

# Improved rapid diagnostic tests to detect syphilis and yaws: a systematic review and meta-analysis

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**Background:** Rapid tests to support the diagnosis of active infection of syphilis and yaws have been developed. We aimed to synthesize data on the accuracy of these rapid diagnostic tests (RDTs) that can detect treponemal and non-treponemal antibodies. Secondary outcomes include feasibility, usability, acceptability of the RDTs, testing uptake and cost-effectiveness.

**Methods:** We conducted a systematic review and meta-analysis, searching five databases between January 2010 and October 2021 (with an update in July 2022). A generalised linear mixed model was used to conduct a bivariate meta-analysis for the pooled sensitivity and specificity. Heterogeneity was assessed using the  $I^2$  statistic. We used QUADAS to assess the risk of bias and GRADE to evaluate the certainty of evidence.

**Results:** We identified 750 potentially relevant studies and included 17 studies for analysis. For syphilis, the pooled sensitivity and specificity of the treponemal component (using a laboratory-based reference test) was 0.93 (95%CI:0.86–0.97) and 0.98 (95%CI:0.96–0.99), respectively. For the nontreponemal component, the pooled sensitivity and specificity was 0.90 (95%CI:0.82–0.95) and 0.97 (95%CI:0.92–0.99), respectively. For yaws, the pooled sensitivity and specificity of the treponemal component was 0.86 (95%CI:0.66–0.95) and 0.97 (95%CI:0.94–0.99), respectively. For the nontreponemal component, the pooled sensitivity and specificity was 0.80 (95%CI:0.55–0.93) and 0.96 (95%CI:0.92–0.98), respectively. Healthcare workers and clients viewed RDTs as acceptable and feasible. The usability of RDTs varied, with some studies recommending digital readers to improve test accuracy.

**Conclusion:** We found that current RDTs for syphilis and yaws had slightly lower sensitivity but a very high specificity than laboratory-based testing. With such performance, these RDTs can support differentiating between active and previously-treated infections and thus could reduce time to treatment, lost-to-follow-up, over-treatment and improve cost-effectiveness. With targeted implementation and scale-

up these tests can potentially decrease the incidence of both adult and congenital syphilis and contribute to the global eradication of yaws.

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