**Search terms used for Medline Database**

(2012/01/01[PDAT] : 2016/10/03[PDAT]) AND

("Syphilis"[Mesh] OR Chancre [TW]OR Neurosyphilis [TW] OR " Tabes Dorsalis " [TW] OR syphilis [TW] OR "Treponema pallidum"[Mesh] OR "treponema pallidum" [TW]) AND

(“HIV Infections” [MeSH] OR “HIV”[MeSH] OR “hiv”[tw] OR “hiv-1”[tw] OR “hiv-2”[tw] OR “hiv1”[tw] OR “hiv2”[tw] OR hiv infect\*[tw] OR “human immunodeficiency virus”[tw] OR “human immunedeficiency virus”[tw] OR “human immuno-deficiency virus”[tw] OR “human immune-deficiency virus”[tw] OR ((human immun\*) AND (“deficiency virus”[tw])) OR “acquired immunodeficiency syndrome”[tw] OR “acquired immunedeficiency syndrome”[tw] OR “acquired immuno-deficiency syndrome”[tw] OR “acquired immune-deficiency syndrome”[tw] OR ((acquired immun\*) AND (“deficiency syndrome”[tw])) OR "Sexually Transmitted Diseases, Viral"[MeSH:NoExp])

AND

(sensitiv\*[Title/Abstract] OR sensitivity and specificity[MeSH Terms] OR diagnose[Title/Abstract] OR diagnosed[Title/Abstract] OR diagnoses[Title/Abstract] OR diagnosing[Title/Abstract] OR diagnosis[Title/Abstract] OR diagnostic[Title/Abstract] OR diagnosis[MeSH:noexp] OR diagnostic \* [MeSH:noexp] OR diagnosis,differential[MeSH:noexp] OR diagnosis[Subheading:noexp] OR “point of care” [TW])

Table S1. Characteristics of commercially available dual RDTs for HIV and syphilis.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test name** | **Time to result** | **Specimen type** | **Description** | **WHO Prequalification status**  | **Shelf life** | **Volume of sample required** |
| SD BIOLINEHIV/Syphilis Duo  | Interpret test results within 15-20 minutes after adding assay diluent. (timer required) | Whole blood, serum or plasma | Solid phase immunochroma-tographic assay | Accepted to list of prequalified *in vitro* diagnostics as of October 2015 | 1-30 °C for 24 months | 10 µL |
| Chembio DPP HIV-Syphilis Assay | Total test time of 15 to 30 minutes  | Whole blood, serum or plasma | Immunochroma-tographic rapid test  | Not listed as of March 2017  | 15-30 °C for 24 months | 10 µL |
| MedMira Multiplo TP/HIV | Results read immediately  | Whole blood, serum or plasma | Rapid vertical flow immunoassay | Not listed as of March 2017 | 2-30 °C for 24 months | 35-40 µl |
| INSTI Multiplex HIV-1/HIV-2/Syphilis Antibody Test | From 60 seconds | Whole blood, serum or plasma | Flow through (immunofiltration) immunoassay  | Not listed as of March 2017 | 12 months | 50 µl |

Evaluation studies of all dual HIV/syphilis RDTs

SD BIOLINE HIV/Syphilis Duo Test

MedMira Multiplo Rapid TP/HIV Antibody Test

Chembio DPP HIV/syphilis Assay

Evaluation studies of all dual HIV/syphilis RDTs

Laboratory evaluation

Field evaluation

a)

b)

Figure S1. Stratification strategy. (a) Evaluation studies were stratified according to the RDT manufacturer, (b) evaluation setting, (c) whether serum or whole blood was used and (d) whether archived or fresh specimens were used.

Evaluation studies of all dual HIV/syphilis RDTs

Serum samples

Whole blood samples

c)

Evaluation studies of all dual HIV/syphilis RDTs

Archived specimens

Fresh specimens

d)

Table S2. Results of STARD evaluation for diagnostic test accuracy evaluation studies included in the meta-analysis.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author** | **Year**  | **1** | **2** | **3**  | **4** | **5**  | **6**  | **7**  | **8** | **9** | **10**  | **11**  | **12**  | **13** | **14** | **15**  | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **30** |
| Ondondo30 | 2013 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Chiappe31 | 2013 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Hess32 | 2014 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| Humphries33 | 2014 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| Omoding34 | 2014 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| Bristow35 | 2014 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| Dagnra36 | 2014 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| Bristow37 | 2015 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| Yin38 | 2015 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| Shimelis39 | 2015 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| Leon40 | 2016 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| Bristow41 | 2016 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| Bristow42 | 2016 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| Bristow43 | 2016 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| Shakya44 | 2016 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| Black45 | 2016 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| Bowen46 | 2016 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Kalou47 | 2016 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |

For a list of corresponding items, refer to Bossuyt *et al*.48

Table S3. Results of QUADAS-2 evaluation for diagnostic test accuracy evaluation studies included in the meta-analysis.

|  |  |  |  |
| --- | --- | --- | --- |
| **Author** | **Year** | **Risk of bias** | **Applicability concerns** |
| **Patient selection** | **Index test** | **Reference standard** | **Flow and timing** | **Patient selection** | **Index test** | **Reference standard** |
| Ondondo30 | 2013 | ? | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ |
| Chiappe31 | 2013 | ? | ? | ? | ? | ☺ | ☺ | ☺ |
| Hess32 | 2014 | ☺ | ☺ | ? | ☺ | ☺ | ☺ | ☺ |
| Humphries33 | 2014 | ? | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ |
| Omoding34 | 2014 | ☺ | ? | ? | ☺ | ☺ | ☺ | ☺ |
| Bristow35 | 2014 | ? | ? | ? | ? | ? | ☺ | ☺ |
| Dagnra36 | 2014 | ? | ? | ? | ? | ☺ | ☺ | ☺ |
| Bristow37 | 2015 | ? | ? | ? | ? | ☺ | ☺ | ☺ |
| Yin38 | 2015 | ☺ | ☺ | ? | ☺ | ☺ | ☺ | ☺ |
| Shimelis39 | 2015 | ☺ | ? | ? | ☺ | ☺ | ☺ | ☺ |
| Leon40 | 2016 | ? | ? | ? | ? | ☺ | ☺ | ☺ |
| Bristow41 | 2016 | ☺ | ☺ | ? | ☺ | ☺ | ☺ | ☺ |
| Bristow42 | 2016 | ? | ☺ | ? | ? | ☺ | ☺ | ☺ |
| Bristow43 | 2016 | ☺ | ☺ | ? | ☺ | ☺ | ☺ | ☺ |
| Shakya44 | 2016 | ☺ | ? | ? | ☺ | ☺ | ☺ | ☺ |
| Black45 | 2016 | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ |
| Bowen46 | 2016 | ☺ | ☺ | ? | ? | ☺ | ☺ | ☺ |
| Kalou47 | 2016 | ? | ? | ? | ? | ☺ | ☺ | ☺ |

Where ☺ = low risk, ? = unclear risk, and ☹ = high risk of bias, as stated in Whitting *et al*.49

**References**

30. Ondondo RO, Odoyo JB, Bukusi EA. Performance Characteristics of SD Bio Line Rapid HIV-Syphilis Duo Test Kit For Simultaneous Detection of HIV and Syphilis Infections. *Sex Transm Infect* 2013;89 (Suppl 1) A56.

31. Chiappe MA, Lopez-Torres L, Carcamo C, et al. Evaluation of a Double Rapid Test For Syphilis and HIV: SD Bioline HIV/Syphilis Duo. *Sex Transm Infect* 2013;89 (Suppl 1):A363.

32. Hess KL, Fisher DG, Reynolds GL. Sensitivity and specificity of point-of-care rapid combination syphilis-HIV-HCV tests. *PLoS One* 2014;9(11):e112190. doi: 10.1371/journal.pone.0112190

33. Humphries RM, Woo JS, Chung JH, et al. Laboratory evaluation of three rapid diagnostic tests for dual detection of HIV and Treponema pallidum antibodies. *J Clin Microbiol* 2014;52(12):4394-7. doi: 10.1128/JCM.02468-14

34. Omoding D, Katawera V, Siedner M, et al. Evaluation of the SD BIOLINE HIV/syphilis Duo assay at a rural health center in Southwestern Uganda. *BMC Res Notes* 2014;7:746.

35. Bristow CC, Adu-Sarkodie Y, Ondondo RO, et al. Multisite Laboratory Evaluation of a Dual Human Immunodeficiency Virus (HIV)/Syphilis Point-of-Care Rapid Test for Simultaneous Detection of HIV and Syphilis Infection. *Open Forum Infect Dis* 2014;1(1):ofu015. doi: 10.1093/ofid/ofu015

36. Dagnra AY, Dossim S, Salou M, et al. Evaluation of 9 rapid diagnostic tests for screening HIV infection, in Lome, Togo. *Med Mal Infect* 2014;44(11-12):525-9. doi: 10.1016/j.medmal.2014.10.007

37. Bristow CC, Leon SR, Ramos LB, et al. Laboratory evaluation of a dual rapid immunodiagnostic test for HIV and syphilis infection. *J Clin Microbiol* 2015;53(1):311-3. doi: 10.1128/JCM.02763-14

38. Yin YP, Ngige E, Anyaike C, et al. Laboratory evaluation of three dual rapid diagnostic tests for HIV and syphilis in China and Nigeria. *Int J Gynaecol Obstet* 2015;130 Suppl 1:S22-6. doi: 10.1016/j.ijgo.2015.04.004

39. Shimelis T, Tadesse E. The diagnostic performance evaluation of the SD BIOLINE HIV/syphilis Duo rapid test in southern Ethiopia: a cross-sectional study. *BMJ Open* 2015;5(4):e007371. doi: 10.1136/bmjopen-2014-007371

40. Leon SR, Ramos LB, Vargas SK, et al. Laboratory Evaluation of a Dual-Path Platform Assay for Rapid Point-of-Care HIV and Syphilis Testing. *J Clin Microbiol* 2016;54(2):492-4. doi: 10.1128/JCM.03152-15

41. Bristow CC, Leon SR, Huang E, et al. Field evaluation of a dual rapid diagnostic test for HIV infection and syphilis in Lima, Peru. *Sex Transm Infect* 2016;92(3):182-5. doi: 10.1136/sextrans-2015-052326

42. Bristow CC, Severe L, Pape JW, et al. Dual rapid lateral flow immunoassay fingerstick wholeblood testing for syphilis and HIV infections is acceptable and accurate, Port-au-Prince, Haiti. *BMC Infect Dis* 2016;16:302. doi: 10.1186/s12879-016-1574-3

43. Bristow CC, Leon SR, Huang E, et al. Field Evaluation of a Dual Rapid Immunodiagnostic Test for HIV and Syphilis Infection in Peru. *Sex Transm Dis* 2016;43(1):57-60. doi: 10.1097/OLQ.0000000000000387

44. Shakya G, Singh DR, Ojha HC, et al. Evaluation of SD Bioline HIV/syphilis Duo rapid test kits in Nepal. *BMC Infect Dis* 2016;16(1):450. doi: 10.1186/s12879-016-1694-9

45. Black V, Williams BG, Maseko V, et al. Field evaluation of Standard Diagnostics' Bioline HIV/Syphilis Duo test among female sex workers in Johannesburg, South Africa. *Sex Transm Infect* 2016 doi: 10.1136/sextrans-2015-052474

46. Bowen V, Lupoli K, Chipungu G, et al. A bundle of health- syphilis test performance in the field evaluation of a novel dual HIV/syphilis rapid test - Malawi, 2014-2015. *Sex Transm Infect* 2015;43:S223.

47. Kalou M, Castro A, Watson A, et al. Laboratory evaluation of the Chembio Dual Path Platform HIV-Syphilis Assay. *African Journal of Laboratory Medicine* 2016;5(1):A433.

48. Bossuyt PM, Reitsma JB, Bruns DE, et al. STARD 2015: an updated list of essential items for reporting diagnostic accuracy studies. *BMJ* 2015;351:h5527. doi: 10.1136/bmj.h5527

49. Whiting PF, Rutjes AW, Westwood ME, et al. QUADAS-2: a revised tool for the quality assessment of diagnostic accuracy studies. *Ann Intern Med* 2011;155(8):529-36. doi: 10.7326/0003-4819-155-8-201110180-00009