

SUPPLEMENTARY MATERIAL

Prevalence and progression of rheumatic heart disease: a global systematic review and meta-analysis of population-based echocardiographic studies

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Supplementary Table 1. Search strategy on PubMed

	Search terms	Items found
#1	("Rheumatic Fever"[Mesh] OR "Rheumatic Heart Disease"[Mesh] OR "Disease, Rheumatic Heart"[Mesh] OR "Diseases, Rheumatic Heart"[Mesh] OR "Heart Disease, Rheumatic"[Mesh] OR "Heart Diseases, Rheumatic"[Mesh] OR "Rheumatic Heart Diseases"[Mesh] OR "Bouillaud Disease"[Mesh] OR "Disease, Bouillaud"[Mesh] OR "Bouillaud's Disease"[Mesh] OR "Bouillauds Disease"[Mesh] OR "Disease, Bouillaud's"[Mesh] OR "Fever, Rheumatic"[Mesh] OR "Fevers, Rheumatic"[Mesh] OR "Rheumatic Fevers"[Mesh] OR "Rheumatic Fever, Acute"[Mesh] OR Rheumatic Fever[tiab] OR Rheumatic Heart Disease[tiab] OR Rheumatic Heart[tiab] OR Rheumatic Heart[tiab] OR Rheumatic[tiab] OR Bouillaud[tiab] OR rheumatic valvular heart disease[tiab] OR "RHD" OR RHD[tiab])	57,953
#2	("Echocardiography"[Mesh] OR Echocardiography[tiab] OR echocardio* OR "cardiac ultrasound" OR "cardiac echo*" OR "cardiac echography")	174,373
#3	#1 AND #2	2,884

Supplementary Table 2. Search strategy on EMBASE

#1	('rheumatic heart disease'/exp OR 'rheumatic fever'/exp OR 'rheumatic heart disease':ab,ti OR 'rheumatic cardiac':ab,ti OR 'rheumatic heart':ab,ti OR 'rheumatic fever':ab,ti OR 'rheumatic valve':ab,ti OR 'rheumatic valvular':ab,ti OR Bouillaud:ab,ti OR Bouillauds:ab,ti OR 'rheumatic cardiac disease':ab,ti OR rhd:ab,ti OR 'rheumatic valvular heart disease':ab,ti)	31,390
#2	('echocardiography'/exp OR 'cardiac echography':ab,ti OR echocardiogram:ab,ti OR 'heart echography':ab,ti)	278,025
#3	#1 AND #2	3,324
#4	#3 AND [embase]/lim NOT [medline]/lim	1,169

Supplementary Table 3. Search strategy on Web of Science

	Search terms	Items found
#1	(((((((((('rheumatic heart disease' OR 'rheumatic fever') OR 'rheumatic cardiac') OR 'rheumatic valve') OR 'rheumatic valvular) OR Bouillaud) OR bouillauds) OR 'rheumatic cardiac disease') OR rhd) OR 'rheumatic valvular heart disease')	37,399
#2	('echocardiography' OR 'cardiac echography' OR echocardiogram OR 'heart echography')	235,302
#3	#1 AND #2	3,471
#4	Medline excluded	2,567

Web of Science includes Web of Sciences Collection, Current Contents Connect, SciELO citation Index, Russian Science Citation Index, and KCI-Korean Journal Database

Supplementary Table 4. Search strategy on Global Index Medicus

#1	tw:(('echocardiography' OR 'cardiac echography' OR echocardiogram OR 'heart echography') AND (instance:"ghl"))	1,029,812
#2	tw:(('rheumatic heart disease' OR 'rheumatic fever' OR 'rheumatic cardiac' OR 'rheumatic valve' OR 'rheumatic valvular' OR 'bouillaud' OR 'bouillauds' OR 'rheumatic cardiac disease' OR 'rhd' OR 'rheumatic valvular heart disease') AND (instance:"ghl"))	2,700
#3	#1 AND #2	370
#4	Medline excluded	1

Global Index Medicus: WPRIM (Western Pacific), LILACS (Americas), IMERMR (Eastern Mediterranean), AIM (Africa), WHOLIS (KMS), BBO – Dentistry (Brazil), IMSEAR (South-East Asia)

Supplementary Table 5. Search strategy on Cochrane Library

#1	'echocardiography' OR 'cardiac echography' OR echocardiogram OR 'heart echography'	9,136
#2	'rheumatic heart disease' OR 'rheumatic fever' OR 'rheumatic cardiac' OR 'rheumatic valve' OR 'rheumatic valvular' OR 'bouillaud' OR 'bouillauds' OR 'rheumatic cardiac disease' OR 'rhd' OR 'rheumatic valvular heart disease'	583
#3	#1 AND #2	75

Supplementary Table 6. Characteristics of included prevalence studies

Characteristics	N = 82 studies
Setting	
- Community-based	14
- School-based	64
- Both	2
- Not reported	2
Area	
- Urban	33
- Rural	16
- Both	26
- Not reported	9
Sampling method	
- Random	80
- Not reported	2
Diagnostic criteria	
- WHO	30
- WHF	32
- Others	22
Diagnostic procedure	
- Auscultation>Echo	31
- Echo>Echo	46
- Echo>Nothing	5
Endemic area	
- Yes	69
- No	13
WHO regions	
- Africa	22
- The Americas	6
- Eastern Mediterranean	9
- Europe	3
- South-East Asia	22
- Western Pacific	20
UNSD regions	
- Africa	25
- The Americas	6
- Asia	29
- Europe	3
- Oceania	19
Income	
- Low	20
- Lower-Middle	34
- Upper-Middle	19
- High	9

Auscultation>Echo = Auscultation only for screening followed with echography confirmation; Echo>Echo: Echography +/- auscultation for screening followed with echography for confirmation; Echo>Nothing: Echography only for screening without echography confirmation; GDP = Gross national income per capita; HDI = Human Development Index; WHO: World Health Organization; WHF: World Heart Federation; UNSD: United Nations Statistic Division

Supplementary Table 7. Individual characteristics of included studies reporting on the prevalence of rheumatic heart disease

Study	Bias	Criteria	Year	Country	Period	Endemic area	GDP	HDI	GINI (*100)	WHO	UNSD	Level of income	Design	Population	Setting	Random sampling	Area	Diagnostic criteria	Male, %	Age, years	Age range	Sample
Abdel-Moula 1998	Low	Others	1998	Egypt	NR	Yes	1042	0.691	31.8	Eastern Mediterranean	Africa	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo				5465
Ahmed 2005	Moderate	Others	2005	Bangladesh	1991	Yes	285	0.579	32.1	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	Children	Both	Yes	Rural	Echo>Echo		12.8	5;15	5923
Allen 2017	Low	WHF	2017	Samoa	2013; 2015	Yes	4179	0.704	42	Western Pacific	Oceania	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	NR	Echo>Nothing	48.90	10.2	5;17	11434
Al-Munibari 2001	Moderate	Others	2001	Yemen	1997-1998	Yes	396	0.482	36.7	Eastern Mediterranean	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Both	Auscultation>Echo	49.90		5;18	5000
Anabwani 1996	Moderate	Others	1996	Kenya	NR	Yes	260	0.555	48.5	Africa	Africa	2.Lower-Middle	Cross-sectional	School children	NR	NR	Rural	Echo>Nothing				1115
Baroux 2013	Low	Others	2013	New Caledonia	2008; 2010	Yes	12580	NR	NR	Western Pacific	Oceania	4.High	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo	50.20	9.6	5;15	12803
Ba-Saddik 2012	Low	WHO	2012	Yemen	2004; 2005	Yes	754	0.482	36.7	Eastern Mediterranean	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Both	Auscultation>Echo	51.00	11.2	5;16	6000
Beaton 2012	Low	WHO	2012	Uganda	2010	Yes	595	0.493	41	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo	44.00	9.6	5;16	4869
Beaton 2015	Low	WHF	2015	Uganda	NR	Yes	655	0.493	41	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	NR	Echo>Echo	47.00	10.8		1420
Bhardwaj 2012	Moderate	Others	2012	India	NR	Yes	1346	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	General population	Community-based	Yes	Rural	Auscultation>Echo	48.00	30.4		1882
Bhaya 2010	Low	WHO	2010	India	2007; 2008	Yes	1036	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo			6;15	1059
Bodian 2014	Low	WHO	2014	Senegal	2011	Yes	1082	0.494	40.3	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo	60.10	9.7	5;18	2019
Campanale 2017	Low	WHF	2017	Madagascar	2013; 2015	Yes	440	0.512	42.7	Africa	Africa	1.Low	Cross-sectional	General population	Community-based	Yes	Both	Echo>Echo			≥ 20	337
Campanale 2017	Low	WHF	2017	Madagascar	2013; 2015	Yes	440	0.512	42.7	Africa	Africa	1.Low	Cross-sectional	General population	Community-based	Yes	Both	Echo>Echo			5;19	522
Carapetis 2008	Low	WHO	2008	Tonga	2003;2004	Yes	2157	0.721	37.5	Western Pacific	Oceania	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	52.00	8.0	3;15	4794
Chaikitpinyo 2014	Moderate	Others	2014	Thailand	2006	No	3369	0.74	37.8	South-East Asia	Asia	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Both	Auscultation>Echo	50.90	10.0	5;15	8555
Colquhoun 2014	Moderate	WHO	2014	Fiji	2009; 2010	Yes	3511	0.736	36.4	Western Pacific	Oceania	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo			5;14	1666
Colquhoun 2014	Moderate	WHF	2014	Fiji	2009; 2011	Yes	3652	0.736	36.4	Western Pacific	Oceania	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo			5;15	1666
Cramp 2012	Low	Others	2012	New Zealand	2009	No	28201	0.915	NR	Western Pacific	Oceania	4.High	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo			5;17	685
El-Aroussy 2013	Low	WHO	2013	Egypt	2009; 2011	Yes	2602	0.691	31.8	Eastern Mediterranean	Africa	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	49.10	11.1	6;18	48930
Engel 2015	Low	WHF	2015	Ethiopia	2008; 2012	Yes	380	0.448	33.2	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Rural	Echo>Echo	49.00	10.7	5;20	2000
Engel 2015	Low	WHF	2015	South Africa	2008; 2012	Yes	7362	0.666	63.4	Africa	Africa	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Rural	Echo>Echo	41.00	12.2	4;24	2720
Engelman 2016	Moderate	WHF	2016	Fiji	2012	Yes	4547	0.736	36.4	Western Pacific	Oceania	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo	48.60	10.0	5;15	2004
Fakakovikaetau 2016	Low	WHF	2016	Tonga	2008; 2015	Yes	4273	0.721	37.5	Western Pacific	Oceania	3.Upper-Middle	Cross-sectional	Children	Community-based	Yes	Both	Echo>Echo			5;14	36990
Farrag 2014	Low	WHO	2014	Egypt	NR	Yes	3181	0.691	31.8	Eastern Mediterranean	Africa	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	NR	Echo>Echo	49.10		6;18	48930

Study	Bias	Criteria	Year	Country	Period	Endemic area	GDP	HDI	GINI (*100)	WHO	UNSD	Level of income	Design	Population	Setting	Random sampling	Area	Diagnostic criteria	Male, %	Age, years	Age range	Sample
Gautam 2014	High	WHO	2014	Nepal	2006; 2007	Yes	8226	0.558	32.8	South-East Asia	Asia	1.Low	Cross-sectional	School children	School-based	Yes	NR	Auscultation>Echo			5;15	2043
Gemechu 2017	Low	WHF	2017	Ethiopia	NR	Yes	660	0.448	33.2	Africa	Africa	1.Low	Cross-sectional	General population	Community-based	Yes	Rural	Echo>Nothing	46.00	13.2	6;25	987
Gul 2009	Low	WHO	2009	Pakistan	2006	Yes	874	0.55	30.7	Eastern Mediterranean	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo		13.3	6;16	1773
Huang 2017	Low	WHF	2017	Samoa	NR	Yes	4149	0.704	42	Western Pacific	Oceania	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo	48.00	11.3	5;18	1058
Jose 2003	Moderate	Others	2003	India	2001; 2002	Yes	457	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Rural	Auscultation>Echo	51.07		6;18	229829
Kane 2013	Moderate	Others	2013	Senegal	2010	Yes	1002	0.494	42	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo	51.60		5;18	2004
Kaul 2005	Low	WHO	2005	India	1999; 2000	Yes	439	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Rural	Auscultation>Echo			5;15	4125
Kennedy 2014	Low	WHF	2014	Solomon Islands	NR	Yes	1859	0.515	37	Western Pacific	Oceania	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo			5;15	700
Kumari 2013	Low	WHO	2013	India	2011	Yes	1462	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo	53.05		5;16	4213
Kwok 2015	Low	WHF	2015	Angola	2013	Yes	2760	0.533	42.7	Africa	Africa	2.Lower-Middle	Cross-sectional	Children	Community-based	Yes	Both	Echo>Echo	44.20	10.1	4;20	574
Ledos 2015	Low	WHF	2015	New Caledonia	2010	Yes	12580	NR	NR	Western Pacific	Oceania	4.High	Cross-sectional	Young adults	Community-based	Yes	Urban	Echo>Nothing	55.00	20.0	18;22	834
Longo-Mbenza 1998	Low	WHO	1998	Congo	1996	Yes	450	0.592	48.9	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo		10.6	5;16	4848
Lu 2015	Moderate	WHF	2015	Uganda	NR	Yes	655	0.493	41	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo	47.00	10.8	5;17	4773
Mahmoudi 2003	Low	WHO	2003	Iran	NR	No	1891	0.774	38.8	Eastern Mediterranean	Asia	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	62.10		7;18	167786
Marijon 2007	Low	WHO	2007	Cambodia	2001; 2002	Yes	330	0.563	30.76	Western Pacific	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	52.00	11.7	6;17	3677
Marijon 2007	Moderate	WHO	2007	Mozambique	2005	Yes	350	0.418	45.6	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	47.50	10.6	6;17	2170
Mirabel 2015	Low	WHF	2015	New Caledonia	2008; 2011	Yes	12580	NR	NR	Western Pacific	Oceania	4.High	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo			9;10	17633
Misra 2007	Low	Others	2007	India	NR	Yes	707	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	NR	NR	NR	Auscultation>Echo	57.80		4;18	118212
Mucumbitsi 2017	Moderate	WHF	2017	Rwanda	NR	Yes	710	0.498	50.4	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo		11.2	6;16	2501
Mulatu 2015	Low	WHO	2015	Ethiopia	2013	Yes	470	0.448	33.2	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Rural	Auscultation>Echo	48.99	8.9	5;15	1874
Nair 2015	Moderate	WHF	2015	India	2013; 2014	Yes	1513	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	64.80	12.6	5;15	2060
Nascimento 2016	Low	WHF	2016	Brazil	2014; 2015	No	10392	0.754	51.3	The Americas	The Americas	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	41.00	11.9		5996
Negi 2013	Low	WHO	2013	India	2007; 2008	Yes	1005	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Both	Auscultation>Echo	59.00	11.1	5;15	15145
Ngaidé 2015	Moderate	WHF	2015	Senegal	2011	Yes	1082	0.494	40.3	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo	60.10	9.7	5;18	2019
Oli 1999	Low	Others	1999	Ethiopia	NR	Yes	140	0.448	33.2	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo				9388
Paar 2010	Low	WHO	2010	Nicaragua	2006; 2009	Yes	8724	0.645	46.6	The Americas	The Americas	2.Lower-Middle	Cross-sectional	Adults	Community-based	Yes	Both	Echo>Echo	38.00	27.4	20;35.9	489
Paar 2010	Moderate	WHO	2010	Nicaragua	2006; 2009	Yes	8724	0.645	46.6	The Americas	The Americas	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo	51.00	9.5	5;15	3150

Study	Bias	Criteria	Year	Country	Period	Endemic area	GDP	HDI	GINI (*100)	WHO	UNSD	Level of income	Design	Population	Setting	Random sampling	Area	Diagnostic criteria	Male, %	Age, years	Age range	Sample
Periwal 2006	Low	Others	2006	India	NR	Yes	621	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	61.00		5;14	3002
Ploutz 2016	Moderate	WHF	2016	Uganda	2014	Yes	703	0.493	41	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	NR	Echo>Echo	42.10	11.1	5;17	956
Poyyamozi 2016	Moderate	Others	2016	India	2005; 2006	Yes	750	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	Community-based	Yes	Urban	Auscultation>Echo	55.00		5;17	7137
Regmi 1997	Moderate	WHO	1997	India	NR	Yes	370	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo			5;16	4736
Rizvi 2003	Moderate	Others	2003	Pakistan	1993; 1994	Yes	437	0.55	30.7	Eastern Mediterranean	Asia	2.Lower-Middle	Cross-sectional	General population	Community-based	Yes	Rural	Auscultation>Echo	53.10			9483
Roberts 2014	Low	WHF	2014	Australia	2008; 2010	No	40911	0.939	34.7	Western Pacific	Oceania	4.High	Cross-sectional	General population	Community-based	Yes	Rural	Echo>Echo	50.90	9.3	5;15	3946
Roberts 2014	Moderate	WHF	2014	Australia	2008; 2010	No	40911	0.939	34.7	Western Pacific	Oceania	4.High	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo	48.80	9.4	5;15	1053
Rossi 2014	Low	WHF	2014	Italy	NR	No	34814	0.887	34.7	Europe	Europe	4.High	Cross-sectional	School children	School-based	Yes	NR	Echo>Echo	54.10	16.7		684
Sadiq 2009	Low	Others	2009	Pakistan	2001; 2002	Yes	506	0.55	30.7	Eastern Mediterranean	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	38.50	10.7	5;15	24980
Sadoh 2013	Moderate	WHO	2013	Nigeria	2011; 2012	Yes	2876	0.527	43	Africa	Africa	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	48.98	8.9	5;15	1764
Sanyahumbi 2016	Moderate	WHF	2016	Malawi	2014	Yes	350	0.476	46.1	Africa	Africa	1.Low	Cross-sectional	Children	Both	Yes	Both	Echo>Echo	47.17		5;16	1450
Satupaitea 2012	Moderate	WHF	2012	Samoa	2008; 2012	Yes	3453	0.704	42	Western Pacific	Oceania	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo			3;16	8457
Saxena 2011	Low	WHO	2014	India	2008; 2010	Yes	1090	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Rural	Echo>Echo	52.65	10.8	5;15	6270
Saxena 2017	Low	WHF	2017	India	2010; 2013	Yes	1447	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo	55.10	10.8	5;15	16294
Schaffer 2003	Low	Others	2003	USA	1993; 1995	No	27777	0.92	41	The Americas	The Americas	4.High	Cross-sectional	Adults	Community-based	Yes	Rural	Echo>Echo			45;74	3501
Shrestha 2016	Moderate	WHF	2016	Nepal	2012; 2014	Yes	10719	0.558	32.8	South-East Asia	Asia	1.Low	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo	51.70	10.0	5;15	5178
Singh 2014	Low	WHF	2014	India	NR	Yes	1447	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo	52.77	11.2	5;15	3015
Spitzer 2015	Low	WHF	2015	Peru	2014	No	6491	0.74	44.3	The Americas	The Americas	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo	50.00	11.0	6;15	1023
Spitzer 2015	Low	WHO	2015	Peru	2014	No	6491	0.74	44.3	The Americas	The Americas	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo	50.00	11.0	6;15	1023
Sriharibabu 2013	Moderate	Others	2013	India	2007; 2012	Yes	1236	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	Children and Adults	Community-based	Yes	Rural	Auscultation>Echo	30.00	33.0	15;64	44164
Steer 2009	Moderate	WHO	2009	Fiji	2006	Yes	3750	0.736	36.4	Western Pacific	Oceania	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo			5;15	3462
Thakur 1996	Low	WHO	1996	India	1992; 1993	Yes	306	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Both	Auscultation>Echo	54.00		5;16	15080
Uner 2009	Moderate	Others	2009	Turkey	2003; 2004	No	5380	0.767	41.2	Europe	Europe	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	55.00	10.0	6;15	6035
Viali 2016	Low	WHF	2016	Samoa	2013	Yes	4219	0.704	42	Western Pacific	Oceania	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	NR	Echo>Echo			14;18	5197
Webb 2011	Low	WHO	2011	New Zealand	NR	No	28201	0.915	NR	Western Pacific	Oceania	4.High	Cross-sectional	School children	School-based	Yes	Urban	Echo>Echo	56.00		10;13	1142
Yadav 2010	Moderate	WHO	2010	India	2010	Yes	1346	0.624	35.2	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Urban	Auscultation>Echo	62.10		5;16	9526
Yadeta 2016	Low	WHF	2016	Ethiopia	2013; 2014	Yes	550	0.448	33.2	Africa	Africa	1.Low	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo	52.00	13.2	6;18	3238

Study	Bias	Criteria	Year	Country	Period	Endemic area	GDP	HDI	GINI (*100)	WHO	UNSD	Level of income	Design	Population	Setting	Random sampling	Area	Diagnostic criteria	Male, %	Age, years	Age range	Sample
Yildiz 2016	Low	WHO	2016	Turkey	NR	No	12127	0.767	41.2	Europe	Europe	3.Upper-Middle	Cross-sectional	School children	School-based	Yes	NR	Echo>Nothing	50.66		5;15	5440
Zaman 2015	Moderate	Others	2015	Bangladesh	2005	Yes	484	0.579	32.1	South-East Asia	Asia	2.Lower-Middle	Cross-sectional	School children	School-based	Yes	Both	Echo>Echo	51.00	11.0	5;19	56827
Zhimin 2006	Low	Others	2006	China	2001; 2002	Yes	1101	0.738	42.2	Western Pacific	Oceania	3.Upper-Middle	Cross-sectional	Adults	Community-based	Yes	Both	Echo>Echo		48.3	27;71	8080

WHF: World Heart Federation; WHO: World Heart Organization; UNSD: United Nations Statistical Divisions; Auscultation>Echo = Auscultation only for screening followed with echography confirmation; Echo>Echo: Echography +/- auscultation for screening followed with echography for confirmation; E>N: Echography only for screening without echography confirmation; NR = not reported; GDP: gross domestic per capita; HDI: human development index

Supplementary Table 8. Individual characteristics of included studies reporting on the evolution of clinically rheumatic heart disease

Study, year of publication	Continent	Region	Country	WHO Region	Area	Median duration of follow up (months)	Study design	Data collection	Sampling method	Male (%)	Mean or Median age (years)	Age range (years)	Sample size	Proportion of participants on BPG	Adherence (%)	Number of cases at onset of follow-up			Predictors of stable and/progressed lesions
																Definite RHD	Borderline	NSVA	
Beaton 2014	Africa	East	Uganda	Africa	Both	25	Cohort	Prospective	Consecutive	40	9.6	5;13	60	23	85.3	8	43	9	Younger children; Increasing morphologic changes; Higher ASLO titres
Beaton 2017	Africa	East	Uganda	Africa	Both	27.6	Cohort	Prospective	Consecutive	30.6	12	10;14	227	49.3	82.4	63	164	.	Younger children (AOR = 0.83); Presence of a functional AV abnormality (AOR= 5.37)
Bertaina 2016	Europe	North	New Caledonia	Western Pacific	Urban	23	Cohort	Prospective	NR	32	9.8	NR	25	NR	NR	0	25	0	NR
Bhaya 2011	Asia	Southeast	India	Southeast Asia	NR	24	Cohort	Prospective	NR	NR	NR	6;15	39	100	NR	0	39	0	NR
Engelman 2016	Oceania	North	Fiji	Western Pacific	Both	90	Cohort	Prospective	Consecutive	32.6	17	8.5;12.0	98	59.2	2	20	17	21	Cases with a duration of diagnosis of at least five years
Mirabel 2015	Europe	West	New Caledonia	Western Pacific	Both	31	Cohort	Prospective	Consecutive	47.4	9.9	9;10	114	88.6	NR	114	0	0	NR
Reymond 2015	Oceania	South	Australia	Western Pacific	Both	3.7	Cohort	Prospective	Consecutive	41	13.7	8;18	117	18.8	NR	0	55	62	Borderline RHD of the MV; Borderline RHD of the AV; Non-specific valvular abnormalities; In receipt of secondary antibiotic prophylaxis
Saxena 2011	Asia	Southeast	India	Southeast Asia	Rural	15.4	Cohort	Prospective	NR	52.7	10.8	5;15	100	NR	NR	100	0	0	NR
Zuhlke 2016	Africa	South	South Africa	Africa	Urban	60.8	Cohort	Prospective	Consecutive	14	13.8	NR	44	NR	NR	10	34	0	Presence of pathological MR

ASLO = Antistreptolysin O antigen; AOR = Adjusted odd's ratio; AV = Aortic valve; MR = Mitral regurgitation; BPG = Benzathine penicillin G; RHD = Rheumatic heart disease; NSVA = Non-specific valvular abnormality; NR = Not reported

Supplementary Table 9. Summary statistics from meta-analyses of prevalence studies on rheumatic heart disease, by subgroup

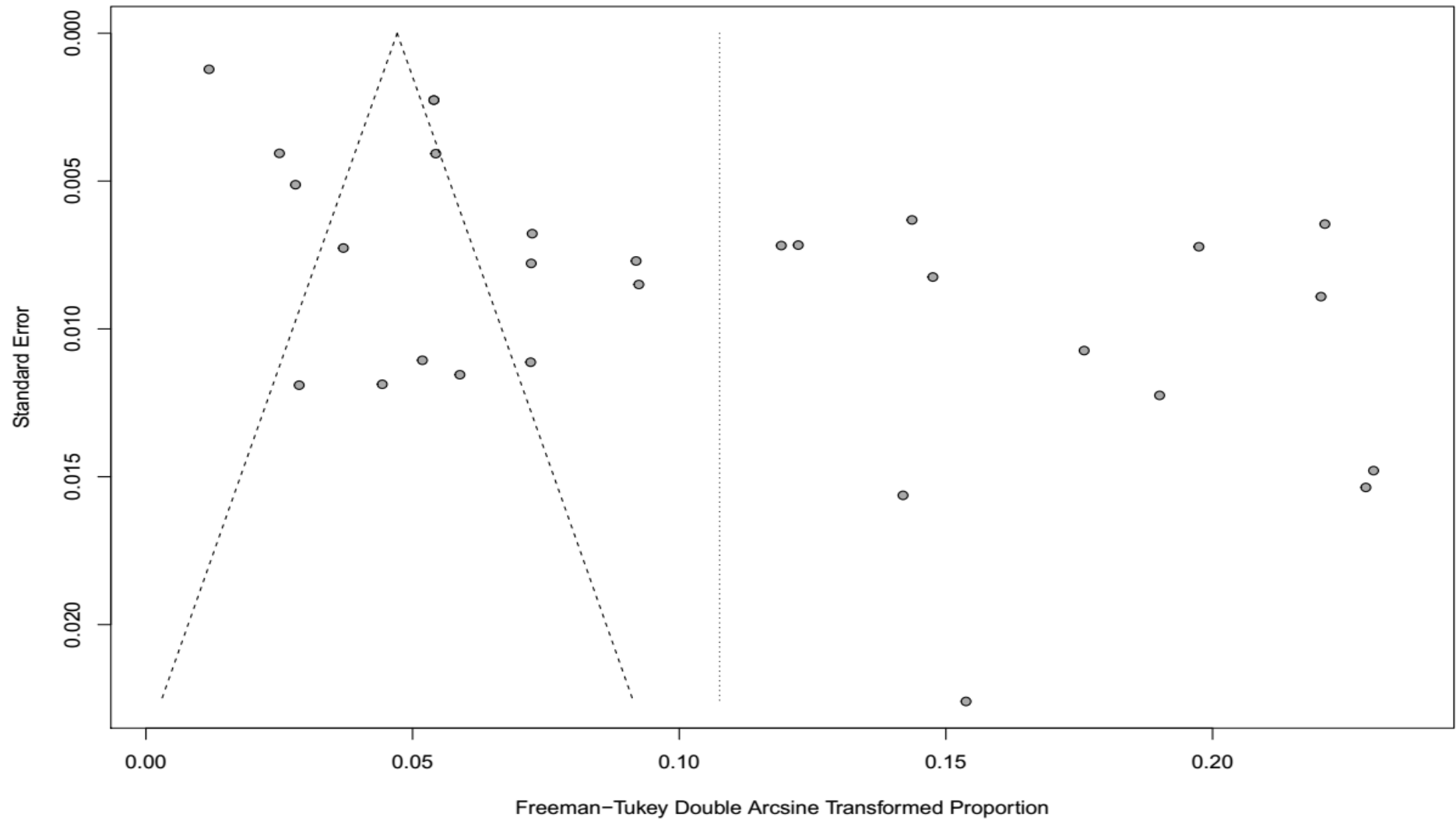
Subgroups	Criteria	N Studies	N Participants	Prevalence, per 1000 (95%CI)	Prediction interval	I ² (95%CI)	H (95%CI)	p heterogeneity	p Egger test	p difference subgroups
Income										
Low	WHF	12	25381	31.0 (18.2-46.9)	0.0-113.3	97.6 (96.8-98.2)	6.5 (5.6-7.5)	< 0.0001	0.288	0.003
Lower-Middle		5	22643	10.9 (5.8-17.7)	0.0-43.1	89.8 (78.9-95.0)	3.1 (2.2-4.5)	< 0.0001	0.346	
Upper-Middle		10	76545	31.7 (21.0-44.6)	2.4-92.1	98.6 (98.1-98.9)	8.4 (7.3-9.6)	< 0.0001	0.376	
High		5	24150	20.8 (8.5-38.1)	0.0-114.5	97.2 (95.4-98.3)	5.9 (4.6-7.6)	< 0.0001	0.278	
WHO										
Low	WHO	6	17823	9.8 (4.2-17.7)	0.0-49.1	95.0 (91.6-97.1)	4.5 (3.4-5.8)	< 0.0001	0.367	< 0.0001
Lower-Middle		16	174867	9.6 (5.2-15.3)	0.0-44.3	99.0 (98.7-99.1)	9.8 (8.9-10.7)	< 0.0001	0.050	
Upper-Middle		6	184171	13.5 (1.8-35.7)	0.0-144.8	99.5 (99.4-99.6)	14.4 (12.7-16.2)	< 0.0001	0.020	
High		1	1142	51.7 (39.5-65.3)	NA	NA	NA	NA	NA	
A>E										
Low	A>E	4	15475	8.2 (1.7-19.3)	0.0-101.4	96.5 (93.6-98.1)	5.4 (4.0-7.3)	< 0.0001	0.821	0.737
Lower-Middle		21	561970	5.5 (3.0-8.6)	0.0-27.8	99.3 (99.2-99.4)	12.3 (11.5-13.1)	< 0.0001	0.022	
Upper-Middle		6	196628	8.6 (0.5-25.9)	0.0-117.4	99.7 (99.6-99.7)	17.6 (15.8-19.5)	< 0.0001	0.087	
High		0	NA	NA	NA	NA	NA	NA	NA	
E>E										
Low	E>E	15	38134	23.3 (14.5-33.7)	0.0-81.8	97.4 (96.6-98.0)	6.2 (5.4-7.0)	< 0.0001	0.317	0.212
Lower-Middle		12	147444	13.5 (7.6-21.0)	0.0-52.8	99.0 (98.7-99.2)	9.8 (8.8-10.9)	< 0.0001	0.008	
Upper-Middle		11	69884	27.2 (14.1-44.5)	0.0-118.0	99.1 (98.9-99.3)	10.8 (9.7-12.0)	< 0.0001	0.378	
High		8	41447	21.5 (12.7-32.5)	0.3-71.7	97.4 (96.2-98.2)	6.2 (5.2-7.4)	< 0.0001	0.066	
Endemic area										
Endemic	WHF	27	136017	26.5 (18.9-35.4)	0.4-89.1	98.8 (98.6-98.9)	9.0 (8.4-9.7)	< 0.0001	0.981	0.801
Non endemic		5	12702	23.9 (9.2-45.2)	0.0-141.0	97.3 (95.6-98.3)	6.1 (4.8-7.8)	< 0.0001	0.478	
WHO										
Endemic	WHO	25	202612	11.2 (7.0-16.3)	0.0-48.6	98.8 (98.7-99.0)	9.3 (8.6-10.0)	< 0.0001	0.006	0.882
Non endemic		4	175391	12.4 (1.1-35.3)	0.0-218.1	99.2 (98.8-99.4)	10.9 (9.0-13.2)	< 0.0001	0.032	
A>E										
Endemic	A>E	27	585701	6.8 (4.1-9.9)	0.0-29.2	99.3 (99.2-99.4)	11.9 (11.2-12.6)	< 0.0001	0.004	0.700
Non endemic		4	188372	4.5 (0.0-20.0)	0.0-175.8	99.7 (99.5-99.7)	17.1 (14.9-19.7)	< 0.0001	0.349	
E>E										
Endemic	E>E	38	283852	20.9 (14.4-28.5)	0.0-88.5	99.4 (99.3-99.4)	12.7 (12.2-13.3)	< 0.0001	0.013	0.812
Non endemic		8	13057	22.8 (10.0-40.4)	0.0-110.1	96.8 (95.3-97.9)	5.6 (4.6-6.8)	< 0.0001	0.352	
UNSD Regions										
Africa	WHF	13	23497	32.0 (20.2-46.4)	0.5-106.5	96.8 (95.7-97.7)	5.6 (4.8-6.5)	< 0.0001	0.560	< 0.0001
Asia		4	26547	7.0 (4.8-9.5)	0.5-20.4	73.7 (26.4-90.6)	1.9 (1.2-3.3)	< 0.0001	0.606	
Europe		1	684	74.6 (56.0-95.5)	NA	NA	NA	< 0.0001	NA	
Oceania		12	90972	27.2 (16.5-40.5)	0.1-95.4	99.0 (98.8-99.2)	10.2 (9.2-11.3)	< 0.0001	0.647	
The Americas		2	7019	18.4 (0.0-73.1)	NA	98.5 (0.0-73.1)	8.3	< 0.0001	NA	

Africa	WHO	8	115404	7.1 (3.9-11.4)	0.0-26.9	97.5 (96.4-98.3)	6.3 (5.3-7.6)	< 0.0001	0.105	0.0003
Asia		13	241433	7.7 (2.8-14.9)	0.0-52.6	99.3 (99.2-99.4)	12.2 (11.2-13.3)	< 0.0001	0.005	
Europe		1	5440	5.1 (3.4-7.2)	NA	NA	NA	NA	NA	
Oceania		4	11064	30.8 (13.1-55.4)	0.0-207.6	97.4 (95.5-98.5)	6.2 (4.7-8.2)	< 0.0001	0.714	
The Americas		3	4662	29.3 (12.9-52.0)	0.0-603.4	91.3 (77.4-96.6)	3.4 (2.1-5.4)	< 0.0001	0.322	
Africa	A>E	6	69591	6.1 (2.5-11.2)	0.0-31.7	96.7 (94.8-97.9)	5.5 (4.4-7.0)	< 0.0001	0.286	< 0.0001
Asia		21	684195	4.9 (2.7-7.8)	0.0-23.8	99.4 (99.4-99.5)	13.3 (12.5-14.1)	< 0.0001	0.016	
Europe		1	6035	1.2 (0.4-2.2)	NA	NA	NA	NA	NA	
Oceania		2	8256	20.8 (1.6-60.1)	NA	98.9 (97.7-99.4)	9.4	< 0.0001	NA	
The Americas		1	5996	41.8 (36.9-47.1)	NA	NA	NA	NA	NA	
Africa	E>E	17	85180	22.5 (13.1-34.4)	0.0-95.1	98.7 (98.4-98.9)	8.8 (8.0-9.7)	< 0.0001	0.0008	< 0.0001
Asia		8	98779	9.2 (3.5-17.4)	0.0-52.3	99.0 (98.6-99.2)	9.8 (8.5-11.2)	< 0.0001	0.024	
Europe		1	684	74.6 (56.0-95.5)	NA	NA	NA	NA	NA	
Oceania		15	103080	27.2 (16.2-40.9)	0.0-105.9	99.2 (99.1-99.4)	11.5 (10.5-12.5)	< 0.0001	0.859	
The Americas		5	9186	16.4 (2.9-39.8)	0.0-160.0	97.7 (96.3-98.5)	6.6 (5.2-8.3)	< 0.0001	0.921	
WHO Regions										
Africa	WHF	13	23497	32.0 (20.2-46.4)	0.5-106.5	96.8 (95.7-97.7)	5.6 (4.8-6.5)	< 0.0001	0.560	< 0.0001
The Americas		2	7019	18.4 (0.0-73.1)	NA	98.5 (96.8-99.3)	8.3	< 0.0001	NA	
Eastern Mediterranean		0	NA	NA	NA	NA	NA	NA	NA	
Europe		1	684	74.6 (56.0-95.5)	NA	NA	NA	NA	NA	
South-East Asia		4	26547	7.0 (4.8-9.5)	0.5-20.4	73.7 (26.4-90.6)	1.9 (1.2-3.3)	0.0096	0.606	
Western Pacific		12	90972	27.2 (6.5-4.5)	0.1-95.4	99.0 (98.8-99.2)	10.2 (9.2-11.3)	< 0.0001	0.647	
Africa	WHO	6	17544	9.1 (3.3-17.6)	0.0-52.9	95.8 (93.1-97.5)	4.9 (3.8-6.3)	< 0.0001	0.299	< 0.0001
The Americas		3	4662	29.3 (12.9-52.0)	0.0-603.4	91.3 (77.4-96.6)	3.4 (2.1-5.4)	< 0.0001	0.322	
Eastern Mediterranean		5	273419	5.8 (1.2-13.8)	0.0-56.0	99.7 (99.6-99.8)	18.2 (16.2-20.4)	< 0.0001	0.146	
Europe		1	5440	5.1 (3.4-7.2)	NA	NA	NA	NA	NA	
South-East Asia		9	62197	6.2 (2.3-12.0)	0.0-37.0	98.0 (97.3-98.5)	7.0 (6.1-8.2)	< 0.0001	0.094	
Western Pacific		5	14741	28.7 (15.4-46.0)	0.0-117.1	96.7 (94.4-98.0)	5.5 (4.2-7.1)	< 0.0001	0.612	
Africa	A>E	4	15196	7.2 (0.9-20.0)	0.0-112.2	97.0 (94.7-98.3)	5.8 (4.3-7.7)	< 0.0001	0.944	< 0.0001
The Americas		1	5996	41.9 (36.9-47.1)	NA	NA	NA	NA	NA	
Eastern Mediterranean		8	269417	7.5 (1.6-17.4)	0.0-64.4	99.7 (99.7-99.8)	19.3 (17.8-21.1)	< 0.0001	0.084	
Europe		1	6035	1.2 (0.4-2.2)	NA	NA	NA	NA	NA	
South-East Asia		14	465296	2.9 (1.4-4.9)	0.0-14.4	98.7 (98.4-98.9)	8.7 (7.9-9.6)	< 0.0001	0.128	
Western Pacific		3	11933	21.0 (7.2-41.8)	0.0-632.6	97.8 (95.7-98.8)	6.7 (4.8-9.2)	< 0.0001	0.219	
Africa	E>E	16	36250	24.4 (15.8-34.6)	0.3-82.2	97.0 (96.1-97.7)	5.7 (5.0-6.5)	< 0.0001	0.411	< 0.0001
The Americas		5	9186	16.4 (2.9-39.8)	0.0-160.0	97.7 (96.3-98.5)	6.6 (5.2-8.3)	< 0.0001	0.921	

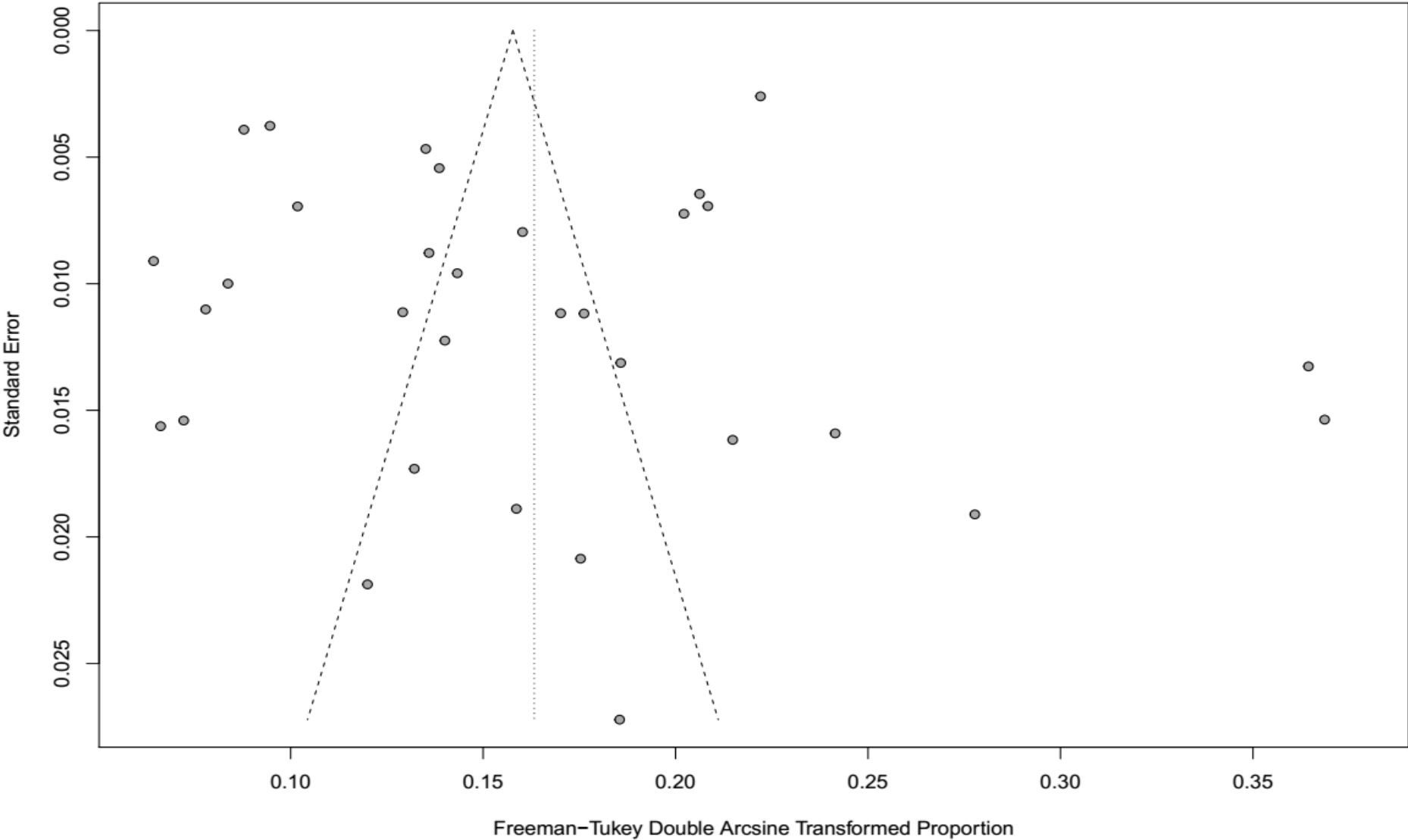
Eastern Mediterranean		1	48930	2.9 (2.4-3.4)	NA	NA	NA	NA	NA	
Europe		1	684	74.6 (56.0-95.5)	NA	NA	NA	NA	NA	
South-East Asia		8	98779	9.2 (3.5-17.4)	0.0-52.3	99.0 (98.6-99.2)	9.8 (8.5-11.2)	< 0.0001	0.024	
Western Pacific		15	103080	27.2 (16.2-40.9)	0.0-105.9	99.2 (99.1-99.4)	11.5 (10.5-12.5)	< 0.0001	0.895	
Areas										
Rural	WHF	4	9653	31.1 (20.8-43.5)	0.4-105.1	89.8 (76.8-95.5)	3.1 (2.1-4.7)	< 0.0001	0.148	0.090
Urban		10	34466	15.6 (8.4-24.9)	0.0-61.7	96.9 (95.6-97.8)	5.7 (4.8-6.7)	< 0.0001	0.616	
Both		13	82909	24.3 (13.2-38.5)	0.0-102.7	99.1 (98.9-99.3)	10.6 (9.6-11.7)	< 0.0001	0.467	
Rural	WHO	3	12269	8.3 (1.2-21.5)	0.0-518.2	97.8 (96.4-98.7)	6.8 (5.2-8.8)	< 0.0001	0.509	0.415
Urban		15	259373	11.8 (6.1-19.4)	0.0-57.4	99.3 (99.2-99.4)	11.9 (11.0-13.0)	< 0.0001	0.0005	
Both		8	49948	16.0 (5.0-33.1)	0.0-107.6	99.3 (99.1-99.4)	11.9 (10.6-13.4)	< 0.0001	0.131	
Rural	A>E	6	291357	4.5 (0.9-10.9)	0.0-41.6	99.2 (99.0-99.4)	11.3 (10.0-12.8)	< 0.0001	0.266	0.635
Urban		18	312681	8.1 (3.6-14.3)	0.0-51.4	99.5 (99.4-99.6)	14.2 (13.2-15.2)	< 0.0001	0.008	
Both		5	49780	5.6 (0.1-18.8)	0.0-100.2	99.5 (99.3-99.6)	13.8 (12.0-15.9)	< 0.0001	0.349	
Rural	E>E	6	24360	14.5 (5.5-27.7)	0.0-83.3	98.1 (97.2-98.7)	7.2 (6.0-8.8)	< 0.0001	0.415	0.741
Urban		14	53138	17.5 (12.4-23.6)	1.9-47.8	95.2 (93.3-96.5)	4.5 (3.9-5.4)	< 0.0001	0.018	
Both		21	16224	20.6 (10.8-23.6)	0.0-112.3	99.5 (99.5-99.6)	14.9 (14.0-15.8)	< 0.0001	0.265	
Settings										
Community-based	WHF	7	44190	30.7 (19.8-44.0)	2.6-5.3	94.2 (90.4-96.5)	4.1 (3.2-5.3)	< 0.0001	0.096	0.302
School-based		24	103079	24.6 (17.5-32.8)	0.7-79.4	98.3 (98.0-98.6)	7.8 (7.1-8.5)	< 0.0001	0.037	
Both		1	1450	33.8 (25.1-43.7)	NA	NA	NA	NA	NA	
Community-based	WHO	1	489	22.5 (11.0-37.8)	NA	NA	NA	NA	NA	0.06
School-based		28	377514	11.0 (7.0-16.0)	0.0-49.6	99.3 (99.2-99.3)	11.6 (10.9-12.3)	< 0.0001	< 0.0001	
Both		0	NA	NA	NA	NA	NA	NA	NA	
Community-based	A>E	4	62666	6.0 (3.2-9.7)	0.0-30.6	94.0 (87.9-97.1)	4.1 (2.9-5.8)	< 0.0001	0.216	0.732
School-based		26	593195	6.8 (3.9-10.4)	0.0-32.2	99.4 (99.3-99.5)	13.0 (12.2-13.7)	< 0.0001	0.002	
Both		0	NA	NA	NA	NA	NA	NA	NA	
Community-based	E>E	8	54439	19.1 (4.7-42.5)	0.0-146.6	99.3 (99.2-99.5)	12.2 (10.9-13.8)	< 0.0001	0.276	0.846
School-based		36	235097	22.2 (16.3-29.1)	0.0-79.0	99.0 (98.9-99.1)	10.1 (9.5-10.7)	< 0.0001	< 0.0001	
Both		2	7373	12.1 (0.0-64.1)	NA	99.0 (98.1-99.5)	10.1	< 0.0001	NA	

NA: not applicable; WHF: World Heart Federation; WHO: World Heart Organization; UNSD: United Nations Statistical Divisions; A>E = Auscultation only for screening followed with echography confirmation; E>E: Echography +/- auscultation for screening followed with echography for confirmation; NA = not applicable

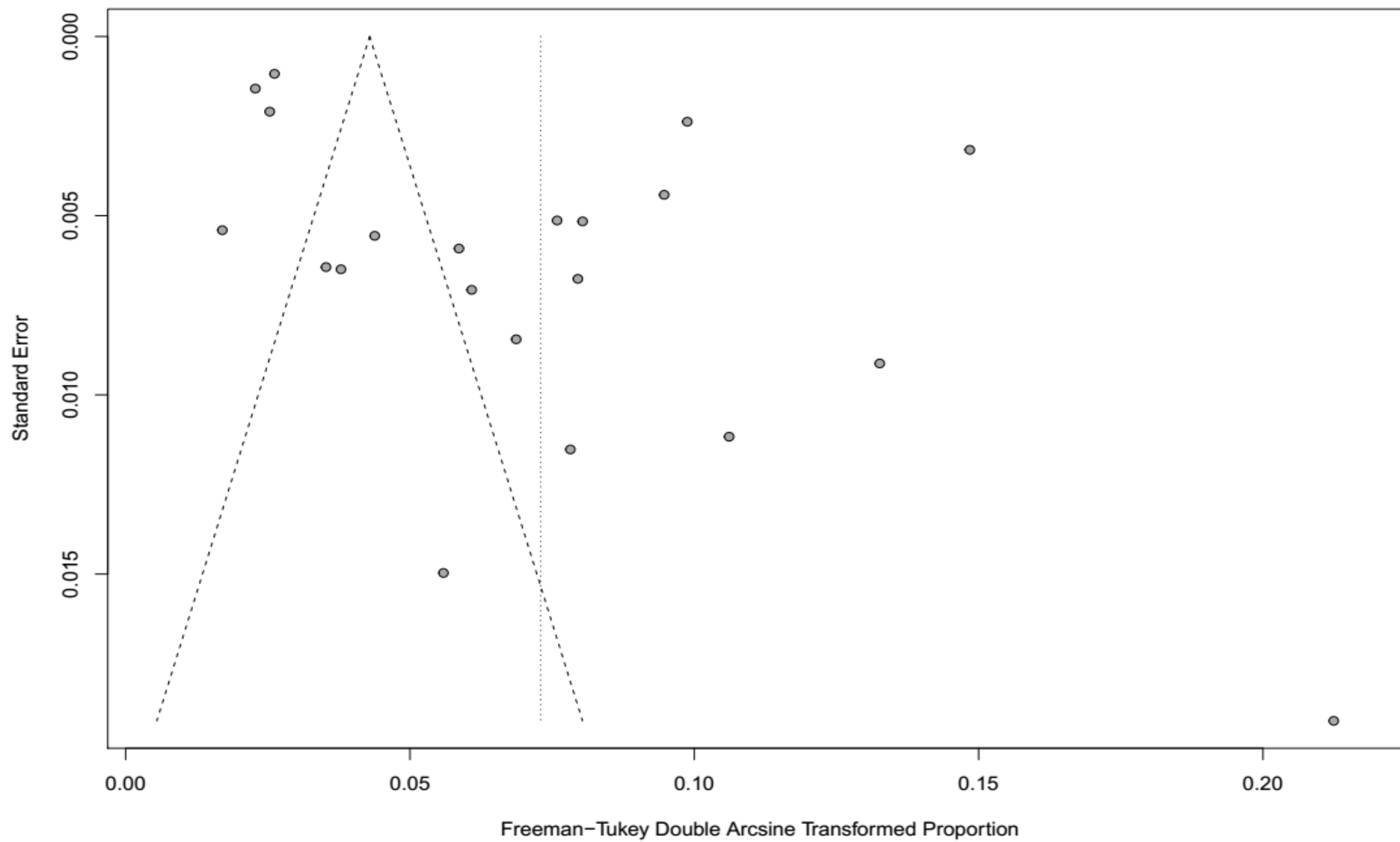
Supplementary Figure 1. Funnel plot for publication bias for studies using the WHO diagnostic criteria



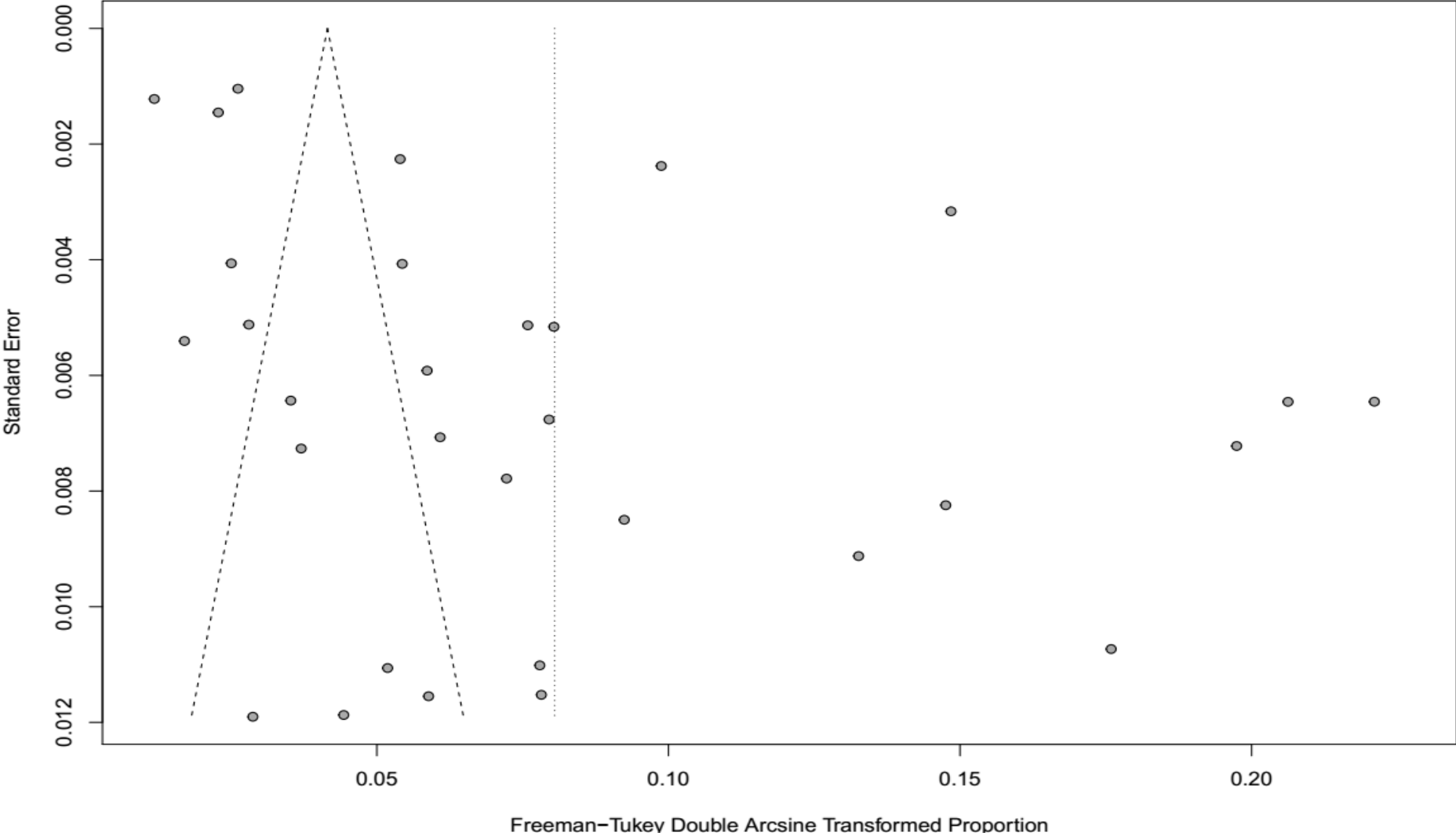
Supplementary Figure 2. Funnel plot for publication bias for studies using the WHF diagnostic criteria



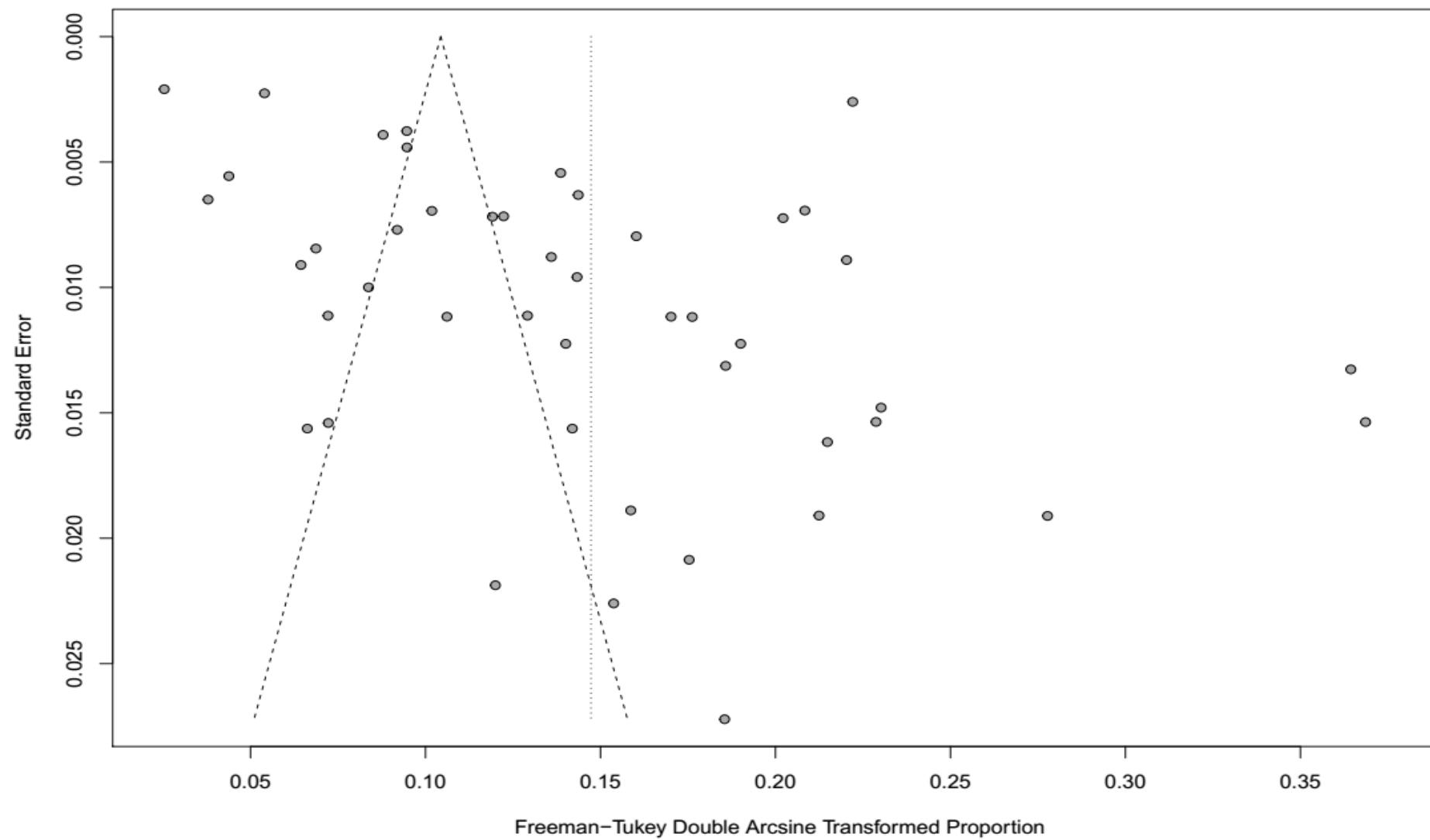
Supplementary Figure 3. Funnel plot for publication bias for studies using diagnostic criteria other than WHF and WHO



Supplementary Figure 4. Funnel plot for publication bias for studies using an auscultation-echocardiographic screening protocol



Supplementary Figure 5. Funnel plot for publication bias for studies using an echocardiography-echocardiography screening protocol



Supplementary Figure 6. Funnel plot for publication bias for studies using only one step echocardiography screening protocol

