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HIV

Supplementary appendix 2

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

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Supplementary Materials

Trends in HIV testing, the treatment cascade, and HIV incidence among men who have sex with men in Africa: A systematic review and meta-analysis

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Table S1: Search terms for HIV testing, treatment cascade, and incidence studies, by database and search domain

a) Embase search strategy Search conducted March 24th 2022 – 4622 articles retrieved
HIV domain (exp Human immunodeficiency virus/ OR exp acquired immune deficiency syndrome/ OR exp Human immunodeficiency virus infection/ OR exp Human immunodeficiency virus antibody/ OR exp Human immunodeficiency virus prevalence/ OR exp HIV test/ OR "hiv*".ab,kw,ti. OR human immun#deficiency virus.ab,kw,ti. OR human immun# deficiency virus.ab,kw,ti. OR acquired immun#deficiency syndrome.ab,kw,ti. OR acquired immun# deficiency syndrome.ab,kw,ti. OR "AIDS*".ab,kw,ti. OR SIDA.ab,kw,ti. OR syndrome d'immunodeficience acquise.ab,kw,ti. OR VIH.ab,kw,ti. OR virus de l'immunodeficience humaine.ab,kw,ti.)
AND MSM domain (exp male homosexuality/ OR exp bisexuality/ OR gay.ab,kw,ti. OR MSM.ab,kw,ti. OR men who have sex with men.ab,kw,ti. OR men that have sex with men.ab,kw,ti. OR HRSH.ab,kw,ti. OR hommes qui ont des relations sexuelles avec des hommes.ab,kw,ti. OR same-sex.ab,kw,ti. OR same sex.ab,kw,ti. OR queer.ab,kw,ti. OR "bisex*".ab,kw,ti. OR "homosex*".ab,kw,ti. OR same-gender.ab,kw,ti. OR same gender.ab,kw,ti. OR "meme sex*".ab,kw,ti. OR "meme genre*".ab,kw,ti. OR (male adj2 sex worker*).ab,kw,ti. OR "male sex work*".ab,kw,ti. OR exp men who have sex with men/ OR exp "sexual and gender minority"/ OR exp "men who have sex with men and women"/ OR sexual minority men.ab,kw,ti. OR (sexual and gender minority men).ab,kw,ti.)
AND Africa domain (exp africa/ OR exp "africa south of the sahara"/ OR exp north africa/ OR exp South Africa/ OR exp North Africa/ OR exp Central Africa/ OR exp African/ OR "Africa*".ab,kw,ti. OR "Afriq*".ab,kw,ti. OR "Algeri*".ab,kw,ti. OR "Angola*".ab,kw,ti. OR "Benin*".ab,kw,ti. OR (Botswana* OR Matswana* OR Batswana*).ab,kw,ti. OR (Burkina* OR Burundi*).ab,kw,ti. OR (Cabo Verde* OR Cape Verde* OR Cap#Vert).ab,kw,ti. OR (Camero* OR Central African Republic* OR republique centrafricaine OR Chad* OR Tchad* OR Comor* OR Cote d'Ivoire OR Ivory Coast OR Ivorian*).ab,kw,ti. OR (Djibouti OR Democratic Republic of the Congo OR Democratic Republic of the Congo OR Congo*).ab,kw,ti. OR (Egypt* OR Equatorial Guinea* OR Guinee Equatoriale OR Equatoguinean* OR Eritrea* OR Erythree* OR eSwatini* OR Ethiop*).ab,kw,ti. OR (Gabon* OR Gambi* OR Ghana* OR Guine*).ab,kw,ti. OR "Kenya*".ab,kw,ti. OR (Lesotho* OR Bathoso* OR Liberia* OR Liby*).ab,kw,ti. OR (Madagas* OR Malawi* OR Mali* OR Maurit* OR Moroc* OR Maroc* OR Mozambi*).ab,kw,ti. OR (Namibi* OR Niger*).ab,kw,ti. OR (Rwanda* OR Rouanda* OR Ruanda*).ab,kw,ti. OR (Sao* OR Senegal* OR Seychel* OR Sierra Leon* OR Somali* OR South Africa* OR Afrique du Sud OR South Sudan* OR Soudan du sud OR Sudan* OR Swazi*).ab,kw,ti. OR (Tanzani* OR Togo* OR Republique togolaise or tunisi*).ab,kw,ti. OR (Uganda* OR Ouganda*).ab,kw,ti. OR (Zambi* OR Zimbabwe*).ab,kw,ti. OR exp Algeria/ OR exp Angola/ OR exp Benin/ OR exp Botswana/ OR exp Burkina Faso/ OR exp Burundi/ OR exp Cape Verde/ OR exp Cameroon/ OR exp Central African Republic/ OR exp Chad/ OR exp Comoros/ OR exp Cote d'Ivoire/ OR exp Djibouti/ OR exp Congo/ OR exp Democratic Republic Congo/ OR exp Egypt/ OR exp Guinea-Bissau/ OR exp Guinea/ OR exp Equatorial Guinea/ OR exp Eritrea/ OR exp Ethiopia/ OR exp Gabon/ OR exp Gambia/ OR exp Ghana/ OR exp Kenya/ OR exp Lesotho/ OR exp Liberia/ OR exp Libyan Arab Jamahiriya/ OR exp Madagascar/ OR exp Malawi/ OR exp Mali/ OR exp Mauritania/ OR exp Mauritius/ OR exp Morocco/ OR exp Mozambique/ OR exp Namibia/ OR exp Niger/ OR exp Nigeria/ OR exp Rwanda/ OR exp "Sao Tome and Principe"/ OR exp Senegal/ OR exp Seychelles/ OR exp Sierra Leone/ OR exp Somalia/ OR exp South Africa/ OR exp South Sudan/ OR exp Sudan/ OR exp Eswatini/ OR exp Tanzania/ OR exp Togo/ OR exp Tunisia/ OR exp Uganda/ OR exp Zambia/ OR exp Zambia/ OR exp Zimbabwe/)
AND limit to yr="1980-Current"
b) Medline search strategy Search conducted March 24th 2022 – 3163 articles retrieved
HIV domain (exp HIV/ OR exp hiv infections/ OR exp acquired immunodeficiency syndrome/ OR exp HIV testing/ OR exp HIV seropositivity/ OR (HIV* OR human immun#deficiency virus OR human immun# deficiency virus OR acquired immun#deficiency syndrome OR acquired immun# deficiency syndrome OR AIDS* OR SIDA OR syndrome d'immunodeficience acquise OR VIH OR virus de l'immunodeficience humaine).ab,kw,ti.)
AND MSM domain (exp Homosexuality, Male/ OR exp Bisexuality/ OR exp "Sexual and Gender Minorities"/ OR "homosex*".ab,kw,ti. OR sexual minority men.ab,kw,ti. OR (sexual and gender minority men).ab,kw,ti. OR (gay OR MSM OR men who have sex with men OR men that have sex with men).ab,kw,ti. OR (HRSH OR hommes qui ont des relations sexuelles avec des hommes).ab,kw,ti. OR (same-sex OR same sex OR same-gender OR same gender OR queer OR bisex*).ab,kw,ti. OR (male adj2 sex worker*).ab,kw,ti. OR "male sex work*".ab,kw,ti. OR (meme sex* OR meme genre*).ab,kw,ti.)
AND Africa domain (exp Africa, Central/ OR exp "Africa South of the Sahara"/ OR exp Africa, Southern/ OR exp Africa, Northern/ OR exp Africa, Western/ OR exp Africa, Eastern/ OR exp Africa/ OR exp South Africa/ OR (Africa* OR Afriq*).ab,kw,ti. OR exp Algeria/ OR exp Angola/ OR exp Benin/ OR exp Botswana/ OR exp Burkina Faso/ OR exp Burundi/ OR exp Cabo Verde/ OR exp Cameroon/ OR exp Central African Republic/ OR exp Chad/ OR exp Comoros/ OR exp Cote d'Ivoire/ OR exp Djibouti/ OR exp "Democratic Republic of the Congo"/ OR exp Congo/ OR exp Egypt/ OR exp Guinea/ OR exp Equatorial Guinea/ OR exp Guinea-Bissau/ OR exp Eritrea/ OR exp Ethiopia/ OR exp Gabon/ OR exp Gambia/ OR exp Ghana/ OR exp Kenya/ OR exp Lesotho/ OR exp Liberia/ OR exp Libya/ OR exp Madagascar/ OR exp Malawi/ OR exp Mali/ OR exp Mauritania/ OR exp Mauritius/ OR exp Morocco/ OR exp Mozambique/ OR exp Namibia/ OR exp Niger/ OR exp

Nigeria/ OR exp Rwanda/ OR exp "Sao Tome and Principe"/ OR exp Senegal/ OR exp Seychelles/ OR exp Sierra Leone/ OR exp Somalia/ OR exp Sudan/ OR exp South Sudan/ OR exp Eswatini/ OR exp Tanzania/ OR exp Togo/ OR exp Tunisia/ OR exp Uganda/ OR exp Zambia/ OR exp Zimbabwe/ OR (Algeri* OR Angola*).ab,kw,ti. OR (Benin* OR Botswana* OR Motswana* OR Batswana* OR Burkina* OR Burundi*).ab,kw,ti. OR (Cabo Verde* OR Cape Verde* OR Cap-Vert).ab,kw,ti. OR (Camero* OR Central African Republic* OR republique centrafricaine OR Chad* OR Tchad* OR Comor* OR Cote d'Ivoire OR Ivory Coast OR Ivorian*).ab,kw,ti. OR (Djibouti OR Democratic Republic of the Congo OR Democratic Republic of the Congo OR Congo*).ab,kw,ti. OR (Egypt* OR Equatorial Guinea* OR Guinee Equatoriale OR Equatoguinean* OR Eritrea* OR Erythree* OR eSwatini* OR Ethiop*).ab,kw,ti. OR (Gabon* OR Gambi* OR Ghana* OR Guine*).ab,kw,ti. OR "Kenya*".ab,kw,ti. OR (Lesotho* OR Bathoso* OR Liberia* OR Liby*).ab,kw,ti. OR (Madagas* OR Malawi* OR Mali* OR Maurit* OR Moroc* OR Maroc* OR Mozambi*).ab,kw,ti. OR (Namibi* OR Niger*).ab,kw,ti. OR (Rwanda* OR Rouanda* OR Ruanda*).ab,kw,ti. OR (Sao* OR Senegal* OR Seychel* OR Sierra Leon* OR Somali* OR South Africa* OR Afrique du Sud OR South Sudan* OR Soudan du sud OR Sudan* OR Swazi*).ab,kw,ti. OR (Tanzani* OR Togo* OR Republique togolaise OR tunisi*).ab,kw,ti. OR (Uganda* OR Ouganda*).ab,kw,ti. OR (Zambi* OR Zimbabwe*).ab,kw,ti.)

AND limit to yr="1980-Current"

c) Global Health search strategy

Search conducted March 24th 2022 – 1951 articles retrieved

HIV domain (exp human immunodeficiency viruses/ OR exp human immunodeficiency virus 1/ OR exp human immunodeficiency virus 2/ OR exp acquired immune deficiency syndrome/ OR exp aids related complex/ OR exp hiv infections/ OR exp hiv-1 infections/ OR exp hiv-2 infections/ OR (HIV* OR human immun#deficiency virus OR human immun# deficiency virus OR acquired immun#deficiency syndrome OR acquired immun# deficiency syndrome OR AIDS* OR SIDA OR syndrome d'immunodeficience acquise OR VIH OR virus de l'immunodeficience humaine).ab,ti.)

AND MSM domain (exp homosexuality/ OR exp homosexual transmission/ OR exp men who have sex with men/ OR exp bisexuality/ OR exp homosexual men/ OR (gay OR MSM OR men who have sex with men OR men that have sex with men).ab,ti. OR (HRSH OR hommes qui ont des relations sexuelles avec des hommes).ab,ti. OR (same-sex OR same sex OR same-gender OR same gender OR queer OR bisex*).ab,ti. OR "male sex work*".ab,ti. OR (male adj2 sex work*).ab,ti. OR (meme sex* OR meme genre*).ab,ti. OR "homosex*".ab,ti. OR sexual minority men.ab,ti. OR (sexual and gender minority men).ab,ti.)

AND Africa domain (exp "Africa South of Sahara"/ OR exp East Africa/ OR exp Africa/ OR exp Central Africa/ OR exp North Africa/ OR exp Southern Africa/ OR exp West Africa/ OR exp Algeria/ OR exp Angola/ OR exp Benin/ OR exp Botswana/ OR exp Burkina Faso/ OR exp Burundi/ OR exp Cape Verde/ OR exp Cameroon/ OR exp Central African Republic/ OR exp Chad/ OR exp Comoros/ OR exp Cote d'Ivoire/ OR exp Djibouti/ OR exp Congo/ OR exp Congo Democratic Republic/ OR exp Egypt/ OR exp Equatorial Guinea/ OR exp Guinea-Bissau/ OR exp Guinea/ OR exp Eritrea/ OR exp Ethiopia/ OR exp Gabon/ OR exp Gambia/ OR exp Ghana/ OR exp Kenya/ OR exp Lesotho/ OR exp Liberia/ OR exp Libya/ OR exp Madagascar/ OR exp Malawi/ OR exp Mali/ OR exp Mauritania/ OR exp Mauritius/ OR exp Morocco/ OR exp Mozambique/ OR exp Namibia/ OR exp Niger/ OR exp Nigeria/ OR exp Rwanda/ OR exp "sao tome and principe"/ OR exp Senegal/ OR exp Seychelles/ OR exp Sierra Leone/ OR exp Somalia/ OR exp South Africa/ OR exp South Sudan/ OR exp Sudan/ OR exp swaziland/ OR exp Tanzania/ OR exp Togo/ OR exp Tunisia/ OR exp Uganda/ OR exp Zambia/ OR exp Zimbabwe/ OR (Africa* OR Afriq*).ab,ti. OR (Algeri* OR Angola*).ab,ti. OR (Benin* OR Botswana* OR Motswana* OR Batswana* OR Burkina* OR Burundi*).ab,ti. OR (Cabo Verde* OR Cape Verde* OR Cap-Vert).ab,ti. OR (Camero* OR Central African Republic* OR republique centrafricaine OR Chad* OR Tchad* OR Comor* OR Cote d'Ivoire OR Ivory Coast or Ivorian*).ab,ti. OR (Djibouti OR Democratic Republic of the Congo OR Democratic Republic of the Congo OR Congo*).ab,ti. OR (Egypt* OR Equatorial Guinea* OR Guinee Equatoriale OR Equatoguinean* OR Eritrea* OR Erythree* OR eSwatini* OR Ethiop*).ab,ti. OR (Gabon* OR Gambi* OR Ghana* OR Guine*).ab,ti. OR "Kenya*".ab,ti. OR (Lesotho* OR Bathoso* OR Liberia* OR Liby*).ab,ti. OR (Madagas* OR Malawi* OR Mali* OR Maurit* OR Moroc* OR Maroc* OR Mozambi*).ab,ti. OR (Namibi* OR Niger*).ab,ti. OR (Rwanda* OR Rouanda* OR Ruanda*).ab,ti. OR (Sao* OR Senegal* OR Seychel* OR Sierra Leon* OR Somali* OR South Africa* OR Afrique du Sud OR South Sudan* OR Soudan du sud OR Sudan* OR Swazi*).ab,ti. OR (Tanzani* OR Togo* OR Republique togolaise or tunisi*).ab,ti. OR (Uganda* OR Ouganda*).ab,ti. OR (Zambi* OR Zimbabwe*).ab,ti.)

AND limit to yr="1980-Current"

d) Scopus search strategy

Search conducted March 24th 2022 – 5451 articles retrieved

HIV domain (TITLE-ABS-KEY(aids*) OR TITLE-ABS-KEY("acquired immune deficiency syndrome") OR TITLE-ABS-KEY("acquired immun?deficiency syndrome") OR TITLE-ABS-KEY("acquired immun? deficiency syndrome") OR TITLE-ABS-KEY(HIV*) OR TITLE-ABS-KEY("human immun?deficiency virus") OR TITLE-ABS-KEY("human immun? deficiency virus") OR TITLE-ABS-KEY(SIDA) OR TITLE-ABS-KEY("syndrome d'immunodeficience acquise") OR TITLE-ABS-KEY(VIH) OR TITLE-ABS-KEY("virus de l'immunodeficience humaines"))

AND MSM domain (TITLE-ABS-KEY(homosex*) OR TITLE-ABS-KEY(bisex*) OR TITLE-ABS-KEY("men who have sex with men") OR TITLE-ABS-KEY("men that have sex with men") OR TITLE-ABS-KEY("same sex") OR TITLE-ABS-KEY("same-sex") OR TITLE-ABS-KEY(gay) OR TITLE-ABS-KEY(MSM) OR TITLE-ABS-KEY(queer) OR TITLE-ABS-KEY("male sex work*") OR TITLE-ABS-KEY("male W/2 sex work*") OR TITLE-ABS-KEY("same gender") OR TITLE-ABS-KEY("same-gender") OR TITLE-ABS-KEY("meme sex*") OR TITLE-ABS-KEY("meme genre*") OR TITLE-ABS-

KEY(HRSH) OR TITLE-ABS-KEY("hommes qui ont des relations sexuelles avec des hommes") OR TITLE-ABS-KEY("sexual minority men") OR TITLE-ABS-KEY("sexual and gender minority men"))

AND Africa domain (TITLE-ABS-KEY(africa*) OR TITLE-ABS-KEY(afriq*) OR TITLE-ABS-KEY(algeri*) OR TITLE-ABS-KEY(angola*) OR TITLE-ABS-KEY(benin*) OR TITLE-ABS-KEY(botswana*) OR TITLE-ABS-KEY(motswana*) OR TITLE-ABS-KEY(batswana*) OR TITLE-ABS-KEY(burkina*) OR TITLE-ABS-KEY(burundi*) OR TITLE-ABS-KEY("Cabo Verde*") OR TITLE-ABS-KEY("Cape Verde*") OR TITLE-ABS-KEY("Cap-Vert") OR TITLE-ABS-KEY(Camero*) OR TITLE-ABS-KEY("Central African Republic*") OR TITLE-ABS-KEY("republique centrafricaine") OR TITLE-ABS-KEY(chad*) OR TITLE-ABS-KEY(tchad*) OR TITLE-ABS-KEY(comor*) OR TITLE-ABS-KEY("cote d'ivoire") OR TITLE-ABS-KEY("ivory coast") OR TITLE-ABS-KEY(ivorian*) OR TITLE-ABS-KEY(djibouti*) OR TITLE-ABS-KEY("democratic republic of the congo") OR TITLE-ABS-KEY(congo*) OR TITLE-ABS-KEY(egypt*) OR TITLE-ABS-KEY("equatorial guinea*") OR TITLE-ABS-KEY("guinee equatoriale") OR TITLE-ABS-KEY(equatoguinean*) OR TITLE-ABS-KEY(eritrea*) OR TITLE-ABS-KEY(erythree*) OR TITLE-ABS-KEY(ethiop*) OR TITLE-ABS-KEY(gabon*) OR TITLE-ABS-KEY(gambi*) OR TITLE-ABS-KEY(ghana*) OR TITLE-ABS-KEY(guine*) OR TITLE-ABS-KEY(kenya*) OR TITLE-ABS-KEY(lesotho*) OR TITLE-ABS-KEY(bathoso*) OR TITLE-ABS-KEY(liberia*) OR TITLE-ABS-KEY(liby*) OR TITLE-ABS-KEY(madagas*) OR TITLE-ABS-KEY(malawi*) OR TITLE-ABS-KEY(mali*) OR TITLE-ABS-KEY(maurit*) OR TITLE-ABS-KEY(moroc*) OR TITLE-ABS-KEY(maroc*) OR TITLE-ABS-KEY(mozambi*) OR TITLE-ABS-KEY(namibi*) OR TITLE-ABS-KEY(niger*) OR TITLE-ABS-KEY(rwanda*) OR TITLE-ABS-KEY(rouanda*) OR TITLE-ABS-KEY(ruanda*) OR TITLE-ABS-KEY(sao*) OR TITLE-ABS-KEY(senegal*) OR TITLE-ABS-KEY(seychel*) OR TITLE-ABS-KEY("sierra leone*") OR TITLE-ABS-KEY(somali*) OR TITLE-ABS-KEY("south africa*") OR TITLE-ABS-KEY("afrique du sud") OR TITLE-ABS-KEY("south sudan*") OR TITLE-ABS-KEY("soudan du sud") OR TITLE-ABS-KEY(sudan*) OR TITLE-ABS-KEY(soudan*) OR TITLE-ABS-KEY(swazi*) OR TITLE-ABS-KEY(eswatini) OR TITLE-ABS-KEY(tanzani*) OR TITLE-ABS-KEY(togo*) OR TITLE-ABS-KEY(tunisi*) OR TITLE-ABS-KEY("republique togolaise") OR TITLE-ABS-KEY(uganda*) OR TITLE-ABS-KEY(ouganda*) OR TITLE-ABS-KEY(zambi*) OR TITLE-ABS-KEY(zimbabwe*))

AND PUBYEAR > 1979

e) Web of Science search strategy
Search conducted March 24th 2022 – 4232 articles retrieved

HIV domain (TS = (AIDS* or "acquired immune deficiency syndrome" or "acquired immun?deficiency syndrome" or "acquired immun? deficiency syndrome" or HIV* or "human immun?deficiency virus" or "human immun? deficiency virus" or SIDA or "syndrome d'immunodeficience acquise" or VIH or "virus de l'immunodeficience humaine"))

AND MSM domain (TS = (homosex* or bisex* or "men who have sex with men" or "men that have sex with men" or "same sex" or "same-sex" or "same gender" or "same-gender" or gay or MSM or queer or "male sex work*" or male near/2 "sex work*" or "meme sex*" or "meme genre*" or "harsh" or "hommes qui ont des relations sexuelles avec des hommes" or "sexual minority men" or "sexual and gender minority men"))

AND Africa domain (TS = (Africa* or afriq* or algeri* or angola* or benin* or botswana* or motswana* or batswana* or burkina* or burundi* or "cabo verde*" or "cap-vert*" or "cape verde*" or camero* or "central african republic*" or "republique centrafricaine" or chad* or tchad* or comor* or "cote d'ivoire" or "ivory coast" or ivorian* or djibouti* or "democratic republic of the congo" or congo* or egypt* or "equatorial guinea*" or "guinee equatoriale" or equatoguinean* or eritrea* or erythree* or ethiop* or gabon* or gambi* or ghana* or guine* or kenya* or lesotho* or bathoso* or liberia* or liby* or madagas* or malai* or mali* or maurit* or moroc* or maroc* or mozambi* or namibi* or niger* or rwanda* or rouanda* or ruanda* or sao* or senegal* or seychel* or "sierra leone*" or somali* or "south africa*" or "afrique du sud" or "south sudan*" or "soudan du sud" or sudan* or soudan* or swazi* or eswatini* or tanzani* or togo* or tunisi* or uganda* or ouganda* or zambi* or zimbabwe*))

AND Timespan=1980-2022

Text S1. Including respondent driven sampling-adjusted HIV testing and treatment cascade proportions which accounted for sampling design

To derive the estimated proportion of HIV testing and treatment cascade outcomes in R requires specifying the numerator (n) and denominator (N) of observations before pooling. As pooling does not account for design effect, we conducted extra steps to be able to include observations from respondent-driven sampling (RDS) and time-location or cluster sampling studies that reported weighted proportions adjusted for sampling design, which typically have a wider confidence interval than the corresponding crude proportion (n/N), due to the design effect). In practice, this only applied to RDS studies.

To include RDS-adjusted observations that accounted for sampling design in our meta-regression analyses, we extracted the RDS-adjusted proportion (p_{rds}) and the RDS-adjusted 95% confidence interval ($95\%CI_{rds}$) from studies that reported them. We then used these to obtain an estimate of the design effect (DE_{rds}), which we calculated from the ratio of variances of the RDS-adjusted proportion and the simple random sample (SRS) proportion for each adjusted observation reported. We then used the design effect to derive the effective sample size, including estimates of the numerator (n_{rds}) and denominator (N_{rds}), which were included in our meta-regression analyses.

To estimate the effective numerator and denominator of adjusted observations and their 95%CI reported in RDS studies, we used the information on n, N, p_{rds}, and $95\%CI_{rds}$ and performed the following steps:

1) Derive the variance of the RDS-adjusted proportion from the $95\%CI_{rds}$:

$$\mathrm{var}_{\mathrm{rds}} = \left(\frac{p_{\mathrm{rds\_uci}} - p_{\mathrm{rds\_lci}}}{3.92}\right)^2$$

where var_{rds} is the variance of the RDS-adjusted proportion accounting for sampling design and p_{rds_uci} and p_{rds_lci} are the upper and lower confidence limits of the $95\%CI_{rds}$.

2) Derive the variance of the SRS proportion, using the RDS-adjusted proportion and the crude sample size, N:

$$\mathrm{var}_{\mathrm{srs}} = \frac{p_{\mathrm{rds}} \times (1 - p_{\mathrm{rds}})}{N}$$

where var_{srs} is the variance of the RDS proportion not accounting for sampling design (as in a simple random sample).

3) Derive the design effect (the ratio of the variances of the RDS-adjusted and SRS proportions):

$$\mathrm{DE}_{\mathrm{rds}} = \frac{\mathrm{var}_{\mathrm{rds}}}{\mathrm{var}_{\mathrm{srs}}}$$

where DE_{rds} is the design effect.

4) Derive the effective sample size from the crude sample size and the design effect:

$$N_{\mathrm{rds}} = \frac{N}{\mathrm{DE}_{\mathrm{rds}}}$$

where N_{rds} is the effective sample size/denominator.

5) Finally, derive the effective numerator for the RDS-adjusted observations:

$$n_{\text{rds}} = N_{\text{rds}} \times p_{\text{rds}}$$

6) Use n_{rds} and N_{rds} in the meta-regression analyses

Text S2. Calculations to standardize proportions of viral suppression to a viral threshold of <1000 copies per mL

We standardized proportions of viral suppression to a threshold of below 1000 copies per mL, which is the viral threshold specified in the 2016 World Health Organization Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection.[1]

For study observations of viral suppression that used different viral thresholds, we estimated the proportion at a threshold of <1000 copies per mL using the following formula based on the reverse Weibull distribution, used as the default for standardizing viral load measurements by the UNAIDS Reference Group on Estimates, Modelling and Projections:[2]

$$p_1 = p_0^{\left(\frac{6-\log_{10} 1000}{6-\log_{10} t_0}\right)^{\phi}}$$

Where p_1 is the proportion of viral suppression at the WHO threshold of <1000 copies per mL, p_0 is the proportion originally reported by the study when the threshold used differed from 1000, t_0 is the viral threshold originally used by the study (e.g., if the threshold used was <200 copies per mL, t_0=200), and ϕ is the region-specific shape parameter for the reverse Weibull distribution, extracted from Johnson et al., 2021.[2]

Text S3. Details of model specifications of generalized linear mixed effects models for meta-regression by study year

Depending on the outcomes, either Bayesian logistic or Poisson generalized mixed effects model (GLMM) are used. These are detailed below.

Binomial regression model for proportions

For HIV testing, knowledge of status, current ART use, and viral suppression outcomes among men who have sex with men (MSM) in Africa, we used a binomial regression model. It takes the following form:

$$y_i \sim \text{Binomial}(n_i, \theta_i)$$

$$\text{logit}(\theta_i) = a_i + b_i$$

Where y_i is the number of MSM with the outcome (e.g., ever or recently testing for HIV, who know their status, currently on ART, or virally suppressed) in study *i*. These are assumed to follow a binomial distribution with sample size n_i and proportion θ_i, in study *i*. The logit-transformed proportion θ_i is modeled as the sum of study-specific intercepts a_i, and the time trend b_i.

$$a_i = \alpha_g + \alpha_{r[i]} + \alpha_{c[i]} + \alpha_{s[i]}$$

The random intercept a_i for study *i*, corresponds to the sum of the global intercept α_g, the region-level intercept $\alpha_{r[i]}$ for region *r*, the country-level intercept $\alpha_{c[i]}$ for country *c*, and the survey-specific intercept $\alpha_{s[i]}$ for survey *s*.

$$b_i = (\beta_g + \beta_{r[i]} + \beta_{c[i]}) X_i$$

The time trend b_i for study *i* is modeled as a random slope. It corresponds to the sum of the global time trend β_g, the region-level time trend $\beta_{r[i]}$, and the country-level time trend $\beta_{c[i]}$. These coefficients are then multiplied by the mean-centered calendar year of the study's midpoint X_i.

The model's specification is complemented with the following prior distributions. We assumed that the global intercept parameter, α_g, and global slope parameter, β_g, follow normal distributions. We used weakly informative prior distributions for the country-level and region-level variance parameters of the random intercepts and random slopes, assuming half-normal distributions, and selected the hyperparameters such that the variance was higher across regions than countries, as we expect outcomes to be more similar with countries than within regions. We allowed for correlations between random intercepts and slopes using multivariate normal distributions, and used weakly informative Lewandowski-Kurowicka-Joe (LKJ) priors for the Cholesky factors, R_c and R_r of the correlation matrices that specify the country-level and region-level variance-covariance matrices Σ_c, and Σ_r.[3] The LKJ-prior has a scale parameter, ζ, that modifies the strength of the correlations. If $\zeta = 1$, the density is uniform over correlation matrices. If $\zeta > 1$, there is a sharper peak in the density for larger values of ζ. If $0 < \zeta < 1$, the distribution is U-shaped, giving higher probabilities for non-zero correlations.

$$\alpha_s \sim \text{Normal}(0, \sigma_s)$$

$$\begin{bmatrix} \alpha_c \\ \beta_c \end{bmatrix} \sim \text{MVNormal}(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \Sigma_c)$$

$$\begin{bmatrix} \alpha_r \\ \beta_r \end{bmatrix} \sim \text{MVNormal}(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \Sigma_r)$$

$$\alpha_g \sim \text{Normal}(0, 2)$$

$$\beta_g \sim \text{Normal}(0, 1)$$

$$\sigma_s \sim \text{HalfNormal}(0, 1)$$

$$\sigma_{\alpha_c}, \sigma_{\beta_c} \sim \text{HalfNormal}(0, 1)$$

$$\sigma_{\alpha_r}, \sigma_{\beta_r} \sim \text{HalfNormal}(0, 0.5)$$

$$R_c, R_r \sim \text{LKJ}(1)$$

$$\Sigma_c = \begin{bmatrix} \sigma_{\alpha_c} & 0 \\ 0 & \sigma_{\beta_c} \end{bmatrix} * R_c * \begin{bmatrix} \sigma_{\alpha_c} & 0 \\ 0 & \sigma_{\beta_c} \end{bmatrix}$$

$$\Sigma_r = \begin{bmatrix} \sigma_{\alpha_r} & 0 \\ 0 & \sigma_{\beta_r} \end{bmatrix} * R_r * \begin{bmatrix} \sigma_{\alpha_r} & 0 \\ 0 & \sigma_{\beta_r} \end{bmatrix}$$

Poisson regression model for counts

For the meta-regression models of HIV incidence rates among MSM in Africa, the model takes the following form:

$$y_i \sim \text{Poisson}(\lambda_i)$$

$$\log(\lambda_i) = a_i + b_i + \log(\delta_i)$$

Where y_i is the number of HIV acquisitions occurring over follow-up in study i, that are Poisson distributed. The log-transformed incidence rate λ_i is modeled as the sum of study-specific intercepts a_i, the time trend b_i, and the offset $\log(\delta_i)$ which corresponds to the log-transformed person-years for study i. The remainder of the model follows the same specification as above. The model's specification is complemented with the following prior distributions.

$$\alpha_s \sim \text{Normal}(0, \sigma_s)$$

$$\begin{bmatrix} \alpha_c \\ \beta_c \end{bmatrix} \sim \text{MVNormal}(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \Sigma_c)$$

$$\begin{bmatrix} \alpha_r \\ \beta_r \end{bmatrix} \sim \text{MVNormal}(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \Sigma_r)$$

$$\alpha_g \sim \text{Normal}(0, 10)$$

$$\beta_g \sim \text{Normal}(0, 1)$$

$$\sigma_s \sim \text{HalfNormal}(0, 1)$$

$$\sigma_{\alpha_c}, \sigma_{\beta_c} \sim \text{HalfNormal}(0, 1)$$

$$\sigma_{\alpha_r}, \sigma_{\beta_r} \sim \text{HalfNormal}(0, 0.5)$$

$$R_c, R_r \sim \text{LKJ}(1)$$

$$\Sigma_c = \begin{bmatrix} \sigma_{\alpha_c} & 0 \\ 0 & \sigma_{\beta_c} \end{bmatrix} * R_c * \begin{bmatrix} \sigma_{\alpha_c} & 0 \\ 0 & \sigma_{\beta_c} \end{bmatrix}$$

$$\Sigma_r = \begin{bmatrix} \sigma_{\alpha_r} & 0 \\ 0 & \sigma_{\beta_r} \end{bmatrix} * R_r * \begin{bmatrix} \sigma_{\alpha_r} & 0 \\ 0 & \sigma_{\beta_r} \end{bmatrix}$$

Text S4. Calculations to population-weight pooled estimates based on the population size of MSM in each country

For these calculations, we assumed that MSM comprise the same proportion of all adult men in each country.

We calculated population-weighted pooled estimates, by region of Africa, for each outcome as follows:

1) For each iteration of the model, we predicted the estimated outcome of e.g., the proportion of MSM ever tested for HIV in each country, in each year
2) We then multiplied the proportion for each iteration by the population size of MSM in the relevant country and year, to give the estimated number of MSM ever tested for HIV in each iteration, for each country and year
3) We then summed the numbers of MSM ever tested across all countries, by iteration and year, to give the numerator of the population-weighted estimate in each iteration and year
4) We then summed the total number of MSM across countries, by iteration and year, to give the denominator of the population-weighted estimate in each iteration and year
5) We then divided the numerator by the denominator, by iteration and year, to calculate the population-weighted pooled estimate for the region for each iteration and year

Finally, we summarized the median and 95% credible interval of the population-weighted proportions across all iterations, by year, to give the population-weighted pooled regional estimates in each year.

Text S5. Study quality assessment tool

Criteria used to assess the quality and risk of bias of included studies
1) **Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 points)**
a) RDS/cluster/time-location sampling with or without statistical adjustment for study design, or snowball/chain-referral sampling (1 point)
b) Convenience or purposive sampling (0 points)
c) Sampling strategy not described (0 points)
2) **Statistical adjustment of outcomes for complex survey design (maximum 1 point)**
a) Observations of outcome adjusted for complex sampling design (e.g., RDS-adjusted observations; 1 point)
b) Crude observations available only (0 points)
3) **Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)**
a) Eligibility criteria designed to recruit a representative sample of MSM participants from the 'general' population of MSM (e.g., not only MSM who are behaviourally vulnerable to HIV (e.g., male sex workers, PWID), or definition of MSM based on sexual behaviour with another man over recall periods >3 months; 1 point)
b) Study recruited a selected sample of MSM participants or eligibility criteria led to more selected sample of MSM (e.g., MSM who are behaviourally vulnerable to HIV (e.g., male sex workers, PWID), definitions of MSM based on anal sex over recall periods <3 months; 0 points)
c) Eligibility criteria not described (0 points)
4) **Inclusion of transgender women in the study definition of MSM (maximum 1 point)**
a) Study did not define transgender women as MSM, or outcome(s) were disaggregated and available among only MSM (1 point)
b) Transgender women were defined as MSM, or outcomes were not disaggregated (0 points)
c) Unclear whether transgender women were included as MSM (0 points)
5) **Risk of misclassification in ascertainment of the relevant outcome(s) reported (maximum 1 point)**
a) Confirmed using biomarkers (for incidence and viral suppression outcomes; 1 point)
b) Self-report in confidential interview (for all other outcomes; e.g., ACASI, CAPI, SAQ, PBS; 1 point)
c) Self-report in face-to-face interview (0 points)
d) Ascertainment method not described (0 points)
ACASI, audio computer-assisted self-interview; CAPI, computer-assisted personal interview; MSM, gay, bisexual, and other men who have sex with men; PBS, pooling booth survey; PWID, people who inject drugs; RCT, randomized controlled trial; RDS, respondent driven sampling; SAQ, self-administered questionnaire.

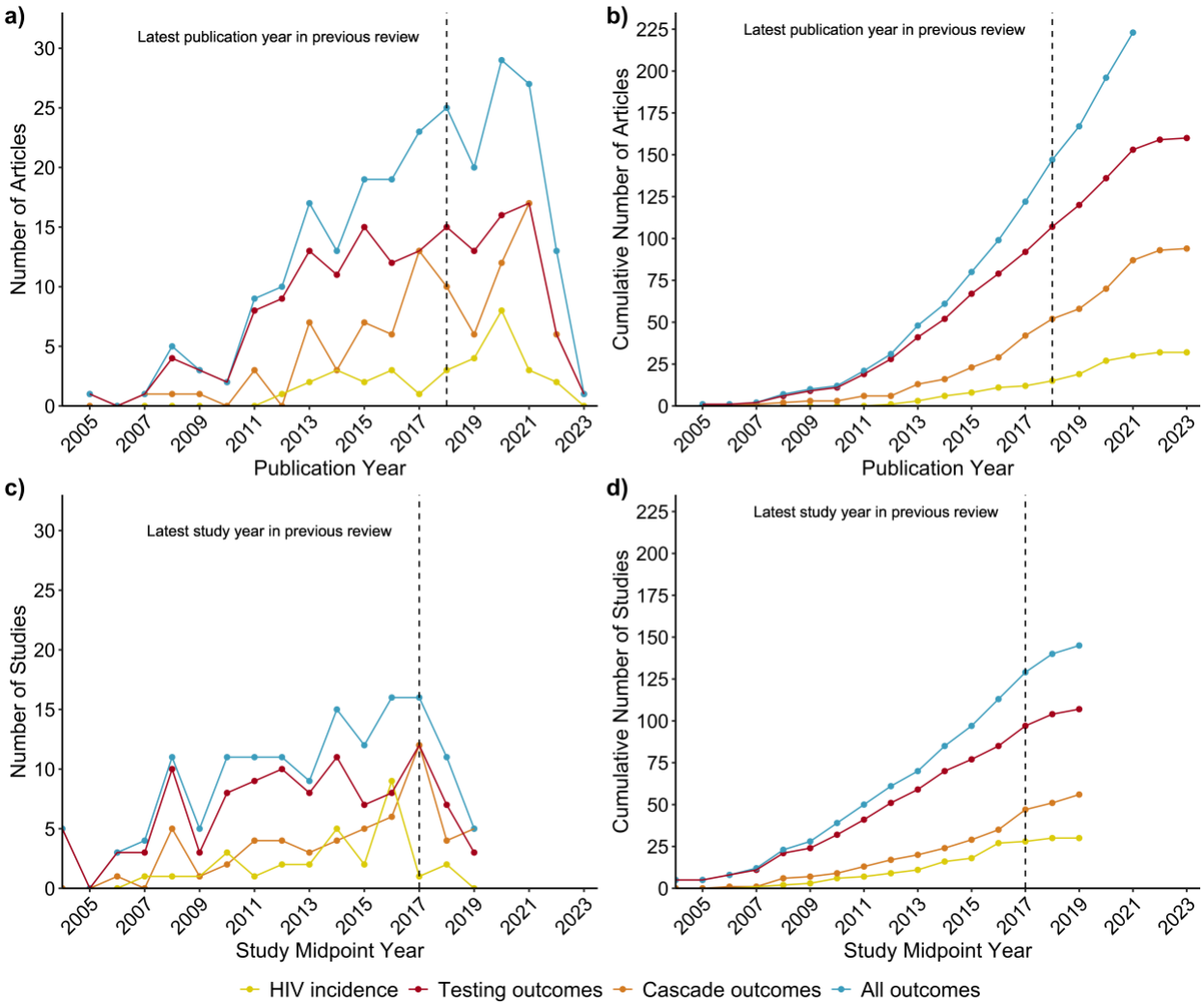

Figure S1. Number of articles and studies over time.

(a) The number of unique research articles published over time (by publication year), (b) the cumulative number of unique research articles published over time (by publication year), (c) the number of unique studies conducted over time (by study midpoint year), and (d) the cumulative number of studies conducted over time (by study midpoint year) included in our review reporting HIV incidence rates (yellow lines), HIV testing outcomes (red lines), and HIV treatment cascade outcomes (orange lines). In 5 studies, the study year was not reported. The dashed lines represent our previous systematic review.

Table S2. Characteristics of unique studies included in our analyses and outcomes reported.

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Central Africa																					
Lillie 2021[4]	general	sex with men in the past 12 months	N	363	Burundi	NR	30	2018	CS	convenience	FTFI	25.1%	12.4%	6	NR	NR	NR	NR	NR	NR	NR
Coulaud 2016[5]	selected population - lower vulnerability	MSM engaged in prevention activities	N	51	Burundi	23	25	2014	CS	convenience	SAQ	96·1%	86·3% 86·3% 68·6%	12 6 3	NR	NR	NR	NR	NR	NR	NR
Lyons 2023[6], Bowring 2019[7], Rao 2017[8]	general	anal sex with men in the past 12 months	Y	1323	Cameroon	23	28	2016	CS	RDS	FTFI	72.4%	55.1%	12	42.3%	NR	66.1% (HIV aware MSM)	Ever	38.2% (MSM living with HIV) 90.4% (HIV aware MSM)	1000 1000	NR NR
Rao 2017[8]	general	anal sex with men in the past 12 months	Y	259	Cameroon	NR	31	2013	CS	snowball	FTFI	NR	88.7%	12	NR	NR	NR	NR	NR	NR	NR
Holland 2015[9], Park 2014[10]	general	anal or oral sex with men in the past 12 months	Y	511	Cameroon	24	26	2011	CS	RDS	FTFI	80.8%	59.8%	12	NR	NR	NR	NR	NR	NR	NR
Lorente 2012[11]	general	ever sex with men	Y	174	Cameroon	25	NR	2008	CS	snowball	FTFI	81.2%	NR	NR	NR	NR	NR	NR	NR	NR	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Mbeko Simaleko 2020[12]	NR	NR	NR	202	Central African Republic	NR	NR	2015	prospective cohort	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	5.0 py-100
Mbeko Simaleko 2018[13]	selected population - higher vulnerability	identified as MSM by peers	NR	99	Central African Republic	NR	24	2011	prospective cohort	purposive	FTFI	NR	NR	NR	NR	NR	NR	NR	NR	NR	9.4 py-100
Gresenguet 2017[14], Longo 2018[15], Boussa 2018[16]	selected population - higher vulnerability	identified as MSM by peers	Y	396	Central African Republic	23	23	2010	CS	purposive	FTFI	9.1%	NR	NR	NR	NR	34.5% (MSM living with HIV)	Current	NR	NR	NR
Eastern Africa																					
Bhattacharjee 2020[17]	general	anal or oral sex with men in the past 12 months	Y	1200	Kenya	23	28	2019	CS	cluster	FTFI	97.0%	85.1%	12	37.8%	32.8% (registered in HIV treatment and care centre)	32.3% (MSM living with HIV); 85.5% (HIV aware MSM)	Current	NR	NR	NR
													71.8%	6			32.8% (MSM living with HIV); 86.8% (HIV aware MSM)	Ever			
													60.3%	3							
Dijkstra 2021[18]	general	anal or oral sex in with men the	Y	452	Kenya	26	NR	2019	CS	convenience	FTFI	94.8%	70.3%	12	46.4%	NR		Current		50	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
		past 6 months or sex with partner living with HIV											7.0%	3			44.6% (MSM living with HIV); 96.2% (HIV aware MSM)		37.5% (MSM living with HIV); 87.5% (MSM currently on ART)		
Graham 2022[19]	selected population - higher vulnerability	three or more male partners, condomless anal sex with partner living with HIV, transactional sex, PWID	NR	157	Kenya	27	NR	2018	prospective cohort (Anza Mapema Mbili)	purposive	ACASI	NR	NR	NR	NR	NR	NR	NR	NR	NR	$1.3^{py\text{-}100}$
Wahome 2020[20], Wahome 2020[21], Sanders 2013[22]	selected population - higher vulnerability	anal sex with men in the past 3 months	NR	170	Kenya	25	29	2018	prospective cohort	purposive/ snowball	FTFI	NR	NR	NR	NR	NR	NR	NR	NR	NR	$3.9^{py\text{-}100}$
Smith 2021[23], Smith 2021[24], Fearon 2020[25]	general	anal or oral sex with men in the past 12 months	Y	761	Kenya	24	28	2017	CS	RDS	SAQ	93.9%	59.2%	6	73.7%	73.4% (currently engaged in care)	65.3% (MSM living with HIV); 86.9% (HIV aware MSM)	Current	60.2% (MSM living with HIV); 68.8% (HIV aware MSM); 79.2% (MSM currently on ART)	1000 or NR	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Kunzweiler 2019[26], Kunzweiler 2018[27], Korhonen 2018[28], Kunzweiler 2017[29]	general	anal or oral sex with men in the past 6 months	Y	1476 (knowledge of status), 711 (ART use and viral suppression)	Kenya	24-27	26-32	2016	prospective cohort baseline	snowball	ACASI	NR	NR	NR	17.9%	NR	2.7% (MSM living with HIV); 9.5% (HIV aware MSM)	Ever	31.1% (MSM living with HIV); 33.3% (HIV aware MSM); 30.6% (MSM currently on ART)	1000	NR
																	12.7% (MSM living with HIV); 44.4% (HIV aware MSM)	Current			
Palumbo 2021[30], Sandfort 2021[31], Sivay 2021[32], Sandfort 2019[33], Zhang 2018[34], Fogel 2018[35]	selected population - higher vulnerability	ever sex with men	Y	85	Kenya	NR	28	2016	prospective cohort (HPTN 075)	snowball/ convenience	FTFI/CASI	95.3%	87.0%	12	82.1%	NR	67.9% (MSM living with HIV); 82.6% (HIV aware MSM)	Current	50% (MSM living with HIV)	400	$3.7^{py\text{-}100}$
													75.7%	6							

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Kimani 2019[36]	general	NR	Y	168	Kenya	NR	26	2016	prospective cohort	purposive	FTFI	NR	NR	NR	NR	NR	NR	NR	NR	NR	3.7 py-100
Graham 2020[37]	selected population - higher vulnerability	sex with men in the past 12 months	Y	60	Kenya	NR	31	2015	RCT baseline	purposive	FTFI	NR	NR	NR	NR	NR	55% (HIV aware MSM)	Ever	54.7% (HIV aware MSM)	40	NR
Nyblade 2017[38]	selected population - higher vulnerability	male sex workers	NR	232	Kenya	NR	26	2015	CS	RDS	FTFI	86.2%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Shangani 2017[39]	general	anal or oral sex in with men the past 6 months	Y	89	Kenya	NR	29	2014	CS	snowball	FTFI	NR	74.2%	12	NR	NR	NR	NR	NR	NR	NR
Musyoki 2018[40], Bhattacharjee 2015[41]	general	NR	Y	1308	Kenya	NR	26	2014	CS	cluster	PBS	91.8%	73.7%	3	NR	NR	NR	NR	NR	NR	NR
Wahome 2020[20], Wahome 2020[21], Wahome 2018[42], Moller 2015[43], Kamali 2015[44], Sanders 2013[22], Price 2012[45]	selected population - higher vulnerability	anal sex with men in the past 3 months	Y	561 (ever test), 726 (incidence)	Kenya	25	26	2008	prospective cohort	convenience	FTFI	47.4%	NR	NR	NR	NR	NR	NR	NR	NR	8.2 py-100 (2005-2008); 6.9 py-100 (2009-2012)
Muraguri 2022[46]	selected population - higher vulnerability	male sex workers	NR	282	Kenya	26	NR	2013	CS	RDS	FTFI	72.3%	70.6%	12	NR	NR	NR	NR	NR	NR	NR
Githuka 2014[47]	general	ever sex with men	NR	25	Kenya	NR	NR	2012	CS	cluster	FTFI	61.3%	NR	NR	NR	NR	NR	NR	NR	NR	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Mdodo 2016[48]	selected population - higher vulnerability	sex with men and either STI, anal sex with more than 2 partners in the past 12 months or HIV+ partner	NR	97	Kenya	NR	NR	2010	prospective cohort	snowball	ACASI/ CAPI	NR	NR	NR	NR	NR	NR	NR	NR	NR	1.0 py-100
Muraguri 2015[49]	general	anal or oral sex with men in the past 6 months	Y	563	Kenya	NR	30	2010	CS	RDS	FTFI	71.4%	47.6%	12	34.0%	NR	NR	NR	NR	NR	NR
McKinnon 2013[50]	selected population - higher vulnerability	male sex workers	NR	507	Kenya	27	NR	2010	prospective cohort	snowball/ convenience	FTFI	85.8%	NR	NR	NR	NR	NR	NR	NR	NR	10.9 py-100
Luchters 2011[51]	selected population - higher vulnerability	male sex workers	Y	442	Kenya	NR	25	2008	CS	time-venue	FTFI	64.0%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Graham 2013[52]	selected population - higher vulnerability	ever sex with men or sex during follow-up	Y	108	Kenya	NR	30	2008	prospective cohort baseline	snowball	FTFI/ ACASI	NR	NR	NR	NR	15.2% (currently in care)	6.8% (MSM living with HIV)	Ever	NR	NR	NR
Kamali 2015[44], Price 2012[45]	selected population - higher vulnerability	NR	NR	303	Kenya	NR	NR	2007	prospective cohort	snowball/ convenience	FTFI	NR	NR	NR	NR	NR	NR	NR	NR	NR	7.8 py-100 (2006); 5.1 py-100 (2006-2009)

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Sanders 2007[53]	selected population - higher vulnerability	anal sex with men in the past 3 months	Y	285	Kenya	27	29	2006	prospective cohort baseline	convenience	FTFI	25.3%	NR	NR	10.0%	NR	NR	NR	NR	NR	NR
Gebrebrhan 2021[54]	selected population - higher vulnerability	ever sex with men	Y	70	Kenya	28	NR	NR	CS	convenience	NR	NR	NR	NR	NR	NR	67.7% (MSM living with HIV)	Current	41.9% (MSM living with HIV); 72.2% (MSM currently on ART)	40	NR
Rucinski 2022[55]	general	NR	NR	303	Malawi	27	NR	2018	retrospective cohort baseline	convenience	NR	NR	NR	NR	NR	55.4% (ART initiation within 30 days of diagnosis)	NR	NR	NR	NR	NR
Herce 2018[56]	general	self-identified as gay or bisexual or ever anal sex with men	N	119	Malawi	NR	NR	2017	CS	time-venue	FTFI	74.8%	NR	NR	50.0%	NR	NR	NR	NR	NR	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Palumbo 2021[30], Sandfort 2021[31], Sivay 2021[32], Sandfort 2019[33], Zhang 2018[34], Fogel 2018[35]	selected population - higher vulnerability	ever sex with men	Y	83	Malawi	NR	28	2016	prospective cohort (HPTN 075)	snowball/ convenience	FTFI/ CASI	89.3%	74.6% 60.7%	12 6	48.1%	NR	37.0% (MSM living with HIV); 76.9% (HIV aware MSM)	Current	14.3% (MSM living with HIV)	400	1.3[py-100]
Wirtz 2017[57], Poteat 2017[58], Stahlman 2016[59], Wirtz 2015[60], Wirtz 2013[61]	general	anal or oral sex with men in the past 12 months	Y	422 (CS); 103 (cohort)	Malawi	24-25	27	2013	CS and prospective cohort	RDS	FTFI	45.9%	24.9%	12	9.0%	NR	0.8% (MSM living with HIV); 19.1% (HIV aware MSM)	Ever	NR	NR	8.8[py-100] (2012); 0[py-100] (2012-2013); 0[py-100] (2013)
Fay 2011[62], Beyrer 2010[63], Baral 2009[64]	general	ever anal sex with men	Y	202	Malawi	25	26	2008	CS	snowball	FTFI	35.2%	NR	NR	4.7%	NR	NR	NR	NR	NR	NR
Ntata 2008[65]	general	NR	NR	97	Malawi	NR	27	2006	CS	snowball	FTFI	58.8%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Adam 2009[66]	NR	NR	NR	50	Mauritius	NR	NR	2004	NR	NR	NR	NR	16.0%	12	NR	NR	NR	NR	NR	NR	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Boothe 2021[67], Boothe 2021[68], Sathane 2016[69], Horth 2015[70]	general	anal or oral sex with men in the past 12 months	Y	1412	Mozambique	NR	22	2011	CS	RDS	FTFI	60.7%	38.0%	12	8.8%	6.1% (ever linked to care)	3.5% (MSM living with HIV)	Ever	NR	NR	NR
																	3.5% (MSM living with HIV)	Current			
Lyons 2023[6]; Twahirwa Rwema 2020[71]	general	anal sex with men in the past 12 months	Y	736	Rwanda	NR	27	2018	CS	RDS	FTFI	91.0%	NR	NR	60.8%	NR	59.6% (MSM living with HIV); 97.8% (HIV aware MSM)	Current	44.6% (MSM living with HIV); 73.3% (HIV aware MSM); 75% (MSM currently on ART)	200	NR
Ntale 2019[72]	general	anal or oral sex with men in the past 12 months	NR	504	Rwanda	23	NR	2015	CS	snowball	FTFI	NR	76.4%	12	NR	NR	NR	NR	NR	NR	NR
Chapman 2011[73]	general	anal or oral sex with men in the past 12 months	Y	99	Rwanda	26	24	2009	CS	snowball	FTFI	62.5%	NR	NR	NR	NR	NR	NR	NR	NR	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Ross 2018 [74]	general	ever sex with men	NR	231	Tanzania	26	26	2015	CS	convenience	FTFI	100.0%	78.8%	6	NR	NR	NR	NR	NR	NR	NR
Mmbaga 2018[75]	general	has sex with men	Y	753	Tanzania	NR	27	2014	CS	RDS	FTFI	62.7%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Ahaneku 2016[76], Romijnders 2016[77], Anderson 2015[78], Ross 2014[79]	general	sex with another man in the past 6 months	Y	300	Tanzania	23	24	2012	CS	RDS	SAQ	77.7%	NR	NR	8.1%	NR	NR	NR	NR	NR	NR
Mmbaga 2012[80]	general	occasionally or regularly has sex with men	NR	150	Tanzania	NR	21	2011	CS	RDS	FTFI	53.3%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Khatib 2017[81]	selected population - higher vulnerability	anal sex with men in the past 3 months	Y	344	Tanzania	32	36	2011	CS	RDS	FTFI	68.2%	55.3%	12	NR	NR	NR	NR	NR	NR	NR
Nyoni 2013[82], Nyoni 2012[83]	general	ever sex with men	Y	271	Tanzania	24	26	2009	CS	RDS	FTFI	60.5%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Khatib 2017[81], Dahoma 2011[84], Johnston 2010[85]	selected population - higher vulnerability	anal sex with another man in the past 3 months	Y	509	Tanzania	31	32	2007	CS	RDS	FTFI	18.8%	11.3%	12	NR	NR	NR	NR	NR	NR	NR

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Magesa 2014[86]	general	ever anal sex with men plus "feminine-like characteristics"	Y	50	Tanzania	NR	26	NR	CS	snowball	FTFI	84.0%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Okoboi 2021[87], Okoboi 2020[88]	general	NR	NR	297	Uganda	28	NR	2018	CS	snowball/ convenience	FTFI	70.3%	NR	NR	25.0%	NR	NR	NR	NR	NR	NR
Wanyenze 2016[89]	general	self-identified MSM	Y	85	Uganda	NR	24	2013	CS	snowball	FTFI	89.4%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hladik 2017[90]	general	anal sex with men in the past 6 months	Y	607	Uganda	23	25	2013	CS	RDS	ACASI	65.1%	70.9%	12	20.2%	NR	15.2% (MSM living with HIV); 75% (HIV aware MSM)	Current	21.5% (MSM living with HIV); 50% (HIV aware MSM); 58.3% (MSM currently on ART)	1000	NR
Robb 2016[91]	selected population - higher vulnerability	sex with 3 or more partners, or HIV+ partner, in the past 3 months	NR	187	Uganda	NR	NR	2012	prospective cohort	convenience	ACASI	NR	NR	NR	NR	NR	NR	NR	NR	NR	$3.6^{py\text{-}100}$
Hladik 2012[92]	selected population - higher vulnerability	anal sex with men in the past 3 months	Y	295	Uganda	25	NR	2008	CS	RDS	ACASI	43.4%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Raymond 2009[93], Kajubi 2008[94]	general	self-identifying as gay or bisexual	Y	224	Uganda	NA	24	2004	CS	RDS	FTFI	24.0%	23.7%	6	NR	NR	NR	NR	NR	NR	NR

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Parmley 2022[95], Parmley 2022[96], Harris 2022[97]	general	anal or oral sex with men in the past 12 months	Y/N	1194	Zimbabwe	25	26	2019	CS	RDS	FTFI	84.8%	NR	NR	72.6%	NR	70.2% (MSM living with HIV); 96.7% (HIV aware MSM)	Current	61.5% (MSM living with HIV); 74.8% (HIV aware MSM); 86.8% (MSM currently on ART)	1000	NR
Virkud 2020[98]	general	sex with men in the past 12 months	NR	183	Kenya, Rwanda, Tanzania, Uganda	NR	NR	2016	CS	convenience	FTFI	NR	67.3%	122	NR	NR	NR	NR	NR	NR	NR
Northern Africa																					
Elmahy 2018[99]	general	self-identifying as gay or bisexual	Y	461	Egypt	NR	27	2016	CS	online	SAQ	34·5%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Valadez 2013[100]	general	anal sex with another man in the past 6 months	Y	227	Libya	NR	24	2010	CS	RDS	FTFI	NR	45.8%	12	NR	NR	NR	NR	NR	NR	NR
Southern Africa																					
Herce 2018[56]	general	anal sex with men in the past 6 months	N	713	Angola	NR	NR	2017	CS	time-venue	FTFI	47.5%	NR	NR	18.2%	NR	NR	NR	NR	NR	NR
Kendall 2014[101]	general	anal sex with men in the past 6 months	Y	351	Angola	NR	NR	2011	CS	RDS	FTFI	38.1%	31.7% 15.9%	12 3	37.0%	NR	NR	NR	NR	NR	NR

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Fay 2011[62], Beyrer 2010[63], Baral 2009[64]	general	ever anal sex with men	Y	117	Botswana	24	25	2008	CS	snowball	FTFI	82.9%	NR	NR	17.4%	NR	NR	NR	NR	NR	NR
Rao 2017[8]	general	anal sex with men in the past 12 months	Y	173	eSwatini	NR	29	2014	CS	snowball	FTFI	NR	89%%	12	NR	NR	NR	NR	NR	NR	NR
Lyons 2023[6], Rao 2017[8], Poteat 2017[58], Grover 2016[102], Stahlman 2016[59], Brown 2016[103], Stahlman 2015[104], Risher 2013[105], Baral 2013[106]	general	anal sex with men in the past 12 months	Y	326	eSwatini	22	23	2011	CS	RDS	FTFI	54.3%	52.4%	12	30.4%	NR	NR	NR	NR	NR	NR
Poteat 2017[58], Stahlman 2016[59], Wendi 2016[107], Stahlman 2015[104], Stahlman 2015[108]	general	anal sex with men in the past 12 months	Y	530	Lesotho	22-23	NR	2014	CS	RDS	FTFI	69.1%	NR	NR	44.0%	NR	NR	NR	NR	NR	NR
Baral 2011[109]	general	ever anal sex with men	N	249	Lesotho	NR	26	2009	CS	snowball	FTFI	NR	54.5%	12	NR	NR	NR	NR	NR	NR	NR
Russell 2019[110]	selected population - higher vulnerability	NR	N	94	Namibia	NR	27	2016	CS	convenience	FTFI	NR	45.7%	6	NR	NR	NR	NR	NR	NR	NR
Fay 2011[62], Beyrer 2010[63], Baral 2009[64]	general	ever anal sex with men	Y	218	Namibia	23	24	2008	CS	snowball	FTFI	59.4%	NR	NR	59.3%	NR	8.3% (MSM living with HIV)	Current	NR	NR	NR

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Montgomery 2021[111], Minnis 2020[112]	young MSM	NR	NR	190	South Africa	20	NR	2019	CS	RDS/ convenience	SAQ/ FTFI	94.7%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Pillay 2020[113]	selected population - lower vulnerability	self-identified MSM recruited from MSMO	Y	96	South Africa	NR	33	2018	CS	purposive	FTFI	97.9%	93.8% 85.4% 42.7%	12 6 3	NR	NR	NR	NR	NR	NR	NR
Scheibe 2020[114]0	general	ever sex with men	Y	746	South Africa	29	34	2017	CS	convenience	FTFI	97.3%	NR	NR	85.6%	NR	93.1% (MSM living with HIV)	Current	NR	NR	NR
Fearon 2020[115]	mix	sex with men in the past 12 months	Y	182	South Africa	NR	24-28	2017	CS	RDS	SAQ	94.5%	73.0%	12	64.4%	NR	30.0% (MSM living with HIV); 53.2% (HIV aware MSM)	Current	46.9% (MSM living with HIV); 77.3% (MSM currently on ART)	50	NR
Fearon 2020[25]	general	sex with men in the past 12 months	Y	301	South Africa	NR	29	2017	CS	RDS	SAQ	NR	65.7%	6	65.0%	NR	33.1% (MSM living with HIV)	Current	54.2% (MSM living with HIV)	200	NR

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Chen 2020[116], Radebe 2020[117], Lippman 2018[118], Lippman 2018[119]	general	sex with men in the past 6 months	Y	127	South Africa	NR	25	2016	CS and prospective cohort	RDS	FTFI	85.0%	66.1%	12	NR	NR	NR	NR	NR	NR	10.9[py-100]
													37.8%	6							
Sullivan 2020[120]	general	anal sex with men in the past 12 months	Y	167	South Africa	NR	31	2016	prospective cohort (Sibanye Health Project)	convenience	SAQ	NR	NR	NR	50.4%	NR	NR	NR	NR	NR	5.3[py-100]
Palumbo 2021[30], Sandfort 2021[31], Sivay 2021[32], Sandfort 2019[33], Zhang 2018[34], Fogel 2018[35]	general	ever sex with men	Y	161	South Africa	NR	25-28	2016	prospective cohort (HPTN 075)	snowball/ convenience	FTFI/ CASI	90%%	69.4%	12	52.3%	NR	26.6% (MSM living with HIV); 50.7% (HIV aware MSM)	Current	13.9% (MSM living with HIV)	400	11.5[py-100]
													46.1%	6							

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Kufa 2017[121]	general	anal or oral sex with men in the past 6 months	Y	2503	South Africa	25	NR	2015	CS	RDS	FTFI	NR	NR	NR	NR	NR	NR	NR	35.0% (MSM living with HIV)	20	NR
Rees 2017[122], van Liere 2019[123]	selected population - higher vulnerability	self-identified gay or bisexual, recruited at clinic	NR	5796	South Africa	28-30	NR	2015	CS	convenience	FTFI	NR	NR	NR	83.7%	NR	61.8% (MSM living with HIV)	NR	NR	NR	NR
Lane 2016[124], Lane 2014[125]	general	anal or oral sex with men in the past 6 months	Y	605	South Africa	NR	27	2012-2014	serial CS	RDS	FTFI/ ACASI	72.1%	NR	NR	28.2%	15.7% (linked to care within 30 days of diagnosis)	12.2% (MSM living with HIV); 52.5% (HIV aware MSM)	Current	NR	NR	$12.5^{py\text{-}100}$
Batist 2013[126]	general	reported to have sex with men	Y	98	South Africa	24	NR	2012	CS	convenience	SAQ	93.8%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Rebe 2015[127]	selected population - higher vulnerability	sex with men in the past 12 months	Y	200	South Africa	32	NR	2012	CS	convenience	FTFI	NR	53.5%	12	NR	NR	52.3% (MSM living with HIV)	Current	NR	NR	NR
Siegler 2015[128]	general	anal sex with men in the past 6 months	Y	34	South Africa	25	NR	2012	CS	snowball	FTFI	97.1%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Knox 2019[129]	general	sex with men in the past 12 months	NR	480	South Africa	NR	30	2012	CS	RDS	FTFI	NR	34.6%	6	NR	NR	NR	NR	NR	NR	NR
Maleke 2017[130]	general	self-identified gay or has sex with men	NR	23	South Africa	NR	25	2012	CS	snowball	FTFI	78.3%	NR	NR	NR	NR	NR	NR	NR	NR	NR

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Maenetje 2019[131]	selected population - higher vulnerability	self-identified gay or bisexual and anal sex with men in the past 3 months	NR	27	South Africa	NR	22	2012	prospective cohort	snowball/ convenience	FTFI	NR	NR	NR	NR	NR	NR	NR	NR	NR	$0^{py\text{-}100}$
Stephenson 2012[132], Wagenaar 2012[133]	general	sex with men in the past 12 months	Y	449	South Africa	30	31	2010	CS	online	SAQ	87.0%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Eaton 2013[134]	selected population - higher vulnerability	drinking venues	Y	143	South Africa	NA	29	2010	CS	convenience	SAQ	62.7%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Kamali 2015[44], Price 2012[45]	selected population - higher vulnerability	NR	NR	29	South Africa	NR	NR	2010	prospective cohort	convenience	FTFI	NR	NR	NR	NR	NR	NR	NR	NR	NR	$9.5^{py\text{-}100}$
Baral 2011[135]	general	ever anal sex with men	N	200	South Africa	24	26	2009	CS	convenience	FTFI	NR	NR	NR	6.0%	NR	NR	NR	NR	NR	NR
Tun 2012[136]	general	NR	Y	NR	South Africa	NR	NR	2009	CS	RDS	FTFI	71.1%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Buchbinder 2014[137], Buchbinder 2014[138]	selected population - higher vulnerability	anal sex with at least 4 male partners in the past 6 months	Y	43	South Africa	NR	NR	2009	RCT	convenience	CASI/ FTFI	NR	NR	NR	NR	NR	NR	NR	NR	NR	$4.7^{py\text{-}100}$
Knox 2013[139], Knox 2011[140]	general	sex with men in the past 12 months	Y	300	South Africa	NR	26	2008	CS	convenience	ACASI	67.7%	40.0%	12	NR	NR	NR	NR	NR	NR	NR
Arnold 2013[141], Lane 2011[142]	general	anal or oral sex with men in the past 6 months	Y	377	South Africa	NR	24	2008	CS	RDS	FTFI	43.5%	NR	NR	11.6%	NR	NR	NR	NR	NR	NR

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Burrel 2010[143]	general	self-identified MSM	Y	542	South Africa	27	NR	2008	CS	convenience	SAQ	NR	72.7%	12	NR	NR	NR	NR	NR	NR	NR
Lane 2008[144]	general	ever sex with men	Y	147	South Africa	NR	28	2004	CS	snowball/ convenience	FTFI	67.3%	31.3%	6	NR	NR	NR	NR	NR	NR	NR
Nel 2013[145], Sandfort 2008[146]	general	same-sex attraction	Y	1045	South Africa	NR	26-29	2004	CS	convenience	SAQ	72.2%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Jobson 2018[147]	general	self-identified MSM	Y	316	South Africa	26	31	NR	CS	snowball	SAQ	86.1%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Cloete 2008[148]	general	NR	NR	92	South Africa	NR	28	NR	CS	convenience	SAQ	NR	NR	NR	NR	NR	27.1% (HIV aware MSM)	Current	NR	NR	NR
Metheny 2022[149], Stephenson 2022[150], Stephenson 2021[151]	partnered MSM	self-identified gay or bisexual and anal or oral sex with men in the past 3 months	NR	440	South Africa, Namibia	NR	28	2017	CS	snowball/ convenience	FTFI	89.0%	49.1% 83.5%	12 6	NR	NR	NR	NR	NR	NR	NR
Western Africa																					
Ahouada 2020[152]	general	self reported not living with HIV or unaware and anal sex with men in the past 12 months	N	400	Benin	NR	26	2018	CS	RDS	FTFI	NR	98.0%	12	NR	NR	NR	NR	NR	NR	NR

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Hessou 2020[153]	general	anal or oral sex with men in the past 12 months	Y	358	Benin	NR	24	2017	prospective cohort	RDS	FTFI	NR	NR	NR	NR	NR	NR	NR	NR	NR	11.6py-100 (2016); 6.8py-100 (2016-2017); 1.9py-100 (2017); 0py-100 (2017-2018); 9.3py-100 (2018)
Dah 2021[154], Dah 2021[155], Yaya 2022[156], Yaya 2021[157], Laurent 2021[158], Coulaud 2020[159]	selected population - higher vulnerability	anal sex with men in the past 3 months, clinic-recruited	Y	168	Burkina Faso	23	NR	2017	prospective cohort (CohMSM)	purposive	FTFI	78.0%	NR	NR	NR	NR	NR	NR	NR	NR	7.3^{py-100}
Lyons 2023[6], Grosso 2019[160], Kim 2018[161], Poteat 2017[58], Holland 2016[162], Goodman 2016[163], Stahlman 2016[164]	general	anal sex with men in the past 12 months	Y	672	Burkina Faso	21-22	25	2013	CS	RDS	FTFI	75.5%	NR	NR	31.3%	NR	15.6% (MSM living with HIV); 41.7% (HIV aware MSM)	Current	NR	NR	NR
Diabate 2021[165]	general	anal sex with men in the past 12 months	NR	201	Cote d'Ivoire	NR	27	2018	CS	RDS	FTFI	NR	87.6%	12	NR	NR	NR	NR	NR	NR	NR
Inghels 2022[166], Inghels 2021[167]	general	ever sex with men	NR	518	Cote d'Ivoire	NR	26	2018	CS	RDS	phone	88.9%	77.6%	12	NR	NR	NR	NR	NR	NR	NR

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	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Dah 2021[154], Dah 2021[155], Yaya 2022[156], Yaya 2021[157], Laurent 2021[158], Coulaud 2020[159]	selected population - higher vulnerability	anal sex with men in the past 3 months, clinic-recruited	Y	193	Cote d'Ivoire	24	NR	2016	prospective cohort (CohMSM)	purposive	FTFI	67.9%	NR	NR	NR	NR	NR	NR	NR	NR	14.4 py-100
Lyons 2023[6], Moran 2020[168], Ulanja 2019[169]	general	anal or oral sex with men in the past 12 months	Y	1301	Cote d'Ivoire	23	24	2015	CS	RDS	FTFI	70.9%	38.3%	6	32.9%	NR	NR	NR	NR	NR	NR
Bouscaillou 2016[170]	selected population - higher vulnerability	men PWID who ever had sex with men	Y	41	Cote d'Ivoire	29	33	2014	CS	RDS	FTFI	NR	37.5%	12	NR	NR	NR	NR	NR	NR	NR
Couderc 2017[171]	selected population - higher vulnerability	anal sex with men in the past 3 months	NR	73	Cote d'Ivoire	25	NR	2014	prospective cohort	convenience	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	15.9 py-100
Hakim 2015[172], Aho 2014[173]	general	anal or oral sex with men in the past 12 months	Y	601	Cote d'Ivoire	23	25	2011	CS	RDS	FTFI	62.6%	32.1%	12	13.6%	NR	NR	NR	NR	NR	NR
Vuylsteke 2012[174]	selected population - higher vulnerability	male sex workers	NR	96	Cote d'Ivoire	27	NR	2007	CS	convenience	FTFI	70.8%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Gu 2021[175]	selected population - higher vulnerability	MSM living with HIV, ever had sex with men	N	225	Ghana	25	27	2017	CS	snowball/ convenience	SAQ	NR	NR	NR	NR	53.6% (linked to care within 3 months of diagnosis plus at least 1 follow-up visit)	NR	NR	NR	NR	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
																93.6% (retained in care within the past 6 months)					
Ogunbajo 2018[176]	general	ever anal or oral sex with another man	Y	30	Ghana	NR	29	2015	CS	convenience	FTFI	NR	NR	NR	NR	70.0% (currently engaged in care)	NR	NR	NR	NR	NR
Abubakari 2021[177]	general	self-identified MSM	N	56	Ghana	NR	27	2014	CS	snowball	SAQ/ FTFI	82.5%	24.6% 26.3%	6 3	NR	NR	NR	NR	NR	NR	NR
Girault 2015[178]	selected population - lower vulnerability	self-reported HIV negative and anal or oral sex with men in the past 12 months	Y	191	Ghana	NR	25	2013	CS	RDS	FTFI	60.2%	59.6%	12	NR	NR	NR	NR	NR	NR	NR
Kushwaha 2017[179], Nelson 2015[180]	general	sex with men in the past 6 months	N/NR	137	Ghana	NR	25	2012	CS	snowball	FTFI/ SAQ	68.4%	87.0% 64.1% 25.0%	12 6 3	NR	NR	NR	NR	NR	NR	NR
Gyamerah 2020[181]	general	anal or oral sex with men in the past 12 months	Y	1382	Ghana	NR	NR	2010	CS	RDS	FTFI	41.3%	30.8%	12	NR	NR	NR	NR	NR	NR	NR
Lyons 2023[6]	NR	NR	NR	451	Guinea-Bissau	NR	NR	2017	CS	RDS	NR	36.3%	NR	NR	9.1%	NR	NR	NR	NR	NR	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Lieber 2018[182]	general	ever sex with men	Y	107	Liberia	NR	27	NR	CS	purposive	FTFI	77.6%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Koyalta 2021[183]	general	identified as MSM by peers	NR	50	Mali	NR	24	2019	CS	purposive	FTFI	NR	NR	NR	NR	NR	87.5% (MSM living with HIV)	Current	NR	NR	NR
Dah 2021[154], Dah 2021[155], Yaya 2022[156], Yaya 2021[157], Laurent 2021[158], Coulaud 2020[159]	selected population - higher vulnerability	anal sex with men in the past 3 months, clinic-recruited	Y	295	Mali	23	NR	2016	prospective cohort (CohMSM)	purposive	FTFI	79.0%	NR	NR	NR	NR	NR	NR	NR	NR	9.0[py-100]
Knox 2021[184], Lahuerta 2018[185], Hakim 2018[186], Hakim 2017[187]	general	ever anal or oral sex with another man	Y	552	Mali	NR	24-28	2014	CS	RDS	FTFI	71.6%	50.2%	12	16.5%	NR	61.2% (HIV aware MSM)	Current	29.1% (MSM living with HIV); 85.2% (HIV aware MSM); 100.0% (MSM currently on ART)	1000	NR
Couderc 2017[171]	selected population - higher vulnerability	anal sex with men in the past 3 months	NR	168	Mali	22	NR	2013	prospective cohort	convenience	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	11.2[py-100]
Adam 2009[66]	NR	NR	NR	26	Mauritania	NR	NR	2006	NR	NR	NR	NR	15.4%	12	NR	NR	NR	NR	NR	NR	NR
Afolaranmi 2021[188]	selected population - higher vulnerability	MSM affiliated with MSM support group	NR	114	Nigeria	NR	26	2019	CS	RDS	FTFI	NR	NR	NR	NR	37.7% (retained in care in the past 6 months)	NR	NR	NR	NR	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Ibiloye 2021[189]	selected population - higher vulnerability	MSM living with HIV and on ART	NR	129	Nigeria	NR	25	2018	retrospective cohort baseline	NR	NR	NR	NR	NR	NR	25.8% (currently engaged in care)	NR	NR	NR	NR	NR
Tun 2018[190]	general	anal sex with men in the past 6 months	Y	319	Nigeria	25	NR	2017	prospective cohort baseline	snowball	FTFI	82.1%	46.1% 17.6%	12 6	NR	NR	NR	NR	NR	NR	NR
Lyons 2023[6], LeeVan 2022[191], Olawore 2021[192], Li 2020[193], Nowak 2020[194], Ramadhani 2020[195], Tiamiyu 2020[196], Robbins 2020[197], Kayode 2020[198], Nowak 2019[199], Nowak 2019[200], Billings 2019[201], Crowell 2019[202], Ramadhani 2018[203], Rodriguez-Hart 2018[204], Stahlman 2017[205], Nowak 2017[206], Ramadhani 2017[207], Crowell 2017[208], Nowak 2016[209], Rodriguez-Hart 2016[210], Baral 2015[211], Schwartz	general	anal sex with men in the past 12 months	Y	2737	Nigeria	23-25	25-28	2017	prospective cohort	RDS	FTFI	82.2%	NR	NR	53.8%	NR	73.8% (MSM living with HIV); 45.8 (HIV aware MSM) 10.1% (MSM living with HIV)	Current Ever	43.4% (MSM living with HIV); 40.6% (HIV aware MSM); 77.3% (MSM currently on ART)	1000 (MSM living with HIV and HIV aware MSM) and 50 (MSM on ART)	10.3[py-100]

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
2015[212], Charurat 2015[213]																					
Ibiloye 2021[214]	selected population - higher vulnerability	MSM living with HIV on ART	N	1040	Nigeria	NR	NR	2017	retrospective cohort baseline (KP-CBART)	convenience	NR	NR	NR	NR	NR	50.2% (currently engaged in care)	NR	NR	98.3% (MSM currently on ART)	1000	NR
Ibiloye 2018[215]	selected population - higher vulnerability	NR	NR	32	Nigeria	NR	30	2017	prospective cohort baseline	convenience	NR	NR	NR	NR	NR	NR	NR	NR	100.0% (MSM living with HIV)	1000	NR
Offie 2021[216]	selected population - higher vulnerability	self-identified MSM, living with HIV enrolled in care	NR	181	Nigeria	24	30	2016	CS	convenience	phone	NR	NR	NR	NR	92.3% (retained in care within the past 12 months)	NR	NR	NR	NR	NR
Tobin-West 2017[217]	general	anal or oral sex with men in the past 12 months	Y	101	Nigeria	NR	25	2014	CS	purposive	SAQ	69.3%	44.6%	6	NR	NR	NR	NR	NR	NR	NR
Eluwa 2019[218]	general	anal sex with men in the past 6 months	NR	3611	Nigeria	22	26	2014	CS	RDS	FTFI	64.6%	78.9%	12	NR	NR	NR	NR	NR	NR	NR
Eluwa 2019[218], Eluwa 2015[219]	general	anal sex with men in the past 6 months	Y	1545	Nigeria	24	29	2010	CS	RDS	FTFI	50.3%	77.1%	12	NR	NR	NR	NR	NR	NR	NR
Adebajo 2014[220], Sheehy 2014[221], Vu 2013[222], Vu 2013[223]	general	anal or oral sex with men in the past 12 months	Y	712	Nigeria	23	25	2010	CS	RDS	FTFI/ ACASI	54.9%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Stromdahl 2019[224],	general	ever anal sex with men	Y	297	Nigeria	26	26	2008	CS	convenience	FTFI	65.2%	NR	NR	NR	NR	NR	NR	NR	NR	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Stromdahl 2012[225]																					
Eluwa 2019[218], Merrigan 2011[226], Adam 2009[66]	general	anal or oral sex with men in the past 6 months	Y	879	Nigeria	22	26	2007	CS	RDS	FTFI	34.0%	72.9%	12	NR	NR	NR	NR	NR	NR	NR
Lyons 2023[6], Lyons 2020[227], Lyons 2017[228]	general	anal sex with men in the past 12 months	Y	724	Senegal	NR	23	2016	CS and prospective cohort	RDS/ purposive	FTFI	70.2%	NR	NR	13.2%	7.8% (ever engaged in care)	10.0% (MSM living with HIV); 75.9% (HIV aware MSM)	Current	63.6% (MSM currently on ART)	1000	3.2[py-100]
																	11.0% (MSM living with HIV); 82.8% (HIV aware MSM)	Ever			
Couderc 2017[171]	selected population - higher vulnerability	anal sex with men in the past 3 months	NR	54	Senegal	26	NR	2013	prospective cohort	convenience	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0[py-100]
Drame 2013[229]	selected population - lower vulnerability	anal sex with men in the past 12 months	Y	119	Senegal	NR	28	2012	prospective cohort	NR	NR	88.0%	NR	NR	48.8%	NR	NR	NR	NR	NR	16.0[py-100]
Dieye 2022[230]	NR	NR	NR	49	Senegal	30	NR	2010	Retrospective CS	purposive	NR	NR	NR	NR	NR	NR	NR	NR	52.0% (MSM living with HIV)	50	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Ndiaye 2013[231], Wade 2005[232]	general	ever sex with men	Y	463	Senegal	24-26	NR	2004-2007	CS	snowball	FTFI	10.8%	NR	NR	NR	NR	9.3% (MSM living with HIV)	Current	NR	NR	NR
Lyons 2023[6]	NR	NR	NR	114	The Gambia	NR	NR	2017	CS	RDS	NR	50.0%	NR	NR	5.0%	NR	NR	NR	NR	NR	NR
Poteat 2017[58], Stahlman 2016[164], Mason 2013[233]	general	anal sex with men in the past 12 months	Y	207	The Gambia	20	22	2011	CS	snowball	FTFI	NR	NR	NR	5.0%	NR	NR	NR	NR	NR	NR
Ferré 2022[234], Sadio 2019[235]	general	anal or oral sex with men in the past 12 months	NR	678	Togo	23	27	2017	CS	RDS	FTFI	89.1%	NR	NR	NR	NR	66.2% (MSM living with HIV)	Current	52.9% (MSM living with HIV); 80.0% (MSM currently on ART)	200	NR
Dah 2021[154], Dah 2021[155], Yaya 2022[156], Yaya 2021[157], Laurent 2021[158], Coulaud 2020[159]	selected population - higher vulnerability	anal sex with men in the past 3 months, clinic-recruited	Y	160	Togo	23	NR	2016	prospective cohort (CohMSM)	purposive	FTFI	80.6%	NR	NR	NR	NR	NR	NR	NR	NR	$10.2^{py\text{-}100}$
Teclessou 2017[236]	general	ever sex with men	N	491	Togo	23	26	2015	CS	RDS	FTFI	68.0%	NR	NR	NR	NR	NR	NR	NR	NR	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
Lyons 2023[6], Ruisenor-Escudero 2019[237], Ruisenor-Escudero 2019[238], Grosso 2019[160], Poteat 2017[58], Ruisenor-Escudero 2017[239], Holland 2016[162], Stahlman 2016[164]	general	anal sex with men in the past 12 months	Y	683	Togo	22-24	NR	2013	CS	RDS	FTFI	70.7%	NR	NR	14.9%	NR	6.0% (MSM living with HIV); 4.0% (HIV aware MSM)	Current	NR	NR	NR
Bakai 2016[240]	general	NR	Y	724	Togo	25	NR	2011	CS	snowball	FTFI	63.0%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Ekouevi 2014[241]	general	ever sex with men	NR	758	Togo	24	29	2011	CS	snowball	FTFI	63.4%	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dah 2021[154], Dah 2021[155], Yaya 2022[156], Yaya 2021[157], Laurent 2021[158], Coulaud 2020[159]	selected population - higher vulnerability	anal sex with men in the past 3 months, clinic-recruited	Y	335	Burkina Faso, Cote d'Ivoire, Mali, Togo	24	NR	2017	prospective cohort baseline (CohMSM)	purposive	FTFI	NR	NR	NR	NR	89.0% (ART initiation within 30 days of diagnosis)	79.6% (MSM living with HIV)	Current	NR	NR	NR
Multiple Regions																					
Herce 2018[56]	general	anal sex with another man in the past 6 months	Y	832	Angola, Malawi	NR	NR	2017	CS	time-venue	FTFI	NR	19·8%	6	NR	NR	NR	NR	NR	NR	NR
Sandfort 2019[33]	general	ever anal sex with another man	Y	601	Kenya, Malawi, South Africa	23	27	2016	prospective cohort baseline (HPTN 075)	snowball/ convenience	FTFI/ CASI	NR	NR	NR	NR	38.8% (currently engaged in care)	NR	NR	50.5% (MSM living with HIV); 82.5% (MSM	400	NR

Reference	PARTICIPANT CHARACTERISTICS							STUDY CHARACTERISTICS				HIV TESTING, TREATMENT CASCADE, AND HIV INCIDENCE OUTCOMES									
	Study population of MSM*	**MSM eligibility criteria**	**TGW included**	**N_{MSM}**	**Country**	**Median age**	**Mean age**	**Study midpoint year**	**Study design**	**Sampling method**	**Interview method**	**Ever test** (self-reported)	**Recent test** (self-reported)	**Period of recent test** (months)	**Knowledge of HIV status** (confirmed with biological test and answered "yes" to question "are you living with HIV?")	**Engagement in care** (self-reported)	**ART use (denominator)** (self-reported)	**Period of ART use** (ever or current)	**Viral suppression (denominator)** (confirmed with biological test)	**Viral threshold** (selected by study authors, copies per mL)	**HIV incidence rate**
																			currently on ART)		

ACASI, audio computer-assisted self-interview; ART, anti-retroviral therapy; CASI, computer-assisted self-interview; CS, cross-sectional; FTFI, face-to-face interview; MSM, men-who-have-sex-with-men; NR, not reported; PBS, polling booth survey; PWID, people who inject drugs; RCT, randomized controlled trial; RDS, respondent driven sampling; SAQ, self-administered questionnaire; TGW, transgender women.

References of all include studies are provided in table S7 on appendix pp 103.

* selected - higher vulnerability includes male sex workers, study MSM definitions based on anal sex only in the past 3 months, sex with multiple partners, MSM with sexually transmitted infections, sex with partners living with HIV, or that recruited MSM living with HIV only. Selected - lower vulnerability includes MSM involved in MSM organisations or prevention activities.

† midpoint between study start and finish

Table S3. Number and characteristics of unique studies included in our review. This includes (a) HIV incidence, testing, and treatment cascade outcomes among men who have sex with men (MSM) in Africa reported by studies, and a summary of (b) study characteristics, (c) participant characteristics, and (d) study quality, of included studies that provided observations that were included in our analyses.

	Total unique studies* (N_s=152)
HIV incidence, testing, and treatment cascade outcomes	
HIV incidence rate (among MSM not living with HIV)	31
HIV testing (among all MSM)	123
Ever	100
Past 12 months	46
Past 6 months	23
Past 3 months	9
Knowledge of status (among MSM living with HIV)	44
Engagement in Care (among MSM living with HIV)	16
Ever in care (non-ART)	3
Ever on ART	7
Currently in care (non-ART)	6
Linked to care within 3 months	1
Linked to care within 30 days	3
Retained in care in the past 12 months	1
Retained in care in the past 6 months	2
Currently on ART	31
Among MSM living with HIV	27
Among HIV aware MSM	18
Viral suppression	23
Among MSM living with HIV	19
Among HIV aware MSM	10
Among MSM currently on ART	13
Study characteristics	
Study midpoint year†	
2011-2020	108
2010 and earlier	41
NR	5
Region†	
Central Africa	9
Western Africa	52
Eastern Africa	50
Southern Africa	40
Northern Africa	2
Multiple regions	2
Study design†	
Cross-sectional	113
Serial cross-sectional surveys	1
Prospective cohort – follow-up	29
Prospective cohort – baseline	7
Retrospective cohort – baseline	3

RCT – follow-up	1
RCT – baseline	1
NR	2
Sampling method[†]	
RDS	52
Cluster/time-location sampling	6
Snowball	37
Convenience	61
Online	2
NR	5
Interview method[†]	
FTFI[‡]	114
Confidential[§]	34
NR	15
Participant characteristics	
MSM eligibility criteria[†]	
Ever sex with men	24
Sex with men in the past 12 months	42
Sex with men in the past 6 months	20
Sex with men in the past 3 months	16
Sex with men occasionally/regularly	2
Male sex workers	5
Self-identified MSM or gay/bisexual	11
Peer-identified as MSM	3
Involvement with MSM organizations/HIV prevention	2
NR	18
Study population of MSM[†]	
General population of MSM	96
Selected population of MSM	50
Selected population – higher vulnerability to HIV[¶]	47
Selected population – lower vulnerability to HIV[‖]	4
NR	6
TGW included[†]	
Yes	95
No	14
Unclear	46
Mean or median age[†]	
15-24	49
25-34	107
NR	17
Study quality	
Risk of bias	
Lower (4-5)	16
Moderate (2-3)	185
Higher (0-1)	129

Table S4: Unweighted estimates of HIV testing, treatment cascade, and HIV incidence outcomes among men who have sex with men (MSM) in Africa in 2010 and 2020, overall and by region of Africa.

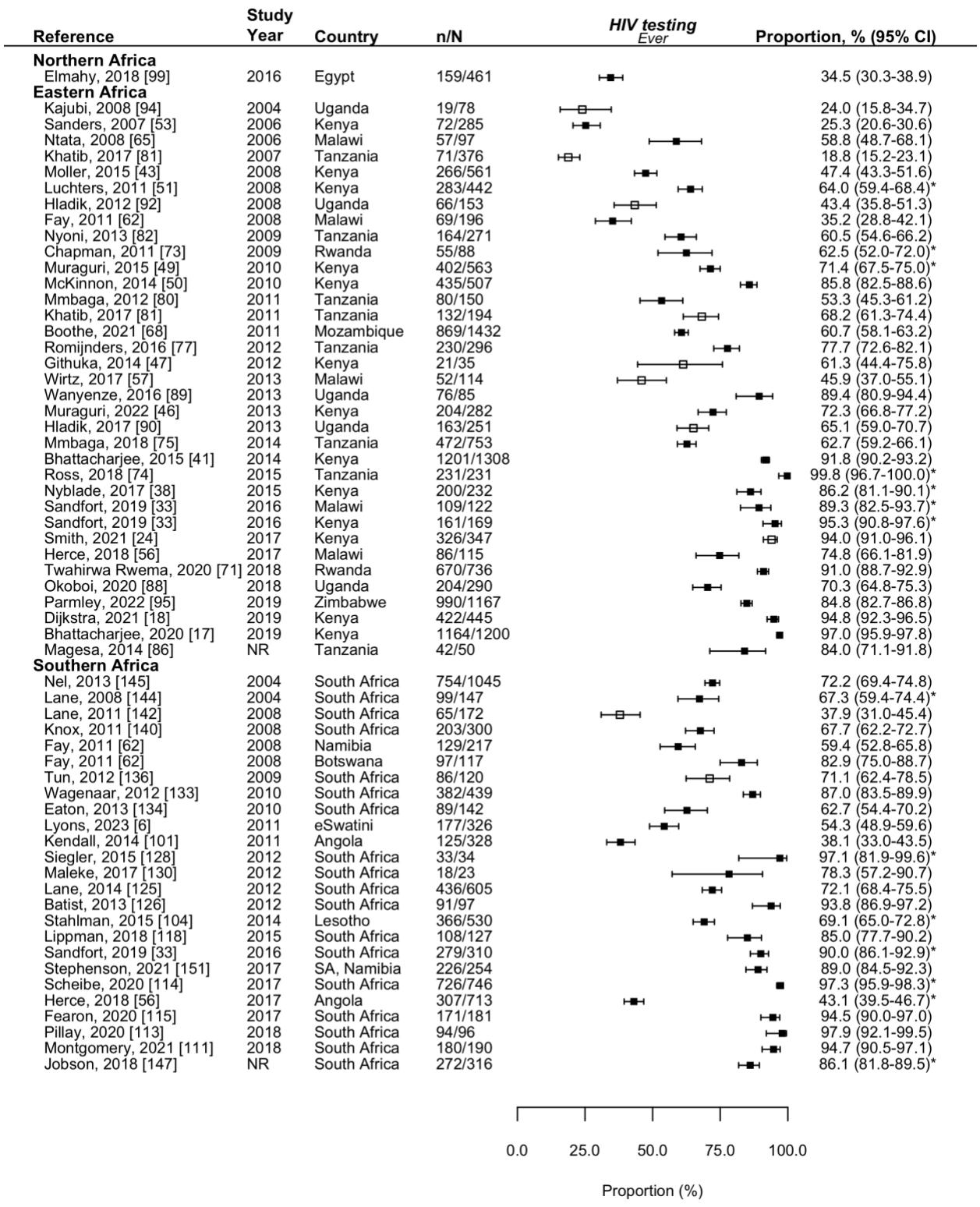
Outcome	Region of Africa	N_o*	Unweighted estimate in 2010	95% CrI	Unweighted estimate in 2020	95% CrI
Ever HIV testing (%)		95				
Among all MSM†	Overall	95	65%	45–85%	83%	26–97%
	Central/Western Africa	37	64%	52–75%	82%	64–92%
	Eastern Africa	34	60%	49–71%	92%	79–97%
	Southern Africa	23	68%	54–79%	85%	57–95%
Past 12 months HIV testing (%)		46				
Among all MSM‡	Overall	46	48%	30–66%	88%	62–97%
	Central/Western Africa	18	49%	34-63%	88%	72–96%
	Eastern Africa	15	45%	30–60%	89%	73–96%
	Southern Africa	12	50%	35–67%	87%	63–96%
Knowledge of status (%)		44				
Among MSM living with HIV	Overall	44	18%	5–50%	53%	10–90%
	Central/Western Africa	12	17%	6–48%	38%	7–75%
	Eastern Africa	17	13%	5–27%	59%	28–85%
	Southern Africa	15	23%	10–47%	58%	17–88%
Currently on ART (%)		43				
Among MSM living with HIV	Overall	26	11%	1–70%	74%	17–97%
	Central/Western Africa	9	10%	2–35%	77%	43–95%
	Eastern/Southern Africa	17	11%	2–40%	72%	41–92%
Among HIV aware MSM	Overall	17	20%	1–91%	93%	37–100%
	Central/Western Africa	5	16%	1–77%	93%	46–100%
	Eastern/Southern Africa	12	22%	2–74%	93%	65–99%
Viral suppression (%)		40				
Among MSM living with HIV	Overall	18	22%	1–92%	70%	13–96%
	Central/Western Africa	6	27%	2–80%	67%	22–94%
	Eastern/Southern Africa	12	16%	2–68%	74%	38–93%
Among HIV aware MSM	Overall	10	64%	2–99%	78%	10–99%
	Central/Western Africa	3	72%	2–100%	79%	5–100%
	Eastern/Southern Africa	7	57%	4–98%	79%	25–98%
Among MSM currently on ART	Overall	12	63%	0–100%	93%	32–100%
	Central/Western Africa	5	66%	0–100%	93%	24–100%
	Eastern/Southern Africa	7	55%	1–100%	94%	50–100%
HIV incidence rate (py^{-100})		39				
Among MSM not living with HIV	Overall	39	$7.6py^{-100}$	1.1–53.3	$4.9py^{-100}$	0.3–71.2
	Central/Western Africa	17	$8.7py^{-100}$	2.9–24.2	$5.6py^{-100}$	2.0–15.8
	Eastern/Southern Africa	22	$8.0py^{-100}$	1.7–39.0	$4.2py^{-100}$	1.3–13.8

ART, antiretroviral therapy; CrI, credible interval; IRR, incidence rate ratio (per year); MSM, men who have sex with men; N_o, number of observations; OR, odds ratio (per year); py^{-100}, per 100 person-years.

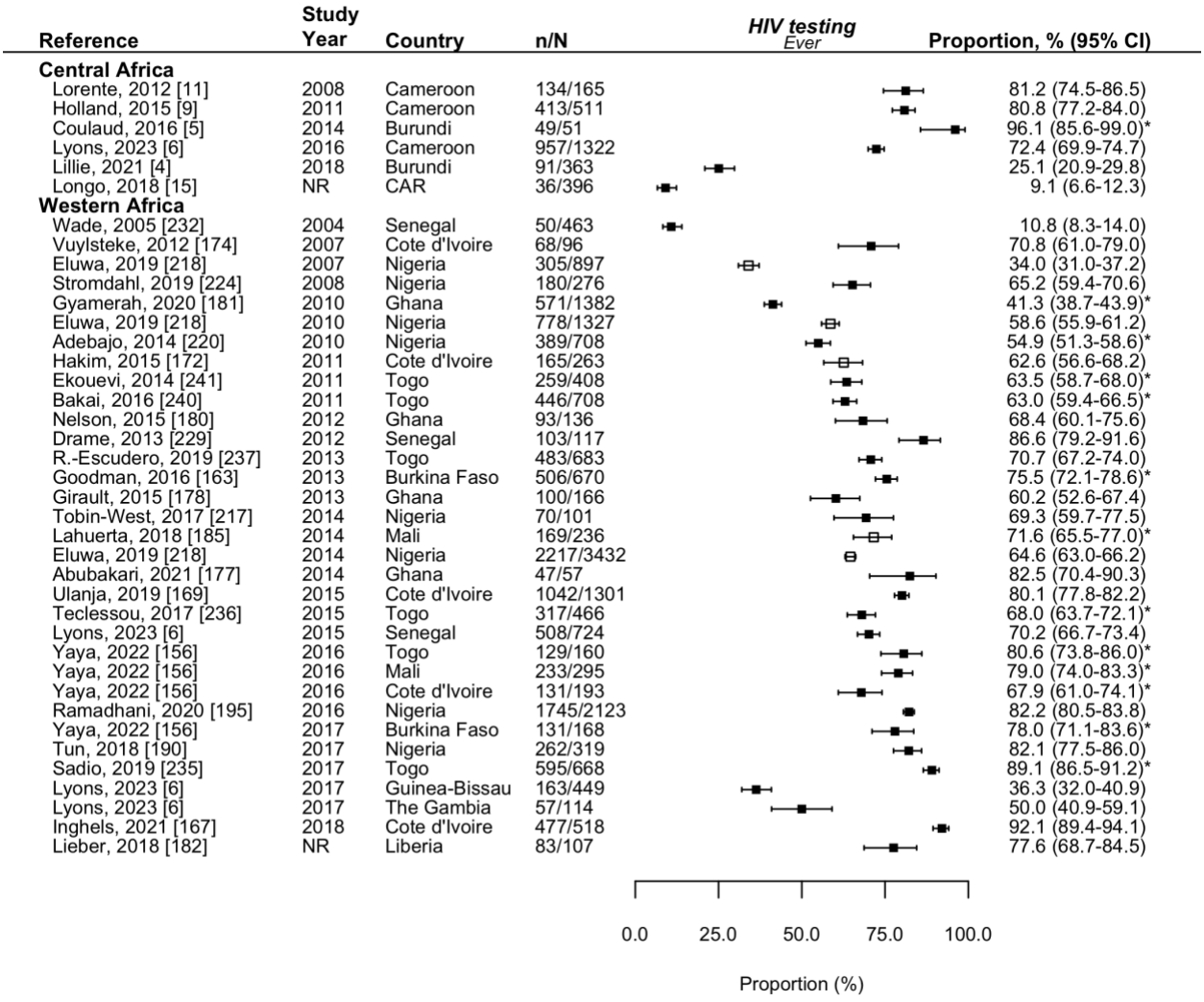
* Study years of 4 observations of ever tested, 1 observation of current ART use among MSM living with HIV, 1 observation of current ART use among HIV aware MSM, 1 observation of viral suppression among MSM living with HIV, and 1 observation of current ART use among MSM currently on ART were not available, therefore these observations were excluded from our analyses of time trends

† 1 observation from Northern Africa included in analysis but not shown

‡ 1 observation from Northern Africa included in analysis but not shown


Reference
Study Year
Country
n/N
HIV testing
Ever
Proportion, % (95% CI)
Northern Africa
Elmahy, 2018 [99] 2016 Egypt 159/461 34.5 (30.3-38.9)
Eastern Africa
Kajubi, 2008 [94] 2004 Uganda 19/78 24.0 (15.8-34.7)
Sanders, 2007 [53] 2006 Kenya 72/285 25.3 (20.6-30.6)
Ntata, 2008 [65] 2006 Malawi 57/97 58.8 (48.7-68.1)
Khatib, 2017 [81] 2007 Tanzania 71/376 18.8 (15.2-23.1)
Moller, 2015 [43] 2008 Kenya 266/561 47.4 (43.3-51.6)
Luchters, 2011 [51] 2008 Kenya 283/442 64.0 (59.4-68.4)*
Hladik, 2012 [92] 2008 Uganda 66/153 43.4 (35.8-51.3)
Fay, 2011 [62] 2008 Malawi 69/196 35.2 (28.8-42.1)
Nyoni, 2013 [82] 2009 Tanzania 164/271 60.5 (54.6-66.2)
Chapman, 2011 [73] 2009 Rwanda 55/88 62.5 (52.0-72.0)*
Muraguri, 2015 [49] 2010 Kenya 402/563 71.4 (67.5-75.0)*
McKinnon, 2014 [50] 2010 Kenya 435/507 85.8 (82.5-88.6)
Mmbaga, 2012 [80] 2011 Tanzania 80/150 53.3 (45.3-61.2)
Khatib, 2017 [81] 2011 Tanzania 132/194 68.2 (61.3-74.4)
Boothe, 2021 [68] 2011 Mozambique 869/1432 60.7 (58.1-63.2)
Romijnders, 2016 [77] 2012 Tanzania 230/296 77.7 (72.6-82.1)
Githuka, 2014 [47] 2012 Kenya 21/35 61.3 (44.4-75.8)
Wirtz, 2017 [57] 2013 Malawi 52/114 45.9 (37.0-55.1)
Wanyenze, 2016 [89] 2013 Uganda 76/85 89.4 (80.9-94.4)
Muraguri, 2022 [46] 2013 Kenya 204/282 72.3 (66.8-77.2)
Hladik, 2017 [90] 2013 Uganda 163/251 65.1 (59.0-70.7)
Mmbaga, 2018 [75] 2014 Tanzania 472/753 62.7 (59.2-66.1)
Bhattacharjee, 2015 [41] 2014 Kenya 1201/1308 91.8 (90.2-93.2)
Ross, 2018 [74] 2015 Tanzania 231/231 99.8 (96.7-100.0)*
Nyblade, 2017 [38] 2015 Kenya 200/232 86.2 (81.1-90.1)*
Sandfort, 2019 [33] 2016 Malawi 109/122 89.3 (82.5-93.7)*
Sandfort, 2019 [33] 2016 Kenya 161/169 95.3 (90.8-97.6)*
Smith, 2021 [24] 2017 Kenya 326/347 94.0 (91.0-96.1)
Herce, 2018 [56] 2017 Malawi 86/115 74.8 (66.1-81.9)
Twahirwa Rwema, 2020 [71] 2018 Rwanda 670/736 91.0 (88.7-92.9)
Okoboi, 2020 [88] 2018 Uganda 204/290 70.3 (64.8-75.3)
Parmley, 2022 [95] 2019 Zimbabwe 990/1167 84.8 (82.7-86.8)
Dijkstra, 2021 [18] 2019 Kenya 422/445 94.8 (92.3-96.5)
Bhattacharjee, 2020 [17] 2019 Kenya 1164/1200 97.0 (95.9-97.8)
Magesa, 2014 [86] NR Tanzania 42/50 84.0 (71.1-91.8)
Southern Africa
Nel, 2013 [145] 2004 South Africa 754/1045 72.2 (69.4-74.8)
Lane, 2008 [144] 2004 South Africa 99/147 67.3 (59.4-74.4)*
Lane, 2011 [142] 2008 South Africa 65/172 37.9 (31.0-45.4)
Knox, 2011 [140] 2008 South Africa 203/300 67.7 (62.2-72.7)
Fay, 2011 [62] 2008 Namibia 129/217 59.4 (52.8-65.8)
Fay, 2011 [62] 2008 Botswana 97/117 82.9 (75.0-88.7)
Tun, 2012 [136] 2009 South Africa 86/120 71.1 (62.4-78.5)
Wagenaar, 2012 [133] 2010 South Africa 382/439 87.0 (83.5-89.9)
Eaton, 2013 [134] 2010 South Africa 89/142 62.7 (54.4-70.2)
Lyons, 2023 [6] 2011 eSwatini 177/326 54.3 (48.9-59.6)
Kendall, 2014 [101] 2011 Angola 125/328 38.1 (33.0-43.5)
Siegler, 2015 [128] 2012 South Africa 33/34 97.1 (81.9-99.6)*
Maleke, 2017 [130] 2012 South Africa 18/23 78.3 (57.2-90.7)
Lane, 2014 [125] 2012 South Africa 436/605 72.1 (68.4-75.5)
Batist, 2013 [126] 2012 South Africa 91/97 93.8 (86.9-97.2)
Stahlman, 2015 [104] 2014 Lesotho 366/530 69.1 (65.0-72.8)*
Lippman, 2018 [118] 2015 South Africa 108/127 85.0 (77.7-90.2)
Sandfort, 2019 [33] 2016 South Africa 279/310 90.0 (86.1-92.9)*
Stephenson, 2021 [151] 2017 SA, Namibia 226/254 89.0 (84.5-92.3)
Scheibe, 2020 [114] 2017 South Africa 726/746 97.3 (95.9-98.3)*
Herce, 2018 [56] 2017 Angola 307/713 43.1 (39.5-46.7)*
Fearon, 2020 [115] 2017 South Africa 171/181 94.5 (90.0-97.0)
Pillay, 2020 [113] 2018 South Africa 94/96 97.9 (92.1-99.5)
Montgomery, 2021 [111] 2018 South Africa 180/190 94.7 (90.5-97.1)
Jobson, 2018 [147] NR South Africa 272/316 86.1 (81.8-89.5)*
0.0
25.0
50.0
75.0
100.0
Proportion (%)

Ever HIV testing continued…



***** observation calculated using available data reported within article

Figure S2. Forest plot of study proportions of men who have sex with men (MSM) ever tested for HIV, by region of Africa. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).

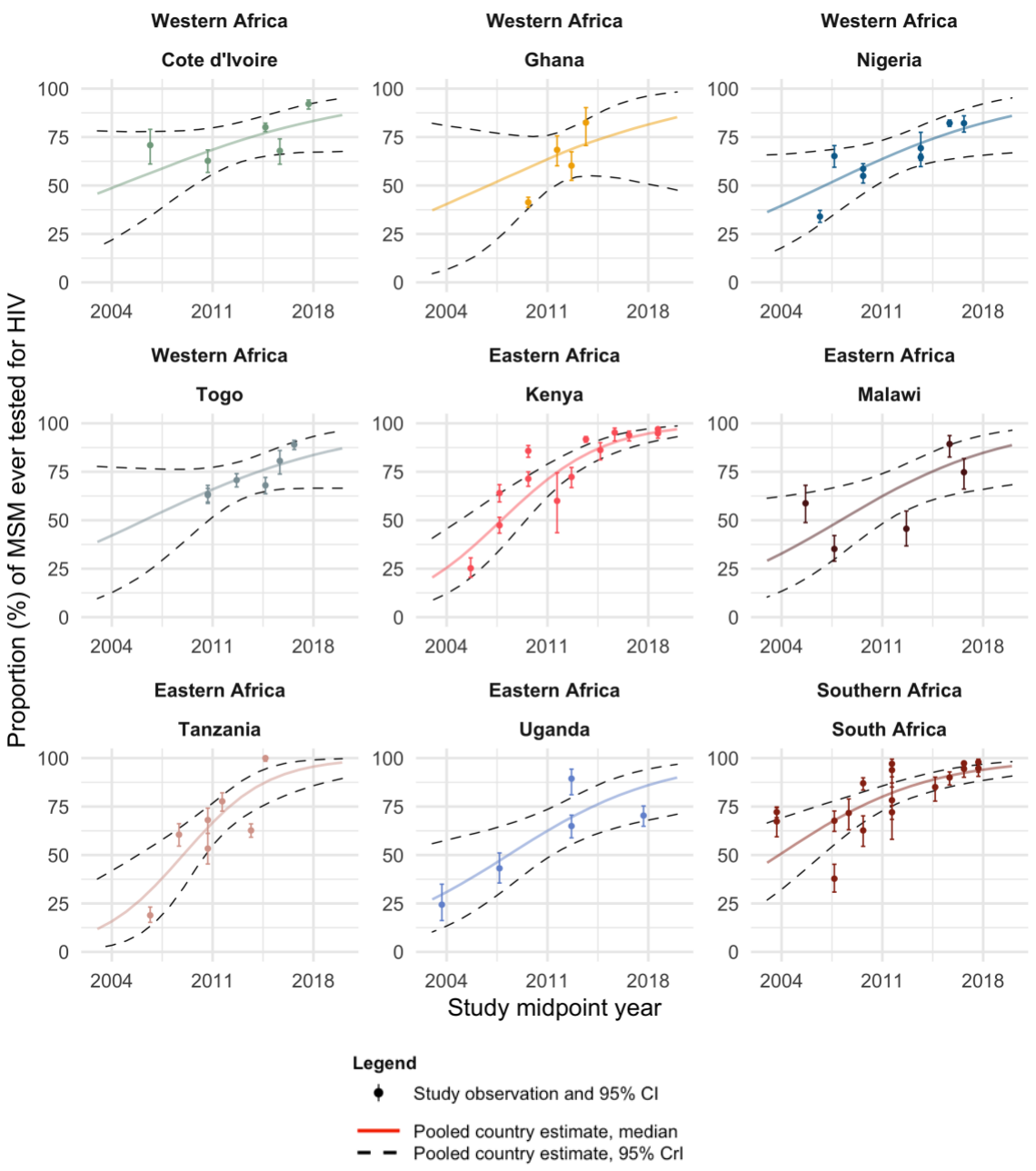
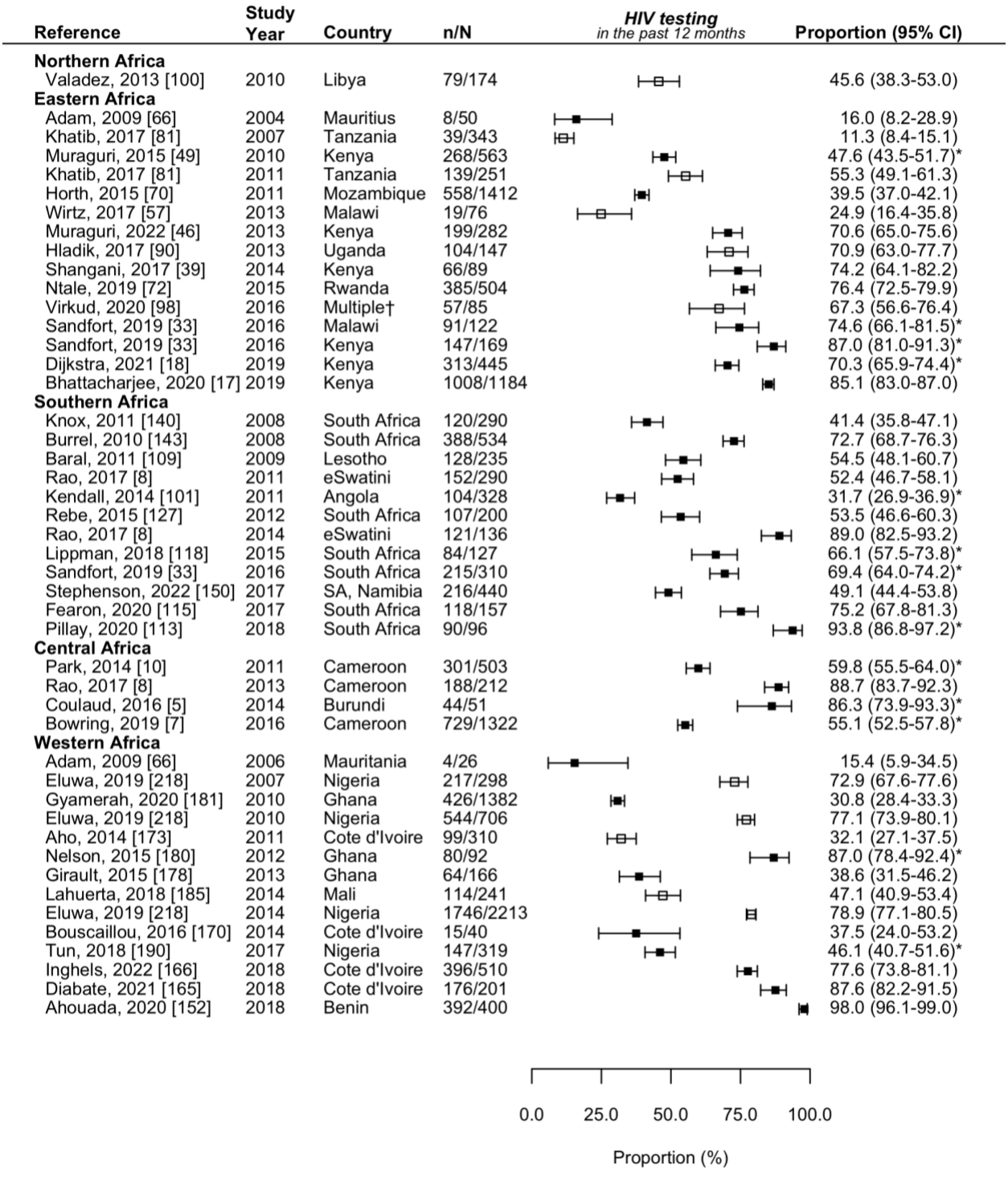


Figure S3. Ever HIV testing among men who have sex with men (MSM) over time, by country of Africa. Estimates are shown over the range of available years in each region of Africa for countries with at least 3 observations from different time points. Points represent available study observations and their 95% confidence intervals. The solid and dotted lines represent the estimated country-level proportions and 95% credible intervals (CrI) over time, respectively.



***** observation calculated using available data reported within article

† includes Kenya, Rwanda, Tanzania, and Uganda.

Figure S4. Forest plot of study proportions of men who have sex with men (MSM) tested for HIV in the past 12 months, by region of Africa. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).

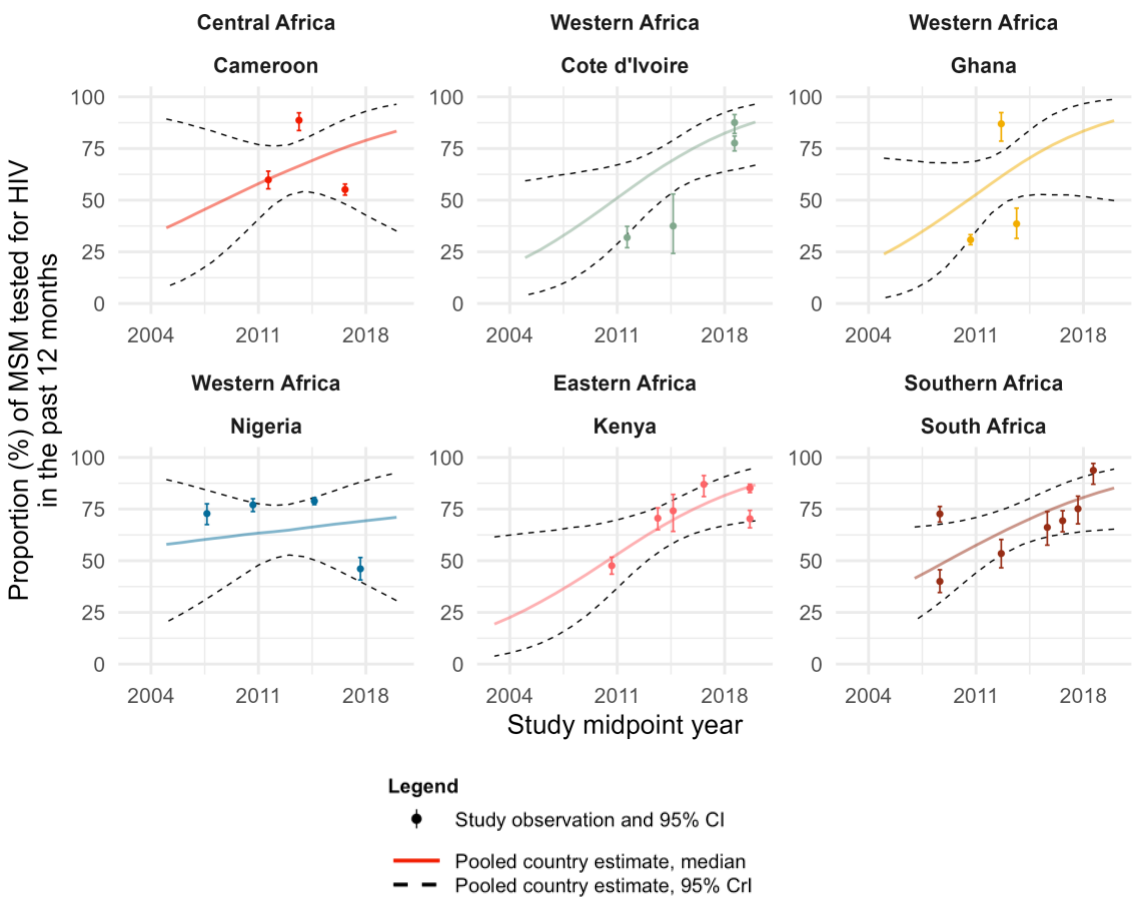
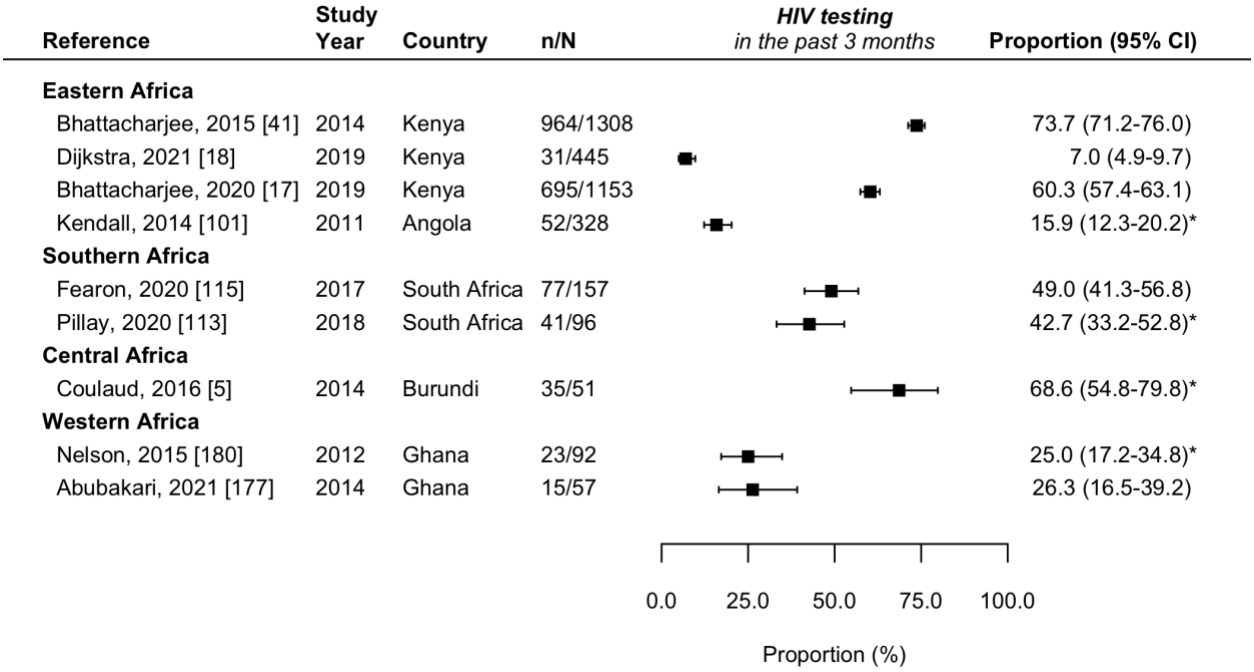
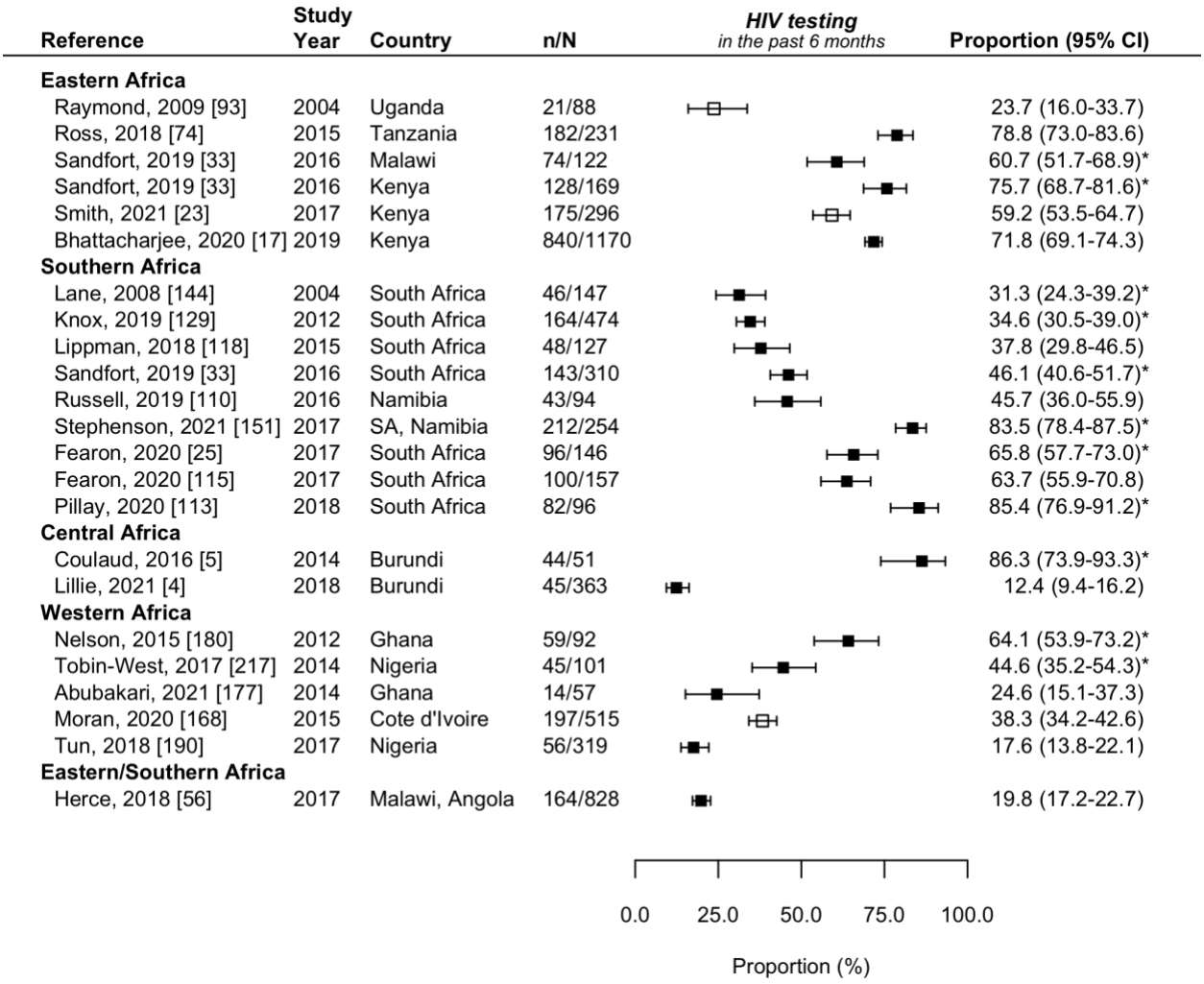


Figure S5. HIV testing in the past 12 months among men who have sex with men (MSM) over time, by country of Africa. Estimates are shown over the range of available years in each region of Africa for countries with at least 3 observations from different time points. Points represent available study observations and their 95% confidence intervals. The solid and dotted lines represent the estimated country-level proportions and 95% credible intervals (CrI) over time, respectively.



***** observation calculated using available data reported within article

Figure S6. Forest plot of study proportions of men who have sex with men (MSM) tested for HIV in the past 3 months, by region of Africa. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).



***** observation calculated using available data reported within article

Figure S7. Forest plot of study proportions of men who have sex with men (MSM) tested for HIV in the past 6 months, by region of Africa. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).

Table S5a. Estimated time trends in HIV testing in the past 6 months among men who have sex with men (MSM) in Africa and population weighted estimated outcomes in 2010 and 2020, overall and by region of Africa.

Outcome	Region of Africa	N_o	Estimate of time trend (per year)	95% CrI	Population weighted estimate in 2010	95% CrI	Population weighted estimate in 2020	95% CrI
Past 6 months HIV testing (%)								
Among	Overall	23	OR=0.85	0.40-1.74	69%	43-82%	31%	23-52%
all	Central/Western Africa	7	OR=0.64	0.41-1.08	86%	46-97%	7%	1-43%
MSM*	Eastern/Southern Africa	16	OR=1.08	0.76-1.36	44%	23-68%	70%	50-83%

ART, antiretroviral therapy; CrI, credible interval; IRR, incidence rate ratio; MSM, men who have sex with men; OR, odds ratio.

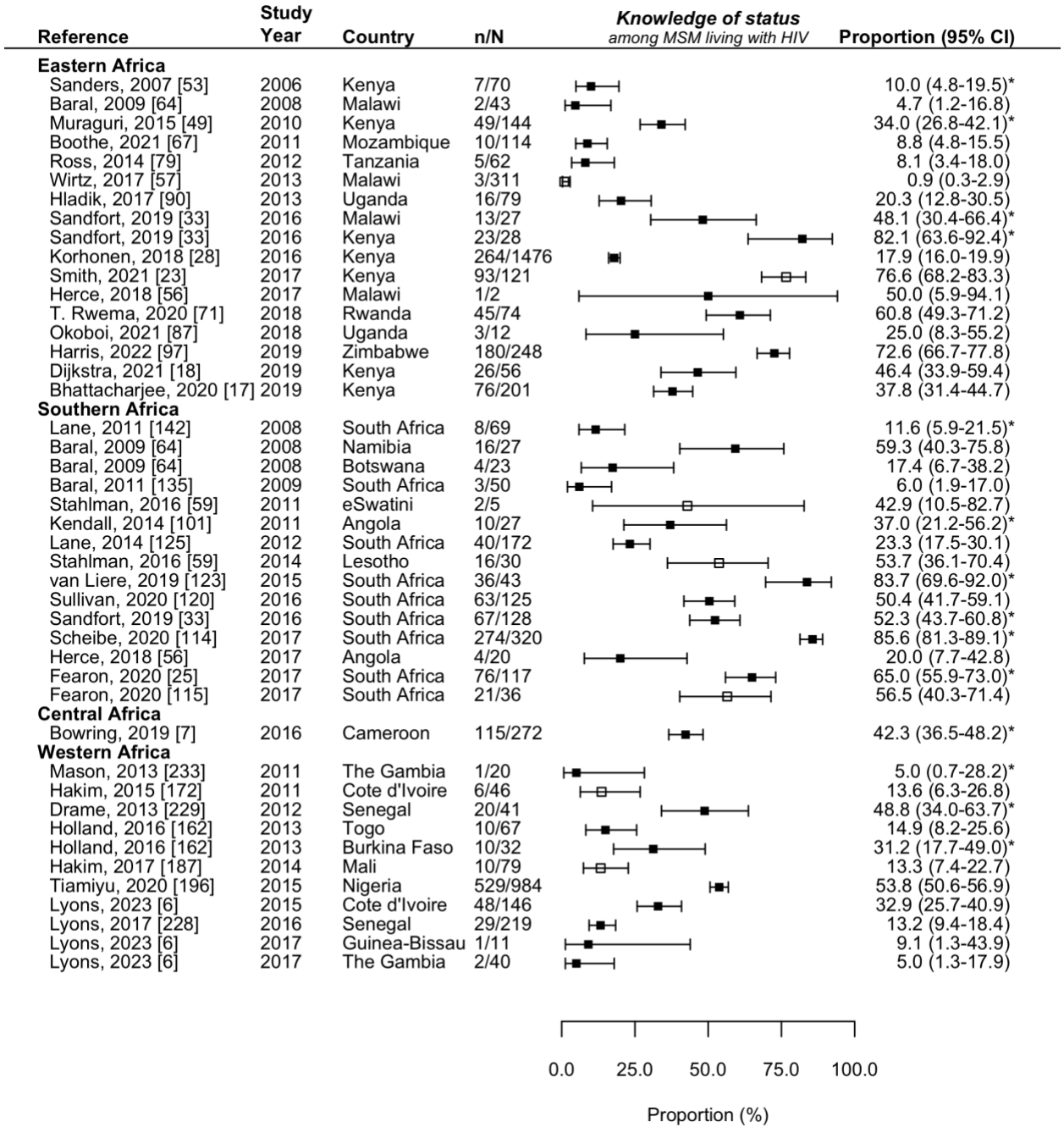
* n = 1 observation from Central/Eastern Africa not included

Table S5b. Unweighted estimate of HIV testing in the past 6 months in 2010 and 2020, overall and by region of Africa.

Outcome	Region of Africa	N_o	Unweighted estimate in 2010	95% CrI	Unweighted estimate in 2020	95% CrI
Past 6 months HIV testing (%)						
Among	Overall	23	68%	7-99%	31%	1-96%
all	Central/Western Africa	7	88%	37-99%	7%	1-60%
MSM*	Eastern/Southern Africa	16	43%	18-86%	65%	25-86%

ART, antiretroviral therapy; CrI, credible interval; IRR, incidence rate ratio; MSM, men who have sex with men; OR, odds ratio.

* n = 1 observation from Central/Eastern Africa not shown



***** observation calculated using available data reported within article

Figure S8. Forest plot of study proportions of men who have sex with men (MSM) living with HIV who know their status (HIV aware MSM), by region of Africa. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).

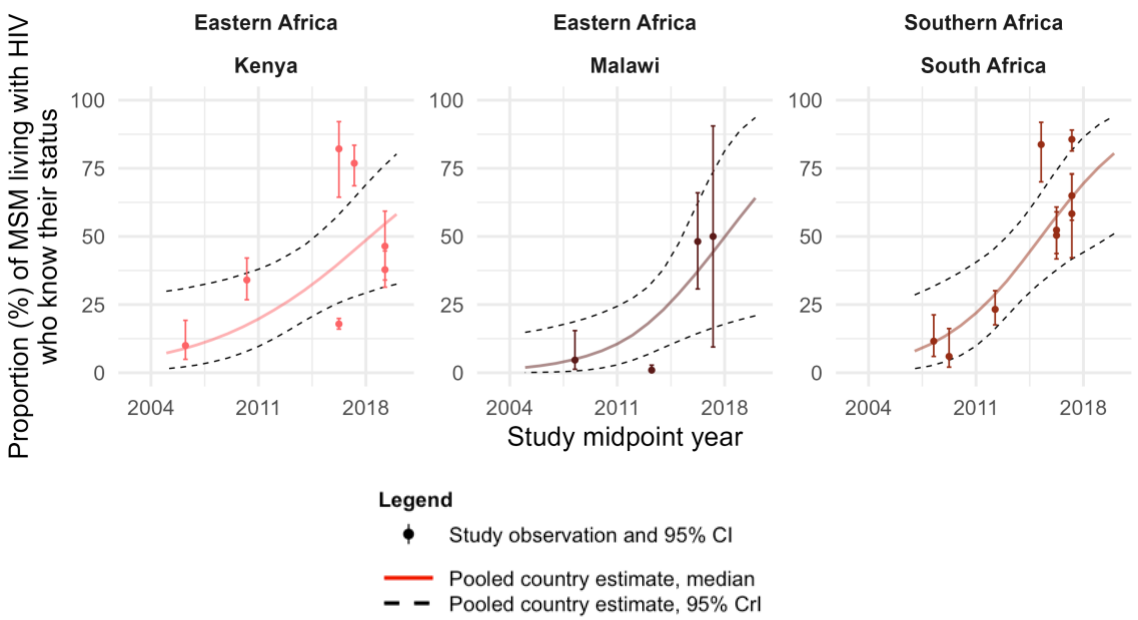
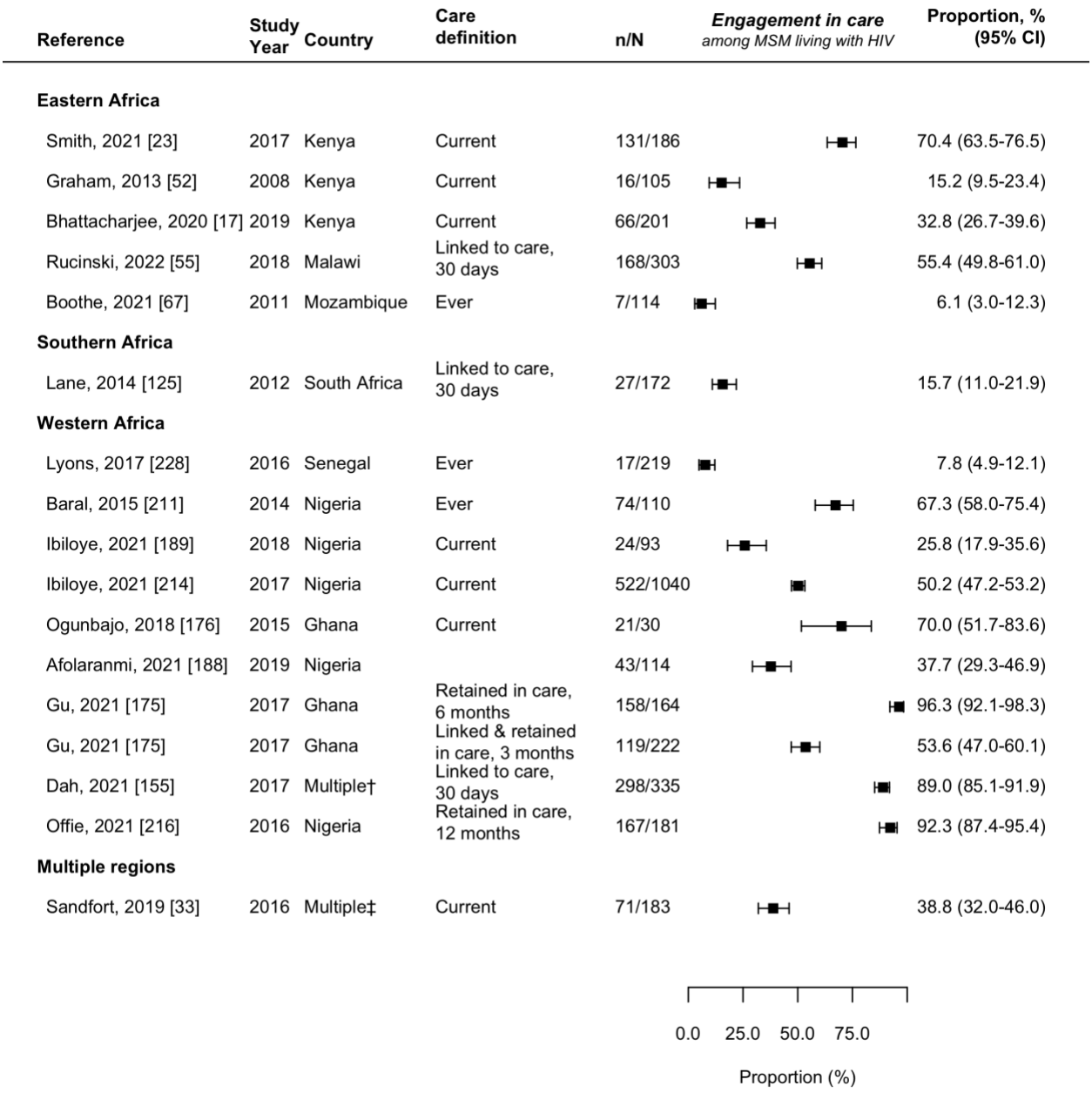


Figure S9. Knowledge of status (self-reported) among men who have sex with men (MSM) living with HIV over time, by country of Africa. Estimates are shown over the range of available years in each region of Africa for countries with at least 3 observations from different time points. Points represent available study observations and their 95% confidence intervals. The solid and dotted lines represent the estimated country-level proportions and 95% credible intervals (CrI) over time, respectively.

Text S6. Additional results pertaining to engagement in care outcomes

Observations of engagement in care (other than current ART use) among MSM living with HIV included reports of ever receiving care (N_o=3), ever receiving ART (N_o=7), currently receiving care (N_o=7), being linked to care within 30 days of diagnosis (N_o=2), being linked and retained in care within 3 months of diagnosis (N_o=1), and being retained in care in the past 12 (N_o=1) or 6 months (N_o=1). In 6 studies, ever ART use among HIV aware MSM was reported (N_o=6).



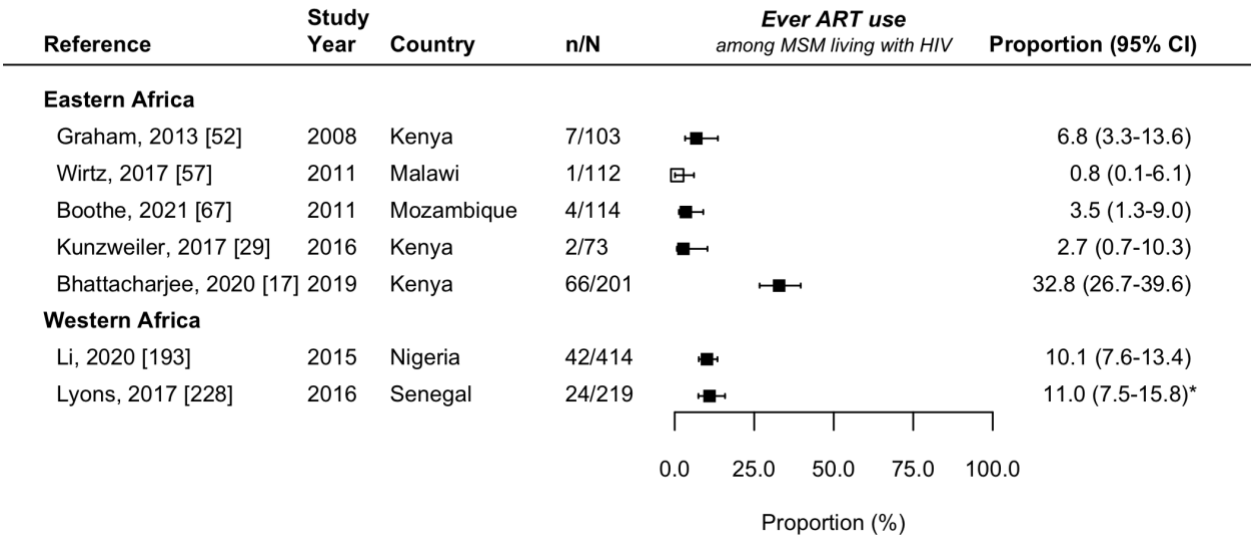
***** observation calculated using available data reported within article

† includes Burkina Faso, Cote d'Ivoire, Mali, Togo

‡ includes Kenya, Malawi, South Africa

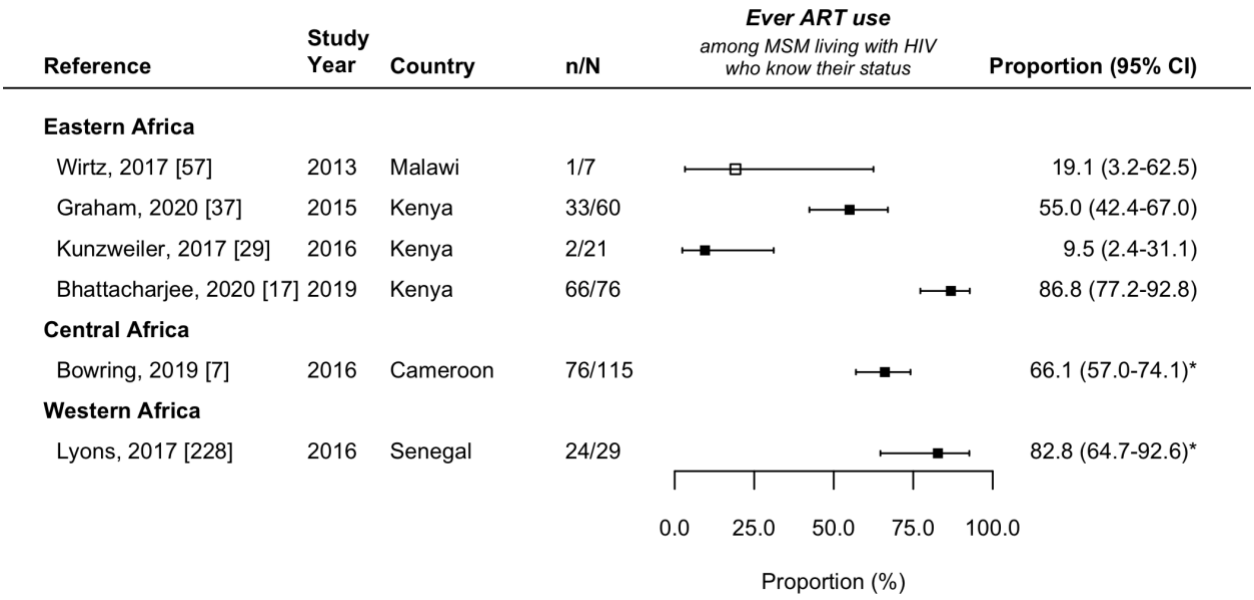
Figure S10. Forest plot of study proportions of men who have sex with men (MSM) living with HIV engaged in care other than current ART use, by region of Africa.

(a)



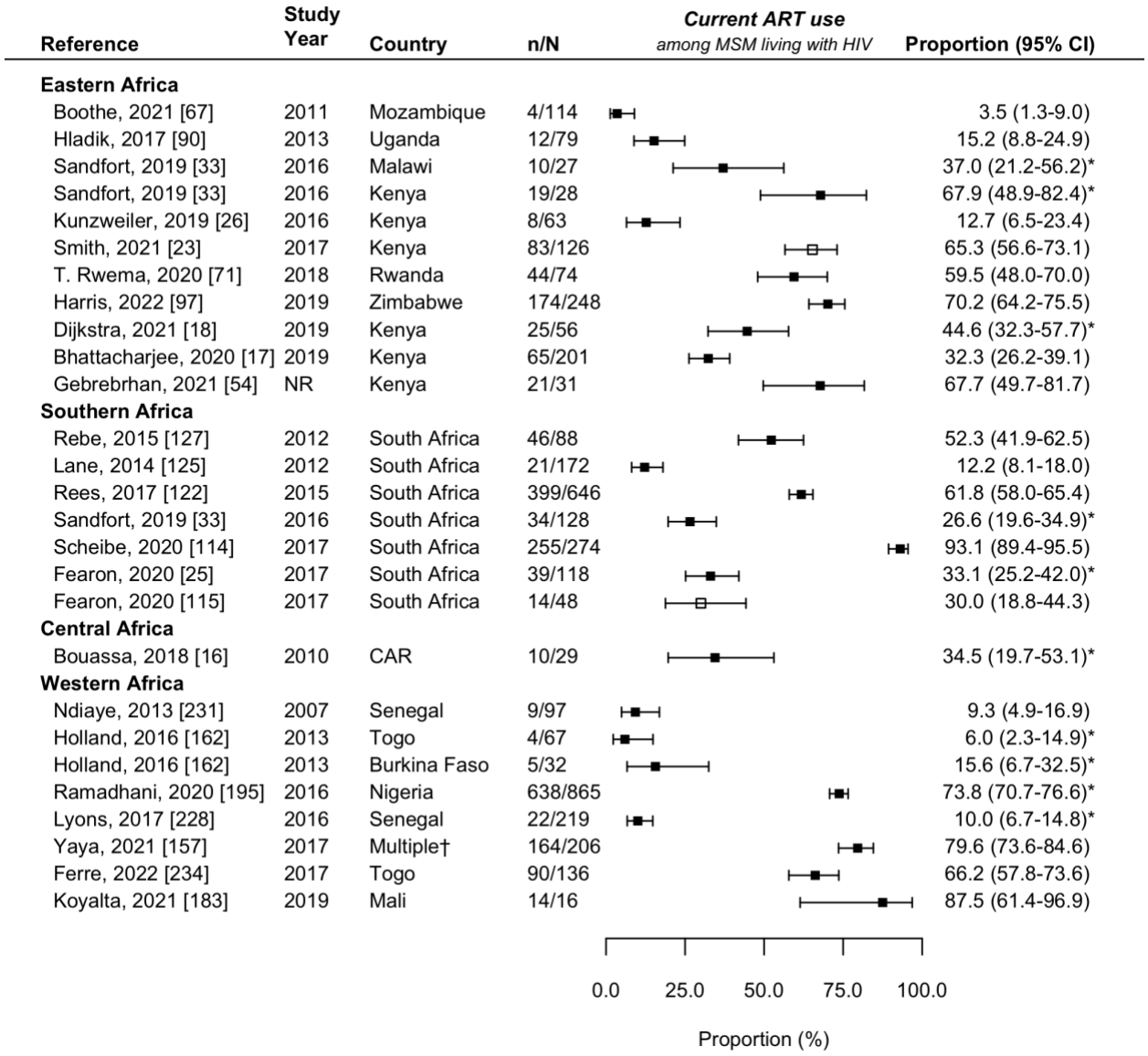
***** observation calculated using available data reported within article

(b)



***** observation calculated using available data reported within article

Figure S11. Forest plot of study proportions of men who have sex with men (MSM) ever on ART, by region of Africa. Ever ART use among (a) MSM living with HIV, and (b) HIV aware MSM. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).



***** observation calculated using available data reported within article

† includes Burkina Faso, Cote d'Ivoire, Mali, and Togo.

Figure S12. Forest plot of study proportions of men who have sex with men (MSM) living with HIV currently on antiretroviral therapy (ART), by region of Africa. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).

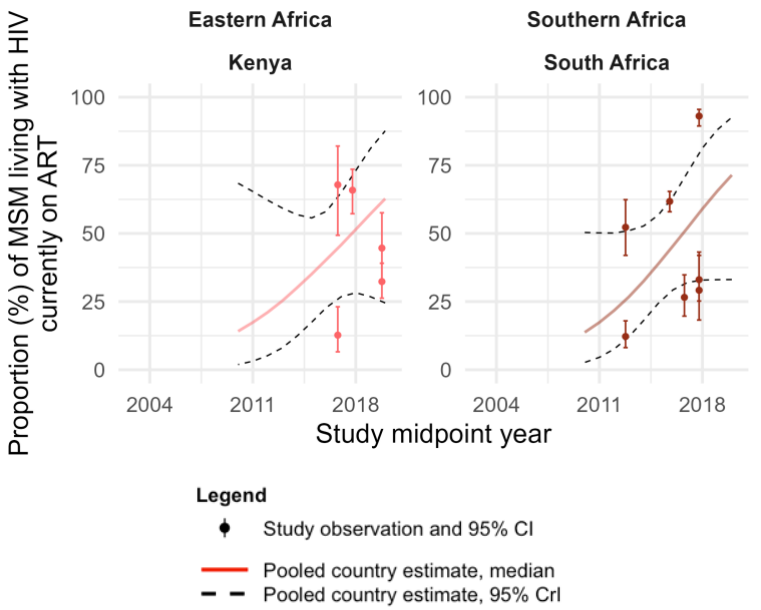
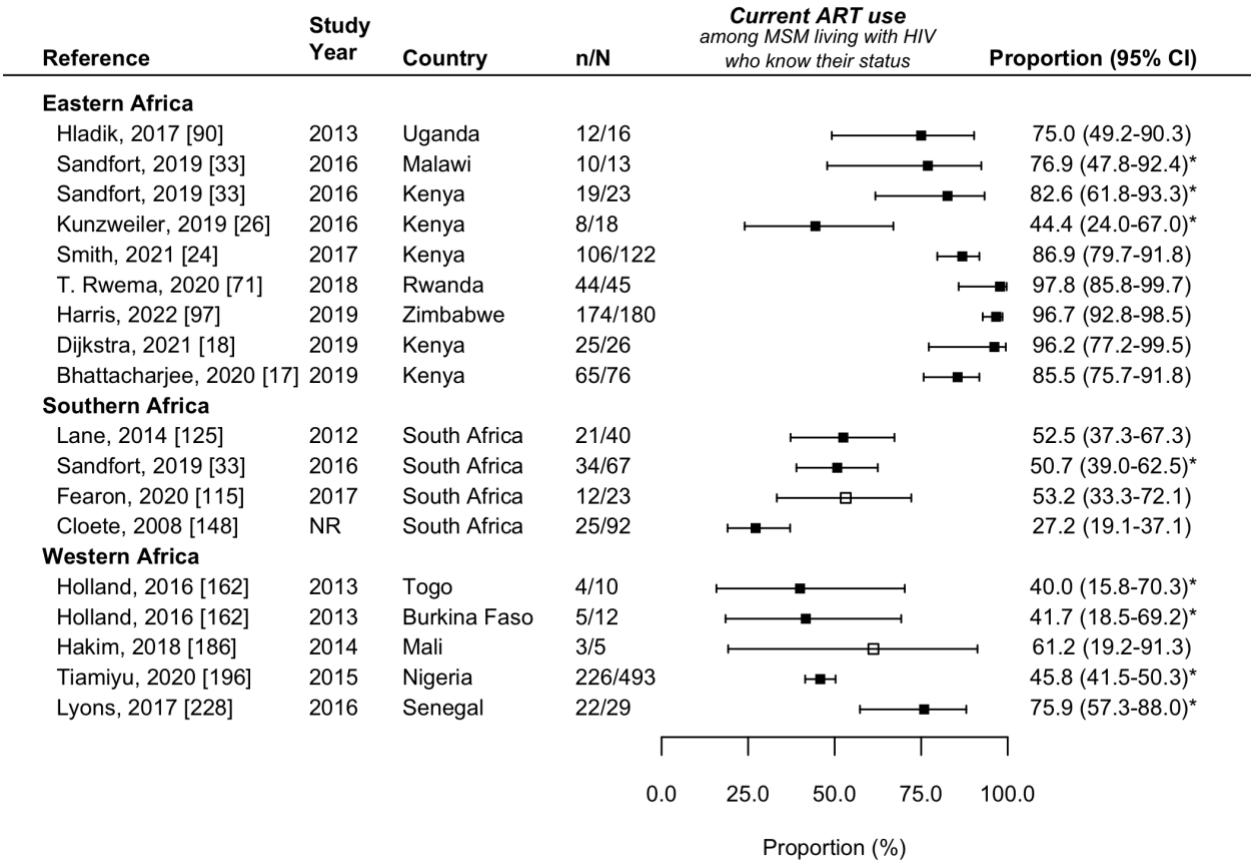


Figure S13. Current antiretroviral therapy (ART) use among men who have sex with men (MSM) living with HIV over time, by country of Africa. Estimates are shown over the range of available years in each region of Africa for countries with at least 3 observations from different time points. Points represent available study observations and their 95% confidence intervals. The solid and dotted lines represent the estimated country-level proportions and 95% credible intervals (CrI) over time, respectively.



***** observation calculated using available data reported within article

Figure S14. Forest plot of study proportions of HIV aware men who have sex with men (MSM) currently on antiretroviral therapy (ART), by region of Africa. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).

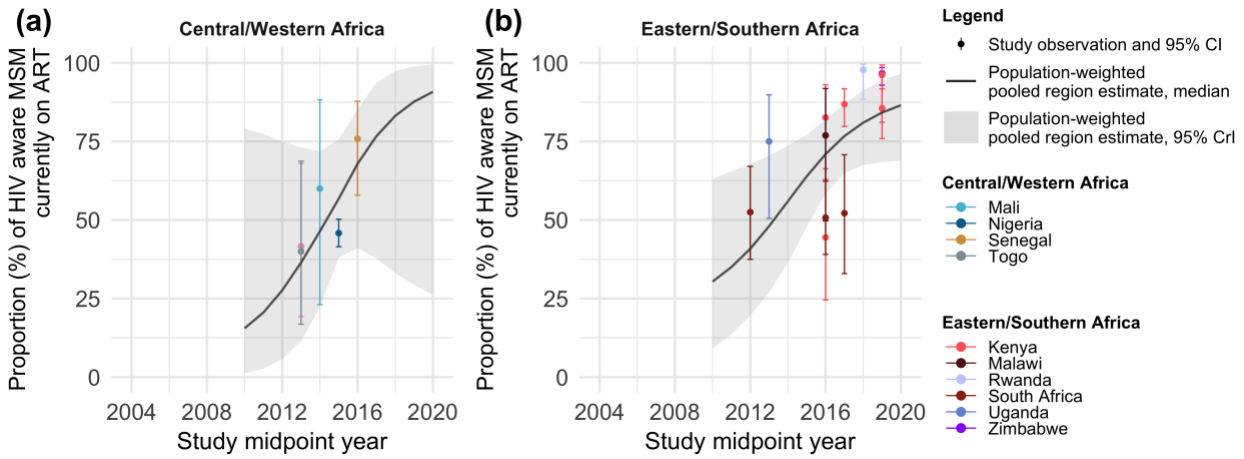


Figure S15. Current antiretroviral therapy (ART) use among HIV aware men who have sex with men (MSM) over time, by region and country of Africa. Current ART use among HIV aware MSM in (a) Central/Western Africa, and (b) Eastern/Southern Africa. Points represent available study observations and their 95% confidence intervals, coloured by country in which the study was conducted. The black solid and dotted lines represent the estimated region-level proportions and 95% credible intervals (CrI), respectively. Coloured solid lines represent estimated country-level proportions for countries with at least 3 estimates from 3 different time points (see Figure S20 for individual country-level time trends and 95% CrI).

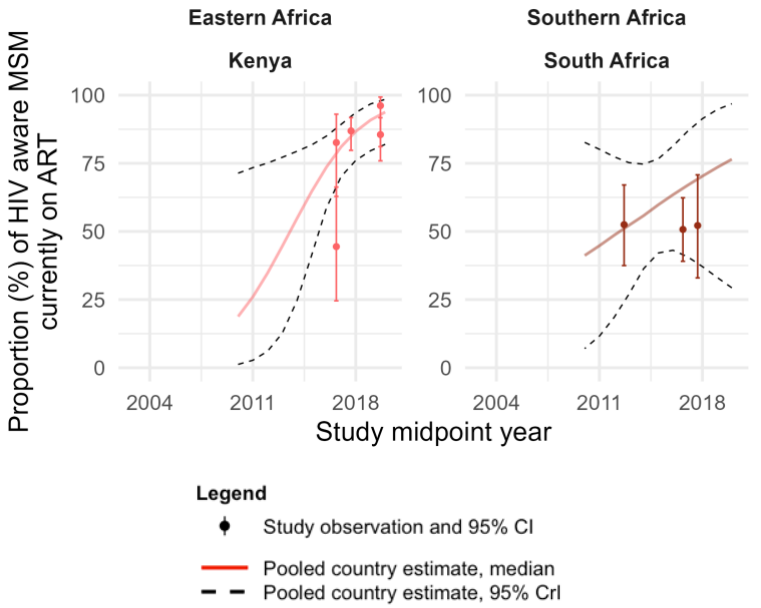
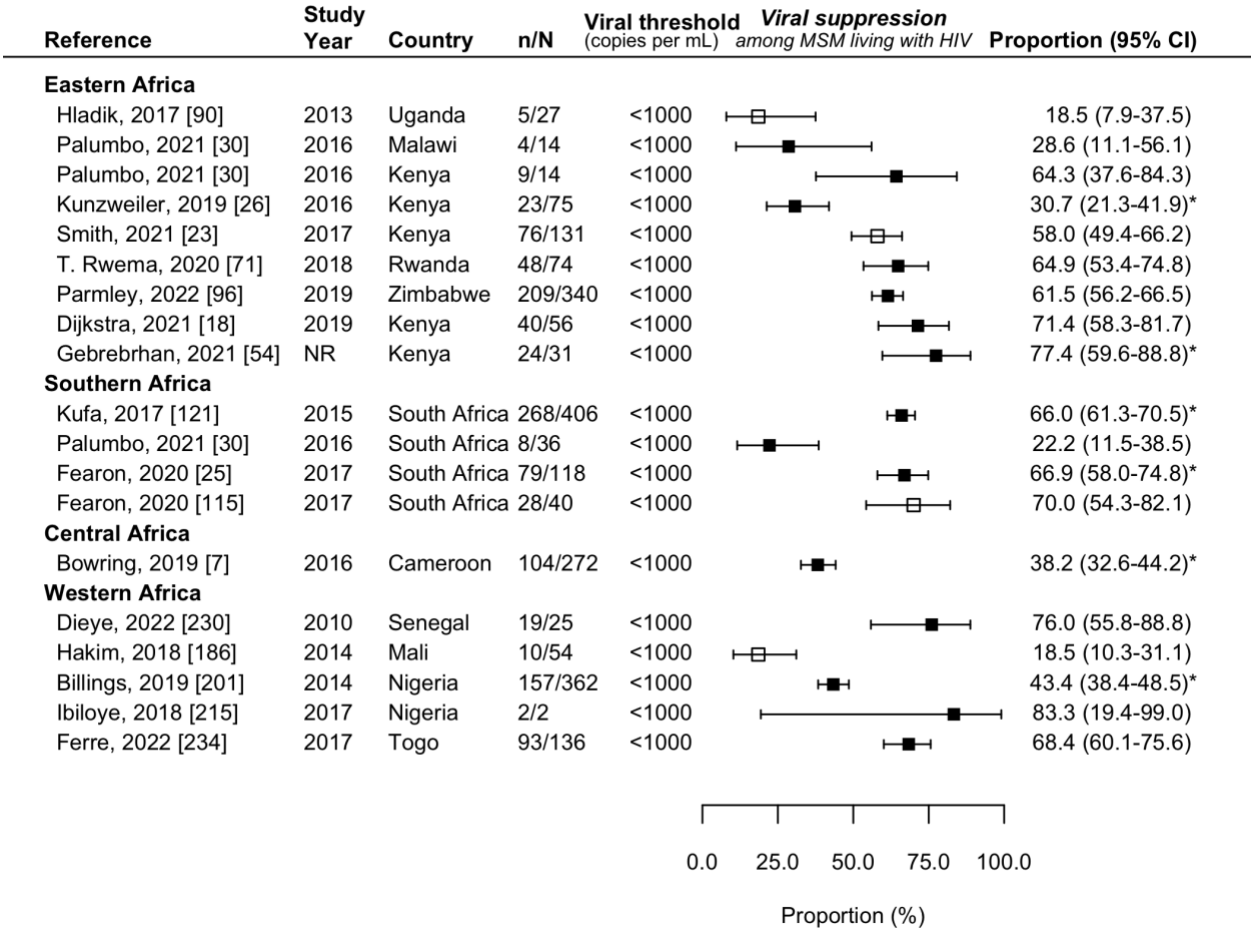
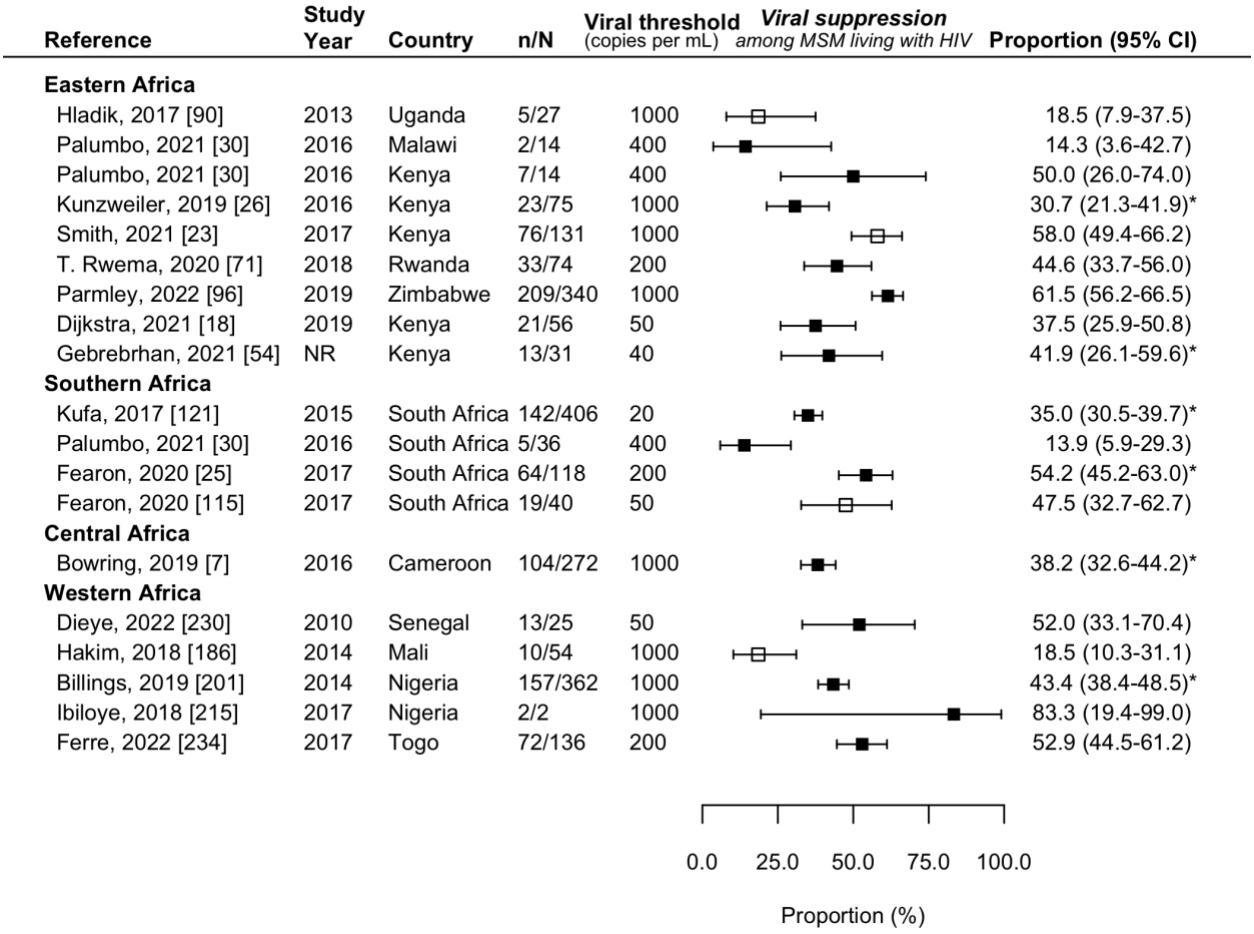


Figure S16. Current antiretroviral therapy (ART) use among HIV aware men who have sex with men (MSM) over time, by country of Africa. Estimates are shown over the range of available years in each region of Africa for countries with at least 3 observations from different time points. Points represent available study observations and their 95% confidence intervals. The solid and dotted lines represent the estimated country-level proportions and 95% credible intervals (CrI) over time, respectively.



***** observation calculated using available data reported within article

Figure S17a. Forest plot of study proportions of men who have sex with men (MSM) living with HIV virally suppressed, by region of Africa, standardised to a viral threshold of <1000 copies per mL. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).



***** observation calculated using available data reported within article

Figure S17b. Forest plot of study proportions of men who have sex with men (MSM) living with HIV virally suppressed, by region of Africa, based on viral threshold defined by the authors of each included study. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).

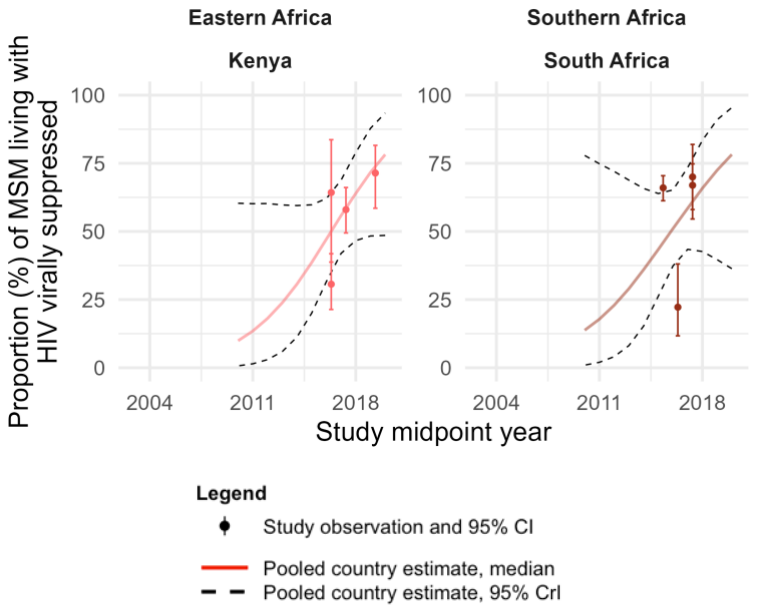
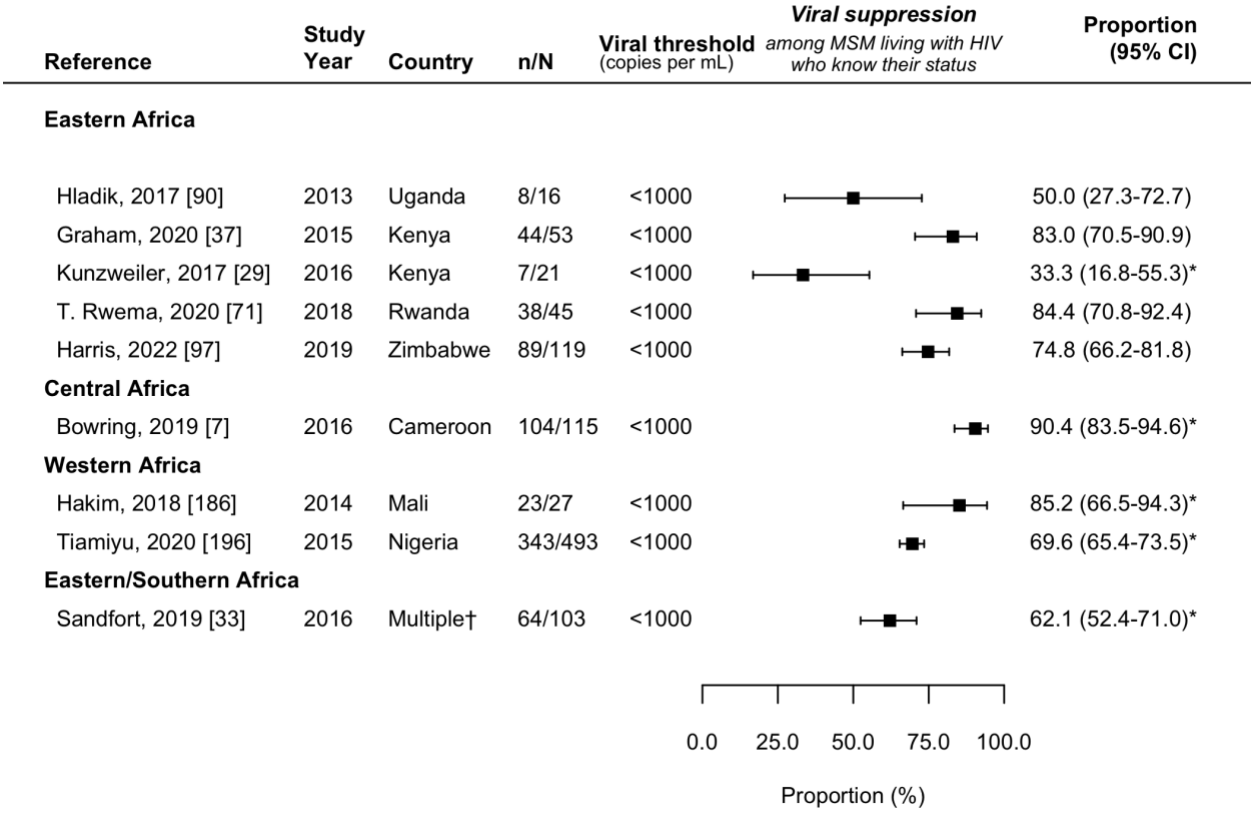


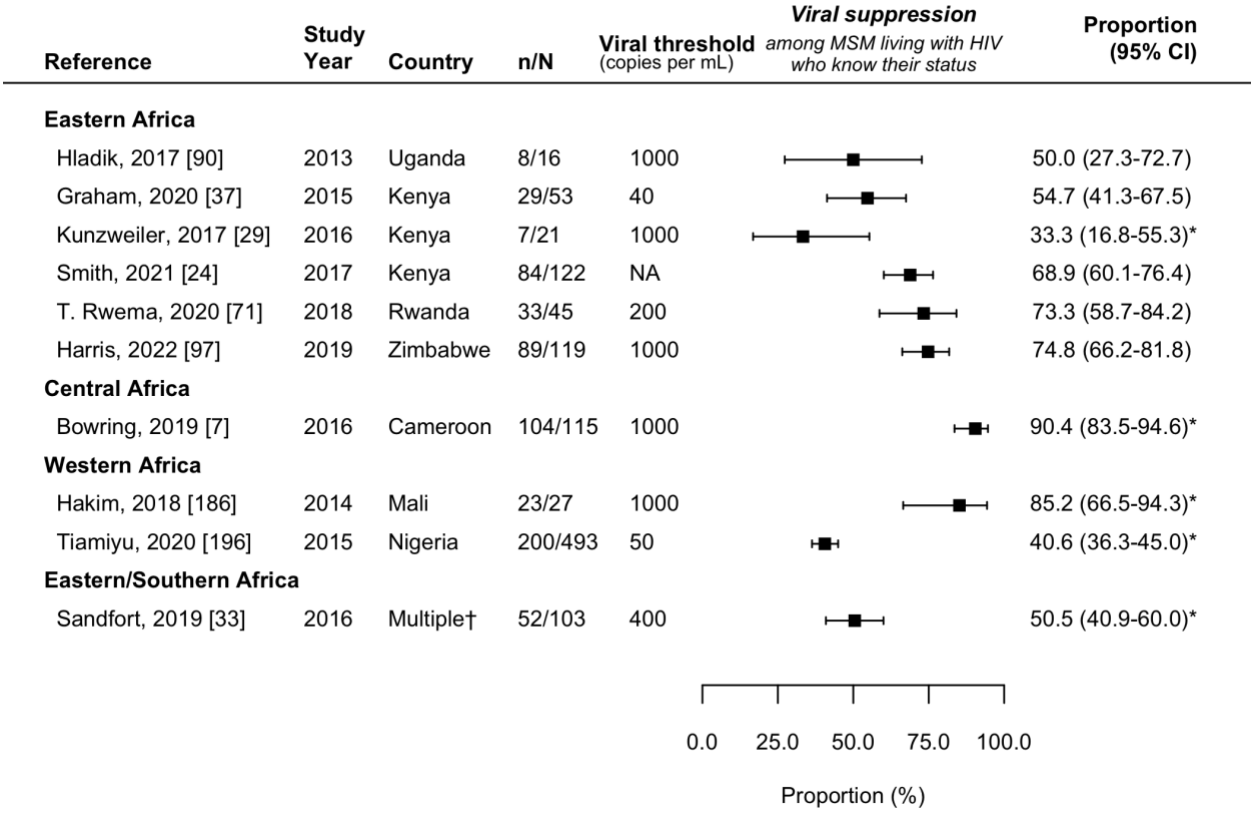
Figure S18. Viral suppression among men who have sex with men (MSM) living with HIV over time, by country of Africa. Estimates are shown over the range of available years in each region of Africa for countries with at least 3 observations from different time points. Points represent available study observations and their 95% confidence intervals. The solid and dotted lines represent the estimated country-level proportions and 95% credible intervals (CrI) over time, respectively.



***** observation calculated using available data reported within article

† includes Kenya, Malawi, and South Africa.

Figure S19a. Forest plot of study proportions of HIV aware men who have sex with men (MSM) virally suppressed, by region of Africa, standardized to a viral threshold of <1000 copies per mL. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).



***** observation calculated using available data reported within article

† includes Kenya, Malawi, and South Africa.

Figure S19b. Forest plot of study proportions of HIV aware men who have sex with men (MSM) virally suppressed, by region of Africa, based on viral thresholds defined by the authors of each included study. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).

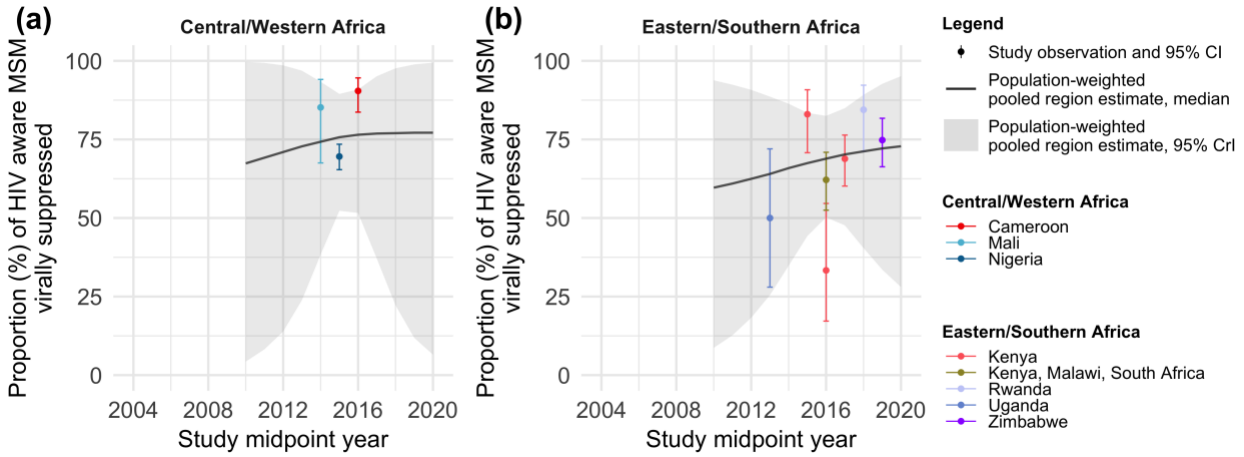


Figure S20. Viral suppression among HIV aware men who have sex with men (MSM) over time, by region and country of Africa. Viral suppression among HIV aware MSM in (a) Central/Western Africa, and (b) Eastern/Southern Africa. Points represent available study observations and their 95% confidence intervals, coloured by country in which the study was conducted. The black solid and dotted lines represent the estimated region-level proportions and 95% credible intervals (CrI), respectively. Coloured solid lines represent estimated country-level proportions for countries with at least 3 estimates from 3 different time points (see Figure S22 for individual country-level time trends and 95% CrI).

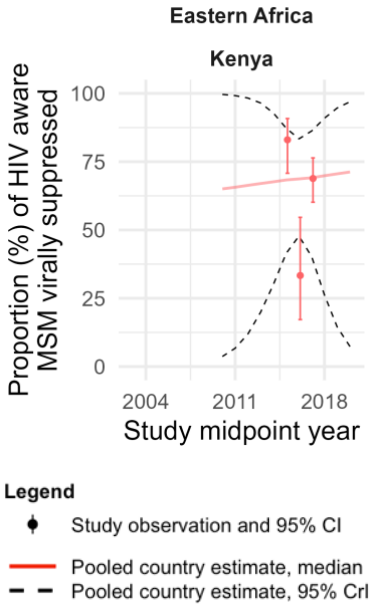
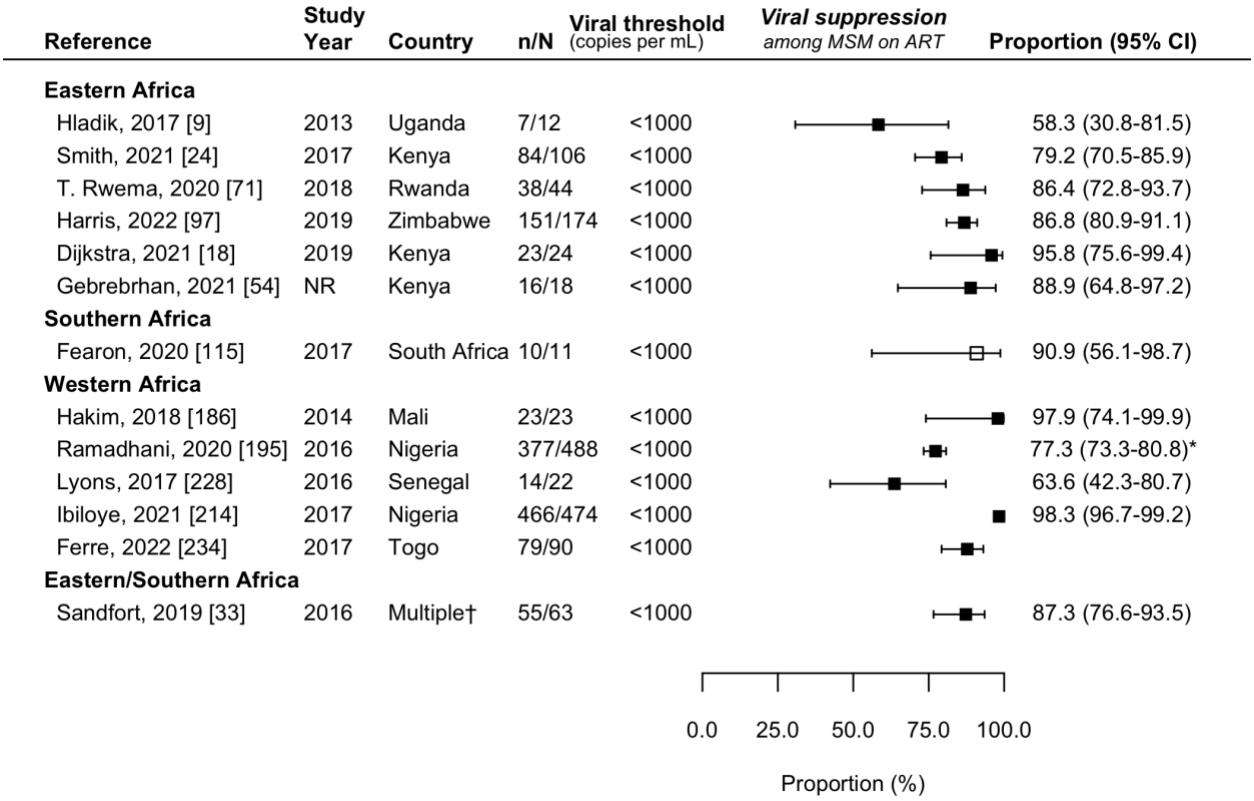


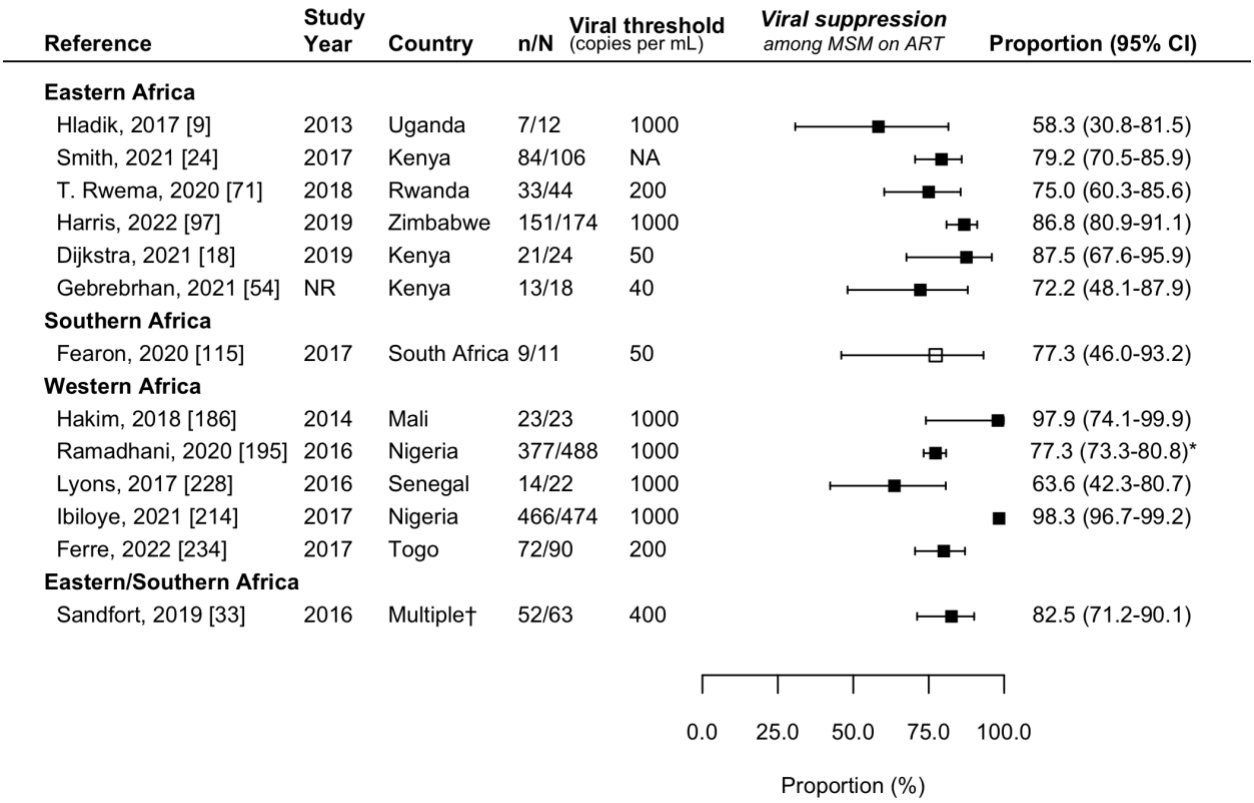
Figure S21. Viral suppression among HIV aware men who have sex with men (MSM) over time, by country of Africa. Estimates are shown over the range of available years in each region of Africa for countries with at least 3 observations from different time points. Points represent available study observations and their 95% confidence intervals. The solid and dotted lines represent the estimated country-level proportions and 95% credible intervals (CrI) over time, respectively.



***** observation calculated using available data reported within article

† includes Kenya, Malawi, and South Africa.

Figure S22a. Forest plot of study proportions of men who have sex with men (MSM) currently on antiretroviral therapy (ART) virally suppressed, by region of Africa, standardized to a viral threshold of <1000 copies per ml. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).



***** observation calculated using available data reported within article

† includes Kenya, Malawi, and South Africa.

Figure S22b. Forest plot of study proportions of men who have sex with men (MSM) currently on antiretroviral therapy (ART) virally suppressed, by region of Africa, based on viral thresholds defined by the authors of each included study. Studies reported crude proportions (filled squares) or proportions adjusted for sampling design (e.g., respondent driven sampling, cluster, time-location sampling; unfilled squares).

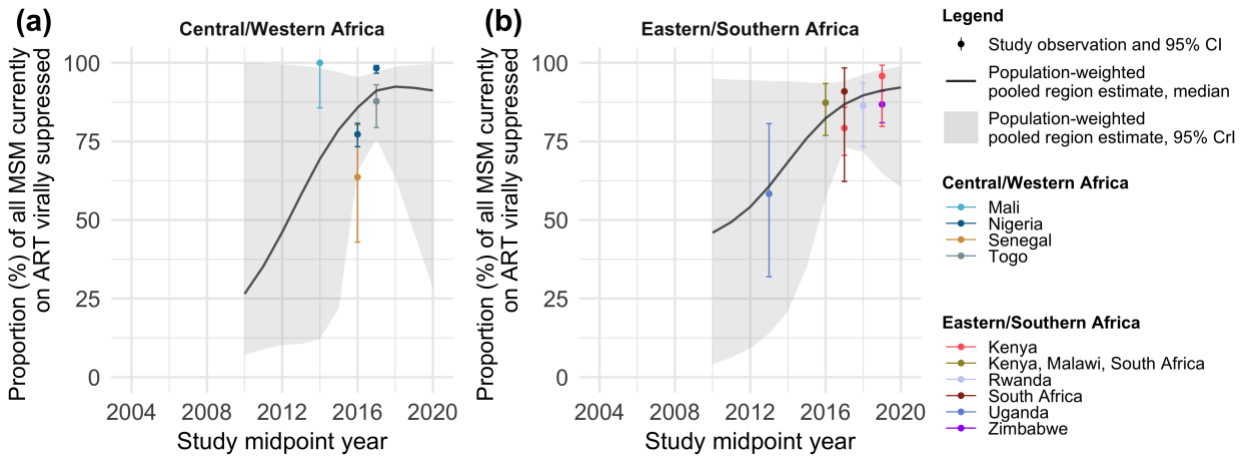
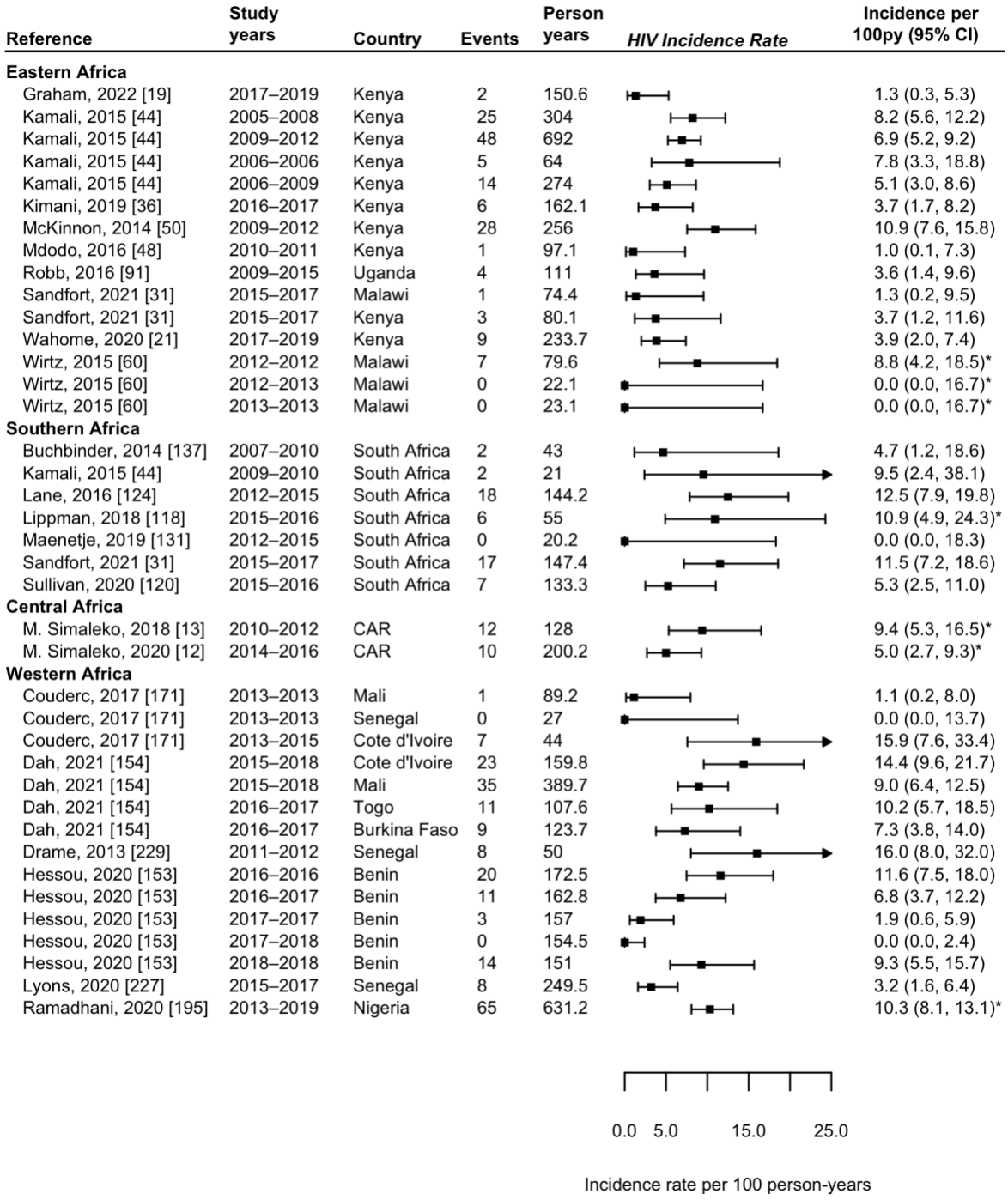


Figure S23. Viral suppression among men who have sex with men (MSM) currently on antiretroviral therapy (ART) over time, by region and country of Africa. Viral suppression among MSM currently on ART over time in (a) Central/Western Africa and (b) Eastern/Southern Africa. Points represent available study observations and their 95% confidence intervals, coloured by country in which the study was conducted. The black solid and dotted lines represent the estimated region-level proportions and 95% credible intervals (CrI), respectively. Coloured solid lines represent estimated country-level proportions for countries with at least 3 estimates from 3 different time points (see Figure S22 for individual country-level time trends and 95% CrI).



***** observation calculated using available data reported within article

Figure S24. Forest plot of study observations of HIV incidence among men who have sex with men (MSM), by region of Africa.

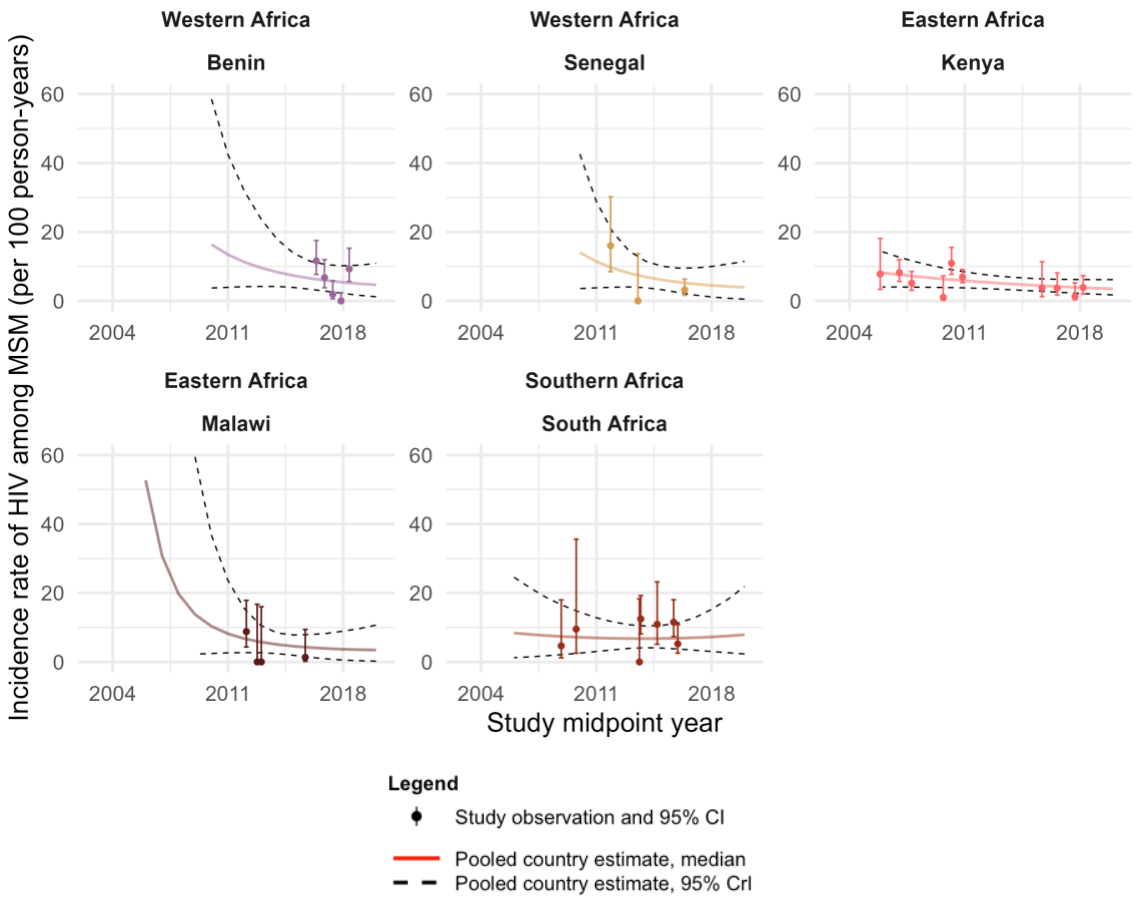


Figure S25. HIV incidence among men who have sex with men (MSM) over time, by country of Africa. Estimates are shown over the range of available years in each region of Africa for countries with at least 3 observations from different time points. Points represent available study observations and their 95% confidence intervals. The solid and dotted lines represent the estimated country-level proportions and 95% credible intervals (CrI) over time, respectively.

Table S6. Estimated associations between HIV testing, treatment cascade (among those living with HIV), and HIV incidence among MSM, with the criminalization of partnerships between men, compared to no crimilaization, adjusted for the midpoint of the study year.

Outcome	Number of studies conducted where partnerships between men were not legal	Number of studies conducted where partnerships between men were legal	Estimate of association with criminalization (adjusted for midpoint of study year)	95% CrI	Unweighted overall pooled estimate in 2010 in presence of criminalization (95% CrI)	Unweighted overall pooled estimate in 2020 in presence of criminalization (95% CrI)	Unweighted overall pooled estimate in 2010 in absence of criminalization (95% CrI)	Unweighted overall pooled estimate in 2020 in absence of criminalization (95% CrI)
Ever HIV testing (%)	68	31	OR_{crim}=0.64	0.37-1.16	63% (44-82%)	80% (25-96%)	73% (51-88%)	86% (32-98%)
Past 12 months HIV testing (%)	30	14	OR_{crim}=1.14	0.53-2.32	47% (28-68%)	91% (62-99%)	44% (21-69%)	90% (61-98%)
Knowledge of status (%)	28	16	OR_{crim}=0.78	0.33-1.95	17% (5-51%)	49% (8-88%)	20% (5-58%)	55% (9-91%)
MSM living with HIV currently on ART (%)	15	11	OR_{crim}=0.57	0.21-1.58	9% (1-69%)	66% (10-96%)	15% (1-80%)	77% (17-98%)
MSM living with HIV virally suppressed (%)	13	6	OR_{crim}=0.97	0.36-2.83	20% (1-92%)	70% (13-96%)	21% (1-93%)	71% (12-97%)
HIV incidence (py^{-100})	16	15	IRR_{crim}=0.69	0.38-1.25	6.3py^{-100} (0.8-49.8)	4.1py^{-100} (0.3-59.5)	9.1py^{-100} (1.1-76.8)	5.9py^{-100} (0.4-88.5)

CrI, credible interval; IRR_{crim}, incidence rate ratio for criminalization vs no criminalization; MSM, men who have sex with men; OR_{crim}, odds ratio for criminalization vs no criminalization, py^{-100}, per 100 person-years

* 1 observation of ever HIV testing and 2 observations of past 12 months HIV testing were excluded from analyses of criminalization, as they were from studies conducted in both criminalizing and non-criminalizing settings (e.g., studies conducted in multiple countries), or criminalization data was not available

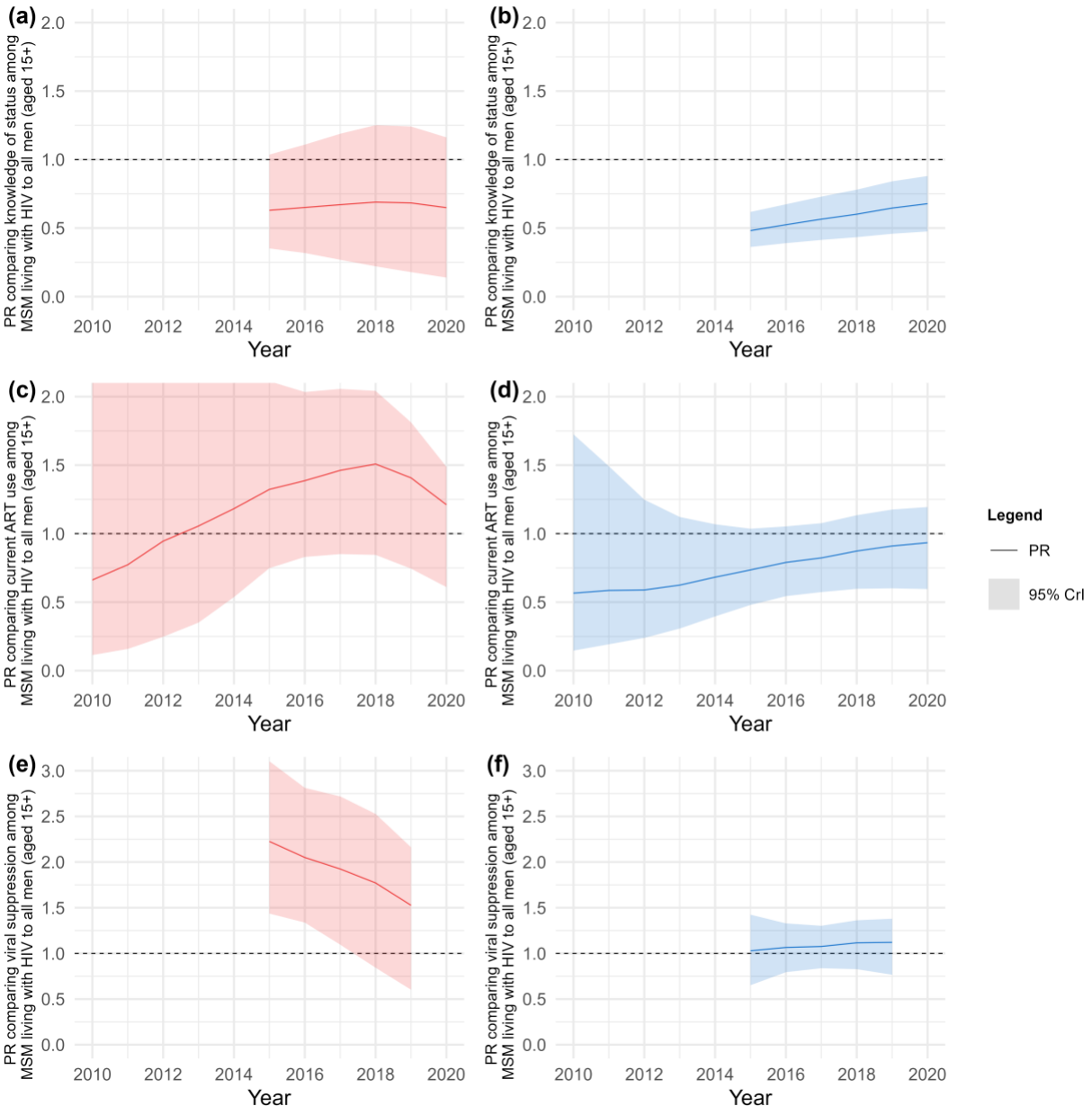


Figure S26. Prevalence ratios (PR) and 95% credible intervals (CrI) comparing population-weighted estimates of HIV treatment cascade outcomes among men who have sex with men (MSM) living with HIV with UNAIDS estimates among all men living with HIV (aged 15+), by region of Africa. PRs comparing estimates of (a) knowledge of status in Central/Western Africa, and (b) knowledge of status in Eastern/Southern Africa, (c) current antiretroviral therapy (ART) use in Central/Western Africa, and (d) current ART use in Eastern/Southern Africa, and (e) viral suppression in Central/Western Africa, and (f) viral suppression in Eastern/Southern Africa among MSM living with HIV with UNAIDS estimates among all men living with HIV (aged 15+). PRs were estimated over the range of years of estimates available for all men.

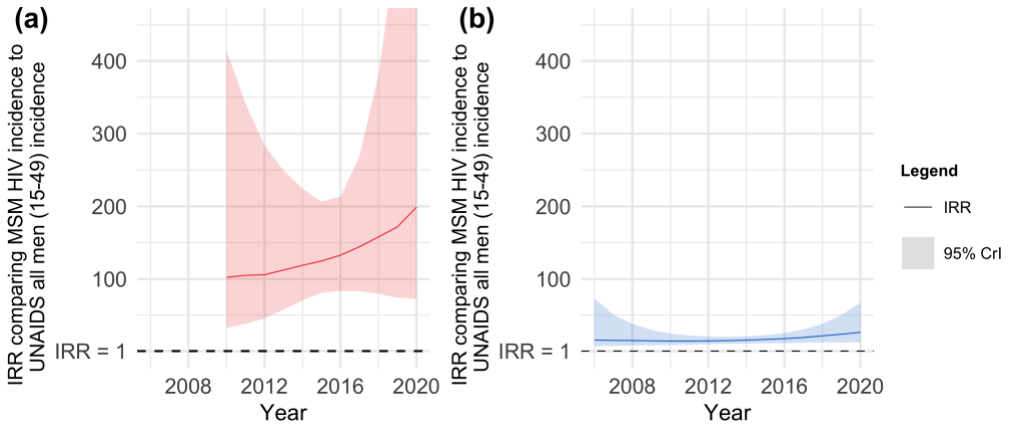


Figure S27. Incidence rate ratios (IRR) over time comparing population-weighted HIV incidence estimates among men who have sex with men (MSM) with UNAIDS estimates among all men (15-49), by region of Africa. (a) Central/Western Africa, and (b) Eastern/Southern Africa. The solid lines and shaded areas represent the estimated region-level IRR and 95% credible intervals (CrI), respectively.

Table S7. Study quality assessment of studies included in our review. Studies received a score ranging from 0-5 for each outcome reported in the study.

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Northern Africa									
Valadez 2013[100]	Libya	2010	HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
Elmahy 2018[99]	Egypt	2016	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	b = 1 point	1
Central Africa									
Coulaud 2016[5]	Burundi	2014	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	b = 1 point	1
			HIV testing in the past 12 months	b = 0 points	b = 0 points	b = 0 points	b = 0 points	b = 1 point	1
			HIV testing in the past 6 months	b = 0 points	b = 0 points	b = 0 points	b = 0 points	b = 1 point	1
			HIV testing in the past 3 months	b = 0 points	b = 0 points	b = 0 points	b = 0 points	b = 1 point	1
Lillie 2021[4]	Burundi	2018	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	a = 1 point	c = 0 points	2
			HIV testing in the past 6 months	b = 0 points	b = 0 points	a = 1 point	a = 1 point	c = 0 points	2
Lorente 2012[11]	Cameroon	2008	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Holland 2015[9], Park 2014[10]	Cameroon	2011	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
Rao 2017[8]	Cameroon	2013	HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Lyons 2023[6], Bowring 2019[7], Rao 2017[8]	Cameroon	2015/ 2016	HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
			Ever ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Viral suppression	a = 1 point	b = 0 points	a = 1 point	b = 0 points	a = 1 point	3
Gresenguet 2017[14], Longo 2018[15], Boussa 2018[16]	Central African Republic	2010	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Current antiretroviral therapy (ART) use	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
Mbeko Simaleko 2018[13]	Central African Republic	2011	HIV incidence	b = 0 points	b = 0 points	b = 0 points	c = 0 points	a = 1 point	1
Mbeko Simaleko 2020[12]	Central African Republic	2015	HIV incidence	c = 0 points	b = 0 points	c = 0 points	c = 0 points	a = 1 point	1
Western Africa									
Hessou 2020[153]	Benin	2017	HIV incidence	a = 1 point	b = 0 points	a = 1 point	b = 0 points	a = 1 point	3
Ahouada 2020[152]	Benin	2018	HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	a = 1 point	c = 0 points	3
Lyons 2023[6], Grosso 2019[160], Kim 2018[161], Poteat 2017[58], Holland 2016[162], Goodman 2016[163], Stahlman 2016[164]	Burkina Faso	2013	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Dah 2021[154], Dah 2021[155], Yaya 2022[156], Yaya 2021[157], Laurent 2021[158], Coulaud 2020[159]	Burkina Faso	2017	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Engagement in care	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			HIV incidence	b = 0 points	b = 0 points	b = 0 points	b = 0 points	a = 1 point	1
Vuylsteke 2012[174]	Côte d'Ivoire	2007	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	c = 0 points	c = 0 points	0
	Côte d'Ivoire	2011	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Hakim 2015[172], Aho 2014[173]			HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			Knowledge of status	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
Couderc 2017[171]	Côte d'Ivoire	2014	HIV incidence	b = 0 points	b = 0 points	b = 0 points	c = 0 points	a = 1 point	1
Bouscaillou 2016[170]	Côte d'Ivoire	2014	HIV testing in the past 12 months	a = 1 point	b = 0 points	b = 0 points	b = 0 points	c = 0 points	1
Lyons 2023[6], Moran 2020[168], Ulanja 2019[169]	Côte d'Ivoire	2015	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			HIV testing in the past 6 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
Dah 2021[154], Dah 2021[155], Yaya 2022[156], Yaya 2021[157], Laurent 2021[158], Coulaud 2020[159]	Côte d'Ivoire	2016	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Engagement in care	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Current ART use	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			HIV incidence	b = 0 points	b = 0 points	b = 0 points	b = 0 points	a = 1 point	1
Diabate 2021[165]	Côte d'Ivoire	2018	HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	c = 0 points	c = 0 points	2
Inghels 2022[166], Inghels 2021[167]	Côte d'Ivoire	2018	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	c = 0 points	c = 0 points	3
Gyamerah 2020[181]	Ghana	2010	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Kushwaha 2017[179], Nelson 2015[180]	Ghana	2012	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			HIV testing in the past 6 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			HIV testing in the past 3 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Girault 2015[178]	Ghana	2013	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
Abubakari 2021[177]	Ghana	2014	HIV testing ever	a = 1 point	b = 0 points	b = 0 points	a = 1 point	c = 0 points	2
			HIV testing in the past 12 months	a = 1 point	b = 0 points	b = 0 points	a = 1 point	c = 0 points	2
			HIV testing in the past 6 months	a = 1 point	b = 0 points	b = 0 points	a = 1 point	c = 0 points	2
Ogunbajo 2018[176]	Ghana	2015	Engagement in care	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
Gu 2021[175]	Ghana	2017	Engagement in care	b = 0 points	b = 0 points	a = 1 point	a = 1 point	b = 1 point	3
Lyons 2023[6]	Guinea-Bissau	2017	HIV testing ever, knowledge of status	a = 1 point	b = 0 points	c = 0 points	c = 0 points	d = 0 points	1
Lieber 2018[182]	Liberia	NR	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
Couderc 2017[171]	Mali	2013	HIV incidence	b = 0 points	b = 0 points	b = 0 points	c = 0 points	a = 1 point	1
Knox 2021[184], Lahuerta 2018[185], Hakim 2018[186], Hakim 2017[187]	Mali	2014	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			Knowledge of status	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			Current ART use	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			Viral suppression	a = 1 point	a = 1 point	a = 1 point	b = 0 points	a = 1 point	4
Dah 2021[154], Dah 2021[155], Yaya 2022[156], Yaya 2021[157], Laurent 2021[158], Coulaud 2020[159]	Mali	2016	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Engagement in care	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Current ART use	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			HIV incidence	b = 0 points	b = 0 points	b = 0 points	b = 0 points	a = 1 point	1

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Koyalta 2021[183]	Mali	2019	Current ART use	b = 0 points	b = 0 points	b = 0 points	c = 0 points	c = 0 points	0
Adam 2009[66]	Mauritania	2006	HIV testing in the past 12 months	c = 0 points	b = 0 points	c = 0 points	c = 0 points	d = 0 points	0
Eluwa 2019[218], Merrigan 2011[226], Adam 2009[66]	Nigeria	2007	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
Stromdahl 2019[224], Stromdahl 2012[225]	Nigeria	2008	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
Eluwa 2019[218], Eluwa 2015[219]	Nigeria	2010	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
Adebajo 2014[220], Sheehy 2014[221], Vu 2013[222], Vu 2013[223]	Nigeria	2010	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
Lyons 2023[6], LeeVan 2022[191], Olawore 2021[192], Li 2020[193], Nowak 2020[194], Ramadhani 2020[195], Tiamiyu 2020[196], Robbins 2020[197], Kayode 2020[198], Nowak 2019[199], Nowak 2019[200], Billings 2019[201], Crowell 2019[202], Ramadhani 2018[203], Rodriguez-Hart 2018[204], Stahlman 2017[205],	Nigeria	2013	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Engagement in care	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Nowak 2017[206], Ramadhani 2017[207], Crowell 2017[208], Nowak 2016[209], Rodriguez-Hart 2016[210], Baral 2015[211], Schwartz 2015[212], Charurat 2015[213]			Ever ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Viral suppression	a = 1 point	b = 0 points	a = 1 point	b = 0 points	a = 1 point	3
			HIV incidence	a = 1 point	b = 0 points	a = 1 point	a = 1 point	a = 1 point	4
Tobin-West 2017[217]	Nigeria	2014	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	b = 0 points	a = 1 point	2
			HIV testing in the past 6 months	b = 0 points	b = 0 points	a = 1 point	b = 0 points	a = 1 point	2
Eluwa 2019[218]	Nigeria	2014	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	c = 0 points	c = 0 points	3
			HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	c = 0 points	c = 0 points	3
Offie 2021[216]	Nigeria	2016	Engagement in care	b = 0 points	b = 0 points	b = 0 points	c = 0 points	c = 0 points	0
Tun 2018[190]	Nigeria	2017	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Ibiloye 2018[215]	Nigeria	2017	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	c = 0 points	d = 0 points	0
Ibiloye 2021[214]	Nigeria	2017	Engagement in care	b = 0 points	b = 0 points	c = 0 points	a = 1 point	d = 0 points	1
			Viral suppression	b = 0 points	b = 0 points	c = 0 points	a = 1 point	a = 1 point	2
Ibiloye 2021[189]	Nigeria	2018	Engagement in care	c = 0 points	b = 0 points	c = 0 points	c = 0 points	d = 0 points	0

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Afolaranmi 2021[188]	Nigeria	2019	Engagement in care	a = 1 point	b = 0 points	b = 0 points	c = 0 points	c = 0 points	1
Ndiaye 2013[231], Wade 2005[232]	Senegal	2004/ 2005	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	c = 0 points	c = 0 points	2
Dieye 2022[230]	Senegal	2010	Viral suppression	b = 0 points	b = 0 points	c = 0 points	c – 0 points	d = 0 points	0
Drame 2013[229]	Senegal	2012	HIV testing ever	c = 0 points	b = 0 points	b = 0 points	b = 0 points	d = 0 points	0
			Knowledge of status	c = 0 points	b = 0 points	b = 0 points	b = 0 points	d = 0 points	0
			HIV incidence	c = 0 points	b = 0 points	b = 0 points	b = 0 points	a = 1 point	1
Couderc 2017[171]	Senegal	2013	HIV incidence	b = 0 points	b = 0 points	b = 0 points	c = 0 points	a = 1 point	1
Lyons 2023[6], Lyons 2020[227], Lyons 2017[228]	Senegal	2015	Knowledge of status	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Engagement in care	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Ever ART use	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Current ART use	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Viral suppression	b = 0 points	b = 0 points	a = 1 point	b = 0 points	a = 1 point	2
			HIV incidence	b = 0 points	b = 0 points	a = 1 point	b = 0 points	a = 1 point	2
Poteat 2017[58], Stahlman 2016[164], Mason 2013[233]	The Gambia	2011	Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Lyons 2023[6]	The Gambia	2017	HIV testing ever, knowledge of status	a = 1 point	b = 0 points	c = 0 points	c = 0 points	d = 0 points	1
Ekouevi 2014[241]	Togo	2011	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	c = 0 points	c = 0 points	2
Bakai 2016[240]	Togo	2011	HIV testing ever	a = 1 point	b = 0 points	c = 0 points	b = 0 points	c = 0 points	1

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Lyons 2023[6], Ruisenor-Escudero 2019[237], Ruisenor-Escudero 2019[238], Grosso 2019[160], Poteat 2017[58], Ruisenor-Escudero 2017[239], Holland 2016[162], Stahlman 2016[164]	Togo	2013	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Teclessou 2017[236]	Togo	2015	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	a = 1 point	c = 0 points	3
Dah 2021[154], Dah 2021[155], Yaya 2022[156], Yaya 2021[157], Laurent 2021[158], Coulaud 2020[159]	Togo	2016	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Engagement in care	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Current ART use	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			HIV incidence	b = 0 points	b = 0 points	b = 0 points	b = 0 points	a = 1 point	1
Ferré 2022[234], Sadio 2019[235]	Togo	2017	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	c = 0 points	c = 0 points	2
Dah 2021[154], Dah 2021[155], Yaya 2022[156], Yaya 2021[157], Laurent 2021[158], Coulaud 2020[159]	Burkina Faso, Cote d'Ivoire, Mali, Togo	2017	Engagement in care	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Current ART use	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
Eastern Africa									
Gebrebrhan 2021[54]	Kenya	NR	Current ART use	b = 0 points	b = 0 points	b = 0 point	b = 0 points	d = 0 points	0
			Viral suppression	b = 0 points	b = 0 points	b = 0 point	b = 0 points	a = 1 point	1
Sanders 2007[53]	Kenya	2006	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Knowledge of status	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
Kamali 2015[44], Price 2012[45]	Kenya	2007	HIV incidence	b = 0 points	b = 0 points	c = 0 points	c = 0 points	a = 1 point	1
Luchters 2011[51]	Kenya	2008	HIV testing ever	a = 1 point	b = 0 points	b = 0 points	b = 0 points	c = 0 points	1
Graham 2013[52]	Kenya	2008	Engagement in care	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Graham 2020[37]	Kenya	2015	Ever ART use	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Viral suppression	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
Graham 2022[19]	Kenya	2018	HIV incidence	b = 0 points	b = 0 points	b = 0 points	c = 0 points	a = 1 point	1
Mdodo 2016[48]	Kenya	2010	HIV incidence	a = 1 point	b = 0 points	b = 0 points	c = 0 points	a = 1 point	2
Muraguri 2015[49]	Kenya	2010	HIV testing ever	a = 1 point	a = 1 point	b = 0 points	b = 0 points	c = 0 points	2
			HIV testing in the past 12 months	a = 1 point	a = 1 point	b = 0 points	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	a = 1 point	b = 0 points	b = 0 points	c = 0 points	2
Muraguri 2022[46]	Kenya	2013	HIV testing ever and in the past 12 months	a = 1 point	b = 0 points	b = 0 points	c = 0 points	c = 0 points	1
McKinnon 2013[50]	Kenya	2010	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	c = 0 points	c = 0 points	0
			HIV incidence	b = 0 points	b = 0 points	b = 0 points	c = 0 points	a = 1 point	1
Wahome 2020[20], Wahome 2020[21], Wahome 2018[42], Moller 2015[43], Kamali 2015[44], Sanders 2013[22], Price 2012[45]	Kenya	2008	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			HIV incidence	b = 0 points	b = 0 points	b = 0 points	c = 0 points	a = 1 point	1
Githuka 2014[47]	Kenya	2012	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	c = 0 points	c = 0 points	3
Shangani 2017[39]	Kenya	2014	HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Musyoki 2018[40], Bhattacharjee 2015[41]	Kenya	2014	HIV testing ever	a = 1 point	b = 0 points	c = 0 points	b = 0 points	b = 1 point	2
			HIV testing in the past 3 months	a = 1 point	b = 0 points	c = 0 points	b = 0 points	b = 1 point	2
			Viral suppression	b = 0 points	b = 0 points	b = 0 points	b = 0 points	a = 1 point	1
Nyblade 2017[38]	Kenya	2015	HIV testing ever	a = 1 point	b = 0 points	b = 0 points	c = 0 points	c = 0 points	1
Kimani 2019[36]	Kenya	2016	HIV incidence	b = 0 points	b = 0 points	c = 0 points	a = 1 point	a = 1 point	2
Kunzweiler 2019[26], Kunzweiler 2018[27],	Kenya	2016	Knowledge of status	a = 1 point	b = 0 points	a = 1 point	c = 0 points	b = 1 point	3
			Ever ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3

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Korhonen 2018[28], Kunzweiler 2017[29]			Current ART use	a = 1 point	b = 0 points	[35]a = 1 point	c = 0 points	b = 1 point	3
			Viral suppression	a = 1 point	b = 0 points	a = 1 point	b = 0 points	a = 1 point	3
Palumbo 2021[30], Sandfort 2021[31], Sivay 2021[32], Sandfort 2019[33], Zhang 2018[34], Fogel 2018[35]	Kenya	2016	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			HIV testing in the past 12 months	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			HIV testing in the past 6 months	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Knowledge of status	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Engagement in care	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Current ART use	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Viral suppression	b = 0 points	b = 0 points	a = 1 point	b = 0 points	a = 1 point	2
			HIV incidence	b = 0 points	b = 0 points	a = 1 point	b = 0 points	a = 1 point	2
Smith 2021[23], Smith 2021[24], Fearon 2020[25]	Kenya	2017	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	a = 1 point	b = 1 point	4
			HIV testing in the past 6 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			Engagement in care	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			Viral suppression	a = 1 point	b = 0 points	a = 1 point	b = 0 points	a = 1 point	3

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Wahome 2020[20], Wahome 2020[21], Sanders 2013[22]	Kenya	2018	HIV incidence	b = 0 points	b = 0 points	b = 0 points	c = 0 points	a = 1 point	1
Bhattacharjee 2020[17]	Kenya	2019	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV testing in the past 6 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV testing in the past 3 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Engagement in care	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Dijkstra 2021[18]	Kenya	2019	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			HIV testing in the past 12 months	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			HIV testing in the past 3 months	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Knowledge of status	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Current ART use	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Viral suppression	b = 0 points	b = 0 points	a = 1 point	b = 0 points	a = 1 point	2
Virkud 2020[98]	Kenya, Rwanda, Tanzania, Uganda (cross-border areas)	2016	HIV testing in the past 12 months	b = 0 points	b = 0 points	a = 1 point	c = 0 points	c = 0 points	1
Ntata 2008[65]	Malawi	2006	HIV testing ever	a = 1 point	b = 0 points	c = 0 points	c = 0 points	c = 0 points	1

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Fay 2011[62], Beyrer 2010[63], Baral 2009[64]	Malawi	2008	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Wirtz 2017[57], Poteat 2017[58], Stahlman 2016[59], Wirtz 2015[60], Wirtz 2013[61]	Malawi	2013	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			Knowledge of status	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			Ever ART use	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			HIV incidence	a = 1 point	b = 0 points	a = 1 point	b = 0 points	a = 1 point	3
Palumbo 2021[30], Sandfort 2021[31], Sivay 2021[32], Sandfort 2019[33], Zhang 2018[34], Fogel 2018[35]	Malawi	2016	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			HIV testing in the past 12 months	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			HIV testing in the past 6 months	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Knowledge of status	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Engagement in care	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Current ART use	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Viral suppression	b = 0 points	b = 0 points	a = 1 point	b = 0 points	a = 1 point	2
			HIV incidence	b = 0 points	b = 0 points	a = 1 point	b = 0 points	a = 1 point	2
Herce 2018[56]	Malawi	2017	HIV testing ever	a = 1 point	a = 1 point	b = 0 points	a = 1 point	c = 0 points	3
			HIV testing in the past 6 months	a = 1 point	a = 1 point	b = 0 points	a = 1 point	c = 0 points	3
Rucinski 2022[55]	Malawi	2018	Engagement in care	b = 0 points	b = 0 points	c = 0 points	c = 0 points	d = 0 points	0

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Adam 2009[66]	Mauritius	2004	HIV testing in the past 12 months	c = 0 points	b = 0 points	c = 0 points	c = 0 points	d = 0 points	0
Boothe 2021[67], Boothe 2021[68], Sathane 2016[69], Horth 2015[70]	Mozambique	2011	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Engagement in care	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Ever ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Chapman 2011[73]	Rwanda	2009	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Ntale 2019[72]	Rwanda	2015	HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	c = 0 points	c = 0 points	2
Lyons 2023[6]; Twahirwa Rwema 2020[71]	Rwanda	2018	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Viral suppression	a = 1 point	b = 0 points	a = 1 point	b = 0 points	a = 1 point	3
Magesa 2014[86]	Tanzania	NR	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Khatib 2017[81], Dahoma 2011[84], Johnston 2010[85]	Tanzania	2007	HIV testing ever	a = 1 point	a = 1 point	b = 0 points	b = 0 points	c = 0 points	2
			HIV testing in the past 12 months	a = 1 point	a = 1 point	b = 0 points	b = 0 points	c = 0 points	2
Nyoni 2013[82], Nyoni 2012[83]	Tanzania	2009	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Khatib 2017[81]	Tanzania	2011	HIV testing ever	a = 1 point	a = 1 point	b = 0 points	b = 0 points	c = 0 points	2
			HIV testing in the past 12 months	a = 1 point	a = 1 point	b = 0 points	b = 0 points	c = 0 points	2
Mmbaga 2012[80]	Tanzania	2011	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	c = 0 points	c = 0 points	2

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Ahaneku 2016[76], Romijnders 2016[77], Anderson 2015[78], Ross 2014[79]	Tanzania	2012	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
Mmbaga 2018[75]	Tanzania	2014	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Ross 2018 [74]	Tanzania	2015	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	c = 0 points	c = 0 points	1
			HIV testing in the past 6 months	b = 0 points	b = 0 points	a = 1 point	c = 0 points	c = 0 points	1
Raymond 2009[93], Kajubi 2008[94]	Uganda	2004	HIV testing ever	a = 1 point	a = 1 point	b = 0 points	b = 0 points	c = 0 points	2
			HIV testing in the past 6 months	a = 1 point	a = 1 point	b = 0 points	b = 0 points	c = 0 points	2
Hladik 2012[92]	Uganda	2008	HIV testing ever	a = 1 point	a = 1 point	b = 0 points	b = 0 points	b = 1 point	3
Robb 2016[91]	Uganda	2012	HIV incidence	b = 0 points	b = 0 points	b = 0 points	c = 0 points	a = 1 point	1
Wanyenze 2016[89]	Uganda	2013	HIV testing ever	a = 1 point	b = 0 points	b = 0 points	b = 0 points	c = 0 points	1
Hladik 2017[90]	Uganda	2013	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	b = 1 point	4
			HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	b = 1 point	4
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			Viral suppression	a = 1 point	a = 1 point	a = 1 point	b = 0 points	a = 1 point	4
Okoboi 2021[87], Okoboi 2020[88]	Uganda	2018	HIV testing ever	a = 1 point	b = 0 points	c = 0 points	c = 0 points	c = 0 points	1
			Knowledge of status	a = 1 point	b = 0 points	c = 0 points	c = 0 points	c = 0 points	1
Parmley 2022[95], Parmley 2022[96], Harris 2022[97]	Zimbabwe	2019	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	a = 1 point	c = 0 points	3

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
			Viral suppression	a = 1 point	b = 0 points	a = 1 point	b = 0 points	a = 1 point	3
Southern Africa									
Kendall 2014[101]	Angola	2011	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV testing in the past 3 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Herce 2018[56]	Angola	2017	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	a = 1 point	c = 0 points	4
			HIV testing in the past 6 months	a = 1 point	a = 1 point	a = 1 point	a = 1 point	c = 0 points	4
			Knowledge of status	a = 1 point	a = 1 point	a = 1 point	a = 1 point	c = 0 points	4
Fay 2011[62], Beyrer 2010[63], Baral 2009[64]	Botswana	2008	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Lyons 2023[6], Rao 2017[8], Poteat 2017[58], Grover 2016[102], Stahlman 2016[59], Brown 2016[103], Stahlman 2015[104], Risher 2013[105], Baral 2013[106]	eSwatini	2011	HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			Knowledge of status	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
Rao 2017[8]	eSwatini	2014	HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Baral 2011[109]	Lesotho	2009	HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	a = 1 point	c = 0 points	3

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Poteat 2017[58], Stahlman 2016[59], Wendi 2016[107], Stahlman 2015[104], Stahlman 2015[108]	Lesotho	2014	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			Knowledge of status	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
Fay 2011[62], Beyrer 2010[63], Baral 2009[64]	Namibia	2008	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Russell 2019[110]	Namibia	2016	HIV testing in the past 6 months	b = 0 points	b = 0 points	c = 0 points	a = 1 point	c = 0 points	1
Cloete 2008[148]	South Africa	NR	Current ART use	b = 0 points	b = 0 points	c = 0 points	c = 0 points	b = 1 point	1
Jobson 2018[147]	South Africa	NR	HIV testing ever	a = 1 point	b = 0 points	b = 0 points	b = 0 points	b = 1 point	2
Lane 2008[144]	South Africa	2004	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			HIV testing in the past 6 months	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
Nel 2013[145], Sandfort 2008[146]	South Africa	2004	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	c = 0 points	c = 1 point	1
Burrel 2010[143]	South Africa	2008	HIV testing in the past 12 months	b = 0 points	b = 0 points	b = 0 points	b = 0 points	b = 1 point	1
Knox 2013[139], Knox 2011[140]	South Africa	2008	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	b = 0 points	b = 1 point	2
			HIV testing in the past 12 months	b = 0 points	b = 0 points	a = 1 point	b = 0 points	b = 1 point	2
Arnold 2013[141], Lane 2011[142]	South Africa	2008	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Baral 2011[135]	South Africa	2009	Knowledge of status	b = 0 points	b = 0 points	a = 1 point	a = 1 point	c = 0 points	2
Buchbinder 2014[137], Buchbinder 2014[138]	South Africa	2009	HIV incidence	b = 0 points	b = 0 points	b = 0 points	b = 0 points	a = 1 point	1
Tun 2012[136]	South Africa	2009	HIV testing ever	a = 1 point	a = 1 point	c = 0 points	b = 0 points	c = 0 points	2

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Eaton 2013[134]	South Africa	2010	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	b = 1 point	1
Kamali 2015[44], Price 2012[45]	South Africa	2010	HIV incidence	b = 0 points	b = 0 points	c = 0 points	c = 0 points	a = 1 point	1
Stephenson 2012[132], Wagenaar 2012[133]	South Africa	2010	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	b = 0 points	b = 1 point	2
Batist 2013[126]	South Africa	2012	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	b = 1 point	1
Knox 2019[129]	South Africa	2012	HIV testing in the past 6 months	a = 1 point	b = 0 points	a = 1 point	c = 0 points	c = 0 points	2
Maleke 2017[130]	South Africa	2012	HIV testing ever	a = 1 point	b = 0 points	b = 0 points	c = 0 points	c = 0 points	1
Rebe 2015[127]	South Africa	2012	HIV testing in the past 12 months	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			Current ART use	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
Siegler 2015[128]	South Africa	2012	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Lane 2016[124], Lane 2014[125]	South Africa	2012	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	c = 0 points	3
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Engagement in care	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
		2014	HIV incidence	a = 1 point	b = 0 points	a = 1 point	c = 0 points	a = 1 point	3
Maenetje 2019[131]	South Africa	2012	HIV incidence	b = 0 points	b = 0 points	b = 0 points	c = 0 points	a = 1 point	1
Kufa 2017[121]	South Africa	2015	Viral suppression	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
Rees 2017[122], van Liere 2019[123]	South Africa	2015	Knowledge of status	b = 0 points	b = 0 points	b = 0 points	c = 0 points	c = 0 points	0
			Current ART use	b = 0 points	b = 0 points	b = 0 points	c = 0 points	c = 0 points	0
Chen 2020[116], Radebe 2020[117], Lippman 2018[118], Lippman 2018[119]	South Africa	2016	HIV testing ever	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV testing in the past 12 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV testing in the past 6 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	c = 0 points	2
			HIV incidence	a = 1 point	b = 0 points	a = 1 point	b = 0 points	a = 1 point	3

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
Palumbo 2021[30], Sandfort 2021[31], Sivay 2021[32], Sandfort 2019[33], Zhang 2018[34], Fogel 2018[35]	South Africa	2016	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			HIV testing in the past 6 months	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Knowledge of status	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Engagement in care	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Current ART use	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Viral suppression	b = 0 points	b = 0 points	a = 1 point	b = 0 points	a = 1 point	2
			HIV incidence	b = 0 points	b = 0 points	a = 1 point	b = 0 points	a = 1 point	2
Sullivan 2020[120]	South Africa	2016	Knowledge of status	b = 0 points	b = 0 points	a = 1 point	b = 0 points	b = 1 point	2
			HIV incidence	b = 0 points	b = 0 points	a = 1 point	a = 1 point	a = 1 point	3
Fearon 2020[115]	South Africa	2017	HIV testing ever	a = 1 point	a = 1 point	a = 1 point	b = 0 points	b = 1 point	4
			HIV testing in the past 12 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	b = 1 point	4
			HIV testing in the past 6 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	b = 1 point	4
			HIV testing in the past 3 months	a = 1 point	a = 1 point	a = 1 point	b = 0 points	b = 1 point	4
			Knowledge of status	a = 1 point	a = 1 point	a = 1 point	b = 0 points	b = 1 point	4
			Current ART use	a = 1 point	a = 1 point	a = 1 point	b = 0 points	b = 1 point	4
			Viral suppression	a = 1 point	a = 1 point	a = 1 point	b = 0 points	a = 1 point	4
Fearon 2020[25]	South Africa	2017	HIV testing in the past 6 months	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			Knowledge of status	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3
			Current ART use	a = 1 point	b = 0 points	a = 1 point	b = 0 points	b = 1 point	3

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
			Viral suppression	a = 1 point	b = 0 points	a = 1 point	b = 0 points	a = 1 point	3
Scheibe 2020[114]0	South Africa	2017	HIV testing ever	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Knowledge of status	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
			Current ART use	b = 0 points	b = 0 points	a = 1 point	b = 0 points	c = 0 points	1
Pillay 2020[113]	South Africa	2018	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			HIV testing in the past 12 months	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			HIV testing in the past 6 months	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
			HIV testing in the past 3 months	b = 0 points	b = 0 points	b = 0 points	b = 0 points	c = 0 points	0
Montgomery 2021[111], Minnis 2020[112]	South Africa	2019	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	c = 0 points	c = 0 points	0
Metheny 2022[149], Stephenson 2022[150], Stephenson 2021[151]	South Africa, Namibia	2017	HIV testing ever	b = 0 points	b = 0 points	b = 0 points	c = 0 points	c = 0 points	0
			HIV testing in the past 6 months	b = 0 points	b = 0 points	b = 0 points	c = 0 points	c = 0 points	0
Multiple Regions									
Herce 2018[56]	Angola, Malawi	2017	HIV testing in the past 6 months	a = 1 point	b = 0 points	a = 1 point	c = 0 points	c = 0 points	2
Sandfort 2019[33]	Kenya, Malawi, South Africa	2016	Engagement in care	b = 0 points	b = 0 points	a = 1 point	c = 0 points	c = 0 points	1

References	Country	Midpoint Year	Outcomes reported	Criterion 1: Appropriateness of the sampling method to recruit a representative sample of MSM participants (maximum 1 point)	Criterion 2: Statistical adjustment of outcomes for complex survey design (maximum 1 point)	Criterion 3: Representativeness of MSM participants based on eligibility criteria used to recruit MSM into the study (maximum 1 point)	Criterion 4: Inclusion of transgender women in the study definition of MSM (maximum 1 point)	Criterion 5: Risk of misclassification in ascertainment of the relevant outcome(s) (maximum 1 point)	Study quality score /5
			Viral suppression	b = 0 points	b = 0 points	a = 1 point	c = 0 points	c = 0 points	1

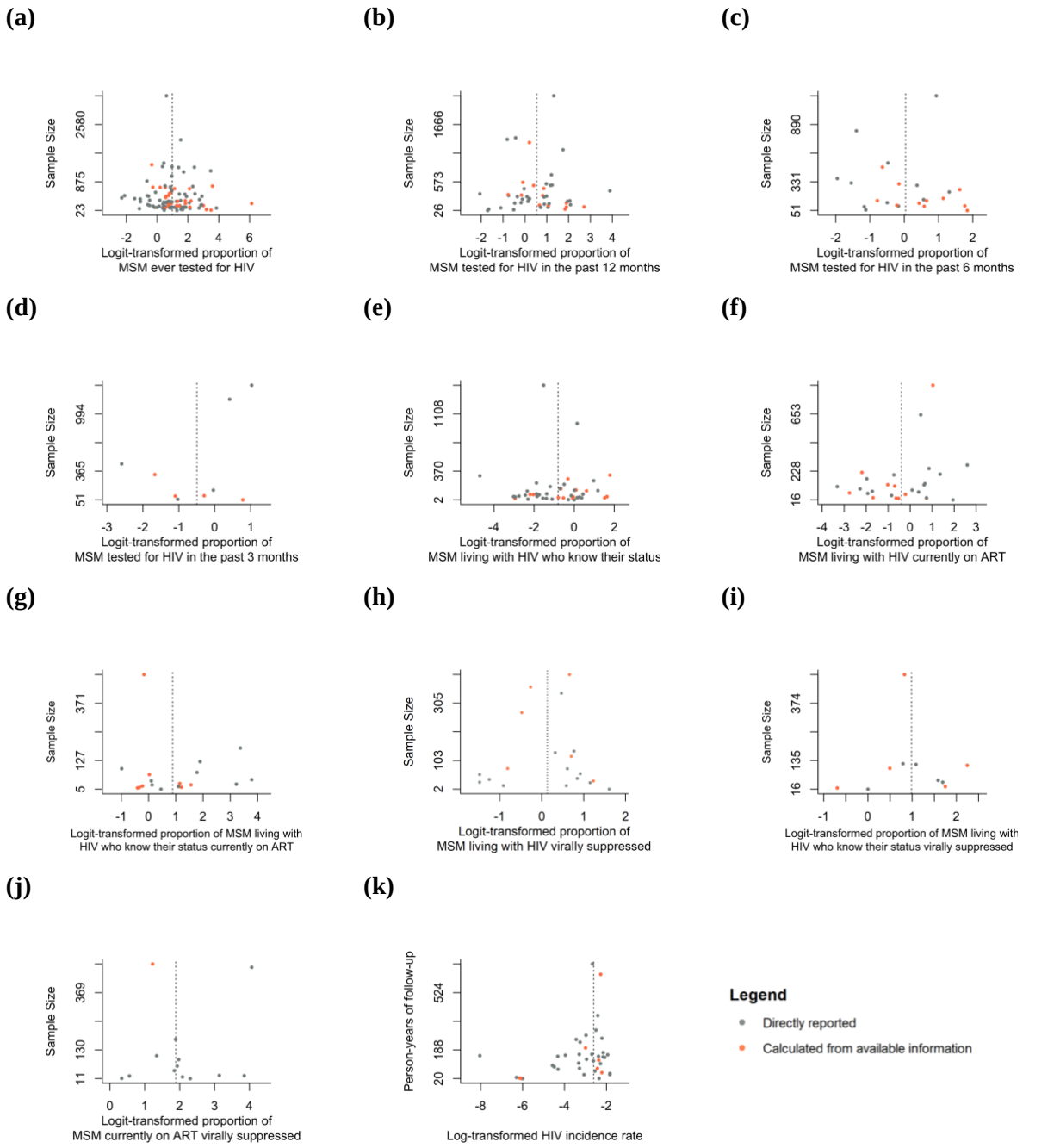

Figure S28. Funnel plots of HIV testing, treatment cascade, and HIV incidence outcomes among men who have sex with men (MSM) in Africa. Funnel plots of (a) ever HIV testing, (b) HIV testing in the past 12 months, (c) HIV testing in the past 6 months, (d) HIV testing in the past 3 months, (e) knowledge of status among MSM living with HIV, (f) current antiretroviral therapy (ART) use among MSM living with HIV, (g) current ART use among HIV aware MSM, (h) viral suppression among MSM living with HIV, (i) viral suppression among HIV aware MSM, (j) viral suppression among MSM currently on ART, and (k) HIV incidence among MSM. Points represent study observations that were either directly reported in articles (grey points) or that we calculated from available information reported in articles (orange points). The vertical dashed line represents the overall logit or log-transformed pooled estimate.

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