

Supplementary material

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PRISMA checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1 - Title
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 – Abstract, paragraphs 1-4
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	3 – Introduction, paragraphs 1 and 2
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	3 – Introduction, paragraph 3
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 – Methods, paragraph 13
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.	3,4 – Methods, paragraphs 1-3
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.	3 – Methods, paragraph 1
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Supplementary material
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).	4 - Methods, paragraphs 2-4
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.	4 – Methods, paragraph 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.	4 – Methods, paragraph 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.	6 – Methods, paragraph 11

Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	5 – Methods, paragraph 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.	5- Methods, paragraph 7
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 - Methods, paragraph 11
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	5,6 -Methods, paragraphs 8-11
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.	6 – Results, paragraph 1, Fig. 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.	6-7 – Results paragraph 2, Table 1, Fig. 2
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).	8 – Results, paragraph 6
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.	Table 1, Fig. 3
Synthesis of results	21	Present the main results of the review. If meta-analyses are done, include for each, confidence intervals and measures of consistency	7 – Results, paragraph 3
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	8 – Results, paragraph 7
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	7-8 – Results, paragraphs 4-7, Table 2
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).	9-10 – Discussion, paragraphs 1-6
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).	11 – Discussion, paragraph 7
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	11 – Discussion, paragraph 8
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.	12 – Funding

Additional inclusion criteria details

Age

Some studies from Europe, North America and South America were not explicit about the age of their participants but instead reported including only “adults” without stating their age. We felt this was sufficient for inclusion, as participants were highly likely to be older than 15.

Study types

The outcome variable was a ratio of prevalence figures at a particular time point, so we included any study reporting on cross-sectional analyses. However, our inclusion criteria allowed cross-sectional studies which were completed as part of larger cohort or case-control studies. For example, cross-sectional studies of participants in the AGEHIV Cohort Study, the Veterans Ageing Cohort Study (VACS) and Health and Aging in Africa: A Longitudinal Study of an INDEPTH Community in South Africa (HAALSI) were used in our analysis.

Search strategy

MEDLINE

1. exp Hypertension/
2. hypertens*.mp.
3. exp Blood Pressure/
4. (blood pressure or bloodpressure).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonym]
5. 1 or 2 or 3 or 4
6. exp HIV/
7. HIV Infections/
8. Acquired Immunodeficiency Syndrome/
9. (hiv or hiv1 or hiv-1* or hiv2 or hiv-2* or aids or human immuno?deficiency virus or human immune?deficiency virus or acquired immuno?deficiency syndrome or acquired immune?deficiency syndrome or hiv?positive or hiv?infected or people living with hiv or plwh or hiv?seropositiv* or hiv?negative or hiv?uninfected or hiv?seronegativ*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
10. (human immun* and deficiency virus).mp.
11. (acquired immun* and deficiency syndrome).mp.
12. HIV Seropositivity/
13. HIV Seronegativity/
14. 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13
15. 5 and 14

EMBASE

1. exp hypertension/
2. hypertens*.mp.
3. exp blood pressure/
4. (blood pressure or bloodpressure).mp.
5. 1 or 2 or 3 or 4
6. exp Human immunodeficiency virus/
7. Human immunodeficiency virus infection/
8. acquired immune deficiency syndrome/
9. Human immunodeficiency virus infected patient/

10. (hiv or hiv1 or hiv-1* or hiv2 or hiv-2* or aids or human immuno?deficiency virus or human immune?deficiency virus or acquired immune?deficiency syndrome or acquired immuno?deficiency syndrome or hiv?positive or hiv?infect* or people living with HIV or plwh or hiv?seropositiv* or hiv?negative or hiv?uninfect* or hiv?seronegativ*).mp.
11. (human immun* and deficiency virus).mp.
12. (acquired immun* and deficiency syndrome).mp.
13. 6 or 7 or 8 or 9 or 10 or 11 or 12
14. 5 and 13

Global Health

1. exp hypertension/
2. hypertens*.mp.
3. exp blood pressure/
4. (blood pressure or bloodpressure).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
5. 1 or 2 or 3 or 4
6. exp human immunodeficiency viruses/
7. HIV infections/
8. acquired immune deficiency syndrome/
9. (hiv or hiv1 or hiv-1* or hiv2 or hiv-2* or aids or human immuno?deficiency virus or human immune?deficiency virus or acquired immune?deficiency syndrome or acquired immuno?deficiency syndrome or hiv?positive or hiv?infect* or people living with hiv or plwh or hiv?seropositiv* or hiv?negative or hiv?uninfect* or hiv?seronegativ*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
10. (human immun* and deficiency virus).mp.
11. (acquired immun* and deficiency syndrome).mp.
12. people living with HIV/
13. 6 or 7 or 8 or 9 or 10 or 11 or 12
14. 5 and 13

Cochrane Central Register of Controlled Trials

1. MeSH descriptor: [Hypertension] explode all trees
2. hypertens*
3. MeSH descriptor: [Blood Pressure] explode all trees
4. blood pressure
5. bloodpressure

6. 1 or 2 or 3 or 4 or 5

7. MeSH descriptor: [HIV] explode all trees

8. MeSH descriptor: [Acquired Immunodeficiency Syndrome] this term only

9. MeSH descriptor: [HIV Infections] this term only

10. MeSH descriptor: [HIV Seroprevalence] explode all trees

11. hiv or hiv2 or hiv-2 or hiv1 or hiv-1 or aids or human immuno?deficiency virus or human immune?deficiency virus or acquired immune?deficiency syndrome or acquired immuno?deficiency syndrome or hiv?positive or hiv?infect* or people living with hiv or plwh or hiv?seropositiv* or hiv?negative or negative or hiv?uninfect* or uninfect* or hiv? seronegativ* or seronegativ*

12. human immun* and deficiency virus

13. acquired immun* and deficiency syndrome

14. 7 or 8 or 9 or 10 or 11 or 12 or 13

15. 6 and 14

Data extraction sheet

[illegible]

PLHIV: People Living with HIV. ART: Anti-retroviral therapy.

Method for contacting authors

Authors of 73 studies were contacted requesting missing data. Replies with requested data were received from 30 authors.

Initial email

Dear << Name >>,

I am contacting you about a **global systematic review and meta-analysis of the prevalence of hypertension among HIV-positive and HIV-negative adults** (PROSPERO ID: CRD42019151359, [outline](#)).

With my colleagues, Dr Mikaela Smit, Dr Pablo Perez and Professor Edward Gregg, (in cc), I am part of a multi-disciplinary team based at Imperial College London, which focuses on multi-morbidity in People Living with HIV (PLHIV).

I am writing to request some further information from you about your << Year >> study entitled “<< Title >>”. We believe this study may need to be included in our meta-analysis. Could you please assist us by providing answers to the questions below?

<< Questions >>

We would be very grateful if you could provide us with this information by <<Date>>. If you need more time to retrieve this information, please let us know an estimated date before <<Date>>. If we do not hear back from you, your study will be excluded from our analysis.

Please don't hesitate to contact me should you have any queries.

All the best,
Katherine Davis

Questions asked

- What was the age range of your participants and did you have any age limits during recruitment?
- How was hypertension defined? Was this based on blood pressure measurement (if so, what cut-off was used?), self-reported diagnosis or clinical factors (such as use of antihypertensives or medical record review)?
- How many PLHIV (aged over 15) had hypertension? How many did not? How many HIV-negative individuals had hypertension? How many did not?
- Could you describe how the American subjects were recruited? Were they taken from the general population, primary care settings, secondary or tertiary care settings or from medical insurance data? Can you briefly describe these settings?
- Could you provide us with data from your study, but excluding commercial sex workers? Specifically, we are interested in knowing how many PLHIV (aged over 15) had hypertension and how many did not, as well as how many HIV-negative individuals had hypertension and how many did not. We also need to know the mean age of study subjects and proportion that were female, in addition to the proportion of PLHIV on ART, for the study to be included.
- Excluding individuals self-reporting hypertension, how many PLHIV (aged over 15) had hypertension? How many did not? How many HIV-negative individuals had hypertension? How many did not?
- How were HIV-negative individuals recruited? How did your recruitment process ensure that PLHIV came from a similar background to HIV-negative individuals?
- Were your participants recruited from key populations (transwomen, commercial sex workers, prisoners, people who inject drugs and migrants), rather than the general population of PLHIV?

- How did you define weighted vs unweighted visits? Is it the case that unweighted visits relate to the actual number of individual patients by arm? What was the number of patients?

Follow-up email to non-responders

Dear << Name >>,

I hope you are well.

I am writing to ask if you have been able to review our questions about your << Year >> study ("<< Title >>")? Our deadline for responses is <<**Date**>> so we would be grateful if you could look over the questions and respond before then.

Full details of our questions and the systematic review are copied below.

Your replies are key to making our systematic review a success. We appreciate the time and effort that you put into reading this email and answering our questions, and look forward to hearing from you.

All the best,
Katherine

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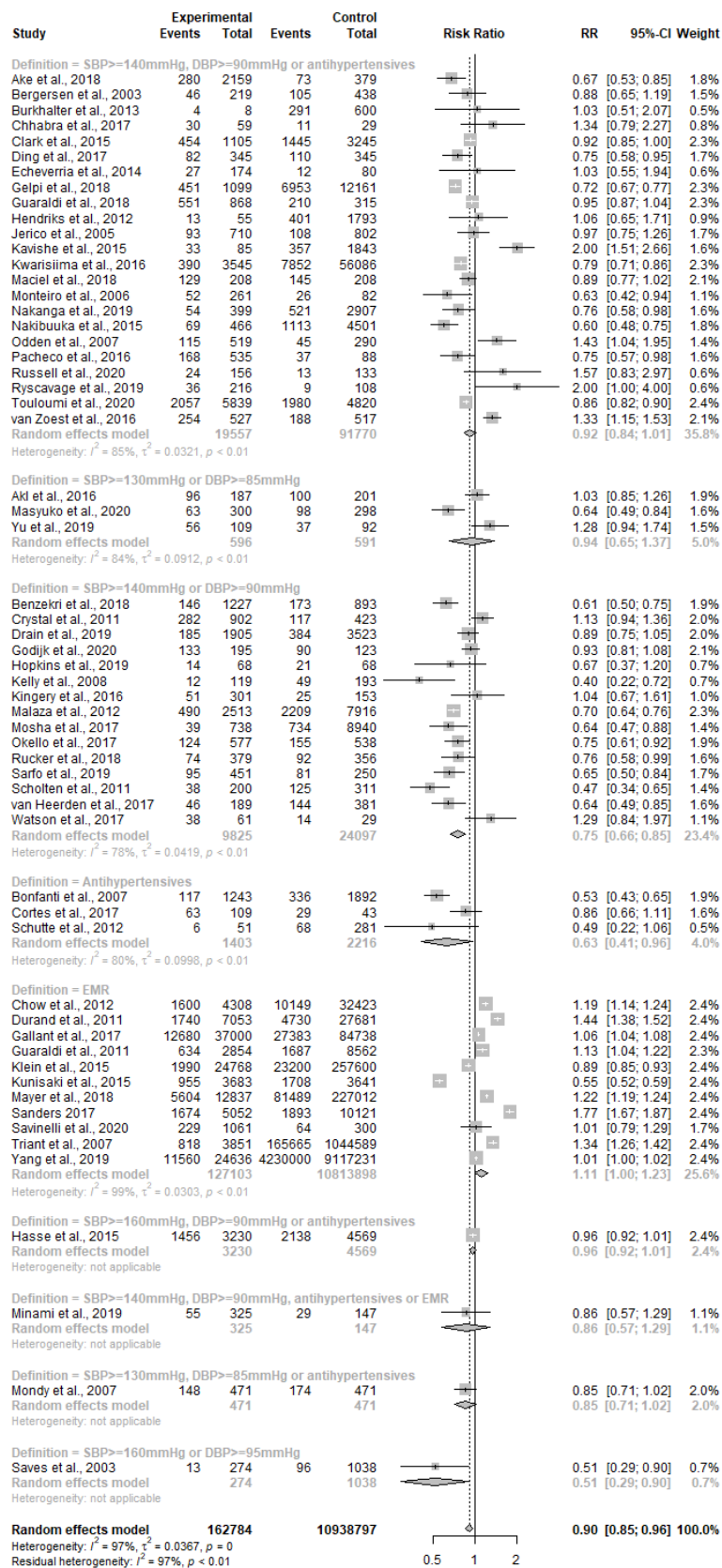
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Forest plot showing risk ratios by hypertension definition



Supplementary figure 1. Forest plot of the risk ratio for hypertension by HIV status, categorised by hypertension definition. Estimates were pooled using a random effects model, with a p-value for subgroup differences of 0.0001. SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, EMR: Electronic Medical Records.

Univariate meta-regression results

Supplementary table 1. Univariate meta-regressions.

Variable	Number of studies	Number of participants	Risk ratio (95% confidence interval)	P-value for sub-category	Overall p-value	R ²
Hypertension definition					0.004	15.49%
SBP≥140mmHg and/or DBP≥90mmHg and/or antidepressant use	41	148,868	1	-		
EMR	11	10,941,001	1.33 (1.16-1.51)	<0.001		
Other	7	11,712	1.06 (0.89-1.27)	0.515		
Continent					<0.001	15.17%
Africa	22	112,005	1	-		
Asia	2	1,162	1.04 (0.74-1.47)	0.806		
Europe	13	53,680	1.21 (1.04-1.40)	0.012		
North America	18	10,932,964	1.49 (1.30-1.70)	<0.001		
South America	4	1,770	1.12 (0.89-1.41)	0.346		
Year study began					0.366	<0.00%
2005 onwards	43	9,663,958	1	-		
Before 2005	10	1,375,532	0.95 (0.81-1.11)	0.520		
Not reported	6	62,091	1.03 (0.84-1.27)	0.756		
Mean age (years) *	32	9,919,853	1.00 (0.99-1.01)	-	0.705	<0.00%
Proportion on ART (%) *	40	1,595,861	1.30 (0.92-1.83)	-	0.130	<0.00%
Proportion female (%) *	56	1,945,979	1.00 (0.99-1.00)	-	0.994	0.52%

SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, EMR: Electronic Medical Records.

* Where variables were examined using a continuous scale, studies without data were dropped from the analysis.

We also saw no effect of study start time on the risk ratio. This remained the case if start time was considered as a continuous variable and may reflect the fact that the study length was highly variable, with some studies running for many years and others ending in the early days of improved ART access.

Age and gender are known to be associated with hypertension, but we did not find a univariate association between either of these variables and the risk ratio in the meta-regression. Categorising mean age or using median age or each study's age limits instead of mean age, did not change these conclusions. We expect this occurred because the two variables had a similar effect among PLHIV and HIV-negative individuals, resulting in minimal change to the risk ratio if they were altered.

Finally, we found no effect of the proportion of PLHIV on ART on relationship between HIV and hypertension in univariate analyses. This was unexpected as previous meta-analyses have demonstrated an increase in hypertension associated with ART usage. The lack of a relationship may reflect heterogeneity in availability of ART and reporting of ART usage between studies.

Permutation test results

Supplementary table 2. Multivariable meta-regression from 1,000 permutations of the data.

Variable	Risk ratio (95% confidence interval)	P-value
Hypertension definition		
Includes SBP $\geq$ 140mmHg and/or DBP $\geq$ 90mmHg and/or antihypertensive use	1	-
EMR	1.05 (0.84-1.32)	0.700
Other	0.99 (0.78-1.26)	0.783
Continent		
Africa	1	-
Asia	1.06 (0.71-1.59)	0.775
Europe	1.21 (0.99-1.47)	0.087
North America	1.46 (1.16-1.83)	0.004
South America	1.12 (0.84-1.48)	0.434

SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, EMR: Electronic Medical Records.

After controlling for study location, we saw no effect of hypertension definition on the risk ratio. It appears likely that the univariate association was the result of an association between study continent and hypertension definition used. This implies that the use of different definitions did not affect the main result, giving confidence that our results are robust.

Risk of bias assessment

Supplementary table 3. Risk of bias assessment for included studies.

First author, year published	Was the research question or objective clearly stated?	Was the study population clearly specified and defined?	Was the participation rate of eligible persons at least 50%?	Were all subjects recruited from the same or similar populations (including the same time period)?	Were inclusion/exclusion criteria prespecified and applied uniformly to all participants?	Was a sample size justification, power description, or variance and effect estimates provided?	Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Were the outcome assessors blinded to the exposure status of participants?	Were the exposure(s) of interest measured prior to the outcome(s) being measured?	Risk of bias
Ake, 2019	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	Yes	Medium
Akl, 2016	Yes	Yes	NR	No	Yes	Yes	Yes	Yes	NR	Yes	Low
Benzekri, 2018	Yes	Yes	NR	No	No	No	Yes	Yes	NR	NR	High
Bergersen, 2003	Yes	Yes	No	Yes	Yes	No	Yes	Yes	NR	Yes	Medium
Bonfanti, 2007	Yes	Yes	NR	No	No	No	Yes	Yes	NR	Yes	High
Burkhalter, 2013	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	NR	NR	Low
Chhabra, 2017	Yes	Yes	NR	Yes	Yes	No	NR	Yes	NR	Yes	Low
Chow, 2012	Yes	Yes	NA	Yes	Yes	No	Yes	Yes	NR	NR	Low
Clark, 2015	Yes	Yes	Yes	No	Yes	No	Yes	Yes	NR	NR	Medium
Cortes, 2017	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	NR	Medium
Crystal, 2011	Yes	Yes	Yes	No	Yes	No	Yes	Yes	NR	Yes	Medium
Ding, 2017	Yes	Yes	NR	Yes	Yes	No	Yes	Yes	NR	Yes	Low
Drain, 2019	Yes	Yes	NR	Yes	Yes	No	Yes	Yes	Yes	No	Low
Durand, 2011	Yes	Yes	NA	Yes	Yes	No	Yes	Yes	NR	NR	Low
Echeverria, 2014	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	NR	Yes	Low
Gallant, 2017	Yes	Yes	NA	Yes	Yes	No	Yes	Yes	NR	NR	Low
Gelpi, 2018	Yes	Yes	No	Yes	Yes	No	Yes	Yes	NR	Yes	Medium

Godijk, 2020	Yes	Yes	Yes	Yes	NR	Yes	Yes	Yes	NR	NR	Low
Guaraldi, 2011	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	NR	Medium
Guaraldi, 2018	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	NR	Medium
Hasse, 2015	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	NR	Medium
Hendriks, 2012	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	NR	NR	Low
Hopkins, 2020	Yes	Yes	NR	Yes	Yes	No	Yes	Yes	Yes	Yes	Low
Jerico, 2005	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Medium
Kavishe, 2015	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	Low
Kelly, 2008	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	Low
Kingery, 2016	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	NR	Yes	Low
Klein, 2015	Yes	Yes	NA	Yes	Yes	No	Yes	Yes	NR	NR	Low
Kunisaki, 2014	Yes	Yes	NR	Yes	Yes	No	Yes	Yes	NR	Yes	Low
Kwarisiima, 2016	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	NR	NR	Low
Maciel, 2018	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	NR	NR	Low
Malaza, 2012	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	NR	NR	Low
Masyuko, 2020	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	NR	Medium
Mayer, 2018	Yes	Yes	NA	Yes	Yes	No	Yes	Yes	NR	NR	Low
Minami, 2019	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	NR	Low
Mondy, 2006	Yes	Yes	Yes	No	Yes	No	Yes	Yes	NR	NR	Low
Monteiro, 2006	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	Yes	Medium
Mosha, 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Low
Nakanga, 2019	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	NR	NR	Low
Nakibuuka, 2015	Yes	Yes	NR	Yes	Yes	No	Yes	Yes	NR	NR	Low
Odden, 2007	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	NR	Medium
Okello, 2017	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	NR	Yes	Low

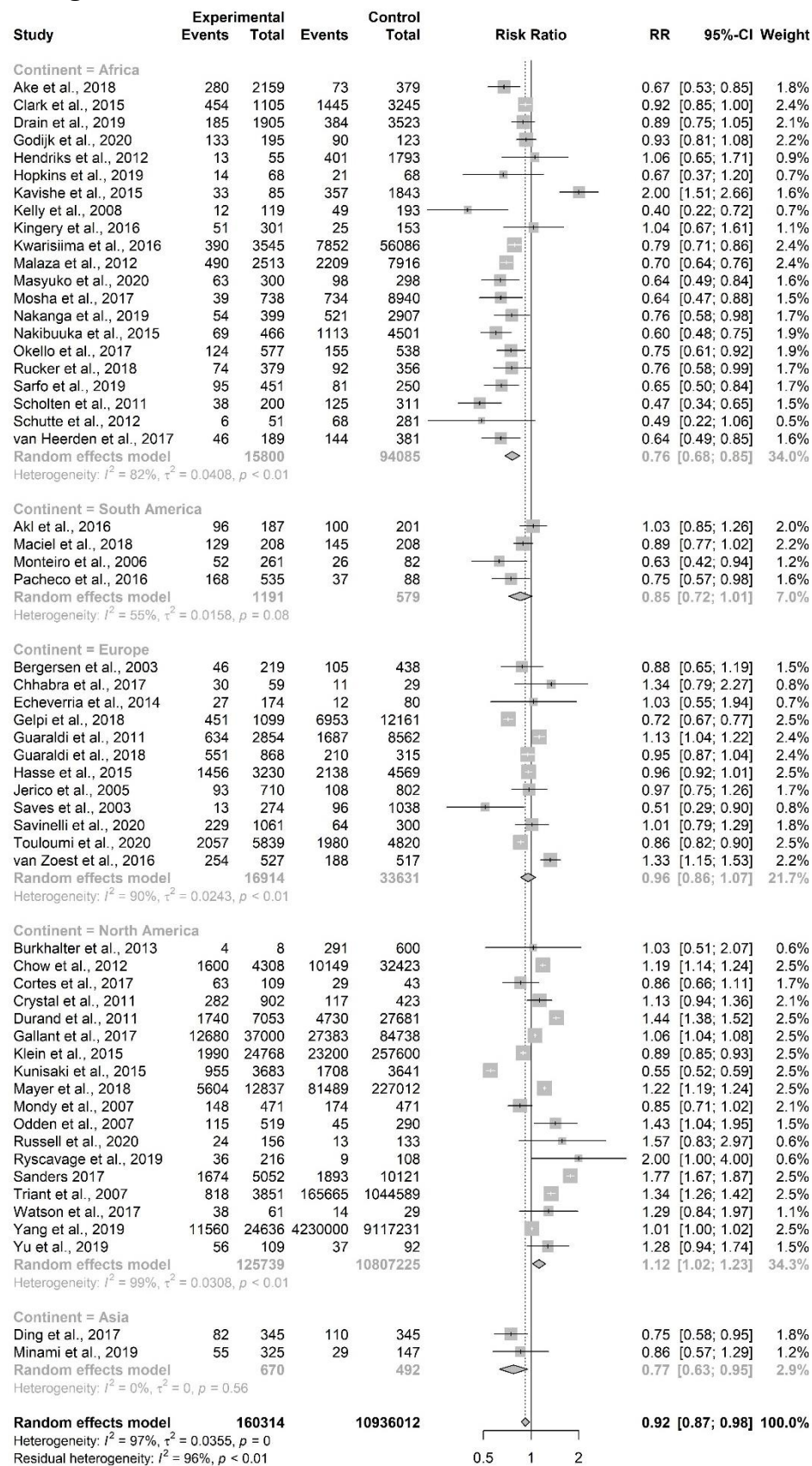
Pacheco, 2016	Yes	Yes	Yes	No	NR	No	Yes	Yes	NR	Yes	Medium
Rucker, 2018	Yes	Yes	Yes	No	Yes	No	Yes	Yes	NR	NR	Medium
Russell, 2020	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	NR	Medium
Ryscavage, 2019	Yes	Yes	NR	Yes	Yes	No	Yes	Yes	NR	NR	Low
Sanders 2017	Yes	Yes	NR	Yes	Yes	No	Yes	Yes	NR	NR	Low
Sarfo, 2019	Yes	Yes	NR	Yes	Yes	No	Yes	Yes	NR	Yes	Low
Saves, 2003	Yes	Yes	NR	No	NR	No	Yes	Yes	NR	Yes	Medium
Savinelli, 2020	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	NR	Yes	Low
Scholten, 2011	Yes	Yes	Yes	Yes	No	No	Yes	Yes	NR	Yes	Medium
Schutte, 2012	Yes	Yes	NR	Yes	Yes	No	Yes	Yes	NR	NR	Low
Touloumi, 2020	Yes	Yes	Yes	No	Yes	No	Yes	Yes	NR	Yes	Medium
Triant, 2007	Yes	Yes	NA	Yes	Yes	No	Yes	Yes	NR	NR	Low
van Heerden, 2017	Yes	Yes	Yes	Yes	NR	No	Yes	Yes	NR	NR	Low
van Zoest, 2016	Yes	Yes	Yes	No	Yes	No	Yes	Yes	NR	Yes	Medium
Watson, 2017	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	Yes	Medium
Yang, 2020	Yes	Yes	NA	Yes	Yes	No	Yes	Yes	NR	Yes	Low
Yu, 2019	Yes	Yes	NR	No	Yes	No	Yes	Yes	NR	Yes	Medium

NR: Not Reported; NA: Not Applicable.

Several questions were not included in quality assessment as they were not relevant for these studies, which were cross-sectional analyses of a binary outcome and used only unadjusted results. The questions which were removed are:

- For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?
- Was the exposure(s) assessed more than once over time?
- Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?
- Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?
- Was loss to follow-up after baseline 20% or less?

Results with high-risk studies removed



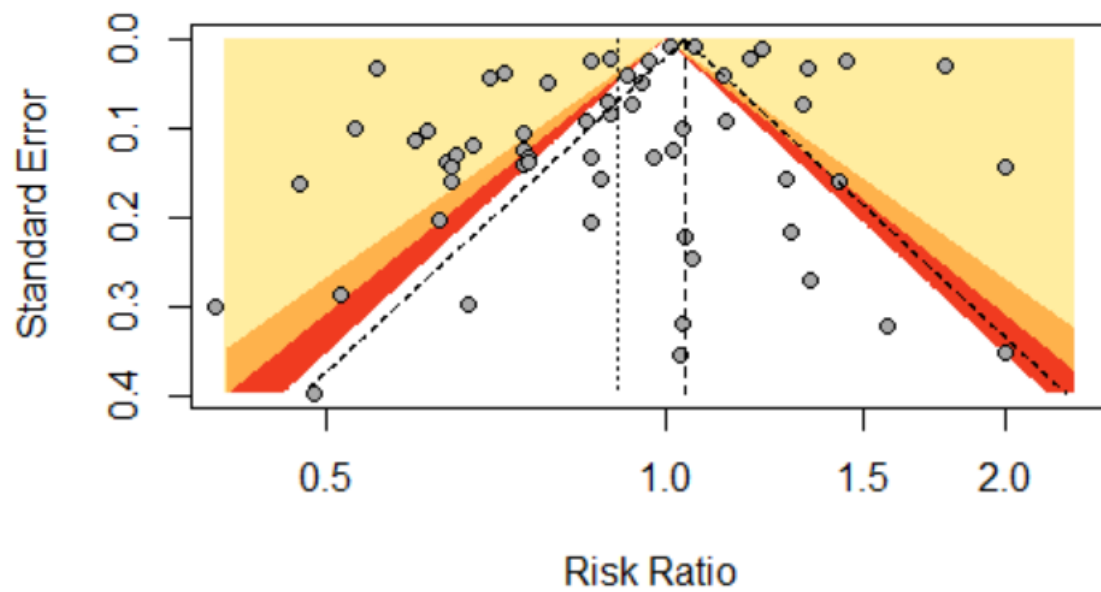
Supplementary figure 2. Forest plot of the risk ratio for hypertension by HIV status, categorised by continent, with the two high-risk studies removed. Estimates were pooled using a random effects model, with a p-value for sub-group differences of less than 0.0001.

Supplementary table 4. Multivariable meta-regression without high-risk studies ($R^2=12.19\%$).

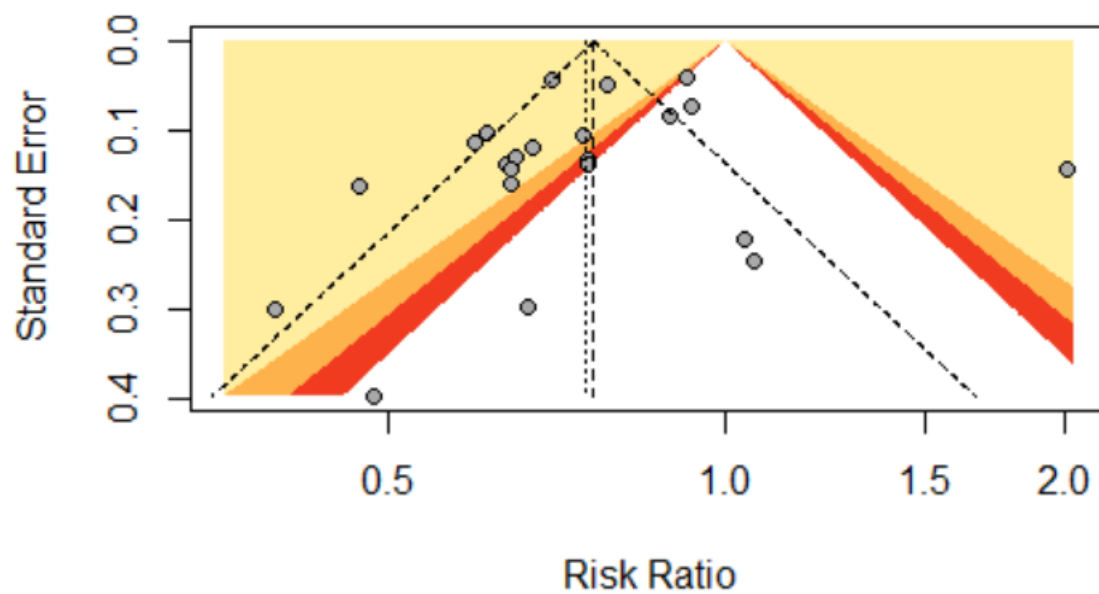
Variable	Number of studies	Number of participants	Risk ratio (95% confidence interval)	P-value for sub-category	Overall p-value
Hypertension definition					0.638
Includes SBP $\geq$ 140mmHg and/or DBP $\geq$ 90mmHg and/or antihypertensive use	39	143,613	1	-	
EMR	11	1,0941,001	1.02 (0.85-1.21)	0.856	
Other	7	11,712	0.94 (0.78-1.14)	0.551	
Continent					0.001
Africa	21	109,885	1	-	
Asia	2	1,162	1.05 (0.74-1.49)	0.777	
Europe	12	50,545	1.26 (1.07-1.48)	0.005	
North America	18	10,932,964	1.46 (1.21-1.75)	<0.001	
South America	4	1,770	1.12 (0.88-1.42)	0.349	

SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, EMR: Electronic Medical Records.

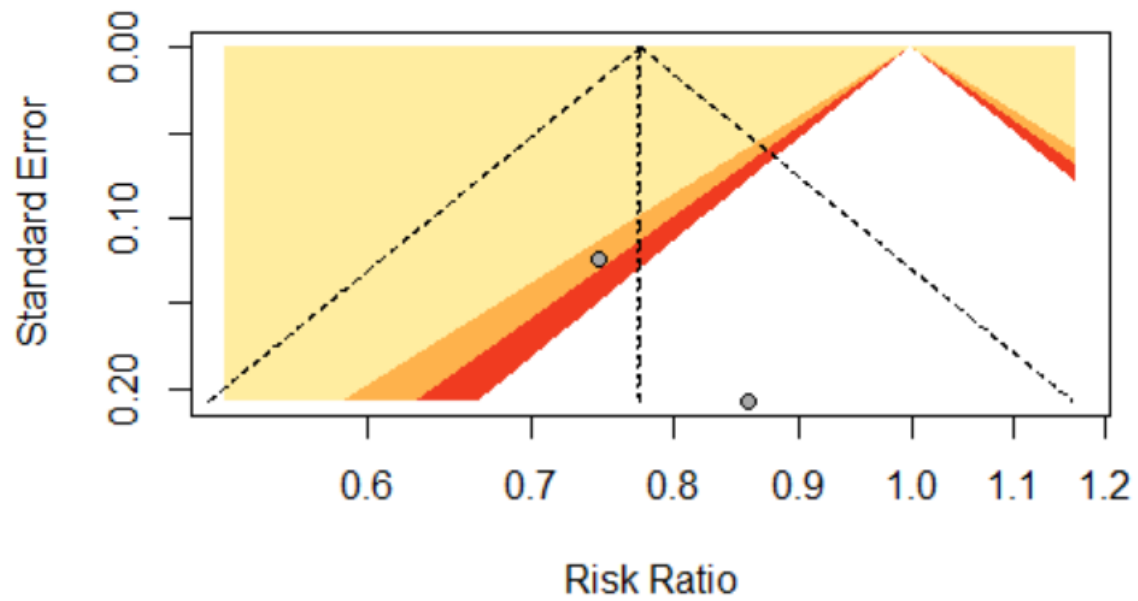
Contour-enhanced funnel plots and Egger's test results



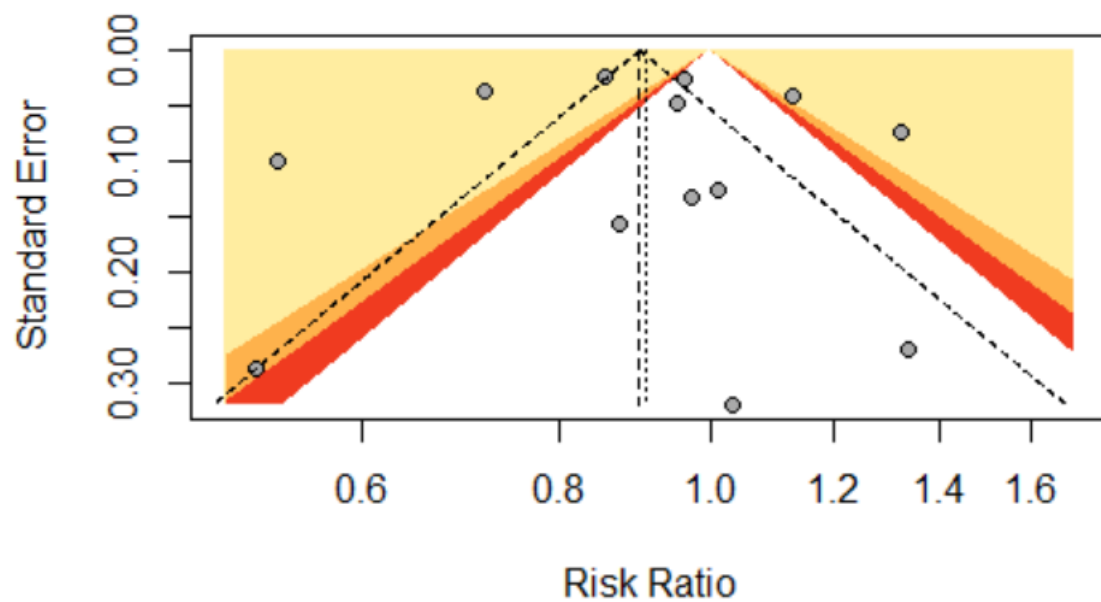
Supplementary figure 3. Contour-enhanced funnel plot with all studies. Red: $p < 0.05$, orange: $p < 0.025$, yellow: $p < 0.01$.



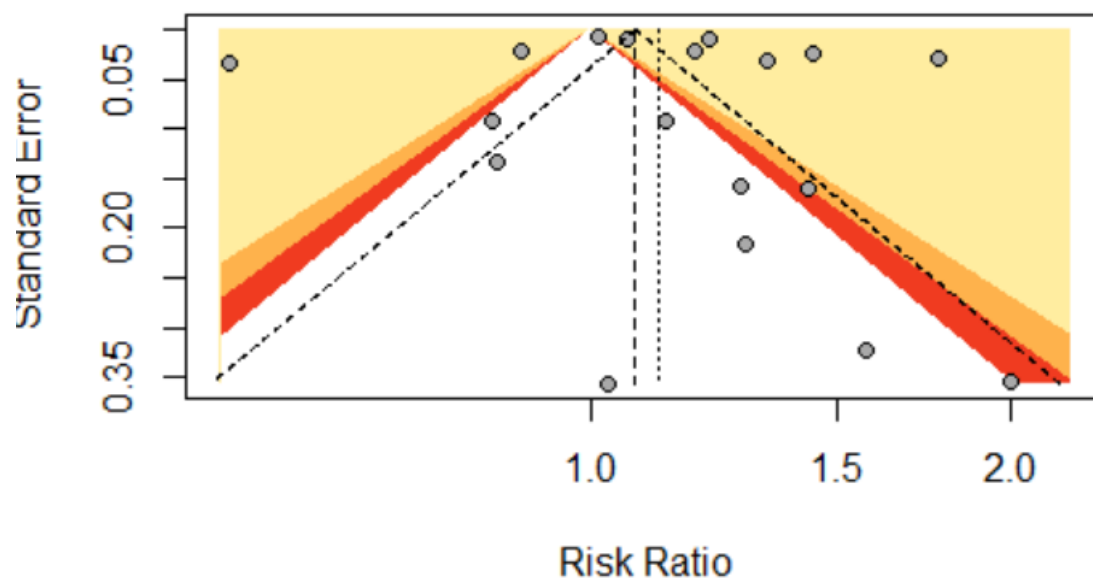
Supplementary figure 4. Contour-enhanced funnel plot with studies from Africa. Red: $p < 0.05$, orange: $p < 0.025$, yellow: $p < 0.01$.



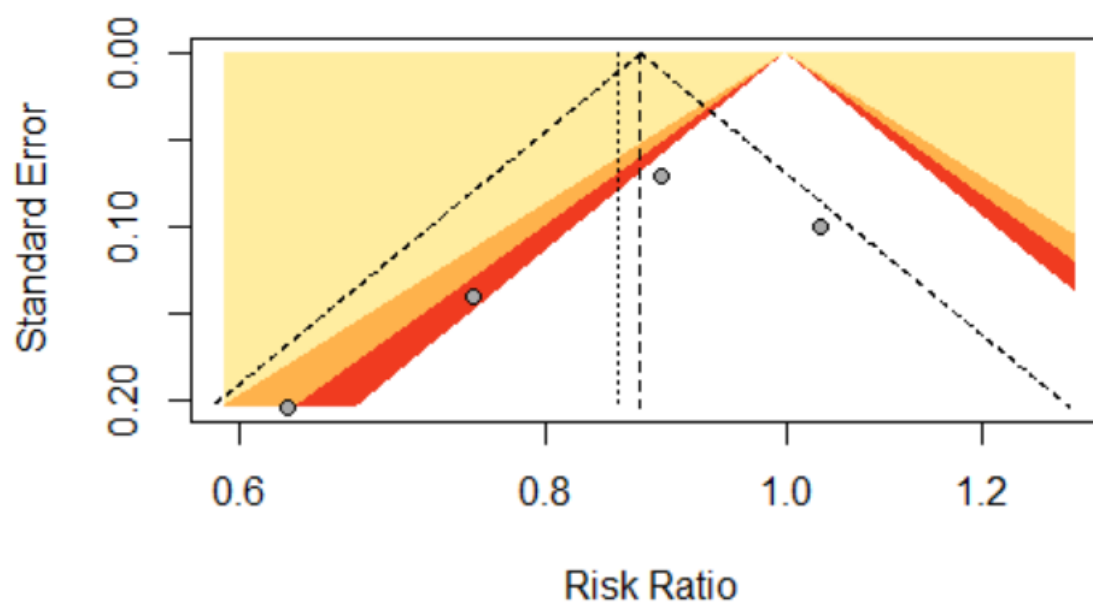
Supplementary figure 5. Contour-enhanced funnel plot with studies from Asia. Red: $p < 0.05$, orange: $p < 0.025$, yellow: $p < 0.01$.



Supplementary figure 6. Contour-enhanced funnel plot with studies from Europe. Red: $p < 0.05$, orange: $p < 0.025$, yellow: $p < 0.01$.



Supplementary figure 7. Contour-enhanced funnel plot with studies from North America. Red: $p < 0.05$, orange: $p < 0.025$, yellow: $p < 0.01$.

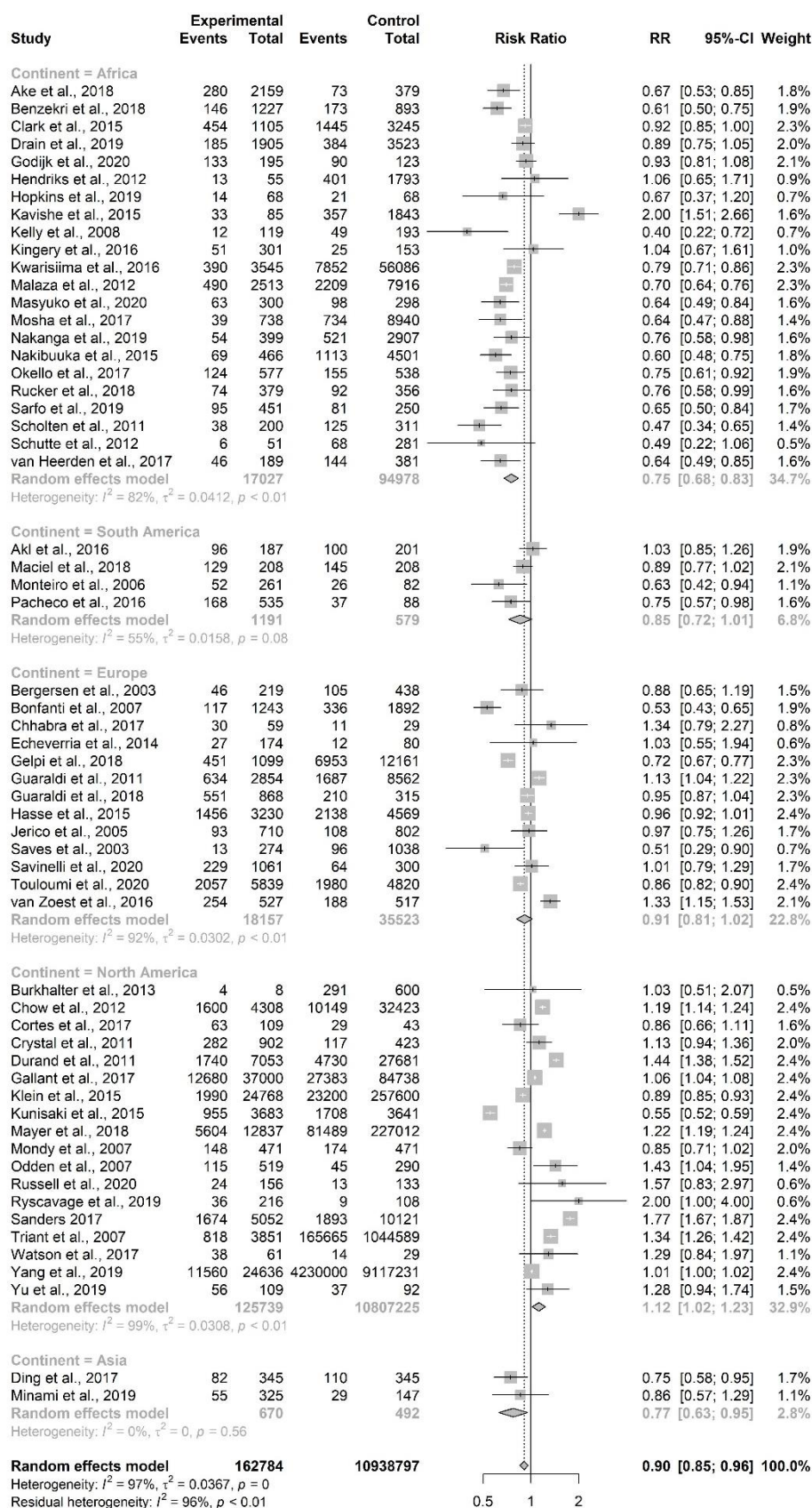


Supplementary figure 8. Contour-enhanced funnel plot with studies from South America. Red: $p < 0.05$, orange: $p < 0.025$, yellow: $p < 0.01$.

Supplementary table 5. Egger's test results.

Studies included	Intercept	P-value
All studied	0.07	0.049
African studies	-0.16	0.294
European studies	-0.10	0.939
North American studies	0.06	0.612

Results with Hartung-Knapp modification



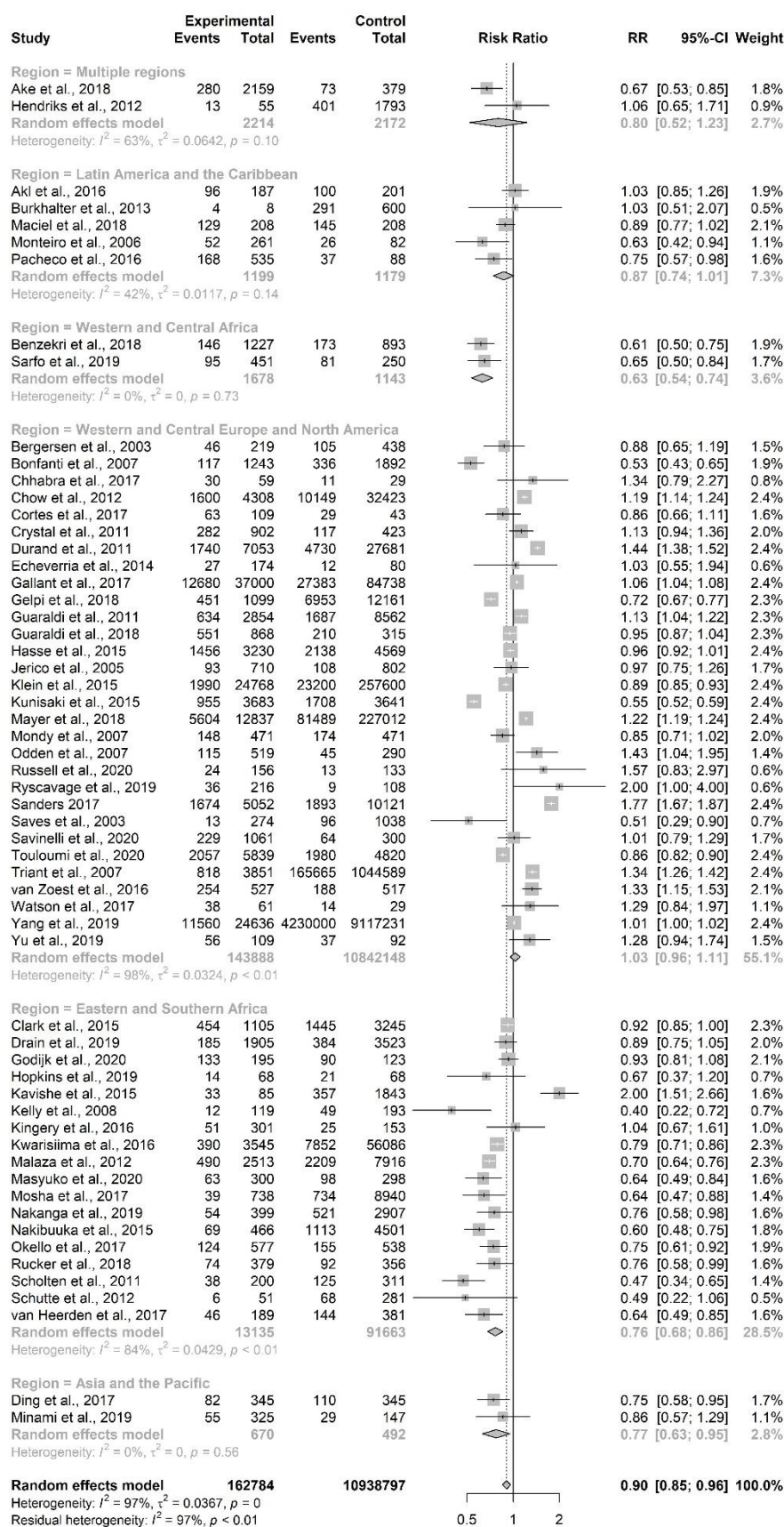
Supplementary figure 9. Forest plot of the risk ratio for hypertension by HIV status, categorised by continent, with the Hartung-Knapp modification. Estimates were pooled using a random effects model, with a p-value for sub-group differences of 0.0002.

Supplementary table 6. Multivariable meta-regression for meta-analyses with the Hartung-Knapp modification ($R^2=15.17\%$).

Variable	Number of studies	Number of participants	Risk ratio (95% confidence interval)	P-value for sub-category	Overall p-value
Hypertension definition					0.002
Includes SBP $\geq$ 140mmHg and/or DBP $\geq$ 90mmHg and/or antihypertensive use	41	148,868	1	-	
EMR	11	10,941,001	1.04 (0.82-1.33)	0.730	
Other	7	11,712	0.97 (0.75-1.26)	0.810	
Continent					0.057
Africa	22	112,005	1	-	
Asia	2	1,162	1.06 (0.65-1.71)	0.823	
Europe	13	53,680	1.20 (0.97-1.49)	0.085	
North America	18	10,932,964	1.45 (1.13-1.86)	0.004	
South America	4	1,770	1.13 (0.81-1.56)	0.467	

SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, EMR: Electronic Medical Records.

UNAIDS regions sensitivity analysis



Supplementary figure 10. Forest plot of the risk ratio for hypertension by HIV status, categorised by UNAIDS region. Estimates were pooled using a random effects model, with a p-value for sub-group differences of <0.0001 .