

The influence of uncertain knowledge about the true classification of evaluation samples on the characterization of imperfect diagnostic tests

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Epidemiological parameters are often determined by stochastic models, whereby it is assumed, that the measured values used in the model correspond exactly to the true situation. In practice, this assumption is not always fulfilled, especially, if complex diagnostic methods are used for producing large numbers of measured values. Uncertainties and errors in results of diagnostic techniques must be quantified and have to be considered in the above-mentioned models. To this end, it is necessary to characterize the diagnostic test methods in respect to their corresponding error rates. Sensitivity and specificity are established parameters that allow as probability values the required theoretical characterization of diagnostic tests. In principle, both parameters do not depend on each other, as they are defined for non-infected and disjoint infected sub-populations. However, the practical determination of sensitivity and specificity of diagnostic tests is often associated with the following problem: The required prior knowledge of the elements membership in evaluation samples used for test evaluation in non-infected or infected is uncertain for certain diseases. As a consequence of the diagnostic results obtained by evaluation samples implies, that the estimation of both sensitivity and specificity is not independent. General Task: to find a solution for estimating sensitivity and specificity in a situation where samples used for diagnostic test evaluation cannot unambiguously be attributed to non-infected or infected populations. The correlation between the two characterizing parameters is shown in an example which investigates the impact of the uncertainty in the classification of evaluation samples on estimating the test parameters sensitivity and specificity.