

1 **On-site test to detect syphilis in pregnancy: a systematic review of test accuracy studies**

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13

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46

47 **Abstract**

48 **Background** Syphilis in pregnancy can lead to fetal and neonatal death or congenital
49 anomalies. Accurate on-site tests are an essential part of effective prevention of mother-to-
50 child transmission of the disease.

51 **Objective** This systematic review assessed the accuracy of the on-site tests to detect infection
52 with *Treponema pallidum* in pregnant women.

53 **Search strategy** Major databases were searched from inception to January 2016 using terms:
54 “pregnancy”, “antenatal”, “syphilis”, “*Treponema pallidum*” with their variations, and the
55 search limit for the relevant study design.

56 **Selection criteria** We included studies that used dual reference standard (non-treponemal and
57 treponemal tests) to detected syphilis in pregnancy.

58 **Data collection and analysis** Extracted accuracy data were tabulated and pooled using
59 hierarchical, bivariate random effects model.

60 **Main results** Seven studies (combined sample 17,546) reporting the accuracy of four on-site
61 tests met the eligibility criteria. On average, Determine™ and SD BioLine Syphilis 3.0 had
62 the highest sensitivity out of all evaluated tests 0.83 (95% CI 0.58, 0.98) and 0.86 (95% CI
63 0.82, 0.89), respectively with a high specificity 0.96 (95% CI 0.89, 1.00) and 0.99 (95% CI
64 0.94, 1.00), respectively. Qualitative Rapid Plasma Reagin card commonly used in clinical
65 practice had a pooled sensitivity of 0.70 (95% CI 0.54, 0.88) and specificity of 0.97 (95% CI
66 0.96, 0.99).

67 **Conclusion** Immunochromatographic tests such as Determine and SD BioLine Syphilis 3.0
68 seem to be acceptable options in antenatal testing for syphilis, especially in resource-limited
69 settings. Future research should seek more evidence to strengthen this claim.

70 **Keywords** Syphilis, Antenatal care, Test accuracy, On-site test

71 **Tweetable abstract** On-site test to detect syphilis - options during antenatal care

72 **Introduction**

73 Syphilis, a sexually transmitted infection caused by the bacterium *Treponema pallidum*
74 (*T.pallidum*), is endemic throughout the developing world.(1) Infection until one year is
75 classified as early syphilis, and after one year as late syphilis. The initial manifestation of the
76 disease can be easily overlooked and progress to the secondary stage which if undiagnosed
77 and consequently non-treated leads to a period of latency with no visible signs of the disease.
78 The infection is most commonly transmitted through sexual intercourse, and it can also be
79 passed from mother to a child; in utero or during birth.

80

81 Transmission of the infection had been linked with the birth of children with reactive
82 serology, long-term congenital abnormalities, miscarriages, and fetal and neonatal deaths.
83 (1,2) The World Health Organization (WHO) estimated that in 2008 around 1.36 million
84 pregnant women were expected to have an active form of syphilis. Without any screening or
85 treatment in place these women would have experienced, overall, more than 700,000 adverse
86 outcomes where more than half would be fetal or neonatal deaths.(3)

87

88 In order to prevent mother-to-child transmission of syphilis WHO advocates screening of all
89 pregnant women antenatally and treating those identified with the disease and their
90 partners.(4) The ideal Point-Of-Care (POC) test should be affordable, sensitive, specific, user-
91 friendly, rapid and robust, equipment free, and deliverable to those who need them.

92 Development of POC test has made syphilis testing more accessible especially in low-
93 resource settings, as lengthy and skilled laboratory testing can be avoided.(5)

94 Immunochromatographic tests or the on-site Rapid Plasma Reagin cards performed on-site
95 give healthcare professionals an opportunity to administer treatment immediately and prevent
96 the transmission of the disease.(6)

97

98 According to reviews assessing the accuracy of the immunochromatographic POC treponemal
99 tests (7,8) they offer an alternative to laboratory-based diagnosis in resource-limited settings.
100 However, none of the reviews focuses solely on pregnant women or compare the
101 immunochromatographic with commonly used in clinics qualitative Rapid Plasma Reagin
102 card which is not an ideal gold standard.(9) Our focus was to synthesise the accuracy of on-
103 site tests used in antenatal care settings to detect syphilis using an established algorithm as a
104 reference standard.(10)

105

106 **Methods**

107 We conducted the review and reported our findings in compliance with the current
108 guidelines.(11) We searched Medline, Embase, Web of Science, Scopus, and Lilacs with no
109 language restrictions. The original search run from inception to February 2015 was updated in
110 January 2016 (Figure 1). The literature search strategy combined clinical terms such as
111 ‘Pregnancy’, ‘Antenatal’, ‘Gestation’, ‘Treponema pallidum’ and ‘Syphilis’ with a filter for
112 test accuracy studies.(12) The detailed search strategy is available in Appendix S1.

113

114 *Study selection*

115 Two independent reviewers (ER and LKN) screened references and then full text of
116 potentially relevant articles. The study had to meet following eligibility criteria: recruit
117 pregnant women without symptoms of syphilis (chancre, rash); use as a double reference
118 standard comprising of non-treponemal (the Rapid Plasma Reagin test or venereal disease
119 research laboratory (VDRL)) followed by treponemal test (treponema pallidum
120 haemagglutination assay (TPHA), fluorescent treponemal antibody-absorbed (FTA-Abs) or
121 the treponema pallidum particle agglutination (TPPA) test). Diagnosis of recently contracted
122 infection with *T.palladium* was defined as a positive result on both treponemal and non-
123 treponemal test.(13)

124

125 We excluded studies in which the population showed symptoms of syphilis, women in labour
126 and studies where reference standard was only a treponemal or non-treponemal test. We
127 excluded studies with a case-control design and those where it was not possible to calculate
128 True Positives, False Positives, False Negatives and True negatives. At each stage of the
129 review process, the consensus was reached through a discussion. In the case of a stalemate,
130 the opinion of a third reviewer's was sought (KSK). We did not attempt to contact the study
131 authors for any further information.

132

133 *Data extraction and study quality assessment*

134 All relevant data from included studies were extracted to a standardized, and pre-piloted form.
135 Information about the country, settings, women's characteristics, type of index test and
136 reference standard, and type of collected blood sample were extracted and tabulated. We
137 classified the countries where the studies were conducted by their income following the
138 World Bank ranking.(14)

139

140 The quality of each included study was assessed by two review authors (ER, LKN) using the
141 QUADAS-2 tool.(15) The risk of bias was evaluated for participants' selection, use and
142 interpretation of index test and reference standard, and participants flow and timing. First
143 three aspects were also evaluated in the context of applicability to the review question. The
144 review authors classified each item as "low" (sufficiently addressed), "high" (insufficiently
145 addressed), or "unclear" (insufficient detail presented to allow judgment to be made) risk of
146 bias. We considered a study to be of low risk of bias if; the patients were selected
147 consecutively or randomly, the index and reference standard tests were correctly implemented,
148 and all patients received the reference standard tests.

149

150 *Data synthesis*

151 To construct two-by-two tables we extracted true positive, false positive, true negative, and
152 false negative results or recalculated the numbers from available parameters (sensitivity,
153 specificity, positive predictive value and negative predictive value). All analyses were
154 performed using STATA version 12.1 (College Station, TX: StataCorp LP). Sensitivity,
155 specificity, likelihood ratios for positive and negative test result and 95% confidence intervals
156 (CIs) were computed for all individual studies. Where we had a sufficient number of studies
157 (more than four), we pooled the accuracy parameters using hierarchical, bivariate, random
158 effects model using the multilevel mixed logistic regression model as implemented by
159 *metandi* command.(16) For meta-analysis with less than four studies, we pooled accuracy of
160 sensitivity and specificity, and likelihood ratios separately using *metaprop* and *metan*
161 commands, respectively. Between-study heterogeneity of studies was assessed graphically
162 evaluating forest plots for sensitivity and specificity. Publication bias was not assessed due to
163 lack of consensus over the reliability of currently available methods.(17,18)

164

165 **Results**

166 The database searches retrieved 2,045 relevant citations; additional eight records were
167 identified through the reference check. Out of 59 potentially relevant articles evaluated by
168 their full text, seven publications met the eligibility criteria (Figure 1). A detailed list of
169 excluded studies with reasons for their exclusion can be found in Table S1.

170

171 *Characteristics of included studies*

172 Eligible studies recruited combined number of 17,546 pregnant women. The prospective
173 studies were published between 1993 and 2015, with seroprevalence of syphilis ranging from
174 1 - 11%. In three publications authors didn't mention in the text whether women were
175 previously treated for syphilis,(19-21) one excluded this group (22), and in the remaining

176 studies around 7% of participants were previously diagnosed with syphilis.(23-25) Included
177 publications reported accuracy data of three immunochromatographic tests: Determine™
178 (Abbott Laboratories, Chicago, USA), SD BioLine Syphilis 3.0 (Standard Diagnostics Inc.,
179 Republic of Korea), VisiTect Syphilis (Omega Diagnostics, Alloa, Scotland) and the
180 qualitative Rapid Plasma Reagin card (multiple manufacturers). The majority of studies
181 recruited women in hospital settings,(19,20,22,23,25) one in primary care (24) and one in the
182 general health centre (21). Three studies were conducted in upper-middle income countries,
183 two in lower-middle income countries and two studies were in low-income countries (Table
184 1). All studies used fresh blood samples.

185

186 *Quality assessment*

187 Six out of seven studies had an unclear risk of bias for the sample selection due to a lack of
188 information about the selection process. The majority of studies were assessed as low risk of
189 bias for the implementation of the reference standard and all for the index test. The bias for
190 flow and timing was unclear in two studies due insufficient level of information (Table 2).
191 One study (25) was classified as of high concern over applicability in sample selection as it
192 reports physical examination findings of participants (Table 2). There was no overall concern
193 applicability of included studies in terms of index test and applied reference standard.

194

195 *Accuracy of immunochromatographic tests*

196 Two studies (20,24) with a combined sample size of 9,587 women reported accuracy data of
197 the Determine™ test. Pooled sensitivity and specificity of the Determine™ were 0.83 (95%
198 CI 0.58, 0.98) and 0.96 (95% CI 0.89, 1.00), respectively with likelihood ratio for the positive
199 test of 24.88 (95% CI 4.19, 147.57), and for a negative test result of 0.16 (95% CI 0.04, 0.66).
200 Two studies (22,25) reported the data on the accuracy of the SD BioLine Syphilis 3.0. Pooled
201 sensitivity from those studies was of 0.86 (95% CI 0.82, 0.89), and sensitivity of 0.99 (95%

202 CI 0.94, 1.00). The likelihood ratio for the positive and negative test result was 54.87 (95% CI
203 6.52, 461.65) and 0.15 (95% CI 0.12, 0.20), respectively. The accuracy of the third test,
204 VisiTect Syphilis, was reported in one study of 712 women. (23) The sensitivity of VisiTect
205 was 0.63 (95% CI 0.31, 0.86) and specificity 0.98 (95% CI 0.97, 0.99).

206

207 *Qualitative Rapid Plasma Reagin card*

208 The qualitative Rapid Plasma Reagin test was used as an index test in five studies. (19-
209 21,23,25) Pooled sensitivity was 0.70 (95% CI 0.50, 0.84) and pooled specificity 0.97 (95%
210 CI 0.96, 0.98). The derived likelihood ratio of the positive test result was 27.07 (95% CI
211 15.39, 47.61) and the negative result of 0.31 (95%CI 0.17, 0.56). There was visible greater
212 heterogeneity between sensitivity estimates than specificity with the 95% predictive region
213 covering less than one-third of the operating space (Figure S1). The accuracy parameters of
214 all evaluated tests have been collated and summarised in Table 3. The numbers used to
215 calculate the parameters are available in Table S2.

216

217 **Discussion**

218 *Main findings*

219 SD BioLine Syphilis 3.0 test had, on average, the highest sensitivity out of all evaluated
220 immunochromatographic tests, and visibly higher sensitivity than qualitative Rapid Plasma
221 Reagin card. Specificity did not differ significantly between the identified tests.

222

223 *Strengths and limitations*

224 This systematic review was conducted using following current methodological standards.(11)
225 The use of search limit for test accuracy studies (12), was a pragmatic choice. The search
226 without the limit had too-broad approach to be practicable. Even though, we identified the
227 majority of studies with antenatal population included in the previous reviews and two

228 additional ones (19,22) the overall number of studies available for the analyses was small.
229 The bivariate analysis was possible only for the RPR card, yet its findings are weakened by a
230 visible heterogeneity of sensitivity parameters between the individual studies.

231

232 Test accuracy studies are prone to numerous sources of bias due to patients' selection and
233 retention in the study, implementation of the index test and reference standard. In our review,
234 we managed to limit spectrum bias by excluding studies with case-control design. However,
235 the majority of included studies failed to describe recruitment method and inclusion criteria.

236

237 The risk of bias and concern over the applicability of the index tests and reference standards
238 were generally low. Ideally, the reference standard and the index test should be entirely
239 independent of each other.(26) This was true for the immunochromatographic test, yet the
240 lab-based confirmatory algorithm for the qualitative Rapid Plasma Reagin card had as its non-
241 treponemal component quantitative Rapid Plasma Reagin test. This raises concern over an
242 incorporation bias (26), however, the extent to which use of the Rapid Plasma Reagin test as a
243 part of gold standard could distort the results is unclear, and couldn't be avoided due to
244 studies' design.

245

246 The average prevalence of double reactive sera in studies evaluating the accuracy of
247 Determine™, SD BioLine Syphilis 3.0, VisiTECT Syphilis and the qualitative Rapid Plasma
248 Reagin card were 4.0%, 8.2%, 1.1% and 5.7%, respectively. This level of prevalence is higher
249 than the global prevalence of the disease among antenatal care attendee and in some cases
250 (South Africa or Senegal) even significantly higher than in the countries where the studies
251 were conducted.(27) By definition, sensitivity and specificity do not depend on the disease
252 prevalence. However, their parallel variability can occur due to clinical or artefactual
253 mechanisms.(28) Clinicians before drawing any conclusion basing on the accuracy findings

254 should be very clear about the clinical question they want to address. The diversity of the
255 prevalence, statistical methods used to pool the data and the quality of reporting impacts the
256 generalisability of presented findings.

257

258 The timely delivery of treatment during prenatal period alters the risk of adverse outcomes
259 due to syphilis infection. (29) In order to optimise the applicability of our findings to the
260 context of antenatal care, we defined a clear research question. We focused solely on pregnant
261 women during the perinatal period. We looked for the immunochromatographic, in detecting
262 double positive sera to non-treponemal and treponemal components of the reference standard.

263

264 *Interpretation*

265 Two previous reviews address the issue of accuracy of the rapid, on-site testing using
266 different methods of data synthesis.(7,8) The first review found that the
267 immunochromatographic tests have a high sensitivity and higher specificity comparable with
268 parameters of non-treponemal.(8) In systematic review with Bayesian approach to data
269 synthesis the Determine test had the highest sensitivity when comparing with *T.palladium*
270 specific reference standard. However, the authors admitted in their work that due to applied
271 methodology the values of sensitivity were overestimated.(7) Both reviews included women
272 tested in antenatal care settings, including women in labour, and focusing on the accuracy and
273 value of the immunochromatographic test in rapid testing for syphilis.

274

275 Similar to the previous reviews (7, 8), the immunochromatographic tests were characterised
276 by high sensitivity and specificity. Additionally, their average sensitivity was higher than for
277 the qualitative Rapid Plasma Reagin on-site card (except VisiTech Syphilis) with the average
278 specificity comparable between all the tests. The immunochromatographic tests are
279 comparable in cost (8) and easier to operate than Rapid Plasma Reagin card (21,24) what

280 makes them less prone to an operator error. The average cost in low resource settings is U.S.
281 \$0.91 and U.S. \$1.05 for the RPR and ICS tests. (8) Nonetheless, their reliability depends on
282 the background proportion of women with past-treated infection who may still test as positive,
283 and consequently be treated unnecessarily. Furthermore, the tests can also give a positive
284 result in various non-venereal treponematoses such as yaws and pinta, these would be
285 considered false positive results and are preferred to false negative results and there is greater
286 benefit in over-treating all patients with positive results as opposed to the alternative.

287

288 In the high-prevalence settings (assumed 11%) around 9% of all positive tests with SD
289 BioLine Syphilis 3.0 would be falsely positive in contrast to 21 – 28% with the other
290 immunochromatographic tests or the Rapid Plasma Reagin card. The proportion of potentially
291 missed cases would be 2% for SD BioLine Syphilis 3.0 and Determine™, and 4% for
292 VisiTech and Rapid Plasma Reagin card. Syphilis in pregnancy is effectively treated with
293 penicillin with benzathine penicillin remaining the first-line therapy for early syphilis. (30)
294 The treatment is administered by intramuscular injection and requires three large doses once
295 weekly for three weeks. This requires patients to return to health care services for each dose
296 which may prove difficult in rural settings. With no cases of antibiotic resistance reported so
297 far (31) prevention of mother-to-child transmission of the disease is more important than
298 overtreatment.

299

300 **Conclusion**

301 Our systematic review adds to the current body of evidence on the accuracy of the rapid and
302 Point-of-Care test to detect infection with *T.palladium* in the context of the antenatal care.
303 Future test accuracy studies should aim to improve reporting of their findings and directly
304 compare the accuracy of available tests controlling for the confounders.

305

306 When testing antenatally for syphilis immunochromatographic tests such as Determine™
307 and SD BioLine Syphilis 3.0 seem to be acceptable options. However, future research is
308 needed to provide more evidence to strengthen this claim.

309

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314

315 **Contribution to Authorship**

316 ER selected eligible texts, data extraction form, extracted data, wrote the protocol, cleaned
317 and analysed the data, drafted and revised the manuscript. LKN selected eligible texts,
318 extracted data, and drafted and revised the manuscript. JZ supervised statistical analysis and
319 revised the manuscript. KSK resolved discrepancies between reviewers and revised the
320 manuscript.

321 **Declaration of interest**

322 The authors report no conflict of interest. The ICMJE disclosure forms are available as online
323 supporting information.

324 **Details of ethics approval**

325 Ethical approval was not required for this project.

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329

330

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418
419

420 **Legends**

421 **Figure 1** Study selection diagram

422 **Table 1** Characteristics of studies of on-site tests to detect syphilis among pregnant women

423 **Table 2** Quality assessment of included studies using QUADAS-2 tool

424 **Table 3** Accuracy of tests to detect syphilis among pregnant women

425

426 **Supporting Information**

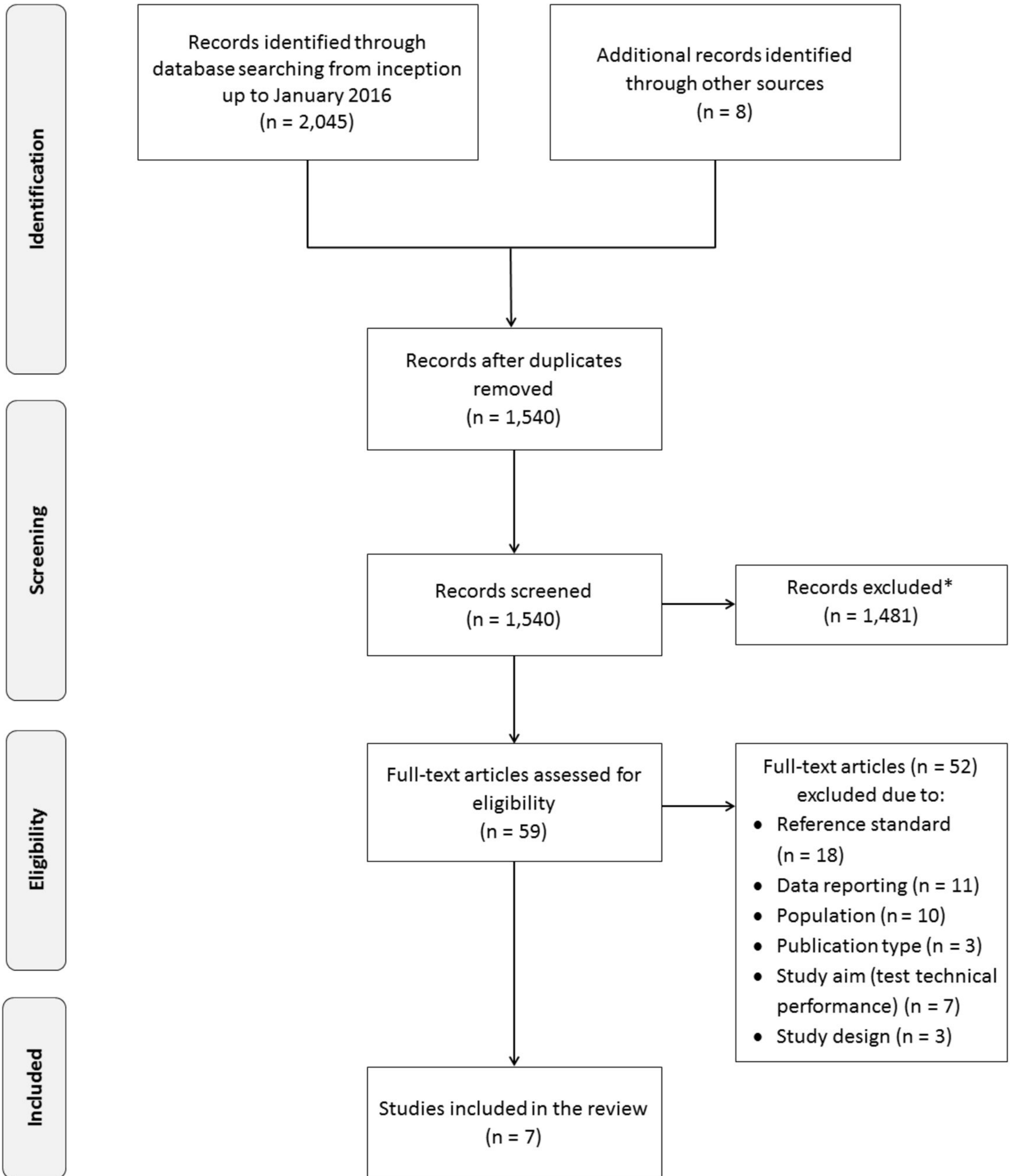
427 **Figure S1** Summary Point in Receiver Operating space for qualitative Rapid Plasma Reagin
428 card

429 **Appendix S1** Search Strategy for Medline 15th January 2015 (updated 11th January 2016)

430 **Table S1** List of excluded full text articles with reasons for exclusion

431 **Table S2** Test accuracy data extracted from included studies

432



**full text of nine papers was not available for the assessment*

Table 1 Characteristics of studies of on-site tests to detect syphilis among pregnant women

| Study ID | Country | Settings | Sample size | Reference standard | | Type of the index test | Index test | Type of blood sample | Sero-prevalence* (95% CI) |
|----------------|--------------|---------------------|-------------|--------------------|----------------|---------------------------|------------------------|----------------------|---------------------------|
| Benzaken 2011 | Brazil | Antenatal clinic | 712 | VDRL | FTA-Abs | Treponemal test - ICS | VisiTest Syphilis test | Whole blood | 0.01 (0.01, 0.02) |
| Bronzan 2007 | South Africa | Primary Care clinic | 1,250 | Quantitative RPR | TPHA | Treponemal test - ICS | Determine™ | Whole blood | 0.06 (0.05, 0.08) |
| | | | | | | Non-treponemal test - RPR | Qualitative RPR card | Whole blood | |
| Delport 1993 | South Africa | Antenatal clinic | 1,237 | Quantitative RPR | TPHA | Non-treponemal test -RPR | Qualitative RPR card | Plasma | 0.07 (0.05, 0.08) |
| Kashyap 2015 | India | University Hospital | 200 | VDLR | TPHA | Treponemal test - ICS | SD BioLine Syphilis | Serum | 0.02 (0.01, 0.05) |
| Montoya 2006 | Mozambique | Antenatal clinic | 4,789 | Quantitative RPR | TPHA | Treponemal test - ICS | SD BioLine Syphilis | Whole blood | 0.08 (0.08, 0.09) |
| | | | | | | Non-treponemal test - RPR | Qualitative RPR card | Whole blood | |
| Tinajeros 2006 | Bolivia | Maternity Hospital | 8,892 | Qualitative RPR | TPPA | Treponemal test - ICS | Determine™ | Whole blood | 0.04 (0.03, 0.04) |
| | | | | | | Non-treponemal test - RPR | Qualitative RPR card | Serum | |
| Van Dyck 1993 | Senegal | Health Centre | 466 | Quantitative RPR | TPHA/FTA-Abs** | Non-treponemal test - RPR | Qualitative RPR card | Whole blood | 0.11 (0.08, 0.14) |

*reactive both non-treponemal and treponemal tests; ** on discordant samples

RPR - Rapid Plasma Reagin

ICS - Immunochromatographic strip

FTA-Abs - Fluorescent treponemal antibody absorption

TPHA - Treponema pallidum hemagglutination assay

TPPA - Treponema pallidum particle agglutination assay

VDRL - Venereal disease research laboratory

Table 2 Quality assessment of included studies using QUADAS-2 tool

| QUADAS | Risk of bias | | | | Concern over applicability | | |
|-----------------|-------------------------|-------------------|---------------------------|------------------------|-----------------------------------|-------------------|---------------------------|
| Study ID | Sample selection | Index test | Reference standard | Flow and timing | Sample selection | Index test | Reference standard |
| Benzaken 2011 | Low | Low | Low | Low | Unclear | Low | Low |
| Bronzan 2007 | Unclear | Low | Low | Low | Unclear | Low | Low |
| Delpont 1993 | Unclear | Low | Low | Unclear | Unclear | Low | Low |
| Kashyap 2015 | Unclear | Low | Unclear | Low | Low | Low | Low |
| Montoya 2006 | Unclear | Low | Low | Low | High | Low | Low |
| Tinajeros 2006 | Unclear | Low | Low | Unclear | Unclear | Low | Low |
| Van Dyck 1993 | Unclear | Low | Low | Low | Unclear | Low | Low |

Table 3 Accuracy of tests to detect syphilis among pregnant women

| Index test | Study ID | Reactive/ Non-reactive | Sensitivity (95%CI) | Specificity (95%CI) | Likelihood ratio for a positive test result (95%CI) | Likelihood ratio for a negative test result (95%CI) |
|---|-----------------------------|---------------------------|--------------------------|--------------------------|---|---|
| Determine | Tinajeros 2006 | 342/8,850 | 0.92 (0.88, 0.95) | 0.99 (0.98, 0.99) | 61.33 (51.49, 73.04) | 0.08 (0.06, 0.12) |
| | Bronzan 2007 [^] | 44/651 | 0.70 (0.56, 0.82) | 0.93 (0.91, 0.95) | 9.97 (7.11, 13.98) | 0.32 (0.20, 0.50) |
| | Pooled estimates | 386/9,201 | 0.83 (0.58, 0.98) | 0.96 (0.89, 1.00) | 24.88 (4.19, 147.57) | 0.16 (0.04, 0.66) |
| SD BioLine Syphilis 3.0 | Montoya 2006 | 381/4,105 | 0.86 (0.82, 0.89) | 0.97 (0.96, 0.97) | 26.41 (22.23, 31.37) | 0.15 (0.12, 0.19) |
| | Kashyap 2015 | 4/196 | 0.75 (0.30, 0.95) | 1.00 (0.98, 1.00) | 275.80 (16.32, 4660.18) | 0.30 (0.08, 1.15) |
| | Pooled estimates | 385/4,301 | 0.86 (0.82, 0.89) | 0.99 (0.94, 1.00) | 54.87 (6.52, 461.65) | 0.15 (0.12, 0.20) |
| VisiTech Syphilis | Benzaken 2011 ^{^^} | 8/704 | 0.63 (0.31, 0.86) | 0.98 (0.97, 0.99) | 40.00 (18.07, 88.57) | 0.38 (0.16, 0.93) |
| Qualitative Rapid Plasma Reagin card | Bronzan 2007 [^] | 35/520 | 0.46 (0.29, 0.63) | 0.97 (0.95, 0.98) | 14.86 (8.13, 27.14) | 0.56 (0.41, 0.76) |
| | Van Dyck 1993 | 50/402 | 0.46 (0.32, 0.61) | 0.97 (0.94, 0.98) | 13.21 (7.28, 23.97) | 0.56 (0.43, 0.72) |
| | Montoya 2006 | 381/4,105 | 0.71 (0.67, 0.76) | 0.96 (0.96, 0.97) | 19.80 (16.70, 23.48) | 0.30 (0.25, 0.35) |
| | Tinajeros 2006 | 342/8,847 | 0.76 (0.71, 0.80) | 0.99 (0.99, 0.99) | 82.98 (66.01, 104.33) | 0.25 (0.20, 0.30) |
| | Delpont 1993 | 83/1,154 | 0.93 (0.85, 0.97) | 0.96 (0.95, 0.97) | 24.90 (18.46, 33.59) | 0.75 (0.04, 0.16) |
| | Pooled estimates | 891/14,728 | 0.70 (0.50, 0.84) | 0.97 (0.96, 0.98) | 27.07 (15.39, 47.61) | 0.31 (0.17, 0.56) |

[^] combined high & low titre (both define active syphilis)

^{^^} Missing VDRL samples assumed as positive