Supplemental material

Use of hospital services by patients with chronic conditions in sub-Saharan Africa: a systematic review and meta-analysis

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Search strategy

OVID MEDLINE search strategy

1. ((high or elevated or raised) adj4 (plasma or serum or blood) adj4 fasting adj4 glucose).mp.
2. ((high or elevated or raised) adj1 ("glycated h?emoglobin A1c" or HbA1c)).mp.
3. 1 or 2
4. ((Diabet* or ("diabetes mellitus" adj1 ("type 1" or "type 2")) or "diabetes mellitus") not (insipidus or gestational)).mp.
5. Diabetes Mellitus, Type 1/ or Diabetes Mellitus, Type 2.mp.
6. 4 or 5
7. 3 or 6
8. (Obesity or ((high or elevated or raised) adj1 (BMI or "body mass index"))).mp.
9. Obesity/ or Obesity, Morbid/
10. 8 or 9
11. (Alcohol adj1 (excess* or abuse or elevated)).mp.
12. Alcoholism/
13. 11 or 12
14. (hypercholesterol?emia or ((high or raised or elevated) adj1 (LDL or "low?density lipoprotein")) or ((high or raised or elevated) adj1 cholesterol)).mp
15. Hypercholesterolemia/
16. 14 or 15
17. ((HIV or "human immunodeficiency virus" or anti?retrovir* or ART) adj1 (treatment or therapy) adj1 (resistance or non?compliance or non?adherence or failure)).
18. HIV Infections/ or Acquired Immunodeficiency Syndrome/
19. (((HIV or "human immunodeficiency virus") adj1 (infect* or patient* or positive)) or "AIDS" or "acquired immunodeficiency syndrome").mp.
20. 18 or 19
21. (Stroke or (cerebro?vascular adj1 (accident or event))).mp.
22. exp Stroke/
23. 21 or 22
24. ("isch?emic heart disease" or ((myocardial or heart or cardiac) adj1 (isch?emia or infarction)) or ("coronary artery" adj1 (disease or thrombo*)) or CAD).
25. exp Myocardial Ischemia/
26. 24 or 25
27. ((liver or hepatic) adj1 cirrhosis).mp.
28. Liver Cirrhosis/
29. 27 or 28
30. ("chronic obstructive pulmonary disease" or COPD or "chronic bronchitis" or emphysema).mp.
31. Pulmonary Disease, Chronic Obstructive/ or Bronchitis, Chronic/ or Pulmonary Emphysema/
32. 30 or 31
33. ((hypertens* adj1 heart adj1 disease) or (congest* adj1 (heart or cardiac) adj1 failure) or "cardiac failure" or "heart failure" or CCF or HF).mp.
34. Heart Failure/
35. 33 or 34
36. Hypertension/ or Essential Hypertension/ or Hypertension, Malignant/
37. (((Hypertens* or arterial hypertens* or ((high or elevated or raised) adj2 "blood pressure") or ((high or elevated or raised) adj1 "systolic blood pressure")) not (pulmonary or renal or retinal or portal)) adj1 hypertens*).mp.
38. 36 or 37
39. (("chronic kidney disease" or "chronic renal disease" or "chronic kidney failure" or "chronic renal failure" or "chronic kidney dysfunction" or "chronic renal dysfunction" or "chronic renal insufficiency" or "chronic kidney insufficiency" or CKD or CRF) not "acute kidney injury" not "acute renal failure" not AKI not ARF).mp.
40. Renal Insufficiency/ or (Renal Insufficiency, Chronic/ or Kidney Failure, Chronic/)
41. 39 or 40
42. Smokers/
43. (smok* or (cigarette adj1 smok*)).mp.
44. 42 or 43
45. 3 or 7 or 10 or 13 or 16 or 17 or 20 or 23 or 26 or 29 or 32 or 35 or 38 or 41 or 44
46. (Co?morbidit* or Multi?morbidit* multiple morbidit* or multiple chronic conditions or undiagnosed diseases or multiple diseases or multiple chronic diseases or chronic illness* or multi?patholog*).mp.
47. Comorbidity/ or Multimorbidity/ or Multiple Chronic Conditions/ or Communicable Diseases/ or Undiagnosed Diseases/

48. 46 or 47
49. 45 or 48
50. (acute disease* or hospitali?ed or hospitali?ation or in?patient* or in-patient* or inpatient* or admit* or admission* or admitted or acute care or hospital presentation* or emergency presentation* or unplanned hospital admission* or unplanned admission* or medical admission* or emergency care or emergency department* or emergency unit* or urgent care or acute* unwell or acute illness* or acute presentation* or (critical* adj1 (ill* or unwell)) or medical ward* or intensive care unit* or ICU or intensive therapy unit* or ITU).mp.
51. Hospitalization/ or Patient Admission/ or Emergency Service, Hospital/
52. 50 or 51
53. Adult/
54. (Adult not (infant or neonat* or maternal)).mp.
55. 53 or 54
56. (SSA or sub?sahara* africa or "Africa south of the Sahara" or "central Africa" or eastern Africa or southern Africa or western Africa or Benin or Dahomey or Burkina Faso or Burkina Fasso or "Upper Volta" or Burundi or "Central African Republic" or Ubangi-Shari or Chad or Comoros or "Comoro Islands" or Mayotte or "Iles Comores" or "Democratic Republic of Congo" or Belgian Congo or Zaire or Eritrea or Ethiopia or Gambia or Guinea or Guinea-Bissau or Portuguese Guinea or Kenya or Liberia or Madagascar or "Malagasy Republic" or Malawi or Nyasaland or Mali or Mauritania or Mozambique or "Portuguese East Africa" or Niger or Rwanda or Ruanda or Sierra Leone or Somalia or Tanzania or Zanzibar or Togo or "Togolese Republic" or Uganda or Zimbabwe or Rhodesia or Cameroon or "Cape Verde" or Congo or "Cote d'Ivoire" or "Ivory Coast" or Ghana or "Gold Coast" or Lesotho or Basutoland or Nigeria or "Sao Tome" or Senegal or Sudan or Swaziland or Zambia or Northern Rhodesia or Angola or Botswana or Bechuanaland or Kalahari or Gabon or "Gabonese Republic" or Mauritius or "Agalega Islands" or Namibia or Seychelles or "South Africa" or "Equatorial Guinea" or "Spanish Guinea").mp.
57. Africa, Central/ or Africa, Eastern/ or "Africa South of the Sahara"/ or Africa, Southern/ or Africa, Western/ or South Africa/ or Cameroon/ or Central African Republic/ or Chad/ or Congo/ or "Democratic Republic of the Congo"/ or Equatorial Guinea/ or Gabon/ or "Sao Tome and Principe"/ or Burundi/ or Djibouti/ or Eritrea/ or Ethiopia/ or Kenya/ or Rwanda/ or Somalia/ or South Sudan/ or Sudan/ or Tanzania/ or Uganda/ or Angola/ or Botswana/ or Eswatini/ or Lesotho/ or Malawi/ or Mozambique/ or Namibia/ or South Africa/ or Zambia/ or Zimbabwe/ or Benin/ or Burkina Faso/ or Cabo Verde/ or Cote d'Ivoire/ or Gambia/ or Ghana/ or Guinea/ or Guinea-Bissau/ or Liberia/ or Mali/ or Mauritania/ or Niger/ or Nigeria/ or Senegal/ or Sierra Leone/ or Togo/
58. 56 or 57
59. 49 and 52 and 55 and 58
60. limit 59 to yr="2010 -Current"

Systematic review definitions for acutely decompensated chronic diseases

Acute hypertensive presentations / severe hypertension: hypertensive emergency or hypertensive crises or SBP > 180 or DBP > 110.

Diabetic emergency: diabetic ketoacidosis or hyperosmolar hyperglycaemic state or severe hyperglycaemia as the reason for admission

HIV treatment failure: as per the reporting study's definition (see study characteristics table above).

Risk of Bias Assessment

Newcastle Ottawa Scale adapted for prevalence studies

Selection:

1. Representativeness of the sample:
    a. Truly representative of the average in the target population. ** (all subjects or random sampling)
    b. Somewhat representative of the average in the target group. * (non-random sampling)
    c. Selected group of users/convenience sample.
    d. No description of the derivation of the included subjects.

2. Sample size:
    a. Justified and satisfactory (including sample size calculation). *
    b. Not justified.
    c. No information provided

3. Non-respondents:
    a. Proportion of target sample recruited attains pre-specified target or basic summary of non-respondent characteristics in sampling frame recorded. *
    b. Unsatisfactory recruitment rate, no summary data on non-respondents.
    c. No information provided

Comparability:

1. Comparability of subjects in different outcome groups on the basis of design or analysis. Confounding factors controlled.
    a. Data/ results adjusted for relevant predictors/risk factors/confounders e.g. age, sex, etc. **
    b. Data/results not adjusted for all relevant confounders/risk factors/information not provided.

Outcome:

1. Assessment of outcome:
    a. Independent blind assessment using objective validated methods. **
    b. Unblinded assessment using objective validated methods. **
    c. Used non-standard or non-validated methods with gold standard. *
    d. No description/non-standard methods used.

2. Statistical test:
    a. Statistical test used to analyse the data clearly described, appropriate and measures of association presented including confidence intervals and probability level (p value). *
    b. Statistical test not appropriate, not described or incomplete.

Scoring: 7-9 high quality, 4-6 high risk, 0-3 very high risk of bias.

Risk of bias findings from the Newcastle Ottawa Scale

Study ID	D1	D2	D3	NOS
Hassan 2023	~	-	~	-
Sendekie 2023	~	-	~	-
Ronny 2022	~	-	+	~
Musung 2022	+	+	+	+
Kemal 2022	~	+	~	~
Kazibwe 2022	~	+	+	+
Ibrahim 2022	~	+	+	+
Roberts 2021	+	+	~	+
Iradukunda 2021	+	+	~	+
Ephraim 2021	+	-	~	~
Pintye 2021	+	+	+	+
Mouton 2021	+	+	~	+
Moretti 2021	+	+	~	+
Mkoko 2021	~	-	~	~
Laher 2021	~	-	+	~
Fiseha 2021	+	+	~	+
Burke 2021	+	+	+	+
Agazhe 2021	+	-	~	~
Rao 2020	-	+	+	~
Nkoke 2020	+	+	+	+
Mulugeta 2020	+	+	+	+

Study ID	D1	D2	D3	NOS
Hertz 2020	+	-	+	+
Gilbert 2020	~	+	+	+
Du Plooy 2020	+	+	+	+
Woyessa 2019	+	-	~	~
Sheikh 2019	~	+	+	+
Ominde 2019	-	+	~	~
Nkoke 2019	-	+	+	~
Nakalema 2019	+	+	+	+
Mwenda 2019	~	+	~	~
Mocumbi 2019	+	-	+	~
Mandi 2019	+	-	+	~
Lakoh 2019	+	+	~	+
Kalyesubula 2019	+	-	~	~
Hertz 2019.i	+	+	~	+
Hertz 2019.ii	+	+	~	+
Hansoti 2019.i	-	+	+	+
Hansoti 2019.ii	+	+	+	+
Haachambwa 2019	-	+	~	~
Elisante 2019	+	+	~	+
Barak 2019	+	-	+	~
Shao 2018	+	-	+	~

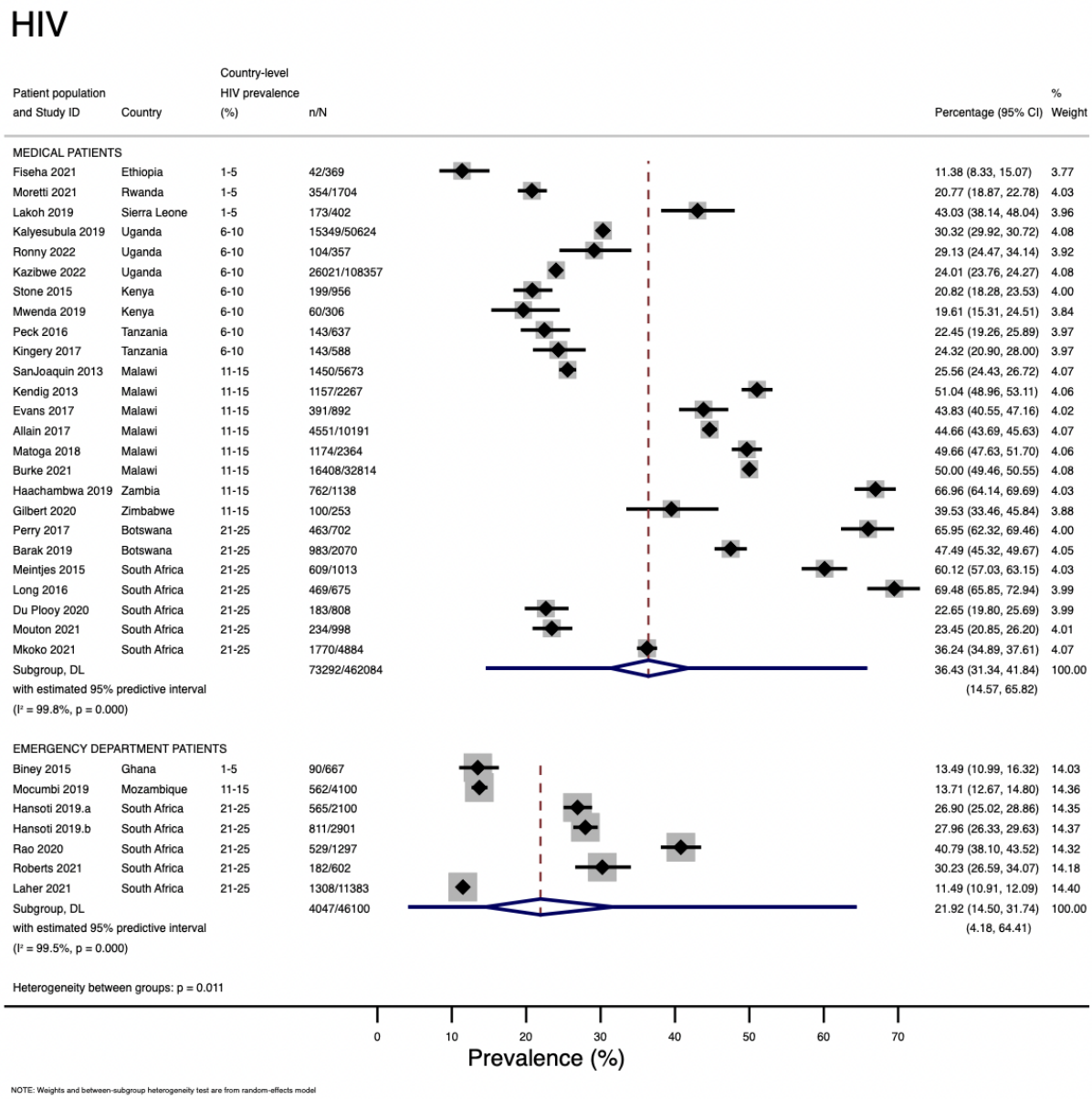
Study ID	D1	D2	D3	NOS
Matoga 2018	-	+	+	~
Perry 2017	+	-	~	~
Kingery 2017	~	+	+	+
Evans 2017	~	-	+	~
Allain 2017	+	+	~	+
Peck 2016	~	+	~	~
Long 2016	+	-	+	~
Stone 2015	-	+	~	~
Noor 2015	-	-	-	-
Meintjes 2015	+	+	+	+
Gizaw 2015	-	-	~	-
Biney 2015	-	-	+	-
Ogunmola 2014	+	-	~	~
Kakoma 2014	-	-	-	-
SanJoaquin 2013	~	-	~	-
Philip-Ephraim 2013	~	-	-	-
Anyanwu 2013	-	-	-	-
Kendig 2013	+	+	+	+
Wachira 2012	+	-	~	~

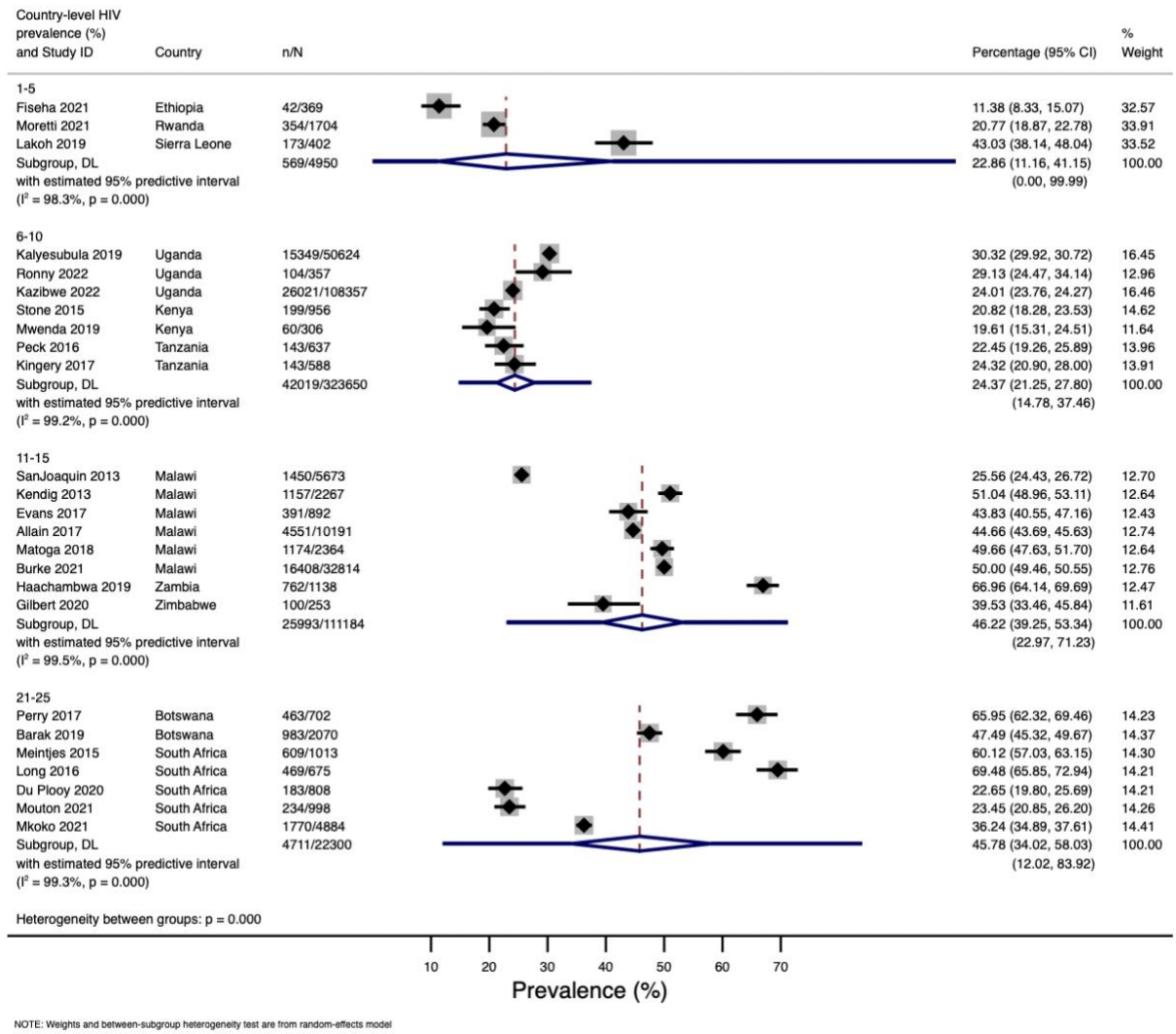
D1 = risk of selection bias
D2 = risk of comparability bias
D3 = risk of outcome bias
NOS = Overall Newcastle Ottawa Scale.

+ = High quality
~ = High risk of bias
- = Very high risk of bias

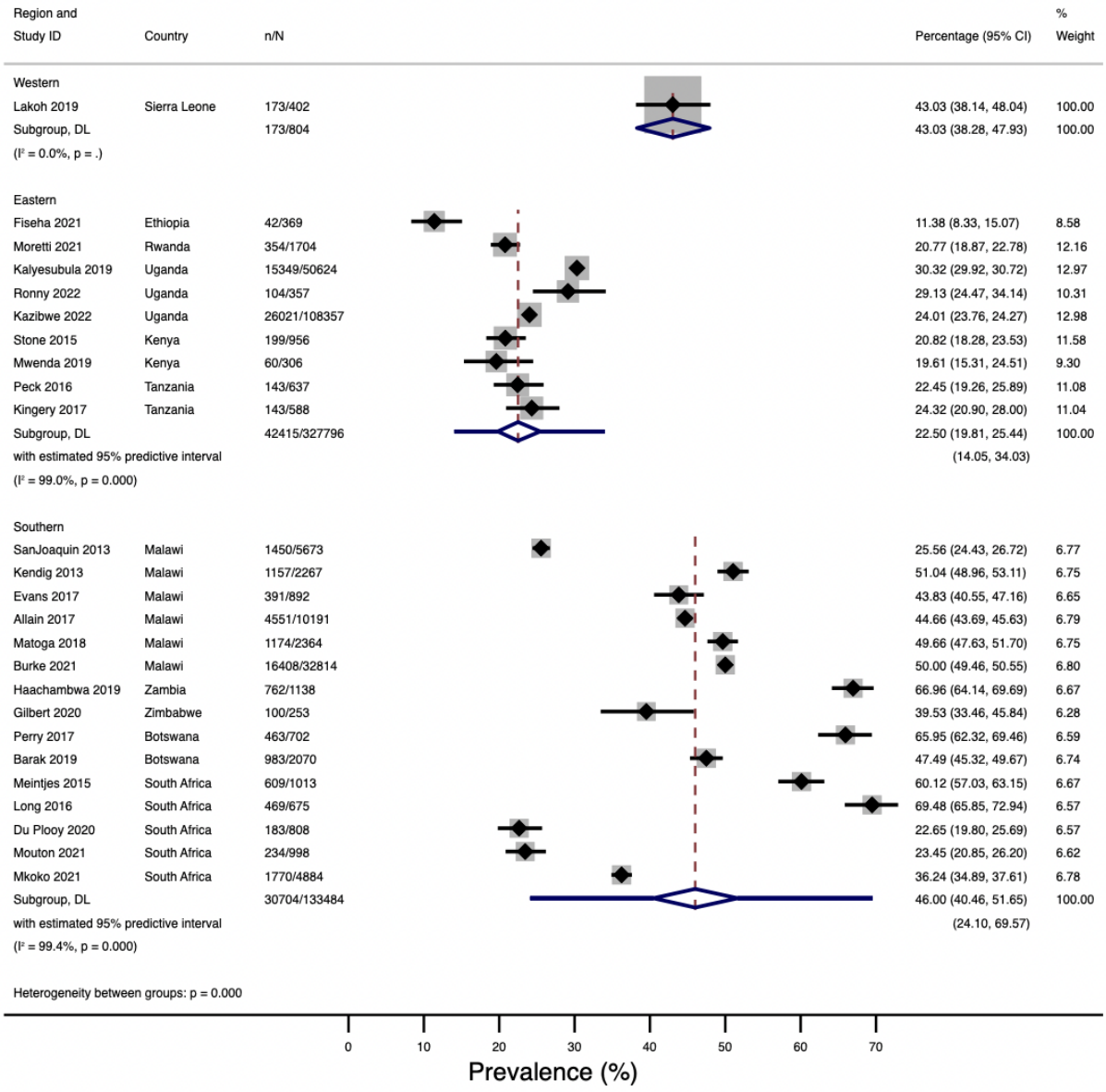
Forest plots and assessment of heterogeneity

HIV



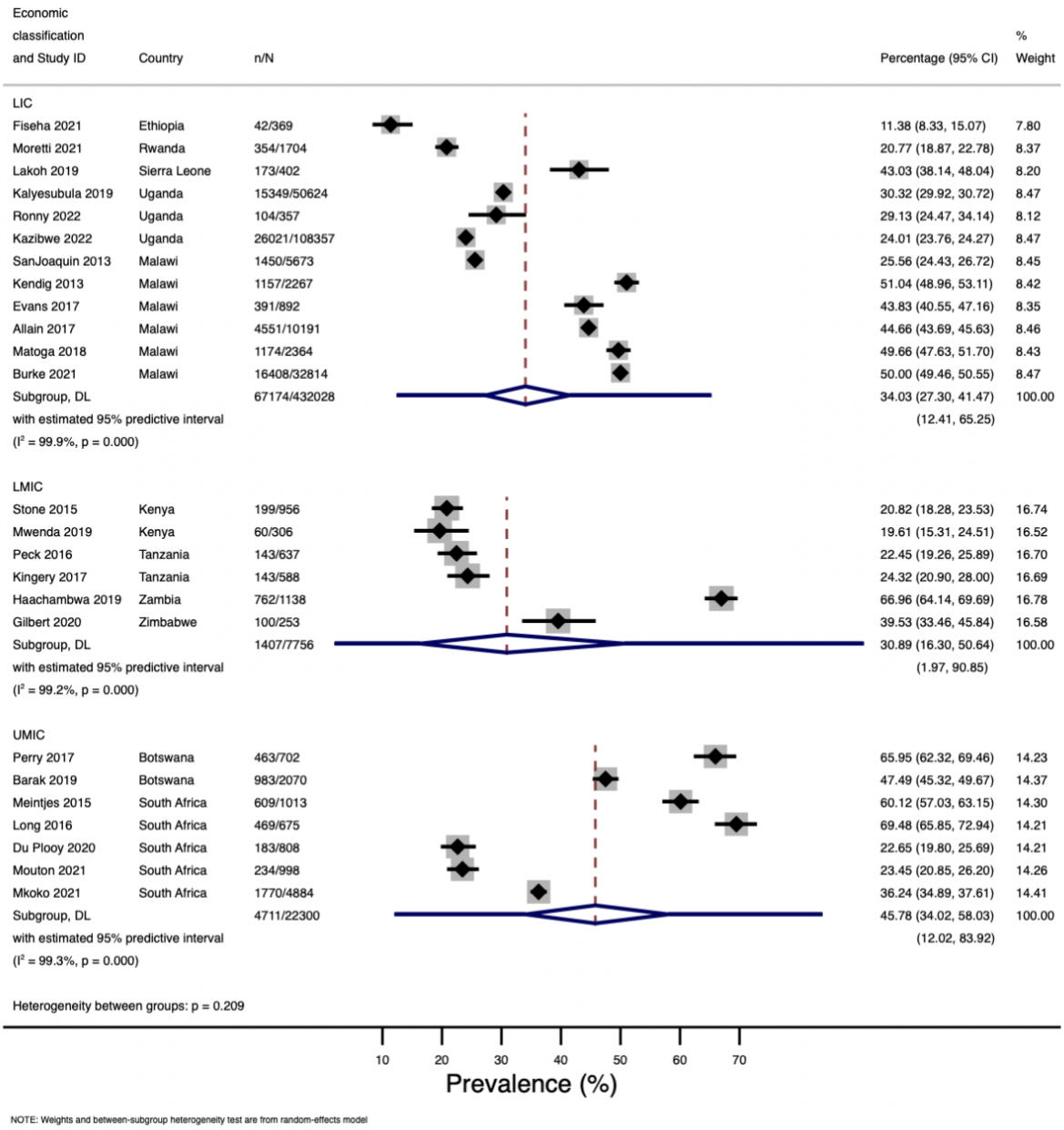

HIV by country-level HIV prevalence
Country-level HIV prevalence (%) and Study ID
Country
n/N
Percentage (95% CI)
% Weight
1-5
Fiseha 2021 Ethiopia 42/369 11.38 (8.33, 15.07) 32.57
Moretti 2021 Rwanda 354/1704 20.77 (18.87, 22.78) 33.91
Lakoh 2019 Sierra Leone 173/402 43.03 (38.14, 48.04) 33.52
Subgroup, DL 569/4950 22.86 (11.16, 41.15) 100.00
with estimated 95% predictive interval (0.00, 99.99)
(I² = 98.3%, p = 0.000)
6-10
Kalyesubula 2019 Uganda 15349/50624 30.32 (29.92, 30.72) 16.45
Ronny 2022 Uganda 104/357 29.13 (24.47, 34.14) 12.96
Kazibwe 2022 Uganda 26021/108357 24.01 (23.76, 24.27) 16.46
Stone 2015 Kenya 199/956 20.82 (18.28, 23.53) 14.62
Mwenda 2019 Kenya 60/306 19.61 (15.31, 24.51) 11.64
Peck 2016 Tanzania 143/637 22.45 (19.26, 25.89) 13.96
Kingery 2017 Tanzania 143/588 24.32 (20.90, 28.00) 13.91
Subgroup, DL 42019/323650 24.37 (21.25, 27.80) 100.00
with estimated 95% predictive interval (14.78, 37.46)
(I² = 99.2%, p = 0.000)
11-15
SanJoaquin 2013 Malawi 1450/5673 25.56 (24.43, 26.72) 12.70
Kendig 2013 Malawi 1157/2267 51.04 (48.96, 53.11) 12.64
Evans 2017 Malawi 391/892 43.83 (40.55, 47.16) 12.43
Allain 2017 Malawi 4551/10191 44.66 (43.69, 45.63) 12.74
Matoga 2018 Malawi 1174/2364 49.66 (47.63, 51.70) 12.64
Burke 2021 Malawi 16408/32814 50.00 (49.46, 50.55) 12.76
Haachambwa 2019 Zambia 762/1138 66.96 (64.14, 69.69) 12.47
Gilbert 2020 Zimbabwe 100/253 39.53 (33.46, 45.84) 11.61
Subgroup, DL 25993/111184 46.22 (39.25, 53.34) 100.00
with estimated 95% predictive interval (22.97, 71.23)
(I² = 99.5%, p = 0.000)
21-25
Perry 2017 Botswana 463/702 65.95 (62.32, 69.46) 14.23
Barak 2019 Botswana 983/2070 47.49 (45.32, 49.67) 14.37
Meintjes 2015 South Africa 609/1013 60.12 (57.03, 63.15) 14.30
Long 2016 South Africa 469/675 69.48 (65.85, 72.94) 14.21
Du Plooy 2020 South Africa 183/808 22.65 (19.80, 25.69) 14.21
Mouton 2021 South Africa 234/998 23.45 (20.85, 26.20) 14.26
Mkoko 2021 South Africa 1770/4884 36.24 (34.89, 37.61) 14.41
Subgroup, DL 4711/22300 45.78 (34.02, 58.03) 100.00
with estimated 95% predictive interval (12.02, 83.92)
(I² = 99.3%, p = 0.000)
Heterogeneity between groups: p = 0.000
10
20
30
40
50
60
70
Prevalence (%)
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

HIV by region



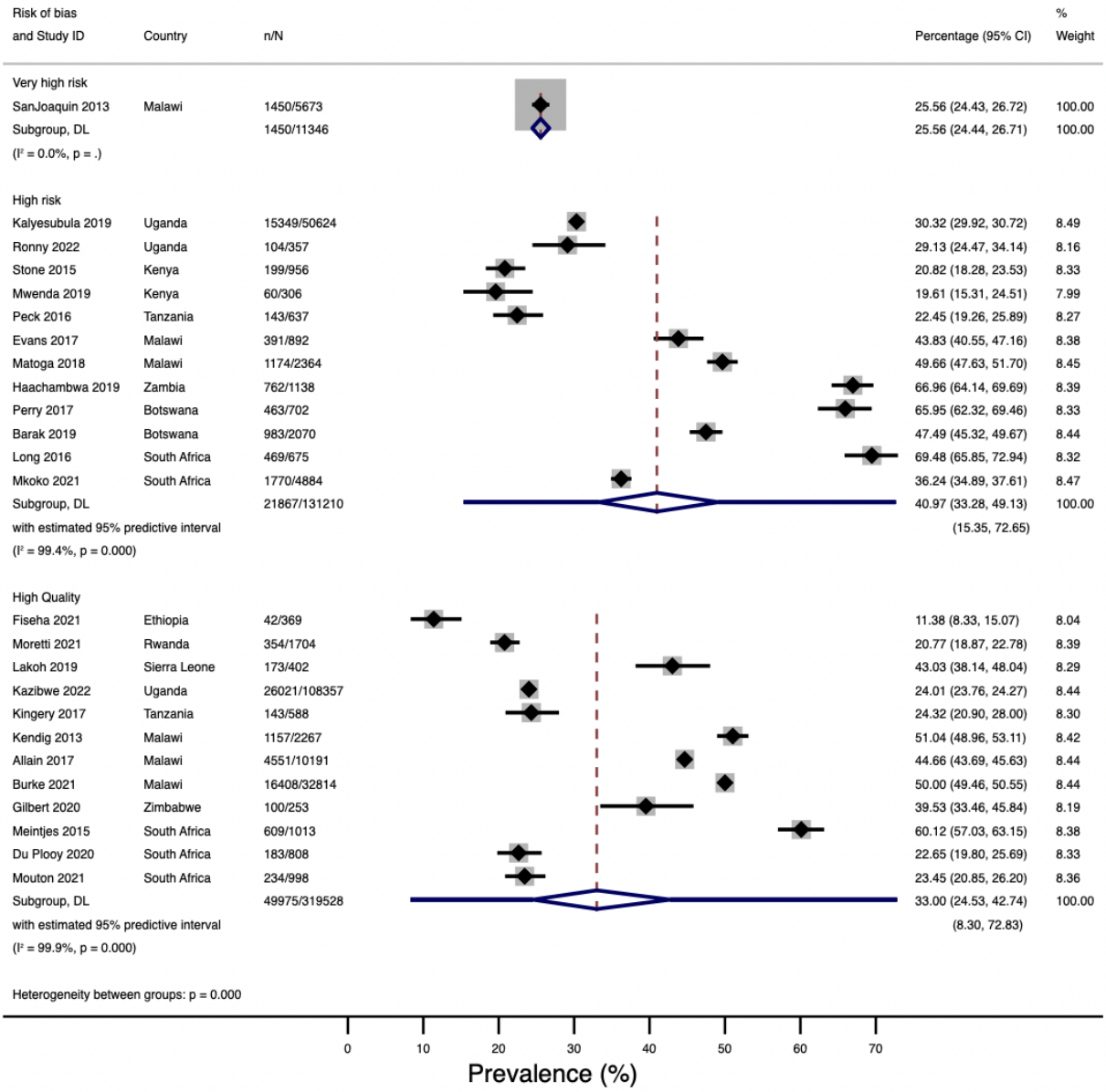
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

HIV by country-level economic status



NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

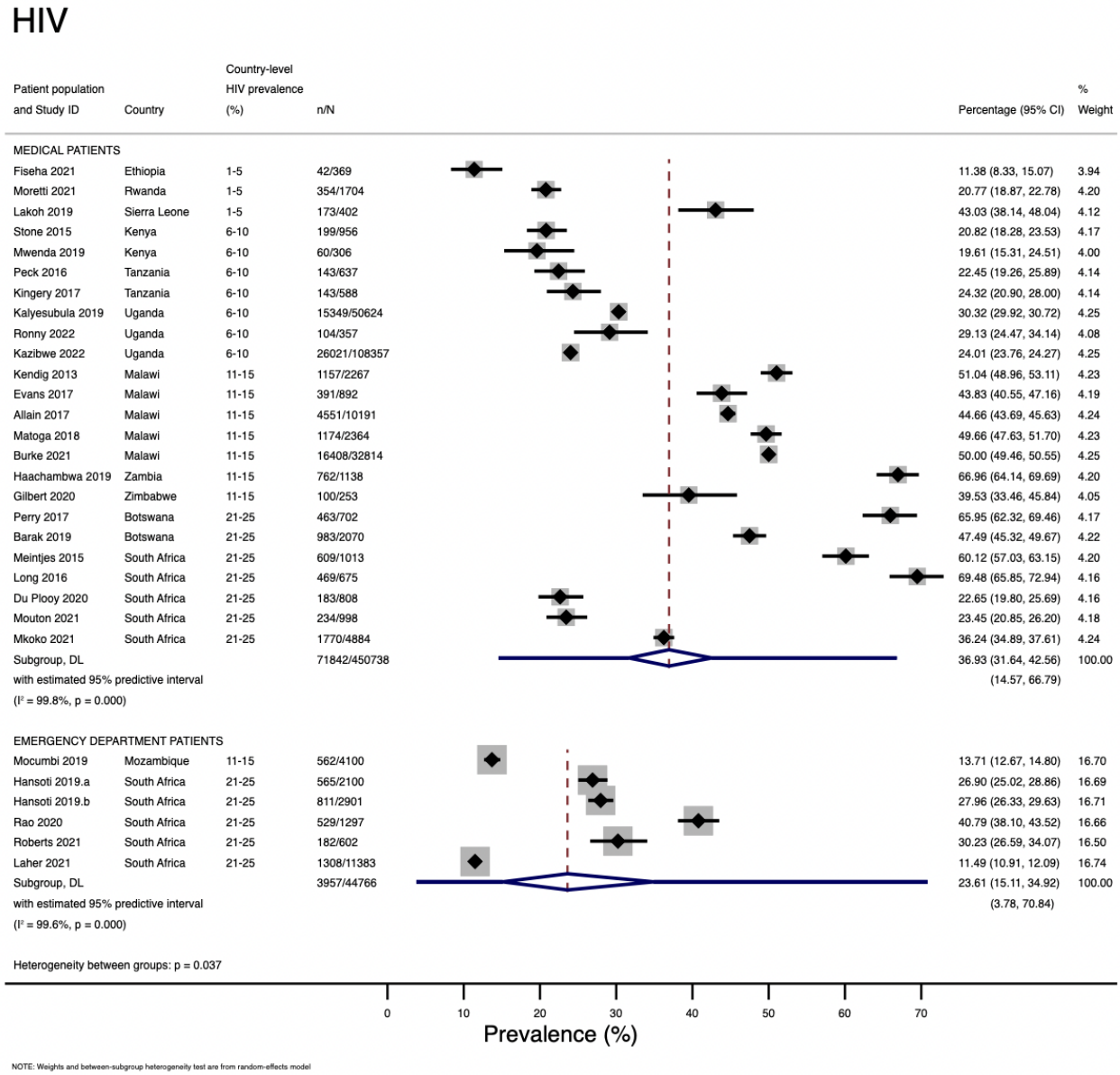
HIV by risk of bias



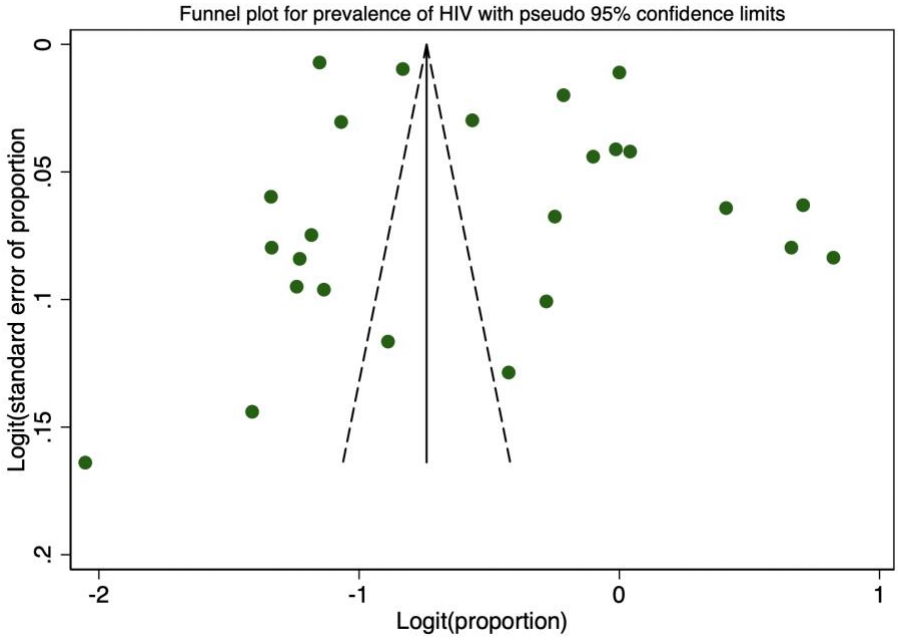
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

HIV sensitivity analysis

Very high risk studies removed from the meta-analysis in this sensitivity analysis:

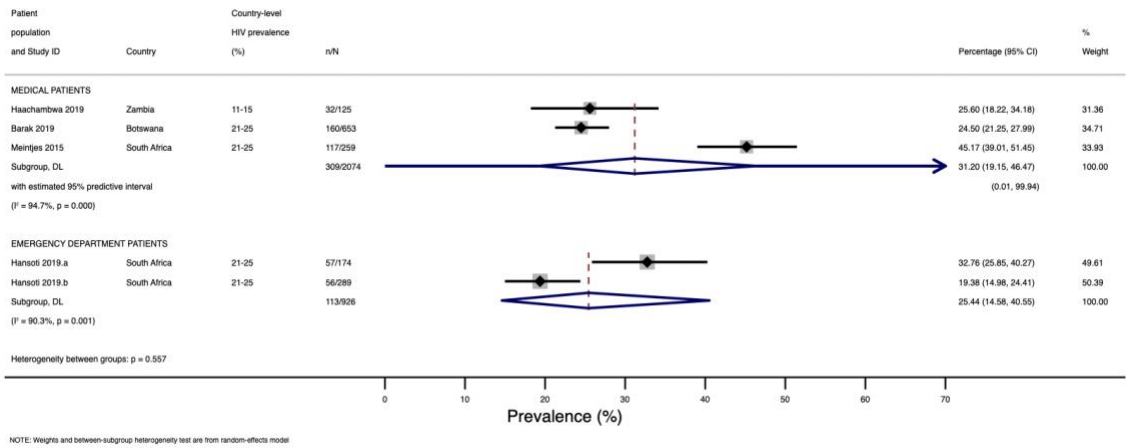


HIV funnel plot



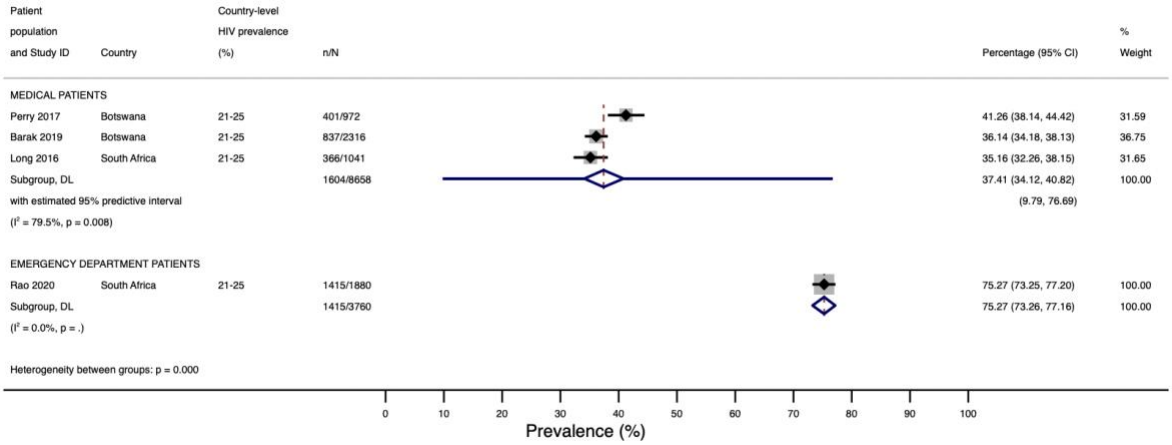
Egger's Test of H0: no small-study effects P = 0.18

HIV treatment failure



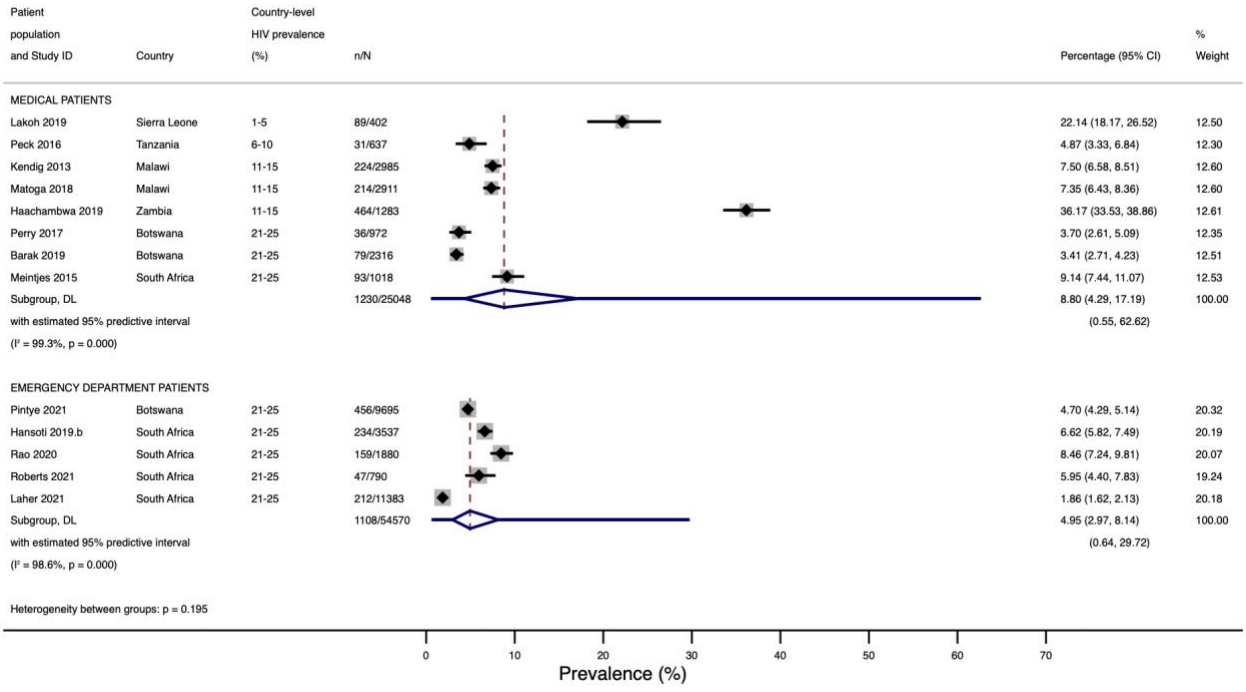
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Unknown HIV status (on admission)



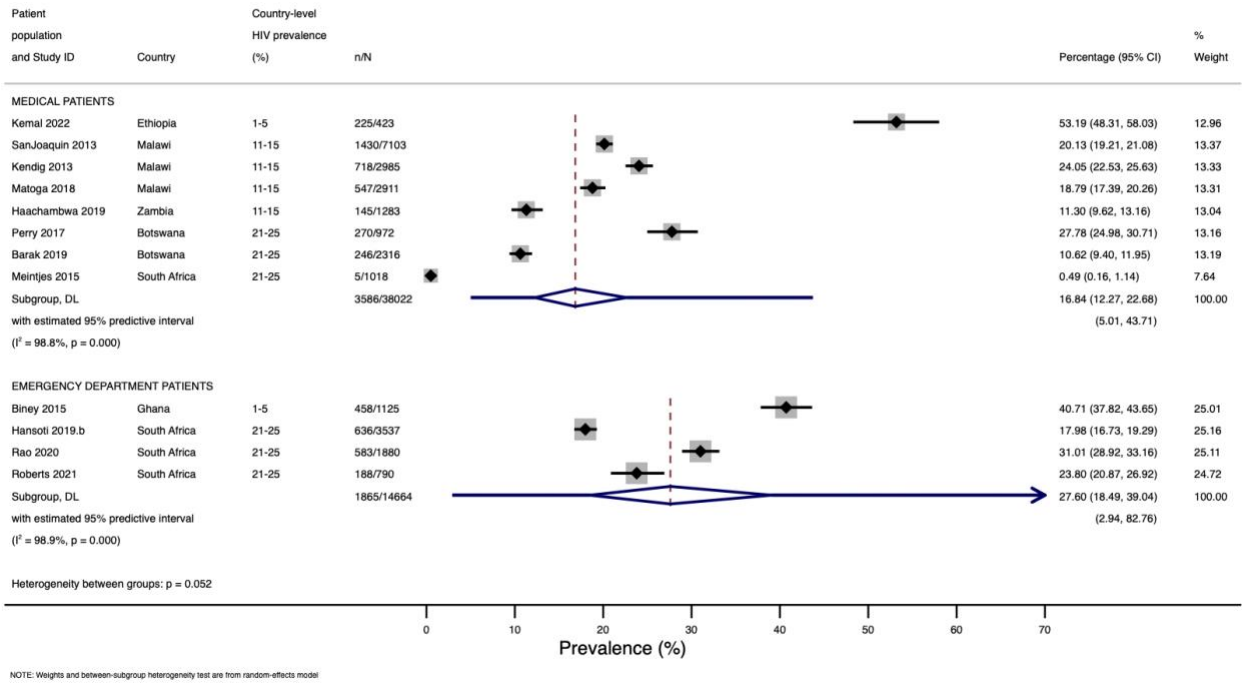
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

New HIV diagnoses



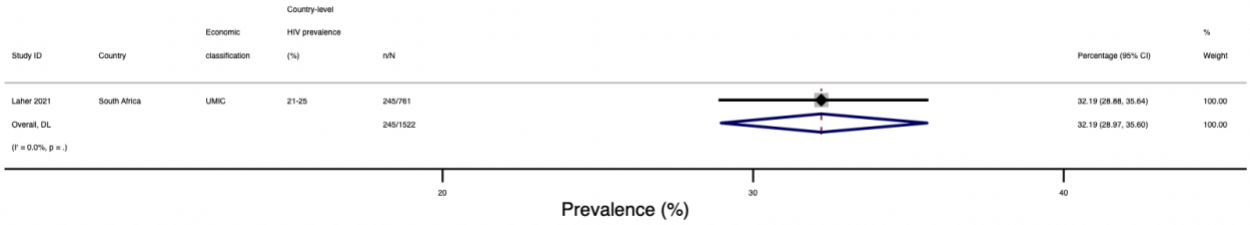
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Unknown HIV status (on discharge)

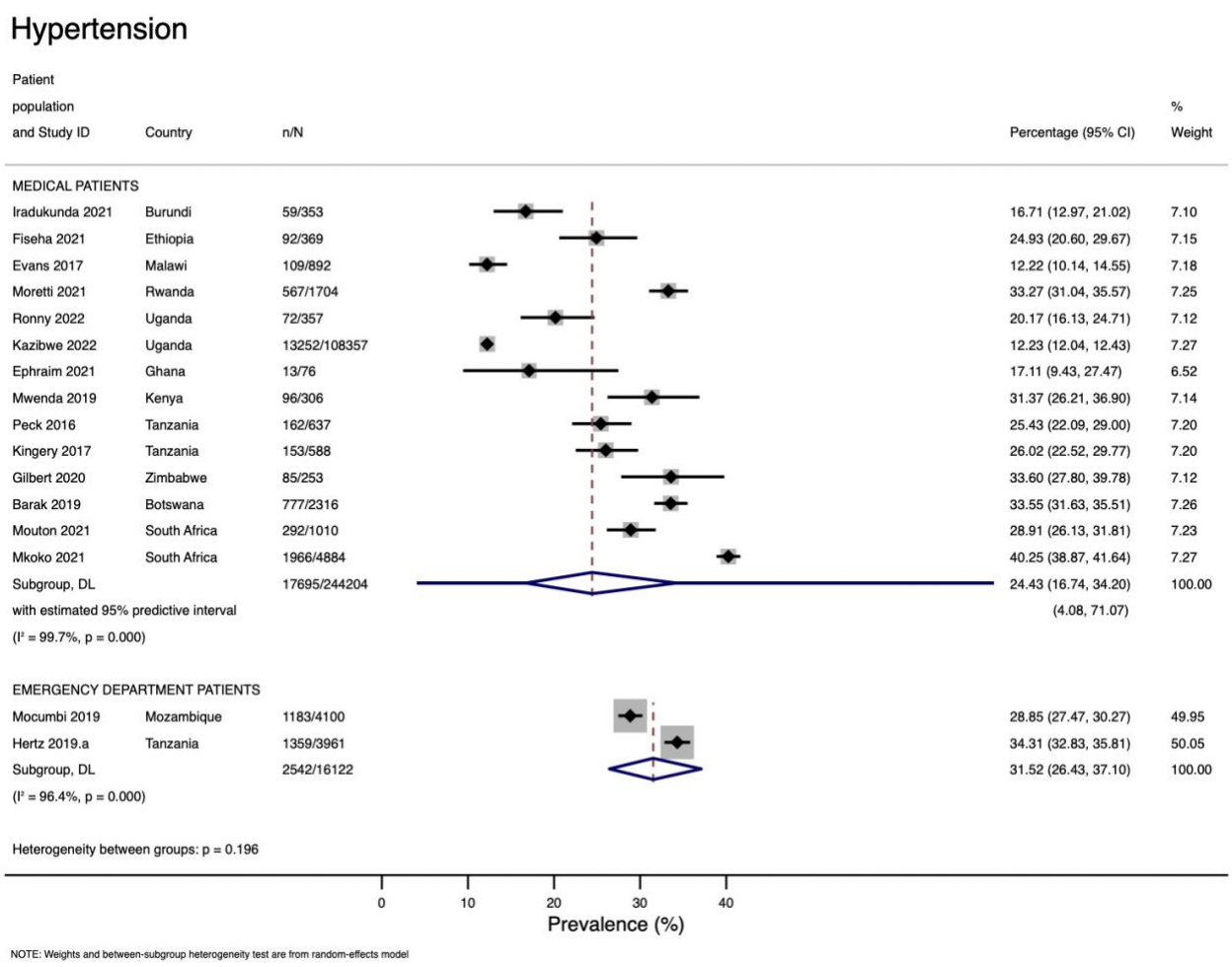


NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

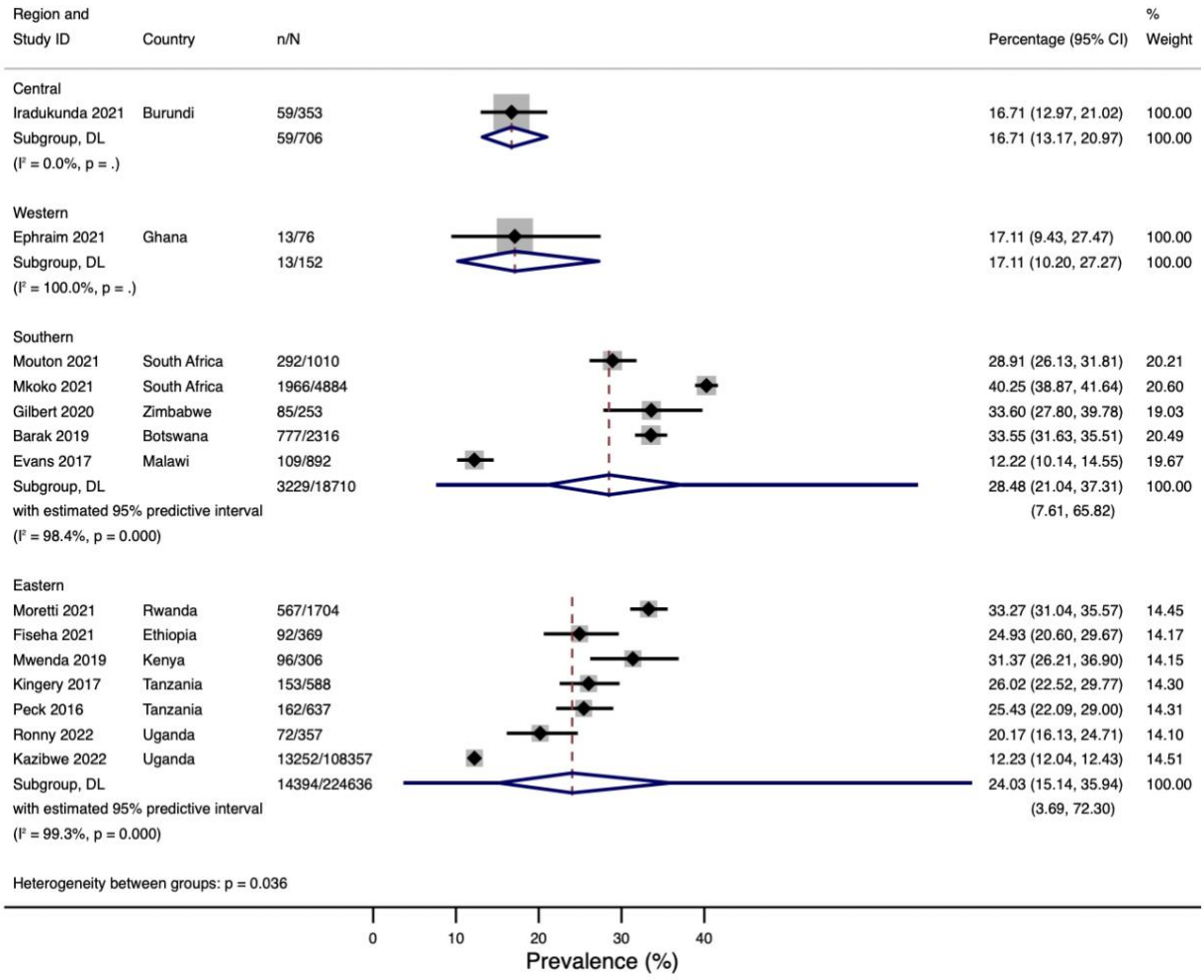
HIV treatment non-compliance among patients on ART



NOTE: Weights are from random-effects model

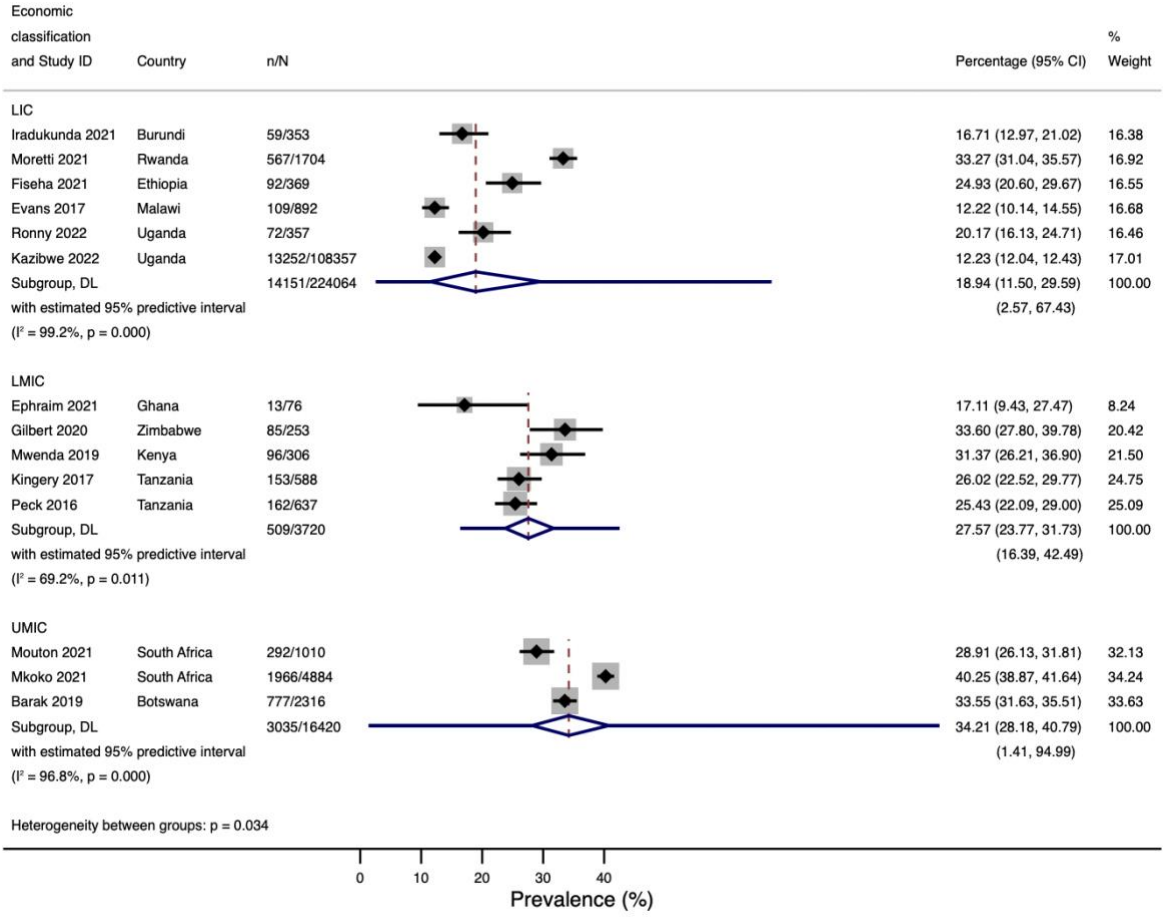

Hypertension
Patient population and Study ID
Country
n/N
Percentage (95% CI)
% Weight
MEDICAL PATIENTS
Iradukunda 2021 Burundi 59/353 16.71 (12.97, 21.02) 7.10
Fiseha 2021 Ethiopia 92/369 24.93 (20.60, 29.67) 7.15
Evans 2017 Malawi 109/892 12.22 (10.14, 14.55) 7.18
Moretti 2021 Rwanda 567/1704 33.27 (31.04, 35.57) 7.25
Ronny 2022 Uganda 72/357 20.17 (16.13, 24.71) 7.12
Kazibwe 2022 Uganda 13252/108357 12.23 (12.04, 12.43) 7.27
Ephraim 2021 Ghana 13/76 17.11 (9.43, 27.47) 6.52
Mwenda 2019 Kenya 96/306 31.37 (26.21, 36.90) 7.14
Peck 2016 Tanzania 162/637 25.43 (22.09, 29.00) 7.20
Kingery 2017 Tanzania 153/588 26.02 (22.52, 29.77) 7.20
Gilbert 2020 Zimbabwe 85/253 33.60 (27.80, 39.78) 7.12
Barak 2019 Botswana 777/2316 33.55 (31.63, 35.51) 7.26
Mouton 2021 South Africa 292/1010 28.91 (26.13, 31.81) 7.23
Mkoko 2021 South Africa 1966/4884 40.25 (38.87, 41.64) 7.27
Subgroup, DL 17695/244204 24.43 (16.74, 34.20) 100.00
with estimated 95% predictive interval (4.08, 71.07)
(I² = 99.7%, p = 0.000)
EMERGENCY DEPARTMENT PATIENTS
Mocumbi 2019 Mozambique 1183/4100 28.85 (27.47, 30.27) 49.95
Hertz 2019.a Tanzania 1359/3961 34.31 (32.83, 35.81) 50.05
Subgroup, DL 2542/16122 31.52 (26.43, 37.10) 100.00
(I² = 96.4%, p = 0.000)
Heterogeneity between groups: p = 0.196
0
10
20
30
40
Prevalence (%)
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Hypertension by region



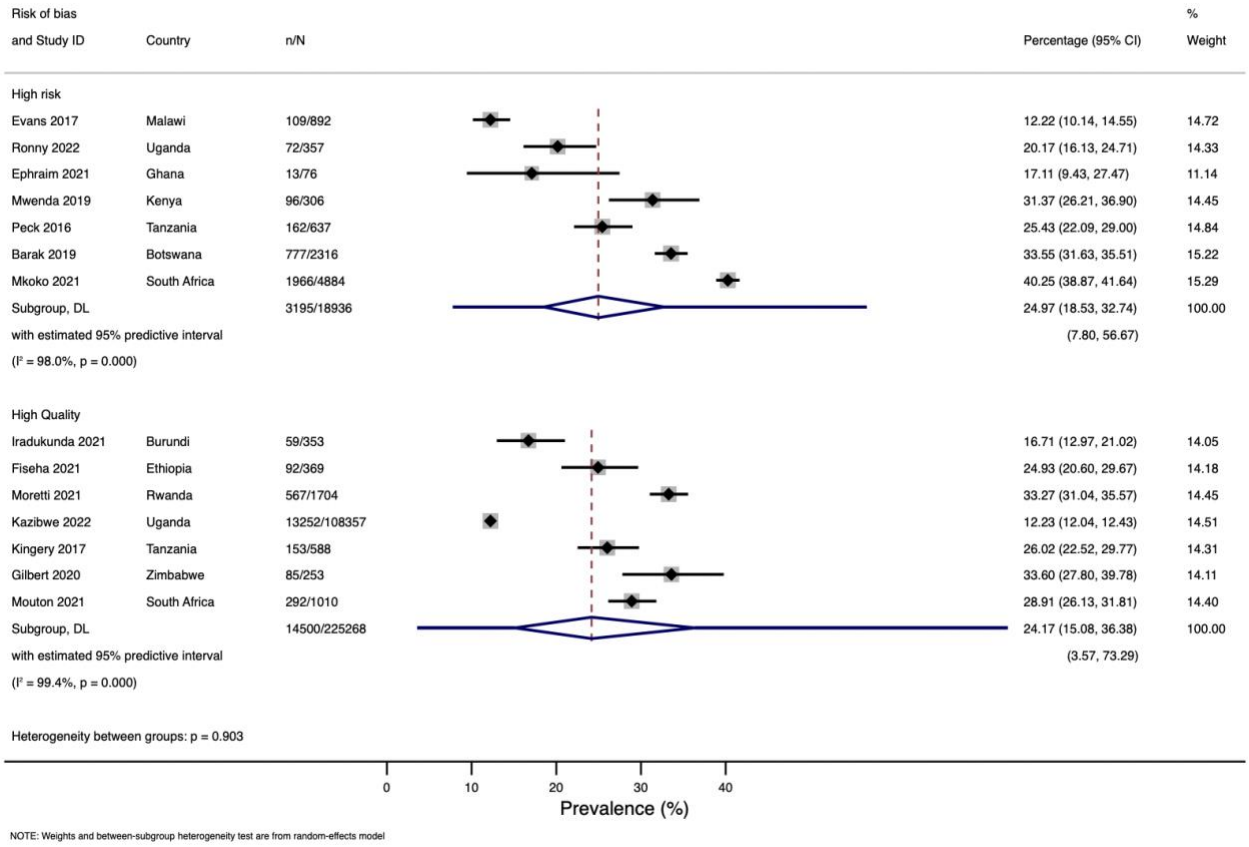
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Hypertension by country-level economic status



NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

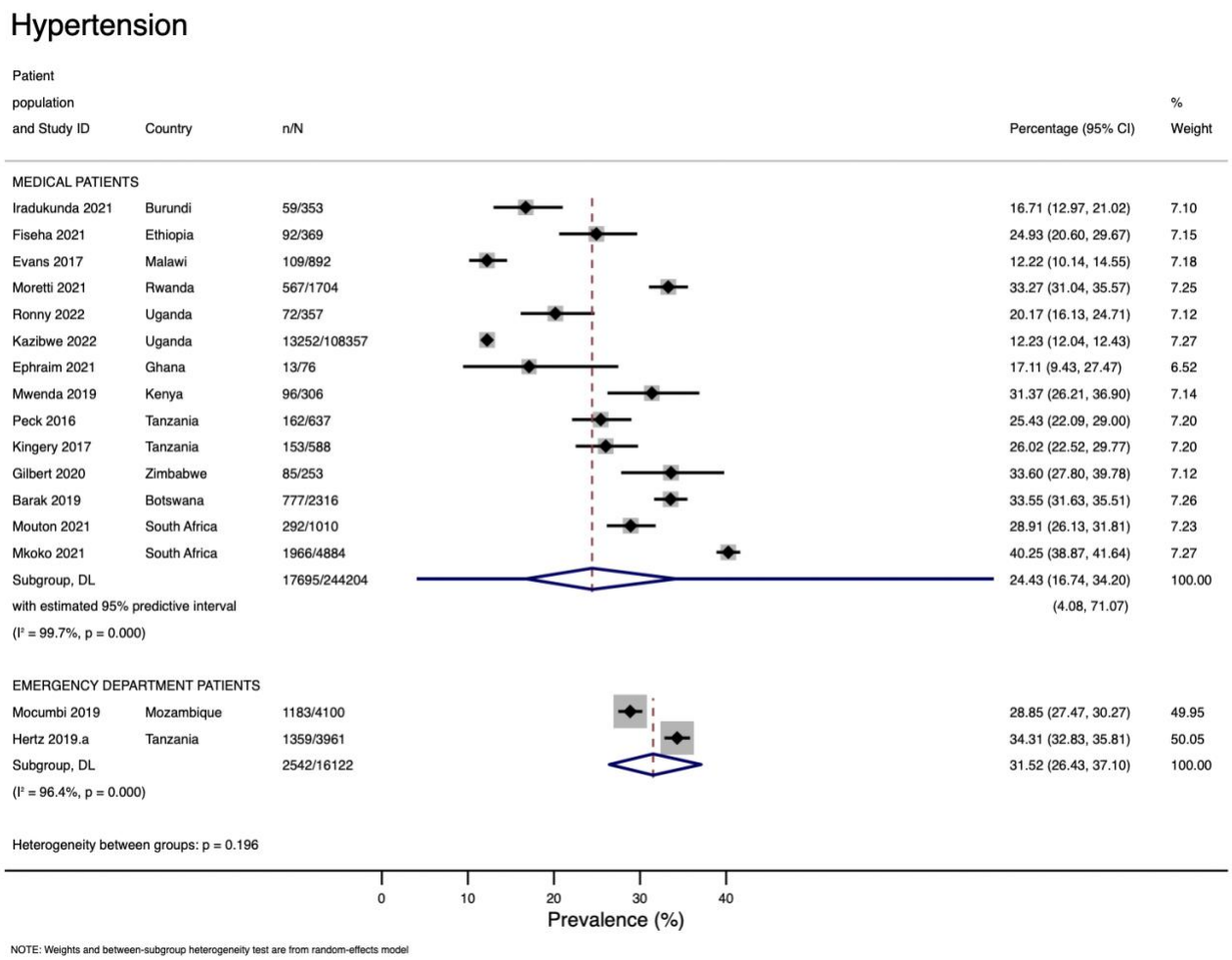
Hypertension by risk of bias



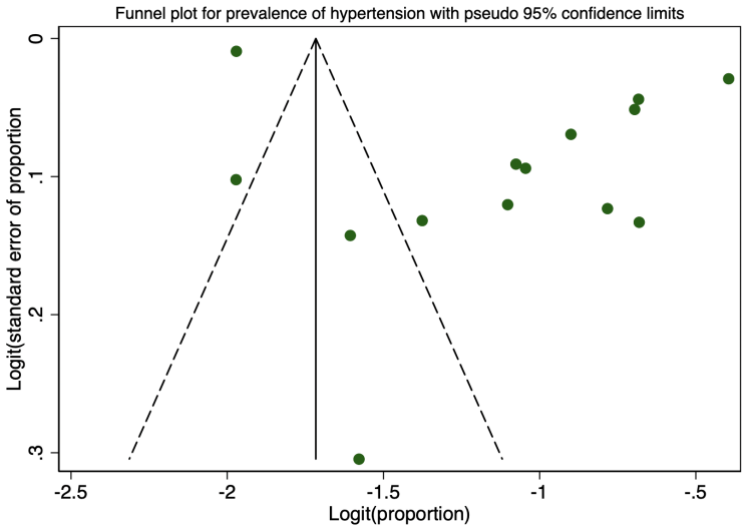
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Hypertension sensitivity analysis

Sensitivity analysis excluding studies with very high risk of bias.

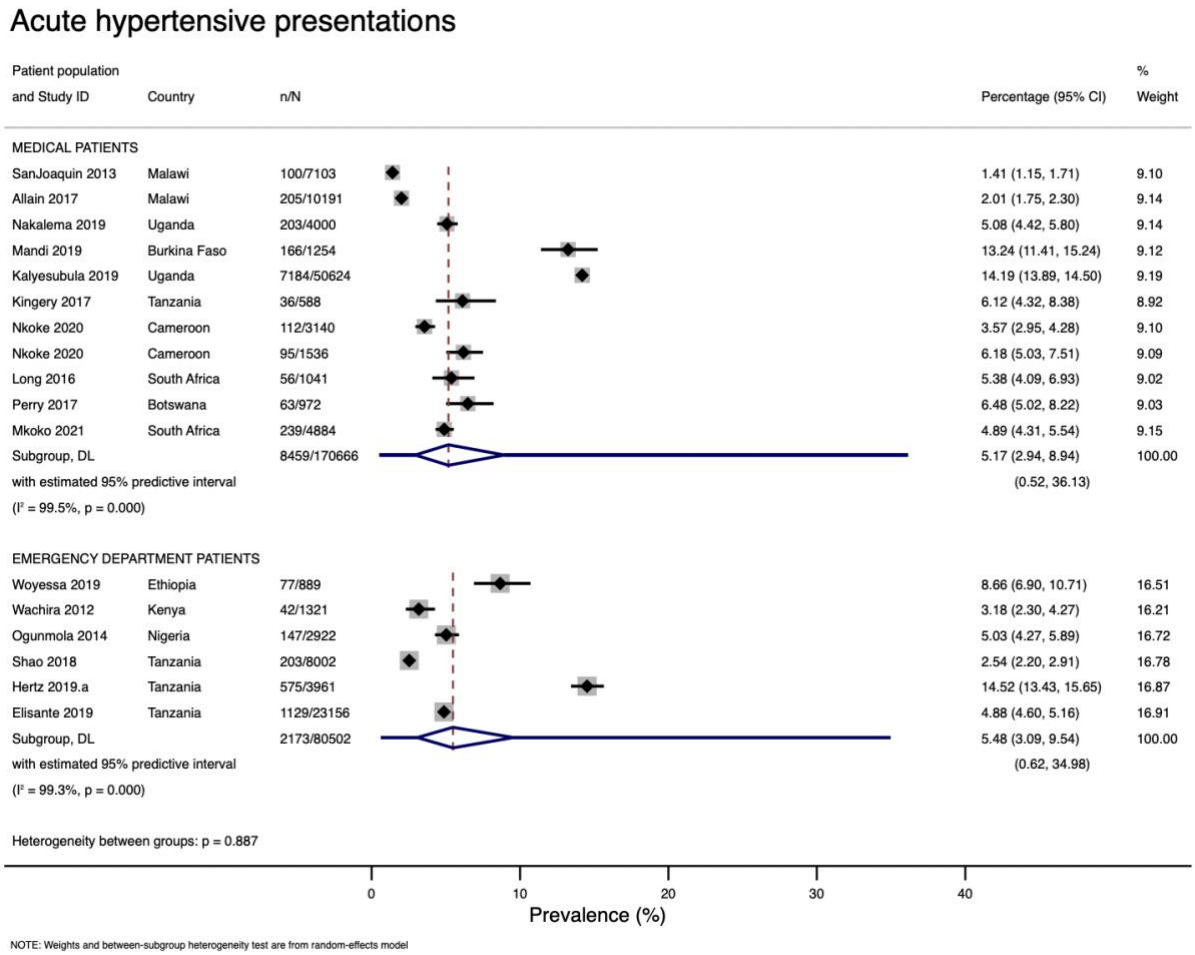


Hypertension funnel plot

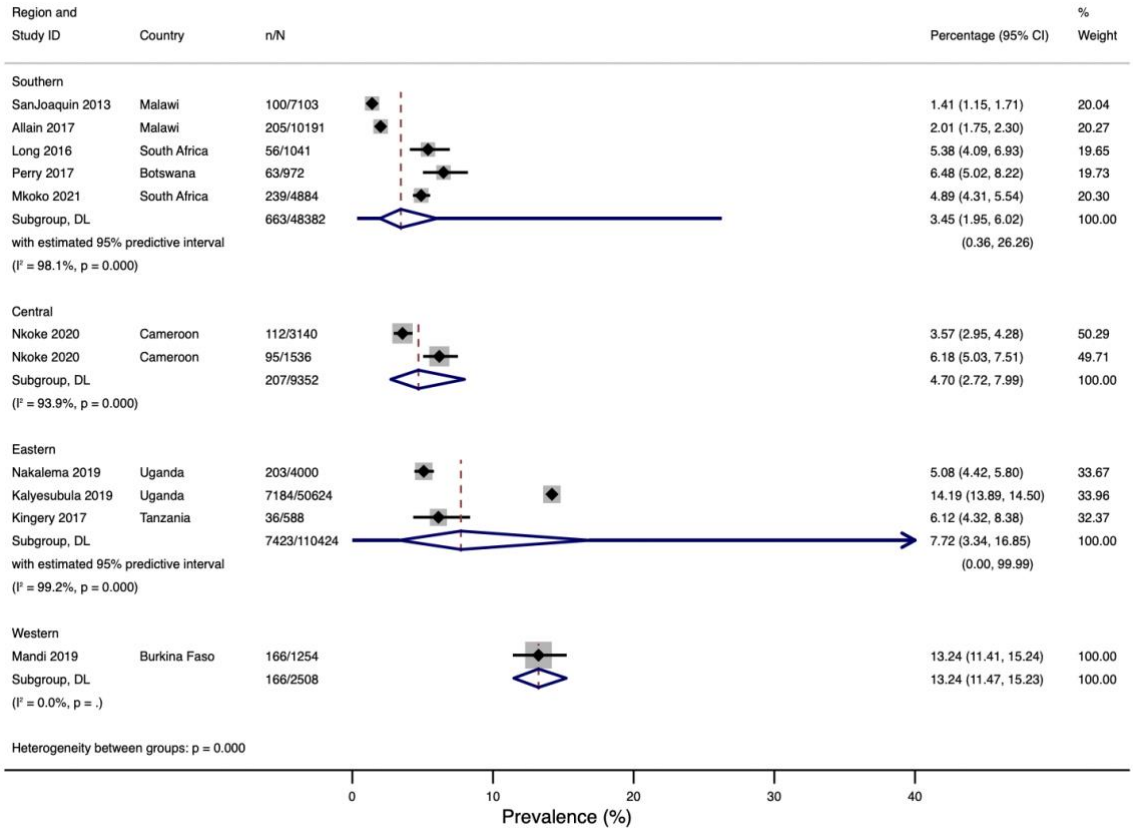


Egger's Test of H0: no small-study effects P = 0.04

Hypertensive presentations

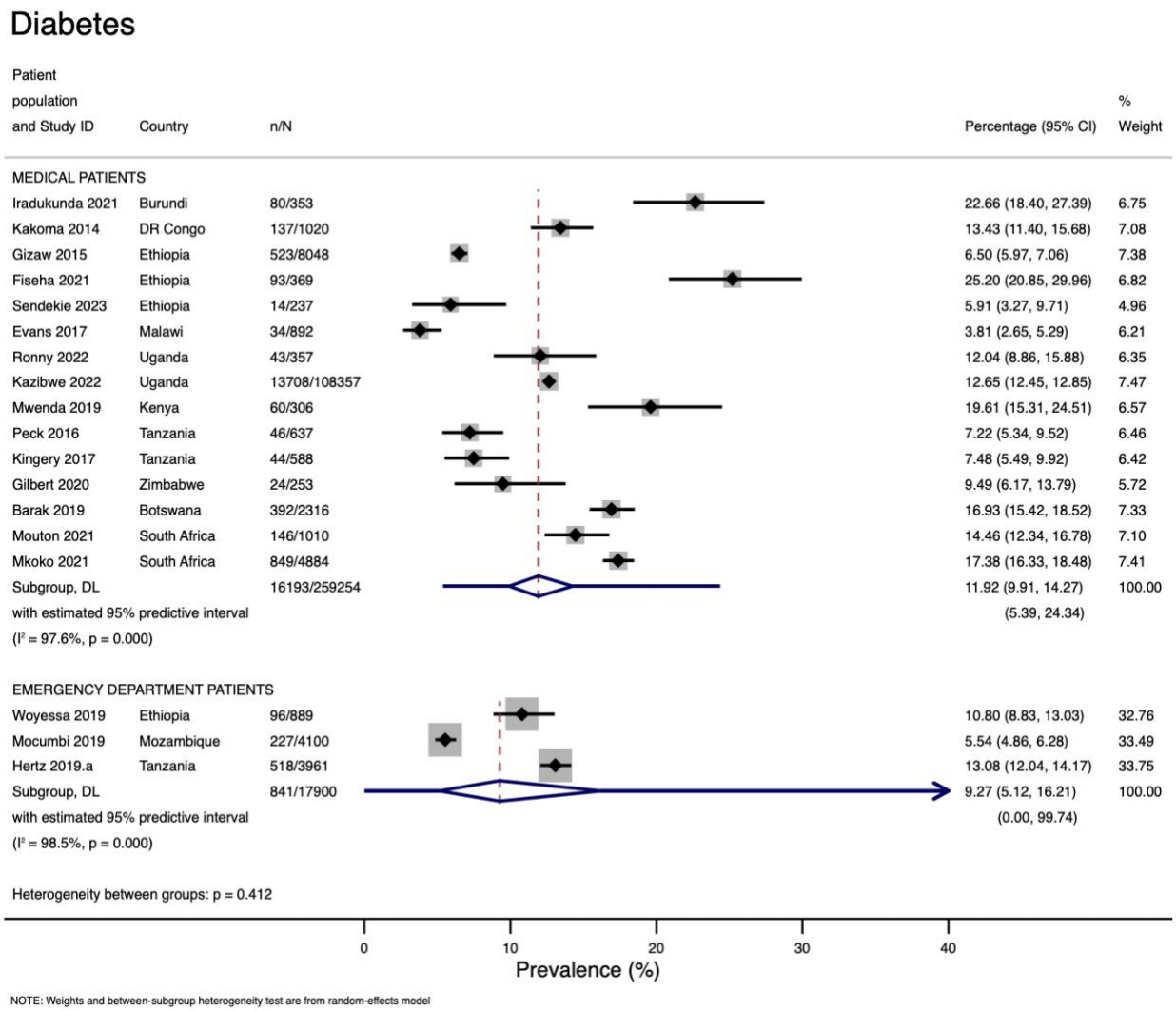


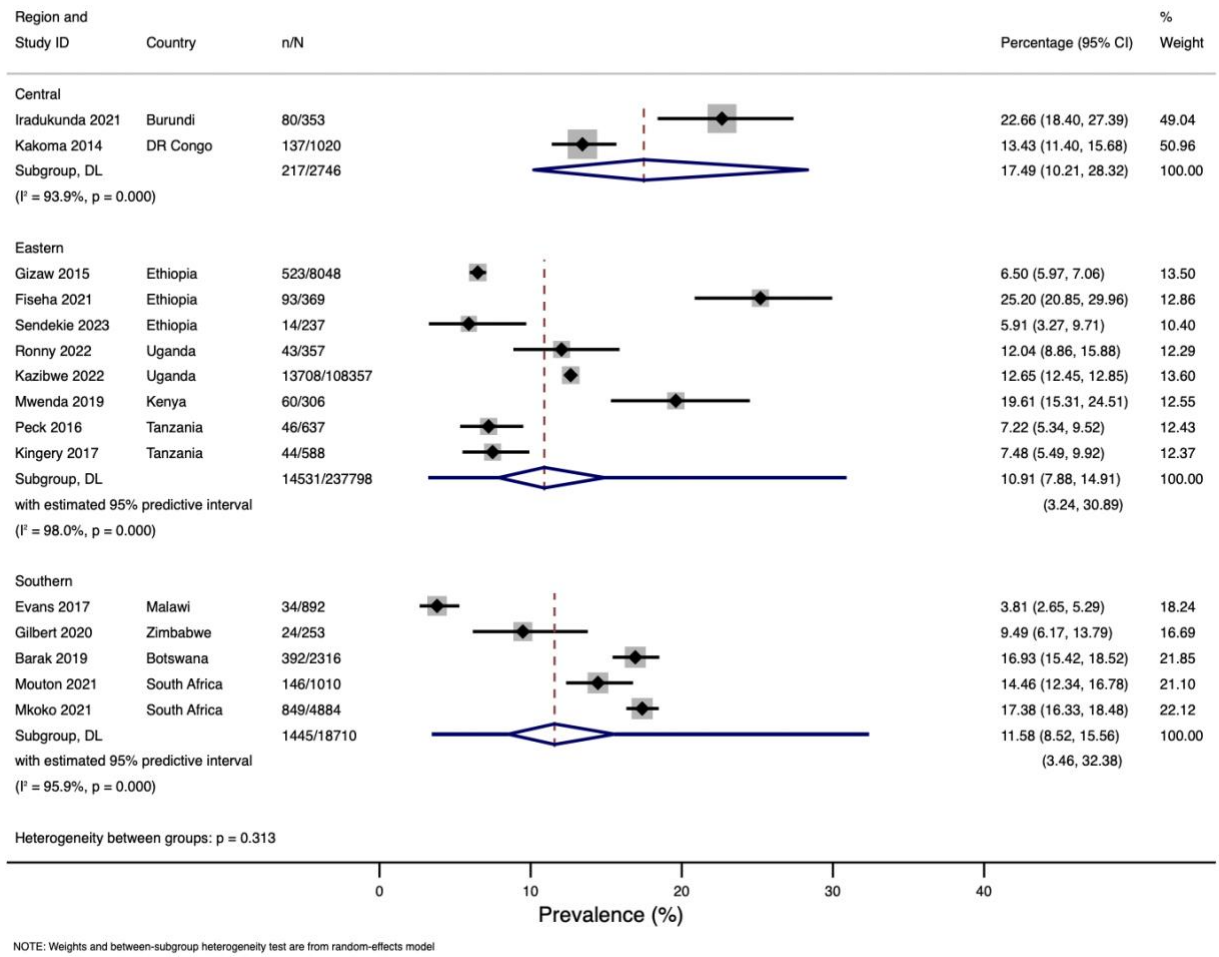
Acute hypertensive presentations by region



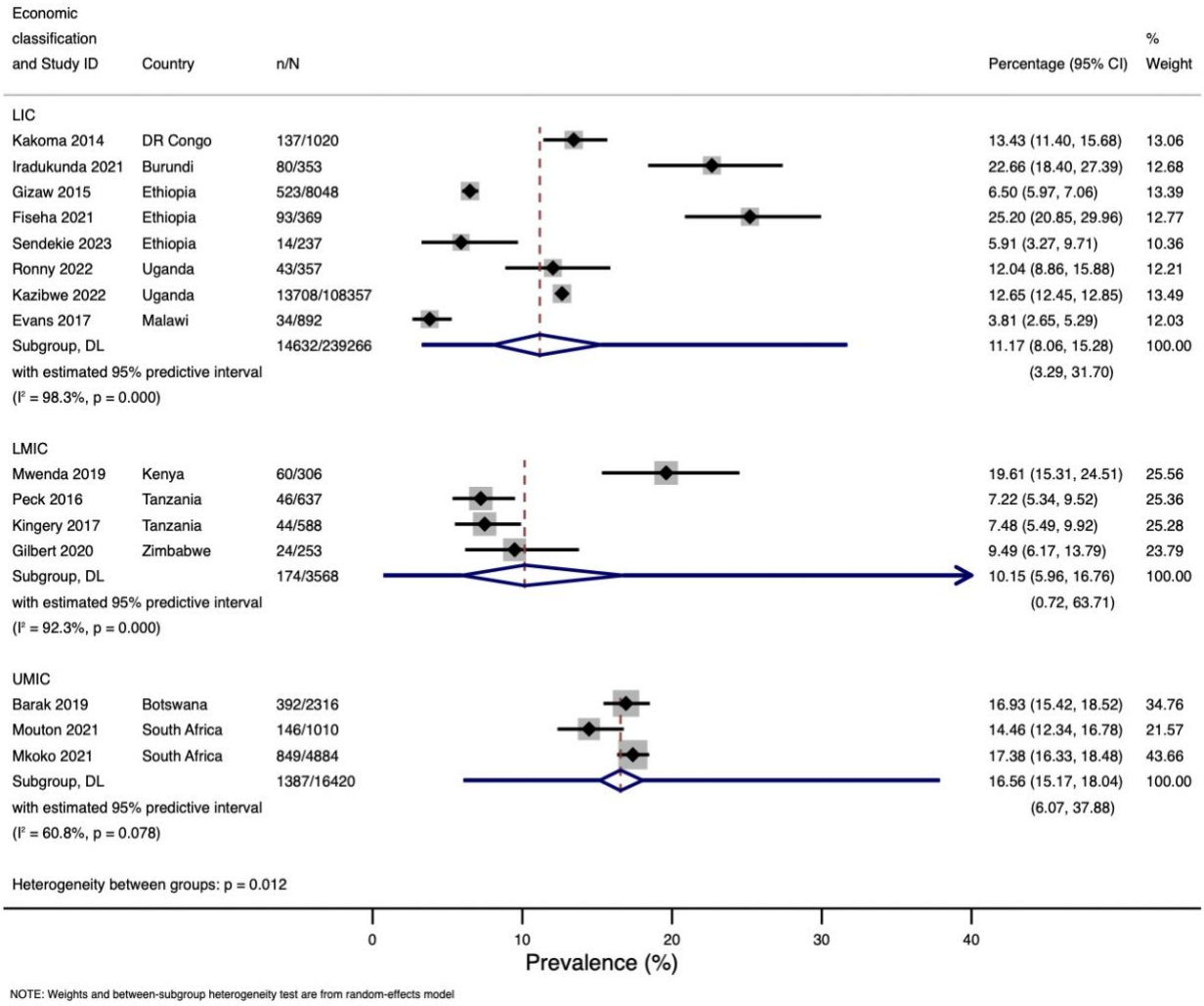
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Diabetes


Diabetes
Patient population and Study ID
Country
n/N
Percentage (95% CI)
% Weight
MEDICAL PATIENTS
Iradukunda 2021 Burundi 80/353 22.66 (18.40, 27.39) 6.75
Kakoma 2014 DR Congo 137/1020 13.43 (11.40, 15.68) 7.08
Gizaw 2015 Ethiopia 523/8048 6.50 (5.97, 7.06) 7.38
Fiseha 2021 Ethiopia 93/369 25.20 (20.85, 29.96) 6.82
Sendekie 2023 Ethiopia 14/237 5.91 (3.27, 9.71) 4.96
Evans 2017 Malawi 34/892 3.81 (2.65, 5.29) 6.21
Ronny 2022 Uganda 43/357 12.04 (8.86, 15.88) 6.35
Kazibwe 2022 Uganda 13708/108357 12.65 (12.45, 12.85) 7.47
Mwenda 2019 Kenya 60/306 19.61 (15.31, 24.51) 6.57
Peck 2016 Tanzania 46/637 7.22 (5.34, 9.52) 6.46
Kingery 2017 Tanzania 44/588 7.48 (5.49, 9.92) 6.42
Gilbert 2020 Zimbabwe 24/253 9.49 (6.17, 13.79) 5.72
Barak 2019 Botswana 392/2316 16.93 (15.42, 18.52) 7.33
Mouton 2021 South Africa 146/1010 14.46 (12.34, 16.78) 7.10
Mkoko 2021 South Africa 849/4884 17.38 (16.33, 18.48) 7.41
Subgroup, DL 16193/259254 11.92 (9.91, 14.27) 100.00
with estimated 95% predictive interval (5.39, 24.34)
(I^2 = 97.6%, p = 0.000)
EMERGENCY DEPARTMENT PATIENTS
Woyessa 2019 Ethiopia 96/889 10.80 (8.83, 13.03) 32.76
Mocumbi 2019 Mozambique 227/4100 5.54 (4.86, 6.28) 33.49
Hertz 2019.a Tanzania 518/3961 13.08 (12.04, 14.17) 33.75
Subgroup, DL 841/17900 9.27 (5.12, 16.21) 100.00
with estimated 95% predictive interval (0.00, 99.74)
(I^2 = 98.5%, p = 0.000)
Heterogeneity between groups: p = 0.412
0
10
20
30
40
Prevalence (%)
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

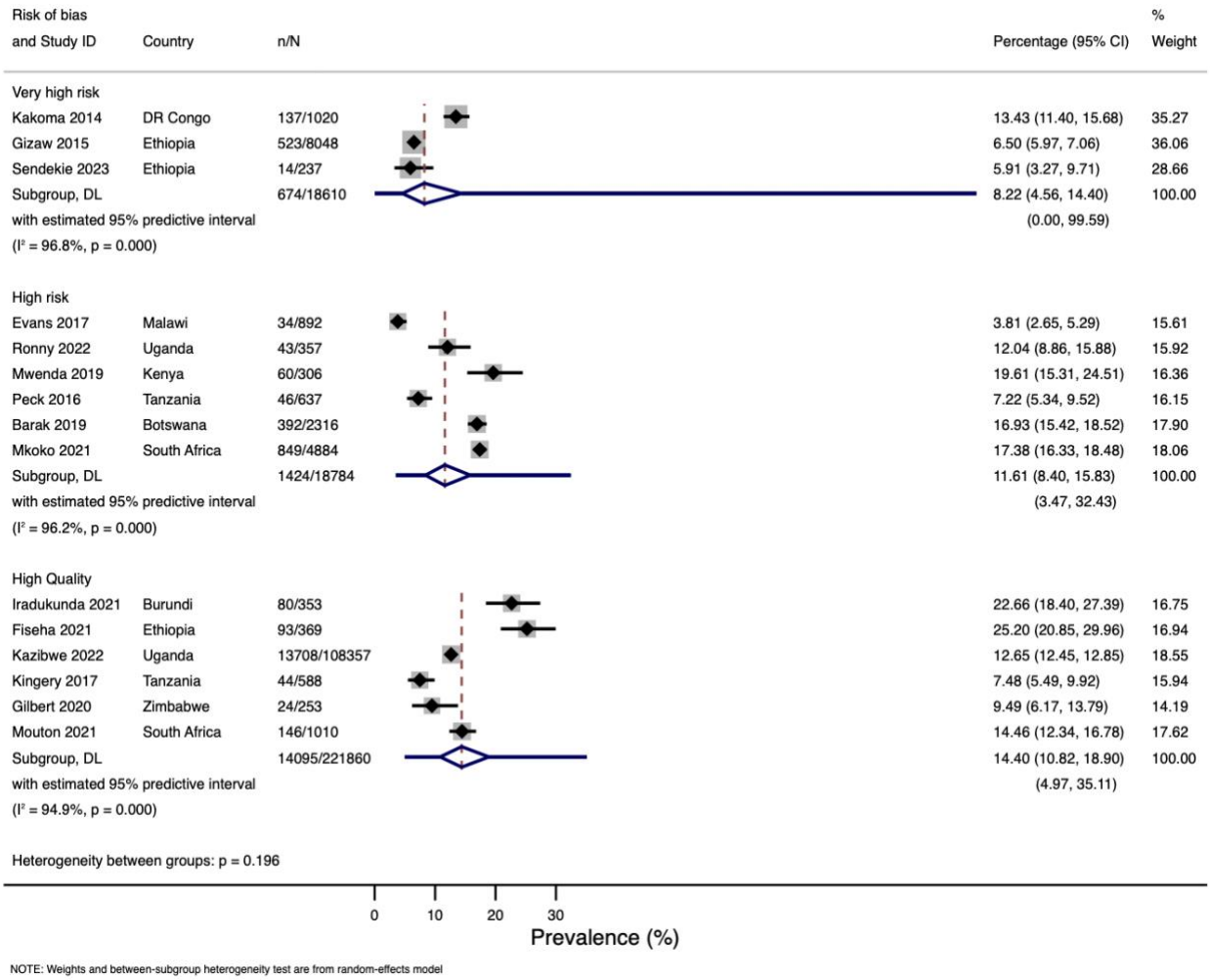

Diabetes by region
Region and Study ID
Country
n/N
Percentage (95% CI)
% Weight
Central
Iradukunda 2021 Burundi 80/353 22.66 (18.40, 27.39) 49.04
Kakoma 2014 DR Congo 137/1020 13.43 (11.40, 15.68) 50.96
Subgroup, DL 217/2746 17.49 (10.21, 28.32) 100.00
(I² = 93.9%, p = 0.000)
Eastern
Gizaw 2015 Ethiopia 523/8048 6.50 (5.97, 7.06) 13.50
Fiseha 2021 Ethiopia 93/369 25.20 (20.85, 29.96) 12.86
Sendekie 2023 Ethiopia 14/237 5.91 (3.27, 9.71) 10.40
Ronny 2022 Uganda 43/357 12.04 (8.86, 15.88) 12.29
Kazibwe 2022 Uganda 13708/108357 12.65 (12.45, 12.85) 13.60
Mwenda 2019 Kenya 60/306 19.61 (15.31, 24.51) 12.55
Peck 2016 Tanzania 46/637 7.22 (5.34, 9.52) 12.43
Kingery 2017 Tanzania 44/588 7.48 (5.49, 9.92) 12.37
Subgroup, DL 14531/237798 10.91 (7.88, 14.91) 100.00
with estimated 95% predictive interval (3.24, 30.89)
(I² = 98.0%, p = 0.000)
Southern
Evans 2017 Malawi 34/892 3.81 (2.65, 5.29) 18.24
Gilbert 2020 Zimbabwe 24/253 9.49 (6.17, 13.79) 16.69
Barak 2019 Botswana 392/2316 16.93 (15.42, 18.52) 21.85
Mouton 2021 South Africa 146/1010 14.46 (12.34, 16.78) 21.10
Mkoko 2021 South Africa 849/4884 17.38 (16.33, 18.48) 22.12
Subgroup, DL 1445/18710 11.58 (8.52, 15.56) 100.00
with estimated 95% predictive interval (3.46, 32.38)
(I² = 95.9%, p = 0.000)
Heterogeneity between groups: p = 0.313
0
10
20
30
40
Prevalence (%)
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Diabetes by country-level economic status



NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

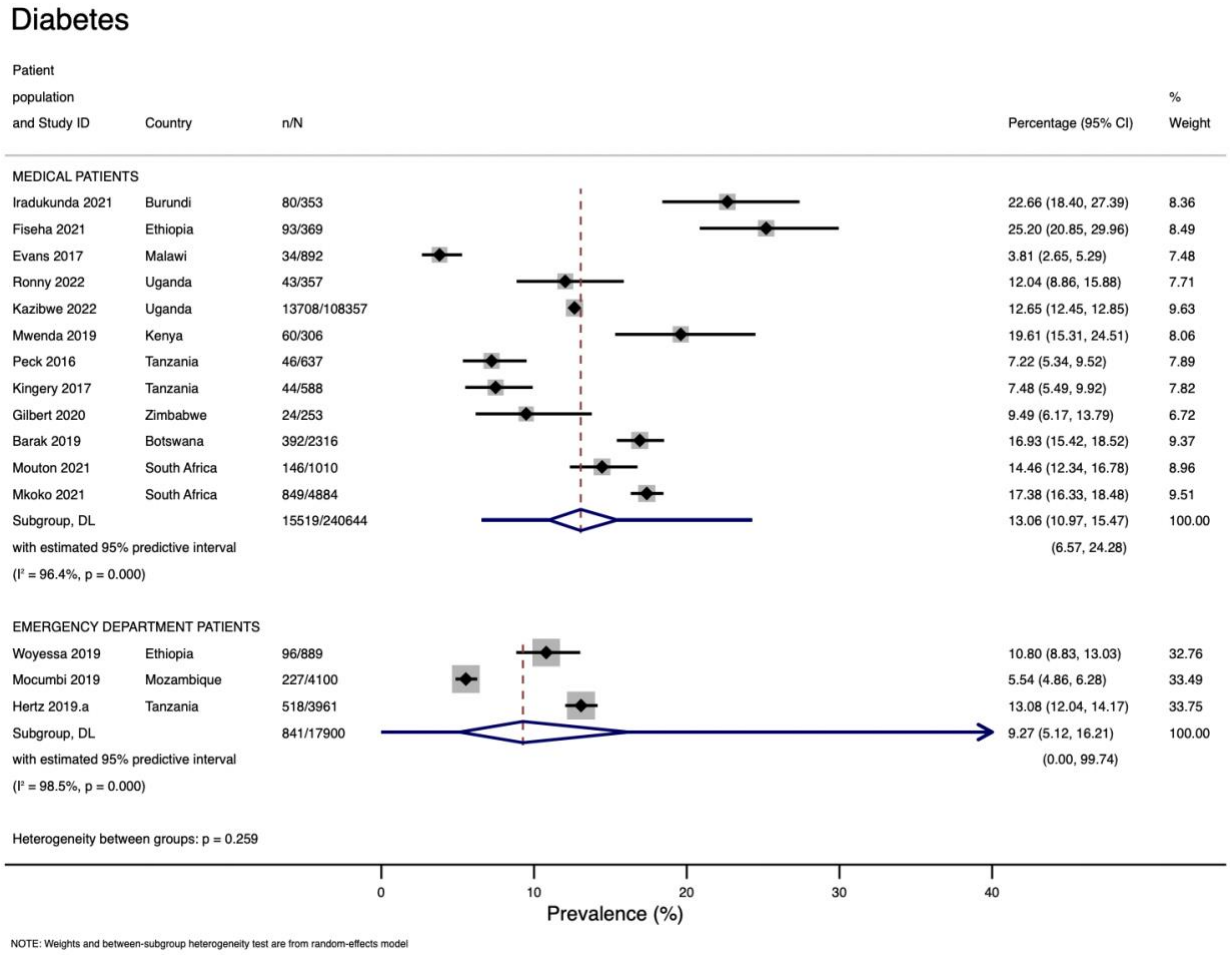
Diabetes by risk of bias



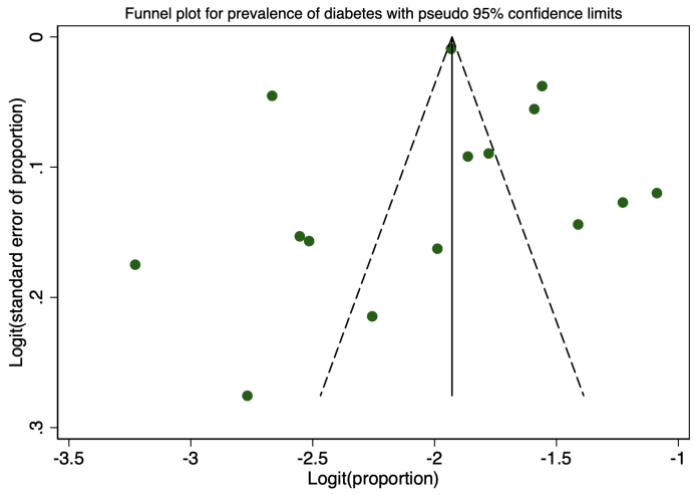
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Diabetes sensitivity analysis

Sensitivity analysis excluding studies with very high risk of bias.

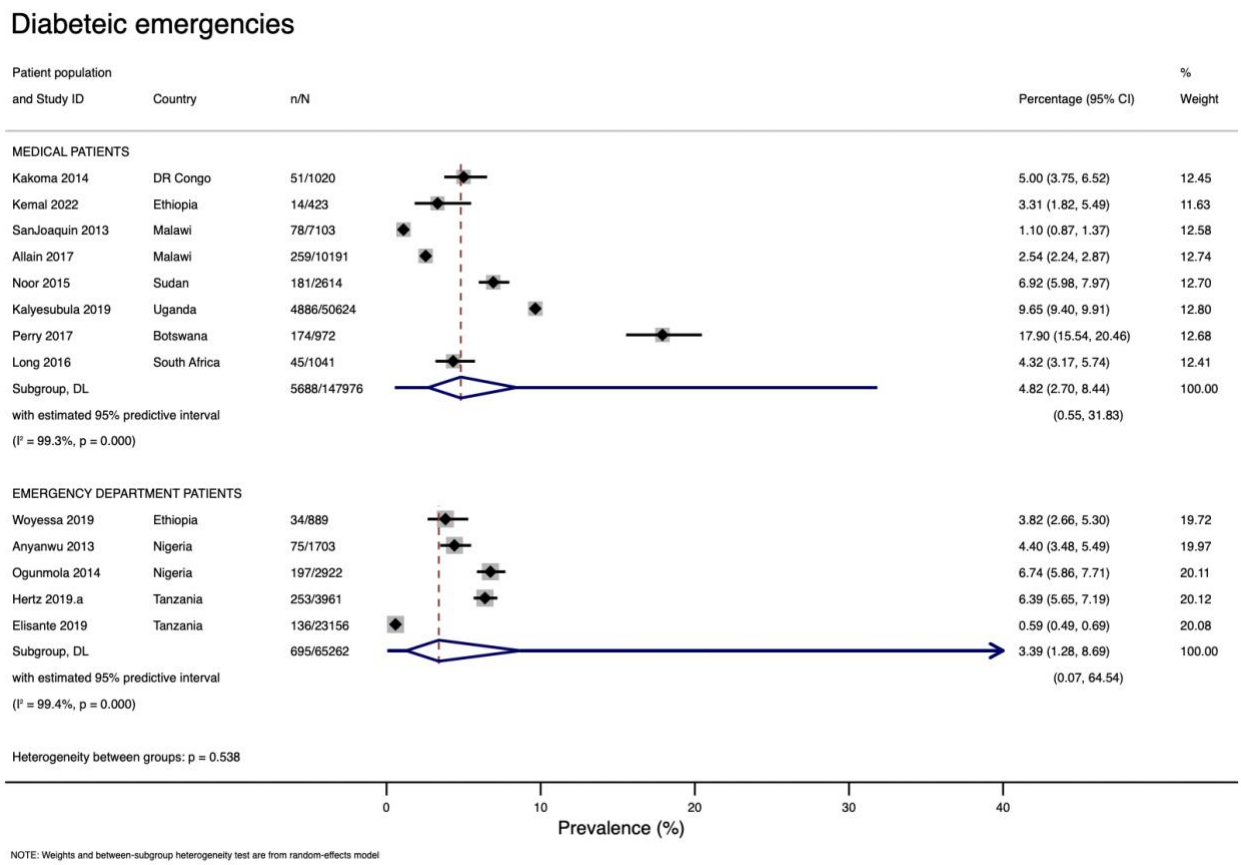


Diabetes funnel plot

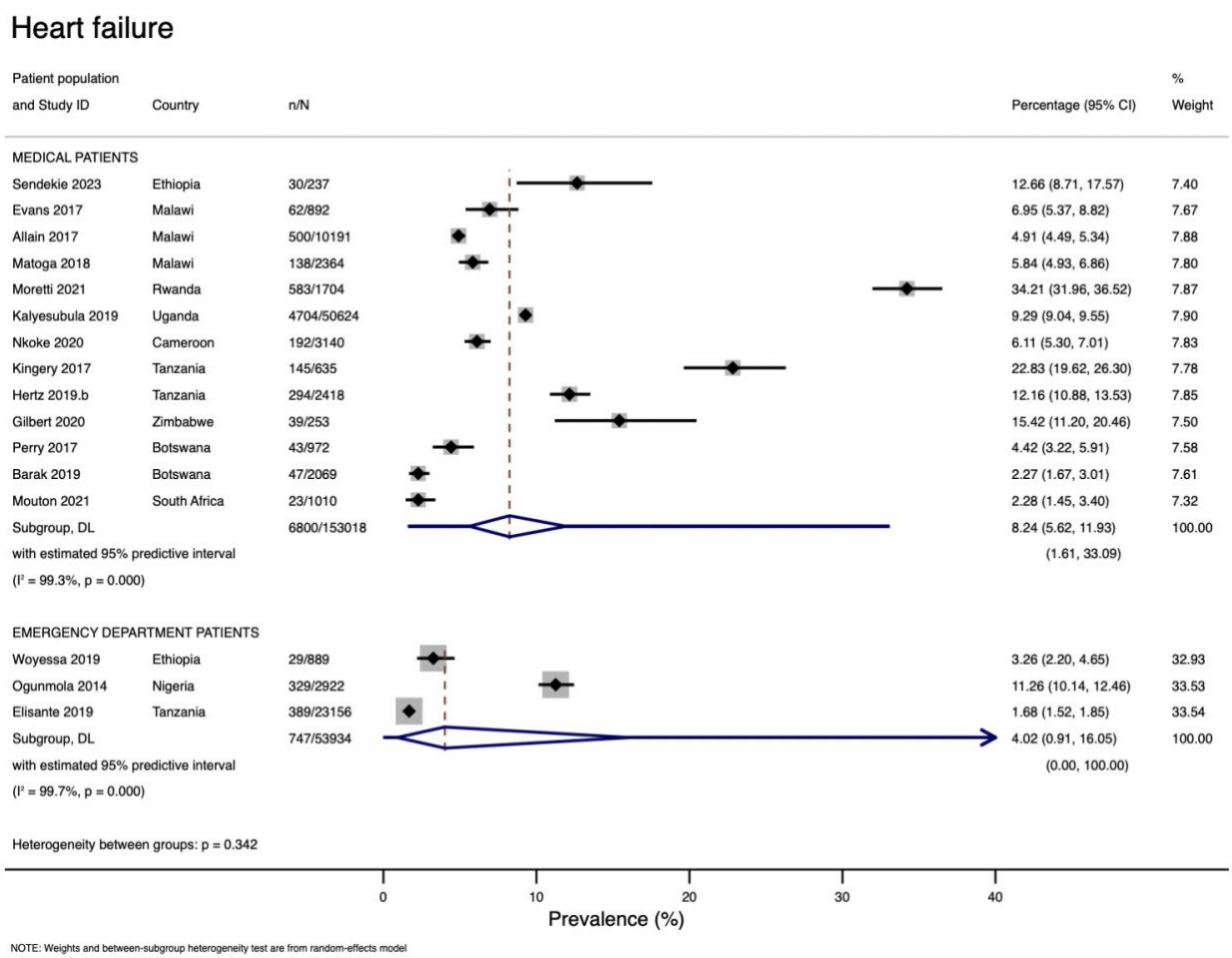


Egger's Test of H0: no small-study effects P = 0.91

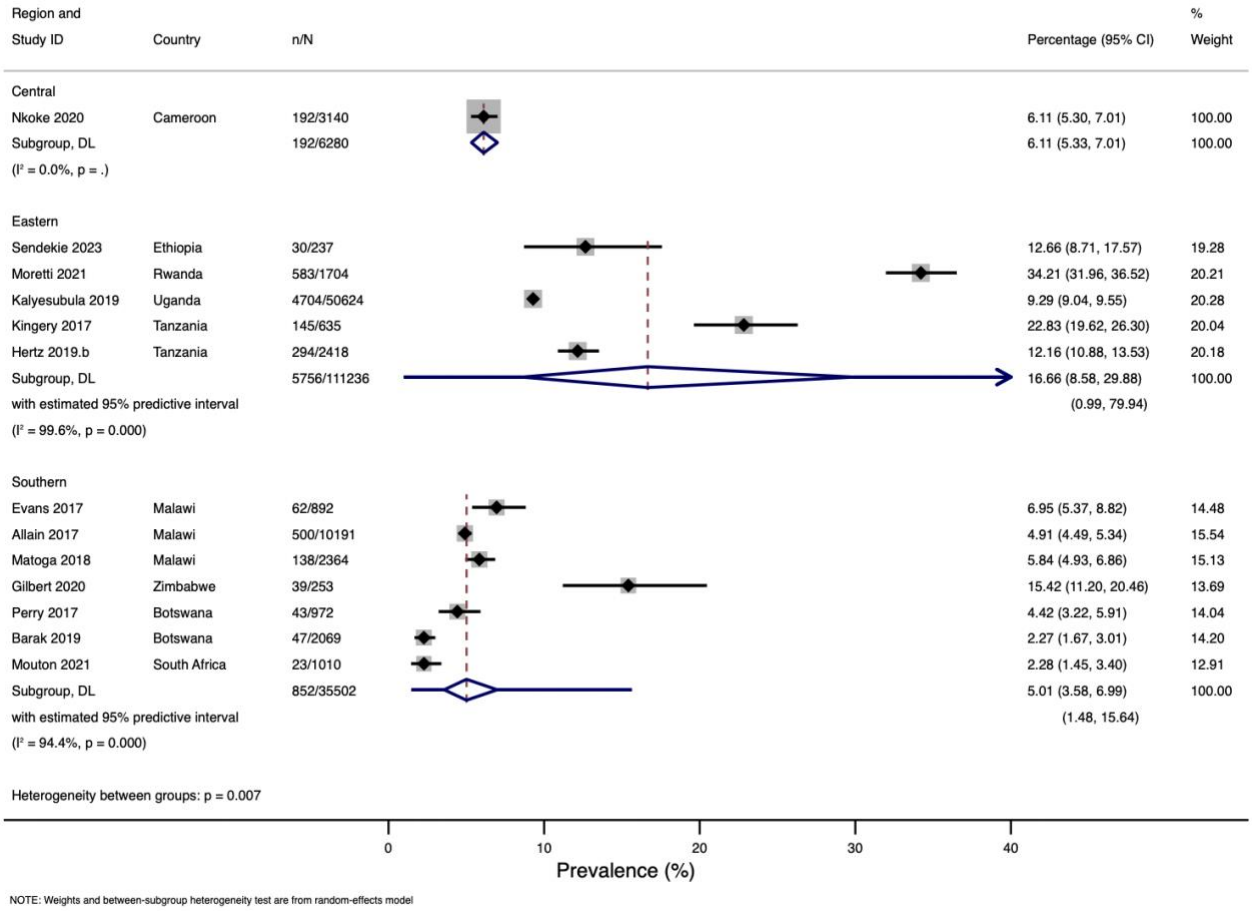
Diabetic emergencies



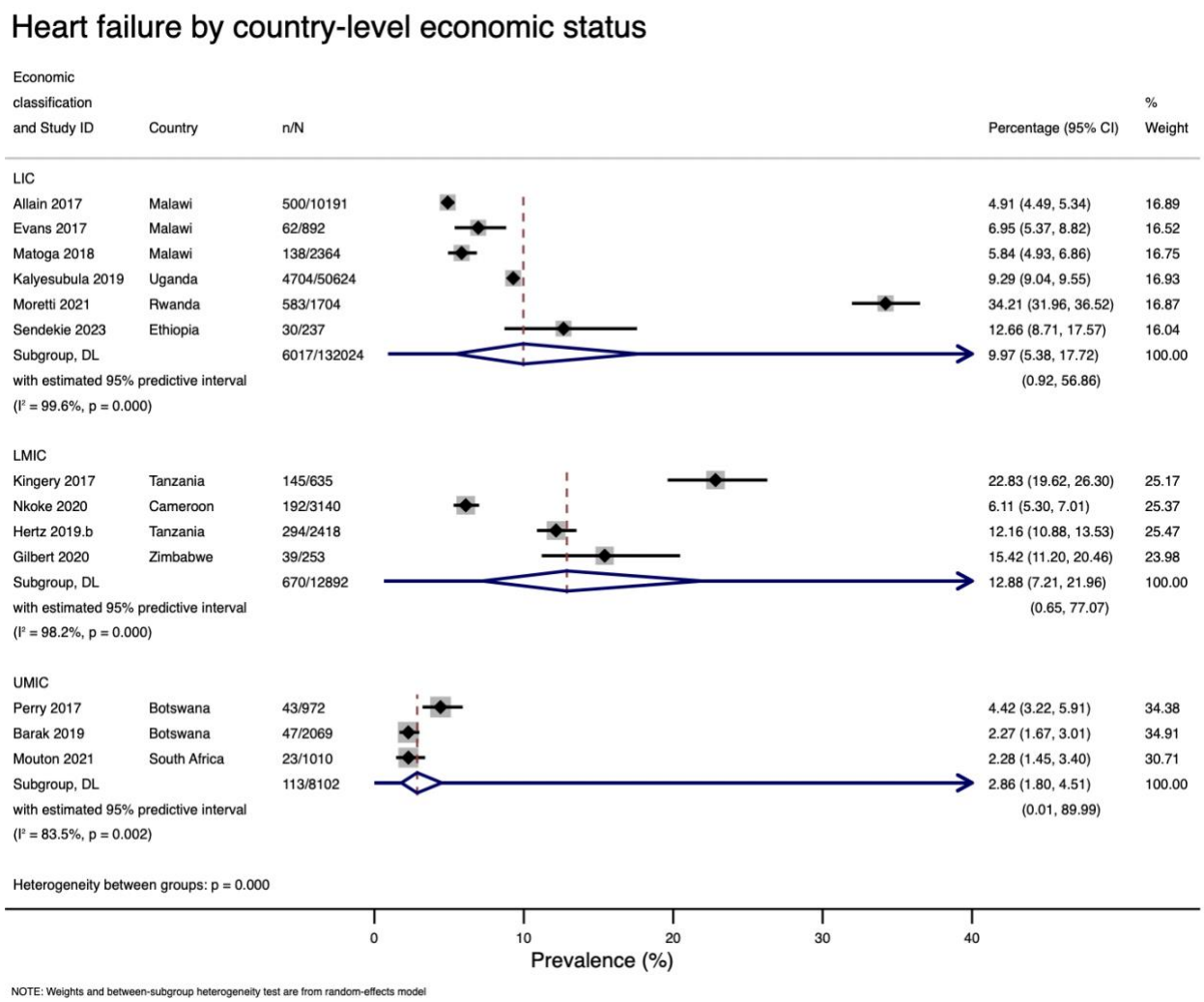
Heart failure



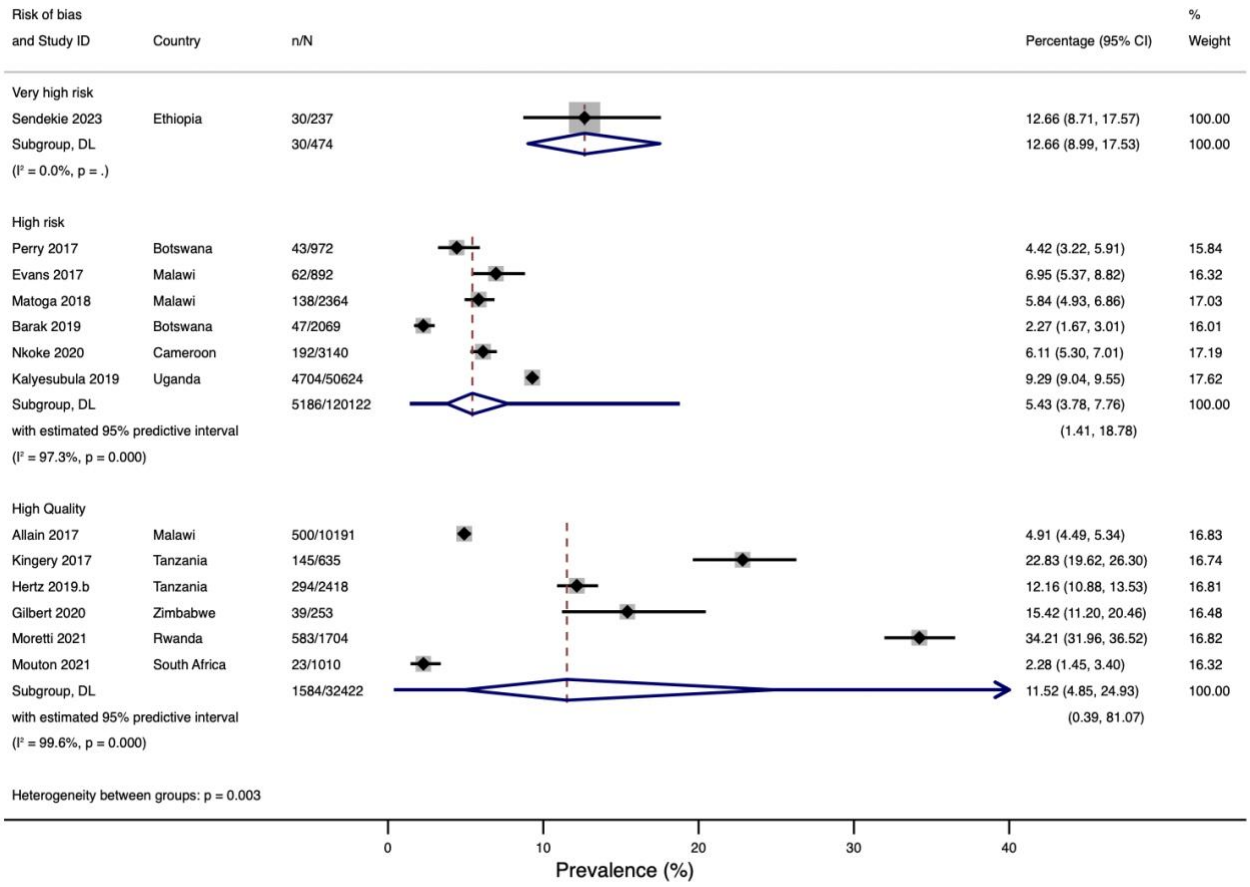
Heart failure by region



NOTE: Weights and between-subgroup heterogeneity test are from random-effects model


Heart failure by country-level economic status
Economic classification and Study ID
Country
n/N
Percentage (95% CI)
% Weight
LIC
Allain 2017 Malawi 500/10191 4.91 (4.49, 5.34) 16.89
Evans 2017 Malawi 62/892 6.95 (5.37, 8.82) 16.52
Matoga 2018 Malawi 138/2364 5.84 (4.93, 6.86) 16.75
Kalyesubula 2019 Uganda 4704/50624 9.29 (9.04, 9.55) 16.93
Moretti 2021 Rwanda 583/1704 34.21 (31.96, 36.52) 16.87
Sendekie 2023 Ethiopia 30/237 12.66 (8.71, 17.57) 16.04
Subgroup, DL 6017/132024 9.97 (5.38, 17.72) 100.00
with estimated 95% predictive interval (0.92, 56.86)
(I² = 99.6%, p = 0.000)
LMIC
Kingery 2017 Tanzania 145/635 22.83 (19.62, 26.30) 25.17
Nkoke 2020 Cameroon 192/3140 6.11 (5.30, 7.01) 25.37
Hertz 2019.b Tanzania 294/2418 12.16 (10.88, 13.53) 25.47
Gilbert 2020 Zimbabwe 39/253 15.42 (11.20, 20.46) 23.98
Subgroup, DL 670/12892 12.88 (7.21, 21.96) 100.00
with estimated 95% predictive interval (0.65, 77.07)
(I² = 98.2%, p = 0.000)
UMIC
Perry 2017 Botswana 43/972 4.42 (3.22, 5.91) 34.38
Barak 2019 Botswana 47/2069 2.27 (1.67, 3.01) 34.91
Mouton 2021 South Africa 23/1010 2.28 (1.45, 3.40) 30.71
Subgroup, DL 113/8102 2.86 (1.80, 4.51) 100.00
with estimated 95% predictive interval (0.01, 89.99)
(I² = 83.5%, p = 0.002)
Heterogeneity between groups: p = 0.000
0
10
20
30
40
Prevalence (%)
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

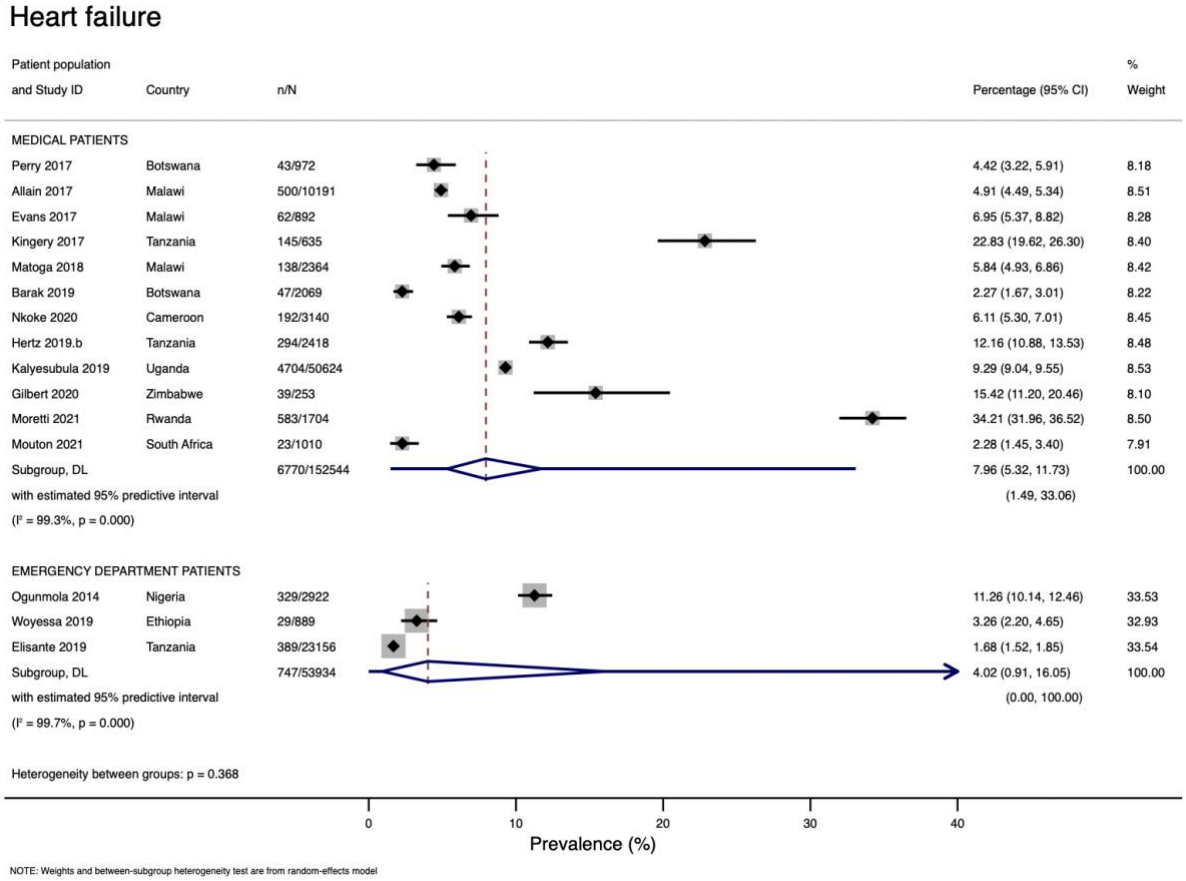
Heart failure by risk of bias



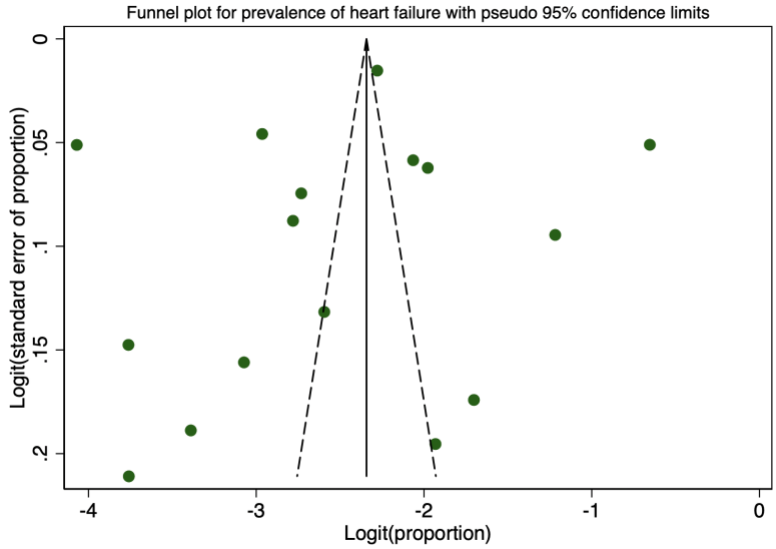
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Heart failure sensitivity analysis

Very high risk studies removed from the meta-analysis in this sensitivity analysis:

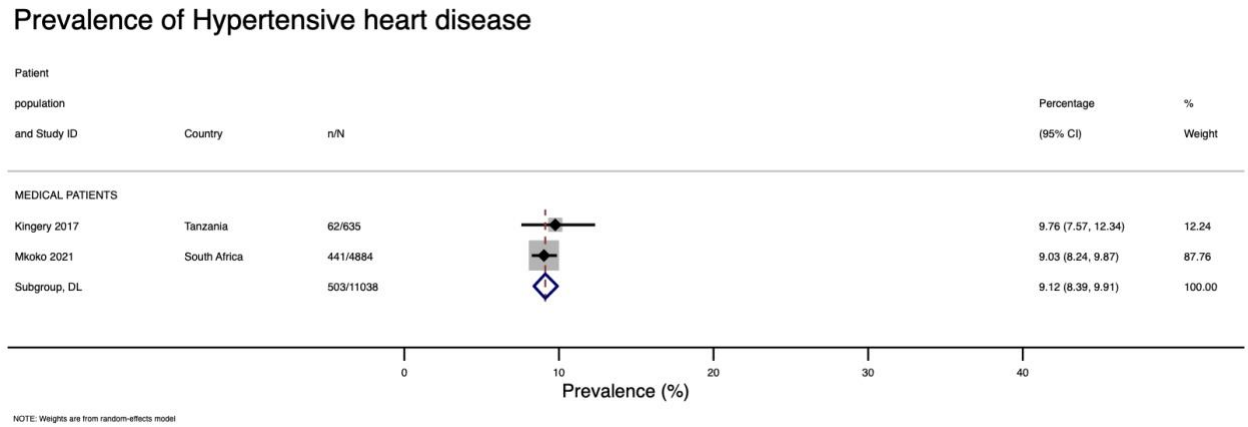


Heart failure funnel plot

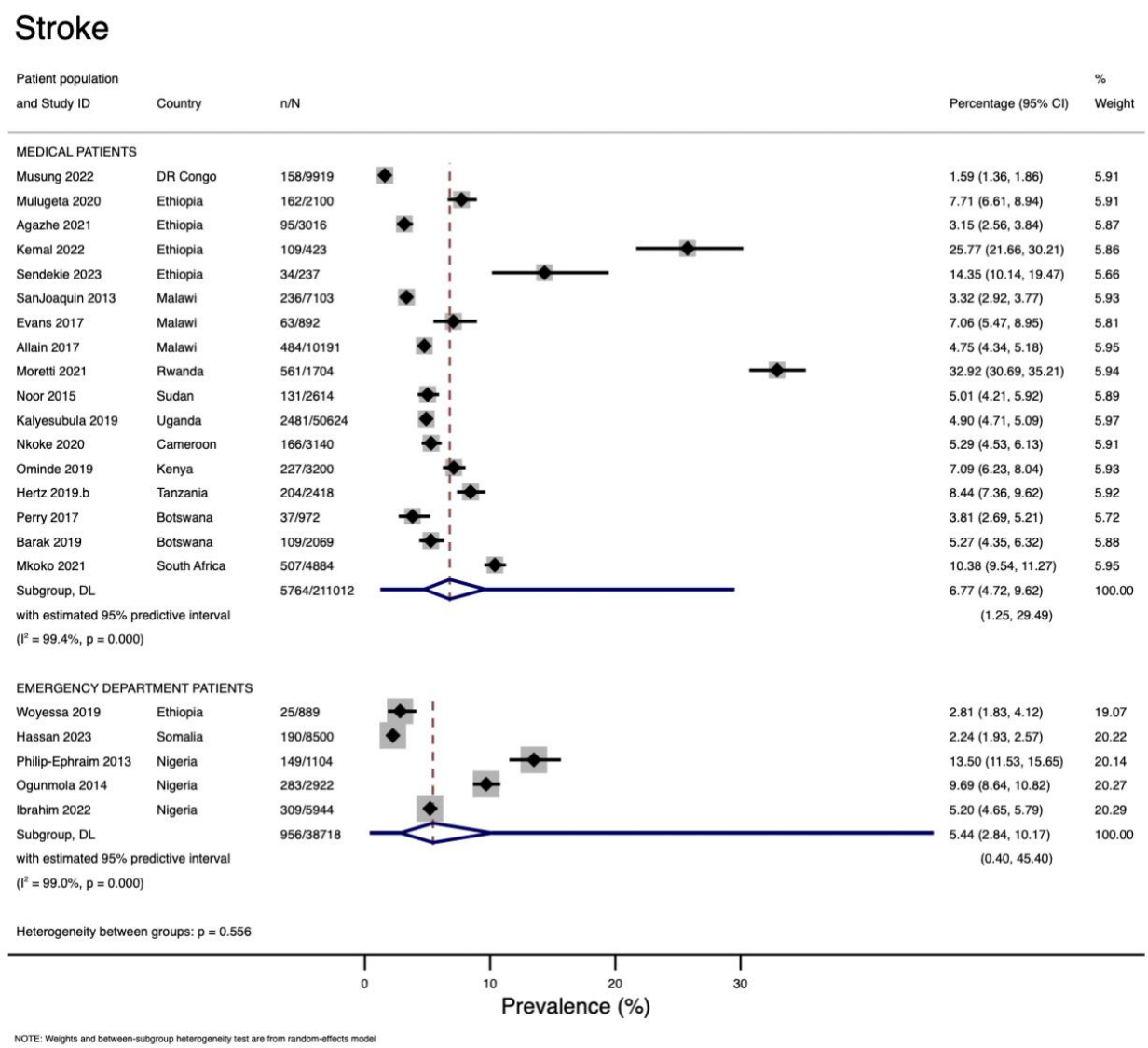


Test of H0: no small-study effects P = 0.61

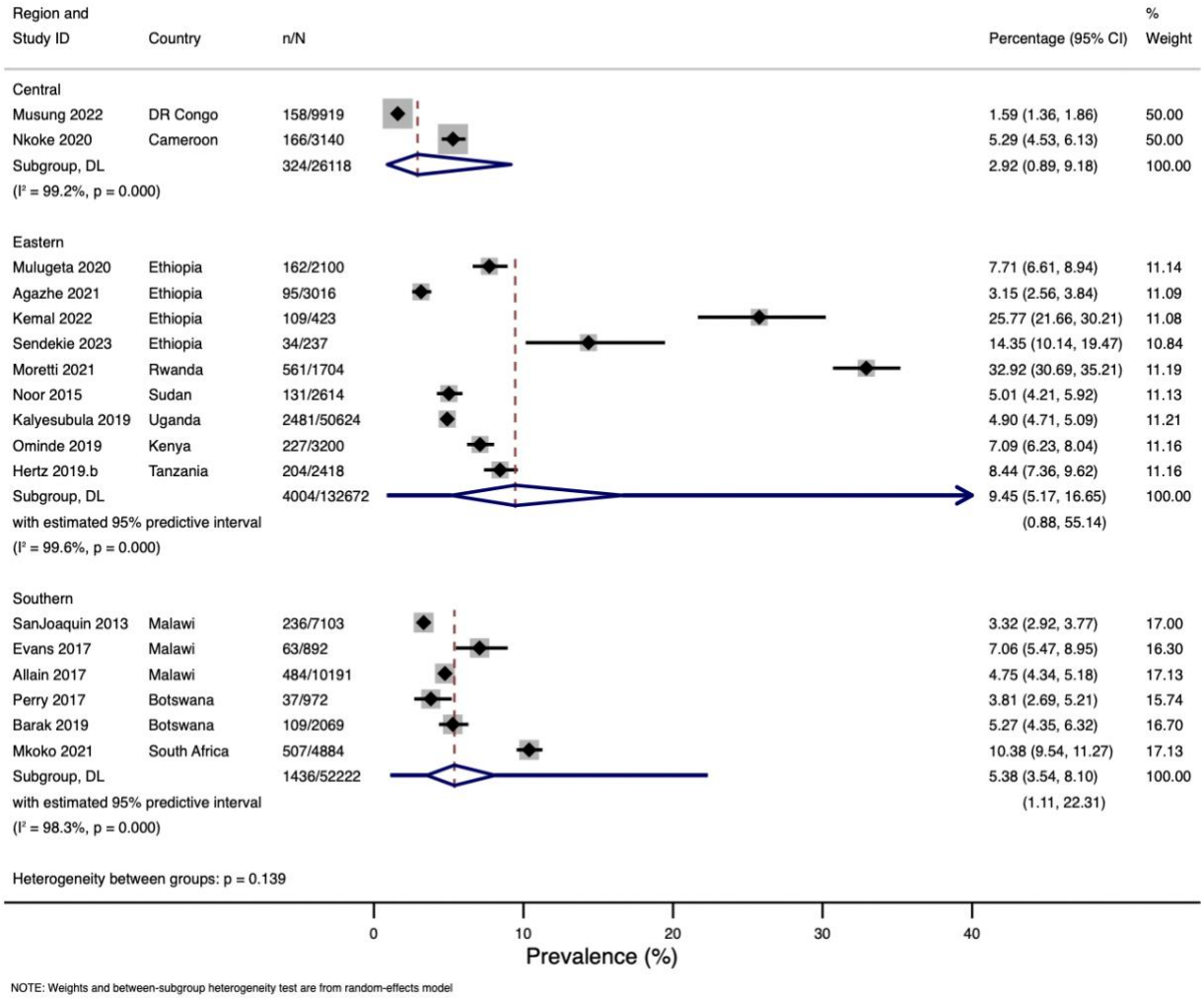
Hypertensive heart disease



Stroke

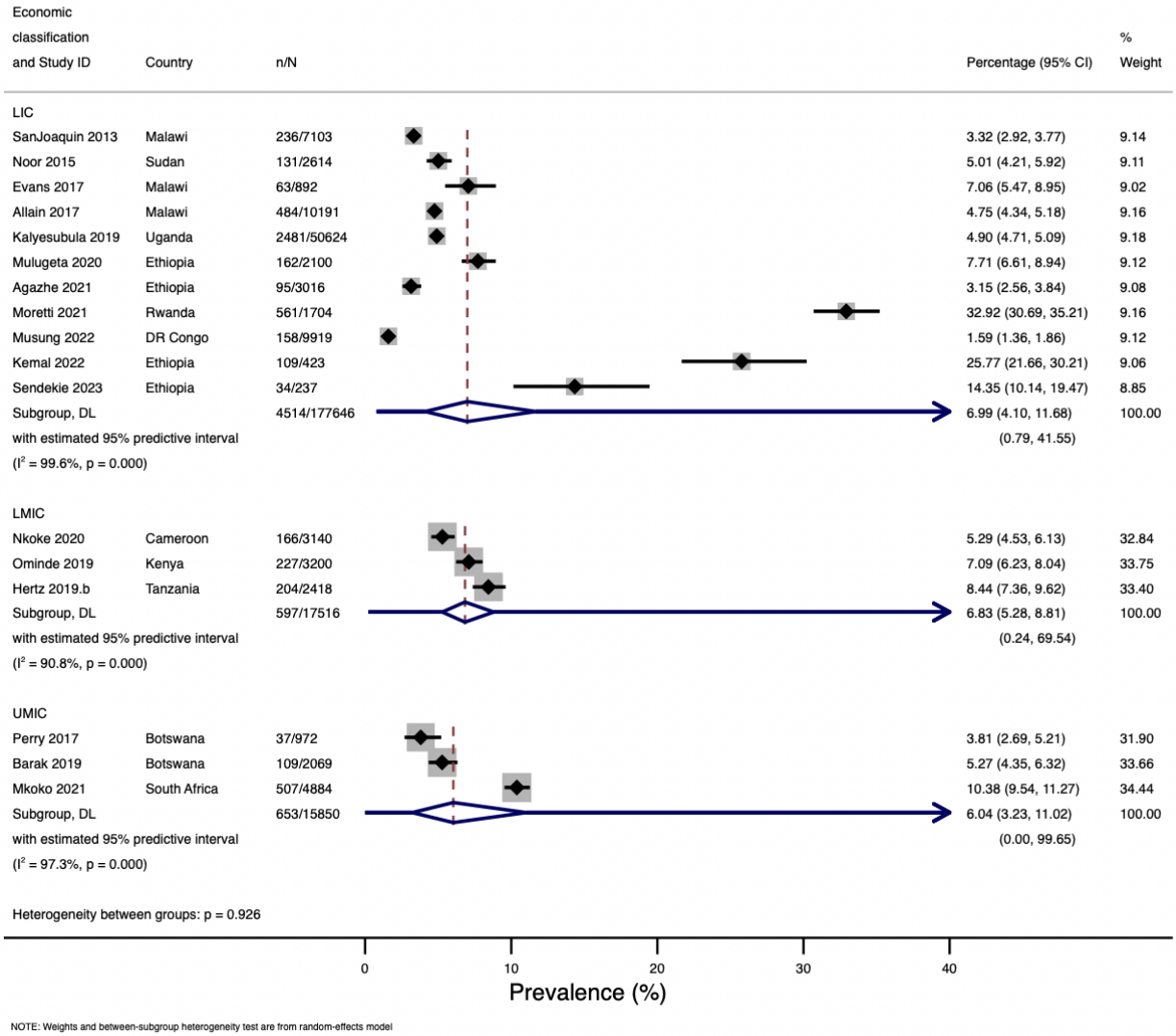

Stroke
Patient population and Study ID
Country
n/N
Percentage (95% CI)
% Weight
MEDICAL PATIENTS
Musung 2022 DR Congo 158/9919 1.59 (1.36, 1.86) 5.91
Mulugeta 2020 Ethiopia 162/2100 7.71 (6.61, 8.94) 5.91
Agazhe 2021 Ethiopia 95/3016 3.15 (2.56, 3.84) 5.87
Kemal 2022 Ethiopia 109/423 25.77 (21.66, 30.21) 5.86
Sendekie 2023 Ethiopia 34/237 14.35 (10.14, 19.47) 5.66
SanJoaquin 2013 Malawi 236/7103 3.32 (2.92, 3.77) 5.93
Evans 2017 Malawi 63/892 7.06 (5.47, 8.95) 5.81
Allain 2017 Malawi 484/10191 4.75 (4.34, 5.18) 5.95
Moretti 2021 Rwanda 561/1704 32.92 (30.69, 35.21) 5.94
Noor 2015 Sudan 131/2614 5.01 (4.21, 5.92) 5.89
Kalyesubula 2019 Uganda 2481/50624 4.90 (4.71, 5.09) 5.97
Nkoke 2020 Cameroon 166/3140 5.29 (4.53, 6.13) 5.91
Ominde 2019 Kenya 227/3200 7.09 (6.23, 8.04) 5.93
Hertz 2019.b Tanzania 204/2418 8.44 (7.36, 9.62) 5.92
Perry 2017 Botswana 37/972 3.81 (2.69, 5.21) 5.72
Barak 2019 Botswana 109/2069 5.27 (4.35, 6.32) 5.88
Mkoko 2021 South Africa 507/4884 10.38 (9.54, 11.27) 5.95
Subgroup, DL 5764/211012 6.77 (4.72, 9.62) 100.00
with estimated 95% predictive interval (1.25, 29.49)
(I^2 = 99.4%, p = 0.000)
EMERGENCY DEPARTMENT PATIENTS
Woyessa 2019 Ethiopia 25/889 2.81 (1.83, 4.12) 19.07
Hassan 2023 Somalia 190/8500 2.24 (1.93, 2.57) 20.22
Philip-Ephraim 2013 Nigeria 149/1104 13.50 (11.53, 15.65) 20.14
Ogunmola 2014 Nigeria 283/2922 9.69 (8.64, 10.82) 20.27
Ibrahim 2022 Nigeria 309/5944 5.20 (4.65, 5.79) 20.29
Subgroup, DL 956/38718 5.44 (2.84, 10.17) 100.00
with estimated 95% predictive interval (0.40, 45.40)
(I^2 = 99.0%, p = 0.000)
Heterogeneity between groups: p = 0.556
0
10
20
30
Prevalence (%)
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Stroke by region



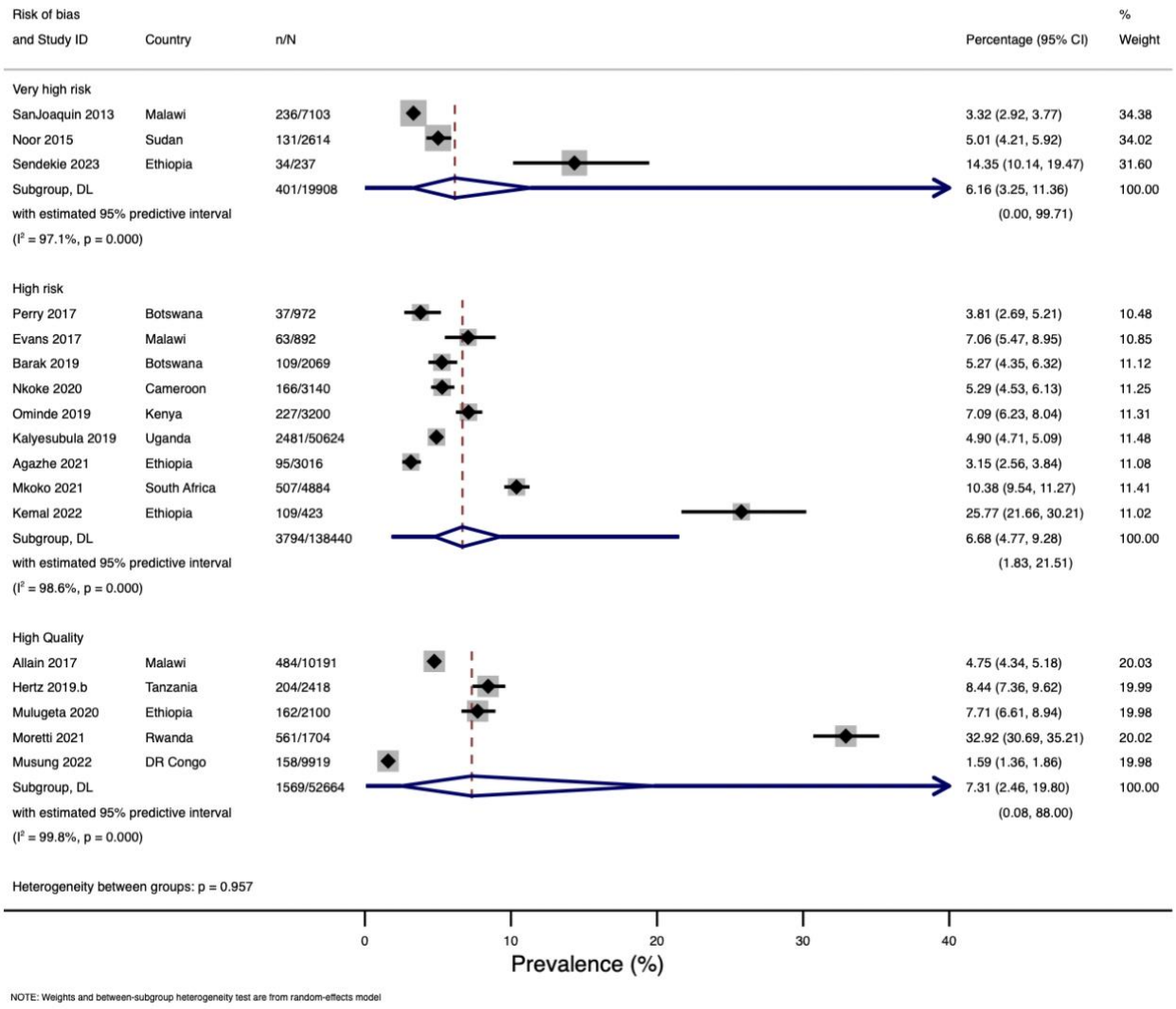
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Stroke by country-level economic status



NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

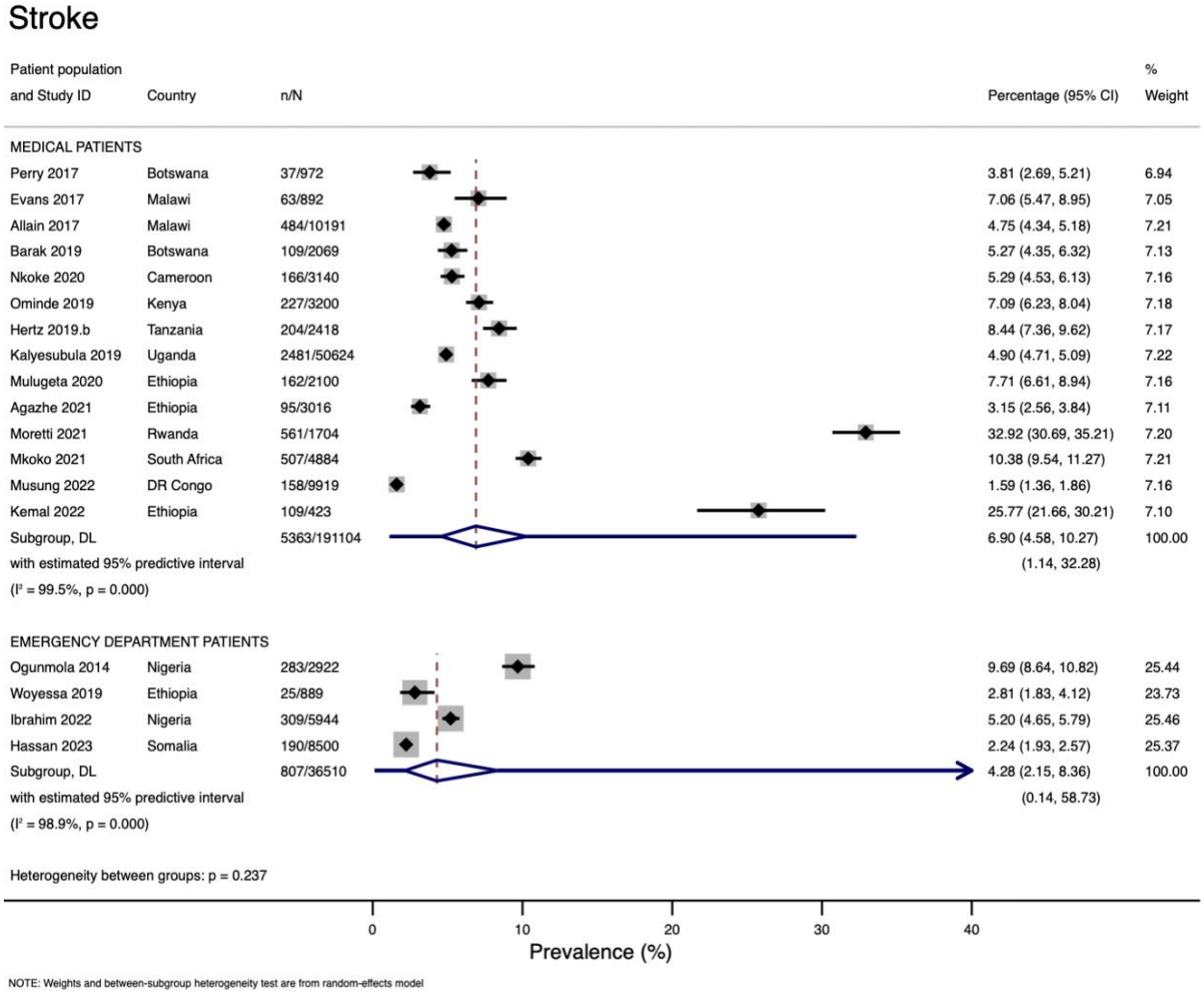
Stroke by risk of bias



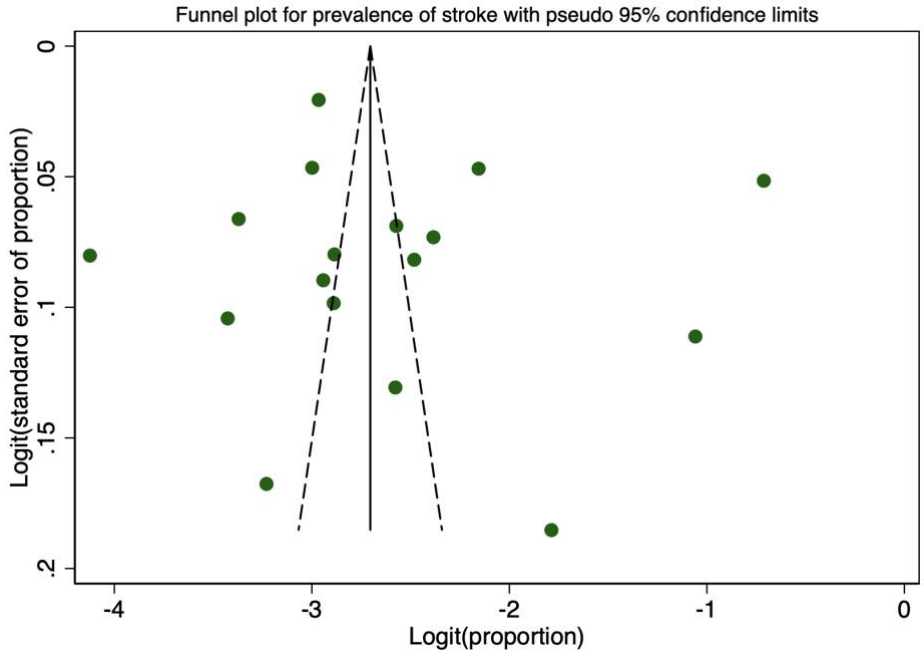
NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Stroke sensitivity analysis

Very high risk studies removed from the meta-analysis in this sensitivity analysis

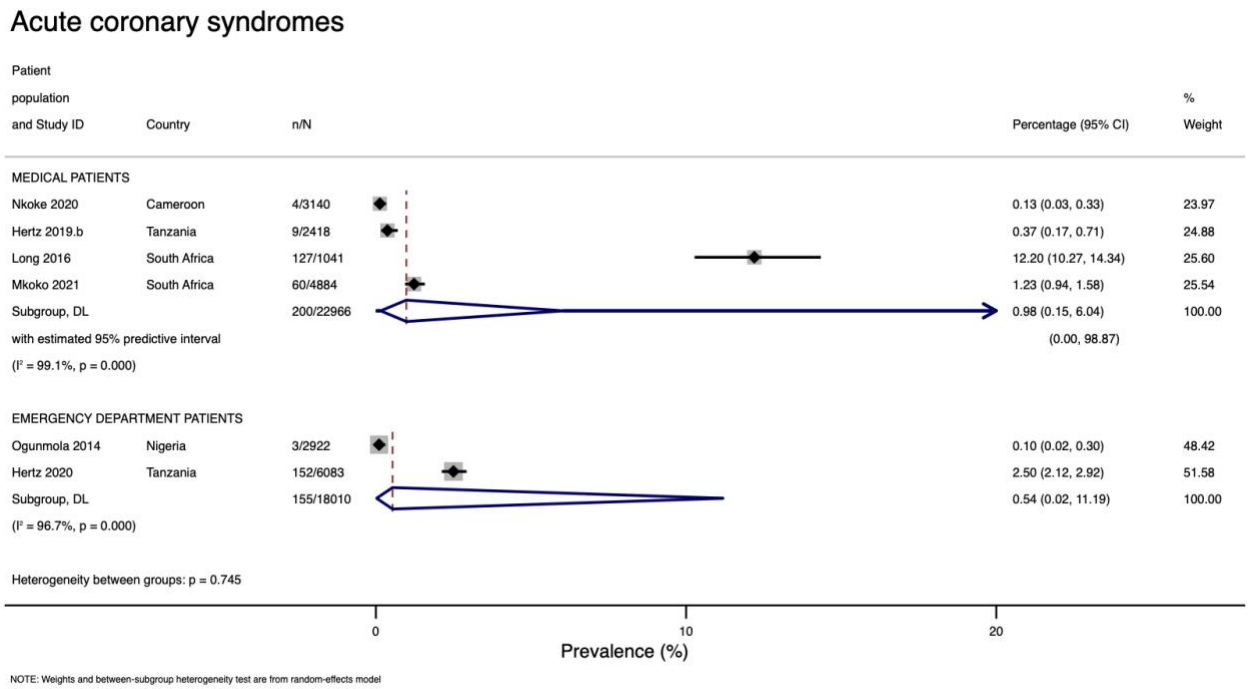


Stroke funnel plot

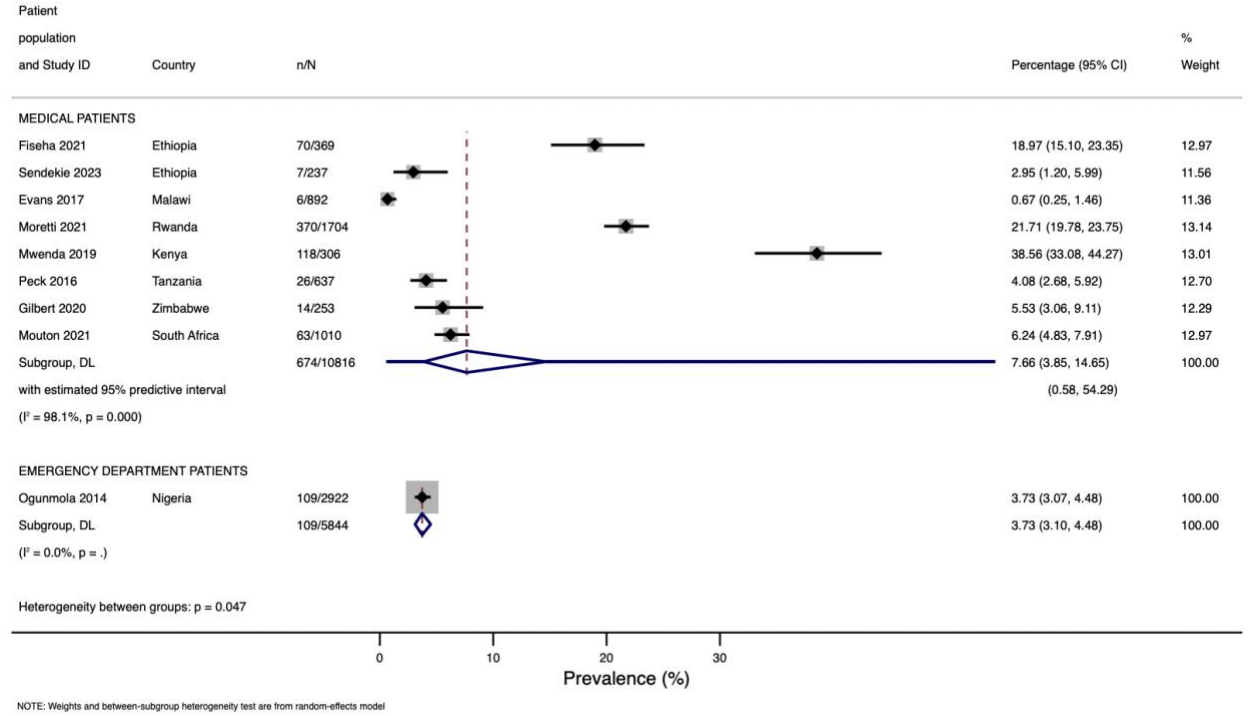


Egger's Test of H0: no small-study effects P = 0.58

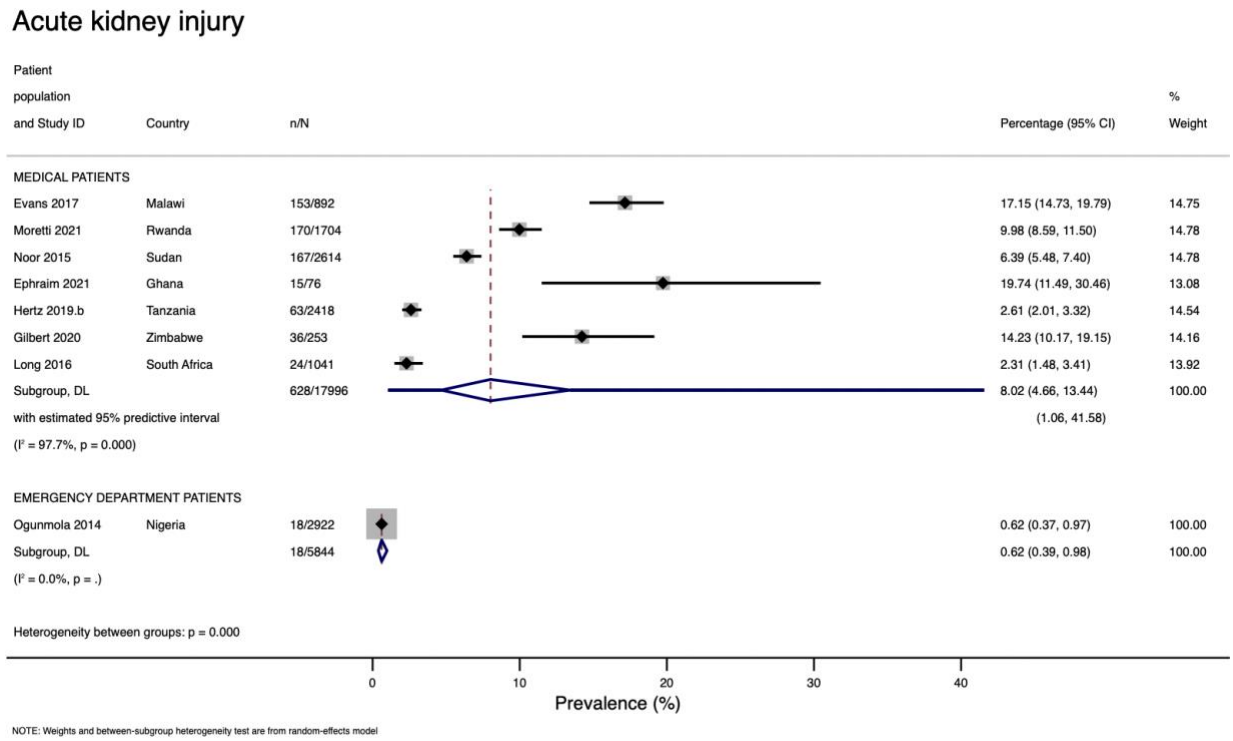
Acute coronary syndromes



Chronic kidney disease



Acute kidney injury



Renal impairment (unclassified)

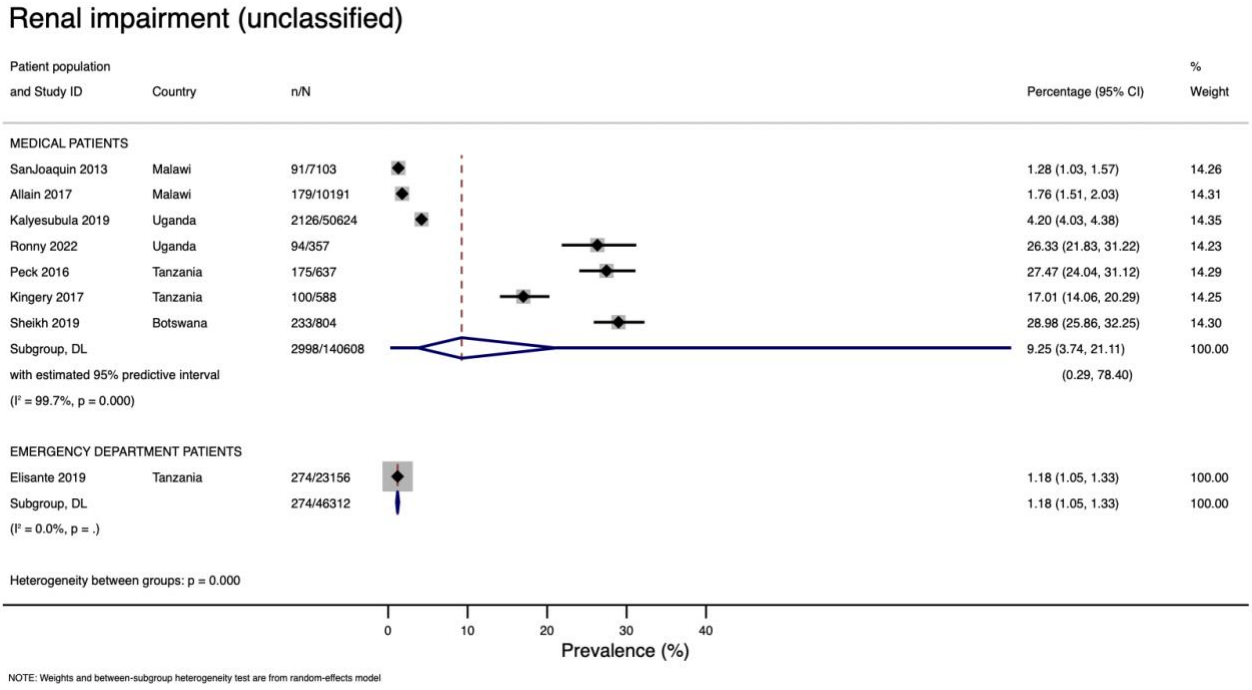
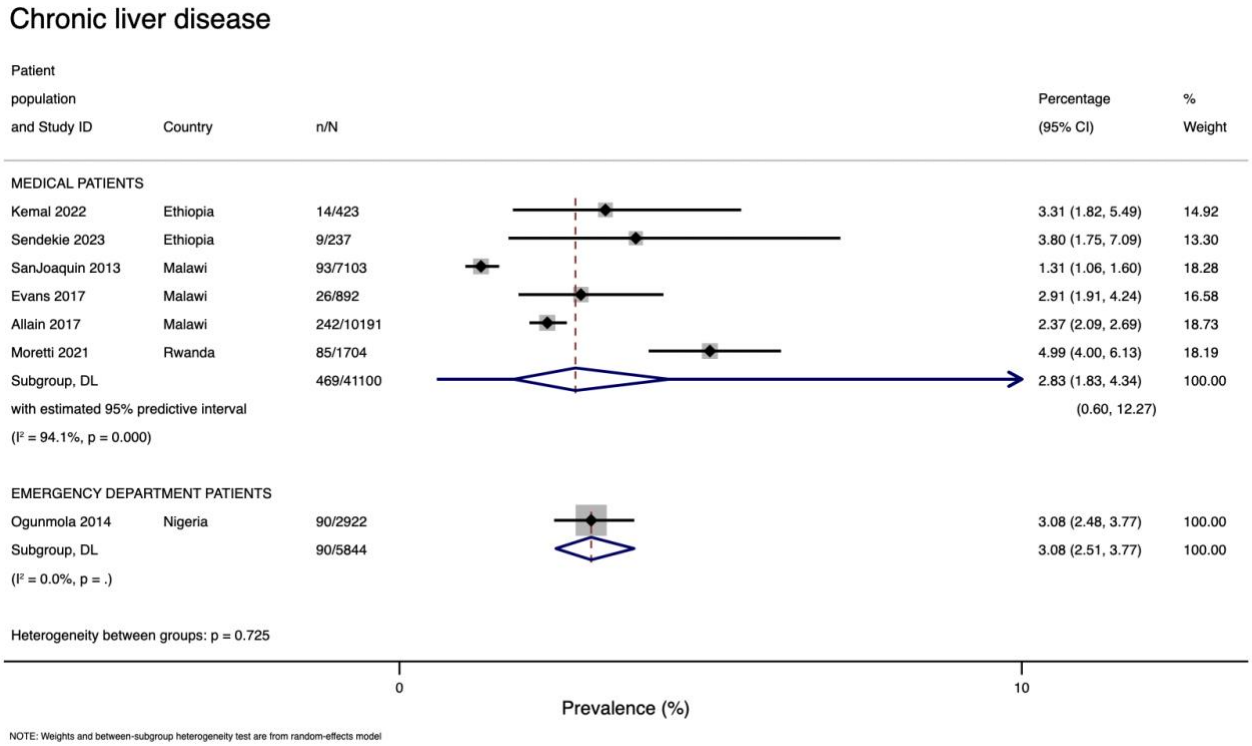
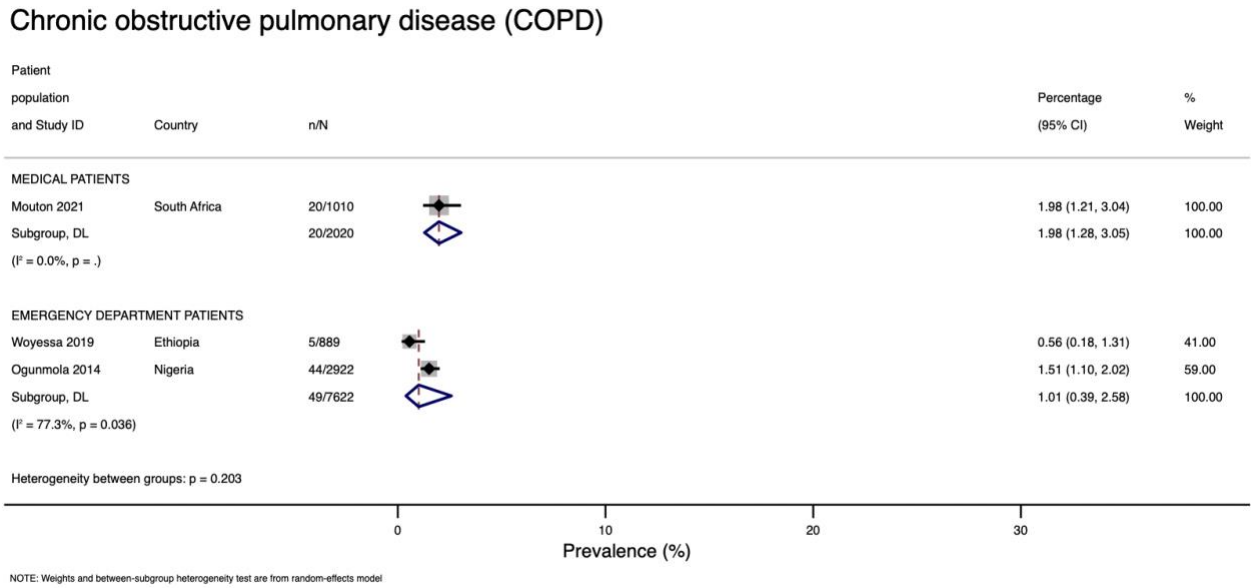


Figure shows prevalence of renal impairment that was not classified as either acute or chronic renal disease.

Chronic liver disease

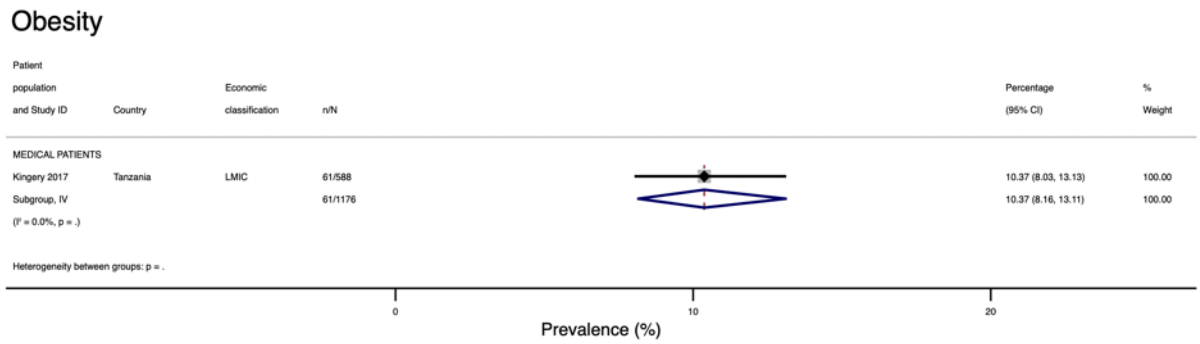


Chronic obstructive pulmonary disease

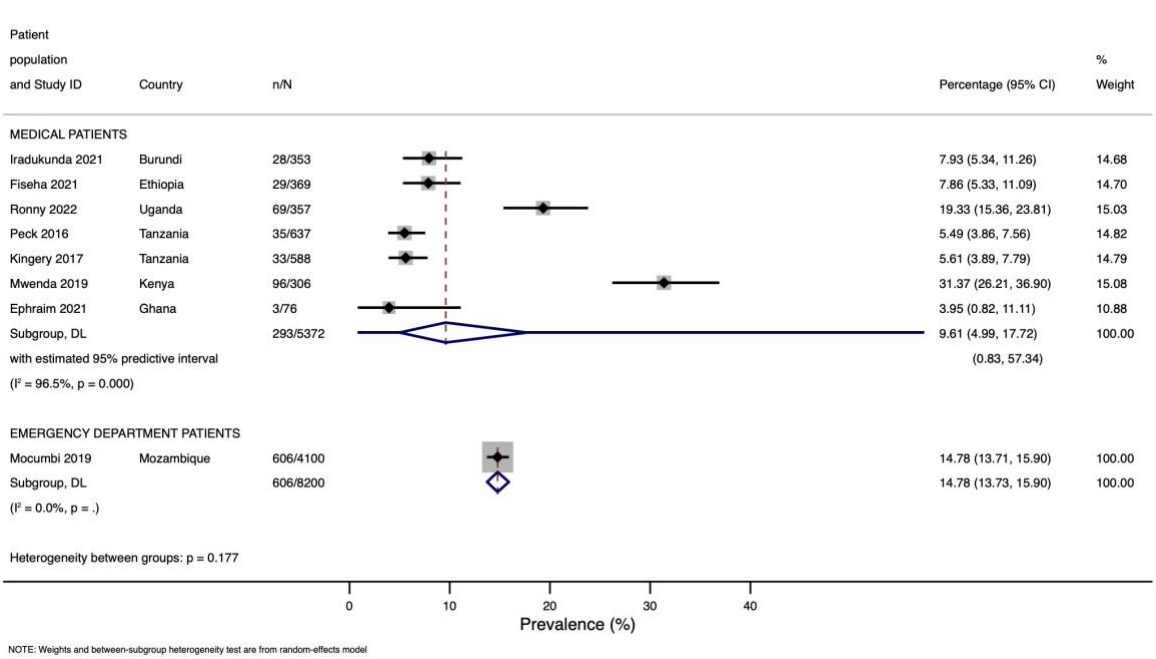


This figure shows the prevalence of patients with acute exacerbations of COPD in medical wards and emergency departments.

Obesity



Tobacco smokers



Alcohol use

Background alcohol use

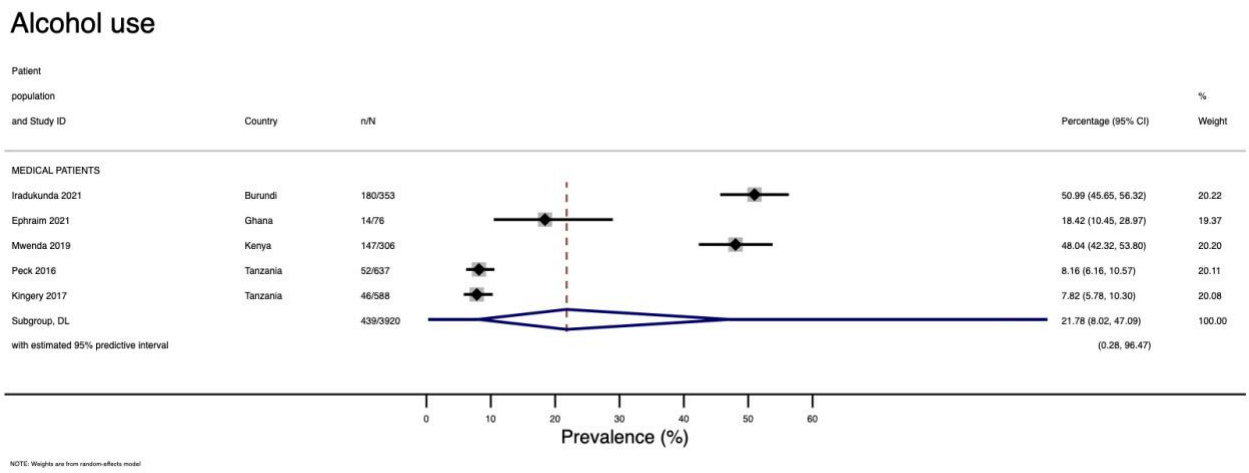
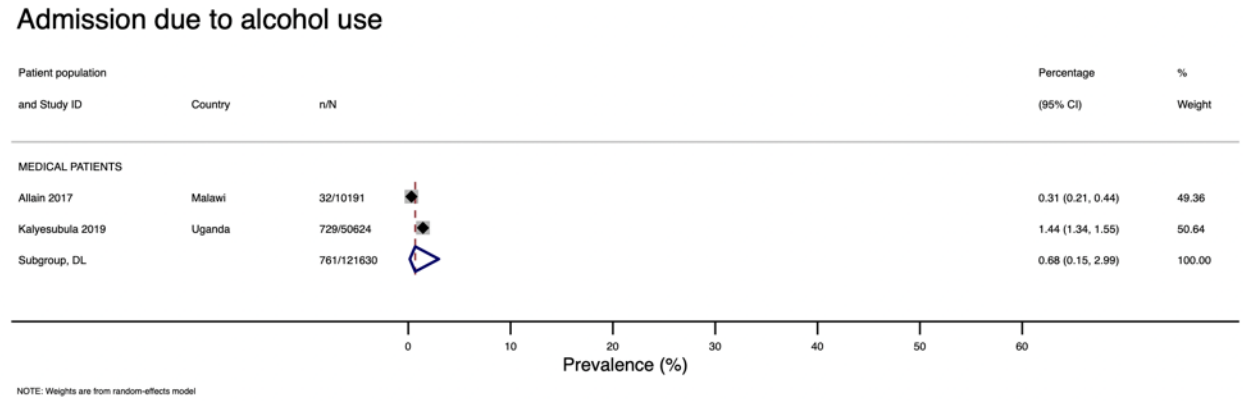


Figure shows prevalence of alcohol use among medically admitted adult patients

Admission due to alcohol use



Metaregression table

Table 1. Univariable meta-regression results. Meta-regression analyses exploring the association between population and study factors and the prevalence of conditions where >10 estimates were available.

	Number of prevalence estimates	Odds ratio	95% CI	p	Tau^2	Residual I^2
HIV prevalence medical departments						
Average age	18	0.97	0.89-1.07	0.55	0.70	99.50
Sex Female:Male	23	0.88	0.62-1.25	0.73	0.62	99.62
Economic status	25	1.25	0.86-1.80	0.22	0.56	99.80
Country HIV prevalence	25	1.33	1.09-1.63	<0.01	0.43	99.64
Study year	25	0.93	0.84-1.04	0.18	0.55	99.75
Hypertension prevalence in medical departments						
Average age	11	1.04	0.96-1.13	0.26	0.22	99.32
Sex Female:Male	14	1.21	0.78-4.58	0.19	0.21	99.59
Economic status	14	1.50	1.12-2.00	0.01	0.14	98.43
Study year	14	1.02	0.91-1.14	0.77	0.26	98.78
Diabetes prevalence across medical departments						
Average age	10	1.02	0.92-1.14	0.53	0.42	94.24
Sex Female:Male	13	1.61	0.10-9.61	0.50	0.39	95.55
Economic status	15	1.19	0.77-1.84	0.40	0.36	97.21
Study year	15	1.05	0.95-1.15	0.31	0.35	96.80
Heart failure prevalence across medical departments						
Average age	10	0.99	0.87-1.12	0.85	1.01	99.33
Sex Female:Male	12	0.96	0.76-1.29	0.62	0.96	99.31
Economic status	13	0.58	0.31-1.09	0.08	0.68	99.32
Study year	13	1.06	0.88-1.28	0.50	0.88	99.32
Stroke prevalence across medical departments						
Average age	10	1.01	0.90-1.12	0.91	0.93	99.58
Sex Female:Male	12	0.94	0.62-1.37	0.99	0.79	99.51
Economic status	17	0.93	0.52-1.66	0.79	0.75	99.40
Study year	17	1.09	0.94-1.25	0.23	0.68	99.38

Multimorbidity table

Table of multimorbidity disease combinations and prevalence in hospital settings. Data extracted from secondary analyses of included studies.

Study	**Country**	**Design**	**Hospital setting**	**Ave Age**	**Primary study condition with prevalence (** in the unselected population**)**	**Multimorbidity disease combinations between co-prevalent primary and secondary condition,** (n, secondary condition/ N, primary condition)	**Multimorbidity prevalence** (in the unselected population**)**
Musung 2022 [1]	Democratic Republic of the Congo	Retrospective cross-sectional	Medical ward	Not reported	Stroke: 158/9919 (1.6%)	Stroke + HTN: 131/158 (82.9%) Stroke + DM: 31/158 (19.6%) Stroke + Hyperlipidaemia: 78/158 (49.4%)	131/9919 (1.3%) 31/9919 (0.3%) 78/9919 (0.8%)
Kazibwe 2022 [2]	Uganda				HIV: 26021/108357 (24.0%) HTN: 13252/108357 (12.2%) DM: 13708/108357 (12.7%)	HIV + DM: 666/26021 (2.6%) HIV + HTN: 665/26021 (2.6%) HTN + DM: 3790/13252 (28.6%) HTN + HIV: 665/13252 (0.7%) DM + HIV: 666/13708 (4.9%) DM + HTN: 3790/13708 (27.6%)	666/108357 (0.6%) 665/108357 (0.6%) 3790/108357 (3.5%)
Iradukunda 2021 [3]	Burundi	Retrospective cross-sectional	Medical ward	Not reported	HTN: 59/353 (16.7%)	HTN + DM: 33/59 (55.9%) HTN + Obesity: 9/59 (15.3%)	33/353 (9.3%) 9/353 (2.5%)
Agazhe 2021 [4]	Ethiopia	Retrospective cross-sectional	Medical ward	Not reported	Stroke: 95/3061 (3.1%)	Stroke + HTN: 68/95 (71.6%) Stroke + DM: 57/95 (60.0%) Stroke + HD: 22/95 (23.2%)	68/3016 (2.3%) 57/3016 (1.9%) 22/3016 (0.7%)
Mulugeta 2020 [5]	Ethiopia	Retrospective cross-sectional	Medical ward	Not reported	Stroke: 162/2100 (7.7%)	Stroke + HTN: 56/162 (34.6%) Stroke + DM: 21/162 (13.0%) Stroke + HTN + DM: 13/162 (8.0%) Stroke + Dyslipidaemia: 34/162 (21.0%)	56/2100 (2.7%) 21/2100 (1.0%) 13/2100 (0.6%) 34/2100 (1.6%)
Hertz 2020 [6]	Tanzania	Prospective cohort study	Emergency department	Not reported	Acute MI: 152/6083 (2.5%)	MI + HTN: 91/152 (59.9%) MI + DM: 27/152 (17.8%) MI + Hyperlipidaemia: 8/152 (5.3%) MI + CKD: 16/152 (10.5%) MI + HF: 48/152 (31.6%) MI + HIV: 5/152 (3.3%)	91/6083 (1.5%) 27/6083 (0.4%) 8/6083 (0.1%) 16/6083 (0.3%) 48/6083 (0.8%) 5/6083 (0.1%)
Du Plooy 2020 [7]	South Africa	Prospective cohort	Medical ward	51 (36 - 65)*	Delirium	≥4	355/808 (44.0%)

Mwenda 2019 [8]	Kenya	Cross-sectional study	Medical ward	40	CKD: 118/306 (38.9%)	CKD + HTN: 57/118 (48.3%) CKD + DM: 31/118 (26.2%) CKD + HIV: 20/118 (16.9%)	57/306 (18.6%) 31/306 (10.1%) 20/306 (6.5%)
Hertz 2019 [9]	Tanzania	Retrospective cohort	Emergency department	50 (32-67)*	HTN: 1359/3961 (34.3%) DM: 518/3961 (13.1%)	HTN + DM: 273/1359 (20.0%) DM + HTN: 273/518 (52.7%)	273/3961 (6.9%)
Barak 2019 [10]	Botswana	Prospective cross-sectional	Medical ward	51 (34-71)*	HIV: 983/2316 (42.4%)	HIV + HTN: 140/983 (14.2%) HIV + DM: 78/983 (7.9%) HIV + CLD: 80/983 (8.1%) HIV + Heart disease: 44/983 (4.5%)	140/2316 (6.0%) 78/2316 (3.4%) 80/2316 (3.5%) 44/2316 (1.9%)
Perry 2017 [11]	Botswana	Prospective cohort	Medical ward	48	HIV: 463/972 (47.6%)	HIV + HTN: 6/463 (1.3%) HIV + DM: 78/463 (16.8%) HIV + Stroke: 9/463 (1.9%) HIV + HF: 10/463 (2.2%)	6/972 (0.6%) 78/972 (8.0%) 9/972 (0.9%) 10/972 (1.0%)
Kingery 2017 [12]	Tanzania	Prospective cohort	Medical ward	Not reported	HF: 145/588 (24.7%)	HF + HTN: 61/588 (10.4%) HF + DM: 14/588 (2.4%)	61/588 (10.4%) 14/588 (2.4%)
Meintjes 2015 [13]	South Africa	Prospective cohort	Medical ward	Not reported	HIV: 609/1013 (60.1%)	HIV + NCD: 22/609 (3.6%)	22/1013 (2.2%)

CLD: Chronic lung disease; CKD: Chronic kidney disease; MI: Myocardial infarction; HF: heart failure; HTN: hypertension; HIV: human immunodeficiency virus; NCD = non-communicable disease; VTE = venous thrombo-embolism.

Data collection tool

List of data collected:

1. Citation details: authorship, year of publication, title and journal.

2. Year and duration of study.

3. Study location: site, country, hospital setting (emergency department or medical ward).

4. Study design.

5. Sample size and statistical considerations.

6. Population characteristics (of the unselected population): age (median and inter-quartile range or mean and standard deviation), proportion males : females.

7. Prevalence outcomes for each condition (see search strategy) as:
   1) background condition prevalence
   2) prevalence of decompensated disease state.

   The following data were collected:
   - definition of outcome
   - diagnostic methods used
   - numerator, denominator and prevalence

8. Newcastle Ottawa Scale for risk of bias assessment.

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