



Marriage and Steady Relationships with Women in Men Who Have Sex with Men in Sub-Saharan Africa: A Mixed-Method Systematic Review and Meta-analyses

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Abstract

High HIV prevalence in Sub-Saharan African (SSA) in men who have sex with men (MSM) leads to greater risk for their wives and other steady female partners because of prolonged exposure. To provide insights into the context possibly contributing to the risk of HIV transmission from MSM to women, our mixed-method synthesis about MSM' marriage and steady relationships with cisgender women aimed to: (i) assess the extent of engagement in steady relationships with women and in risky behaviors with these women across SSA's four regions; (ii) explore the underlying dynamics within these relationships by gathering qualitative information. We used quantitative and qualitative data specifically pertaining to related to marriage or other steady relationships with women from a systematic review on men who have sex with both men and women (MSMW) in SSA (PROSPERO-CRD42021237836). Meta-analyses were performed on quantitative data for each region. Pooled proportions were calculated using random-effects models. Qualitative data were analyzed using thematic synthesis. Data were selected from 125 studies. For Southern, East and West Africa, the estimated pooled proportions of married MSM were 4% (95% CI 2–8%; n = 10 studies; 4183 MSM), 8% (6–11%; 19; 7070), and 7% (6–9%; 13; 4705). In Southern Africa, 29% (11–56%; 5; 1667) of MSM had steady female partners. In East Africa, 34% (14–61%; 5; 2003) were currently or previously married to women. Motives to marry women included a desire to have children, and to conform to heteronormative social norms and family pressure. Marriage was seen as a means to discontinue homosexual behaviors or, conversely, a way to secretly continue same-sex behaviors more freely. Procreative intentions and a desire for secrecy often deterred MSM from using HIV prevention methods with their wives. For some MSM, steady relationships with women provided them with mutual support. However, these relationships could also lead to stressful and conflict-ridden situations, potentially resulting in psychosocial and HIV-related risks for the MSM as well as their male and steady female partners. Steady relationships with women are common in MSM in SSA. Sexuality concealment strategies with steady female partners depend on the circumstances that lead MSM to enter into these relationships, and have various implications on sexual behaviors with both male and female partners. Community-based support, HIV research, prevention, and care programs should be adapted to MSM's different life situations to reduce direct HIV transmission risk to steady female partners.

Keywords Men who have sex with men · Women · Marriage · Bisexual · Africa · HIV

Introduction

The HIV epidemiological context varies across the different regions of Sub-Saharan Africa (SSA). In East and Southern Africa, it is classified as generalized, with new infections occurring mostly in the general population. Key populations (i.e., men who have sex with men (MSM), sex workers, people who inject drugs, transgender women, and people in prison) account for 14% of new infections. In West and Central Africa, the HIV epidemic is characterized as mixed, with key

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populations accounting for 45% of new infections [1–5]. These numbers underscore the importance of examining the potential risk of HIV transmission from key populations to their partners in the general population.

HIV disproportionately affects MSM in SSA, with an estimated prevalence of 8% in Central and West Africa and 13% in East and Southern Africa [6, 7], compared to an estimated prevalence of 1% and 6% in the general population in these two regions, respectively [8]. The annual estimated incidence in MSM in Central and West Africa is 8[3–36] new cases per 100 person-years and 5[2–12] in East and Southern Africa [7]. MSM in SSA frequently have sexual relations with cisgender women (“women” hereafter in the manuscript), largely driven by heteronormative pressure [9]. Proportions of MSM having had recent sex with women were estimated 27% (13–48%), 50% (39–62%), and 58% (33–83%) in Southern, West, and East Africa respectively [9]. As two-thirds of new HIV infections in SSA occur in women [1], it is important to explore the factors that may contribute to HIV transmission between MSM and women.

Marriage is a fundamental social and familial institution in SSA, and together with fatherhood, exemplifies the archetypal heteronormative lifestyle [10–13]. These two societal elements may exert pressure on MSM to enter into marital relationships with women, resulting in psychosocial and behavioral consequences. Because of potentially prolonged and frequent sexual exposure, MSM’s wives—and in general, all steady female partners of MSM—may be at greater risk of HIV acquisition than other female partners. The involvement of MSM in heterosexual marriages also raises concerns about the potential indirect transmission of HIV to their children through mother-to-child transmission.

With the aim of shedding light on this phenomenon that may contribute to the risk of HIV transmission from MSM to women in SSA, we sought to gather and synthesize the existing information regarding the involvement of MSM in heterosexual marriages and steady relationships with women available in published data in SSA. In particular, the objectives of this comprehensive, mixed-method synthesis were to (i) assess the extent of engagement in marriage and in steady relationships with women, among MSM; (ii) assess the proportion of engagement in risky behaviors—such as unprotected sex—with wives and steady female partners; (iii) explore the underlying psychosocial, familial, behavioral and sexual dynamics within these relationships by gathering qualitative information, including motives, perceptions, and experiences.

Methods

Large-Scale Systematic Review Entitled ‘Men Who have Sex with Both Men and Women in Sub-Saharan Africa’

Data from the present article were drawn from a large-scale comprehensive mixed-method systematic review entitled ‘Men who have sex with both men and women (MSMW) in Sub-Saharan Africa’, which our team conducted in 2021–2022. This review aimed at gathering all quantitative and qualitative data available about MSMW and male bisexuality in SSA published from 1990 until its completion. The protocol was developed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [14] and was prospectively registered in PROSPERO in April 2021 (Registration Number CRD42021237836) [15].

Search Strategy (Step A)

We created a concept table to list the related concepts and keywords, starting from the key concepts “men who have sex with both men and women” (MSMW) and “SSA”, in order to define queries for search in both English and French, across six databases; Pubmed, EMBASE, PsycINFO, Web of Science Core collection, Google Scholar, CAIRN (see full literature search strategy in Supplementary Information 1). All the identified records were exported to the Covidence systematic review software tool (Veritas Health Innovation, Melbourne, Australia).

Article Selection

Two study investigators (NY and MF) in Covidence using pre-developed decision trees performed the two-step selection process for articles (*ie.* peer-reviewed articles, PhD theses, and scientific reports) independently. Articles identified as duplicates were excluded. The investigators held weekly meetings to resolve any discrepancies. Data selection was done according to the following PICOT criteria: Population (P): MSM in SSA; Intervention (I): not applicable; Comparison (C): if applicable, MSMW compared to other MSM; Outcome (O): Quantitative or qualitative information about MSMW; Timeframe (T): Studies published from 1990 up to the date of the systematic review.

Title and Abstract Screening (Step B) Article titles and abstracts were screened to exclude those clearly indicating settings other than SSA, or which had no information about MSM, male bisexuality, or homosexuality.

Full-Text Screening (Step C) Among the screened articles, those were considered eligible if the examination of full texts revealed they provided any information about MSMW in SSA. This was irrespective of their publishing date, inclusion criteria, research study design, determinants, implications, and topics investigated. Articles about MSM that did not provide any information about bisexuality or relationships with women were excluded.

Data Extraction (Step D)

Before data extraction, articles reporting information on the same participants or pooled samples across different countries were identified and managed accordingly (see details in Supplementary Information 1). A standardized data extraction form was developed using the Covidence software tool to record the following information:

- Study identification, setting, methods, and sample characteristics
- All data susceptible to provide information about MSM bisexuality and involvement in relationships with women, such as:
 - sexual activity with women
 - types of female sexual partners
 - sexual practices and condom use with female partners
 - identification as bisexual or heterosexual
 - sexual attraction to women
 - perception of HIV sexual risk regarding female partners
 - marriage, steady relationships with women, having children
 - disclosure of MSM status or HIV status to female partners
 - experience of violence with female partners etc.

We built a quality evaluation scale, adapted from the QuADS (Quality Assessment for Diverse Studies) tool for reporting methodological quality in systematic reviews of mixed-method studies [16, 17], to measure the value and quality of studies regarding our topic. Extracted data constituted the systematic review's database and was exported from the Covidence software tool to Excel (version 16.0, Microsoft Corporation, Redmond, WA, USA).

Mixed-Method Synthesis: 'Marriage and Other Steady Relationships with Women in MSM in Sub-Saharan Africa' (Step E)

Due to the heterogeneity of the extracted data, the authors decided to analyse and present the data separately by conducting distinct mixed-methods thematic syntheses, each focusing on a specific subtopic regarding MSM and women. A first synthesis concerning sexual behaviors and risks with female partners (in general) among MSM in SSA (proportions of engagement in recent sex with women—all kind of female partners considered-, of condom use and sexual practices with women; motives and perceptions of sexual experience with women) is available elsewhere [9].

For the purpose of this second synthesis, we identified and selected studies from the systematic review's database that provided data specifically related to marriage or other steady relationships with women among MSM. Any quantitative and qualitative data related to marriage, cohabitation or other steady relationships with women, sexual behaviors with wives/steady female partners, motives, perceptions, familial dynamics, or any contextual information related to the topic were selected. Because having children potentially indicates past or current steady relationships with women, particularly within marriage, and considering the potential HIV transmission risks to both their wives and indirectly to their children through mother-to-child transmission, information about fatherhood was also included. Using a 'parallel-results convergent synthesis design' [18–20], quantitative and qualitative data were analyzed, synthesized and presented separately (see below). Integration took place during the interpretation of the results, in the discussion section.

Quantitative Data Analysis and Synthesis

Data Selection and Management A diverse range of quantitative indicators related to MSM' marriage and other steady relationships with women were available in the systematic review's database from cross-sectional studies and from baseline data reported in longitudinal studies conducted among MSM in SSA. These indicators (which varied, depending on the studies, in terms of labeling questions and responses about steady female partnerships, categories reported, and timeframes covered) were grouped into comparable categories:

- i) Proportion (in %) of MSM in **current steady relationships** with women
 - 'Currently married to a woman'
 - 'Currently married to or cohabiting with a woman'
 - 'Currently with a steady female partner' (i.e., MSM declaring 'wife or girlfriend' or 'steady/regular female partner' or 'in union with a woman')

- ii) Proportion (in %) of MSM in **lifetime** (i.e., current or previous) **steady relationships** with women
‘Lifetime marriage to a woman’ (i.e., MSM currently married, divorced or widowed)
‘Lifetime marriage to or cohabitation with a woman’ (i.e., MSM currently or previously married or cohabiting)
‘Previous marriage’ (i.e., MSM previously married to a woman, but no longer married at the time of the study (divorcee, widower)).
- iii) Proportion (in %) of MSM who recently practiced **condomless sex with a steady female partner** (understood as inconsistent condom use over a given period of time (i.e., previous 6 months, 12 months, etc. depending on the selected article) or condomless during the most recent sexual encounter)
- iv) Proportion (in %) of MSM who disclosed their same-sex behaviors to a steady female partner
- v) Proportion (in %) of MSM with children (biological if specified)

Meta-Analyses We conducted a meta-analysis for each SSA region (West, Central, East, and Southern Africa). When data for a given indicator (see, (i), (ii), (iii), (iv) or (v) above) were available in at least four studies in the given region. To calculate pooled proportions, we used the random-effects model based on the DerSimonian and Laird method [21]. The logit transformation was applied to observed proportions in order to yield a normal distribution when the observed proportions or the boundaries of the confidence interval were less than 0.2 or greater than 0.8 for more than 20% of the studies [22–24]. Heterogeneity was quantified by the I² parameter [25]. If I² was higher than 75%, identification of outlying studies with influence on the overall effect size was performed using three methods: a Baujat plot [26], screening for externally studentized residuals [24, 27], and a leave-one-out analysis [22]. When all three methods identified a study as an outlier, it was definitively dropped from the meta-analysis provided that its exclusion led to an increase of at least 10 points in heterogeneity. No moderator analysis was performed for these data if fewer than 10 studies (i.e., the minimum number required) were available [22]. Egger’s regression test and a visual inspection of funnel plots for asymmetry were used to assess publication bias. Two-sided statistical tests were performed, with a *p* value ≤ 0.05 being considered statistically significant. Statistical analyses were performed using RStudio software.

Qualitative Data Analysis and Synthesis

Qualitative data collected from participant discourses, interviews, focus groups, and author commentaries in selected articles were imported into NVivo software (v 1.7.1). We

used three-stage thematic synthesis as recommended for qualitative research in systematic reviews [28]. Initially, sentences were coded line-by-line inductively, to capture their content and meaning. Subsequently, new codes known as ‘descriptive themes’ were established to group initial codes in a hierarchical coding tree. Finally, ‘analytical themes’ were derived from the interpretation of descriptive themes. For the purpose of this qualitative synthesis, we deliberately focused on themes and verbatim quotes pertaining to marriage and steady relationships with women among MSM, which included perceptions, motives, experiences, and behaviors of MSM concerning marriage or other steady relationships with women. Verbatim quotes from articles originally written in French, which are presented in this paper, were translated into English by a professional translator.

Results

Studies Included and Data Selected

For the mixed-method systematic review, we initially identified 5,098 articles through the search of the six literature databases (Step A, Fig. 1). After removing duplicates and conducting both title/abstract and full-text screenings (Steps B and C), we extracted quantitative and qualitative data related to MSMW in SSA from 277 eligible studies (Step D), which constituted the large-scale systematic review database. Of these, 124 reported specific information on marriage and steady relationships with women were selected, for the current synthesis [29–152] (see study characteristics, sample characteristics, quality scores and extracted data in Table 1). Eighty nine of these studies provided quantitative data, and 39 provided qualitative data. Overall, the 124 studies contributed data from 24 different countries in SSA, with a majority (59%) of them presenting information collected from 2010 onwards.

Quantitative Data Synthesis

Current Steady Relationships with Women

Seventy-nine proportions of MSM currently in steady relationships with women, using three different indicators (currently married, currently married or cohabiting with a woman, or currently with a steady female partner, Table 1) were available. A total of six regional meta-analyses were performed (Fig. 2, Supplementary Information 2). In West Africa, the estimated pooled proportions of currently married MSM and MSM currently married or cohabiting with a woman were 7% (95% confidence interval 6–9%, *n* = 13

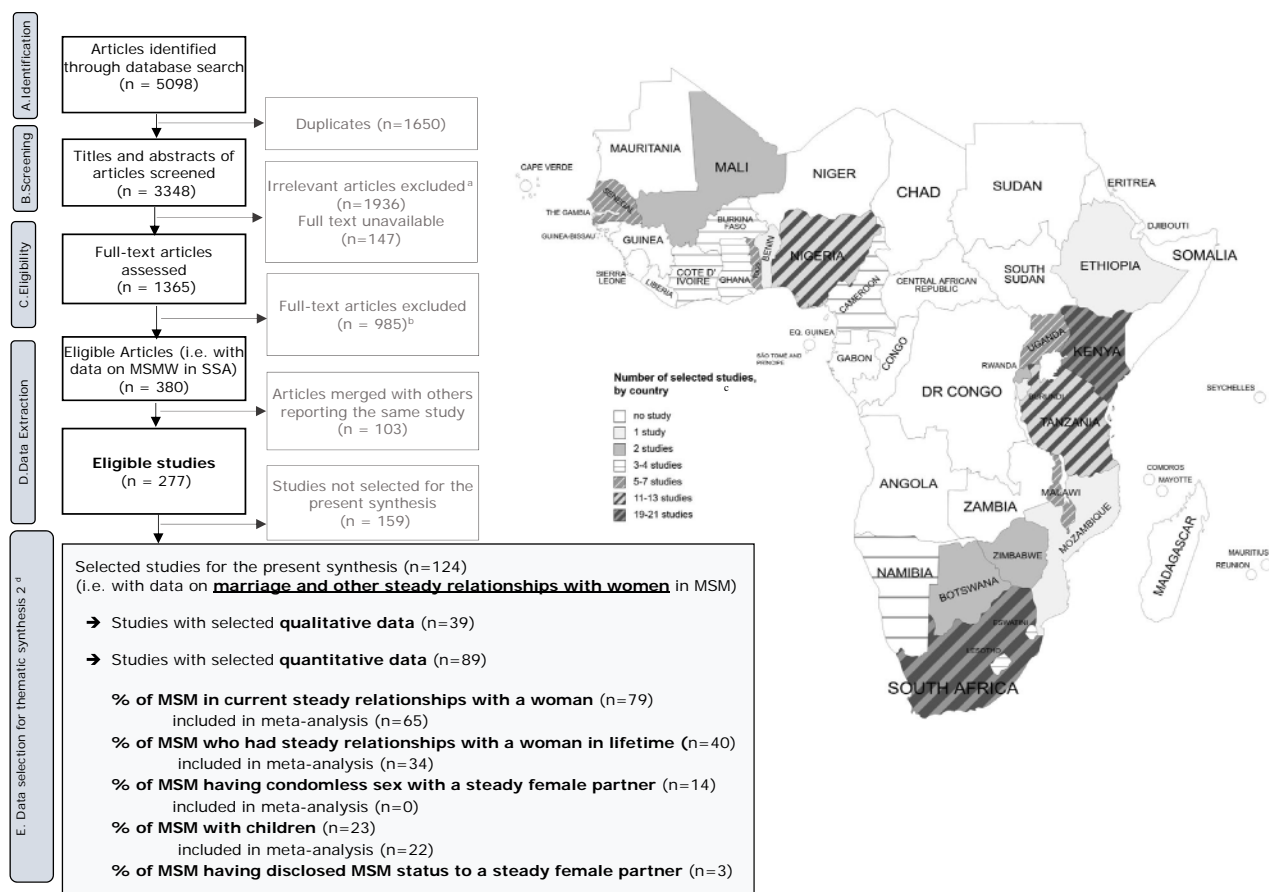


Fig. 1 PRISMA flow chart of articles and map of selected studies. ^a*ie.* The title and abstract indicate no information about MSM, or focuses on settings other than SSA. ^b Reasons to exclude full-text articles: 364 concerned gay men or MSM in SSA but had no data on MSMW; 180 concerned HIV/Sexually Transmitted Infections epidemics in SSA but did not examine HIV-bridging from infected MSM to women; 136 did not have enough data (e.g., conference abstract

without related published article); 133 concerned a setting other than SSA); 76 investigated men in SSA but had no data on MSMW and male bisexuality; 74 were duplicates; 17 studied women in SSA but had no data on MSMW partners; 3 had publication issues; 2 articles were not in the languages set out in the protocol (i.e., English or French). ^cFour studies provided data for SSA as a whole. ^dThematic synthesis 1 was published elsewhere [9]

studies, 4705 MSM) and 9% (6–13%, n=9 studies, 4966 MSM), respectively. In East Africa, these proportions were estimated at 8% (6–11%, n=19 studies, 7070 MSM) and 8% (5–12%, n=9 studies, 4196 MSM), respectively. In Southern Africa, the model estimated that 4% (2–8%, n=10 studies, 4183 MSM) of MSM were currently married and that 29% (11–56%, n=5 studies, 1667 MSM) currently had steady female partners.

No meta-analysis for these three indicators could be performed for Central Africa because of insufficient data. Specifically, there were only three studies for this region with data on the proportions of MSM currently married or having a steady female partner (ranging 6%–45%).

One online study reporting data from 22 countries in SSA indicated that 20% of MSM were currently married to a woman (Table 1).

Lifetime Steady Relationships with Women

Forty studies provided data about MSM who had lifetime (i.e., current or previous) steady relationships with women, with three different indicators -lifetime marriage, lifetime marriage to or lifetime cohabitation with a woman, or previous marriage (i.e., not currently married—Table 1). We performed a total of six regional meta-analyses on these data (Fig. 3, Additional File 2). The estimated pooled proportions for lifetime marriage or lifetime cohabitation with a woman (i.e., second indicator above) were 13% (6–26%, n=5 studies, 2523 MSM) for MSM in Southern Africa and 28% (13–51%, n=4 studies, 971 MSM) for those in East Africa. The proportion for lifetime marriage (i.e., first indicator) in the latter region was estimated at 34% (14–61%, n=5 studies, 2003 MSM) of MSM. With regard to previous marriage, the pooled proportions were estimated at 1%

Table 1 List of included studies and extracted data

Study identification			Study characteristics			Sample characteristics			Data related to steady relationships with women and fatherhood in MSM				
Country	First author, published year	Design ^a	Pop ^b	Sam-pling method ^c	Inclusion criteria ^d	Period	Location	Qual-ity	HIV status	Age (years)	Extracted data ^e	%	In meta-analysis
West Africa													
Benin	Ahouada 2020 [112]	Quanti cr-sec	MSM	RDS	Anal sex (12m)	2018	Cotonou, Porto Novo, Abomey-Calavi, Pobe, Parakou, Bohico	400	Unkn	Mean 26.2 ± 5.0	Curr. married Prev. married (i.e., not curr. married)	7% 2%	Yes Yes
Burkina Faso	Dah 2016 [113]	Quanti cr-sec	MSM	Snow-ball	Sex (12m)	2013	Ouagadougou	17	HIV+—	Median 22.4	Curr. married Curr. married/cohabiting with a ♀ Prev. married (i.e., not curr. married)	6% 10% 4%	Yes Yes Yes
	Grosso 2019 [114]	Quanti cr-sec	MSM	RDS	Anal sex (12m)	2013	Ouagadougou, Bobo-Dioulasso	11	Unkn	Median 21	Curr. married/cohabiting with a ♀ Have children Lifetime marriage or cohabitation with a ♀ Have children ICU with a steady ♀ partn. (12m)	11% 8% 5% 7% (5–11) 22%	Yes Yes No Yes No
	Ouedraogo 2019 [115]	Quanti cr-sec	MSM	RDS	Anal sex (12m)	2013	Ouagadougou, Bobo-Dioulasso Ouagadougou	16 333	HIV+—	Mean 22.1 ± 4.4	Have children ICU with a steady ♀ partn. (last sex) Have children ICU with a steady ♀ partn. (12m) No condom use with steady ♀ partn. (last sex)	10% 7% (5–12) 14% 8% 3% (1–5)	No Yes No No Yes
Cote d'Ivoire	Aho 2014, Ndour 2012 [116, 117]*	Quanti cr-sec	MSM	RDS	Unkn	2012	Bobo-Dioulasso	22	HIV+—	Median 23 range 18–51	Curr. married/cohabiting with a ♀ <i>Qualitative data</i> Lifetime marriage to a ♀	— — 2% (1–3)	— — No
	Moran 2020 [118]	Quanti cr-sec	MSM	RDS	Anal sex (12m)	2016	Abidjan, Agboville, Bouake, Gagnoa, Yamoussoukro	9	HIV+—	Mean 24 (IQR 21–26) range 18–54			
	Thomann 2016 [119]	Quali		Conv	Unkn	2012	Abidjan	17	Unkn		<i>Qualitative data</i>	—	—
Gambia	Mason [120, 121]	Quanti cr-sec	MSM	Snow-ball	Anal sex (12m)	Unkn	Banjul	14	HIV+—	Mean 36.1	Lifetime marriage to a ♀ Have children ICU with a steady ♀ partn. (u)	7% 7% 26%	No Yes No

Table 1 (continued)

Study identification				Study characteristics			Sample characteristics		Data related to steady relationships with women and fatherhood in MSM				
Country	First author, published year	Design ^a	Pop ^b	Sam-pling method ^c	Inclusion criteria ^d	Period	Location	Qual-ity	HIV status	Age (years)	Extracted data ^e	%	In meta-analysis
Ghana	Abubakari 2020 [122]	Quanti cr-sec	MSM	Snow-ball	Self-id MSM	2014	urban (Accra)	18	57				
	Banks 2014 [123]	Quali			Unkn	Unkn		20					
	Nelson 2015 [124]	Quanti cr-sec	MSM	Snow-ball	Sex (6 m)	2012		16	137				
Ghana, Togo	Moore [125]	Mixed cr-sec	MSM	Conv	Sex	2013	Accra (Ghana) and Lomé (Togo)	17	60				
	Broqua 2010 [126]	Quali		Conv	Unkn	2008	Bamako	9	Unkn				
Mali	Lahuerta 2018 [127]	Quanti cr-sec	MSM	RDS	Anal or oral sex (6m)	2015	Bamako	6	552				
	Adebajo 2012 [128]	Quanti cr-sec	MSM	RDS	Anal or oral sex (12m)	2006	Lagos and Ibadan	1125					
	Afolaranmi 2020 [129]	Quanti cr-sec	MSM	RDS	Unkn	2019	Jos, Plateau state, North Central Nigeria	12	114				
	Allman 2007 [130]	Quali		Conv	Unkn	Unkn		16	58				
	Ayoola 2013 [131]	Quanti cr-sec	MSM	Snow-ball	Sex (4 m)	2011	Lagos	15	291				
	Charurat 2015 [132]	Baseline from long	MSM	RDS	Anal sex (12m)	2014	Abuja	16	186				
Crowell 2017 [133]		Baseline from long	MSM	RDS	Anal sex (12m)	2019	Abuja and Lagos	15	1152				

Table 1 (continued)

Study identification			Study characteristics					Sample characteristics		Data related to steady relationships with women and fatherhood in MSM			
Country	First author, published year	Design ^a	Pop ^b	Sam-pling method ^c	Inclusion criteria ^d	Period	Location	Qual-ity	HIV status	Age (years)	Extracted data ^e	%	In meta-analysis
Senegal	Hamill 2021 [134]*				Anal sex (12m)			2221	HIV+–	≤21 y 34%; 22–30 y 57%; > 30 y 10%	Curr. married	5%	Yes
	Ochonye 2019 [135]	Quanti cr-sec	MSM	Snow-ball	Unkn	2015	Enugu, Nas-sarawa, Benue, Akwa-Ibom	17	Unkn	Unkn	Curr. married	8%	Yes
	Oginni 2018 [136]	Quanti cr-sec	MSM	Snow-ball	Self-id MSM	Unkn		13	Unkn	Mean SD 25.8 (5.69)	Curr. married	12%	Yes
	Oginni 2020 [137]	Quanti cr-sec	MSM	Snow-ball	Unkn	2014	Ekiti, Ogun, Ondo, Osun, Oyo, Lagos	12	Unkn	Mean 26+–5	Curr. married	7%	Yes
	Sheehy 2014 [138]	Quanti cr-sec	MSM	RDS	Anal sex (2m)	2017	Dar es Salaam	6	HIV+–		Curr. married/cohabiting with a ♀	12%	Yes
	Strömdahl 2012 [139]	Quanti cr-sec		Snow-ball	Anal sex (lifetime)	2008	Abuja	16	HIV+–	Mean 26 median 26 range 18–45	ICU with a steady ♀ partn. (6 m)	7%	No
	Tun 2018 [140]	Baseline from long	MSM	Other	Anal sex (6m)	2017	Lagos	14	HIV+–	Mean IQR 25 (21, 32)	Curr. married	6%	Yes
	Enel 2009 [141]	Quali	MSM-♀ part	Snow-ball	Unkw	2007		21	HIV+–		Qualitative data	–	–
	Gning 2013 [142]	Quali	MSM	Unkn	Unkn	2010		20	Unkn		Qualitative data	–	–
	Niang 2003 [143]	Quanti cr-sec	MSM	Snow-ball	Sex (life-time)	2003	Dakar	21	Unkn	Mean 25 range (18–53)	Curr. married	15%	Yes
	Larmarange 2009 [144]	Quanti cr-sec	MSM	Snow-ball	Sex (life-time)	2004	Dakar, Thies, Mbour, Kaolack, St Louis	21	HIV+–	Median 24 range 18–52	Have children Curr. with a steady ♀ partn	25% 7%	outlier No
	Wade 2005 [145]*				Sex (life-time)			22	Unkn	Median 24 range 18–52	Curr. married	8%	Yes
	Nkoum 2020 [146]	Quali	MSMW	Snow-ball	Unkn	2019	Dakar	18	HIV+–	Mean 24 range 18–33	Prev. married (i.e., not curr. married) Qualitative data	–	–
	Sappe 2003 [147]	Quali, review	Other	Other	Unkn	2002		15	HIV+–	20–29 y n=9; 30–39 y n=3; ≥ 39 y n=1	Qualitative data	–	–

Table 1 (continued)

Study identification				Study characteristics				Sample characteristics			Data related to steady relationships with women and fatherhood in MSM		
Country	First author, published year	Design ^a	Pop ^b	Sam-pling method ^c	Inclusion criteria ^d	Period	Location	Qual-ity	HIV status	Age (years)	Extracted data ^e	%	In meta-analysis
Togo	Ekouevi 2014 [148]	Quanti cr-sec	MSM	Snow-ball	Unkn	2012		15	758	Median 24 IQR 21–28 52.1% < 25 y	Curr. married/cohabiting with a ♀	15%	Yes
					Unkn						Curr. with a steady ♀ partn	7%	No
											Had disclosed MSM status to a steady ♀ partn	2%	No
	Ferré 2019 [149]	Quanti cr-sec	MSM	RDS	Sex (12m)	2017	Lomé, Kpalimé, Atakpamé, Tsévié	4	214	Median 22 IQR 20–26	Curr. married/cohabiting with a ♀	10%	Yes
	Grosso 2019 [114]	Quanti cr-sec	MSM	RDS	Anal sex (12m)	2013	Lomé and Kara	11	684		Curr. married/cohabiting with a ♀	7%	Yes
Central Africa Burundi	Ruiseñor-Escudero 2019 [150]	Quanti cr-sec	MSM	RDS	Anal sex (12m)	2013	Lomé and Kara	16	683	Median 24 63% 18–24 y	Curr. married	2%	outlier
											No condom use with steady ♀ partn. (last sex)	10%	No
	Teclesou 2017 [151]	Quanti cr-sec	MSM	RDS	Sex (life-time)	2015	Lome	8	496	Median IQR 23 [21–27]	Curr. with a steady ♀ partn	2%	No
	Coulaud 2016 [29]	Quanti cr-sec	MSM	Conv	Unkn	2014	Bujumbura	21	51	Median IQR 23 (21–25)	Curr. Married	10%	No
Cameroon	Billong 2013 [30]	Quanti cr-sec	MSM	RDS	Sex (life-time)	2011		21	239	Median 23 range 18–51	Curr. with a steady ♀ partn	45%	No
	Gueboguo 2007 [31]	Quali			Unkn	2006	Douala, Yaoundé	11			Curr. with a steady ♀ partn	6%	No
	Henry 2010 [32]	Quanti cr-sec	MSM	Other	Sex (life-time)	2015	Rustenburg	19	142	Mean (sd) 22 ± 3	Curr. married	13%	No
	Lorente 2012* [33]				Sex (life-time)				165		Life marriage to a ♀	15%	No
											<i>Qualitative data</i>	–	–
East Africa Ethiopia	Tadele 2011 [34]	Quali	MSM	Unkn	Unkn	2007	Addis Ababa	12	30	Range 24–33	<i>Qualitative data</i>	–	–
	Fearon 2020 [35]	Quanti cr-sec	MSM	RDS	Sex (12m)	2017	Nairobi	4	618	18–21 y 28%; 22–24y 29%; 25–29 y; 21%; ≥ 30 years 22%	Curr. married	7%	Yes

Table 1 (continued)

Study identification			Study characteristics				Sample characteristics			Data related to steady relationships with women and fatherhood in MSM					
Country	First author, published year	Design ^a	Pop ^b	Sam-pling method ^c	Inclusion criteria ^d	Period	Location	Qual-ity	HIV status	Age (years)	Extracted data ^e	%	In meta-analysis		
	Geibel 2008 [36]	Quanti cr-sec	MSM	MSM	Location	Selling sex	2006	Mombasa	19	425	Unkn	Median IQR 26(22–31)	Curr. married	4%	Yes
	Graham 2020 [37]	Randomized controlled trial	MSM	Random	Sex (12m)	2016			60	HIV+		18–24 y 20%, 25–34 y 57%, > 34 y 23%	Curr. married/cohabiting with a ♀	12%	Yes
	Karuga 2016 [38]	Mixed cr-sec	MSM	RDS	Unkn	2014	Kisumu and Nairobi	15	55		HIV–	Median IQR 24.9 5 25% < 22 years 49% 23–27 years 16% 28–32 years 5% > = 33 years	Curr. married/cohabiting with a ♀	2%	Yes
	Kimani 2019 [39]	Mixed cr-sec	MSM/ TGW	RDS	Sex (6m)	2017	Malindi	19	168		HIV+–	18–24 y 38%; 25–34 y 52%; > 35 years 11%	Curr. with a steady ♀ partn <i>Qualitative data</i>	5% –	No –
	Kimani 2021 [40]	Baseline from long	MSM	Other	Unkn	2018	Coastal Kenya	13	42		HIV–	18–24 y 29%; 25–34 y 50%; > 34 years 21%	Curr. married <i>Qualitative data</i>	10% –	Yes –
	Korhonen 2018 [41]	Quanti cr-sec	MSM	Unkn	Self-id MSM	2016	Nairobi, coastal Kenya, and Kisumu	9	1476		HIV+–	Median IQR 25 (22–29)	Prev. married (i.e., not curr. married)	7%	Yes
	Kunzweiler 2018 [42]	Baseline from long	MSM	Snow-ball	Anal or oral sex (6m)	2016	kisumu	18	63		HIV+	Median 27 IQR: 22–32	Curr. married/cohabiting with a ♀	14%	Yes
	Kunzweiler 2020 [43]	Baseline from long	MSM	Snow-ball	Anal or oral sex (6m)	2016	Kisumu	18	609		HIV–	Median IQR 23 (21– 28) 18–24 y 58%	Prev. married (i.e., not curr. married) Curr. married/cohabiting with a ♀	24% 11%	Yes Yes

Table 1 (continued)

Study identification			Study characteristics				Sample characteristics		Data related to steady relationships with women and fatherhood in MSM				
Country	First author, published year	Design ^a	Pop ^b	Sam-pling method ^c	Inclusion criteria ^d	Period	Location	Qual-ity	HIV status	Age (years)	Extracted data ^e	%	In meta-analysis
	Mannava 2013 [44]	Quanti cr-sec	MSM	Location	Selling sex	2008	Mombasa	20	867	Median 25 (IQR = 22–28)	Prev. married (i.e., not curr. married)	15%	Yes
	Midoun 2016 [45]	Quali			Anal sex (12m)	2012	Malindi	12	26	Mean 31 (range 18–50)	Curr. married	33%	Yes
	Möller 2015 [46]	Baseline from long	MSM	Conv	Anal sex (follow-up)	2011	Kilifi, Mtwapa	13	561	Median IQR 25.2 (21.5–29.7)	Lifetime marriage to a ♀	20%	Yes
	Mugo 2015 [47]	Baseline from long	MSM	Other	Unkn	2010	Nairobi and Kilifi	12	62	Mean 26	Have children	26%	Yes
	Muraguri 2015 [48]	Quanti cr-sec	MSM	RDS	Anal or oral sex (6m)	2010	Nairobi	16	563	18–24 y 38%; 25–29 y 29%; 30–34 y 18%; ≥ 35 y 26%	Qualitative data	–	–
	Okal 2009 [49]	Quali		Location	Selling sex	2006	Mombasa	15	36	Range 17–45	Lifetime marriage to a ♀	18%	Yes
	Onyango-Ouma 2005 [50]	Mixed cr-sec	MSM	Snow-ball	Sex (life-time)	2004	Nairobi	18	500	Median 26 range 18–55 91% < 35 y	Curr. married	7%	Yes
											Prev. married (i.e., not curr. married)	27%	outlier
											Qualitative data	–	–
											Curr. married	7%	Yes
											Have children	22%	Yes
											No condom use with steady ♀ partn. (last sex)	6%	No
											Prev. married (i.e., not curr. married)	7%	Yes
											Qualitative data	–	–
	Sandfort 2019, 2020 [51, 52]	Baseline from long	MSM	Conv	Sex (life-time)	2016	Kisumu	20	100	Mean 25, median 23	Curr. married	7%	Yes
	Secor 2015 [53]	Quanti cr-sec	MSM	Other	Sex (3m)	2014	Coastal	14	112	Median IQR 26 (23.5–30)	Have children	28%	Yes
	Shangani 2017 [54]	Quanti cr-sec	MSM	Snow-ball	Anal or oral sex (6m)	2014	Eldoret	16	89	52% 18–24 y; 48% ≥ 25 y	Curr. married	34%	Yes

Table 1 (continued)

Study identification				Study characteristics				Sample characteristics			Data related to steady relationships with women and fatherhood in MSM		
Country	First author, published year	Design ^a	Pop ^b	Sam-pling method ^c	Inclusion criteria ^d	Period	Location	Qual-ity	HIV status	Age (years)	Extracted data ^e	%	In meta-analysis
Rwanda	Sharma 2008 [55]	Quali	MSM	Snow-ball	Unkn	2002	Nairobi	16	30	Range 19–35	Lifetime marriage to a ♀ Have children	81% 80%	Yes Yes
	Singh 2012 [56]	Baseline from long	MSM	conv	Unkn	2010	Malindi (MSM)	17	262	15–24 21%; 25–34 50%; ≥ 34 28%	<i>Qualitative data</i>	–	–
	Adedimeji 2019 [57]	Quali	MSM	RDS	Sex (life-time)	2015	Kigali	19	30	Unkn	Lifetime marriage to a ♀	46%	Yes
	Twahirwa Rwema 2020 [58]	Quanti cr-sec	MSM	RDS	Anal sex (12m)	2018	Kigali	15	736	18–24 y 49%; 25–34 y 36%; > 35 y 11%	<i>Qualitative data</i>	–	–
Tanzania	Alexander Ishungisa 2020 [59]	Quanti cr-sec	MSM	RDS	Sex (3m)	2017	Dar-es-salam	777	HIV+–	Mean 26 y (SD ± 7.1)	Curr. married/cohabiting with a ♀ No condom Use with steady ♀ partin. (last sex) Curr. married/cohabiting with a ♀	3% (1–5) 50% 4%	Yes No Yes
	Anderson 2015 [60]	Quanti cr-sec	MSM	RDS	Unkn	2013	Dar es Salaam	200	HIV+–	Median 23 IQR 21–28	Lifetime marriage or cohabitation with a ♀	17%	Yes
	Bui 2014 [61]	Quanti cr-sec	MSM	Unkn	Sex (6m)	Unkn	dar es Salaam	15	200	Mean SD 24.6 (5.3)	Lifetime marriage or cohabitation with a ♀	22%	Yes
	Johnston 2010 [62] Kigumiu 2019 [63]	Quanti cr-sec Quanti cr-sec	MSM MSM	RDS RDS	Anal sex (3m) Unkn	2007 2015	Unguja, Zanzibar Tanga Municip- pal, Muhe-za, Pangani and Korogwe	13 14	509 266	Median 28 y IQR 22–34 Mean 27 y ± 7; 15–24 y: 34%, 25–34 y: 50%, 35–54: 16%	Curr. married/cohabiting with a ♀ Curr. married	14% 15%	Yes Yes
	Mmbaga 2017 [65]	Quanti cr-sec	MSM	RDS	Unkn	2014	Dodoma regio	12	409	18–24 y 36%; 25–34 y 48%; ≥ 35 y 15%	Curr. married	8%	Yes
								12 12			have children Prev. married (i.e., not curr. married)	35% 12%	Yes Yes
	Mmbaga 2018 [64]	Quanti cr-sec	MSM	RDS	Sex	2014	Dar es Salaam (Kinondoni, Ilala and Temeke.)	13	753	Mean 27 SD 6	Curr. married	6%	Yes
											Curr. married/cohabiting with a ♀	6%	Yes

Table 1 (continued)

Study identification			Study characteristics				Sample characteristics		Data related to steady relationships with women and fatherhood in MSM				
Country	First author, published year	Design ^a	Pop ^b	Sam-pling method ^c	Inclusion criteria ^d	Period	Location	Qual-ity	HIV status	Age (years)	Extracted data ^e	%	In meta-analysis
Uganda	Mmbaga 2020 [66]	Quanti cr-sec	MSM	RDS	Anal sex (6m)	2014	Dar es salaam	15	753	Mean sd 26.5 6.6	Have children	30%	Yes
	Nyoni 2013 [67]	Quanti cr-sec	MSM	RDS	Unkn	2010	Dar es Salaam,	10	271	Mean 26.16 SD 6.16, median 24	Curr. married/cohabiting with a ♀	13%	Yes
	Ross 2014 [68]*	Quanti cr-sec	MSM	RDS	Unkn	2013	Dar es Salaam and Tanga	2	300	Median 23 (IQR: 21–28)	Curr. married	4%	Yes
	Shio 2021 [69]	Quali			Unkn			10	13		Lifetime marriage or cohabitation with a ♀	19%	Yes
	Bryan 2019 [70]	Quali		conv	Unkn	2016		14	10		Qualitative data	–	–
	Hladik 2012 [71]*	Mixed cr-sec	MSM	RDS	Anal sex (3m)	2009	Kampala	14	295	18–24 y 50%; ≥ 25 years 50%	Curr. married	13% (9–19)	Yes
Southern Africa	King 2013 [72]*		MSM					16	HIV+–	50% < 25 y	Qualitative data	–	–
	Hladik 2017 [73]	Quanti cr-sec	MSM	RDS	Anal sex (6m)	2013	Kampala	19	608	Median 23 (IQR range (IQR) 21–26)	Curr. married	9% (5–12)	Yes
	Peters 2015 [74]	Quali		Unkn	Unkn	2012		18	110		Prev. married (i.e., not curr. married)	9% (7–13)	yes
	Peters 2016 [75]	Mixed cr-sec		Snow-ball RDS	Anal sex (3m)	Unkn	Kampala	9	50	range 18–45	Qualitative data	–	–
	Kajubi 2008 [76]	Quanti cr-sec	MSM	RDS	Self-ld MSM	2004	Kampala	14	295	< 25 y 62%; ≥ 25 years 38%	Have children	30% (22–37)	Yes
	Tafuma 2014 [77]	Quanti cr-sec	MSM	RDS	Anal or oral sex (6m)	2012	Gaborone, Kasane	13	454	Mean 95% CI 23.2 (22.9–23.7)	Prev. married (i.e., not curr. married)	17% (11–23)	Yes
Botswana								17	224		Curr. married	5%	Yes
											Lifetime marriage to a ♀	17%	Yes

Table 1 (continued)

Study identification			Study characteristics				Sample characteristics		Data related to steady relationships with women and fatherhood in MSM				
Country	First author, published year	Design ^a	Pop ^b	Sam-pling method ^c	Inclusion criteria ^d	Period	Location	Qual-ity	HIV status	Age (years)	Extracted data ^e	%	In meta-analysis
Lesotho	Baral 2011 [78]	Quanti cr-sec	MSM	Snow-ball	Anal sex (lifetime)	2009		16	252	Mean 26 range 18–56	Prev. married (i.e., not curr. married)	0% (0–1)	Yes
	Epprecht 2002 [79]	Quali	MSM	Unkn	Unkn	Unkn		15			Lifetime marriage or cohabitation with a ♀	24%	Yes
	Stahlman 2015 [80]	Quanti cr-sec	MSM	RDS	Self-id MSM	2014	Maseru	10	527	37% <21 y; 41% 21–28 y; 23% ≥28 y	Have children	21%	Yes
											<i>Qualitative data</i>	–	–
Malawi	Ntata 2008 [81]	Quanti cr-sec	MSM	Snow-ball	Unkn	2006	Blantyre, Zomba, Lilongwe, Machinga, Mangochi, Dedza	12	318		Lifetime marriage or cohabitation with a ♀	21%	Yes
											Have children	9%	Yes
											Lifetime marriage or cohabitation with a ♀	25%	Yes
											Have children	31%	Yes
	Sandfort 2019, 2020 [51, 52]	Baseline from long	MSM	Conv	Sex (lifetime)	2016	Blantyre	20	100	Mean 25, median 24	Had disclosed MSM status to a steady ♀ partn	1%	Yes
											Curr. married	10%	Yes
											Have children	29%	Yes
											Curr. married/cohabiting with a ♀	16% (10–23)	No
	Wirtz 2013 [82]	Quanti cr-sec	MSM	RDS	Anal sex (12m)	2012	Blantyre	19	338	Median 25 y (range 18–49)	Have children	15% (1–22)	Yes
											ICU with a steady ♀ partn. (12m)	24%	No
											No condom use with steady ♀ partn. (last sex)	17%	No
											Curr. married	10%	Yes
	Wirtz 2017 [83]	Quanti cr-sec	MSM	RDS	Anal sex (12m)	2014	Blantyre, Chikwawa, Lilongwe, Mangochi, Mulanje, Mzuzu, Nkhata Bay	12	2453	18–20 y 24%; 21–30 y 60%; ≥31 y 16%			
Malawi, Namibia, Botswana	Beyrer 2010 [84]	Quanti cr-sec	MSM	Snow-ball	Sex (lifetime)	2008		20	537		Curr. with a steady ♀ partn	34%	Yes

Table 1 (continued)

Study identification			Study characteristics				Sample characteristics		Data related to steady relationships with women and fatherhood in MSM				
Country	First author, published year	Design ^a	Pop ^b	Sam- pling method ^c	Inclusion criteria ^d	Period	Location	Qual- ity	HIV status	Age (years)	Extracted data ^e	%	In meta- analysis
Mozambique	Sathane 2016 [86], Boothe 2020 [85]	Quanti cr- sec	MSM	RDS	Anal or oral sex (12m)	2011	Maputo, Beira, Nampula-Nacara	19	1325	73% 18–24 y	lifetime Marriage or cohabi- tation with a ♀	6%	Yes
Namibia	Boulton 2020 [87]	Quali	Men	Unkn	young men	2016	Swakopmund	15	Unkn		Curr. married/cohabiting with a ♀	7%	No
	Stephenson 2014 [88]	Quali	Purpo- sive	Unkn	Unkn	Unkn	Windhoek, Luder- itz, Keetman- shoop, Mariental and Khorixa	19	52	Unkn	Qualitative data	–	–
Namibia, South Africa	Essack 2020 [89]	Quali	MSM	Conve	Sex (study time)	Unkn	KwaZulu-Natal, Windhoek, Swakopmund, Keetmanshoop	5	36	Unkn	Qualitative data	–	–
South Africa	Baral 2011 [90]	Quanti cr- sec	MSM	Snow- ball	Anal sex (lifetime)	2009	Peri-urban townships of CapeTown	200	HIV+–	Mean 26 (Range 18–58) median 24 IQR 21–29	Curr. married	8%	Yes
	Cloete 2008 [91]	Quanti cr- sec	Men	conv	Unkn	Unkn	Capetown	8	92	18–20 y 14%; 21–25 y 36%; 26–35 y 30%; 36–45 y 12%; >45 years 3%	ICU with a steady ♀ partn. (6m)	56%	No
											Curr. married	12%	Yes
											Have children	24%	Yes
	Fearon 2020 [35]	Quanti cr- sec	MSM	RDS	Sex (12m)	2017	Johannesburg	4	301	18–21 y 24%; 22–24 y 24%; 25–29y 23%; ≥30 y 30%	Curr. married	1%	Yes
	Gyamerah 2019 [93]	Quali		onv	Sex (12m)	2011	Tshwane Munici- pality	13	81	Range 20–39 (M =25.16 y)	Qualitative data	–	–
	Heusser 2014 [94]	Quanti cr- sec	MSM	Other	Unkn	Unkn	online	18	230	Mean 34.96 ; SD 0.11 ; median 34	Curr. married	2%	Yes
	Icard 2020 [95]	Quanti cr- sec	MSM	Snow- ball	Sex (12m)	Unkn	Eastern Cape Province	12	125	Mean (SD) 24.36 (6.93)	Curr. married	4%	Yes
											Prev. married (i.e., not curr. married)	1%	Yes

Table 1 (continued)

Study identification				Study characteristics				Sample characteristics			Data related to steady relationships with women and fatherhood in MSM		
Country	First author, published year	Design ^a	Pop ^b	Sam-pling method ^c	Inclusion criteria ^d	Period	Location	Qual-ity	HIV status	Age (years)	Extracted data ^e	%	In meta-analysis
South Africa and Africa	Lane 2008 [96]	Quanti cr-sec	MSM	Snow-ball	Sex (12m)	2005	Gauteng province	16	147	Unkn	Curr. with a steady ♀ partn	4%	Yes
	Lane 2011 [97]	Quanti cr-sec	MSM	RDS	Anal or oral sex (6m)		Soweto	14	378	HIV+–	Curr. with a steady ♀ partn	63% (56–71)	Yes
	Lane 2014 [98]	Baseline from long	MSM	RDS	Anal or oral sex (6m)	2013	Ehlanzeni (rural district)	18	298	HIV+–	Curr. with a steady ♀ partn	26% (18–33)	Yes
	Maenette 2019 [99]	Baseline from long	MSM	Other	Anal sex (3 m)	2015	Rustenburg	14	27	HIV+–	Curr. married	0%	Yes
	Mantell 2016 [100]	Quali		Snow-ball	Unkn	Unkn	Mpumalanga	103	Unkn	Range 18–49	Prev. married (i.e., not curr. married) <i>Qualitative data</i>	–	–
Swaziland	Mavhandu-Mudzusi 2017 [101]	Quali		Snow-ball	Unkn	2012	Limpopo province (rural)	12	20	Unkn	<i>Qualitative data</i>	–	–
	Peters 2019 [102]	Quali		Snow-ball	Unkn	2015	Cape town	14	Unkn		<i>Qualitative data</i>	–	–
	Reygan 2019 [103]	Quali		Snow-ball	Unkn	Unkn	Cape Town, Gauteng province	20	22	Unkn	<i>Qualitative data</i>	–	–
	Sandfort 2019, 2020 [51, 52]	Baseline from long	MSM	Conv	Sex (life-time)	2016	Cape Town and Soweto	20	201	HIV+–	Mean 23, median 22 Curr. married	5%	Yes
	Stobie 2003 [104]	Review, text, opinion			Unkn	Unkn		13	200	HIV+– Unkn	Have children <i>Qualitative data</i>	15%	Yes
Swaziland	Baral 2013 [105]	Quanti cr-sec	MSM	RDS	Anal sex (12m)	2011		16	324	HIV+–	curr. married/cohabiting with a ♀ have children	2% (0–4)	No
	Sithole 2017 [106]	Quanti cr-sec	MSM	Snow-ball	Anal sex (12m)	2013	Manzini	12	35	HIV+–	ICU with a steady ♀ partn. (12m) have children	11% (6–15)	Yes
	Stahlman 2015 [92]	Quanti cr-sec	MSM	RDS	Anal sex (12m)			16	322	HIV+–	lifetime marriage or cohabitation with a ♀	15%	No
												12%	Yes
												4%	Yes

Table 1 (continued)

Study identification				Study characteristics				Sample characteristics			Data related to steady relationships with women and fatherhood in MSM				
Country	First author, published year	Design ^a	Pop ^b	Sam-pling method ^c	Inclusion criteria ^d	Period	Location	Qual-ity	HIV status	Age (years)	Extracted data ^e	%	In meta-analysis		
Africa	Zimbabwe	Chitando 2016 [107]	Review, text, opinion		Unkn	Unkn		8	Unkn	Mean 27 (range 19–38)	Qualitative data	–	–		
		Tsang 2019 [108]	Mixed cr-sec	MSM	Conv	Sex (life-time)	2016	Bulawayo	16	15	Unkn	Qualitative data	–	–	
		Isano 2020 [109]	Quanti cr-sec	MSM	Unkn	Self-id MSM	2019		18	297	Unkn	Mean (range) 35.9 (18–69)	Curr. married	20%	No
		Epprecht 2012 [110]	Review, text, opinion			Unkwn	Unkn		10	Unkn		Qualitative data	–	–	
		Saavedra 2008 [123]	Review, text, opinion			Unkw	2008		10	Unkn	<24 y	Qualitative data	–	–	
		Winskell 2016 [152]	Quali	Young	Unkn	<24 years	2013	19	56	unkw	Qualitative data	–	–		

*Same participants, included as a unique study

^a‘quanti cr-sec’: quantitative cross-sectional study; ‘mixed cr-sec’: mixed-methods cross-sectional study; ‘quali’: qualitative study; ‘baseline from long’: baseline data from quantitative longitudinal study

^bMSM: men who have sex with men; SW: male sex workers; TGW: transgender women

^c‘RDS’: respondent driven sampling; ‘conv’: convenience sampling

^dMSM inclusion criteria i.e. Type of sexual relationships with men (time frame) or: self-identified MSM ‘self-id MSM’

^e‘curr’: currently; ‘prev’: previously; ‘♀ part’: female partner; ‘ICU’: Inconsistent Condom Use; ‘12m’: in the previous 12 months; ‘6m’: in the previous 6 months; ‘lifetime’: (i.e., current or previous) ‘unkw’: Unkn own

(0–7%, $n = 4$ studies, 3059 MSM) in Southern Africa, 11% (9–14%, $n = 10$ studies, 3531 MSM) in East Africa, and 3% (2–5%, $n = 6$ studies, 1450 MSM) in West Africa. Just as was the case for current steady relationships, there were not enough data to perform a meta-analysis for any of the three indicators for Central Africa. One study covering that region reported lifetime marriage in 19% of MSM (Table 1).

Fatherhood

Twenty-three studies provided data on the proportions of MSM with children (Table 1). For this indicator, we performed three regional meta-analyses (Fig. 3, Additional File 2), the estimated pooled proportions being 8% (7–10%, $n = 5$ studies, 2652 MSM) of MSM in West Africa, 32% (20–46%, $n = 8$ studies, 3766 MSM) in East Africa, and 17% (13–23%, 9 studies, 2086 MSM) in Southern Africa.

Condomless Sex with Steady Female Partners

No meta-analysis could be performed on condomless sex with steady female partners for any of the four regions because of insufficient data (Tables 1, 2). Fourteen proportions of recent condomless sex with steady female partners in MSM were available (Table 2); however, the time periods used to reflect the notion of ‘recent’ varied. In West Africa, 7% to 26% of MSM reported having recent condomless sex with a steady female partner ($n = 8$ studies). In Southern Africa, these proportions ranged from 15 to 56% ($n = 4$ studies), while in East Africa, they ranged from 6 and 50% ($n = 2$).

Disclosure of MSM Sexuality to Steady Female Partners

Only three studies reported MSM disclosure of their MSM sexuality to a steady female partner. Specifically, one study in Southern Africa and two in West Africa reported that 1%, 0%, and 2% of MSM, respectively, had done so (Table 1).

Qualitative Data Synthesis

Three analytical themes related to the topic of steady relationships with women (mostly about marriage) were identified from the thematic synthesis of the qualitative data extracted from 39 studies (Table 3).

Theme 1: Motives for MSM to Enter into a Steady Relationship with a Woman

Being in love with a woman, the desire to have a sexual relationship in the open without having to hide [142, 146],

and the longing to have children [34, 75, 126, 142, 146], were among the reasons given for entering into a steady relationship with a woman (i.e., wife, fiancée or girlfriend).

Many MSM declared that they got married or wished to marry in order to suit cultural and religious norms and perform the expected masculine role [31, 34, 45, 69, 79, 89, 93, 104, 107, 108, 116, 117, 146, 152, 153], or out of a sense of social responsibility linked to getting older [116, 126, 146, 147]. Often, direct family pressure—whether based on long-standing arranged marriages or on age—pushed MSM into marriage [34, 69, 72, 75, 107, 108, 116, 130, 142, 146, 147]. Sometimes, in cases where family members were aware of the MSM’s sexuality, marriage was negotiated with family members, whereby same-sex sexual relations would be tolerated—provided they were kept hidden—if the MSM ‘compensated’, either by providing for the family’s financial needs and/or promising to marry and have children later [142, 146, 147].

Given that marriage and having children is the highest heteronormative standard in SSA, some MSM decided to marry women who were unaware of their sexuality, with a view to keeping it secret. Some of these MSM saw this ‘cover’ as the best strategy to exercise their sexuality more freely (especially when marrying younger women with little life experience), compared to living under their parents’ roof [49, 50, 55, 55, 57, 72, 107, 123, 141, 146, 146, 147], while others chose marriage as a means to escape their homosexuality and stop homosexual behaviors [34, 45, 108, 141, 146, 147]. These diverse motivations to marry a woman had implications for how MSM chose wives. Some married lesbian women so they could both conform to social norms and family pressure while keeping the relationship platonic, all the while ensuring their freedom to secretly live their sexuality (known as ‘lavender marriages’) [70, 74, 75, 101].

Theme 2: Experience & Behaviors of Married MSM

Relationships with Wives and Children Secrecy played a significant role in the relationships between married MSM and their wives. Some wives were aware of and accepted their husband’s MSM status [79, 87, 89, 142, 146], while others were unaware or were suspicious [72, 102, 108, 125, 142, 146]. To avoid the latter, MSM adopted different coping behaviors, such as refraining from having a steady male partner and having only casual male partners [50, 55], or reducing the number of male partners they had [142, 146].

Some married MSM considered PrEP as a helpful strategy to reduce the risk of HIV acquisition and therefore transmission to their wives and children [39]. Others believed that taking PrEP was too risky for married MSM as sooner or later their secret would be discovered [38]. The same fear prevented them from using condoms with their wives [57] and, for HIV-positive MSM, from disclosing their HIV

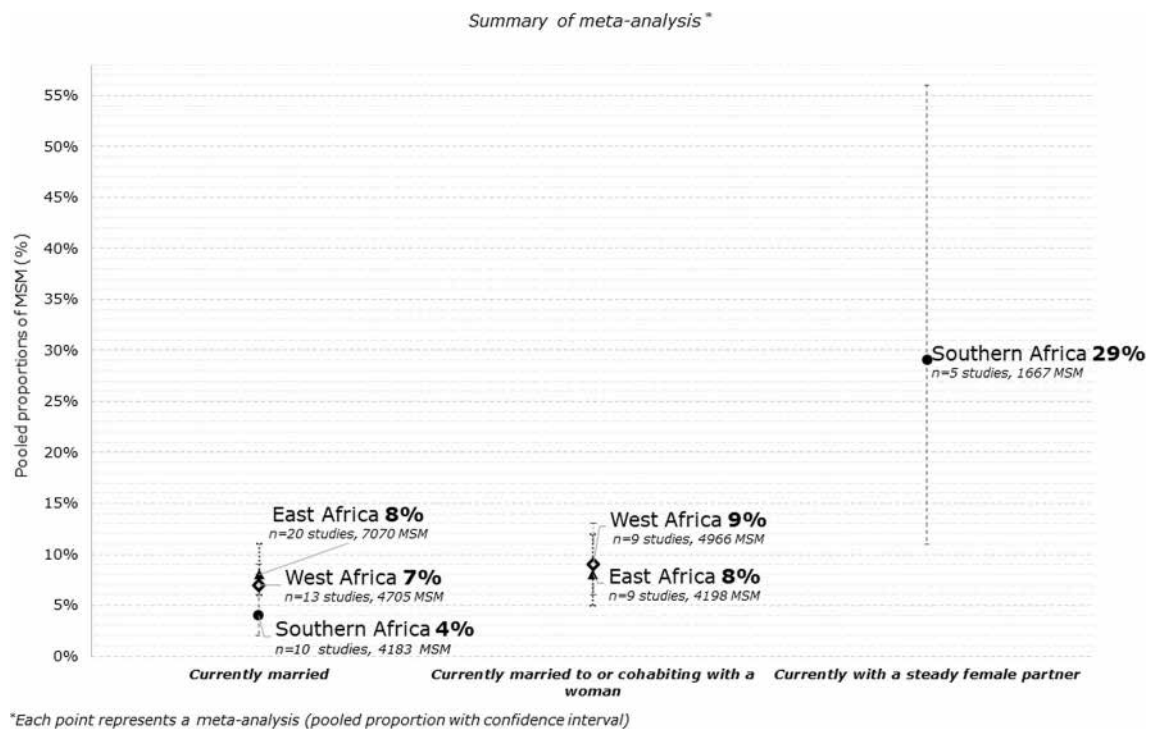


Fig. 2 Pooled proportions of MSM currently in a steady relationship with a woman (i.e., at the time of the study)

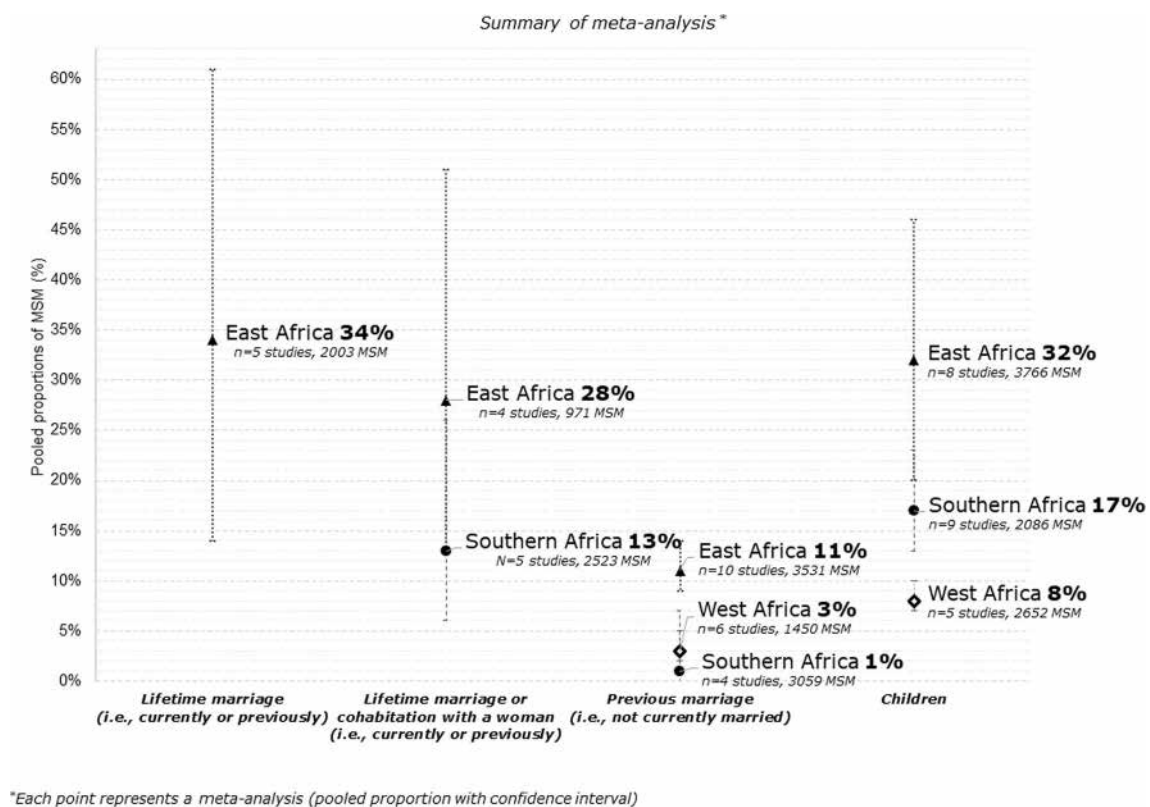


Fig. 3 Pooled proportions of MSM who had steady relationships with a woman in lifetime (i.e., at the time of the study or previously), and having children

status to them [146]. Often MSM reported difficulties in engaging in sexual relations with their wives, due to not being sexually aroused by them [49, 50, 79, 146]; others self-identified as faithful (i.e., did not have other female partners) [146]. Some MSM reported they committed domestic violence against their steady female partner; this may have been a way to maintain a form of dominance when they felt their masculinity was being challenged by their homosexual behaviors [102]. The need to keep their status secret also distanced some married MSM from community-based HIV prevention and support [154].

MSM described a variety of material and child custody arrangements with their wives. Some who provided adequately for their wives' material and financial needs were granted a certain amount of sexual freedom and tolerance in exchange [79, 142, 146]. Some MSM reported that their wives mutually agreed with them to live apart since the beginning of the union [142, 146]. In other cases, a wife's discovery of their MSM status—or for some, HIV seroconversion – may lead to divorce [146]. Some continued to enjoy a friendly and supportive relationship with their ex-wives [103]. Several with children declared they had contemplated their own reactions if their child identified as homosexual. These reactions ranged from tolerance to non-acceptance [146].

Relationships with Male Partners Relationships of married MSM with their male partners were diverse. Some had the opportunity to lead a double life, maintaining stable, loving relationships with their male partners [87, 107, 123, 142, 146]. A number of male partners of married MSM were jealous, acted in a confrontational manner towards MSM's wives, or experienced high levels of emotional distress [79, 142, 146, 154]. Others did not view themselves as competing with wives, and behaved in a friendly, discreet, and accepting manner [146]. In some cases, male partners of 'closeted' married MSM blackmailed them for money or sexual favors by threatening to 'out' them to their wives [55].

Theme 3: Perceptions of MSM Who did not Marry

Despite various contextual factors – including internalized heteronormative expectations—putting pressure on them to marry women, some MSM reported they had no intention of doing so. Unsurprisingly, one of the primary reasons for this choice was their exclusive sexual and emotional attraction to men [34, 146]. Some were concerned that entering into marriage would greatly increase the risk of their sexual orientation being involuntarily disclosed. Additionally, some HIV-positive MSM chose not to marry women for fear of transmission to their wives and potential children, as well

Table 2 Summary of studies reporting % of MSM who had recent condomless sex with a steady female partner

SSA region	Study country (author, publication year)	Sample size	Condomless sex ^a with a steady female partner ^b		Time frame
			n	% ^c	
East Africa	Kenya (Onyango-Ouma 2005)	500	32	6	Most recent encounter
	Rwanda (Twahirwa Rwema 2020)	736	368	50	
Southern Africa	Malawi (Wirtz 2013)	338	80	24	Previous 12 months
	Swaziland (Baral 2013)	324	47	15	Previous 6 months
	South Africa (Baral 2011)	200	111	56	
	Malawi (Wirtz 2013)	338	56	17	Most recent encounter
West Africa	Burkina Faso (Ouedraogo 2019)				Previous 12 months
	Ouagadougou	333	74	22	
	Bobo-Dioulasso	328	47	14	
	Nigeria (Strömdahl 2012)	297	20	7	Previous 6 months
	Burkina Faso (Ouedraogo 2019)				Most recent encounter
	Ouagadougou	333	34	10	
	Bobo-Dioulasso	328	27	8	
	Gambia (Mason 2015)	202	35	17	
	Togo (Ruiseñor-Escudero 2019)	683	67	10	“Condom not used in general”
	Gambia (Mason 2015)	202	53	26	

^aCondomless sex: vaginal or vaginal/anal or not specified

^bWives or steady female partners according to study

^cPercentages for the entire MSM sample (recalculated if necessary using the raw numbers of MSM who had condomless sex with a steady female partner). NB: no data was available for Central Africa

Table 3 Themes emerging from qualitative data synthesis “Marriage and other steady MSM relationships with cisgender women in Sub-Saharan Africa” (including verbatim excerpts of interviewees’ discourses and/or authors’ citations from the articles selected for the synthesis)

Theme ①—Reasons and motives of MSM to engage in marriage or steady relationships with women

In love with wife	<i>“Until now, I love the girl I had a child with. Really, the love I have for her is embarrassing. Despite my love for her, I’m actually more attracted to men.” (interviewee discourse, Senegal, Nkoum 2020)</i>
Willing to live a relationship in the open	<i>“My wife, it’s an obligatory thing. It’s written down by God. Anything outside of that is of no importance. If I’m with my wife in the street, I can kiss her, carry her things and all that. I don’t dare do that with the other person [i.e., male partner]. (...) No man would dare to be in the company of his boyfriend and walk down the street, or eat together in a restaurant, giving each other kisses. But with my wife, in my bedroom, I can do what I want.” (interviewee discourse, Senegal, Nkoum 2020)</i>
Strong desire to have a child	<i>“I used to wish for a child, you know, at least I would have something I leave behind in this world even if I die. And when I got a child, I was very pleased with it.” (interviewee discourse, Ethiopia, Tadele 2011)</i>
Complying social, cultural, religious norms	<i>“Societal and family pressure to conform to community norms, as well as the role of children and procreation within family structure, meant that most participants either planned to be or were currently married. Many believed that this was non-negotiable within Nigerian society.” (authors’ citation, Nigeria, Allman 2007)</i>
Performing masculinity	<i>“I was in my mid-20 s. (...) My relatives pressured me to start a relationship with Asha, and I married her six months later. I was not entirely happy with this marriage, but one thing was positive about it: everyone stopped questioning my manhood, believing that I am a “real man” but in truth, I still maintained my relationships with other men. I no longer needed to try so hard to prove my manhood to my family and neighbors.” (interviewee discourse, Tanzania, Shio 2021)</i>
By sense of responsibilities When getting older	<i>“At a certain age, some guys become bisexual...They are gay when they are young and then... I don’t know if it’s because of responsibilities or what (...) but after 30, 35 years old, they all get married, have kids. But still they continue [to have same-sex relationships]. I think it is mostly their jobs that ask for that...I can’t really explain it... or maybe it’s family pressure, I don’t know.” (interviewee discourse, Cote d’Ivoire, Ndour 2012)</i>
Family pressure	
Arranged/long-term planned marriage	<i>“From a certain age onwards, it is also difficult to escape this union [i.e., marriage with a woman], which in the end, may be organized by families if no commitment is envisaged. During our stay, one of the people we met, in his forties, went absent from Dakar on two occasions to meet his chosen wife and get married. (...) He declared that until that moment he had never had sexual relations with a woman”. (authors’ citation, Senegal, Sappe 2003)</i>
Negotiation with mothers/families	<i>“When I explained to my mother what happened with my father [who discovered his homosexuality], she said: ‘There’s nothing to worry about, as long as you don’t intend to stay homosexual for the rest of your life. As far as I’m concerned, I’m gay because that’s how I feel. (...) So I can only accept my homosexuality. So, I’m homosexual, but for my mother I’m heterosexual and I do everything I can to prove it to her. Because I can’t stay homosexual for life, I don’t want to. I promised her I’d start a family.” (interviewee discourse, Senegal, Nkoum 2020)</i>
Intend to stop MSM behaviors	<i>“The day I marry a woman, I’ll give up homosexuality. God made me part of that world [i.e., homosexual]; but today, if God gave me a wife, I’d never kiss a man again. I’d leave that circle. God willing. Speaking of my fellow beings [i.e., homosexuals], this very day, where I’m known, I’m not going to live there anymore. I have somewhere else to go if I get married, that’s for sure. It’s true that people will come looking for me. I’ve been with them, but I’d run away.” (interviewee discourse, Senegal, Nkoum 2020)</i>
<i>Choice of spouse</i>	<i>“MSM who desire someone of the opposite sex consider heterosexual marriage—even marriage based on love—as a solution to escape their homosexual practices from which they derive sexual pleasure and/or monetary interest, but which they are neither proud of nor satisfied with. Men who are sexually attracted to the same sex but romantically attracted to the opposite sex would choose wives who are more sexually experienced, with whom they have [already] been able to maintain a long-standing sexual relationship.” (authors’ citation, Senegal, Enel 2009)</i>

Table 3 (continued)

Theme ①—Reasons and motives of MSM to engage in marriage or steady relationships with women

Concealing MSM behaviors**Gaining more freedom do maintain a dual life**

Marriages with heterosexual women	<i>"Most of the MSM we met expressed the need and value in leading a double life, that is to say an official heterosexual appearance formalized by marriage, in parallel with hidden homosexual relationships. They often said that they found a certain freedom in this "schizophrenia" which they would not have had if they were single. In fact, all usually had an official girlfriend, removing any doubt about who he was dating. However, marriage was the best "hiding place", providing them the freedom of movement they needed, all the while dispelling any possible doubts." (authors' citation, Senegal, Sappe 2003)</i>
Choice of spouse	<i>"Men who envision a romantic life with another man, and who most often self-identify as gay, view marriage more as a 'pragmatic' marriage, be it to conceal their homosexual practices, which often lead to strong feelings of guilt in relation to religion or family, or to alleviate familial pressure for a heterosexual marriage (...). Men who are emotionally attracted to other men often wait quite comfortably until the marriage for their first sexual encounter with their wives. In order to control the situation and prevent their homosexual practices from being revealed, they would rather choose women who are young, submissive, have a low level of education, are not sexually liberated, come from very religious families advocating strict norms, and are far from suspecting that they are involved in a sexual network involving men with homosexual practices." (authors' citation, Senegal, Enel 2009)</i>
«Lavender marriages» with lesbian women	<i>"If you are gay or lesbian and are being pressured by family, friends, community, etc. to get married, but you cannot see yourself lying to a straight unsuspecting person of the opposite sex. This is the group for you. Lavender marriage is about lesbians marrying gay men just for convenience." (Description of a Facebook group, Uganda, Bryan 2019)</i> <i>"Instead of encroaching into the world of heterosexual individuals, we create heterosexual couples among ourselves. A feminine gay can date a 'butch' (Masculine) female. What we call 'Gaybian'. This solves all our problems (...) of stigma and discrimination. For those feminine gays who use to have problems of being abused by the masculine men, they are engaged in relationships among each other (...) However, we continue to have lovers/partners of our choice. And as we are all in the same situation of averting stigma and discrimination, we understand each other. When the university community see these types of relationships (...), they end up leaving us alone." (interviewee discourse, South Africa, Mavhandu-Mudzusi 2017)</i>

Theme ②—Experience and behaviours of married MSM

*Relationship with their wives***Secrecy and disclosure with wives**

Wives ignoring MSM status	<i>"My wife doesn't know but I use her as a cover up." (interviewee discourse, Kenya, Sharma 2008)</i>
Coping behaviors to avoid wives suspicion	
Avoid condom use with wives	<i>Those who reported marriage to women almost never use condoms when they have intercourse with their wives because they want to avoid suspicion of any extra marital activity. (authors' citation, Rwanda, Adedimeji 2019)</i>
Avoid having steady male partners	<i>I have had different (male) sexual partners but not permanent partners.... Most of my (male) partners are married just like me. I do not like having a permanent partner for fear of my wife finding out the truth (interviewee discourse, Kenya, Onyango-Ouma 2005)</i>
Reduce number of male partners	<i>Being married, I was aware that I couldn't behave as I used to. So I cut down a lot on dating. At the same time, I hardly ever went out anymore. And I had to come up with an alibi to go out at night. I did everything I could to get home early because I had to behave like a good father (interviewee discourse, Senegal, Gning, 2013)</i>
Use PrEP	<i>[With PrEP] I will be able to protect my wife and family while at the same time fulfilling my sexual desires (interviewee discourse, Kenya, Kimani 2019)</i>
Not use PrEP	<i>MSM who are married to women are not safe at all. If you are MSM that you are married and your wife have been hearing stories but you have never been caught that you sleep with other men, but you don't want to sleep with her, then you want to PrEP yourself, no way (interviewee discourse, Kenya, Karuga 2016)</i>
Avoid MSM HIV counseling and testing	<i>Participants colloquially called "after nines," men who may have a wife and kids, and then have sexual relations with men at night unbeknownst to their female sexual partners. (...) Participants reported that these men would not be willing to bring their male partners to use couples-based HIV counseling and testing, especially "in a place meant for gays" because their sexual identities would be revealed (authors' citation, South Africa, Stephenson 2013)</i>

Table 3 (continued)

Theme ②—Experience and behaviours of married MSM

Wives aware of, accepting MSM status	<p><i>When I married her, all my MSM friends knew I got married. So she got phone calls from all over. People asking her why she got married to that person. They told her all about my sexual orientation. She replied that she saw me as I was, she liked me as I was, and that's why she married me. Once again, she never asked me any questions about what I got up to. In short, she accepted me as I was. (interviewee discourse, Senegal, Gning 2013)</i></p> <p><i>There are cases of wives who know their husband's identity and continue to live with him. It's because of love. I know the case of a homosexual whose wife knows everything about him. But she doesn't care. And yet, when the locals found out that the man was from the [homosexual] circle, they beat him up and had him exiled from the neighborhood. That didn't stop his wife from following him. She said: "Whatever he is, I love him like this. (interviewee discourse, Senegal, Nkoum 2020)</i></p>
Wives ignoring HIV+ status	<p><i>I haven't informed my wife [of his HIV+ status]; we have unprotected sex. I'm waiting for her to get pregnant so that I can be exonerated, be innocent. For me, the fact of informing her scares me because it could spoil our relationship. I don't know what her reaction will be. You know, nobody knows anything about me (interviewee discourse, Senegal, Nkoum 2020)</i></p>
Wives ignoring male sex work	<p><i>My wife and none of my family members know anything about this [male sex work] and I don't want them to know. It would be a great embarrassment on my part and besides, in our culture it is unheard of, and it is also considered a taboo. It's regarded an "impure and a western concept" (interviewee discourse, Zimbabwe, Tsang 2019)</i></p>
Sexual behaviors with wives	
Difficulties to have sex	<p><i>At the time of my wedding, it was hard, and during the wedding night, the burden was a heavy one, because I couldn't satisfy her, I couldn't feel her. It lasted two days. (...) But on the third day, God came to my help (...) I felt my virility. When I took her, I felt like a man. That had a real impact on me in my life. It was ignorance and stress (interviewee discourse, Senegal, Nkoum 2020)</i></p>
Fidelity (no other female partners)	<p><i>I'm faithful. I only know my wife, I don't court anyone. It's God who united us, I love her. Even if I talk to another woman, she gets angry. And God knows I'm faithful (interviewee discourse, Senegal, Nkoum 2020)</i></p>
Material arrangements with wives	
Providing for wives' material needs	<p><i>We had a good marriage. [When she learned about my homosexual behaviors], she understood me. As I was fulfilling my obligations to her then she accepted that I had this need. In fact, she noticed that I was not able to be excited sexually with her, although we had children. (interviewee verbatim, Lesotho, Eppretch 2002)</i></p>
Living apart after marriage	<p><i>For the past two years, Maurice has led a conjugal life with this woman, but only temporarily lives in his wife's place. Both live in separate houses, those of their parents. This gives Maurice a certain amount of freedom. A little girl was born from this union in 2010. (authors' citation, Senegal, Gning 2013)</i></p>
Separation/divorce	<p><i>As soon as they [i.e., MSM's wives] know for sure, they leave their husbands. Because even if it's seen as a betrayal or a lack of love, a woman may accept you taking a second wife, but not you having sexual relations with men (interviewee discourse, Senegal, Gning 2013)</i></p>
Mutual social support with ex-wives	<p><i>My ex-wife and my children, they are my neighbours, they have accepted me, they still support me. I help them and I'm still there for them (interviewee verbatim, South Africa, Reygan 2019)</i></p>
Domestic violence	<p><i>'I don't like a woman to scream at me in front of my friends. Her mother and father were e like, 'Why you hit my daughter?'... Take a beer bottle and I was hitting her with it.' (...)': [These men] position themselves as men who have and maintain dominance over the women in their narratives and additionally inscribe the women as victims. They suggest that the violence they employed was somehow justified as their masculine identities had been challenged (interviewee discourse and authors' citation, South Africa, Peters)</i></p>
<i>Relationship with their male partners (while married with a woman)</i>	
Romantic relationship with male partners	<p><i>At the moment, I have a [male] partner I love (...) He loves me. When he contacted me, my body quivered (...). If I have the means, I'll find him wherever he is. I think about it all the time. To tell you the truth, I think more about him than about my wife (interviewee discourse, Senegal, Nkoum 2020)</i></p>
Blackmail by male partners	<p><i>Men in a high socioeconomic class usually led double lives as married men with children while having clandestine sex with boyfriends. Most of their relationships did not last long because they lost interest in current partners, desired variety or younger men, or feared disclosure. Some men blackmailed closeted or married men who feared disclosure or provided sexual favors to avoid prosecution or get security. (authors' citation, Kenya, Sharma 2008)</i></p>

Table 3 (continued)

Theme ②—Experience and behaviours of married MSM

Perception of wives by male partners

Emotional suffering, jealousy, conflicts, violence	<p><i>I was the first person he confided in: ‘I’ve been with you for a very long time. I’m getting married (...) I didn’t ask for it but the family wants me to marry my first cousin’. I told him ‘There’s no problem’. We talked about it for a long time and finally agreed. When he got married and his wife moved in I was shocked, because a fortnight would go by without seeing him. I only hear him by telephone. I had a hard time of it, because every week, on Saturdays, he’d come to stay for the weekend. The next weekend, I’d go to his place. Now I don’t see him on Saturdays. I stay in my room in front of the TV until I fall asleep (...). I can’t see his face anywhere, anywhere. It’s only on the phone that we talk. I didn’t kill myself, but it was very hard (interviewee discourse, Senegal, Nkoum 2020)</i></p> <p><i>“By far the most commonly cited cause of this behavior [abuse between male partners] was jealousy regarding both women and other men: ‘man-to-man’ relationships are all about jealousy’. Respondents also talked about controlling behaviour from their partners, such as being unable to hug or talk to women in front of their male partners, while simultaneously describing their own jealously around their male partners’ female partners (authors’ citation, Namibia, Stephenson 2014)</i></p>
Acceptance, discretion, friendship	<p><i>His wife is my friend. Sometimes I buy her a pretty fabric, have it sewn and bring it to her as a gift. Even if he’s away from home, if I’m present, she talks to me as if I were her husband. She doesn’t know anything about it; to her, we’re friends. I don’t think she’ll ever know (interviewee discourse, Senegal, Nkoum 2020)</i></p> <p><i>If I marry a woman, he [his male partner] won’t say anything. We understand each other. Even if I were to get married, he’d come and support me. He would support me by taking care of the costs of the ceremony and good organization (interviewee discourse, Senegal, Nkoum 2020)</i></p>
Relationship with their children	
Custody of children	<p><i>In 2015, I had a daughter. My child’s mother was in charge of her, but when she started school, she brought her to me. My mom raises her. (...) My daughter calls my father dad. She calls my mother by mom. Because they’re the ones who raised her. She was entrusted to my mother before she was 5 years old (interviewee discourse, Senegal, Nkoum 2020)</i></p>
Anticipated reaction to children’s homosexuality	
Desire to prevent	<p><i>In the future, if I had children and they had a [homosexual] sexual orientation, I wouldn’t like it (...). So I pray to God that my son will not have this sexual orientation. (interviewee discourse, Senegal, Nkoum 2020)</i></p>
Will be understanding	<p><i>You have to deal with life the way you deal with it, because if you want to date a man, you date a man. When you want to date with a woman, you date with a woman. The only thing you need to know is that there are STIs. The only solution is to protect yourself, to try to find out the status of the person you date. And if she came up to me now and said ‘Daddy, I’m a lesbian’, I don’t care. ‘You do what you want and you’re happy’. It’s true that it pisses me off a bit, but it’s her life. (...). For now, I would like her to enjoy her childhood to the fullest. And when the time comes, we’ll talk about that. (Interviewee discourse, Senegal, Nkoum 2020)</i></p>

Theme ③—Perceptions of MSM who do not engage in marriage with women

Sexual attraction only to men	<p><i>I am a homosexual. Today I feel homosexual in my body and I live it intensely. If you get the urge to have sex with a man, you can’t hold back. I feel a greater connection with a man than with a woman. I’m more attracted to men than women. It’s not my will. (...) If it were up to me, I’d never be gay. It’s a test from God, but I was born this way. I pray to God to change so that I can have a family, a wife and children (interviewee discourse, Senegal, Nkoum 2020)</i></p>
Positive HIV status	<p><i>I found out I was HIV-positive a few months ago (...). What am I going to do if my family wants me to marry a girl? Besides, at home, I don’t even want to stay in front of the TV anymore, because just hearing [the word] AIDS is like they’re talking directly to me. Frankly, I don’t have any peace of mind. (...) Many questions plague my mind. Is the future possible with an uninfected woman? (interviewee discourse, Senegal, Nkoum 2020)</i></p>
Critical of heterosexual marriage and polygamy	<p><i>For me, marriage isn’t an end in itself, it’s not a finality. There are people happily married, and others married and sad. There are single people who are sad. I mean, if I get married, so much the better. And if I don’t get married, all the better. There’s no point in getting married if six, seven years, or eight months later you have to get divorced.(...) I find polygamy disgusting, to be honest. It disgusts me because I cannot give my heart to multiple people (interviewee discourse, Senegal, Nkoum 2020)</i></p>

as the potential for being ‘outed’ as an MSM following HIV diagnosis [142]. For others, the decision was based on criticism of the institution of heterosexual marriage and of polygamy [146].

Discussion

In the present review, the quantitative synthesis estimated pooled proportions of MSM living in SSA involved in marriage or other steady relationships with women. The qualitative synthesis provided an overview of various motives for these MSM to enter—or not—into marriage with women, along with insights into the experiences, behaviors, and perceptions of those who were married.

Extent of MSM Marriage and Other Steady Relationships with Women in Sub-Saharan Africa

The proportions of MSM currently in steady relationships with a woman did not significantly differ across the four SSA regions. For instance, the pooled proportion of MSM currently married was below 10% in the three regions for which a meta-analysis was performed. The qualitative synthesis suggested that external normative social pressure to marry tended to increase as MSM grew older. Most of the studies included in the meta-analyses for the ‘currently married’ indicator comprised samples with predominantly young participants (< 30 years), who were less likely to be married. As a result, it is plausible that the true proportion of those currently married in the entire population of MSM in SSA is higher than the estimate from our meta-analysis.

Unsurprisingly, the proportion of MSM with a steady female partner tended to be higher in studies that provided indicators not restricted to marriage (i.e., also included cohabitation or another steady relationship such as, girlfriend, fiancée). In Southern Africa, approximately one third of MSM were estimated to have a current steady female partner. The meta-analyses for the different indicators revealed one quarter to one third of MSM in East Africa had a lifetime steady relationship with a woman (i.e., at least one). This proportion was generally higher than in Southern Africa.

The proportions of MSM in steady relationships with women (i.e., current or lifetime) in SSA in the present synthesis were comparable to findings from a systematic review in the Middle East and North Africa [155], but lower compared to a meta-analysis in China and a study in Bhutan [156, 157].

Structural and Psychosocial Context

The desire to conform to heteronormative religious, social, and family pressures, the wish to have children, the intention to dispel suspicion, the wish to conceal their same-sex behaviors, and, in contrast, the hope of being able to cease same-sex behaviors, were the primary reasons cited by MSM for having steady relationships (i.e., including marriage) with women in this synthesis. These factors align with previous research in MSM married to women in China, the USA, Malaysia, and Australia [158–162]. The present synthesis reported negotiations with family, particularly with mothers, allowing hidden homosexual behaviors to be tolerated by promising to marry a woman in the future. Similar practices have been reported in China [158]. Research in Australian MSM suggested that beyond the external pressure to marry, internalized homonegativity is an important factor leading to marriage with women [160]. Furthermore, these levels of homonegativity probably vary across life stages, and are particularly high when MSM decide to enter into a heterosexual marriage [160]. More positive motivations, such as being genuinely in love with one’s wife or the desire to be completely open with a partner—which we found in the present synthesis—have also been observed in the USA, India and Malaysia [161–163]. Furthermore, just as was observed in our synthesis, arranged (or ‘lavender’) marriages of MSM to lesbian women was not only a strategy to hide same-sex behaviors without having to lie or deceive one’s wife, but also a means to benefit from mutual understanding and support, as also reported in China [158]. One added finding in the present synthesis is that some MSM perceived that marrying a younger woman with little life experience would enable them to live their sexuality more discreetly and to maintain better control over it. This perception was especially prominent when compared to the alternative: remaining a bachelor in their parents’ house, where they were under the latter’s authority, and where they ran a higher risk of their sexuality being discovered.

Our qualitative synthesis showed that marriage to a woman could be a source of emotional and social support for MSM, especially when their wives were aware of and accepted their same-sex behaviors. In some cases, MSM continued to benefit from this support even after divorce. Interestingly, a study conducted in China showed that currently married MSM exhibited lower levels of anxiety symptoms compared to both single MSM and divorced MSM [164]. Elsewhere, an Australian study showed that there was a psychological benefit from publicly revealing one’s homosexuality following separation from a steady female partner [165].

The motives and circumstances that led MSM to enter into marriage had an impact on their experiences and behaviors when married, especially for MSM who chose to marry in order to ensure secrecy about their same-sex behaviors. Our qualitative synthesis reported that MSM who concealed their same-sex activities from their wives often experienced challenging and stressful situations related to the fear of being publicly 'outed', getting divorced, and losing their wives and children. Similar stressors were previously described in married MSM in New Zealand, as were several psychological defense mechanisms to manage double lives, including rationalization, dissociation, and denial [166].

Although based on a very small number of studies, our quantitative synthesis found that very few MSM disclosed their same-sex behaviors to their steady female partners. Our qualitative synthesis highlighted that married MSM experienced conflict in their relationships with their male and steady female partners. Jealousy of male partners could lead to violence within male couples, including potential blackmail by these partners. Furthermore, some MSM perpetrated violence against their steady female partners; this may have been a way to maintain dominance when they felt their masculinity was being challenged by their homosexual behaviors. This finding on violence reflects findings from a cohort study that showed internalized homonegativity led to sexual violence against female partners among MSM in West Africa [167].

In summary, stress, conflicts, and partner violence can affect not only married MSM but also their male and steady female partners. A systematic review in China showed that wives of MSM suffered severe mental-, physical-, and health-related harms [168].

Implications on Sexual Risk Taking and HIV Prevention Behaviors

In order to avoid raising suspicion, many married MSM in our synthesis reported adopting sexual coping behaviors. These could either lower or increase the risk of acquiring HIV from male partners and of transmitting it to steady female partners. Specifically, in terms of lowering the risk, some married MSM reported self-imposed behavioral restrictions they adopted to conceal their MSM status and preserve family life with wives and children, such as reducing the number of male partners, and refraining from having female partners other than their wives. The same coping behavior was consistently reported in married MSM in New Zealand [166]. Conversely, other coping behaviors, such as deciding not to have a steady male partner (for fear of disclosure) and only having casual male-male sexual relations, could lead to an increase in the number of male partners and therefore a greater risk of HIV acquisition – and potentially of transmission to wives – among married MSM [169].

The necessity to keep extramarital activities secret and the desire to have children often discouraged MSM in our review from using condoms with their steady female partners. As a result, the latter were unable to assess sexual risk or to negotiate prevention. While we found qualitative evidence that some wives of MSM were aware of and accepting of their husbands' same-sex behaviors, there was insufficient information on how these couples managed sexual risk and negotiated preventive measures in their relationships. Research conducted in India have shown that gender-based inequities often result in husbands being the primary decision-makers regarding sexual relations and condom use, even when wives are aware of their husbands' engagement in same-sex behaviors [170].

Our quantitative synthesis showed that between 7 and 56% of MSM had engaged in condomless sex with their wives or other steady female partners in the previous 12 or 6 months. These very differing figures may underestimate the true prevalence due to social desirability bias when responding. Modelling studies have estimated that female partners of MSM are highly exposed to HIV. For example, it was estimated that 4% of new infections in South Africa in the previous decade were attributable to sex between MSM and their female partners, a proportion similar to the proportion of new infections attributable to sex between MSM in that country [171]. Additionally, the HIV incidence in female partners of MSM was estimated at between 1.3 and 5.9 per 100 persons per year in Togo, Uganda, Kenya and Zambia, which is two to eight times higher than in the general adult female population in these countries in 2000–2012 [8].

Compared to other female partners, wives and other steady female partners of MSM may be at greater risk of HIV acquisition for several reasons including prolonged sexual exposure and barriers to prevention related to secrecy around MSMs' homosexual behaviors. Moreover, despite having a young (mostly <30 years) pool of MSM in the present quantitative synthesis, we estimated that in West, Southern, and East Africa, respectively, 8%, 17%, and 32% already had at least one child. The qualitative synthesis highlighted that heteronormative pressure to have children, and MSM's own desire to do so, are important drivers of engaging in heterosexual relationships. Procreative intentions when engaging in sexual activity with their wives and steady female partners (procreative sex) likely represent an additional barrier to condom use. The risk of partner violence between MSM and their male and/or steady female partners—something identified in our qualitative synthesis—could further increase the risk of HIV transmission among the individuals involved [172–174].

Overall, substantial evidence suggests that the high levels of discrimination, social and internalized stigma, and violence experienced by MSM in SSA increase the risk of

HIV transmission and hinder their access to HIV prevention and healthcare services, even in countries where same-sex relationships are not legally criminalized but protective laws are absent [60, 91, 175–179]. The present synthesis further underscore the adverse effect of social rejection of same-sex behaviors on the HIV epidemics in SSA: the high social and internalized pressure on MSM to marry women while concealing their sexuality is associated with HIV risk behaviors and barriers to HIV prevention and care within these relationships, potentially facilitating the spread of the HIV epidemic from MSM to the general population.

Given the barriers to condom use, the use of PrEP by MSM would appear to be a more suitable method to prevent HIV transmission from married MSM to their steady female partners. Our qualitative synthesis indicated that some married MSM adopted PrEP to protect their wives, while others considered that being married to a woman was a barrier to PrEP use. We can hypothesize that living with a female partner unaware of her MSM husband's sexuality, poses challenges to the latter taking oral PrEP (storing pills, regular adherence, and concealing medical check-ups). Long-acting injectable PrEP could partially address this difficulty [180]. Similarly, we postulate that HIV screening and diagnosis, as well as access and adherence to antiretroviral therapy (ARV), may pose specific challenges for MSM living with women who wish to keep their sexuality secret.

Data presented here were collected from MSM, with a significant gap in understanding the viewpoints of their female partners, primarily due to the challenges in surveying them, as many MSM prefer to keep their behaviors hidden from their wives. However, some of these women may have doubts or concerns about their husbands' extramarital behaviors, even if they are not fully aware of same-sex behaviors, and may not feel willing or able to openly discuss these concerns with them. Women who perceive themselves at high risk of HIV exposure due to their male partners engaging in risky behaviors such as condom refusal, having multiple sexual partners concurrently, or being abusive, have considered taking PrEP as a viable autonomous option to protect themselves [181–185]. Although barriers remain, community-based integrated strategies for delivering PrEP in non-stigmatizing and easily accessible facilities have proven effective among young women in SSA [186, 187]. Our findings underscore the need to consider how to enhance the utilization of PrEP and other preventive measures by women involved in long-term relationships with MSM, who are a key population for HIV. Firstly, a deeper understanding of MSM wives' awareness and perceptions of husbands' sexual behaviors is crucial, as self-perception of HIV exposure closely influences uptake of preventive behaviors [188–191].

Strengths and Limitations

To the best of our knowledge, this is the first mixed-method synthesis to examine the extent and characteristics of relationships of MSM with steady female partners in SSA. More specifically, it provides estimates for the proportion of MSM engaged in steady relationships with women (i.e., current or lifetime relationships), and for the proportion of MSM with children, in East, West and Southern Africa. It also provides valuable insights into the psychosocial and behavioral aspects of these diverse relationships.

There are several limitations to our synthesis. First, the indicators used to assess steady relationships with women, as well as the relevant timeframes, varied widely across the studies included. This limited our ability to combine a larger number of studies in the different region-specific meta-analyses, and probably contributed to the observed heterogeneities in these analyses. Second, our review revealed significant disparities in the number of available studies across different countries in SSA, with data lacking for some countries altogether while others were overrepresented. Finally, data on condomless sex with steady female partners yielded disparate results. Moreover, no meta-analysis could be conducted for this indicator because of insufficient data.

Conclusions

In the present synthesis, the motives for MSM in SSA to enter into a steady relationship (i.e., including marriage) with a woman extended beyond considerations of heteronormativity, although this, together with procreative intentions, constituted the primary reasons. These relationships encompassed various sexual dynamics and emotional, social, and material aspects. The synthesis provided an overview of how MSM in SSA navigate expectations and pressures related to heterosexual marriage, and how this navigation impacts their lives—positively or negatively—as well as their relationships with their wives, children and male partners. The vulnerability of MSM and their steady female partners is a multifaceted issue involving psychosocial issues, internal and external conflicts, and various HIV-risk and preventive coping sexual behaviors. Given the high prevalence of HIV among MSM in SSA [8], and their difficulties in accessing the HIV care cascade [7], this situation encourages the risk of HIV transmission to steady female partners of MSM, and indirectly to their children through mother-to-child transmission, in the absence of other prevention strategies.

In conclusion, it is crucial to develop a comprehensive approach that takes into account the diverse situations of MSM when advancing our understanding of the HIV epidemics in SSA. Developing innovative strategies, which

allow avoiding forced disclosure of MSM, to effectively reach their female partners is highly challenging but important for investigating their characteristics, perceptions, needs, and directly offering them prevention services. For direct prevention efforts targeting MSM, raising awareness of sexual risks with both male and female partners, as well as the risk of indirect transmission to children is important. HIV prevention initiatives and community-based support for MSM should acknowledge the possibility of relationships with female partners, and provide tailored counseling, diverse HIV testing tools, and PrEP regimens adapted to individual circumstances and relationships, addressing barriers to condom use with wives and steady female partners. Further efforts should be made to reach older and possibly married MSM in research and HIV prevention interventions. Strengthening community-based support and advocating against criminalization laws and social stigmas important to reduce the pressure on MSM to enter into possibly unwanted and often conflict-ridden relationships with women, which pose challenges for both the MSM and the women concerned.

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Author Contributions The systematic review process was overseen by the project's steering committee consisting of AE, PR, CL, BS, and MF. All authors played an active role in designing the study and interpreting the results. MF was responsible for developing the research protocol, conducting the literature search, screening and assessing articles, extracting data, managing data, performing qualitative thematic analysis, synthesizing results, and drafting the manuscript. NY participated in the screening and assessment of articles, as well as data extraction. RGDM conducted the meta-analyses. All authors collaborated on revising the manuscript, and all approved the final version.

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Declarations

Competing interests The authors declare no competing interest.

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