%	88%	71%	46%
Spezifität	61%		61%	81%	95%	
PPV	40%					
NPV	94%					
LR+	2.2		2.3	3.8	8.7	
LRq		0.7				
LR-	0.20		0.19	0.35	0.54	

Sensitivität (Richtig-Positiv-Rate)

ROC



Odds und Wahrscheinlichkeiten



Odds 94 : 314
94 : 314

	qualitativ	quantitativ	CRP		
			20 mg/L	40 mg/L	80 mg/L
Sensitivität	46%		88%	71%	46%
Spezifität	94%		61%	81%	95%
PPV	69%				5.4%
NPV	85%				
LR+	7.6		2.3	3.8	8.7
LRq		31.5			
LR-	0.58		0.19	0.35	0.54