Hellenic Complex Systems Laboratory

Calculator for Diagnostic Accuracy Measures

Technical Report XIII

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WOLFRAM Demonstrations Project

Calculator for Diagnostic Accuracy Measures

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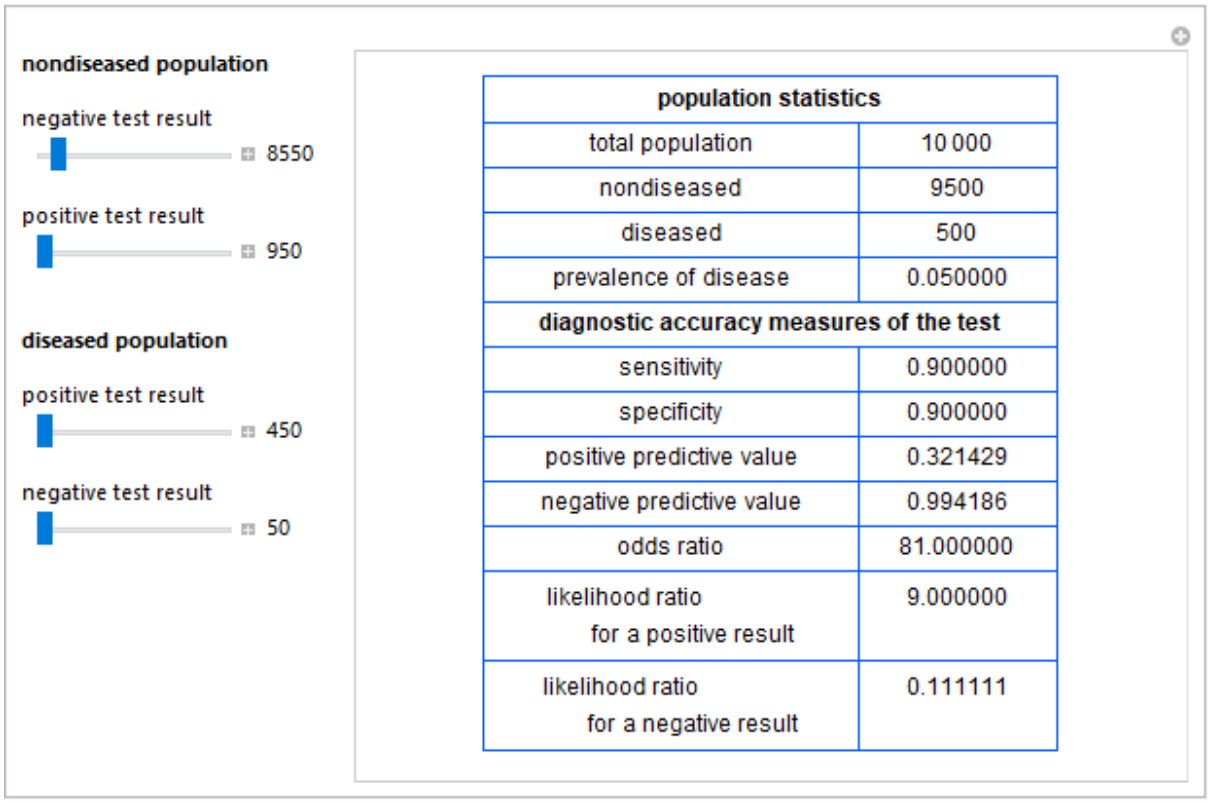
Search Terms: sensitivity, specificity, diagnostic test, clinical accuracy, diagnostic accuracy, positive predictive value, negative predictive value, likelihood ratio, odds ratio

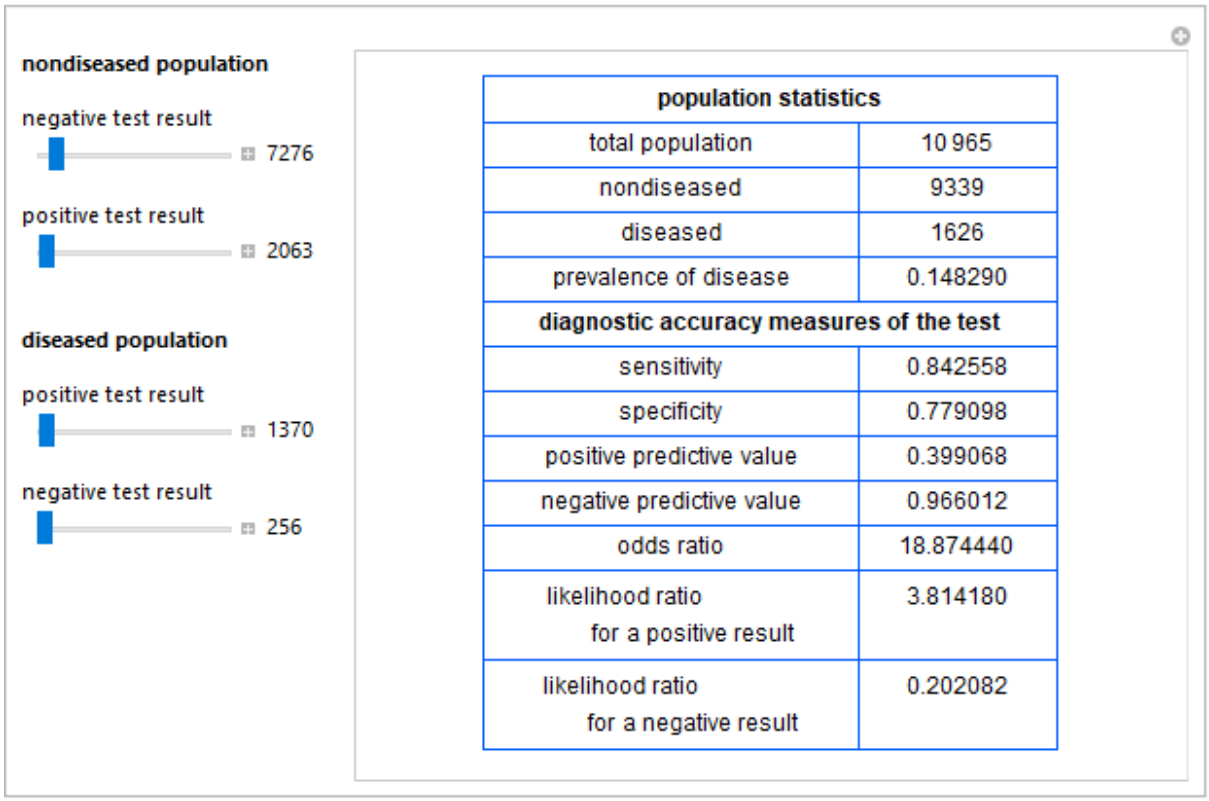
Short Description of the Demonstration

This Demonstration calculates various accuracy measures of a diagnostic test for a disease. This is done for differing negative and positive test results of nondiseased and diseased populations. The measures calculated are the sensitivity, the specificity, the positive predictive value ("PPV"), the negative predictive value ("NPV"), the (diagnostic) odds ratio ("OR"), the likelihood ratio for a positive test result ("LR+"), and the likelihood ratio for a negative test result ("LR-"). The negative and positive test results of the nondiseased and diseased populations are selected using the sliders.



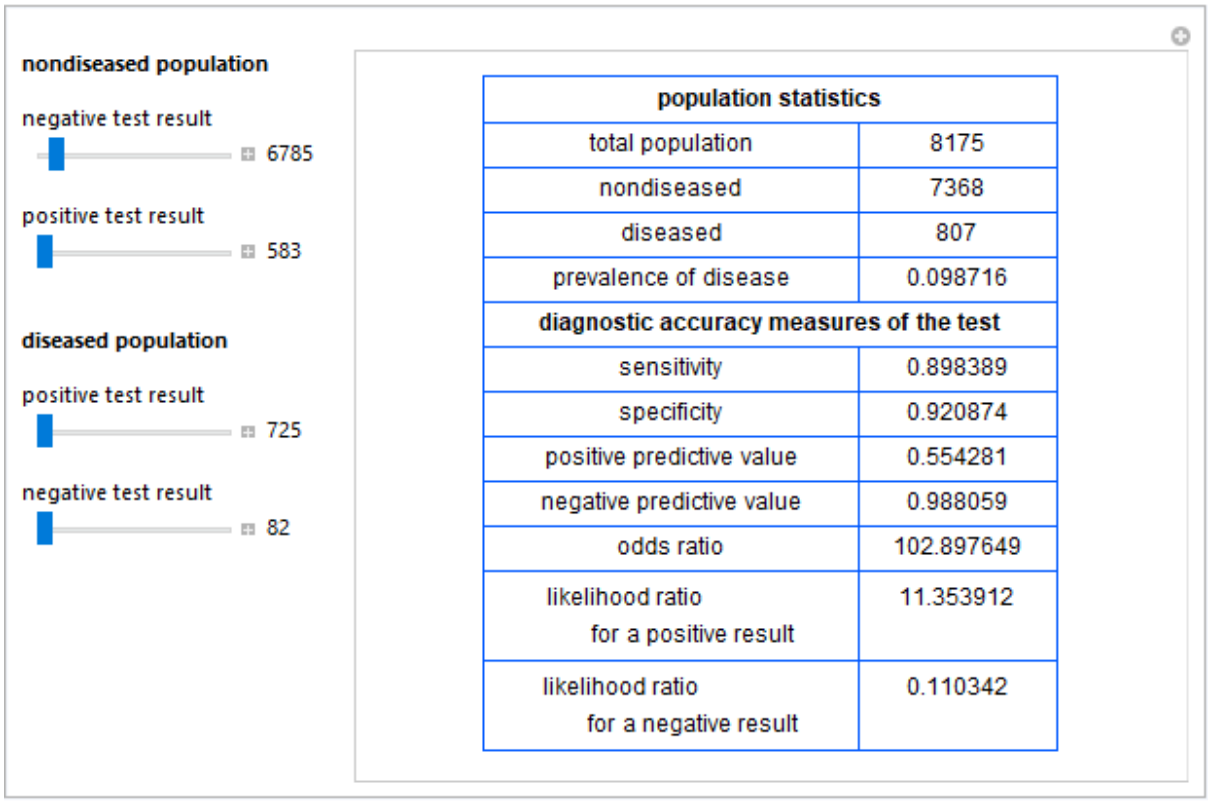
population statistics	
total population	10 000
nondiseased	9500
diseased	500
prevalence of disease	0.050000
diagnostic accuracy measures of the test	
sensitivity	0.900000
specificity	0.900000
positive predictive value	0.321429
negative predictive value	0.994186
odds ratio	81.000000
likelihood ratio for a positive result	9.000000
likelihood ratio for a negative result	0.111111

Figure 1: *Population statistics and diagnostic accuracy measures of a diagnostic test, with the settings shown at the left.*



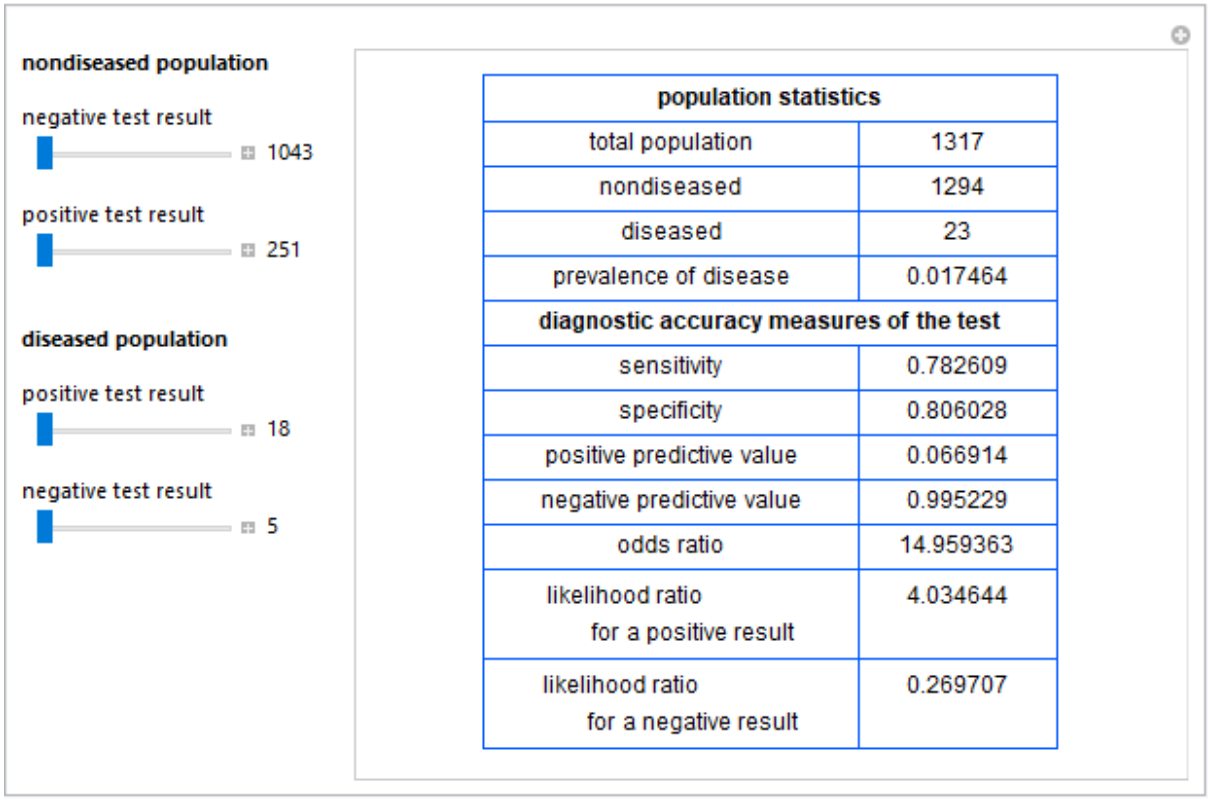
population statistics	
total population	10 965
nondiseased	9339
diseased	1626
prevalence of disease	0.148290
diagnostic accuracy measures of the test	
sensitivity	0.842558
specificity	0.779098
positive predictive value	0.399068
negative predictive value	0.966012
odds ratio	18.874440
likelihood ratio for a positive result	3.814180
likelihood ratio for a negative result	0.202082

Figure 2: *Population statistics and diagnostic accuracy measures of a diagnostic test, with the settings shown at the left.*



population statistics	
total population	8175
nondiseased	7368
diseased	807
prevalence of disease	0.098716
diagnostic accuracy measures of the test	
sensitivity	0.898389
specificity	0.920874
positive predictive value	0.554281
negative predictive value	0.988059
odds ratio	102.897649
likelihood ratio for a positive result	11.353912
likelihood ratio for a negative result	0.110342

Figure 3: *Population statistics and diagnostic accuracy measures of a diagnostic test, with the settings shown at the left.*



population statistics	
total population	1317
nondiseased	1294
diseased	23
prevalence of disease	0.017464
diagnostic accuracy measures of the test	
sensitivity	0.782609
specificity	0.806028
positive predictive value	0.066914
negative predictive value	0.995229
odds ratio	14.959363
likelihood ratio for a positive result	4.034644
likelihood ratio for a negative result	0.269707

Figure 4: *Population statistics and diagnostic accuracy measures of a diagnostic test, with the settings shown at the left.*

Details

Sensitivity is the fraction of the diseased population with a positive test result, while specificity is the fraction of the nondiseased population with a negative test result. Positive predictive value is the fraction of the population with a positive test result that is diseased, while negative predictive value is the fraction of the population with a negative test result that is nondiseased. Prevalence of the disease is the ratio of the diseased population to the total (nondiseased and diseased) population. If we denote by $sens$ the sensitivity, $spec$ the specificity, and pr the prevalence, we have:

$$OR = \frac{\frac{sens}{1 - sens}}{\frac{1 - spec}{spec}}$$

$$LR+ = \frac{sens}{1 - spec}$$

$$LR- = \frac{1 - sens}{spec}$$

The Demonstration is appropriate as an educational tool for medical students.

Source Code

The updated Wolfram Mathematica© source code is available at:
https://www.hcsl.com/Tools/CalculatorForDiagnosticAccuracyMeasures-author.nb

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