

Dengue virus infection in people residing in Africa: a systematic review and meta-analysis of prevalence studies

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Supplementary Table 1 : 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.	3
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	3-4
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.	4
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.	4
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.	4-5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	4-5
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).	5
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.	5
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5

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.	5-6
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	6
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.	6
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).	6
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	6-7
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.	7
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.	7
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).	7
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
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	8
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	8
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	9
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).	9
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).	12
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13
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.	13
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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(6): e1000097. doi:10.1371/journal.pmed1000097

Supplementary Table 3. Risk of bias tool to assess methodological quality of included studies

Risk of bias items
Was the study's target population a close representation of the national population in relation to relevant variables?
Was the sampling frame a true or close representation of the target population?
Was some form of random selection used to select the sample, OR was a census undertaken?
Was the likelihood of nonresponse bias minimal?
Were data collected directly from the subjects (as opposed to a proxy)?
Was an acceptable case definition used in the study?
Was the study instrument that measured the parameter of interest shown to have validity and reliability?
Was the same mode of data collection used for all subjects?
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?

0-3 items: high risk of bias; 4-6: Moderate risk of bias; 7-9: low risk of bias

Supplementary Table 4 : Individual characteristics of included studies

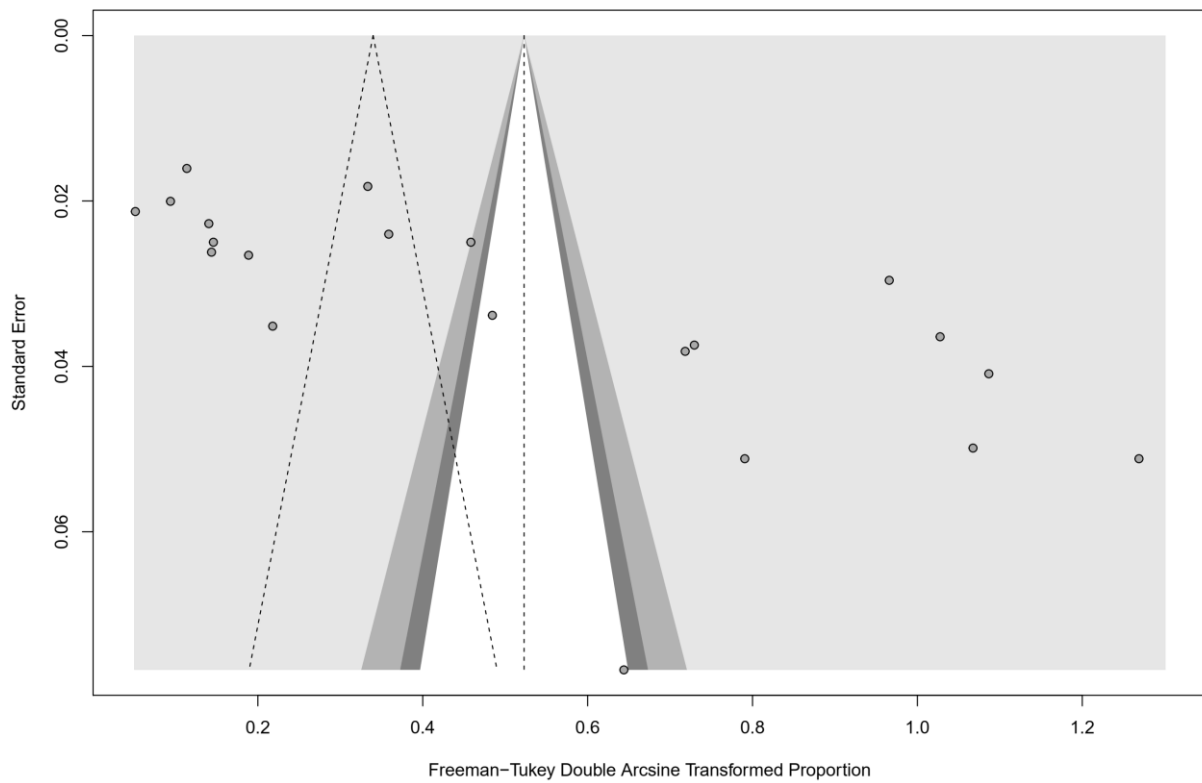
Author	Clinical presentation	Year	#Center	Timing	Design	Period of recruitment	Country	Sample	Rob	Sampling	Sample type
Abdalla	Febrile	2014	One site	Retrospective	Cross-sectional	Oct/2010-Nov/2010	Sudan	113	Low	Consecutive	Blood
Abdallah	Febrile	2014	One site	Prospective	Cross-sectional	Jan/2012–Mar/2012	Sudan	275	Low	Consecutive	Blood
Adam	Apparently healthy	2014	One site	Retrospective	Cross-sectional	2008-2009	Sudan	10820	Low	Consecutive	Blood
Adam	Apparently healthy	2018	One site	Prospective	Cross-sectional	Dec/2012-Jan/2013	Sudan	448	Low	Consecutive	Blood
Adedayo	Febrile	2013	One site	Prospective	Cross-sectional	Not defined	Nigeria	130	Low	Consecutive	Blood
Adeleke	Febrile	2016	One site	Prospective	Cross-sectional	Jul/2014-Sep/2014	Nigeria	100	Low	Consecutive	Blood
Ageep	Febrile	2006	One site	Prospective	Cross-sectional	Apr/2005-Jul/2005	Sudan	84	Low	Consecutive	Blood
Akoua-Koff	Febrile	2001	One site	Prospective	Cross-sectional	Aug/1999	Côte d'Ivoire	42	Low	Consecutive	Blood
Amoako	Febrile	2018	One site	Prospective	Cross-sectional	Oct/2016-Jul/2017	Ghana	700	Moderate	Consecutive	Blood
Andayi	Apparently healthy	2014	One site	Prospective	Cross-sectional	Nov/2010-Feb/2011	Djibouti	911	Low	Consecutive	Blood
Aoussi	Febrile	2014	One site	Retrospective	Cross-sectional	May/2010-Oct/2010	Côte d'Ivoire	28	Moderate	Consecutive	Blood
Ariyonde	Febrile	2016	One site	Prospective	Cross-sectional	Apr/2014-May/2014	Nigeria	60	Low	Consecutive	Blood
Baba	Febrile	2013	One site	Prospective	Cross-sectional	Jul/2008-Dec/2008	Nigeria	285	Low	Consecutive	Blood
Becquart	Febrile	2010	One site	Prospective	Cross-sectional	Mar2007-Aug2007	Gabon	773	Low	Consecutive	Blood
Blaylock	Apparently healthy	2011	One site	Retrospective	Cross-sectional	Not defined	Kenya	354	Moderate	Consecutive	Blood
Caron	Febrile	2013	One site	Prospective	Cross-sectional	Sep/2007-Aug/2010	Gabon	4287	Low	Consecutive	Blood
Chipwaza	Febrile	2014	One site	Prospective	Cross-sectional	Mar/2013-Oct/2013	Tanzania	364	Moderate	Consecutive	Blood
Collenberg	Apparently healthy	2006	One site	Prospective	Cross-sectional	Jul/2003-Jan/2004	Burkina Faso	683	Low	Consecutive	Blood
Dariano	Febrile	2017	One site	Prospective	Cross-sectional	Jul/2012-Jun/2013	Sierra Leone	1392	Low	Consecutive	Blood
Dellagi	Febrile	2013	One site	Prospective	Cross-sectional	Aug/2011-Oct/2011	Comores	400	Moderate	Consecutive	Blood
Demanou	Apparently healthy	2014	One site	Prospective	Cross-sectional	Sep/2006-Dec/2007	Cameroon	2030	Low	Cluster	Blood
Elduma	Apparently healthy	2014	One site	Prospective	Cross-sectional	Jan/2012-Apr/2012	Sudan	39	Low	Consecutive	Blood
Enkhtsetseg	Apparently healthy	2016	One site	Prospective	Cross-sectional	2012-2013	South Sudan	632	Low	Consecutive	Blood
Farnon	Febrile	2010	One site	Prospective	Cross-sectional	Dec/ 2005	Sudan	552	Low	Consecutive	Blood
Ferede	Apparently healthy	2018	One site	Prospective	Cross-sectional	Mar/2016-May/2017	Ethiopia	600	Low	Consecutive	Blood
Gabor	Apparently healthy	2016	One site	Retrospective	Cross-sectional	Dec/2002-Apr/2007	Gabon	162	Moderate	Clutser Random	Blood

Grossi	Apparently healthy	2017	One site	Prospective	Cross-sectional	Aug/2010-Jul/2012	Kenya	500	Low	Stratified Random	Blood
Hercik	Febrile	2018	One site	Prospective	Cross-sectional	Jun-Jul/2014	Tanzania	205	Low	Consecutive	Blood
Hertz	Febrile	2012	One site	Prospective	Cross-sectional	Sep/2007-Aug/2008	Tanzania	751	Low	Consecutive	Blood
Hortion	Febrile	2019	One site	Prospective	Cross-sectional	Dec/2014-Dec/2015	Kenya	968	Low	Consecutive	Blood
Hunsperger	Febrile	2016	One site	Prospective	Cross-sectional	2013	Angola	46	Moderate	Consecutive	Blood
Jentes	Febrile	2010	One site	Prospective	Cross-sectional	Aug/2006-Jan/2007	Guinea	47	Low	Consecutive	Blood
Kajeguka	Apparently healthy	2016	One site	Retrospective	Cross-sectional	May/2013-May/2014	Tanzania	381	Moderate	Consecutive	Blood
Kajeguka	Febrile	2016	One site	Retrospective	Cross-sectional	May/2013-May/2014	Tanzania	622	Moderate	Consecutive	Blood
Kolawole	Febrile	2017	One site	Prospective	Cross-sectional	Jan/2016-Feb/2016	Nigeria	95	Low	Consecutive	Blood
Konongoi	Febrile	2016	One site	Prospective	Cross-sectional	Sep/2011-Dec/2014	Kenya	868	Low	Consecutive	Blood
Laval	Febrile	2013	Multisite	Prospective	Cross-sectional	Jan/2010-Dec/2011	Côte d'Ivoire	972	Moderate	Consecutive	Blood
Laval	Febrile	2013	Multisite	Prospective	Cross-sectional	Jan/2010-Dec/2011	Djibouti	2882	Moderate	Consecutive	Blood
Laval	Febrile	2013	Multisite	Prospective	Cross-sectional	Jan/2010-Dec/2011	Tanzania	1217	Moderate	Consecutive	Blood
L'Azou	Febrile	2015	One site	Prospective	Cross-sectional	Dec/2011-Dec/2012	Côte d'Ivoire	796	Moderate	Consecutive	Blood
Le Gonidec	Febrile	2016	One site	Retrospective	Cross-sectional	Jan/2011-May/2014	Djibouti	354	Moderate	Consecutive	Blood
Lobo	Febrile	2016	One site	Prospective	Cross-sectional	Not defined	Sierra Leone	149	Low	Consecutive	Blood
Makiala-M.	Febrile	2018	One site	Prospective	Cross-sectional	Jan/2003-Jan/2012	D.R. of the Congo	423	Moderate	Consecutive	Blood
Mazaba-Liwewe	Apparently healthy	2014	One site	Prospective	Cross-sectional	Not defined	Zambia	3624	Low	Cluster	Blood
Mease	Apparently healthy	2011	One site	Prospective	Cross-sectional	Jul/2014-Sep/2014	Kenya	1141	Low	Consecutive	Blood
Mustapha	Febrile	2017	One site	Prospective	Cross-sectional	Not defined	Nigeria	178	Low	Consecutive	Blood
Narkwa	Apparently healthy	2016	One site	Prospective	Cross-sectional	Feb/2013-Dec/2015	Ghana	188	Low	Consecutive	Blood
Nasira	Febrile	2017	One site	Prospective	Cross-sectional	May/2016-Aug/2016	Nigeria	171	Low	Consecutive	Blood
Ngoi	Febrile	2016	One site	Prospective	Cross-sectional	2014-2015	Kenya	489	Low	Consecutive	Blood
Nkoghe	Febrile	2012	One site	Prospective	Cross-sectional	2010	Gabon	433	Moderate	Consecutive	Blood
Noden	Apparently healthy	2014	One site	Prospective	Cross-sectional	Sep/2011-Feb/2012	Namibia	312	Low	Consecutive	Blood
Ochieng	Apparently healthy	2015	One site	Prospective	Cross-sectional	2007	Kenya	1091	Low	Consecutive	Blood
Oladipo	Apparently healthy	2014	One site	Prospective	Cross-sectional	Not defined	Nigeria	93	Low	Consecutive	Blood
Oludele	Febrile	2017	One site	Prospective	Cross-sectional	Jan/2015-Mar/2016	Zimbabwe	192	Moderate	Consecutive	Blood
Olufisayo	Febrile	2016	One site	Prospective	Cross-sectional	Not defined	Nigeria	179	Low	Consecutive	Blood

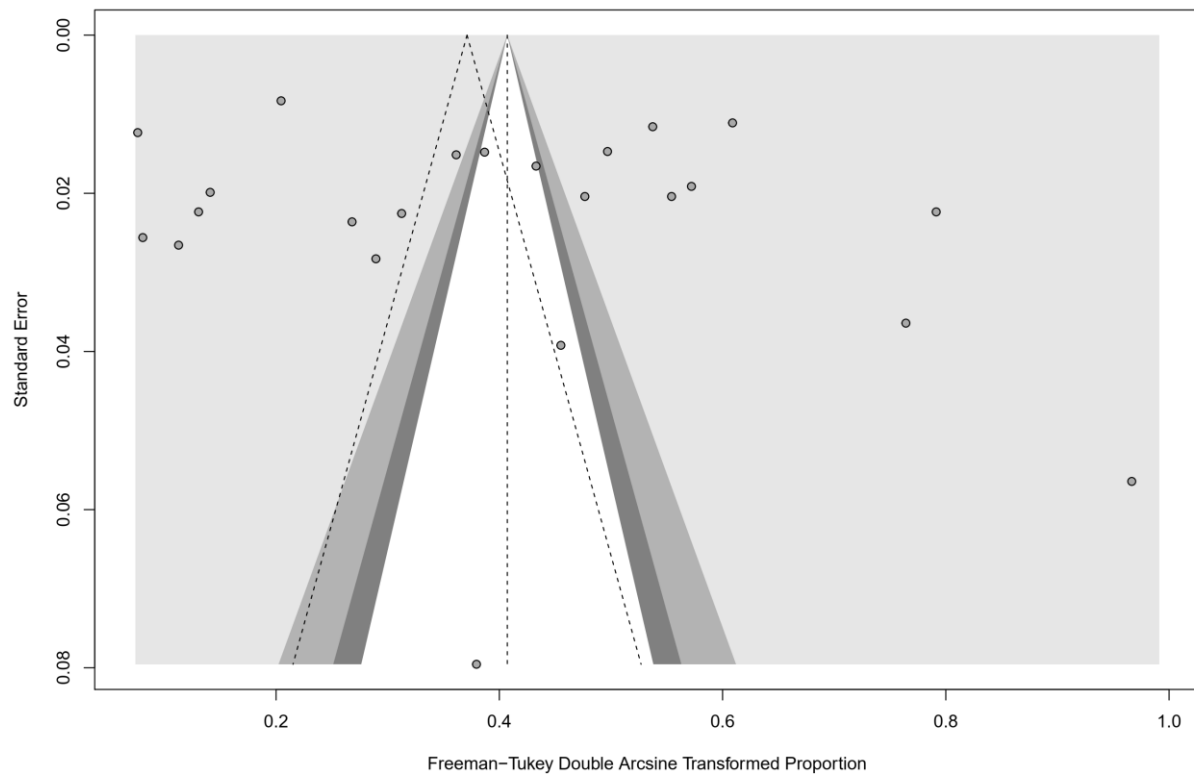
Onoja	Febrile	2016	One site	Prospective	Cross-sectional	Apr/2014-Dec/2014	Nigeria	274	Low	Consecutive	Blood
Otu	Febrile	2019	One site	Prospective	Cross-sectional	Jan/2017-Aug/2017	Nigeria	400	Moderate	Consecutive	Blood
Oyero	Febrile	2014	One site	Prospective	Cross-sectional	Jan/2013-Apr/2013	Nigeria	188	Low	Consecutive	Blood
Phoutrides	Febrile	2011	One site	Retrospective	Cross-sectional	Jul/2006-	Mali	95	Moderate	Consecutive	Blood
Ridde	Febrile	2016	One site	Prospective	Cross-sectional	Dec/2013-Jan/2014	Burkina Faso	379	Moderate	Consecutive	Blood
Sado	Febrile	2018	One site	Prospective	Cross-sectional	Mar-Apr/2017	Cameroon	114	Low	Consecutive	Blood
Schoepp	Febrile	2014	One site	Retrospective	Cross-sectional	Oct/2006–Oct/2008	Sierra Leone	253	Low	Consecutive	Blood
Seidahmed	Apparently healthy	2012	One site	Prospective	Cross-sectional	Nov/2008-Oct/2009	Sudan	791	Low	Consecutive	Blood
Sissoko	Apparently healthy	2010	One site	Retrospective	Cross-sectional	Nov/2016-Dec/2006	Mayotte	1154	Low	Cluster	Blood
Soghaier	Apparently healthy	2015	One site	Prospective	Cross-sectional	Not defined	Sudan	491	Low	Cluster	Blood
Soghaier	Apparently healthy	2014	One site	Prospective	Cross-sectional	Not defined	Sudan	600	Low	Cluster	Blood
Sow	Febrile	2016	One site	Prospective	Cross-sectional	Jul2009-Mar2013	Senegal	13845	Moderate	Consecutive	Blood
Stoler	Febrile	2015	One site	Retrospective	Cross-sectional	2011-2014	Ghana	218	Low	Consecutive	Blood
Tchuandom	Febrile	2018	One site	Prospective	Cross-sectional	Mar/2016-Apr/2017	Cameroon	384	Low	Random	Blood
Tsegaye	Apparently healthy	2018	One site	Prospective	Cross-sectional	Not defined	Ethiopia	1645	Moderate	Consecutive	Blood
Vairo	Febrile	2012	One site	Prospective	Cross-sectional	Feb/2007-Mar/2007	Tanzania	202	Low	Consecutive	Blood
Vairo	Febrile	2017	One site	Prospective	Cross-sectional	Not defined	Tanzania	483	Low	Consecutive	Blood
Vairo	Apparently healthy	2014	One site	Prospective	Cross-sectional	Sep/2011-Dec/2011	Tanzania	500	Low	Consecutive	Blood
Vu	Apparently healthy	2016	One site	Prospective	Cross-sectional	2009-2011	Kenya	1863	Low	Cluster	Blood
Woyessa	Febrile	2013	One site	Prospective	Cross-sectional	Sep/2013-Dec/2013	Ethiopia	11409	Low	Consecutive	Blood
Yen	Apparently healthy	2016	One site	Prospective	Cross-sectional	2003-2004	Sao Tome and Principe	78	Low	Consecutive	Blood

NR: not reported

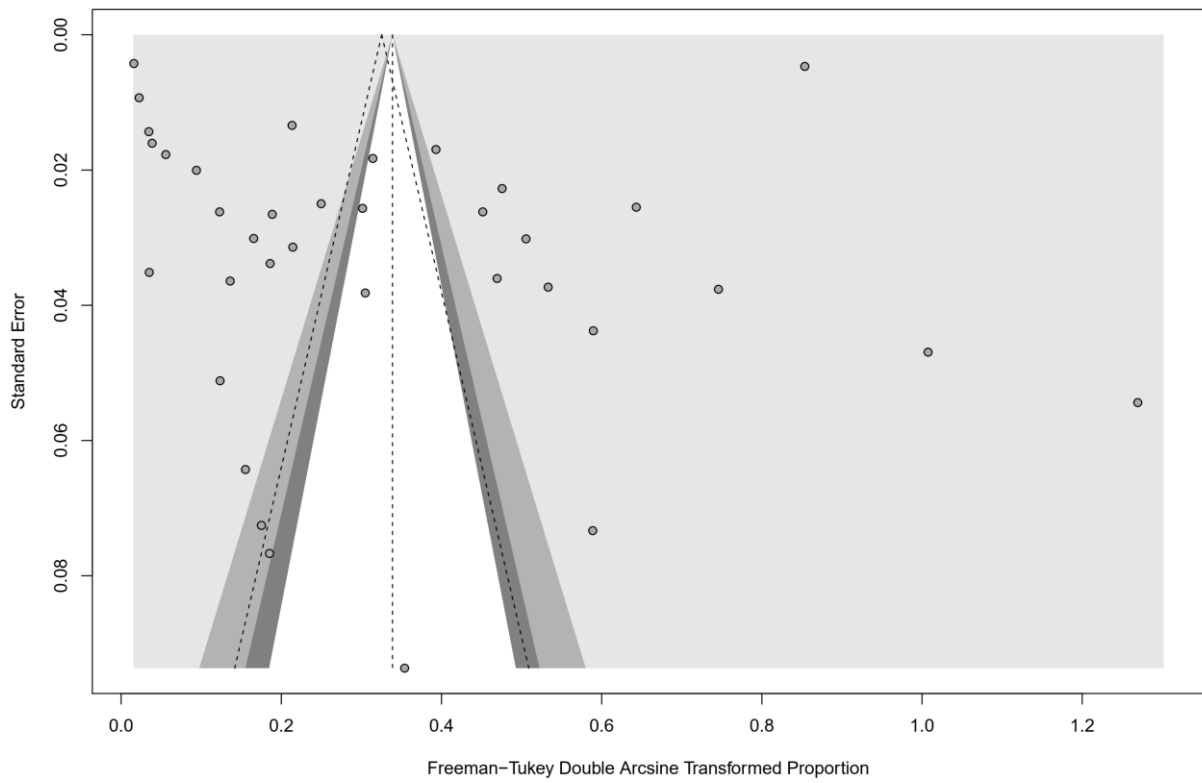
Supplementary Figure 1 : Funnel plot for publication in the IgG seroprevalence of Dengue virus infection in febrile participants in Africa



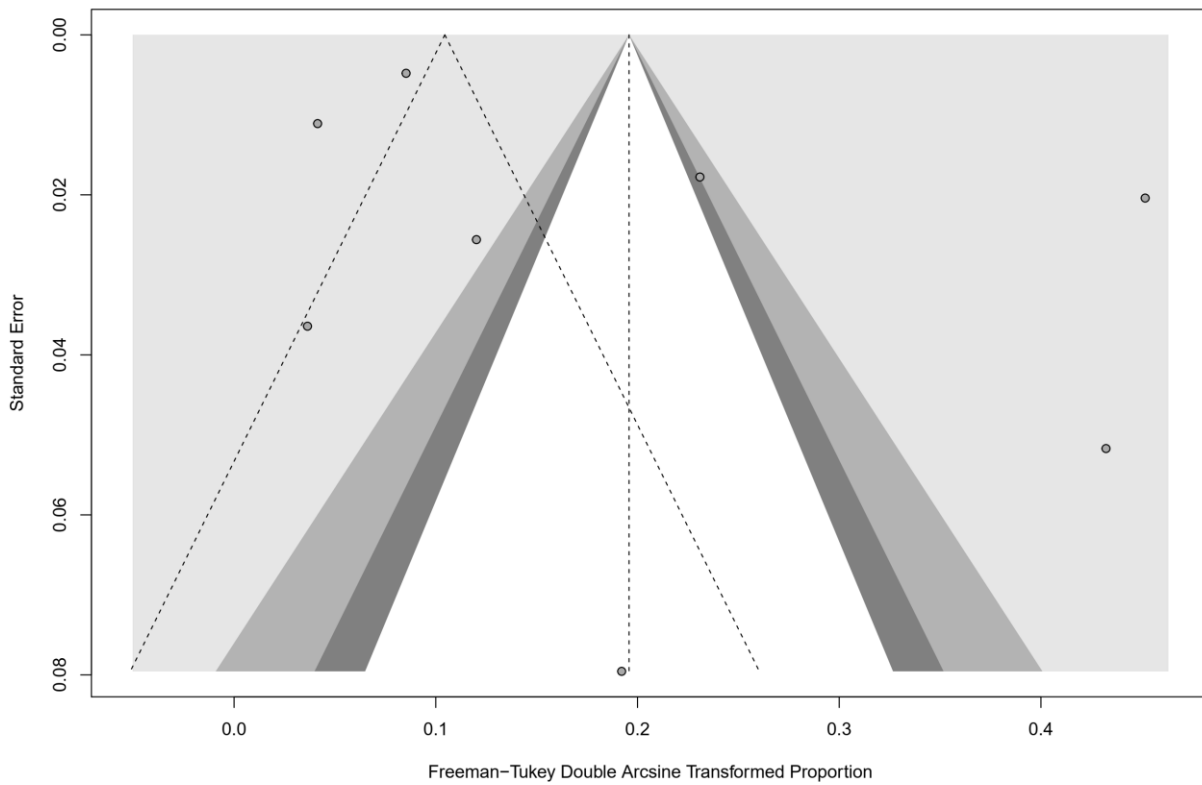
Supplementary Figure 2 : Funnel plot for publication in the IgG seroprevalence of Dengue virus infection in apparently healthy participants in Africa



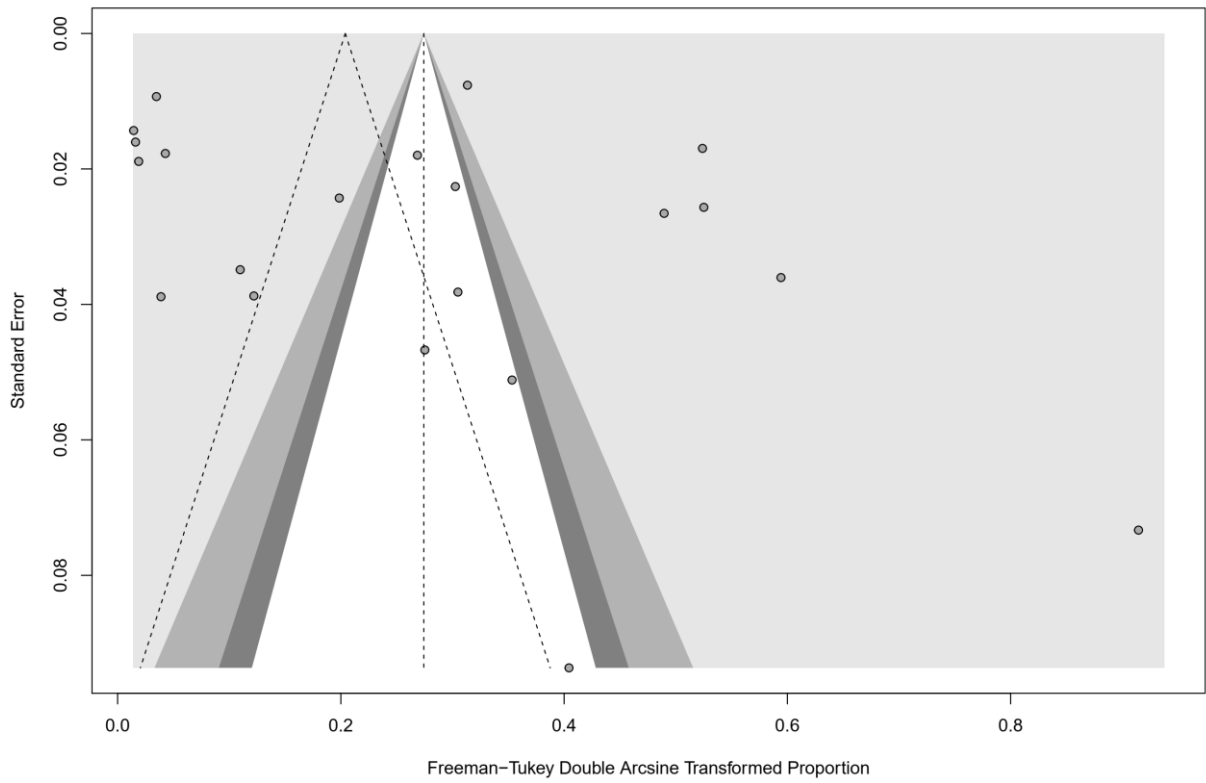
Supplementary Figure 3 : Funnel plot for publication in the IgM seroprevalence of Dengue virus infection in febrile participants in Africa



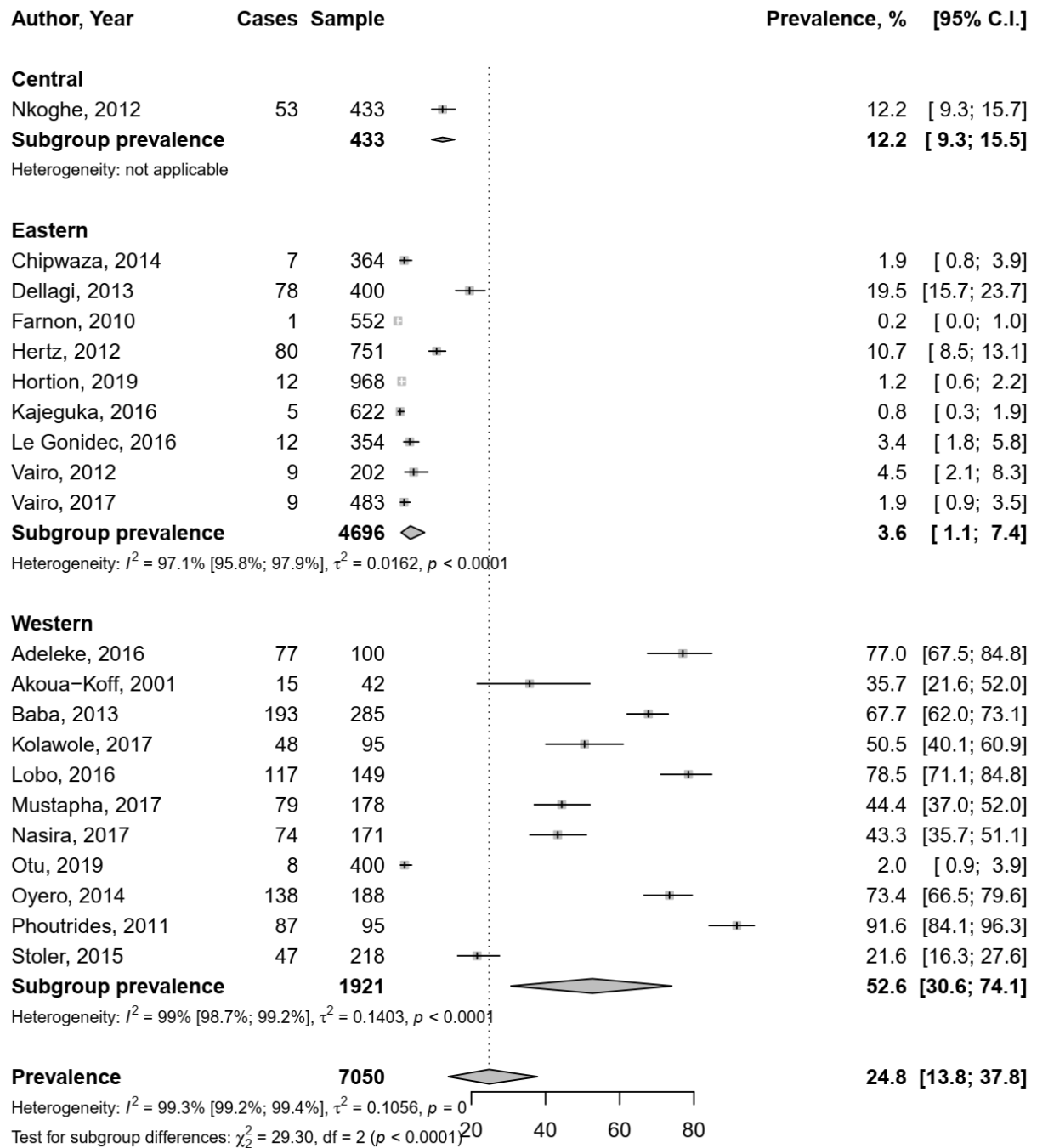
Supplementary Figure 4 : Funnel plot for publication in the IgM seroprevalence of Dengue virus infection in apparently healthy participants in Africa



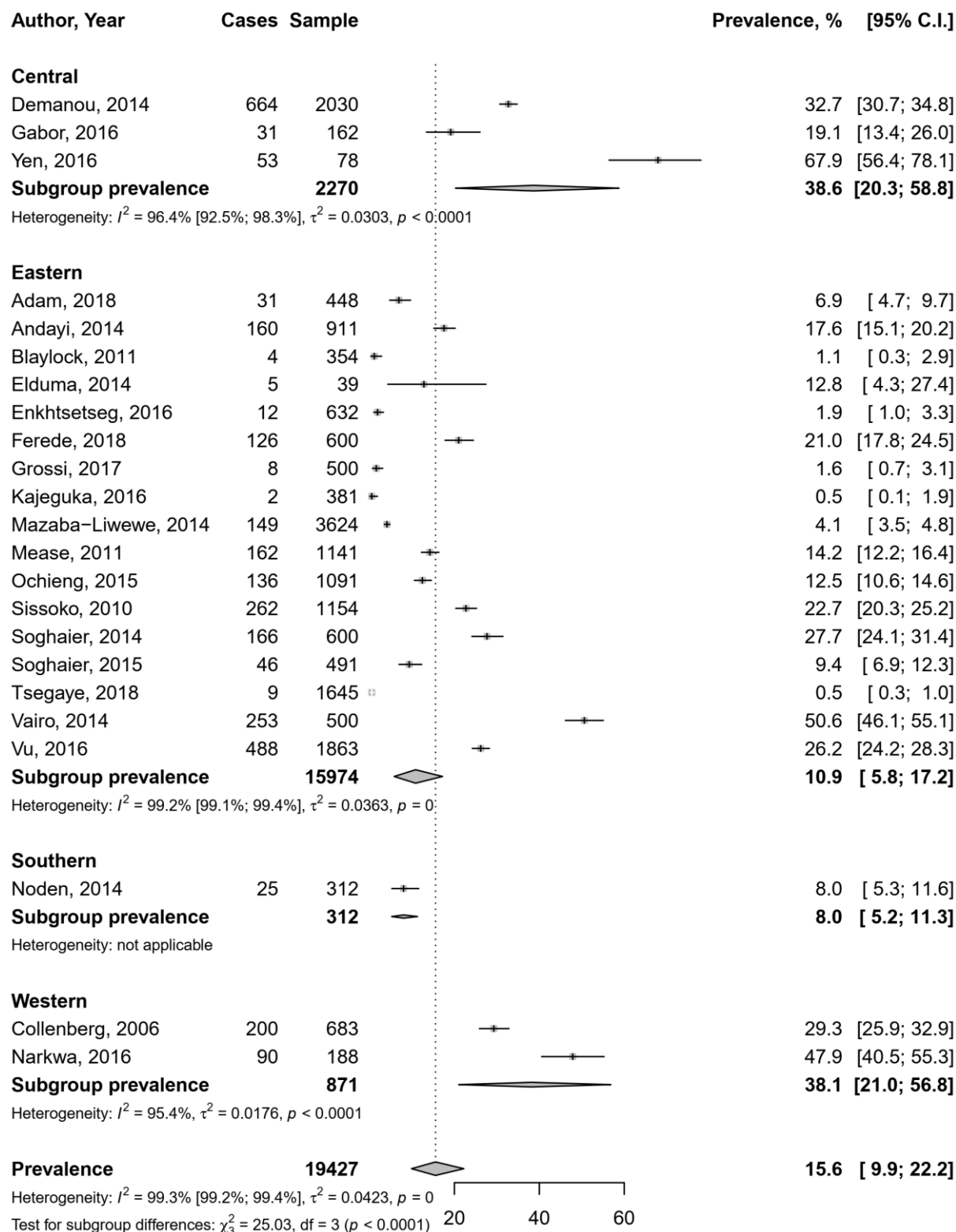
Supplementary Figure 5 : Funnel plot for publication in the RNA prevalence of Dengue virus infection in febrile participants in Africa



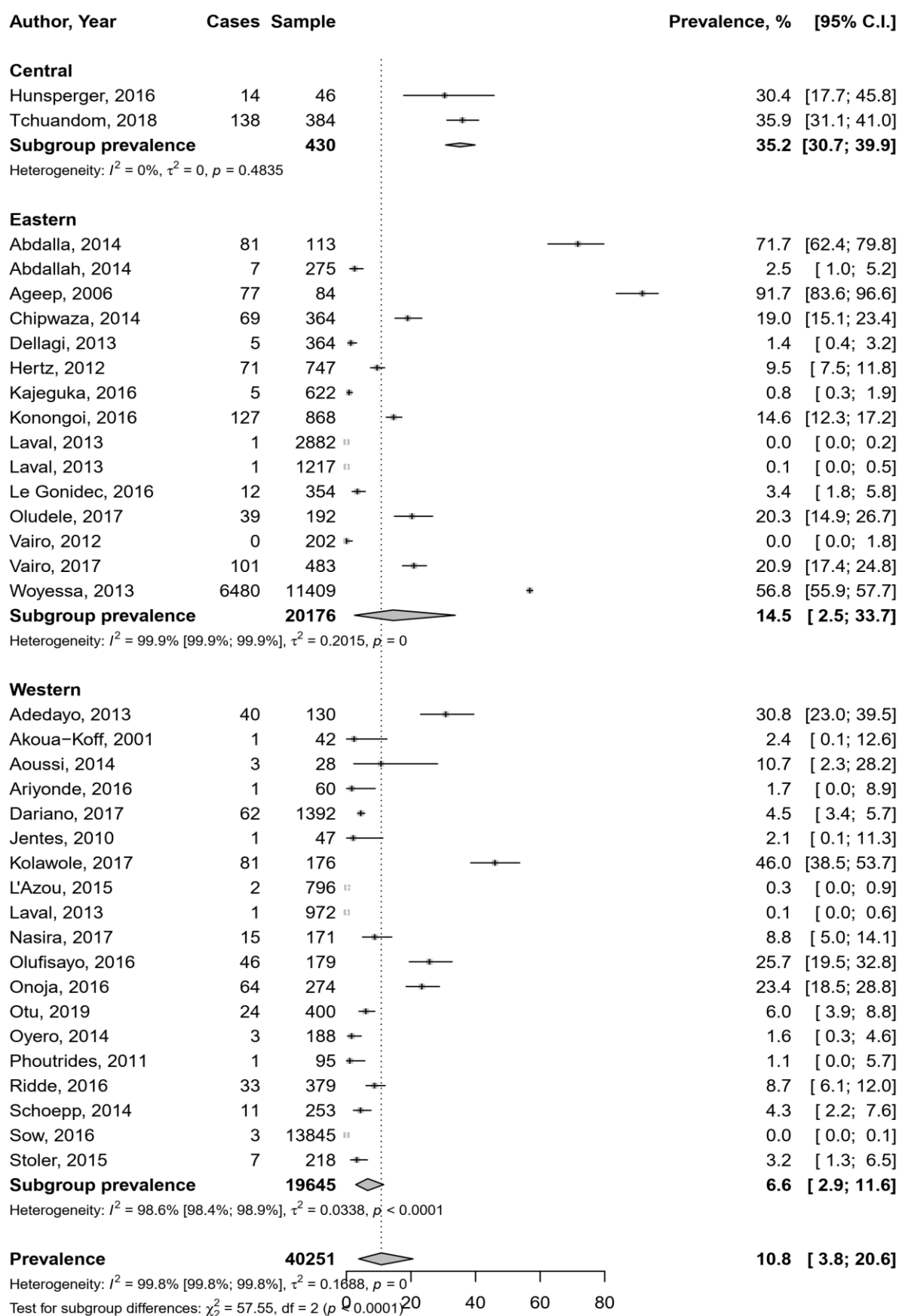
Supplementary Figure 6 : Forest plot IgG seroprevalence of Dengue virus infection in febrile participants in Africa, by region



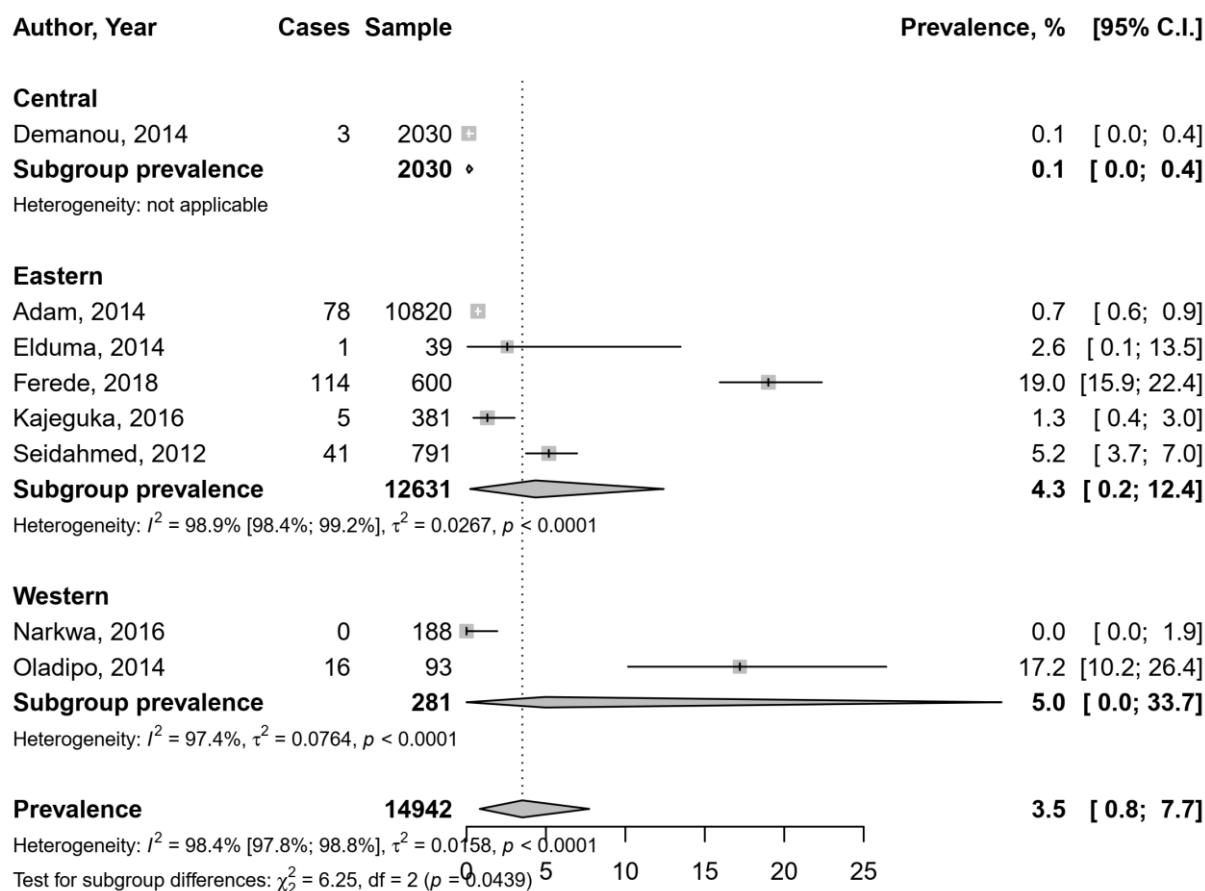
Supplementary Figure 7 : Forest plot IgG seroprevalence of Dengue virus infection in apparently healthy participants in Africa, by region



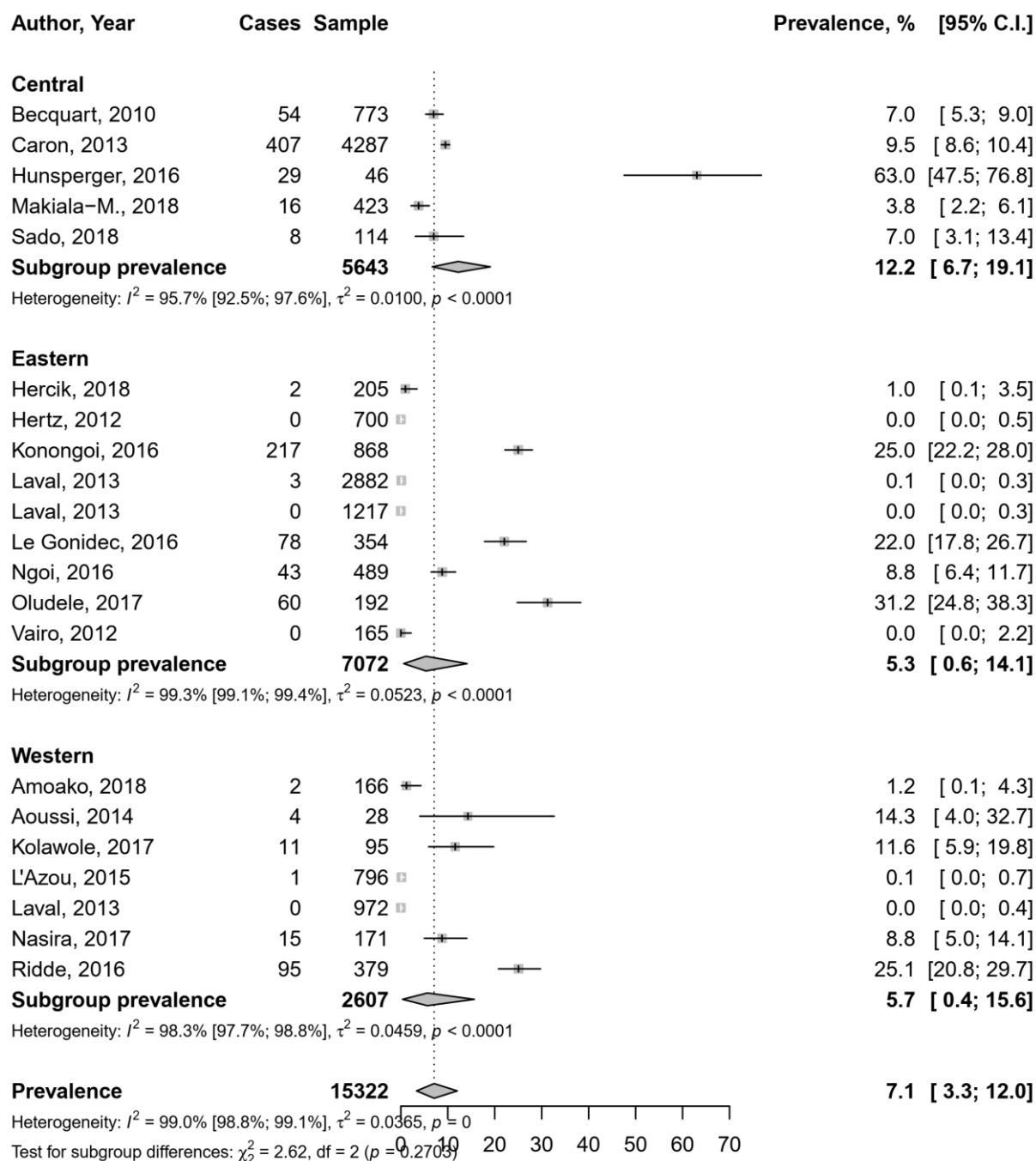
Supplementary Figure 8 : Forest plot IgM seroprevalence of Dengue virus infection in febrile participants in Africa, by region



Supplementary Figure 9 : Forest plot IgM seroprevalence of Dengue virus infection in apparently healthy participants in Africa, by region



Supplementary Figure 10 : Forest plot dengue virus RNA prevalence of Dengue virus infection in febrile participants in Africa, by region



List of included studies¹⁻⁷⁷

- 1 Abdallah, T. M., Ali, A. A. A., Karsany, M. S. & Adam, I. Epidemiology of dengue infections in Kassala, Eastern Sudan. *Journal of Medical Virology* **84**, 500-503, doi:10.1002/jmv.23218 (2012).
- 2 Abdalla, T. M., Karsany, M. S. & Ali, A. A. Correlation of measles and dengue infection in Kassala, Eastern Sudan. *Journal of Medical Virology* **87**, 76-78, doi:10.1002/jmv.24001 (2015).
- 3 Adam, I., Jumaa, A. M., Elbashir, H. M. & Karsany, M. S. Maternal and perinatal outcomes of dengue in PortSudan, Eastern Sudan. *Virology Journal* **7**, doi:10.1186/1743-422X-7-153 (2010).
- 4 Adedayo, F., Nioma, I., Olanrewaju, M. B., Adeyinka, A. & Ebele, A. Serological evidence of recent dengue virus infection among febrile children in a semi arid zone. *American Journal of Infectious Diseases* **9**, 7-10, doi:10.3844/ajidsp.2013.7.10 (2013).
- 5 Adeleke, M. A. *et al.* Dengue virus specific Immunoglobulin G antibodies among patients with febrile conditions in Osogbo, Southwestern Nigeria. *Tropical Biomedicine* **33**, 1-7 (2016).
- 6 Ageep, A. K., Malik, A. A. & Elkarsani, M. S. Clinical presentations and laboratory findings in suspected cases of dengue virus. *Saudi Medical Journal* **27**, 1711-1713 (2006).
- 7 Akoua-Koffi, C. *et al.* Investigation surrounding a fatal case of yellow fever in Côte d'Ivoire in 1999. *Bulletin de la Société de pathologie exotique (1990)* **94**, 227-230 (2001).
- 8 Aoussi, E. B. F. *et al.* Seven native cases of dengue in Abidjan, Ivory Coast. *Medecine Et Maladies Infectieuses* **44**, 433-436, doi:10.1016/j.medmal.2014.08.002 (2014).
- 9 Andayi, F. *et al.* A Sero-epidemiological Study of Arboviral Fevers in Djibouti, Horn of Africa. *PLoS Neglected Tropical Diseases* **8**, doi:10.1371/journal.pntd.0003299 (2014).
- 10 Ayorinde, A. F., Oyeyiga, A. M., Nosegbe, N. O. & Folarin, O. A. A survey of malaria and some arboviral infections among suspected febrile patients visiting a health centre in Simawa, Ogun State, Nigeria. *Journal of Infection and Public Health* **9**, 52-59, doi:10.1016/j.jiph.2015.06.009 (2016).
- 11 Baba, M. *et al.* Evidence of arbovirus co-infection in suspected febrile malaria and typhoid patients in Nigeria. *Journal of Infection in Developing Countries* **7**, 51-59 (2013).
- 12 Babaniyi, O. *et al.* Risk assessment for yellow fever in western and North-Western provinces of Zambia. *Journal of Global Infectious Diseases* **7**, 11-17, doi:10.4103/0974-777X.150884 (2015).
- 13 Becquart, P. *et al.* Acute dengue virus 2 infection in Gabonese patients is associated with an early innate immune response, including strong interferon alpha production. *BMC Infectious Diseases* **10**, doi:10.1186/1471-2334-10-356 (2010).
- 14 Blaylock, J. M. *et al.* The seroprevalence and seroincidence of dengue virus infection in western Kenya. *Travel Medicine and Infectious Disease* **9**, 246-248, doi:10.1016/j.tmaid.2011.06.005 (2011).
- 15 Caron, M. *et al.* First Evidence of Simultaneous Circulation of Three Different Dengue Virus Serotypes in Africa. *PLoS ONE* **8**, doi:10.1371/journal.pone.0078030 (2013).
- 16 Chipwaza, B. *et al.* Dengue and Chikungunya Fever among Viral Diseases in Outpatient Febrile Children in Kilosa District Hospital, Tanzania. *PLoS Neglected Tropical Diseases* **8**, doi:10.1371/journal.pntd.0003335 (2014).
- 17 Collenberg, E. *et al.* Seroprevalence of six different viruses among pregnant women and blood donors in rural and urban Burkina Faso: A comparative analysis. *Journal of Medical Virology* **78**, 683-692, doi:10.1002/jmv.20593 (2006).
- 18 Dariano, D. F. *et al.* Surveillance of vector-borne infections (chikungunya, dengue, and malaria) in Bo, Sierra Leone, 2012-2013. *American Journal of Tropical Medicine and Hygiene* **97**, 1151-1154, doi:10.4269/ajtmh.16-0798 (2017).
- 19 Dellagi, K. *et al.* Serological Evidence of Contrasted Exposure to Arboviral Infections between Islands of the Union of Comoros (Indian Ocean). *Plos Neglected Tropical Diseases* **10**, doi:10.1371/journal.pntd.0004840 (2016).

- 20 Demanou, M. *et al.* Evidence of Dengue Virus Transmission and Factors Associated with the Presence of Anti-Dengue Virus Antibodies in Humans in Three Major Towns in Cameroon. *Plos Neglected Tropical Diseases* **8**, doi:10.1371/journal.pntd.0002950 (2014).
- 21 Elduma, A. H. & Osman, W. M. Dengue and hepatitis E virus infection in pregnant women in Eastern Sudan, A challenge for diagnosis in an endemic area. *Pan African Medical Journal* **19**, doi:10.11604/pamj.2014.19.391.5439 (2014).
- 22 Enkhtsetseg, A. *et al.* Seroconversion to causes of febrile illness in Mongolian peacekeepers deployed to south Sudan. *American Journal of Tropical Medicine and Hygiene* **95**, 1469-1471, doi:10.4269/ajtmh.16-0174 (2016).
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- 24 Fokam, E. B. *et al.* Silent circulation of arboviruses in Cameroon. *East African medical journal* **87**, 262-268 (2010).
- 25 Gabor, J. J., Schwarz, N. G., Esen, M., Kreamsner, P. G. & Grobusch, M. P. Dengue and chikungunya seroprevalence in Gabonese infants prior to major outbreaks in 2007 and 2010: A sero-epidemiological study. *Travel Medicine and Infectious Disease* **14**, 26-31, doi:10.1016/j.tmaid.2016.01.005 (2016).
- 26 Grossi-Soyster, E. N. *et al.* Serological and spatial analysis of alphavirus and flavivirus prevalence and risk factors in a rural community in western Kenya. *Plos Neglected Tropical Diseases* **11**, doi:10.1371/journal.pntd.0005998 (2017).
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