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Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Tsuboi M, Evans J, Davies EP, et al. Prevalence of syphilis among men who have sex with men: a global systematic review and meta-analysis from 2000–20. *Lancet Glob Health* 2021; published online July 8. http://dx.doi.org/10.1016/S2214-109X(21)00221-7.

Supplementary appendix

Supplement to: Motoyuki Tsuboi, Jayne Evans, Ella P Davies, Jane Rowley, Eline L Korenromp, Tim Clayton, Melanie M Taylor, David Mabey, R Matthew Chico; "Prevalence of syphilis among men who have sex with men: A global systematic review and meta-analysis from 2000 to 2020."

Supplementary Figures

Supplementary Tables

Supplementary Text

Figure S1. Histogram of pooled syphilis prevalence estimates among MSM by regions of the World Health Organization between 2000-2020

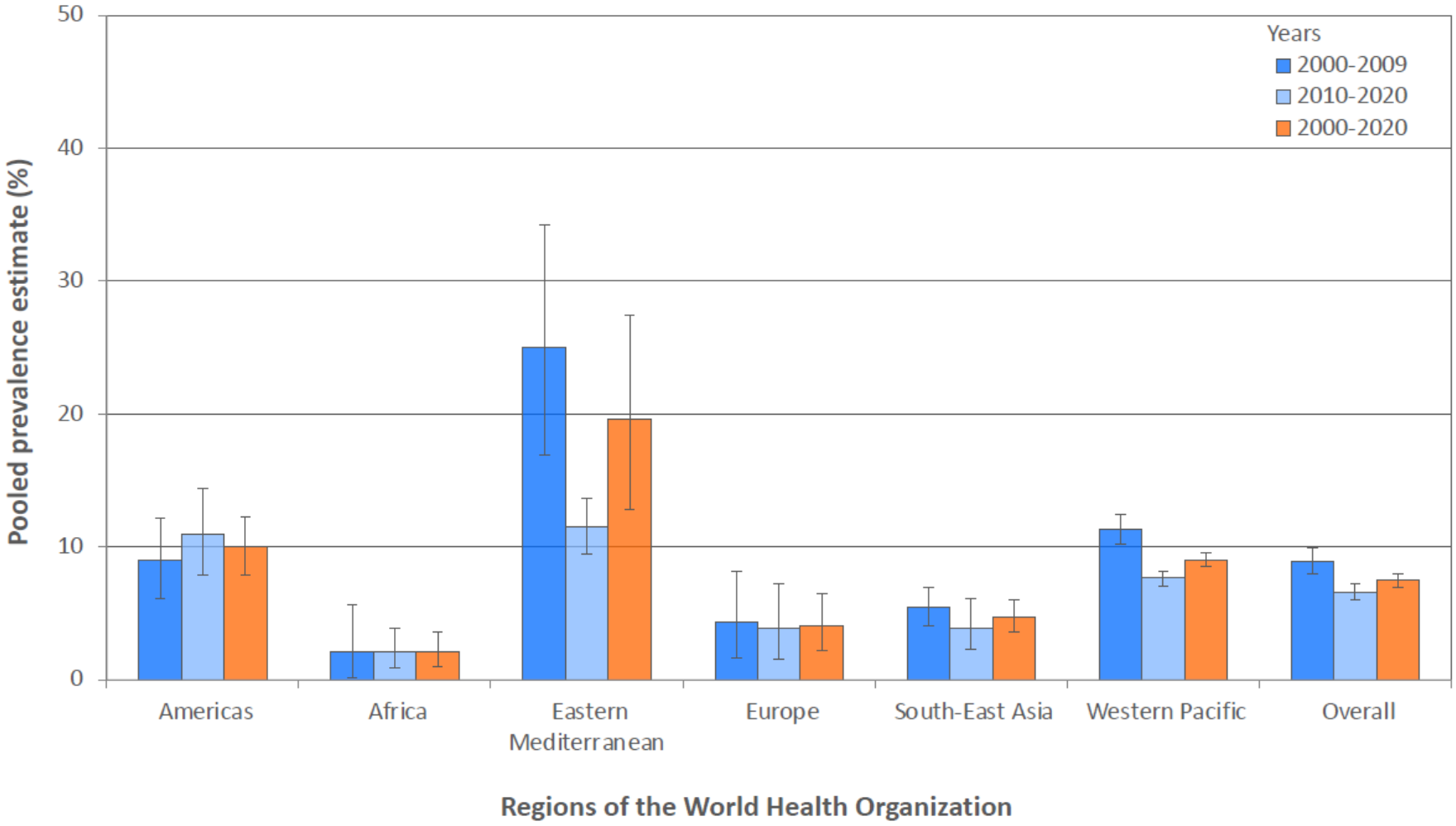


Figure S2. Histogram of pooled syphilis prevalence estimates among MSM by regions of the World Health Organization between 2000-2020 in five-year intervals

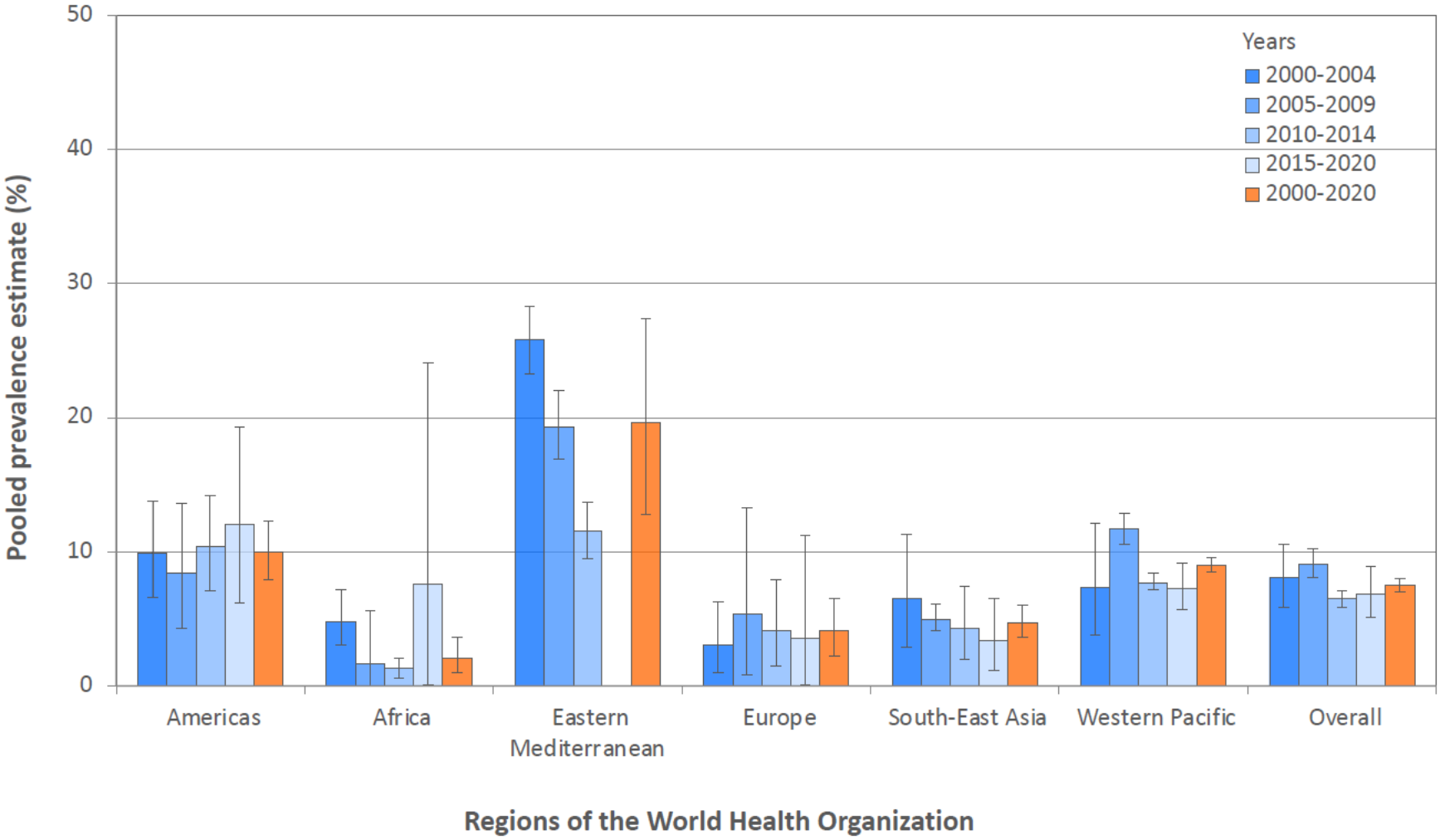
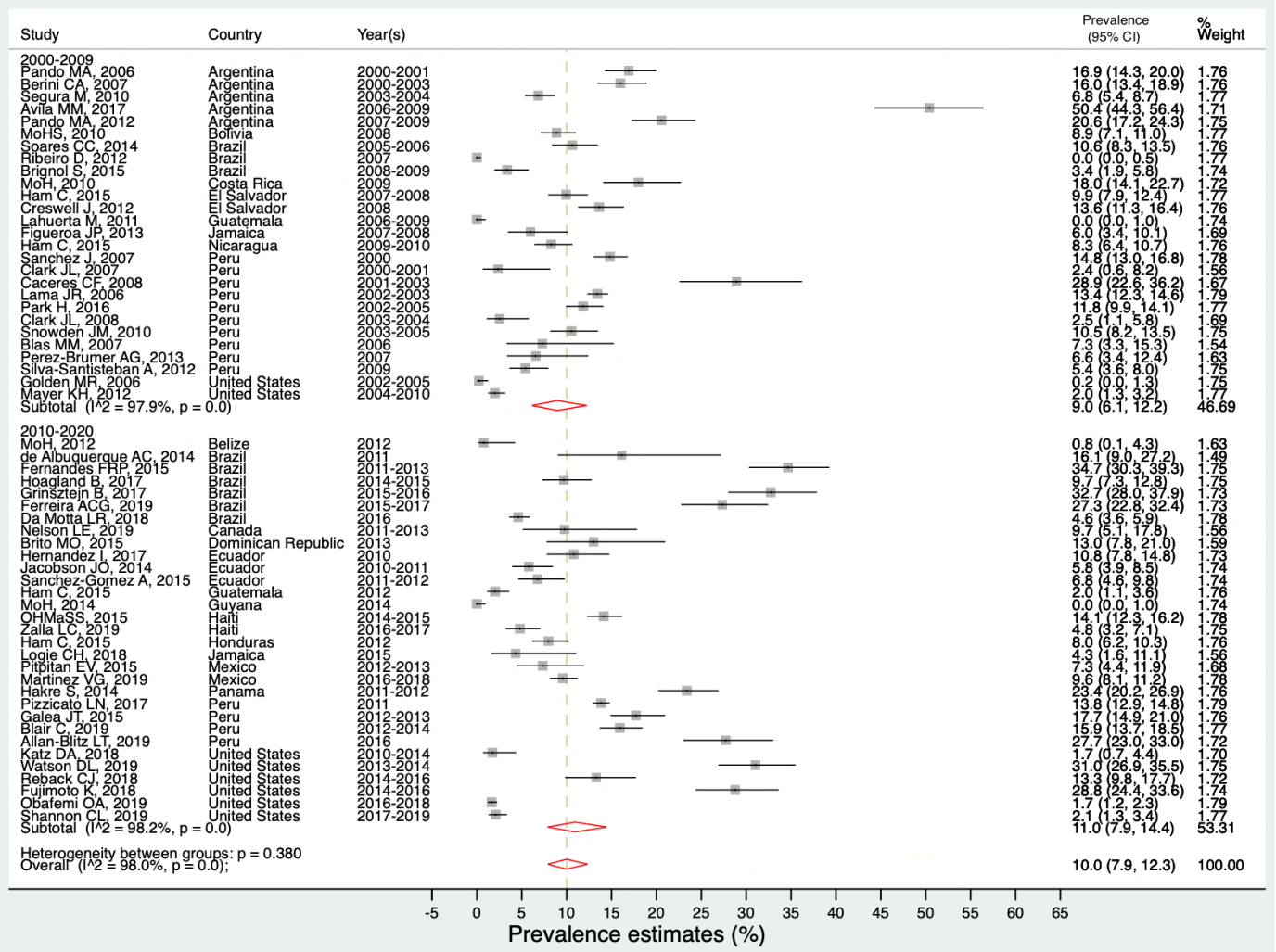
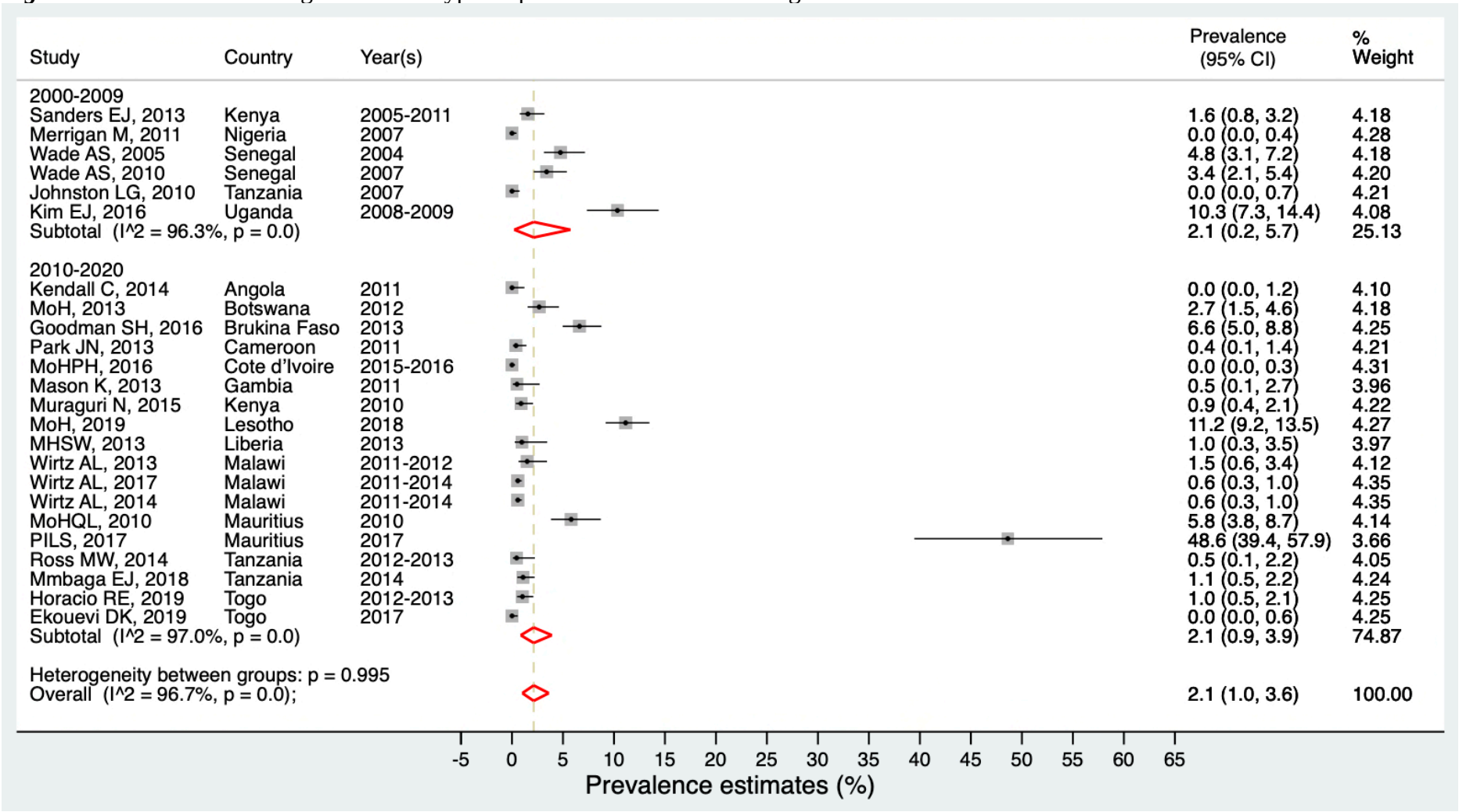


Figure S3.1. Americas WHO Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



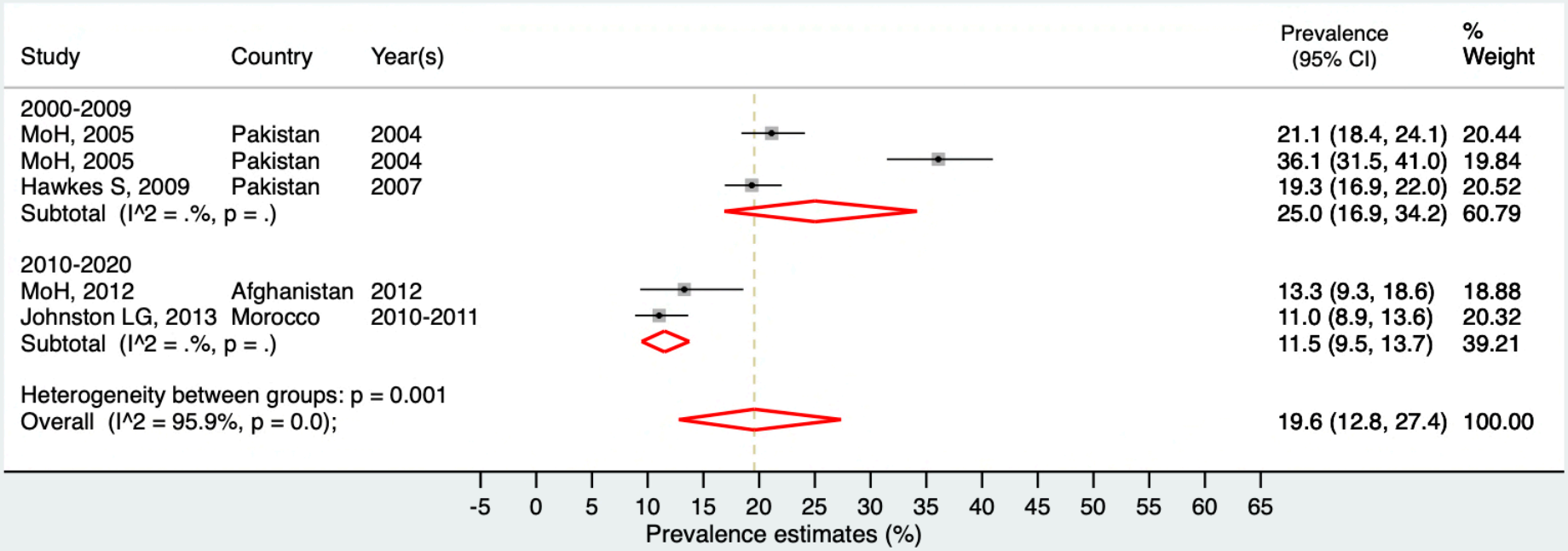
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S3.2. Africa WHO Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



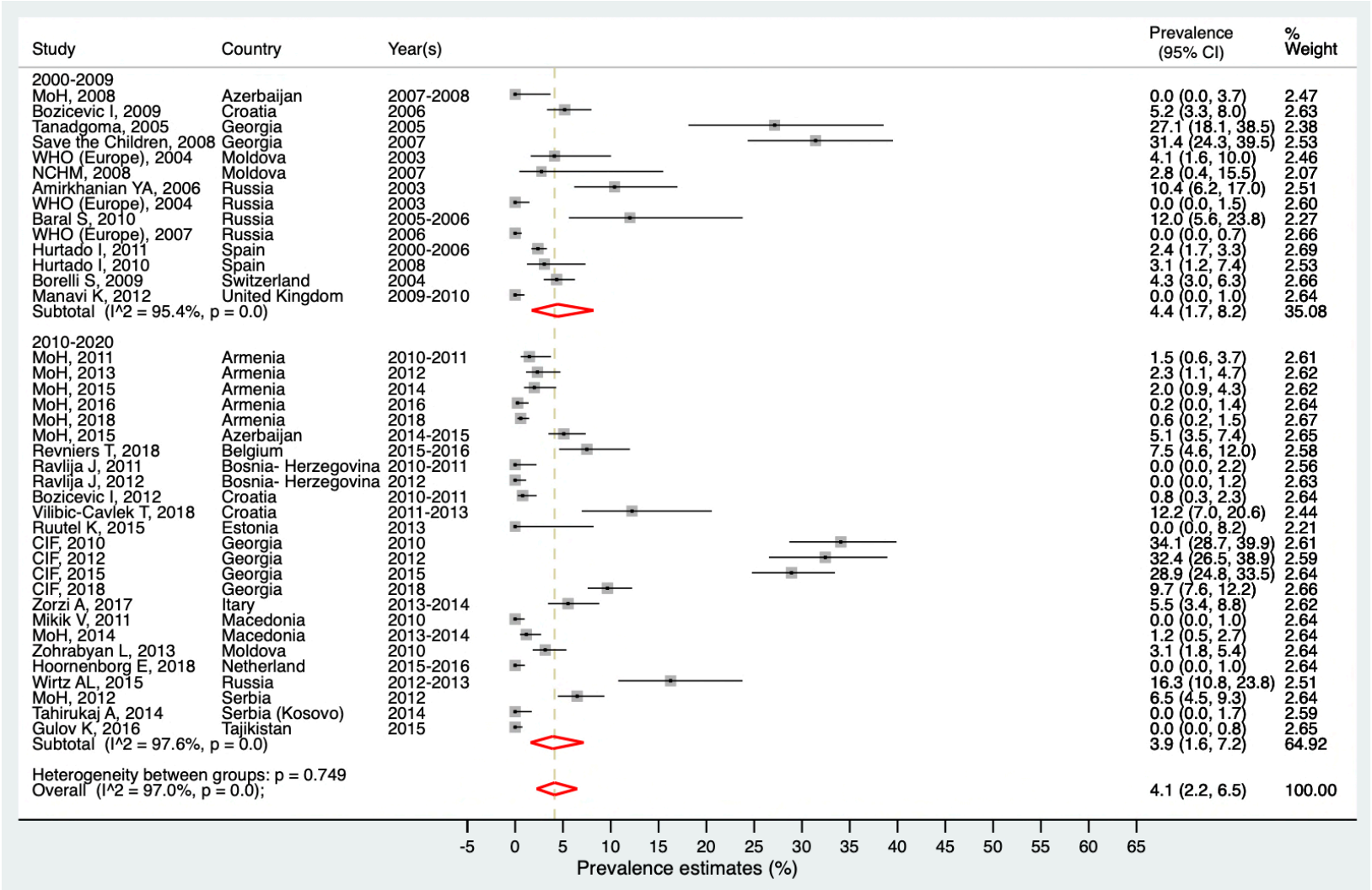
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S3.3. Eastern Mediterranean WHO Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



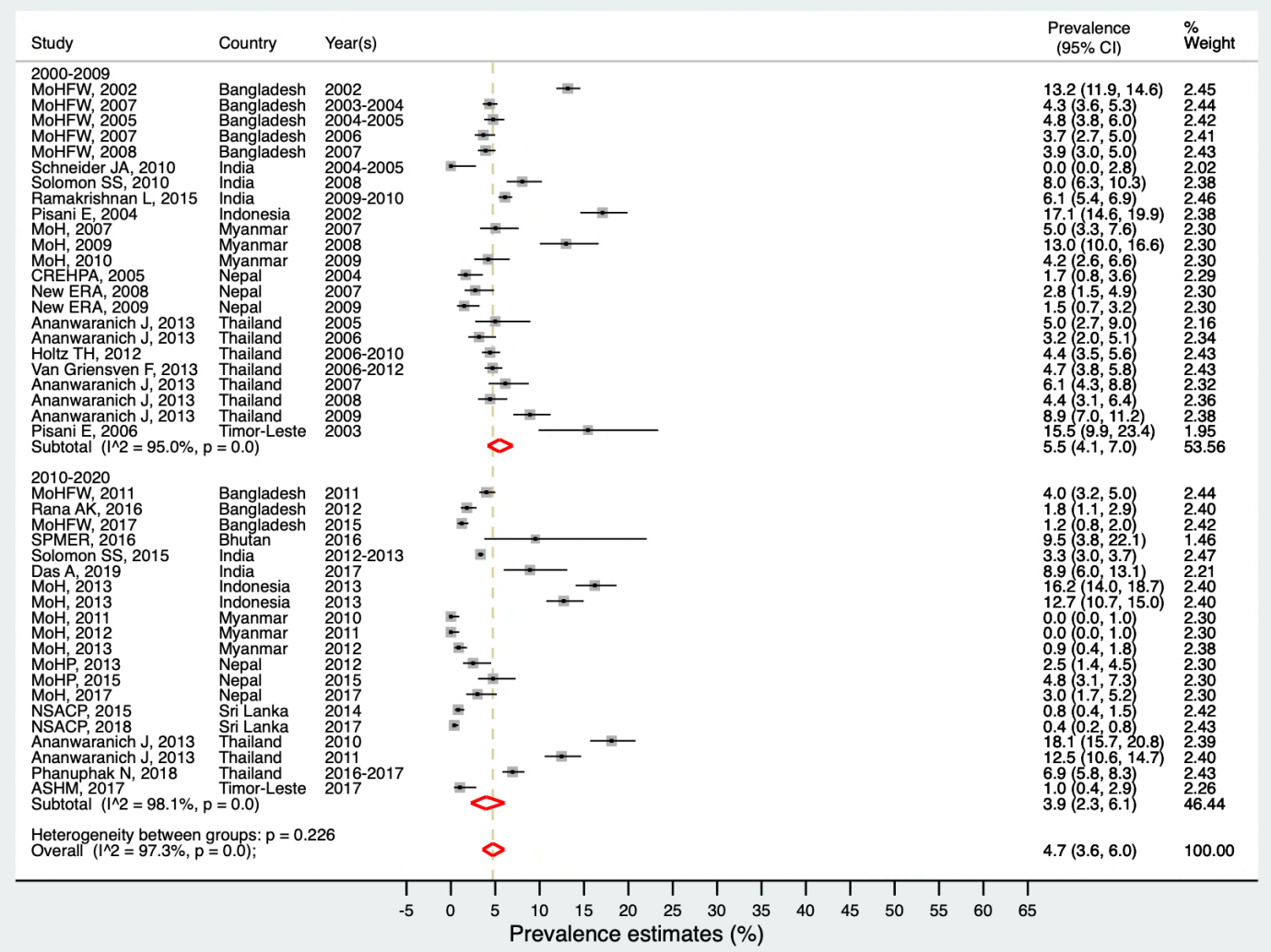
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S3.4. Europe WHO Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



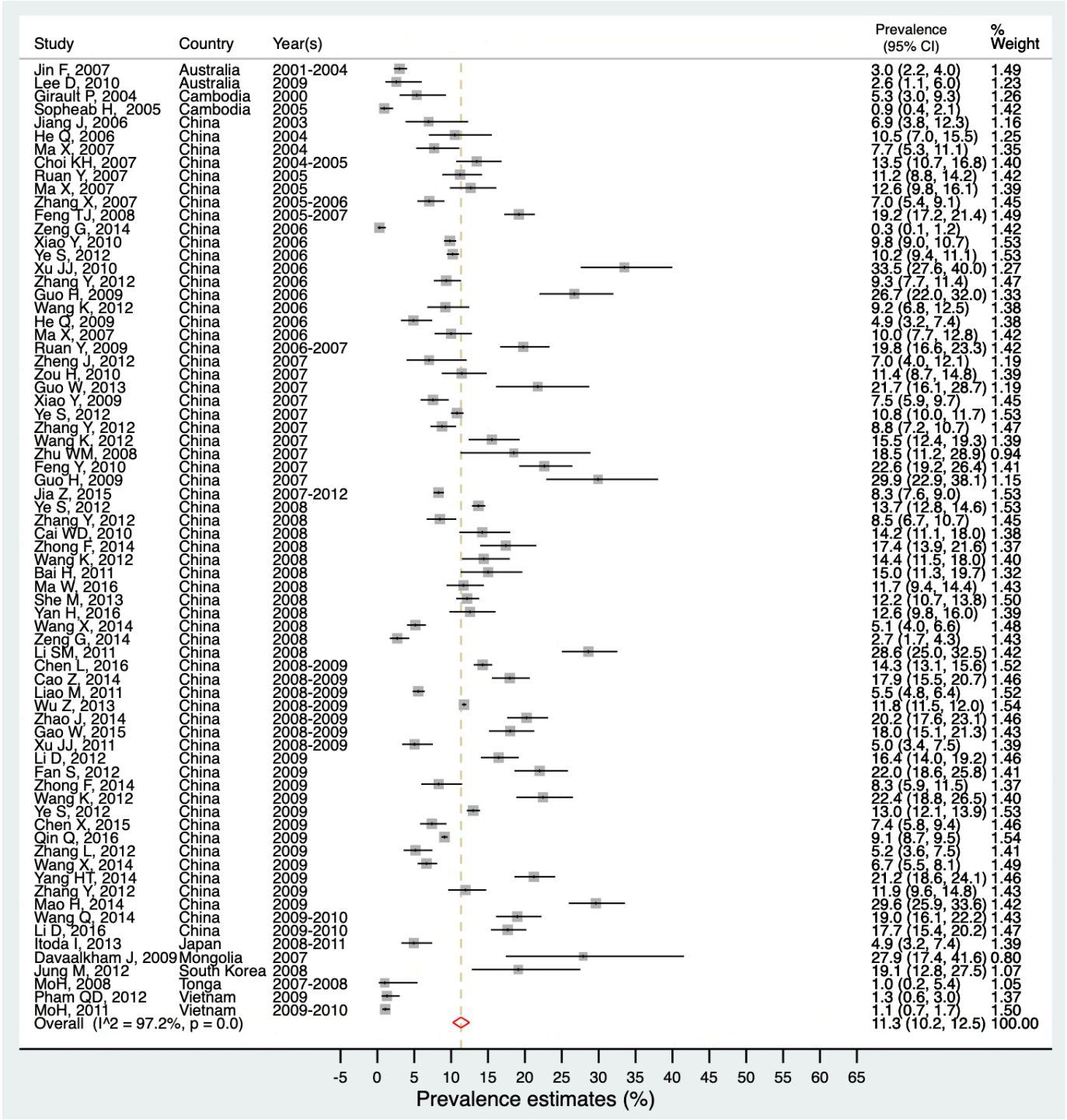
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S3.5. South-East Asia WHO Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



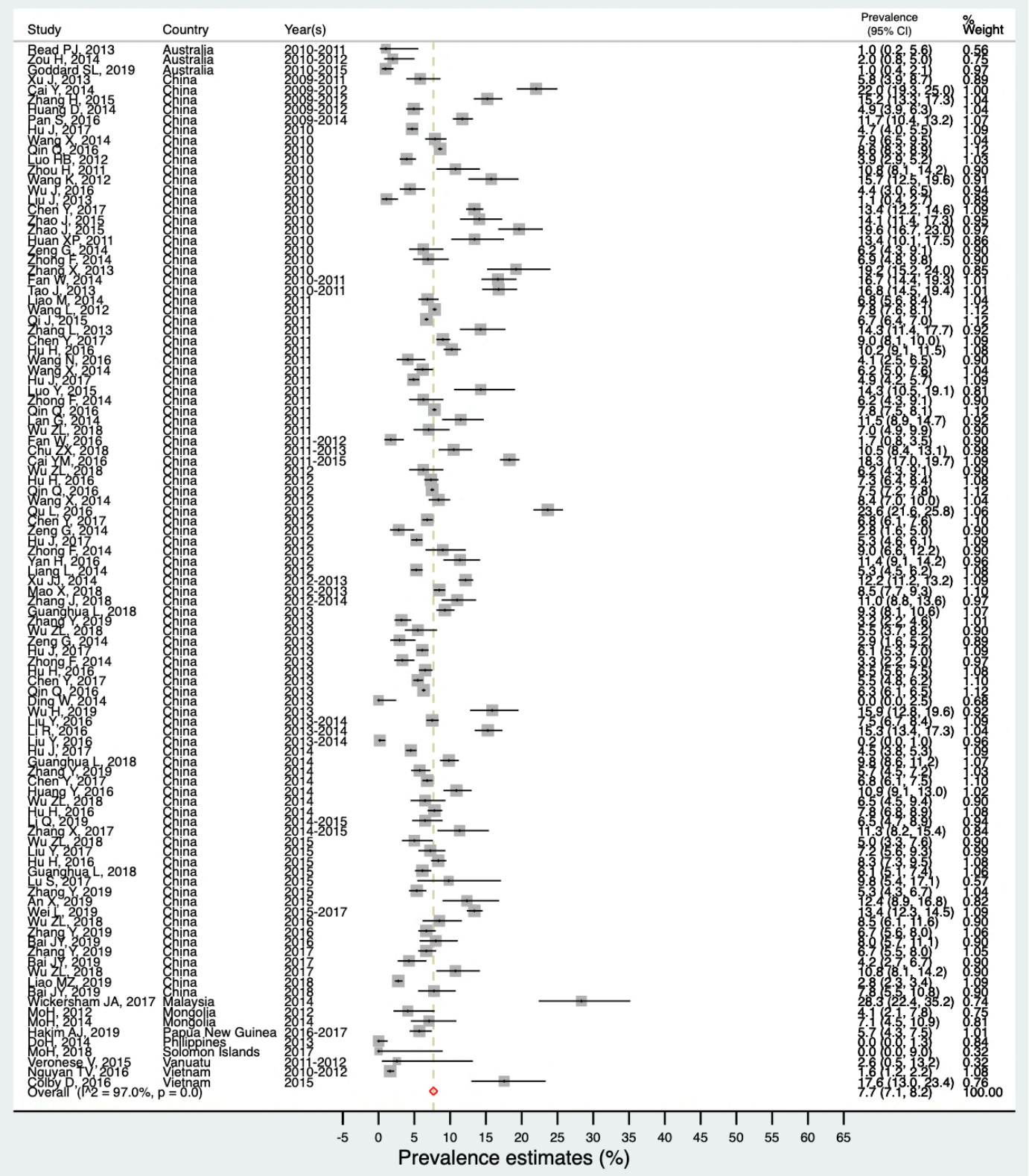
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S3-6a. Western Pacific WHO Region: Pooled syphilis prevalence estimates among MSM between 2000-2009



Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S3-6b. Western Pacific WHO Region: Pooled syphilis prevalence estimates among MSM between 2010-2020



Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S4. Histogram of pooled syphilis prevalence estimates among MSM by regions of the Sustainable Development Goals between 2000-2020 in five-year intervals

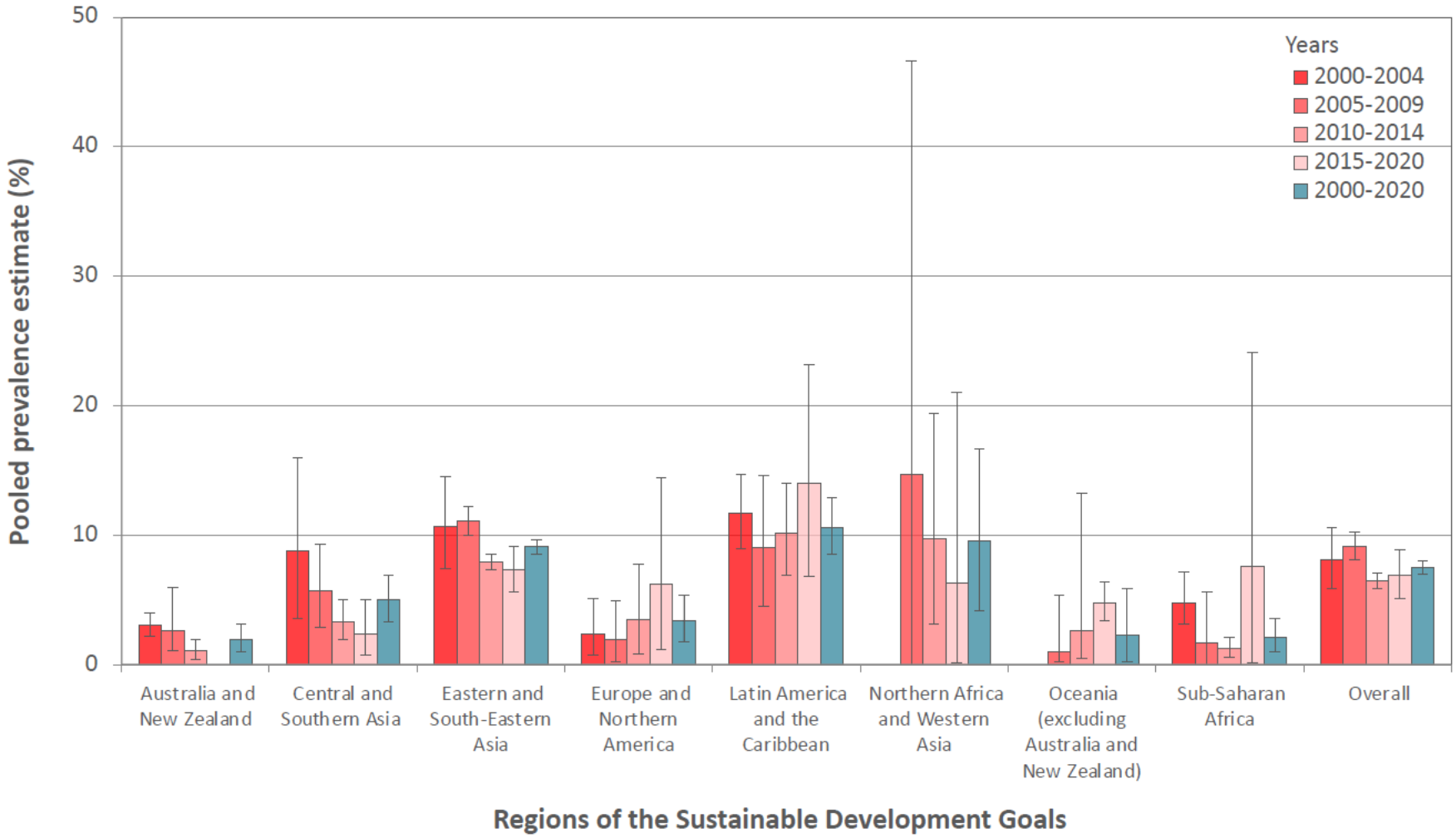
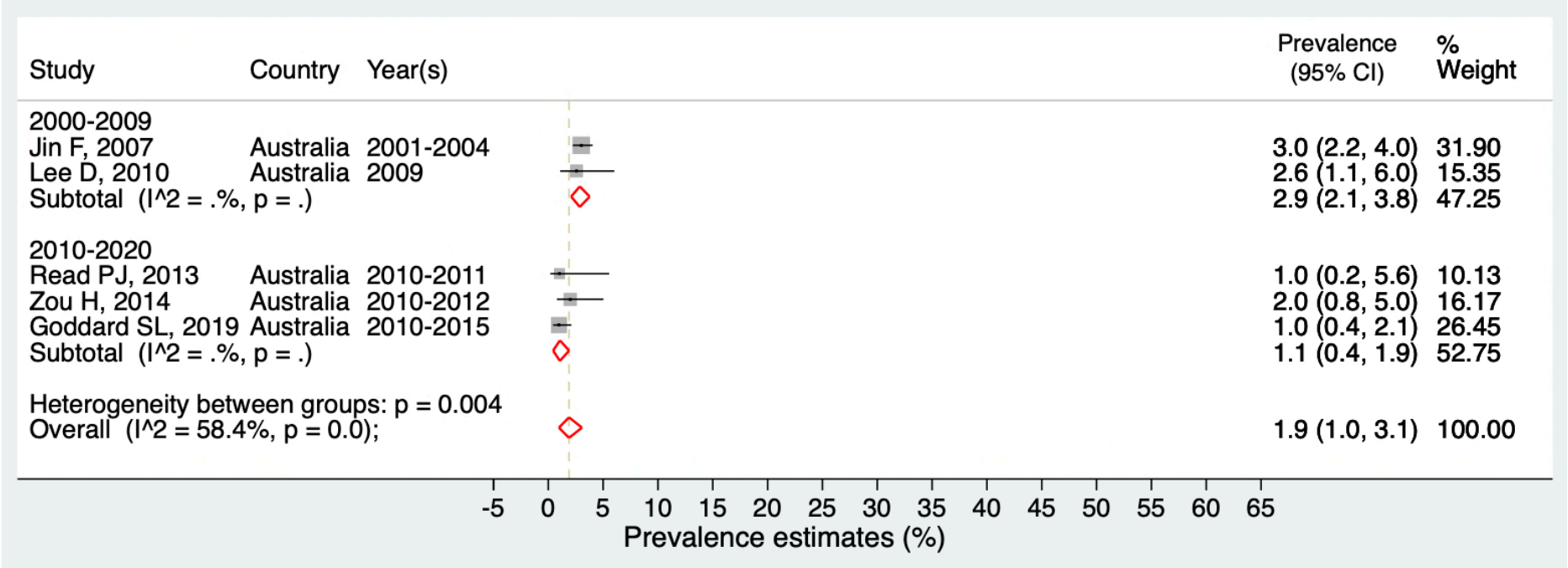
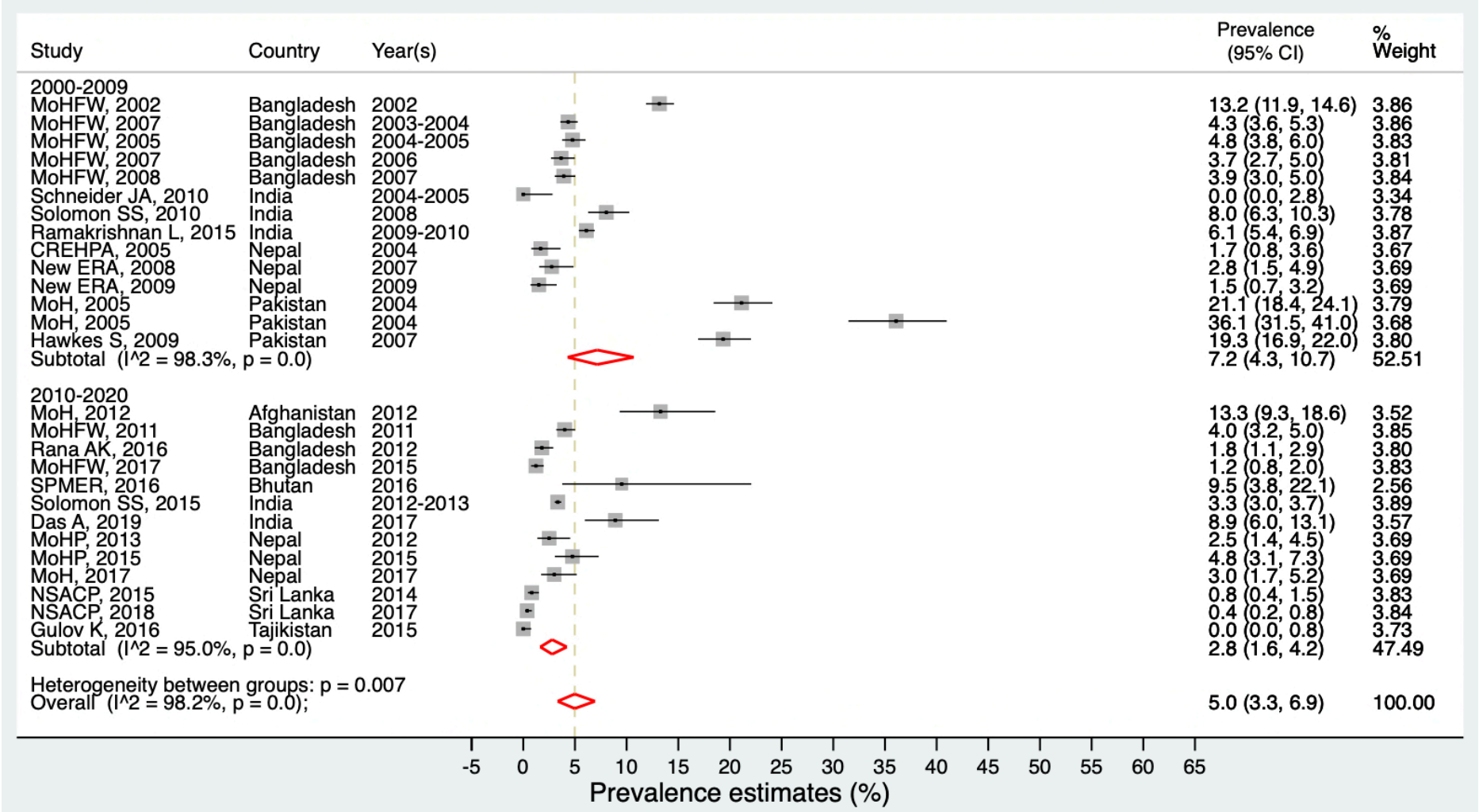


Figure S5.1. Australia and New Zealand SDG Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



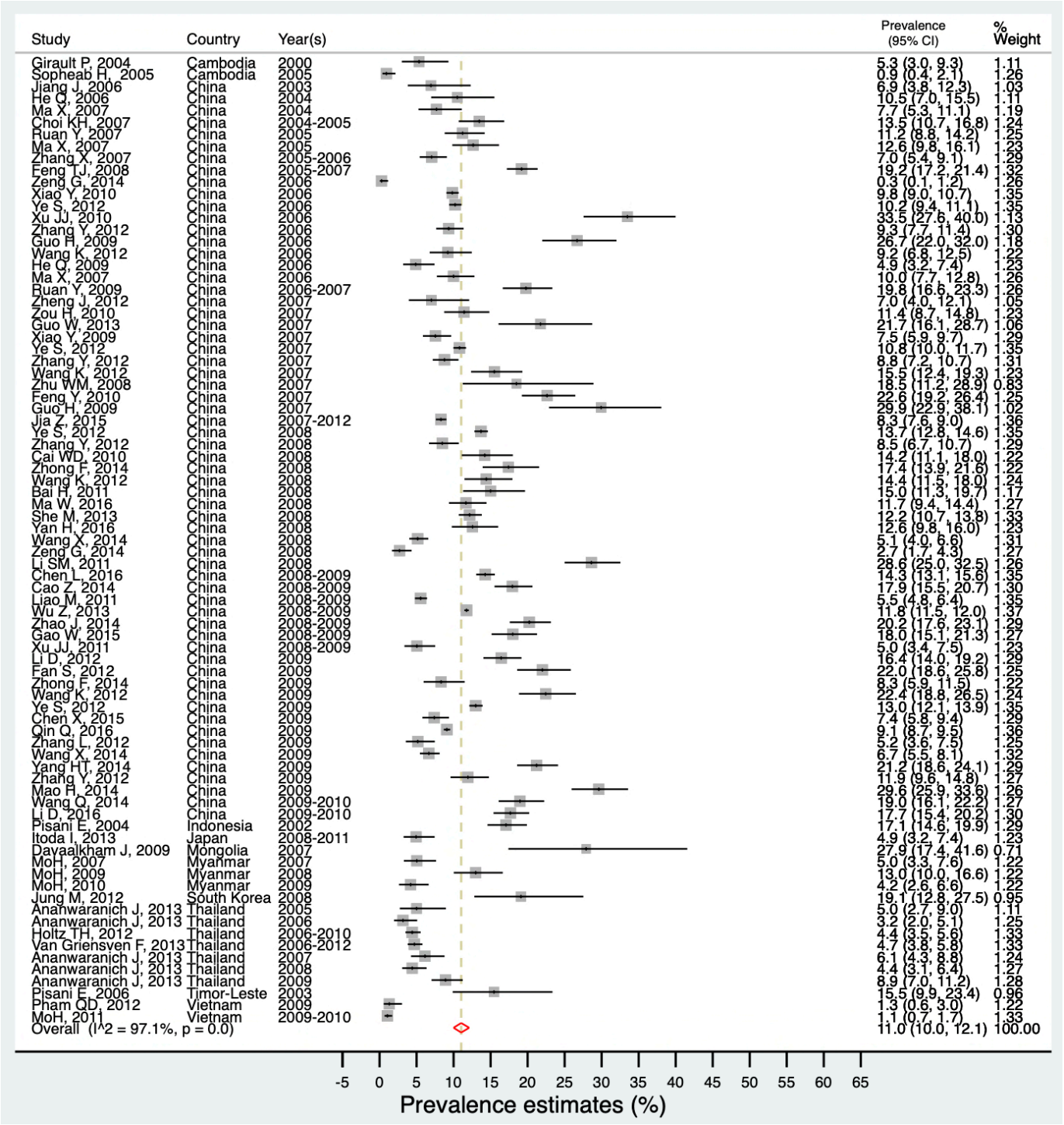
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S5.2. Central and Southern Asia SDG Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



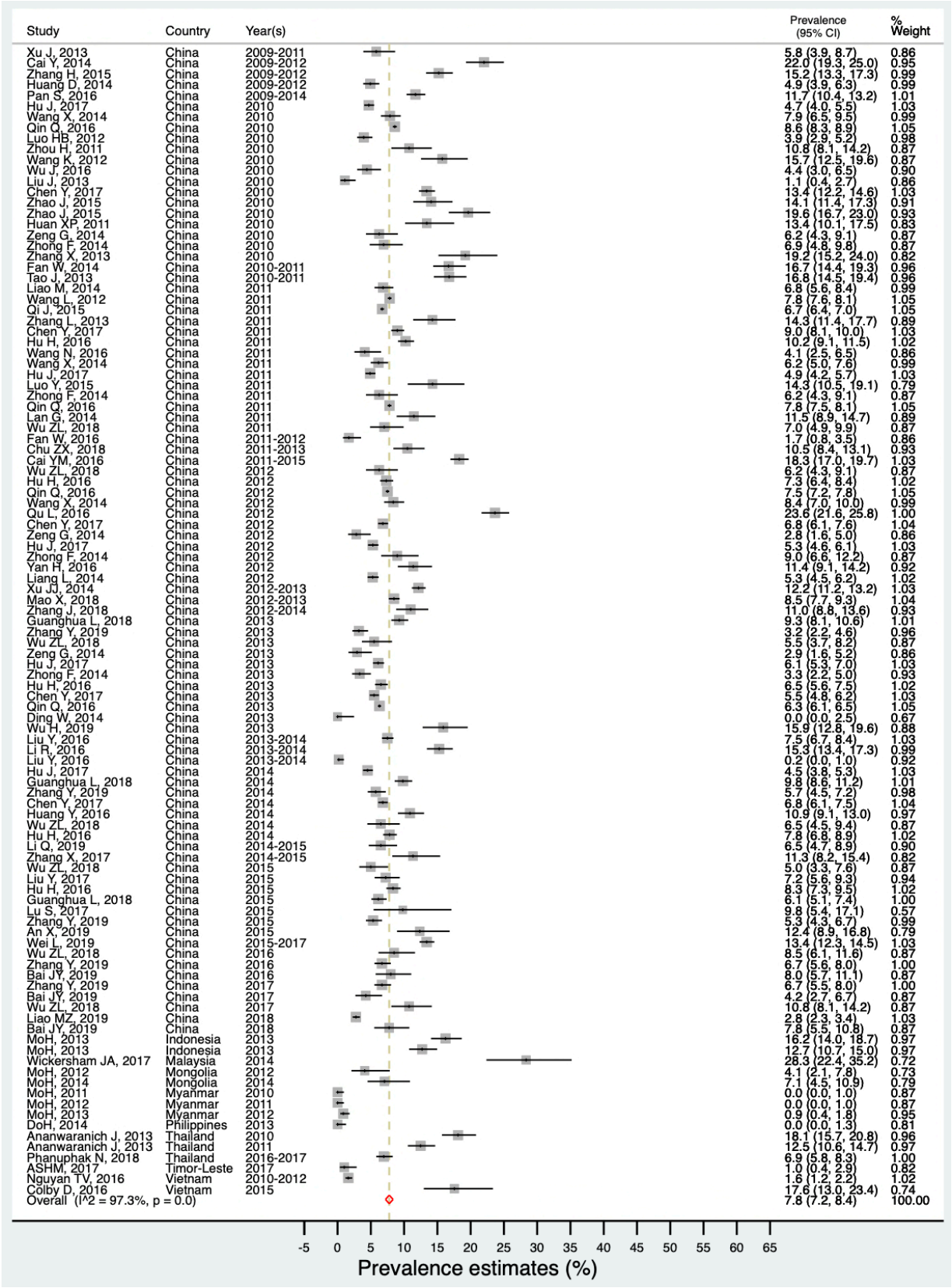
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S5.3a. Eastern and South-Eastern Asia SDG Region: Pooled syphilis prevalence estimates among MSM between 2000-2009



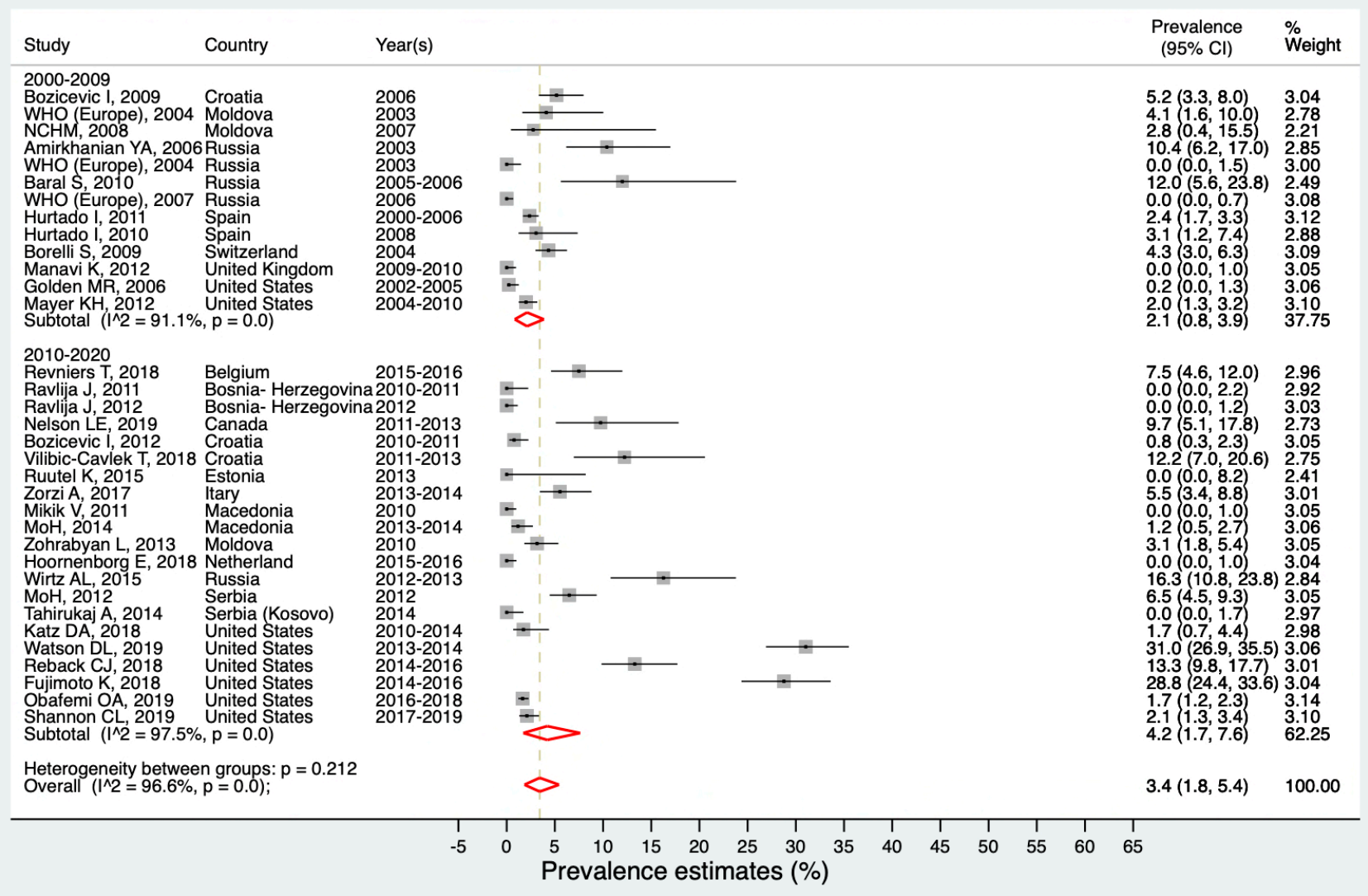
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S5.3b. Eastern and South-Eastern Asia SDG Region: Pooled syphilis prevalence estimates among MSM between 2010-2020



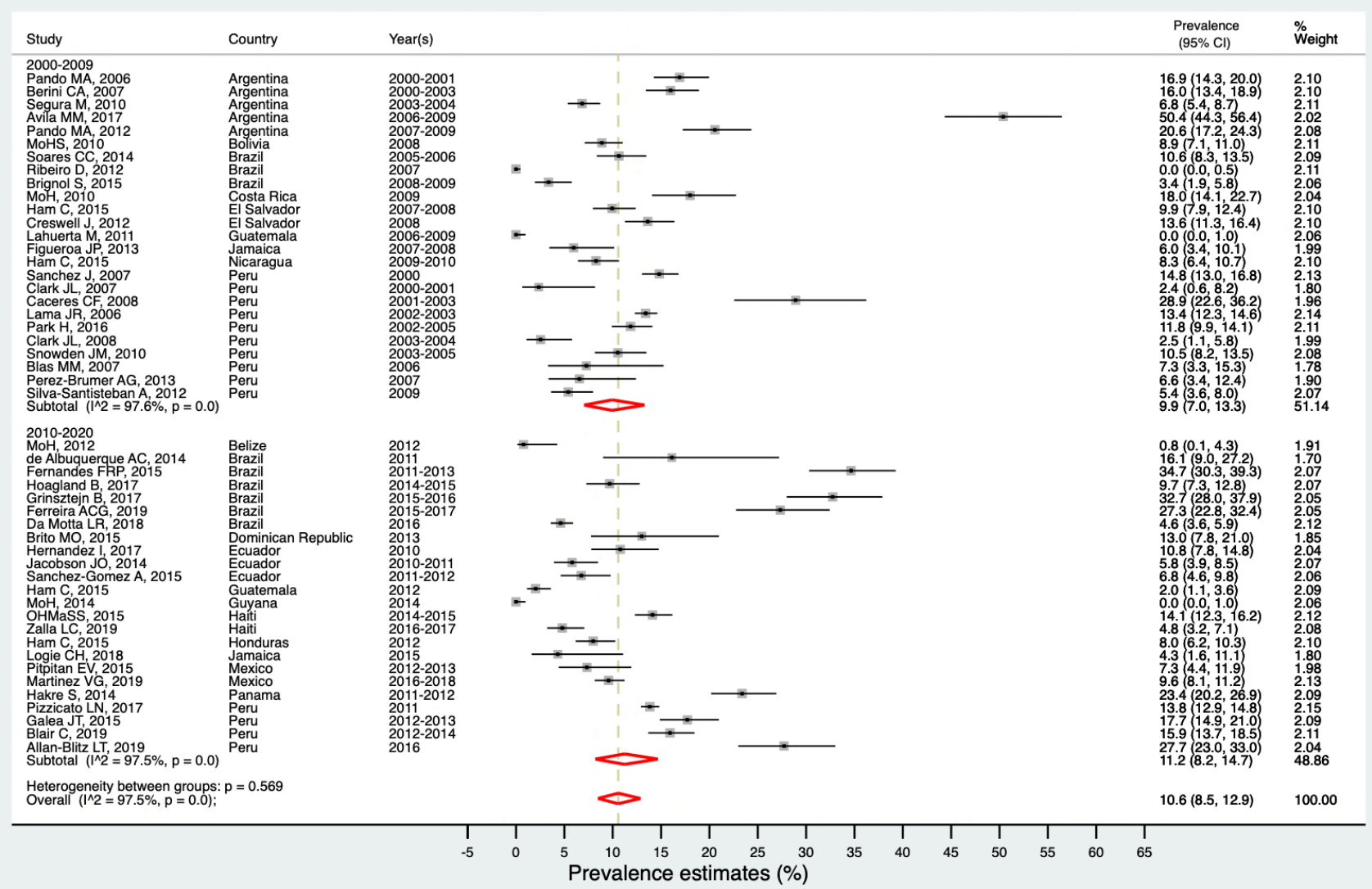
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S5.4. Europe and Northern America SDG Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



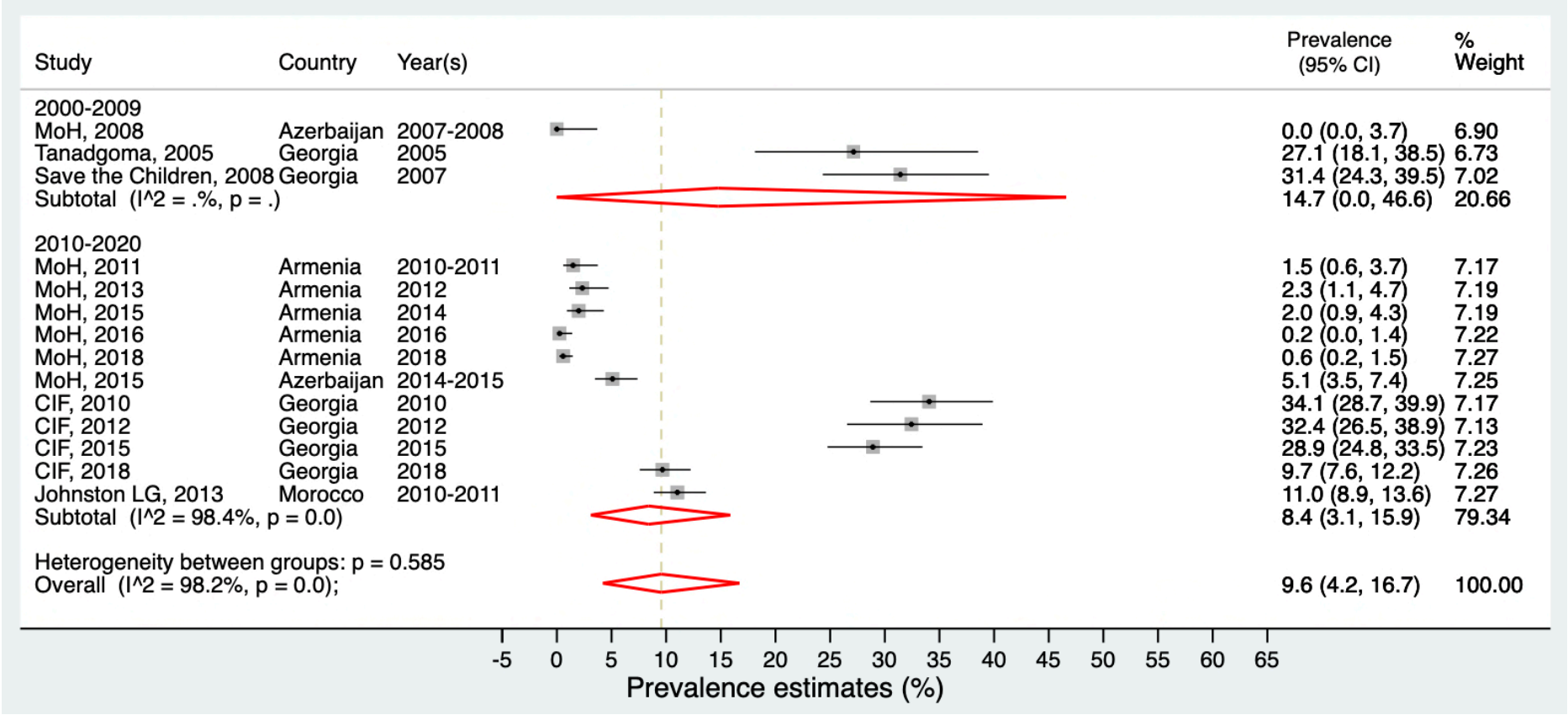
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S5.5. Latin America and the Caribbean SDG Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



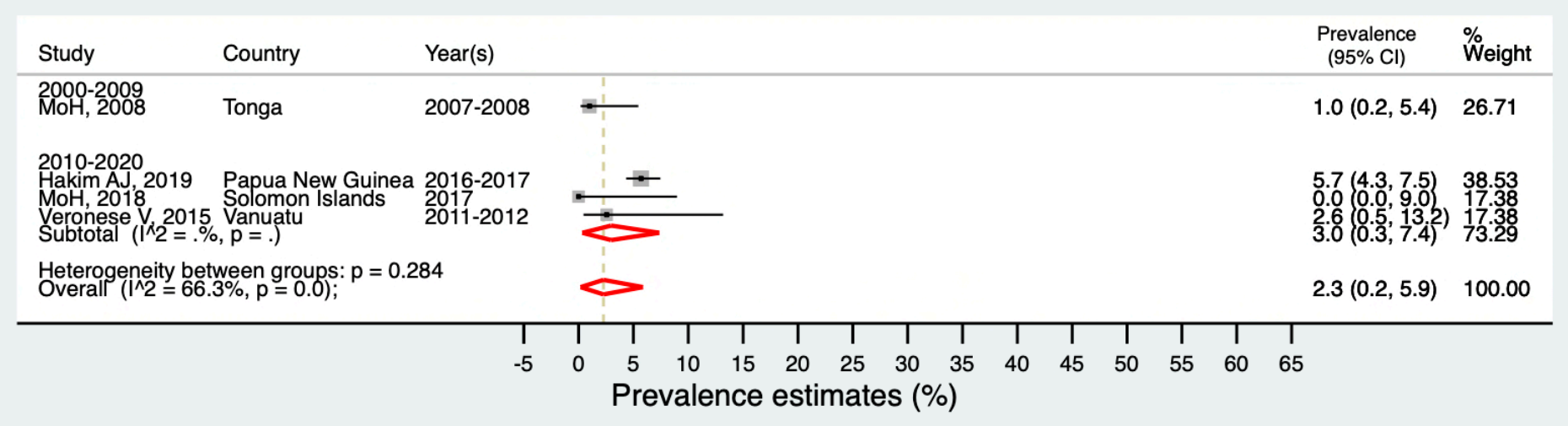
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S5.6. Northern Africa and Western Asia SDG Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



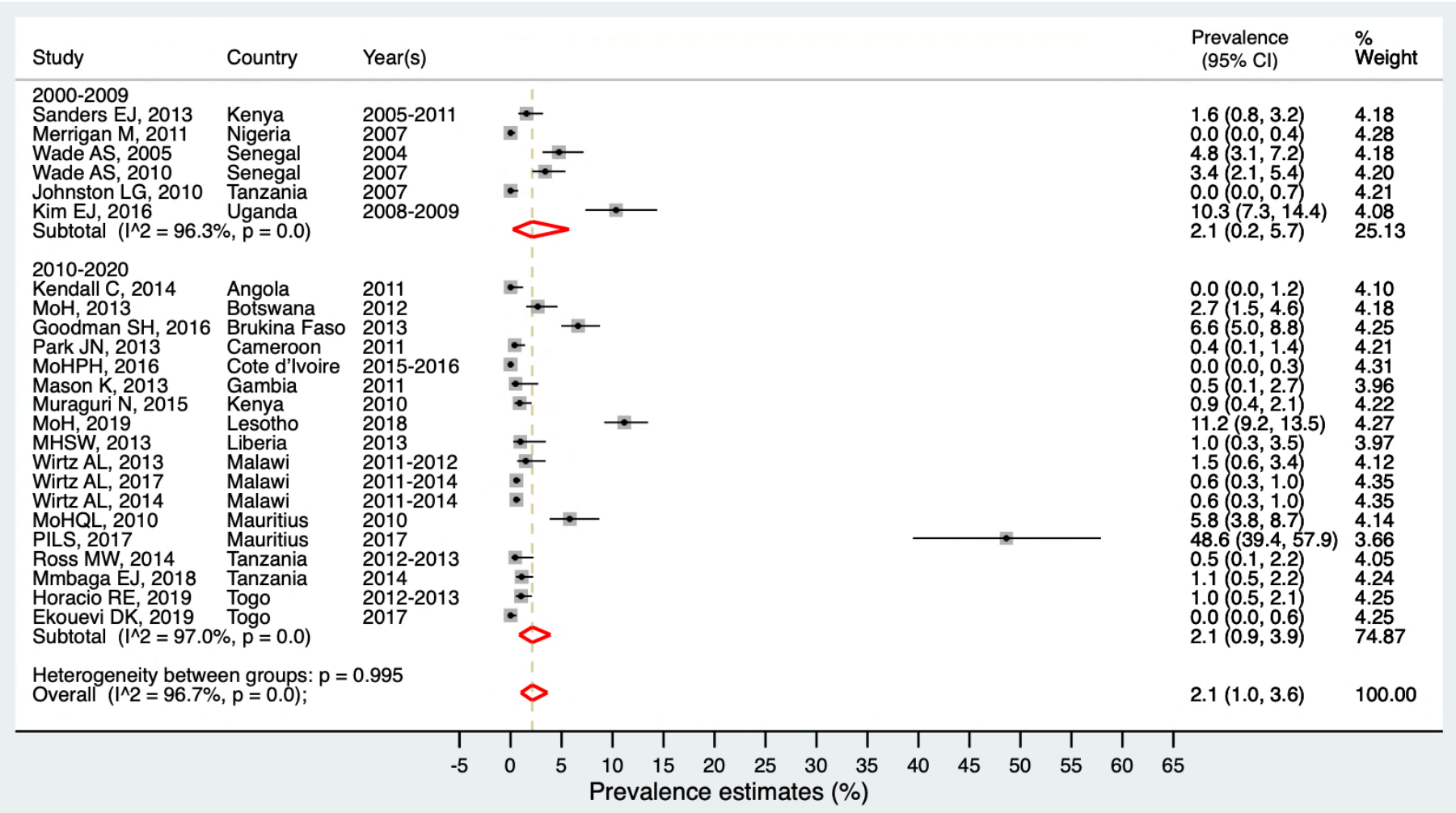
Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S5.7. Oceania (excluding Australia/New Zealand) SDG Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Figure S5.8. Sub-Saharan Africa SDG Region: Pooled syphilis prevalence estimates among MSM between 2000-2020



Diamonds indicate pooled mean prevalence estimates; the extremes of the diamonds indicate 95% CIs

Table S1. PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	6
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	6
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	6-7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7-8
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	8, Supplementary materials p38
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	7
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	7

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	8
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	7-8
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8, figure 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Supplementary materials p28-34
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Supplementary materials p28-34
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	8, table 1 and 2, and Figure S5.1.-5.8.
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	8-9
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	10-11
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	9-11, table 1-3
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	11-13
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	13
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13-14
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	8

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLOS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

Table S2. Sensitivity and specificity of syphilis diagnostic tests

Diagnostic tests	Sensitivity (%)	Specificity (%)	No. of data points	No. of MSM tested
Non-treponemal test combined with treponemal test				
RPR plus any Treponemal test (regardless of RPR titer)*	~100	~100	211	501,078
VDRL plus any Treponemal test (regardless of VDRL titer)*	~100	~100	19	10,767
TRUST plus any Treponemal test (regardless of TRUST titer)*	~100	~100	33	56,486
Wasserman reaction assay plus TPHA	~100	~100	1	125
Chembio DPP Syphilis Screen & Confirm Assay	~100	~100	1	860
Non-treponemal test only				
RPR only [1-3]	84.6~100	98.3-99.6	3	515
RPR≥1:8	~100	~100	3	712
VDRL only [1-3]	83.8~100	96.1-98.9	6	2,760
Treponemal test only				
TPPA [4-6]	92.1~100	95~100	6	2,868
TPHA [5]	86~100	96	8	6,496
EIA/ELISA (overall)[4-6]	85.3~98.5	82.6~98.6	13	5,188
Immunochemiluminescene				
CLIA (LIAISON Treponema screen) [5,6]	95.8~96.9	94.5~99.1	1	374
POCT (Rapid test) (overall)	85.7~98.8	89.7~98.5	7	4,458
Determine Syphilis TP [7]	91.8	98.5	6	2,054
SD Bioine Syphilis 3.0 [8,9]	86.0-98.8	91.4-96.8	5	1,451
Syphilis Health Check [8,10]	85.7-95.3	89.7-98.1	1	788
SD Bioline HIV/Syphilis Duo [11]	95.5	99.9	1	678
Multiplex flow immunoassay [6]	96.9	96.7	1	442
Any combination of two treponemal tests	~100	~100	10	5,827
Other tests				
Syphilis antibody/ Treponema antibody/ RPGA†	83.8~100	82.6~100	8	1,923
PCR test for blood specimen [12]	31.2~52.2	83.3~95.7	1	382

Notes:
1. For studies that reported more than one data point for the same study population, we used prevalence data based on qualitative diagnostic methods that were based on both non-treponemal and treponemal tests to produce corrected point prevalence estimates. One exception was a study that had data based on qualitative and quantitative non-treponemal tests; we used quantitative non-treponemal test results because they are considered to be more accurate.
2. If there was a range for either the sensitivity or specificity of a specific biological assay, we used the midpoint to calculate the corrected point estimate.

*Including TPPA, TPHA, FTA-ABS, MHA-TP, EIA, ELISA, POCT (rapid test).
†Considered as the whole range of any non-treponemal and treponemal test because the definition of syphilis antibody or treponemal antibody was not clearly described and no sensitivity and specificity data of RPGA was obtained.

CLIA: chemiluminescence immunoassay, EIA: enzyme immunoassay, ELISA: enzyme linked immunosorbent assay, FTA-ABS: fluorescent treponemal antibody absorption, MHA-TP: microhemagglutination assay for Treponema pallidum, POCT: point of care test, RPGA: reaction of passive hemagglutination, RPR: rapid plasma reagin, TPHA: treponema pallidum hemagglutination test, TPPA: treponema pallidum particle agglutination test, TRUST: toluidine red unheated serum test, VDRL: venereal disease research laboratory.

Table S3. Pooled syphilis prevalence estimates among MSM in regions of the World Health Organization between 2000-2020

WHO Regions	No. of MSM tested positive	No. of MSM tested (% of total)	Uncorrected pooled prevalence estimates (95%CI)	Corrected pooled prevalence estimates (95%CI)	Median no. of positive diagnoses	Range of study sample size	No. of countries	No. of point prevalence data (% of total)	Heterogeneity I^2 (%)*
2000-2020									
Americas	4,567	38,104 (6·3)	11·0 (8·9-13·2)	10·0 (7·9-12·3)	54	62-5,101	19	58 (16·8)	98·0
Africa	573	16,054 (2·6)	2·9 (1·6-4·6)	2·1 (1·0-3·6)	7	109-2,442	16	24 (7·0)	96·7
Eastern Mediterranean	592	2,958 (0·5)	20·4 (13·7-28·1)	19·6 (12·8-27·4)	140	207-915	3	5 (1·4)	95·9
Europe	874	12,635 (2·1)	6·6 (4·3-9·4)	4·1 (2·2-6·5)	11	31-1,387	17	39 (11·3)	97·0
South-East Asia	2,763	49,700 (8·2)	5·4 (4·3-6·7)	4·7 (3·6-6·0)	27	42-11,997	9	43 (12·5)	97·3
Western Pacific	42,698	486,781 (80·3)	9·5 (9·0-10·1)	9·0 (8·5-9·6)	65.5	39-47,231	13	176 (51·0)	97·6
Total	52,067	606,232 (100)	8·4 (7·9-8·9)	7·5 (7·0-8·0)	48	31-47,231	77	345 (100)	98·1
2010-2020									
Americas	2,654	21,200 (5·0)	12·2 (9·1-15·7)	11·0 (7·9-14·4)	49	62-5,101	14	31 (15·5)	98·2
Africa	496	12,985 (3·1)	3·1 (1·6-5·1)	2·1 (0·9-3·9)	7	109-2,442	13	18 (9·0)	97·0
Eastern Mediterranean	109	869 (0·2)	12·4 (10·2-14·7)	11·5 (9·5-13·7)	54.5	207-662	2	2 (1·0)	-
Europe	628	8,321 (2·0)	5·9 (3·0-9·5)	3·9 (1·6-7·2)	9	43-700	14	25 (12·5)	97·6
South-East Asia	1,323	27,569 (6·6)	4·9 (3·1-7·1)	3·9 (2·3-6·1)	20	42-11,997	9	20 (10·0)	98·1
Western Pacific	27,156	349,411 (83·1)	8·0 (7·5-8·6)	7·7 (7·1-8·2)	66·5	39-42,680	9	104 (52·0)	97·0
Sub-total	32,366	420,355 (100)	7·5 (6·9-8·0)	6·6 (6·0-7·2)	43	39-42,680	61	200 (100)	98·0
2000-2009									
Americas	1,913	16,904 (9·1)	9·6 (7·0-12·6)	9·0 (6·1-12·2)	54	78-3,280	10	27 (18·6)	97·9
Africa	77	3,069 (1·7)	2·4 (0·4-5·8)	2·1 (0·2-5·7)	12	290-879	5	6 (4·1)	96·3
Eastern Mediterranean	483	2,089 (1·1)	25·0 (16·9-34·2)	25·0 (16·9-34·2)	166	388-915	1	3 (2·1)	-
Europe	246	4,314 (2·3)	8·1 (4·7-12·3)	4·4 (1·7-8·2)	12·5	31-1,387	8	14 (9·7)	95·4
South-East Asia	1,440	22,131 (11·9)	5·9 (4·6-7·5)	5·5 (4·1-7·0)	38	110-3,739	7	23 (15·9)	95·0
Western Pacific	15,542	137,370 (73·9)	12·0 (10·9-13·1)	11·3 (10.2-12·5)	64.5	50-47,231	8	72 (49·7)	97·2
Sub-total	19,701	185,877 (100)	9·8 (8·9-10·8)	8·9 (8·0-9·9)	54	31-47,231	39	145 (100)	97.8

*Heterogeneity between subgroups in all subgroup analyses had a P value <0.001

Table S4. Pooled syphilis prevalence estimates among MSM in regions of the World Health Organization between 2000-2020 in five-year intervals

WHO Regions	No. of MSM tested positive	No. of MSM tested (% of total)	Uncorrected pooled prevalence estimates (95%CI)	Corrected pooled prevalence estimates (95%CI)	Median no. of positive diagnoses	Range of study sample size	No. of countries	No. of point prevalence data (% of total)	Heterogeneity I^2 (%)*
2015-2020									
Americas	841	7,950 (19·7)	14·5 (8·2-22·2)	12·0 (6·2-19·3)	62	83-2,296	6	11 (22·4)	98·7
Africa	151	2,900 (7·2)	8·4 (0·5-23·8)	7·6 (0·1-24·1)	29·5	109-1,288	4	4 (8·2)	99·3
Eastern Mediterranean	-	-	-	-	-	-	-	-	-
Europe	235	3,212 (8·0)	5·3 (0·7-13·4)	3·6 (0·1-11·2)	11	200-700	5	7 (14·3)	98·6
South-East Asia	213	5,905 (14·6)	4·2 (1·7-7·6)	3·4 (1·2-6·5)	17·5	42-1,626	7	8 (16·3)	96·1
Western Pacific	1,534	20,390 (50·5)	7·3 (5·7-9·2)	7·3 (5·7-9·2)	43	39-3,613	4	19 (38·8)	95·3
Sub-total	2,974	40,357 (100)	7·9 (6·0-9·9)	6·9 (5·1-8·9)	38	39-3,613	26	49 (100)	98·2
2010-2014									
Americas	1,813	13,250 (3·5)	11·0 (7·8-14·7)	10·4 (7·1-14·2)	29	62-5,101	13	20 (13·2)	97·3
Africa	345	10,085 (2·7)	2·2 (1·3-3·4)	1·3 (0·6-2·1)	7	205-2,442	11	14 (9·3)	89·9
Eastern Mediterranean	109	869 (0·2)	12·4 (10·3-14·7)	11·5 (9·5-13·7)	54·5	207-662	2	2 (1·3)	-
Europe	393	5,109 (1·3)	6·1 (2·9-10·5)	4·1 (1·5-7·9)	8	43-500	11	18 (11·9)	96·9
South-East Asia	1,110	21,664 (5·7)	5·4 (2·9-8·5)	4·3 (2·0-7·4)	48·5	400-11,997	7	12 (7·9)	98·6
Western Pacific	25,622	329,021 (86·6)	8·2 (7·6-8·8)	7·7 (7·2-8·4)	71	39-42,680	7	85 (56·3)	97·2
Sub-total	29,392	379,998 (100)	7·4 (6·8-8·0)	6·5 (5·9-7·1)	44	39-42,680	51	151 (100)	98.0
2005-2009									
Americas	757	7,727 (4·8)	9·4 (5·5-14·1)	8·4 (4·3-13·6)	43	78-850	10	16 (14·2)	98·2
Africa	56	2,627 (1·6)	2·0 (0·1-5·7)	1·7 (0-5·6)	7	290-879	5	5 (4·4)	96·5
Eastern Mediterranean	177	915 (0·6)	19·3 (16·9-22·0)	19·3 (16·9-22·0)	177	915-915	1	1 (0·9)	-
Europe	127	1,840 (1·1)	8·8 (3·2-16·6)	5·4 (0·8-13·3)	8	31-558	7	9 (8·0)	96·7
South-East Asia	801	14,724 (9·1)	5·3 (4·3-6·4)	5·0 (4·1-6·1)	33	200-3,739	5	16 (14·2)	85·8
Western Pacific	15,369	134,624 (82·9)	12·4 (11·3-13·6)	11·7 (10·6-12·9)	68	50-47,231	8	66 (58·4)	97·3
Sub-total	17,287	162,457 (100)	10·0 (9·0-11·0)	9·1 (8·1-10·2)	54	31-47,231	36	113 (100)	97.8
2000-2004									
Americas	1,156	9,177 (39·2)	10·1 (6·7-14·0)	9·9 (6·6-13·8)	60	85-3,280	3	11 (34·4)	96·6
Africa	21	442 (1·9)	4·8 (3·1-7·2)	4·8 (3·1-7·2)	21	442-442	1	1 (3·1)	-
Eastern Mediterranean	306	1,174 (5·0)	25·8 (23·3-28·3)	25·8 (23·3-28·3)	153	388-786	1	2 (6·3)	-
Europe	119	2,474 (10·6)	7·1 (3·5-11·8)	3·1 (1·0-6·3)	21	99-1,387	4	5 (15·6)	89·7
South-East Asia	639	7,407 (31·6)	7·6 (3·9-12·4)	6·5 (2·9-11·3)	65	110-2,399	5	7 (21·9)	97·8
Western Pacific	173	2,746 (11·7)	7·4 (3·8-12·1)	7·4 (3·8-12·1)	23	144-1,396	3	6 (18·8)	92·7
Sub-total	2,414	23,420 (100)	9·2 (7·0-11·8)	8·1 (5·9-10·6)	41	85-3,280	17	32 (100)	97·6

*Heterogeneity between subgroups in all subgroup analyses except for the period 2015-2020 had a P value <0.001, while the period 2015-2020 had a P value of 0·07.

Table S5. Sensitivity and specificity of HIV diagnostic tests

Diagnostic tests	Sensitivity (%)	Specificity (%)	No. of data points	No. of MSM tested
≥ 2 HIV diagnostics	~100	~100	305	586,139
NAAT/ PCR	100	100	1	382
EIA/ ELISA (overall) [13]	100	99.4~100	7	2,677
Genscreen ULTRA HIV Ag-Ab [14]	100	98.7~100	1	397
Rapid test (overall) [13]	97.6~100	97.6~100	1	423
Abbott Determine HIV-1/2[13]	100	99.4	1	171
Alere Determine HIV-1/2 Ag/Ab rapid test [13]	100	98.9	1	788
Hexagon HIV [15]	99.0	99.0	1	400
Murex HIV Ag/Ab combination [13]	100	99.3	1	300
Uni-Gold HIV-1/2 [13]	99.8~100	99.9~100	1	2,296
HIV antibody/ No information about HIV diagnostic	97.6~100	97.6~100	11	6,145

EIA: enzyme immunoassay, ELISA: enzyme-linked immunosorbent assay, NAAT: nucleic acid amplification techniques, PCR: polymerase chain reaction

Table S6. Pooled syphilis prevalence estimates among MSM in regions of the Sustainable Development Goals between 2000-2020 in five-year intervals

SDG regions	No. of MSM tested positive	No. of MSM tested (% of total)	Uncorrected pooled prevalence estimates (95%CI)	Corrected pooled prevalence estimates (95%CI)	Median no. of positive diagnoses	Range of study sample size	No. of countries	No. of point prevalence data (% of total)	Heterogeneity I^2 (%)*
2015-2020									
Australia and New Zealand	-	-	-	-	-	-	0	0 (0)	-
Central and Southern Asia	90	4,471 (11·1)	3·0 (1·2-5·6)	2·4 (0·7-5·0)	12	42-1,573	6	7 (14·3)	94·1
Eastern and South-Eastern Asia	1,619	21,427 (53·1)	7·7 (6·1-9·5)	7·3 (5·6-9·1)	43	102-3,613	4	19 (38·8)	95·5
Europe and Northern America	264	4,309 (10·7)	8·3 (2·5-17·0)	6·2 (1·2-14·4)	38	200-2,296	3	6 (12·2)	98·5
Latin America and the Caribbean	598	4,215 (10·4)	16·8 (9·3-26·0)	14·0 (6·8-23·2)	84	83-1,398	5	7 (14·3)	98·2
Northern Africa and Western Asia	203	2,136 (5·3)	6·9 (0-23·5)	6·3 (0·1-21·0)	32	400-700	2	4 (8·2)	99·1
Oceania (excluding Australia and New Zealand)	49	899 (2·2)	4·8 (3·4-6·4)	4·8 (3·4-6·4)	24·5	39-860	2	2 (4·1)	-
Sub-Saharan Africa	151	2,900 (7·2)	8·4 (0·5-23·8)	7·6 (0·1-24·1)	29·5	109-1,288	4	4 (8·2)	99·3
Total	2,974	40,357 (100)	7·9 (6·0-9·9)	6·9 (5·1-8·9)	38	39-3,613	26	49 (100)	98·2
2010-2014									
Australia and New Zealand	11	915 (0·2)	1·1 (0·4-1·9)	1·1 (0·4-1·9)	4	98-617	1	3 (2·0)	-
Central and Southern Asia	545	16,507 (4·3)	3·6 (2·0-5·6)	3·3 (1·9-5·0)	26	207-11,997	5	6 (4·0)	93·8
Eastern and South-Eastern Asia	26,211	333,431 (87·7)	8·5 (7·9-9·1)	7·9 (7·3-8·5)	78	151-42,680	8	88 (58·3)	97·5
Europe and Northern America	306	4,010 (1·1)	5·8 (2·2-10·7)	3·5 (0·8-7·8)	9	43-442	10	15 (9·9)	97·1
Latin America and the Caribbean	1,651	12,492 (3·3)	10·5 (7·4-14·0)	10·2 (6·9-14·0)	33	62-5,101	11	17 (11·3)	97·2
Northern Africa and Western Asia	322	2,519 (0·7)	11·1 (4·0-21·1)	9·7 (3·1-19·4)	68	216-662	4	7 (4·6)	98·0
Oceania (excluding Australia and New Zealand)	1	39 (0·01)	2·6 (0·5-13·2)	2·6 (0·5-13·2)	1	39-39	1	1 (0·7)	-
Sub-Saharan Africa	345	10,085 (2·7)	2·2 (1·3-3·4)	1·3 (0·6-2·1)	7	205-2,442	11	14 (9·3)	89·9
Sub-total	29,392	379,998 (100)	7·4 (6·8-8·0)	6·5 (5·9-7·1)	44	39-42,680	51	151 (100)	98.0
2005-2009									
Australia and New Zealand	7	183 (0·1)	3·8 (1·9-7·7)	2·6 (1·1-6·0)	7	183-183	1	1 (0·9)	-
Central and Southern Asia	576	8,694 (5·4)	5·7 (2·9-9·3)	5·7 (2·9-9·3)	58	400-3,739	4	7 (6·2)	97·3
Eastern and South-Eastern Asia	15,763	141,286 (87·0)	11·7 (10·7-12·8)	11·1 (10·0-12·2)	65	50-47,231	8	74 (65·5)	97·3
Europe and Northern America	73	2,380 (1·5)	3·5 (1·2-6·7)	1·9 (0·2-4·9)	6	31-850	6	7 (6·2)	91·6
Latin America and the Caribbean	740	6,877 (4·2)	10·1 (6·0-15·0)	9·0 (4·5-14·6)	54	78-833	9	15 (13·3)	98·1
Northern Africa and Western Asia	71	310 (0·2)	21·1 (7·7-38·7)	14·7 (0-46·6)	19	70-140	2	3 (2·7)	-
Oceania (excluding Australia and New Zealand)	1	100 (0·1)	1·0 (0·2-5·4)	1·0 (0·2-5·4)	1	100-100	1	1 (0·9)	-
Sub-Saharan Africa	56	2,627 (1·6)	2·0 (0·1-5·7)	1·7 (0-5·6)	7	290-879	5	5 (4·4)	96·5
Sub-total	17,287	162,457 (100)	10·0 (9·0-11·0)	9·1 (8·1-10·2)	54	31-47231	36	113 (100)	97.8
2000-2004									
Australia and New Zealand	42	1,396 (6·0)	3·0 (2·2-4·0)	3·0 (2·2-4·0)	42	1,396-1,396	1	1 (3·1)	-
Central and Southern Asia	797	7,704 (32·9)	10·1 (4·6-17·4)	8·8 (3·6-16·0)	99	132-2,399	4	7 (21·9)	98·8
Eastern and South-Eastern Asia	279	2,227 (9·5)	10·7 (7·4-14·5)	10·7 (7·4-14·5)	21	110-767	4	7 (21·9)	85·1
Europe and Northern America	120	2,919 (12·5)	5·4 (2·2-9·7)	2·4 (0·7-5·1)	17	99-1,387	5	6 (18·8)	91·3
Latin America and the Caribbean	1,155	8,732 (37·3)	11·9 (9·2-14·9)	11·7 (9·0-14·7)	84·5	85-3,280	2	10 (31·3)	93·1
Northern Africa and Western Asia	-	-	-	-	-	-	0	0 (0)	-
Oceania (excluding Australia and New Zealand)	-	-	-	-	-	-	0	0 (0)	-
Sub-Saharan Africa	21	442 (1·9)	4·8 (3·1-7·2)	4·8 (3·1-7·2)	21	442-442	1	1 (3·1)	-
Sub-total	2,414	23,420 (100)	9·2 (7·0-11·8)	8·1 (5·9-10·6)	41	85-3,280	17	32 (100)	97·6

*Heterogeneity between subgroups in all sub-group analyses had a *P* value <0·05

Table S7. Pooled syphilis prevalence estimates among MSM by country between 2000-2020

Country	No. of point prevalence data	Corrected pooled Prevalence estimates	95% CI
Afghanistan	1	13·3	9·3-18·6
Angola	1	0	0-1·2
Argentina	5	20·5	10·6-32·7
Armenia	5	1·1	0·4-2·1
Australia	5	1·9	1·0-3·1
Azerbaijan	2	3·7	2·2-5·4
Bangladesh	8	4·2	2·1-6·9
Belgium	1	7·5	4·6-12·0
Belize	1	0·8	0·1-4·3
Bhutan	1	9·5	3·8-22·1
Bolivia	1	8·9	7·1-11·0
Bosnia-Herzegovina	2	0	0-0·4
Botswana	1	2·7	1·5-4·6
Brazil	9	12·5	4·7-23·3
Burkina Faso	1	6·6	5·0-8·8
Cambodia	2	1·8	0·9-2·9
Cameroon	1	0·4	0·1-1·4
Canada	1	9·7	5·1-17·8
China	153	9·7	9·2-10·3
Costa Rica	1	18·0	14·1-22·7
Cote d'Ivoire	1	0	0-0·3
Croatia	3	4·7	0·6-12·1
Dominican Republic	1	13·0	7·8-21·0
Ecuador	3	7·6	5·0-10·6
El Salvador	2	11·7	10·1-13·4
Estonia	1	0	0-8·2
Gambia	1	0·5	0·1-2·7
Georgia	6	26·5	16·4-38·1
Guatemala	2	0·8	0·3-1·5
Guyana	1	0	0-1·0
Haiti	2	11·0	9·6-12·6
Honduras	1	8·0	6·2-10·3
India	5	4·7	2·7-7·3
Indonesia	3	15·3	12·7-18·0
Italy	1	5·5	3·4-8·8
Jamaica	2	5·4	3·0-8·4
Japan	1	4·9	3·3-7·4
Kenya	2	1·2	0·6-1·9
Lesotho	1	11·2	9·2-13·5

Country	No. of point prevalence data	Corrected pooled Prevalence estimates	95% CI
Liberia	1	1·0	0·3-3·5
Macedonia	2	0·4	0-1·0
Malawi	3	0·6	0·3-1·0
Malaysia	1	28·3	22·4-35·2
Mauritius	2	12·7	9·8-15·9
Mexico	2	9·2	7·8-10·7
Moldova	3	2·9	1·5-4·6
Mongolia	3	10·3	2·9-21·4
Morocco	1	11·0	8·9-13·6
Myanmar	6	2·4	0·2-6·6
Nepal	6	2·6	1·8-3·6
Netherlands	1	0	0-1·0
Nicaragua	1	8·3	6·4-10·7
Nigeria	1	0	0-0·4
Pakistan	3	25·0	16·9-34·2
Panama	1	23·4	20·2-26·9
Papua New Guinea	1	5·7	4·3-7·5
Peru	14	12·3	10·0-14·7
Philippines	1	0	0-1·3
Republic of Korea	1	19·1	12·8-27·5
Russia	5	4·8	0·1-14·7
Senegal	2	4·0	2·8-5·4
Serbia	2	3·0	1·8-4·6
Solomon Islands	1	0	0-9·0
Spain	2	2·3	1·6-3·2
Sri Lanka	2	0·6	0·3-0·9
Switzerland	1	4·3	3·0-6·3
Tajikistan	1	0	0-0·8
Tanzania	3	0·4	0-1·4
Thailand	10	7·0	4·7-9·7
Timor-Leste	2	3·2	1·6-5·1
Togo	2	0·3	0·1-0·7
Tonga	1	1·0	0·2-5·4
Uganda	1	10·3	7·3-14·4
United Kingdom	1	0	0-1·0
United States	8	6·9	1·8-14·9
Vanuatu	1	2·6	0·5-13·2
Viet Nam	4	3·5	1·0-7·3

Table S8. Individual studies identified by systematic review containing syphilis prevalence estimates among MSM

Study	Country	Study year(s)	Income level	Study design	Sampling method*	Diagnostic method	HIV prevalence (crude)	No. syphilis positive	No. syphilis tested	Syphilis prevalence (crude)†	Axis score
Australia and New Zealand											
Jin, 2007 [16]	Australia	2001-2004	High	Cross-sectional	Convenience	TPPA+FTA-ABS	0.0%	42	1396	3.0%	12
Lee, 2010 [17]	Australia	2009	High	Cross-sectional	Convenience	POCT	-	7	183	3.8%	9
Read, 2013 [18]	Australia	2010-2011	High	Cross-sectional	Convenience	RPR+TPPA+FTA-ABS	-	1	98	1.0%	13
Zou, 2014 [19]	Australia	2010-2012	High	Cross-sectional	Convenience	RPR+EIA	0.0%	4	200	2.0%	11
Goddard, 2019 [20]	Australia	2010-2015	High	Cohort	Convenience	RPR≥1:4+TPPA±FTA-ABS	35.8%	6	617	1.0%	12
Central and Southern Asia											
MOH, 2012 [21]	Afghanistan	2012	Low	Cross-sectional	RDS	POCT	0.5%	36	207	17.4%	15
MOH, 2002 [22]	Bangladesh	2002	Low	Cross-sectional	Convenience	RPR+TPHA	0.2%	316	2399	13.2%	14
MOH, 2007 [23]	Bangladesh	2003-2004	Low	Cross-sectional	Convenience	RPR≥1:8+TPHA/TPPA	0.1%	99	2276	4.3%	14
MOH, 2005 [24]	Bangladesh	2004-2005	Low	Cross-sectional	Convenience	RPR≥1:8+TPPA	0.4%	65	1365	4.8%	14
MOH, 2007 [25]	Bangladesh	2006	Low	Cross-sectional	Convenience	RPR≥1:8+TPPA	0.5%	38	1038	3.7%	13
MOH, 2008 [26]	Bangladesh	2007	Low	Cross-sectional	Convenience	RPR≥1:8+TPPA	0.2%	58	1481	3.9%	14
MOH, 2011 [27]	Bangladesh	2011	Low	Cross-sectional	Convenience	RPR≥1:8+TPPA	0.3%	72	1797	4.0%	14
Rana, 2016¶ [28]	Bangladesh	2012	Low	Cross-sectional	VCT	RPR≥1:8+TPPA	0.8%	16	889	1.8%	12
MOH, 2017 [29]	Bangladesh	2015	Lower-middle	Cross-sectional	Convenience	RPR≥1:8+TPPA	0.6%	16	1307	1.2%	14
SPMER, 2016 [30]	Bhutan	2016	Lower-middle	Cross-sectional	RDS	RPR+TPPA	0.0%	4	42	9.5%	13
Schneider, 2010 [31]	India	2004-2005	Low	Cross-sectional	Probability	ELISA	7.6%	5	132	3.8%	15
Solomon, 2010 [32]	India	2008	Lower-middle	Cross-sectional	RDS	RPR+TPPA	9.0%	58	721	8.0%	13
Ramakrishnan, 2015 [33]	India	2009-2010	Lower-middle	Cross-sectional	TLS	RPR+TPHA	12.5%	228	3739	6.1%	14
Solomon, 2015 [34]	India	2012-2013	Lower-middle	Cross-sectional	RDS	RPR+TPHA	9.6%	401	11997	3.3%	11
Das, 2019 [35]	India	2017	Lower-middle	Cross-sectional	Snowball	RPR≥1:8	3.2%	22	247	8.9%	14
CREHPA, 2005 [36]	Nepal	2004	Low	Cross-sectional	RDS	RPR≥1:8+TPPA	3.9%	6	358	1.7%	13
New ERA, 2008 [37]	Nepal	2007	Low	Cross-sectional	RDS	RPR+TPHA	3.3%	11	400	2.8%	15
New ERA, 2009 [38]	Nepal	2009	Low	Cross-sectional	RDS	RPR≥1:8+TPHA	3.8%	6	400	1.5%	12
MOH, 2013 [39]	Nepal	2012	Low	Cross-sectional	RDS	RPR+TPPA	6.3%	10	400	2.5%	17
MOH, 2015 [40]	Nepal	2015	Low	Cross-sectional	RDS	RPR+TPPA	5.3%	19	400	4.8%	15
MOH, 2017 [41]	Nepal	2017	Low	Cross-sectional	RDS	RPR+TPPA	6.3%	12	400	3.0%	17
MOH, 2005¶‡ [42]	Pakistan	2004	Low	Cross-sectional	Snowball	RPR+TPHA	2.2%	166	786	21.1%	14
MOH, 2005¶ [42]	Pakistan	2004	Low	Cross-sectional	Probability	RPR+TPHA	1.0%	140	388	36.1%	14
Hawkes, 2009¶‡ [43]	Pakistan	2007	Low	Cross-sectional	RDS	RPR+TPHA	0.8%	177	915	19.3%	13
NSACP, 2015 [44]	Sri Lanka	2014	Lower-middle	Cross-sectional	RDS	VDRL≥16+POCT	0.6%	10	1217	0.8%	15
NSACP, 2018 [45]	Sri Lanka	2017	Lower-middle	Cross-sectional	RDS	VDRL+TPPA	0.3%	6	1573	0.4%	15
Gulov, 2016 [46]	Tajikistan	2015	Lower-middle	Cross-sectional	Convenience	Syphilis antibody	2.6%	11	502	2.2%	12
Eastern and South-Eastern Asia											
Girault, 2004 [47]	Cambodia	2000	Low	Cross-sectional	TLS	RPR+TPPA	14.1%	11	206	5.3%	14
Sopheab, 2005 [48]	Cambodia	2005	Low	Cross-sectional	RDS	RPR+TPPA	5.2%	5	541	0.9%	13
Jiang, 2006 [49]	China	2003	Lower-middle	Cross-sectional	Convenience	RPR≥1:8+TPPA	0.0%	10	144	6.9%	12
Ma, 2007 [50]	China	2004	Lower-middle	Cross-sectional	RDS	RPR+ELISA	1.5%	25	325	7.7%	13
He, 2006 [51]	China	2004	Lower-middle	Cross-sectional	Convenience	TRUST+ELISA	0.0%	21	200	10.5%	9
Choi, 2007 [52]	China	2004-2005	Lower-middle	Cross-sectional	Snowball	TRUST+TPPA	1.5%	64	475	13.5%	11
Ruan, 2007 [53]	China	2005	Lower-middle	Cross-sectional	Convenience	TPPA	3.2%	59	526	11.2%	12
Ma, 2007 [50]	China	2005	Lower-middle	Cross-sectional	RDS	RPR+ELISA	6.1%	54	427	12.6%	13
Zhang, 2007 [54]	China	2005-2006	Lower-middle	Cross-sectional	VCT	RPR+TPHA	2.1%	53	753	7.0%	13
Ye, 2012 [55]	China	2006	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	2.3%	518	5076	10.2%	11
Xiao, 2010 [56]	China	2006	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	2.9%	490	4983	9.8%	11

Study	Country	Study year(s)	Income level	Study design	Sampling method*	Diagnostic method	HIV prevalence (crude)	No. syphilis positive	No. syphilis tested	Syphilis prevalence (crude)†	Axis score
Ma, 2007 [50]	China	2006	Lower-middle	Cross-sectional	RDS	RPR+ELISA	6.9%	54	540	10.0%	13
Zhang, 2012 [57]	China	2006	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	10.9%	89	953	9.3%	13
Zeng, 2014 [58]	China	2006	Lower-middle	Cross-sectional	Snowball	ELISA	13.0%	54	561	9.6%	12
He, 2009 [59]	China	2006	Lower-middle	Cross-sectional	RDS	RPR+ELISA	1.7%	20	409	4.9%	11
Wang, 2012 [60]	China	2006	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	1.0%	37	401	9.2%	13
Guo, 2009 [61]	China	2006	Lower-middle	Cross-sectional	Convenience	RPR+TPPA	4.7%	79	296	26.7%	10
Xu, 2010 [62]	China	2006	Lower-middle	Cohort	Convenience	RPR+TPPA	0.0%	73	218	33.5%	13
Feng, 2008 [63]	China	2005-2007	Lower-middle	Cross-sectional	Convenience	TRUST+TPPA	3.3%	264	1376	19.2%	12
Ruan, 2009 [64]	China	2006-2007	Lower-middle	Cross-sectional	Convenience	TPHA	4.8%	107	541	19.8%	12
Ye, 2012 [55]	China	2007	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	3.4%	538	4981	10.8%	11
Zheng, 2012 [65]	China	2007	Lower-middle	Cross-sectional	Convenience	RPR+TPPA	2.5%	11	157	7.0%	12
Zou, 2010 [66]	China	2007	Lower-middle	Cross-sectional	Convenience	TPPA	4.8%	48	420	11.4%	11
Feng, 2010 [67]	China	2007	Lower-middle	Cross-sectional	Snowball	ELISA	9.1%	144	513	28.1%	11
Xiao, 2009 [68]	China	2007	Lower-middle	Cross-sectional	Convenience	RPR+TPPA	10.9%	56	742	7.5%	11
Zhang, 2012 [57]	China	2007	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	12.8%	89	1015	8.8%	13
Wang, 2012 [60]	China	2007	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	2.9%	65	419	15.5%	13
Guo, 2013 [69]	China	2007	Lower-middle	Cohort	Convenience	RPR+TPHA	8.1%	35	161	21.7%	13
Zhu, 2008 [70]	China	2007	Lower-middle	Cross-sectional	Convenience	ELISA	3.9%	18	73	24.7%	12
Guo, 2009 [61]	China	2007	Lower-middle	Cross-sectional	Convenience	RPR+TPPA	8.0%	41	137	29.9%	10
Ye, 2012 [55]	China	2008	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	4.9%	748	5460	13.7%	11
Wang, 2014 [71]	China	2008	Lower-middle	Cross-sectional	Convenience	RPR+ELISA	1.7%	59	1146	5.1%	13
Li, 2011 [72]	China	2008	Lower-middle	Cross-sectional	Convenience	TPPA	4.5%	161	550	29.3%	12
She, 2013 [73]	China	2008	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	6.9%	206	1693	12.2%	11
Zhang, 2012 [57]	China	2008	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	16.6%	63	743	8.5%	13
Zeng, 2014 [58]	China	2008	Lower-middle	Cross-sectional	Snowball	ELISA	16.3%	70	602	11.6%	12
Ma, 2016 [74]	China	2008	Lower-middle	Cross-sectional	RDS	RPR+TPPA	16.2%	72	617	11.7%	13
Zhong, 2014 [75]	China	2008	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	5.0%	66	379	17.4%	14
Wang, 2012 [60]	China	2008	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	3.5%	65	451	14.4%	13
Yan, 2016 [76]	China	2008	Lower-middle	Cross-sectional	RDS	RPR+TPPA	4.7%	54	430	12.6%	13
Cai, 2010¶ [77]	China	2008	Lower-middle	Cross-sectional	TLS	RPR+TPPA	5.3%	56	394	14.2%	14
Bai, 2011 [78]	China	2008	Lower-middle	Cross-sectional	Snowball	RPR/TRUST+TPPA	7.1%	42	280	15.0%	11
Xu, 2011 [79]	China	2008-2009	Lower-middle	Cross-sectional	Convenience	RPR+TPPA	3.0%	22	436	5.0%	13
Wu, 2013 [80]	China	2008-2009	Lower-middle	Cross-sectional	Snowball	RPR/TRUST+TPPA	4.9%	5552	47231	11.8%	13
Chen, 2016 [81]	China	2008-2009	Lower-middle	Cross-sectional	RDS	RPR+TPPA	7.7%	422	2958	14.3%	11
Cao, 2014 [82]	China	2008-2009	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	8.0%	154	858	17.9%	12
Gao, 2015 [83]	China	2008-2009	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	6.0%	108	600	18.0%	12
Zhao, 2014 [84]	China	2008-2009	Lower-middle	Cross-sectional	TLS	RPR+TPPA	7.0%	162	801	20.2%	15
Liao, 2011 [85]	China	2008-2009	Lower-middle	Cross-sectional	Convenience	RPR+TPPA	2.5%	166	2994	5.5%	11
Qin, 2016 [86]	China	2009	Lower-middle	Cross-sectional	Snowball	RPR+ELISA	5.5%	1586	17431	9.1%	12
Ye, 2012 [55]	China	2009	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	5.3%	692	5326	13.0%	11
Wang, 2014 [71]	China	2009	Lower-middle	Cross-sectional	Convenience	RPR+ELISA	1.3%	90	1351	6.7%	13
Fan, 2012 [87]	China	2009	Lower-middle	Cross-sectional	RDS	RPR+TPPA	7.2%	110	500	22.0%	12
Mao, 2014 [88]	China	2009	Lower-middle	Cohort	Convenience	RPR+TPPA	6.6%	162	547	29.6%	12
Li, 2012 [89]	China	2009	Lower-middle	Cohort	Convenience	RPR+TPPA	0.0%	131	797	16.4%	12
Chen, 2015 [90]	China	2009	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	12.3%	61	826	7.4%	12
Zhang, 2012 [91]	China	2009	Lower-middle	Cross-sectional	RDS	RPR+TPPA	11.5%	26	503	5.2%	12
Zhang, 2012 [57]	China	2009	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	19.1%	72	603	11.9%	13
Zhong, 2014 [75]	China	2009	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	3.9%	32	385	8.3%	14
Wang, 2012 [60]	China	2009	Lower-middle	Cross-sectional	Snowball	RPR+TPPA	5.1%	101	450	22.4%	13

Study	Country	Study year(s)	Income level	Study design	Sampling method*	Diagnostic method	HIV prevalence (crude)	No. syphilis positive	No. syphilis tested	Syphilis prevalence (crude)†	Axis score
Yang, 2014 [92]	China	2009	Lower-middle	Cross-sectional	Convenience	TRUST+ELISA	14.7%	178	839	21.2%	13
Jia, 2015 [93]	China	2007-2012	Lower-middle	Cohort	Convenience	RPR+TPPA	8.4%	481	5800	8.3%	12
Li, 2016 [94]	China	2009-2010	Lower-middle	Cohort	Convenience	RPR+TPPA	6.3%	170	962	17.7%	12
Wang, 2014 [95]	China	2009-2010	Lower-middle	Cohort	Snowball	TRUST+ELISA/TPPA	10.5%	118	622	19.0%	15
Huan, 2011 [96]	China	2010	Upper-middle	Cross-sectional	Snowball	TRUST≥1:8+ELISA	-	44	328	13.4%	11
Qin, 2016 [86]	China	2010	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	5.7%	2940	34191	8.6%	12
Luo, 2012 [97]	China	2010	Upper-middle	Cross-sectional	Snowball	RPR+TPPA	8.2%	44	1118	3.9%	11
Chen, 2017 [98]	China	2010	Upper-middle	Cross-sectional	Snowball	TRUST+ELISA	8.9%	410	3061	13.4%	13
Hu, 2017 [99]	China	2010	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	1.0%	145	3087	4.7%	12
Wang, 2014 [71]	China	2010	Upper-middle	Cross-sectional	Convenience	RPR+ELISA	3.2%	99	1257	7.9%	13
Zhang, 2013 [100]	China	2010	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	9.9%	58	302	19.2%	13
Zeng, 2014 [58]	China	2010	Upper-middle	Cross-sectional	Snowball	TRUST+ELISA	12.5%	25	400	6.3%	12
Zhong, 2014 [75]	China	2010	Upper-middle	Cross-sectional	Snowball	RPR+TPPA	7.7%	28	405	6.9%	14
Wu, 2016 [101]	China	2010	Upper-middle	Cross-sectional	Convenience	TPPA	3.4%	23	522	4.4%	13
Wang, 2012 [60]	China	2010	Upper-middle	Cross-sectional	Snowball	RPR+TPPA	7.5%	65	413	15.7%	13
Xu, 2013 [102]	China	2009-2011	Upper-middle	Cohort	Convenience	RPR+TPPA	0.0%	22	378	5.8%	13
Zhao, 2015 [103]	China	2010	Upper-middle	Cross-sectional	RDS	RPR+TPPA	9.5%	122	621	19.6%	15
Zhao, 2015 [103]	China	2010	Upper-middle	Cross-sectional	TLS	RPR+TPPA	9.4%	75	533	14.1%	17
Zhou, 2011 [104]	China	2010	Upper-middle	Cross-sectional	Snowball	RPR+TPPA	2.3%	43	400	10.8%	9
Liu, 2013 [105]	China	2010	Upper-middle	Cross-sectional	Convenience	ELISA	13.1%	40	388	10.3%	12
Tao, 2013 [106]	China	2010-2011	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	5.4%	150	894	16.8%	11
Fan, 2014 [107]	China	2010-2011	Upper-middle	Cross-sectional	Snowball	RPR+TPPA	5.3%	148	887	16.7%	11
Zhang, 2015 [108]	China	2009-2012	Upper-middle	Cross-sectional	Snowball	RPR+TPPA	7.9%	187	1230	15.2%	13
Huang, 2014 [109]	China	2009-2012	Upper-middle	Cross-sectional	RDS	RPR+TPPA	15.4%	61	1239	4.9%	11
Cai, 2014 [110]	China	2009-2012	Upper-middle	Cross-sectional	Snowball	TRUST+TPPA	8.0%	179	813	22.0%	10
Wang, 2012 [111]	China	2011	Upper-middle	Cross-sectional	Snowball	RPR/TRUST+ELISA	6.3%	2902	37084	7.8%	10
Qin, 2016 [86]	China	2011	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	6.3%	2894	37099	7.8%	12
Qi, 2015 [112]	China	2011	Upper-middle	Cross-sectional	Convenience	RPR+rapid test	6.3%	2189	32701	6.7%	12
Chen, 2017 [98]	China	2011	Upper-middle	Cross-sectional	Snowball	TRUST+ELISA	7.9%	300	3337	9.0%	13
Lan, 2014 [113]	China	2011	Upper-middle	Cross-sectional	Convenience	RPR/TRUST+TPPA	3.0%	53	462	11.5%	10
Hu, 2016 [114]	China	2011	Upper-middle	Cross-sectional	Convenience	TRUST+ELISA	8.1%	249	2433	10.2%	12
Hu, 2017 [99]	China	2011	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	1.9%	156	3192	4.9%	12
Wang, 2014 [71]	China	2011	Upper-middle	Cross-sectional	Convenience	RPR+ELISA	2.7%	81	1314	6.2%	13
Wang, 2016 [115]	China	2011	Upper-middle	Cross-sectional	RDS	RPR+TPPA	19.2%	16	391	4.1%	11
Zhong, 2014 [75]	China	2011	Upper-middle	Cross-sectional	Snowball	RPR+TPPA	9.3%	25	400	6.3%	14
Luo, 2015¶ [116]	China	2011	Upper-middle	Cross-sectional	Snowball	RPR+TPHA	10.4%	37	259	14.3%	13
Zhang, 2013 [117]	China	2011	Upper-middle	Cross-sectional	Snowball	RPR+TPPA	9.5%	66	463	14.3%	13
Liao, 2014 [118]	China	2011	Upper-middle	Cross-sectional	Convenience	RPR+TPPA	1.6%	84	1228	6.8%	13
Wu, 2018 [119]	China	2011	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	3.8%	28	400	7.0%	11
Fan, 2016 [120]	China	2011-2012	Upper-middle	Cross-sectional	Convenience	TPPA	19.2%	16	391	4.1%	11
Pan, 2016 [121]	China	2009-2014	Upper-middle	Cross-sectional	VCT	RPR+TPPA	11.9%	232	1981	11.7%	12
Qu, 2016 [122]	China	2012	Upper-middle	Cross-sectional	Snowball	TRUST+ELISA	6.8%	381	1611	23.6%	12
Qin, 2016 [86]	China	2012	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	6.7%	2993	39910	7.5%	12
Chen, 2017 [98]	China	2012	Upper-middle	Cross-sectional	Snowball	TRUST+ELISA	9.6%	298	4380	6.8%	13
Hu, 2016 [114]	China	2012	Upper-middle	Cross-sectional	Convenience	TRUST+ELISA	9.6%	196	2678	7.3%	12
Hu, 2017 [99]	China	2012	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	2.2%	170	3202	5.3%	12
Liang, 2014 [123]	China	2012	Upper-middle	Cross-sectional	Snowball	TRUST+EIA	11.1%	147	2783	5.3%	10
Wang, 2014 [71]	China	2012	Upper-middle	Cross-sectional	Convenience	RPR+ELISA	3.7%	109	1301	8.4%	13

Study	Country	Study year(s)	Income level	Study design	Sampling method*	Diagnostic method	HIV prevalence (crude)	No. syphilis positive	No. syphilis tested	Syphilis prevalence (crude)†	Axis score
Zeng, 2014 [58]	China	2012	Upper-middle	Cross-sectional	Snowball	TRUST+ELISA	19.5%	11	390	2.8%	12
Zhong, 2014 [75]	China	2012	Upper-middle	Cross-sectional	Snowball	RPR+TPPA	10.0%	36	401	9.0%	14
Yan, 2016 [76]	China	2012	Upper-middle	Cross-sectional	RDS	RPR+TPPA	9.2%	67	589	11.4%	13
Chu, 2018 [124]	China	2011-2013	Upper-middle	Cohort	Snowball	RPR+TPPA	9.1%	69	657	10.5%	12
Wu, 2018 [119]	China	2012	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	7.3%	25	400	6.3%	11
Mao, 2018 [125]	China	2012-2013	Upper-middle	Cross-sectional	Convenience	RPR+TPPA	9.9%	381	4496	8.5%	14
Xu, 2014 [126]	China	2012-2013	Upper-middle	Cross-sectional	Convenience	RPR+TPPA	9.2%	466	3830	12.2%	12
Qin, 2016 [86]	China	2013	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	7.3%	2689	42680	6.3%	12
Chen, 2017 [98]	China	2013	Upper-middle	Cross-sectional	Snowball	TRUST+ELISA	8.6%	231	4208	5.5%	13
Guanghua, 2018 [127]	China	2013	Upper-middle	Cross-sectional	Convenience	RPR+ELISA	6.6%	185	1996	9.3%	14
Hu, 2016 [114]	China	2013	Upper-middle	Cross-sectional	Convenience	TRUST+ELISA	8.8%	169	2591	6.5%	12
Hu, 2017 [99]	China	2013	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	3.6%	193	3164	6.1%	12
Zeng, 2014 [58]	China	2013	Upper-middle	Cross-sectional	Snowball	TRUST+ELISA	19.7%	11	376	2.9%	12
Zhang, 2019 [128]	China	2013	Upper-middle	Cross-sectional	Snowball	RPR+TRUST+ELISA	23.0%	28	875	3.2%	13
Zhong, 2014 [75]	China	2013	Upper-middle	Cross-sectional	Snowball	RPR+TPPA	11.4%	21	633	3.3%	14
Wu, 2019 [129]	China	2013	Upper-middle	Case-control	Convenience	TRUST+TPPA	.	71	447	15.9%	13
Ding, 2014 [130]	China	2013	Upper-middle	Cross-sectional	Snowball	Syphilis antibody	1.3%	2	151	1.3%	10
Zhang, 2018 [131]	China	2012-2014	Upper-middle	Cross-sectional	Convenience	RPR+TPPA	10.8%	71	646	11.0%	13
Cai, 2016 [132]	China	2011-2015	Upper-middle	Cross-sectional	VCT	TRUST+TPPA	9.8%	556	3040	18.3%	11
Wu, 2018 [119]	China	2013	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	5.5%	22	400	5.5%	11
Liu, 2016 [133]	China	2013-2014	Upper-middle	Cross-sectional	Convenience	TRUST+TPPA	12.7%	269	3588	7.5%	12
Li, 2016 [134]	China	2013-2014	Upper-middle	Cross-sectional	RDS	TRUST+TPPA	14.7%	201	1316	15.3%	13
Liu, 2016 [135]	China	2013-2014	Upper-middle	Cross-sectional	Snowball	ELISA	12.4%	56	587	9.5%	13
Chen, 2017 [98]	China	2014	Upper-middle	Cross-sectional	Snowball	TRUST+ELISA	8.9%	324	4766	6.8%	13
Guanghua, 2018 [127]	China	2014	Upper-middle	Cross-sectional	Convenience	RPR+ELISA	8.4%	193	1965	9.8%	14
Hu, 2016 [114]	China	2014	Upper-middle	Cross-sectional	Convenience	TRUST+ELISA	10.6%	204	2610	7.8%	12
Hu, 2017 [99]	China	2014	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	4.4%	138	3060	4.5%	12
Zhang, 2019 [128]	China	2014	Upper-middle	Cross-sectional	Snowball	RPR+TRUST+ELISA	21.5%	66	1149	5.7%	13
Huang, 2016 [136]	China	2014	Upper-middle	Cross-sectional	TLS	RPR+TPPA	9.7%	105	965	10.9%	14
Wu, 2018 [119]	China	2014	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	6.0%	26	400	6.5%	11
Li, 2019 [137]	China	2014-2015	Upper-middle	Cohort	Convenience	RPR+TPPA	0.0%	34	523	6.5%	14
Zhang, 2017 [138]	China	2014-2015	Upper-middle	Cross-sectional	Convenience	TRUST+TPPA	17.0%	34	300	11.3%	14
Lu, 2017 [139]	China	2015	Upper-middle	Cross-sectional	Snowball	TRUST+ELISA	9.8%	10	102	9.8%	11
Guanghua, 2018 [127]	China	2015	Upper-middle	Cross-sectional	Convenience	RPR+ELISA	11.2%	104	1697	6.1%	14
Hu, 2016 [114]	China	2015	Upper-middle	Cross-sectional	Convenience	TRUST+ELISA	10.1%	212	2541	8.3%	12
Zhang, 2019 [128]	China	2015	Upper-middle	Cross-sectional	Snowball	RPR+TRUST+ELISA	20.3%	71	1329	5.3%	13
Liu, 2017 [140]	China	2015	Upper-middle	Cross-sectional	VCT	RPR+TPPA	11.6%	53	732	7.2%	13
An, 2019 [141]	China	2015	Upper-middle	Cross-sectional	Convenience	RPR+TPPA	22.5%	33	267	12.4%	15
Wu, 2018 [119]	China	2015	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	8.3%	20	400	5.0%	11
Zhang, 2019 [128]	China	2016	Upper-middle	Cross-sectional	Snowball	RPR+TRUST+ELISA	19.8%	107	1604	6.7%	13
Wei, 2019 [142]	China	2015-2017	Upper-middle	Cross-sectional	TLS	RPR+TPPA	13.5%	484	3613	13.4%	11
Bai, 2019 [143]	China	2016	Upper-middle	Cross-sectional	Convenience	TRUST+ELISA	3.8%	32	400	8.0%	11
Wu, 2018 [119]	China	2016	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	9.0%	34	400	8.5%	11
Zhang, 2019 [128]	China	2017	Upper-middle	Cross-sectional	Snowball	RPR+TRUST+ELISA	18.9%	102	1527	6.7%	13
Bai, 2019 [143]	China	2017	Upper-middle	Cross-sectional	Convenience	TRUST+ELISA	3.3%	17	400	4.3%	11
Wu, 2018 [119]	China	2017	Upper-middle	Cross-sectional	Snowball	RPR+ELISA	6.3%	43	400	10.8%	11
Liao, 2019 [144]	China	2018	Upper-middle	Cross-sectional	Snowball	TRUST+ELISA	3.0%	96	3474	2.8%	12
Bai, 2019 [143]	China	2018	Upper-middle	Cross-sectional	Convenience	TRUST+ELISA	3.0%	31	400	7.8%	11
Pisani, 2004 [145]	Indonesia	2002	Low	Cross-sectional	Convenience	RPR+TPPA	9.0%	131	767	17.1%	14

Study	Country	Study year(s)	Income level	Study design	Sampling method*	Diagnostic method	HIV prevalence (crude)	No. syphilis positive	No. syphilis tested	Syphilis prevalence (crude)†	Axis score
MOH, 2013 [146]	Indonesia	2013	Lower-middle	Cross-sectional	RDS	RPR+TPHA	17.3%	122	960	12.7%	11
MOH, 2013¶ [146]	Indonesia	2013	Lower-middle	Cross-sectional	Probability	RPR+TPHA	19.0%	159	980	16.2%	11
Itoda, 2013 [147]	Japan	2008-2011	High	Cross-sectional	VCT	POCT	3.1%	43	423	10.2%	13
Wickersham, 2017¶ [148]	Malaysia	2014	Upper-middle	Cross-sectional	RDS	RPR+TPPA	12.4%	53	187	28.3%	15
Davaalkham, 2009 [149]	Mongolia	2007	Lower-middle	Cross-sectional	Convenience	POCT	0.0%	15	50	30.0%	11
MOH, 2012 [150]	Mongolia	2012	Lower-middle	Cross-sectional	RDS	RPR≥1:2+TPPA	10.7%	8	196	4.1%	14
MOH, 2014 [151]	Mongolia	2014	Upper-middle	Cross-sectional	RDS	RPR+TPHA	13.7%	18	255	7.1%	14
MOH, 2007 [152]	Myanmar	2007	Low	Cross-sectional	Convenience	VDRL	29.3%	28	400	7.0%	11
MOH, 2009 [153]	Myanmar	2008	Low	Cross-sectional	Convenience	VDRL	28.8%	56	397	14.1%	12
MOH, 2010 [154]	Myanmar	2009	Low	Cross-sectional	Convenience	VDRL	22.3%	25	400	6.3%	12
MOH, 2011 [155]	Myanmar	2010	Low	Cross-sectional	Convenience	VDRL	11.0%	4	400	1.0%	12
MOH, 2012 [156]	Myanmar	2011	Low	Cross-sectional	Convenience	VDRL	7.8%	10	400	2.5%	11
MOH, 2013 [157]	Myanmar	2012	Low	Cross-sectional	Convenience	VDRL	8.9%	25	763	3.3%	11
Dept of Health, 2014¶ [158]	Philippines	2013	Lower-middle	Cross-sectional	Probability	TPPA	3.7%	7	296	2.4%	12
Jung, 2012 [159]	South Korea	2008	High	Cross-sectional	TLS	TPPA	6.5%	22	108	20.4%	13
Ananwaranich, 2013 [160]	Thailand	2005	Lower-middle	Cross-sectional	VCT	RPR+POCT	24.6%	10	200	5.0%	10
Ananwaranich, 2013 [160]	Thailand	2006	Lower-middle	Cross-sectional	VCT	RPR+POCT	23.0%	16	505	3.2%	10
Ananwaranich, 2013 [160]	Thailand	2007	Lower-middle	Cross-sectional	VCT	RPR+POCT	25.3%	27	440	6.1%	10
Holtz, 2012 [161]	Thailand	2006-2010	Lower-middle	Cross-sectional	Convenience	RPR≥1:8+POCT	21.6%	68	1541	4.4%	14
Ananwaranich, 2013 [160]	Thailand	2008	Lower-middle	Cross-sectional	VCT	RPR+POCT	26.6%	27	611	4.4%	10
Ananwaranich, 2013 [160]	Thailand	2009	Lower-middle	Cross-sectional	VCT	RPR+POCT	27.4%	63	707	8.9%	10
Van Griensven, 2013 [162]	Thailand	2006-2012	Lower-middle	Cohort	Convenience	RPR≥1:8+POCT	21.3%	82	1744	4.7%	12
Ananwaranich, 2013 [160]	Thailand	2010	Upper-middle	Cross-sectional	VCT	RPR+POCT	34.1%	157	867	18.1%	10
Ananwaranich, 2013 [160]	Thailand	2011	Upper-middle	Cross-sectional	VCT	RPR+POCT	29.4%	124	994	12.5%	10
Phanuphak, 2018 [163]	Thailand	2016-2017	Upper-middle	Cross-sectional	Convenience	RPR+TPHA	0.0%	113	1626	6.9%	13
Pisani, 2006 [164]	Timor -Leste	2003	Low	Cross-sectional	Convenience	RPR+TPHA	0.9%	17	110	15.5%	10
ASHM, 2017 [165]	Timor-Leste	2017	Lower-middle	Cross-sectional	RDS	POCT	0.3%	21	310	6.8%	15
Pham, 2012 [166]	Vietnam	2009	Lower-middle	Cross-sectional	Convenience	TPHA	6.3%	5	381	1.3%	12
MOH, 2011 [167]	Vietnam	2009-2010	Lower-middle	Cross-sectional	RDS	RPR+TPHA	13.7%	17	1595	1.1%	15
Nguyan, 2016 [168]	Vietnam	2010-2012	Lower-middle	Cross-sectional	Convenience	RPR+TPHA	2.6%	40	2467	1.6%	14
Colby, 2016¶ [169]	Vietnam	2015	Lower-middle	Cross-sectional	Snowball	RPR+POCT	18.0%	36	205	17.6%	12
Europe and Northern America											
Revniers, 2018 [170]	Belgium	2015-2016	High	Cross-sectional	Convenience	RPR≥1:4 +TPPA/TPA	0.0%	15	200	7.5%	15
Ravlija, 2011 [171]	Bosnia- Herzegovina	2010-2011	Upper-middle	Cross-sectional	Snowball	ELISA	1.8%	1	168	0.6%	12
Ravlija, 2012 [172]	Bosnia- Herzegovina	2012	Upper-middle	Cross-sectional	Snowball	ELISA	1.2%	2	330	0.6%	12
Nelson, 2019 [173]	Canada	2011-2013	High	Cross-sectional	Convenience	EIA	38.4%	15	86	17.4%	12
Bozicevic, 2009 [174]	Croatia	2006	Upper-middle	Cross-sectional	RDS	TPHA	5.0%	31	360	8.6%	15
Bozicevic, 2012 [175]	Croatia	2010-2011	High	Cross-sectional	RDS	RPR+TPHA	3.6%	3	387	0.8%	15
Vilibic-Cavlek, 2018 [176]	Croatia	2011-2013	High	Cross-sectional	VCT	ELISA+Western Blotting	3.3%	11	90	12.2%	12
Ruutel, 2015 [177]	Estonia	2013	High	Cross-sectional	Convenience	Syphilis antibody	7.0%	2	43	4.7%	15
Zorzi, 2017 [178]	Itary	2013-2014	High	Cross-sectional	RDS	RPR+TPPA	.	16	289	5.5%	14
Mikik, 2011 [179]	Macedonia	2010	Upper-middle	Cross-sectional	RDS	Real time PCR (blood)	0.5%	2	382	0.5%	12
MOH, 2014 [180]	Macedonia	2013-2014	Upper-middle	Cross-sectional	RDS	Syphilis antibody+TPH-test	2.3%	5	426	1.2%	13
WHO (Europe), 2004 [181]	Moldova	2003	Low	Cross-sectional	Convenience	Treponema antibody	1.7%	12	99	12.1%	11
NCHM, 2008 [182]	Moldova	2007	Lower-middle	Cross-sectional	Convenience	TPHA	4.8%	2	31	6.5%	14
Zohrabyan, 2013 [183]	Moldova	2010	Lower-middle	Cross-sectional	RDS	TPHA	1.5%	27	397	6.8%	13
Hoornenborg, 2018 [184]	Netherland	2015-2016	High	Cross-sectional	Convenience	CLIA	0.0%	6	374	1.6%	13
Amirkhanian, 2006 [185]	Russia	2003	Lower-middle	Cross-sectional	Convenience	Wasserman reaction assay+TPHA	.	13	125	10.4%	10
WHO (Europe), 2004 [181]	Russia	2003	Lower-middle	Cross-sectional	Snowball	Treponema antibody	2.5%	21	253	8.3%	11

Study	Country	Study year(s)	Income level	Study design	Sampling method*	Diagnostic method	HIV prevalence (crude)	No. syphilis positive	No. syphilis tested	Syphilis prevalence (crude)†	Axis score
Baral, 2010¶ [186]	Russia	2005-2006	Upper-middle	Cohort	RDS	RPR	16.0%	6	50	12.0%	11
WHO (Europe), 2007 [187]	Russia	2006	Upper-middle	Cross-sectional	Convenience	RPGA	2.2%	10	558	1.8%	15
Wirtz, 2015 [188]	Russia	2012-2013	High	Cross-sectional	RDS	RPR+RPGA	47.2%	20	123	16.3%	14
MOH, 2012 [189]	Serbia	2012	Upper-middle	Cross-sectional	Snowball	POCT	3.8%	46	400	11.5%	13
Tahirukaj, 2014 [190]	Serbia (Kosovo)	2014	Lower-middle	Cross-sectional	RDS	Syphilis antibody	2.3%	9	217	4.1%	15
Hurtado, 2011 [191]	Spain	2000-2006	High	Cross-sectional	VCT	RPR+ELISA±FTA-ABS	.	33	1387	2.4%	9
Hurtado, 2010 [192]	Spain	2008	High	Cross-sectional	Convenience	POCT	4.1%	6	141	4.3%	11
Borelli, 2009 [193]	Switzerland	2004	High	Cross-sectional	Convenience	TPPA	.	40	610	6.6%	10
Manavi, 2012 [194]	United Kingdom	2009-2010	High	Cross-sectional	Convenience	POCT	1.5%	1	390	0.3%	8
Golden, 2006 [195]	United States	2002-2005	High	Cross-sectional	Convenience	RPR+TPPA	5.0%	1	445	0.2%	12
Mayer, 2012 [196]	United States	2004-2010	High	Cross-sectional	Convenience	RPR+FTA-ABS	2.3%	17	850	2.0%	12
Katz, 2018 [197]	United States	2010-2014	High	RCT	Convenience	RPR+TPPA	0.0%	4	230	1.7%	15
Watson, 2019 [198]	United States	2013-2014	High	Cross-sectional	RDS	Treponema antibody	36.8%	143	442	32.4%	13
Fujimoto, 2018 [199]	United States	2014-2016	High	Cross-sectional	RDS	RPR≥1:4+FTA-ABS	40.5%	105	365	28.8%	12
Reback, 2018 [200]	United States	2014-2016	High	Cohort	Convenience	RPR+FTA-ABS	41.6%	38	286	13.3%	12
Obafemi, 2019 [201]	United States	2016-2018	High	Cross-sectional	Convenience	RPR+TPPA	1.8%	38	2296	1.7%	11
Shannon, 2019 [202]	United States	2017-2019	High	Cross-sectional	Convenience	POCT	17.0%	62	788	7.9%	15
Latin America and the Caribbean											
Pando, 2006 [203]	Argentina	2000-2001	Upper-middle	Cross-sectional	Convenience	VDRL+TPHA±FTA-ABS	13.8%	112	662	16.9%	14
Berini, 2007 [204]	Argentina	2000-2003	Upper-middle	Cross-sectional	Convenience	VDRL+TPHA+FTA-ABS	13.2%	109	682	16.0%	12
Segura, 2010 [205]	Argentina	2003-2004	Upper-middle	Cohort	Convenience	RPR+TPPA/TPHA±FTA-ABS	7.5%	60	877	6.8%	9
Avila, 2017¶ [206]	Argentina	2006-2009	Upper-middle	Cross-sectional	Convenience	VDRL+TPHA±FTA-ABS	34.1%	130	258	50.4%	14
Pando, 2012 [207]	Argentina	2007-2009	Upper-middle	Cross-sectional	RDS	VDRL+TPHA±FTA-ABS	17.2%	102	496	20.6%	13
MOH, 2012 [208]	Belize	2012	Upper-middle	Cross-sectional	RDS	RPR+TPPA	13.8%	1	129	0.8%	11
MOH, 2010 [209]	Bolivia	2008	Lower-middle	Cross-sectional	RDS	RPR+TPPA	13.6%	72	811	8.9%	15
Soares, 2014 [210]	Brazil	2005-2006	Lower-middle	Cross-sectional	RDS	POCT	7.3%	62	558	11.1%	11
Ribeiro, 2012 [211]	Brazil	2007	Upper-middle	Cross-sectional	Convenience	ELISA	.	21	833	2.5%	13
Brignol, 2015 [212]	Brazil	2008-2009	Upper-middle	Cross-sectional	RDS	POCT	6.3%	32	363	8.8%	13
de Albuquerque, 2014 [213]	Brazil	2011	Upper-middle	Cross-sectional	Convenience	VDRL+MHA-TP	4.8%	10	62	16.1%	10
Fernandes, 2015 [214]	Brazil	2011-2013	Upper-middle	Cross-sectional	Convenience	VDRL+EIA	14.4%	149	430	34.7%	12
Hoagland, 2017 [215]	Brazil	2014-2015	Upper-middle	Cross-sectional	Convenience	RPR≥1:8+MHA-TP	0.0%	43	444	9.7%	15
Grinsztejn, 2017¶ [216]	Brazil	2015-2016	Upper-middle	Cross-sectional	RDS	VDRL≥1:8+TPHA	41.2%	112	342	32.7%	14
Da Motta, 2018 [217]	Brazil	2016	Upper-middle	Cross-sectional	Probability	VDRL+FTA-ABS	.	59	1279	4.6%	16
Ferreira, 2019¶ [218]	Brazil	2015-2017	Upper-middle	Cohort	RDS	VDRL≥1:8+POCT	54.0%	88	322	27.3%	11
MOH, 2010 [219]	Costa Rica	2009	Upper-middle	Cross-sectional	RDS	VDRL+TPHA	12.7%	54	300	18.0%	14
Brito, 2015 [220]	Dominican Republic	2013	Upper-middle	Cross-sectional	Snowball	VDRL+FTA-ABS	5.0%	13	100	13.0%	12
Hernandez, 2017 [221]	Ecuador	2010	Upper-middle	Cross-sectional	Convenience	VDRL+TPPA	9.5%	33	306	10.8%	15
Jacobson, 2014 [222]	Ecuador	2010-2011	Upper-middle	Cross-sectional	RDS	RPR≥1:8+FTA-ABS	12.8%	24	414	5.8%	14
Sanchez-Gomez, 2015 [223]	Ecuador	2011-2012	Upper-middle	Cross-sectional	RDS	RPR≥1:8+FTA-ABS	13.6%	25	370	6.8%	14
Ham, 2015 [224]	El Salvador	2007-2008	Lower-middle	Cross-sectional	RDS	RPR+TPPA	13.5%	70	704	9.9%	8
Creswell, 2012 [225]	El Salvador	2008	Lower-middle	Cross-sectional	RDS	RPR+TPHA	13.4%	94	690	13.6%	14
Lahuerta, 2011 [226]	Guatemala	2006-2009	Lower-middle	Cross-sectional	VCT	VDRL+TPHA	0.8%	0	385	0.0%	12
Ham, 2015 [224]	Guatemala	2012	Lower-middle	Cross-sectional	RDS	RPR≥1:8+TPPA	10.4%	11	541	2.0%	8
MOH, 2014 [227]	Guyana	2014	Lower-middle	Cross-sectional	Convenience	RPR	.	4	387	1.0%	15
OHMaSS, 2015 [228]	Haiti	2014-2015	Low	Cross-sectional	RDS	RPR+POCT	16.0%	175	1239	14.1%	16
Zalla, 2019 [229]	Haiti	2016-2017	Low	Cross-sectional	Probability	POCT	4.7%	49	488	10.0%	17
Ham, 2015 [224]	Honduras	2012	Lower-middle	Cross-sectional	RDS	RPR+TPPA	14.4%	54	677	8.0%	8
Figueroa, 2013 [230]	Jamaica	2007-2008	Upper-middle	Cross-sectional	Convenience	TRUST+TPPA	32.3%	12	201	6.0%	11
Logie, 2018¶ [231]	Jamaica	2015	Upper-middle	Cross-sectional	Snowball	POCT	.	8	83	9.6%	13

Study	Country	Study year(s)	Income level	Study design	Sampling method*	Diagnostic method	HIV prevalence (crude)	No. syphilis positive	No. syphilis tested	Syphilis prevalence (crude)†	Axis score
Pitpitan, 2015 [232]	Mexico	2012-2013	Upper-middle	Cross-sectional	RDS	RPR+TPHA	17.3%	14	191	7.3%	15
Martinez, 2019 [233]	Mexico	2016-2018	Upper-middle	Cross-sectional	VCT	POCT	16.7%	198	1398	14.2%	5
Ham, 2015 [224]	Nicaragua	2009-2010	Lower-middle	Cross-sectional	RDS	RPR+TPPA	7.8%	54	652	8.3%	8
Hakre, 2014 [234]	Panama	2011-2012	Upper-middle	Cross-sectional	RDS	RPR+TPHA	20.6%	141	603	23.4%	14
Sanchez, 2007 [235]	Peru	2000	Lower-middle	Cross-sectional	Snowball	RPR+MHA-TP	19.7%	201	1357	14.8%	14
Clark, 2007 [236]	Peru	2000-2001	Lower-middle	Cross-sectional	Probability	RPR+TPPA	0.0%	2	85	2.4%	15
Caceres, 2008 [237]	Peru	2001-2003	Lower-middle	Cross-sectional	Convenience	RPR+TPPA	9.6%	48	166	28.9%	12
Lama, 2006 [238]	Peru	2002-2003	Lower-middle	Cross-sectional	Snowball	RPR+MHA-TP	13.9%	440	3280	13.4%	13
Clark, 2008 [239]	Peru	2003-2004	Lower-middle	Cross-sectional	Convenience	RPR+TPPA	1.5%	5	197	2.5%	14
Park, 2016 [240]	Peru	2002-2005	Lower-middle	Cohort	Convenience	TPPA	.	124	913	13.6%	12
Snowden, 2010 [241]	Peru	2003-2005	Lower-middle	Cross-sectional	Convenience	RPR≥1:8+TPPA	11.9%	54	513	10.5%	12
Blas, 2007 [242]	Peru	2006	Lower-middle	Cross-sectional	Convenience	RPR	5.5%	6	78	7.7%	11
Perez-Brumer, 2013 [243]	Peru	2007	Lower-middle	Cross-sectional	Convenience	RPR≥1:16+TPPA	8.2%	8	122	6.6%	12
Silva-Santisteban, 2012¶ [244]	Peru	2009	Upper-middle	Cross-sectional	RDS	RPR≥1:8	29.8%	23	426	5.4%	14
Pizzicato, 2017 [245]	Peru	2011	Upper-middle	Cross-sectional	Convenience	RPR+MHA-TP	8.0%	706	5101	13.8%	13
Galea, 2015 [246]	Peru	2012-2013	Upper-middle	Cross-sectional	Convenience	POCT	0.0%	105	600	17.5%	12
Blair, 2019 [247]	Peru	2012-2014	Upper-middle	Cross-sectional	Convenience	RPR≥1:16+MHA-TP	.	143	898	15.9%	13
Allan-Blitz, 2019 [248]	Peru	2016	Upper-middle	Cross-sectional	Convenience	RPR+TPPA	22.8%	84	303	27.7%	11
Northern Africa and Western Asia											
MOH, 2011 [249]	Armenia	2010-2011	Lower-middle	Cross-sectional	RDS	RPR+TPHA	2.2%	4	270	1.5%	10
MOH, 2013 [250]	Armenia	2012	Lower-middle	Cross-sectional	RDS	RPR+TPHA	2.0%	7	300	2.3%	11
MOH, 2015 [251]	Armenia	2014	Lower-middle	Cross-sectional	RDS	RPR+TPHA	1.3%	6	300	2.0%	11
MOH, 2016 [252]	Armenia	2016	Lower-middle	Cross-sectional	RDS	RPR+TPHA	1.3%	1	400	0.3%	14
MOH, 2018 [253]	Armenia	2018	Upper-middle	Cross-sectional	RDS	Rapid test+TPHA	2.0%	4	700	0.6%	16
MOH, 2008 [254]	Azerbaijan	2007-2008	Lower-middle	Cross-sectional	Convenience	Syphilis antibody	1.0%	8	100	8.0%	11
MOH, 2015 [255]	Azerbaijan	2014-2015	Upper-middle	Cross-sectional	RDS	ELISA	2.2%	68	500	13.6%	13
Tanadgoma, 2005 [256]	Georgia	2005	Lower-middle	Cross-sectional	RDS	RPR+TPHA+ ELISA	4.3%	19	70	27.1%	12
Save the Children, 2008 [257]	Georgia	2007	Lower-middle	Cross-sectional	RDS	RPR+TPHA+ syphilis antibody	3.7%	44	140	31.4%	14
Curatio Intl, 2010 [258]	Georgia	2010	Lower-middle	Cross-sectional	RDS	TPHA	7.0%	93	271	34.3%	15
Curatio Intl, 2012 [259]	Georgia	2012	Lower-middle	Cross-sectional	RDS	TPHA	13.0%	71	216	32.9%	16
Curatio Intl, 2015 [260]	Georgia	2015	Upper-middle	Cross-sectional	RDS	ELISA	20.7%	138	415	33.3%	14
Curatio Intl, 2018 [261]	Georgia	2018	Upper-middle	Cross-sectional	RDS	RPR+TPHA+LIA	16.2%	60	621	9.7%	13
Johnston, 2013 [262]	Morocco	2010-2011	Lower-middle	Cross-sectional	RDS	VDRL+TPHA	4.9%	73	662	11.0%	11
Oceania (excluding Australia and New Zealand)											
Hakim, 2019 [263]	Papua New Guinea	2016-2017	Lower-middle	Cross-sectional	RDS	POCT	6.4%	49	860	5.7%	15
MOH, 2018 [264]	Solomon Islands	2017	Lower-middle	Cross-sectional	RDS	RPR≥1:8	0.0%	0	39	0.0%	17
MOH, 2008 [265]	Tonga	2007-2008	Lower-middle	Cross-sectional	Convenience	RPR≥1:8+TPPA	0.0%	1	100	1.0%	13
Veronese, 2015 [266]	Vanuatu	2011-2012	Lower-middle	Cross-sectional	RDS	RPR+POCT	0.0%	1	39	2.6%	15
Sub-Saharan Africa											
Kendall, 2014 [267]	Angola	2011	Upper-middle	Cross-sectional	RDS	POCT	8.2%	1	310	0.3%	14
MOH, 2013 [268]	Botswana	2012	Upper-middle	Cross-sectional	RDS	RPR+TPHA	13.1%	12	450	2.7%	15
Goodman, 2016 [269]	Brukina Faso	2013	Low	Cross-sectional	RDS	RPR+POCT	4.8%	44	665	6.6%	13
Park, 2013 [270]	Cameroon	2011	Lower-middle	Cross-sectional	RDS	RPR+TPHA	37.0%	2	511	0.4%	15
MoH, 2016 [271]	Cote d'Ivoire	2015-2016	Lower-middle	Cross-sectional	RDS	POCT	11.6%	6	1288	0.5%	17
Mason, 2013 [272]	Gambia	2011	Low	Cross-sectional	Snowball	RPR+TPHA	9.8%	1	205	0.5%	13
Sanders, 2013 [273]	Kenya	2005-2011	Low	Cohort	Convenience	RPR+TPHA	0.0%	7	449	1.6%	12
Muraguri, 2015 [274]	Kenya	2010	Low	Cross-sectional	RDS	RPR+TPHA	25.6%	5	563	0.9%	11
MoH, 2019 [275]	Lesotho	2018	Lower-middle	Cross-sectional	RDS	POCT+EIA	22.7%	92	825	11.2%	14
MOH, 2013¶ [276]	Liberia	2013	Low	Cross-sectional	Convenience	RPR+TPHA	19.8%	2	207	1.0%	12

Study	Country	Study year(s)	Income level	Study design	Sampling method*	Diagnostic method	HIV prevalence (crude)	No. syphilis positive	No. syphilis tested	Syphilis prevalence (crude)†	Axis score
Wirtz, 2013 [277]	Malawi	2011-2012	Low	Cross-sectional	RDS	TPHA	15.4%	18	338	5.3%	14
Wirtz, 2017 [278]	Malawi	2011-2014	Low	Cross-sectional	RDS	TPHA	17.3%	110	2442	4.5%	14
Wirtz, 2014 [279]	Malawi	2011-2014	Low	Cross-sectional	RDS	TPHA	17.3%	110	2441	4.5%	12
MOH, 2010 [280]	Mauritius	2010	Upper-middle	Cross-sectional	RDS	VDRL+TPHA	10.6%	21	362	5.8%	15
PILS, 2017¶ [281]	Mauritius	2017	Upper-middle	Cross-sectional	RDS	RPR/VDRL+TPHA	28.4%	53	109	48.6%	15
Merrigan, 2011 [282]	Nigeria	2007	Low	Cross-sectional	RDS	RPR+TPHA	12.4%	0	879	0.0%	14
Wade, 2005 [283]	Senegal	2004	Low	Cross-sectional	Snowball	RPR+TPHA	21.5%	21	442	4.8%	13
Wade, 2010 [284]	Senegal	2007	Low	Cross-sectional	Snowball	RPR+TPHA	21.8%	17	500	3.4%	12
Johnston, 2010 [285]	Tanzania	2007	Low	Cross-sectional	RDS	POCT	12.8%	2	509	0.4%	11
Ross, 2014 [286]	Tanzania	2012-2013	Low	Cross-sectional	RDS	POCT	23.7%	5	262	1.9%	12
Mmbaga, 2018 [287]	Tanzania	2014	Low	Cross-sectional	RDS	VDRL+TPHA	22.3%	7	646	1.1%	14
Horacio, 2019 [288]	Togo	2012-2013	Low	Cross-sectional	RDS	VDRL+TPHA	9.1%	7	683	1.0%	14
Ekouevi, 2019 [289]	Togo	2017	Low	Cross-sectional	RDS	POCT	22.0%	0	678	0.0%	13
Kim, 2016 [290]	Uganda	2008-2009	Low	Cross-sectional	RDS	RPR+ELISA	13.4%	30	290	10.3%	11

*If snowball sampling, RDS, or TLS was used with other convenience sampling methods, it was described and counted as snowball sampling, RDS, or TLS, respectively. †If a study did not have crude prevalence data of syphilis and there was no response from authors (or there was no contact information), the study was excluded from our study. ¶Data points exclusively with male sex workers, transgender women, transgender women sex workers. ‡All of the participants were male or transgender women sex workers. For male sex workers in these two studies, it is possible that heterosexual male sex workers were included to some extent.

Text S1. *Search terms*

Search on MEDLINE (full text and subject heading search terms)
(syphili* OR exp syphilis [MeSH] OR treponema pallidum OR treponema pallidum [MeSH] OR great pox) AND (men who have sex with men OR exp “Sexual and Gender Minorities” [MeSH] OR gay OR homosexual* OR Homosexuality, Male [MeSH] OR bisexual* OR Bisexuality [MeSH] OR transgender OR high risk population) AND limit to yr=“2000-Current” AND “each country name”
Search on EMBASE (full text and subject heading search terms)
(syphili* OR exp syphilis/ OR treponema pallidum OR Treponema pallidum/ OR great pox) AND (men who have sex with men OR men who have sex with men/ OR gay OR homosexual male/ OR homosexual* OR bisexual* OR bisexual male/ OR men who have sex with men and women/ OR transgender OR transgender/ OR high risk population OR high risk population/) AND limit to yr=“2000-Current” AND “each country name”
Search on LILACS (full text and subject heading search terms)
tw:((tw:(syphili*)) OR (mh:("syphilis")) OR (tw:(great pox)) OR (tw:(treponema pallidum)) OR (mh:("treponema pallidum")) AND (tw:(men who have sex with men)) OR (tw:(msm)) OR (tw:(gay*)) OR (tw:(bisexual*)) OR (tw:(homosexual*)) OR (tw:(transgender*)) OR (tw:(high risk population*)) OR (tw:(same sex*)) OR (mh:("homosexuality, male")) OR (mh:("bisexual")) OR (mh:("gay")) OR (mh:("transgender"))) AND (db:("LILACS")) AND (year_cluster:[2000 TO 2020])
Search on African Index Medicus (AIM) (full text search terms)
Syphili$ OR Treponema pallidum

Text S2. *Data extraction form*

General information					
Study ID (No.)			Date form completed	DD / MM / YYYY	
Name of person extracting data		1.	2.	3.	
Study title					
First author			Year of publication		
Source	Database / reference	1. MEDLINE or EMBASE	2. References of review studies		
	Other data sets	1. IBBS (for syphilis)	2. LILACS	3.AIM	
Included STIs in this article		1. Syphilis	2. Gonorrhoea	3. Chlamydia	4. Trichomoniasis
Study eligibility					
Country		_____			
SDG region		1. Sub-Saharan Africa	2. Northern Africa & Western Asia	3. Central & Southern Asia	4. Eastern & South -Eastern Asia
		5. Latin America & the Caribbean	6. Australia & New Zealand	7. Europe & Northern America	8. Oceania (excluding Australia & New Zealand)
Study type		1. Cross sectional	2. Cohort	3. Case-control	4. Other studies using primary data (_____)
Study duration		From DD / MM / YYYY		To DD / MM / YYYY	
Age of participants (years)		_____ If available, mean/median (_____), range/IQR (_____)			
Location		1. Community			2. Clinic
Population definition					
Sex at birth		1. Male	2. Female	3. Intersex	
Sexuality		1. MSM	2. Bisexual	3. Transgender	4. Heterosexual 5. Others (_____)
Language (of full-text)		1. English	2. Others (_____)		
Eligibility criteria met?		1. Yes	2. No		
Reason for exclusion					
For syphilis					
Definition of syphilis diagnosis according to authors					
Diagnostic test		1. Both NTT & TT	2. NTT only	3. TT only	
Non-treponemal test (NTT)		1. RPR	2. VDRL	3. TRUST	
Treponemal test (TT)		1. TPPA	2.TPHA	3. FTA-ABS	4. MHA-TP 5. ELISA
		6. EIA	7.CIA	8. POCT (ICS)	9. Others (_____)
Any NTT titer information?		1. Yes	2. No		
NTT Cutoff titer for active syphilis		1. 1:8	2. 1:16	3. Other	
Outcomes (Prevalence)					
Reported prevalence		_____%	95% CI:		
Number tested			Number positive		
Others					
Reference to other relevant studies		1. Yes	2. No		
Notes		HIV prevalence = (No. tested positive) / (No. tested) =____% (diagnosed with _____)			

Text S3. *Correction of observed prevalence*

We corrected errors of known magnitude with the following formula based on the sensitivity and specificity of each assay used.[291] If there was a range for either the sensitivity or specificity of a specific biological assay, we used the midpoint to calculate the corrected point estimate.

Corrected prevalence = (Observed prevalence + Specificity – 1) / (Sensitivity + Specificity – 1)

Text S4. *Appraisal tool for cross-sectional studies (AXIS)*

	Question	Yes	No	Don't know/ Comment
Introduction				
1	Were the aims/objectives of the study clear?			
Methods				
2	Was the study design appropriate for the stated aim(s)?			
3	Was the sample size justified?			
4	Was the target/reference population clearly defined? (Is it clear who the research was about?)			
5	Was the sample frame taken from an appropriate population base so that it closely represented the target/reference population under investigation?			
6	Was the selection process likely to select subjects/participants that were representative of the target/reference population under investigation?			
7	Were measures undertaken to address and categorise non-responders?			
8	Were the risk factor and outcome variables measured appropriate to the aims of the study?			
9	Were the risk factor and outcome variables measured correctly using instruments/measurements that had been trialled, piloted or published previously?			
10	Is it clear what was used to determined statistical significance and/or precision estimates? (e.g. p-values, confidence intervals)			
11	Were the methods (including statistical methods) sufficiently described to enable them to be repeated?			
Results				
12	Were the basic data adequately described?			
13	Does the response rate raise concerns about non-response bias?			
14	If appropriate, was information about non-responders described?			
15	Were the results internally consistent?			
16	Were the results presented for all the analyses described in the methods?			
Discussion				
17	Were the authors' discussions and conclusions justified by the results?			
18	Were the limitations of the study discussed?			
Other				
19	Were there any funding sources or conflicts of interest that may affect the authors' interpretation of the results?			
20	Was ethical approval or consent of participants attained?			

Text S5. *References*

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