**REVIEW ARTICLE**

# Is polygyny a risk factor in the transmission of HIV in sub- Saharan Africa? A systematic review

DOI: 10.29063/ajrh2020/v24i4.20

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## Abstract

Using a systematic literature review approach, this paper focused on the role of polygyny in the spread of HIV/AIDS in sub-Saharan Africa (SSA) countries. The widespread practice of polygyny is one feature of many SSA contexts that may be relevant to understanding patterns of HIV prevalence. Building on the conflicting studies on the importance of polygyny, this study investigated whether or not polygyny is a conduit for elevating HIV transmission in SSA countries. Findings showed that polygyny as an institution is perhaps less of a concern; rather the implication that men and women who are in polygamous relationships are also more likely to engage in extra-marital sex - raises secondary questions about their patterns of sexual networking and concurrent sexual partnerships. The findings however show that polygyny amplifies risky sexual behaviours such as sexual networking and concurrent sexual partnerships, all of which were found to be significantly associated with the risk of HIV transmission. This demonstrates that targeting risky sexual behaviours in a broader marital context may be more important for HIV risk reduction than targeting polygyny as an institution. *(Afr J Reprod Health 2020; 24[4]: 198-212).*

**Keywords:** Polygyny; HIV transmission; sub-Saharan Africa; systematic literature review

## Résumé

En utilisant une approche de revue systématique de la littérature, cet article s'est concentré sur le rôle de la polygamie dans la propagation du VIH / sida dans les pays d'Afrique subsaharienne (ASS). La pratique répandue de la polygamie est une caractéristique de nombreux contextes de l'ASS qui peut être utile pour comprendre les modèles de prévalence du VIH. S'appuyant sur les études contradictoires sur l'importance de la polygamie, cette étude a cherché à savoir si la polygamie est ou non un moyen d'augmenter la transmission du VIH dans les pays d'Afrique subsaharienne. Les résultats ont montré que la polygamie en tant qu'institution est peut-être moins préoccupante; au contraire, l'implication que les hommes et les femmes qui sont dans des relations polygames sont également plus susceptibles de s'engager dans des relations sexuelles hors mariage - soulève des questions secondaires sur leurs modèles de réseautage sexuel et de partenariats sexuels concomitants. Les résultats montrent cependant que la polygamie amplifie les comportements sexuels à risque tels que le réseautage sexuel et les partenariats sexuels concomitants, qui se sont tous révélés significativement associés au risque de transmission du VIH. Cela démontre que le ciblage des comportements sexuels à risque dans un contexte matrimonial plus large peut être plus important pour la réduction du risque de VIH que le ciblage de la polygamie en tant qu'institution. *(Afr J Reprod Health 2020; 24[4]: 198-212).*

**Mots-clés**: Transmission du VIH; Afrique sub-saharienne; revue systématique de la littérature

## Introduction

Polygamy is a form of marriage that allows a person to have more than one spouse and in Sub-Saharan Africa (SSA) it typically takes the form of polygyny which involves men marrying multiple wives[1]. Polygyny is practiced in contemporary societies on all continents[2]. Although the practice is declining in some countries (Appendix 1), the prevalence remains particularly high in parts of sub-Saharan Africa (SSA)[3]. Researchers have long recognized that polygyny is not just a traditional practice but is found in marriage patterns in rural and urban areas, among the rich and poor classes; and is also not restricted to a particular religion but is found across various religious and ethnic groups

in SSA[4,5]. In several SSA countries, more than 10% of married women are in polygynous marriage[3] and the practice is most common in western Africa.

Traditionally, there are perceived benefits that accrue from polygynous marriage. Firstly, it increases the number of children per household and ensures child replacement in the context of high infant mortality[6]. Secondly, polygyny increases the possibility of wealth accumulation for the husband as a result of free labour supply by several wives and children[7]. Third, it ensures divorcees, widows and their children are inherited or cared for by polygynist men[8]. It has also been revealed that widows and divorced women can benefit from polygyny as they are more likely to be married in polygynous than monogamous unions[9]. It is therefore a source of social security for widows and divorcees[6,10]. The major flaw of polygyny is that it creates concurrent sexual networks within marriage between multiple wives and their husband[3,11-13]. Extant literature reported that concurrent sexual partnership is positively associated with HIV transmission[3,15,.45,46]. While, it may be true that there is not enough empirical research on polygyny and the HIV/AIDs epidemic available, it is also not true that mainstream research is ignorant or sceptical about the importance of polygyny in the spread of the HIV epidemic.

Because research on polygyny and HIV/AIDS is sparse, there is a need to consolidate the available literature in a systematic way. There is a great need for knowledge distribution on the topic as advocates often need hard evidence to convince policy makers on the need to act on polygyny and HIV issues in Africa. Since the latest set of systematic reviews on the topic of polygyny and HIV/AIDS undertaken in 2010[12,16-18] significant new evidence from empirical studies[3,5,6,11,15,19,20,46,47] and mathematical simulations[14] have emerged. The objective of the current paper is to re-examine the polygyny hypotheses in relation to the HIV/AIDS epidemic in SSA, incorporating more recent evidence from published literature. Polygyny represents a particular institutionalized form of concurrency, which may in some ways deserve special consideration since polygynous marriages are likely to be less transient and more accurately reported than informal partnerships, and account for a substantial share of all concurrent partnerships in many countries in sub-Saharan Africa[21].

# Methods

## *Search strategy and study selection*

This review paper followed the Preferred Reporting Items for Systematic Reviews as a guideline (PRISMA)[22] and a systematic approach to retrieve relevant research studies was utilised. The review included all study designs and methods, including qualitative, quantitative, and mixed-methods studies. The literature search was conducted among the following electronic databases, Academic Search Complete, CINAHL Complete, MEDLINE with Full Text databases, PsycINFO and PubMed. To capture relevant studies, the searches were performed using the following algorithm: (‘Polygamy’ OR ‘polygyny’ OR ‘polygamous’ OR ’polygynous partnership’ OR ‘married polygamous’ OR ‘married polygynous’ OR ‘concurrency’) AND (HIV OR ‘human immunodeficiency virus OR ‘HIV infection’ OR ‘AIDS’) AND (‘sub-Saharan Africa’) AND (‘Cohort’ OR ‘Cross section’ OR ‘RCT’ OR ‘Longitudinal’). Although this paper focuses specifically on polygyny, we recognize the fact that some studies on polygyny have used the more general term: ‘polygamy’. We also hand-searched key journals: Journal of AIDS; Social Science and Medicine, Culture, Health and Sexuality, Reproductive matters, AIDS Care, and Biosocial Sciences.

## *Inclusion criteria*

No restrictions applied other than that the literature had to focus on HIV/AIDS and polygyny or concurrent partnerships. Using these inclusion criteria, it was possible to include studies which focused on related issues such as extra-marital affairs, widowhood, reproductive health, for as long as the studies have included HIV and polygyny in their designs. Since the main focus of the review was focused on mapping literature and

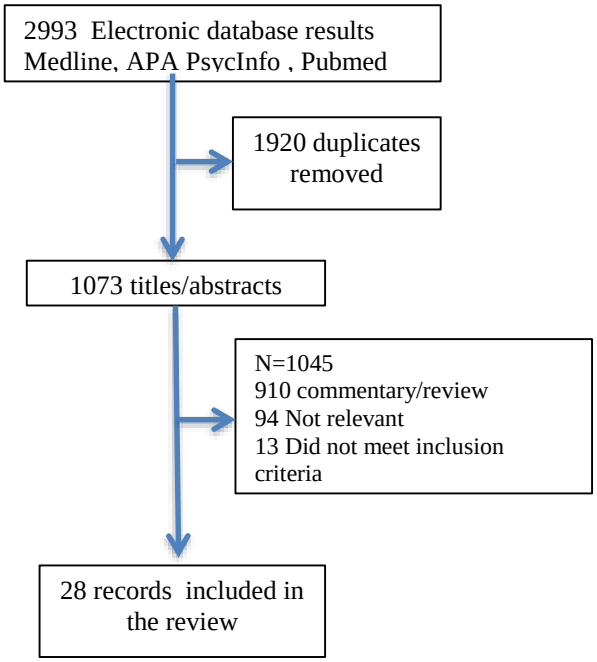


**Figure 1:** Included and excluded studies in systematic review

identifying research gaps on polygamy/polygyny and HIV/AIDS, only papers that included both phenomena were selected. A geographical filter was brought in at a later stage and only studies conducted in SSA countries were included in the final sample. The final sample included only studies that made use of scientific evidence (see Prism in Figure 1). The final sample was analysed with regard to research methods used, geographical distribution, targeted population, objectives, and research outcomes.

## Results

The research retrieved 2993 studies, of which 1045 were potentially relevant for inclusion in this review. Of the 1045 studies, 910 were commentary/review papers, 94 were not relevant to our study and 13 that did not meet inclusion criteria were excluded from the study. After these exclusions, 28 studies met the inclusion criteria and were included in the study. All the studies used were published in peer-reviewed journals.

### *Description of studies*

The studies included in the review are shown in Table 1. In the early 90s, almost no research existed that focused on polygamy or polygyny and HIV/AIDS. However, studies in SSA began to emerge in the late 90s. In 1997, Morris and Kretzschmar[23] used mathematical modelling to compare the spread of HIV between serial monogamy and long-term concurrency. In 2000, a modified version of Morris and Kretzschmar based on microsimulation[24] was published by the same authors. From 2004, publications increased as data from DHS surveys became widely available. The studies used a variety of methods. Seventeen studies were quantitative studies[1,3,6,8,11-15,19-21,42,43,45-49]. Three of the quantitative studies used DHS data, while eight studies collected data from longitudinal studies. One study used data from a health facility in rural Malawi[20] and in Zimbabwe[3] that used five rounds of longitudinal data from Manicaland province[1] and combined DHS and HIV/AIDS Indicator Surveys (AIS) to model marital order and vulnerability to HIV infection. In Malawi, Reniers and Tfaily[8] used three rounds of Malawi Diffusion and Ideational Change project data to study the relationship between polygyny and HIV. Seven studies focused predominantly on systematic reviews. The majority of study population targets were polygynous couples, widows and divorcees. While most studies focused on HIV and concurrency, six studies were part of a more comprehensive study on polygyny[1,3,6,17,20,44]. While some studies[6,11,15,20] used control-groups, only one[15] gave detailed information about their sampling methods. Most longitudinal studies concentrated only on a small area and are therefore not representative of the national populations. For example, one study focussed on the trends in concurrency, polygamy, and multiple sex partnerships during the declining of HIV prevalence only in Eastern Zimbabwe[3]. Geographically, most studies were done in East and Southern Africa, with the exception of one in Nigeria[7].

### *Description of study outcomes*

Existing evidence on the association between polygyny and HIV transmission in sub-Saharan Africa shows mixed patterns. While most studies, mainly based on theoretical explanations or mathematical simulations, largely linked polygyny

**Table 1:** A summary of studies on polygyny/partnership concurrency and HIV/AIDS in SSA countries

| Author/s, Year | Study design, population | Title | Key findings | Factors adjusted for |
|---|---|---|---|---|
| Sawers & Isaac 2017 | Stochastic Simulation, SSA | Partnership duration, concurrency, and **HIV in sub-Saharan Africa.** | Long-duration concurrent partnering is protective against HIV transmission | Age, education, schooling, sexual behaviour, household income, religion |
| Bertocchi and Dimico, 2015 | Regression models Data: HIV dataset of the DHS in SSA | The long-term determinants of female HIV infection in Africa: The slave trade, polygyny, and sexual behaviour, | $OR_{adj}$ (95% CI) HIV infection: Ever in a polygamous union: Yes 0.541** (0.210) **Ref: No** | 1: Cluster level control: distance from the coast, soil fertility, annual precipitation, annual temperature, net primary productivity, mean GDP 2000, population density 2000, slave density, water availability, altitude and forest land cover. 2: Individual level control: age, gender, individual income, education, occupation and religion. 3: Household level controls: gender of the household head, relationship to the head, relationship structure and household wealth. 4: District level controls |
| Fox, 2014 | Cross-sectional DHS Sample size (n=unknown), 16 countries | Marital Concurrency and HIV Risk in 16 African Countries | $OR_{adj}$ (95% CI) HIV infection: Polygamous union: Yes OR=1.25, p<0.01 **Ref: No** | Age, education, schooling, sexual behaviour, household income, religion |
| Kenyon et al, 2013 | Longitudinal, South Africa | HIV Prevalence by Race Co-Varies Closely with Concurrency and Number of Sex Partners in South Africa | The prevalence of concurrency and the number of sexual partners explained the differing prevalence's of HIV between South Africa's racial groups. | |
| Kenyon C, Colebunders R (2012) | Linear regression Data: Global Health Observatory Data Repository of the World Health Organization, | Strong association between point-concurrency and national peak HIV prevalence. | There is evidence of a strong association between point-prevalence of concurrency and HIV prevalence for both men (Pearson R2 = 0.78; p = 0.0003) and women (R2 = 0.89; p = 0.0014) | Information not available |

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| | 1990–2009 | | | |
| Maher et al, 2011 | Cohort HIV serosurvey among adults | Concurrent sexual partnerships and associated factors: a cross-sectional population-based survey in a rural community in Africa with a generalised HIV epidemic | ORadj (95% CI) HIV infection:<br><br>Concurrent partnership: Yes 0.40 (0.14,1.11): P.007<br>**Ref: No** | Age, education, schooling, sexual behaviour, household income, religion |
| Tanser, 2011 | Population-based cohort study<br>Men (n = 2153)<br>HIV negative women (n= 7284), | Effect of concurrent sexual partnerships on rate of new HIV infections in a high-prevalence, rural South African population: a cohort study | $HR_{adj}$ (95% CI) HIV infection:<br><br>Men: polygamous union: Yes 1.08 (1.03-1.14), p=0..04<br>Women: polygamous union: Yes 1.02 (0.95-1.09), p=0.556<br>**Ref: No** | Individual-level sexual behaviour and demographic, socioeconomic, and environmental factors |
| Muldoon et al., 2011 | Cohort study of sero-discordant couples (n=444), 111 (25%) polygynous and 333 (75%) single-spouse partnerships,<br>Uganda | Gendered HIV risk patterns among polygamous sero-discordant couples in Uganda | The results show an excess HIV risk behaviour among men involved in polygamous relationships; e.g .polygamous men are more likely to report unprotected sex with unknown sero-status partners. | Information not available |
| Magadi, 2011 | Multivariate Regression analysis<br>Data: DHS | Understanding the gender disparity in HIV infection across countries in sub-Saharan Africa: evidence from the Demographic and Health Surveys | $OR_{adj}$ (95% CI) HIV infection:<br><br>Married polygamously : 1.02 [0.94, 1.10] ns<br>**Ref: married monogamous** | Individual-level sexual behaviour and demographic, socioeconomic, and community factors |
| Magadi and Desta, 2011 | Multivariate regression analysis<br>Data: DHS | A multilevel analysis of the determinants and cross-national variations of HIV seropositivity in sub-Saharan Africa: evidence from the DHS. | $OR_{adj}$ (95% CI) HIV infection:<br><br>Males: married polygamous : −0.10(0.086) ns<br>Females: married polygamous 0.12(0.048)*<br>**Ref: married monogamous** | Individual-level sexual behaviour and demographic, socioeconomic, and community factors |
| Maher et al, 2011 | Cohort HIV serosurvey study. Sample n=4,968 males and n=5,598 | **Concurrent sexual partnerships and associated factors: a cross-sectional population-based survey in a rural** | $OR_{adj}$ (95% CI) HIV infection:<br><br>Males only: polygamous married: | Age group, marital status, Median age at first marriage, difference median age at first marriage, place of residence, |

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|---|---|---|---|---|
| | females aged ≥ 13 years. | **community in Africa with a generalised HIV epidemic** | 0.40(0.14-1.11), P=0.07<br>Spouse: polygamous married 1.11(0.61-2.03), P=0.72ns<br>**Ref: married monogamous** | mobility of men, reporting extra-marital affairs, reporting STI symptoms |
| Kretzschmar et al, 2010 | Literature reviews | **Concurrency is more complex than it seems.** | The proportion of **HIV** transmission that is due to **concurrency** is unknown | Information not available |
| Epstein and Stanton, 2010 | Literature reviews | Is polygamy really benigh? | Closed polygamy could be protective against HIV. | Information not available |
| Sawers, Stillwagon, 2010 | Systematic review | Concurrent Sexual Partnerships Do Not Explain the HIV Epidemics in Africa: A Systematic Review of the Evidence | No evidence showing correlation between HIV prevalence and concurrency. | Information not available |
| Mah and Halperin, 2010 | Mathematical modelling | Concurrent sexual partnerships and the HIV epidemics in Africa: evidence to move forward. | Concurrent partnership compared with serial partnership can increase the size of HIV epidemic | Information not available |
| Reniers and Watkin, 2010 | Unconditional country fixed-effects negative binomial regression models<br>Data: 19 DHS & (AIS) | Polygyny and the spread of HIV in sub-Saharan Africa: a case of benign concurrency | I6 countries pooled $IRR_{adj}$ (95% CI) HIV infection:<br>Women: Polygynous: 0.995*** (-3.908)<br>Men: Polygynous: 0.995*** (-3.313)<br>**Ref: No** | Age group, marital status, Median age at first marriage, difference median age at first marriage, place of residence, mobility of men, reporting extra-marital affairs, reporting STI symptoms |
| Lurie and Rosenthal, 2010 | Systematic review, | Concurrent Partnerships as a Driver of the HIV Epidemic in sub Saharan Africa? The Evidence is Limited | No conclusive evidence that concurrency 1) is associated with HIV prevalence, 2) increases the size of an HIV epidemic, 3) increases the speed of HIV transmission, | Information not available |
| Lurie & Rosenthal, 2009 | Reviews | The Concurrency Hypothesis in Sub-Saharan Africa: Convincing Empirical Evidence is Still Lacking. Response to Mah and Halperin, Epstein, and Morris | No evidence that concurrency is associated with HIV epidemic | Information not available |
| Bove and Valeggia, 2009 | Desk research | Polygyny and women's health in sub-Saharan Africa. | Polygyny is associated with an accelerated transmission of HIV, because it permits a multiplication of sexual partners and because it correlates with low rates of condom use, | Information not available |
| Boileau et al,2009 | Retrospective survey data and HIV biomarker data for 926 ever-married women interviewed in the | Sexual and marital trajectories and HIV infection among ever-married women in rural Malawi | $OR_{adj}$ (95% CI) HIV infection:<br>Polygamous union: Yes<br>1.54 (0.93 to 2.54)ns | Age, education, schooling, sexual behaviour, household income, religion |

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| | Malawi Diffusion and Ideational Change Project were used | | Ref: monogamous men | |
| Reniers and Tfaily, 2008 | Longitudinal survey data; rural areas in Malawi, sample (n=1500 couples), | Polygamy and HIV in Malawi | $OR_{adj}$ (95% CI) HIV infection:<br>Women: Ever polygynous: 1.670** (2.10)<br>Men: Ever polygynous: 1.568 (1.07)<br>**Ref: No** | Age at marriage, district, marital order, Spousal age difference |
| Helleringer, S and Kohler, H.P,2007 | A cross-sectional (n= 923 participants (501 women and 422 men) | Sexual network structure and the spread of HIV in Africa: evidence from Likoma Island, Malawi | $OR_{adj}$ (95% CI) HIV infection:<br>Ever in a polygamous union: Yes<br>3.78 (1.45, 9.79)<br>**Ref: No** | Age, education, schooliing, sexual behaviour, household income, religion |
| Eaton et al, 2004 | The Manicaland HIV/STD Prevention cohort study<br>N=2100 couples, Zimbabwe | Trends in Concurrency, Polygyny, and Multiple Sex Partnerships During a Decade of Declining HIV Prevalence in Eastern Zimbabwe | $OR_{adj}$ (95% CI) HIV infection:<br>Polygamous men: Yes<br>1.46 (80–2.68)ns<br>**Ref: monogamous men** | After adjustment for age group, survey round, socioeconomic stratum, and religion |
| Halperin and Epstein, 2004 | Literature review | Concurrent sexual partnerships help to explain Africa's high HIV prevalence: implications for prevention | They concluded that it is risky to have one extra partner if the relationship is going to be long-term and concurrent such as in polygamy. This is because per-act probability of HIV transmission is low, but the much higher number of cumulative sexual acts the higher the likelihood of transmission. | Age at marriage, SES , Spousal age difference |
| Brahmbhatt et al, 2002 | Cohort study<br>4000 pregnant women and their infants | Polygyny, maternal HIV status and child survival: Rakai, Uganda | HRadj (95% CI) HIV infection and mortality of mothers:<br>Mother: in polygamous marriage<br>2.17 (0.14,1.11): P<.001<br>**Ref: in monogamous marriage** | Age at marriage, SES , Spousal age difference |
| Lagarde et al, 2001 | Multicentre study | Concurrent sexual partnerships and HIV prevalence in five urban communities of sub-Saharan Africa. | $OR_{adj}$ (95% CI) HIV infection:<br>Males: Concurrency with polygynous partner in past 12 months:<br>0.40 (0.14-1.11), p=007<br>**Ref: Married 1 wife** | Age group, marital status, lifetime partners and casual partner in past 12 months |
| Morris Kretzschmar, 2000 | Data from the 1994 | A microsimulation study of the effect of | The observed level of concurrency raised | Information not available |

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|---|---|---|---|---|
| | Ugandan sexual network survey (n=1627) from 90 villages | concurrent partnerships on the spread of HIV in Uganda | the number of infected cases by about 26% at the end of 5 years compared to sequential monogamy. | |
| Morris, Kretzschmar, 1997 | Stochastic Simulation | Concurrent partnerships and the spread of HIV/AIDS | Concurrent partnerships exponentially increase the number of infected individuals and growth rate of the epidemic during its initial phase | Information not available |

to high HIV prevalence in SSA[8,13,25-27], some empirical evidence support the view that polygyny is likely to be protective against HIV transmission, especially at the aggregate level[1,9,14,15]. Possible explanations advanced for these patterns include: reduced coital frequency in polygynous unions (coital dilution); and polygynous men monopolizing women in their community, restricting access to sexual partners for younger men in these populations (monopolizing polygynists)[9]. One study by Reniers and Watkins[1] treated polygyny as a subset of concurrent partnership and claimed that in theory a closed polygynous relationship could be as insulated from HIV as a mutually monogamous one. One hypothesis is that communities where polygyny is common, such as in some West African countries, communities might be more conservative and women are faithfully dependent wives, with no room for committing adultery[19].

However, it is widely believed that polygyny account for a large share of concurrent long-term sexual relationships, a phenomenon that is the basis of the disproportionate levels of HIV in sub Saharan Africa[13]. Three large-scale studies have demonstrated that HIV/AIDS epidemic and concurrent sexual partnerships are concentrated in polygynous households[28-30]. However, Sawers and Isaac[14] suggest that long-duration concurrent partnering such as in a stable polygynous marriage can be protective against HIV transmission. This contradicts most studies reviewed which seem to agree that it is not polygyny that shapes vulnerability, but the dynamics of sexual relationships and practice such as extra-marital affairs and concurrency that characterises polygynous marriage[1,3,26]. A study in Zimbabwe revealed that the relationship between polygynous spouses is sometimes marked by loose emotional ties, and extra-marital sexual activity is more common among polygynous than monogamous women[3].This is usually during the period of unmet social and sexual needs of women in the polygynous marriage[7]. While social control over women in polygyny has been assumed to ensure their fidelity to their husbands, women in such unions may be less likely to be satisfied emotionally and sexually, and such women are more likely to have non-marital sexual partners[15]. Non-marital affairs can also happen among men during the pre-marital search for new wives[19]. These factors together contribute to an expansion of a web of sexual partners and an increased risk of HIV transmission within and outside polygynous marriages.

A Malawian study by Reniers and Watkins[1] revealed that polygyny is negatively associated with HIV prevalence at community level, but the association between HIV prevalence and polygyny at the individual-level is not known. Although Reniers and Watkins[1] study findings on the relationship between HIV prevalence and polygyny at individual level are inconclusive, six studies including those of the authors themselves revealed that within a given geographical area, men and women in polygynous marriages tend to have more extramarital sex and sexually transmitted diseases[3,7,8,31]. For example, two longitudinal studies of HIV-negative couples in polygynous and monogamous marriages, which repeatedly tested both members of the dyad found that men in polygynous marriages are twice as likely as women to first become infected with HIV and bring it into the union[32,33]. Eaton et al.[3] revealed that 4.6% of men in polygynous marriage in Zimbabwe reported non-marital concurrency, compared with 3.2% of monogamously married men. Mitsunaga et al.[7] reported in Nigeria that about 11% of males in polygynous marriages were at risk of extra marital affairs than in monogamous marriage. A study in Malawi also reported that males in polygynous marriages are 50% more likely than those in monogamous marriages to report extra-marital affairs, and that HIV prevalence rates were higher among those who are in polygynous compared with those in monogamous marriages[8]. These studies shed light on the extent of extra-marital prevalence in polygynous marriages, and the authors[8] reported that HIV prevalence and extra-marital affairs are higher among those in polygynous marriages compared to monogamous union. Since condom use is very low among married couples[3], polygyny can facilitate the transmission and acquisition of HIV much more rapidly[24]. One study by Reniers and Watkins[1] reported that direct sexual transmission of HIV can occur in the concurrent sexual networks where the virus is introduced through the extra-marital contacts or where a new

wife who is already infected enters the polygynous union. These studies revealed that this is due to the fact that partners in polygynous union have more extra-marital relationships and that women who marry into polygynous unions are more likely to be HIV positive than those who marry a monogamous husband[1,8,34]. Further data on the issue of marriage of HIV positive partners into polygyny is not available.

## Discussion

The studies included in this review indicate that in polygyny, the partner's behaviour or participation in concurrent sexual relationships have a profound effect on their role as a transmitter of HIV. This is particularly because an individual's risk cannot be calculated solely on the basis of his or her behaviour, but can also be assessed in light of their partner's behaviour[35,43]. Firstly, an individual may have only one sexual partner, but if that partner is connected to a wider sexual network through concurrent sexual relationships, then the individual is at a higher risk of acquiring HIV[2,36,48,49]. Secondly, the risk of infection to an individual is also determined by the number of partners that they have. Their concurrency will increase their risk of HIV only if one of their partners has other partners[25]. The weaker link in these theories is the lack of empirical evidence to support the claim that concurrency is driving the HIV epidemic in Southern Africa[7,8,15,36,45]. Although, there are mathematical modelling studies that support concurrency as a central factor in the spread of HIV[24,30], such studies have been criticised for not specifying the types of concurrency that are associated with HIV transmission[32]. For example, Morris et al.[35] asserts that some researchers such as Lurie and Rosenthal[32] made several mistakes with regard to their assertion that concurrency is not a proven driver of the HIV epidemic. First, researchers argue that measuring concurrency in the index person who acquires HIV is a mistake since concurrency increases one's risk of transmitting infection, not acquiring it. Second, the use of HIV prevalence is an improper measure since prevalence is a cumulative measure over time, while concurrency is generally measured over a limited time period. Lurie and Rosenthal[18] posit that it is only when both prevalence and concurrency are in equilibrium that the effects of concurrency can be measured. Morris et al.[35] argued that HIV incidence should be measured instead of prevalence and it should be measured during a time window matched to measures of concurrency. Other researchers like Tanser and others[15] have also reported that concurrency drives HIV epidemic in the population, but the effect of concurrent partnerships on HIV incidence has not been tested.

Some studies have demonstrated that communities with high polygynous marriages tend to have lower HIV infection rates and that polygyny is protective against HIV infection[14]. However, in this review, we did not find any study to show that polygyny is protective at individual-level after they controlled for potential confounders such as extra-marital affair, male circumcision, urban residence, religion, ethnicity and nationality. Despite the general understanding that men in polygynous unions have enough women within their circles and, in any case, if they need other women the culture allows them to marry and as such wouldn't be enticed to extra-marital affairs as compared to men in monogamous unions, many studies including those of Reniers and Watkins[1] have found that both men and women in polygynous unions tend to have more extra-marital sex and HIV compared to those in monogamous unions. One study by Fox[19] considered the possibility that greater surveillance of women within the polygynous marriage cultures in West Africa could explain the fact that HIV and polygyny are negatively associated at community-level. However, this hypothesis was rejected by Minnis et al.[36] who argued that the use of DHS data by Fox[19] are subject to under-reporting of concurrency and multiple partnerships, especially for women.

Two studies[12,14] have also revealed that long-duration concurrent partnering such as in a stable polygynous marriage can be protective against HIV transmission, rather than promoting it. Sawers and Isaac[14] cited the 2006 global review of sexual behaviour[13] and quoted their conclusion that long-duration concurrent relationships in some West African countries might explain the low prevalence of HIV in the region. However, their use of the phrase 'might have been' suggests a mere

hypothesis, rather than conclusive evidence. Mitsunaga et al.[7] revealed that there is more short-term concurrency in the West African region than elsewhere in Africa. Some researchers have suggested that it is actually the prevalence of long-term concurrency partnerships that distinguishes HIV prevalence in East and Southern Africa from other regions[7,37]. They argue that long-term partnering is key because the longer the average duration of overlap, the greater the impact of concurrency transmission, which is why long-term concurrencies such as polygyny should be the focus of contemporary studies[14]. Since the risk of HIV is a function of the number of exposures, short duration partnering and lower coital frequency entail a lower cumulative transmission risk than long duration partnering[38]. Two studies measured partnership duration, concurrency, coital frequency and HIV[14,38], but did not specify polygyny in their analysis which limits other researchers to detect the effect of long-duration concurrency and coital frequency on HIV transmission in the context of polygynous marriage.

Furthermore, religion is likely to be an important factor, many west African countries being predominantly Islamic. Sarah Gilbert[50] has argued that polygyny within Islamic marriages has a contradictory influence on risky decisions about sex. At the time of her article (2008), Senegal had one of the lowest HIV/AIDS rates in sub-Saharan Africa, and 96% of the population was Muslim. Islam forbids both premarital and extramarital sex. Yet, Gilbert argues that the Senegalese youth which she met associated Islam's permission to have polygynous marriages, to mean that men could conclude that it was 'natural' to be promiscuous before marriage, and that there is a Wolof word, 'Mbaran', for dating more than one woman at a time. She notes, however, that the Sengalese population is largely Sufi, whereas other Islamic affiliations may have different interpretations. At a similar time to Gilbert's study, interviews carried out with Muslim students and teachers in Kisumu, Kenya found that there was a perception of lower rates of HIV amongst Muslims[51], and yet there was also the admission from all 27 interviewees (12 teachers and 15 students) that Muslim boys did have sexual relations with non-Muslims before marriage, and this was accepted for teenage boys and not girls. Suggesting more complicated factors within Islamic marriages, interviews undertaken for a study of a fishing village in coastal Tanzania revealed that some men had extra-marital 'informal relationships', 'secret' or 'outside wives', and lovers[52]. By 2004, a study showed that countries within Africa with largely Islamic populations had a lower rate of HIV, and associated this with cultural and religious beliefs and practices, including lower alcohol consumption, personal hygiene after sex, and circumcision[53]. A more recent analysis of DHS data across 20 countries of SSA confirmed significantly lower HIV prevalence among Muslims than other religious denominations, with Muslims having 20 percent lower odds of being HIV-positive compared to Roman Catholic counterparts of similar background demographic and socio-economic characteristics[46].

Reniers and Tfaily[8] assert that polygyny is likely to pair polygynist men with widows, divorcees and women with history of extra-marital affairs. Therefore, remarriage of divorcees and widows as junior wives into polygynous marriages is also a conduit to HIV transmission[8]. In populations with generalized HIV epidemics, Reniers and Tfaily[8] assert that these women often have elevated HIV prevalence and could bring HIV into the household. A study by Agot et al.[34] argues that HIV positive widows, divorcees and women with history of extra-marital affairs are more likely to be recruited into polygynous marriages than monogamous. Based on Gausset[2], in most cases, polygyny is accepted with no room to HIV testing before picking a new wife. A study by Eaton et al.[3] reported that widows and divorcees who joined polygynous marriages compete with co-wives at having more children, leaving no room for condom use with their husband. As a result the virus can be transmitted relatively very quickly throughout the network, particularly if one member within the polygynous marriage has a high level of viral load[39]. There is evidence that an acute infection increases the probability of HIV transmission[40]. There are no studies that made a direct assessment of the selection of HIV positive women into polygynous marriages. The only direct way of assessing the adverse selection of wives is to measure HIV status for all women at the time of

entering polygynous marriage. Using widow and divorce as proxy for HIV risk factors in polygynous marriage, Reniers and Tfaily[8] revealed that the likelihood of HIV positive widows and divorcees to enter polygyny is higher than to enter into monogamous marriage. However, due to lack of HIV sero-status data, Reniers and Tfaily[8] failed to test the key hypothesis that HIV positive widows and divorces are more likely to become second wives. We cannot therefore conclude in this analysis that HIV positive widows and divorcees are more likely to be selected into polygynous marriages than monogamous unions. This hypothesis, however, remains a strong argument in the literature with regard to the link between polygyny and risk of HIV transmission. Together with the pre-marital search for new wives by polygynist men and extra-marital affairs by women in polygynous unions, they provide the most plausible explanation of how HIV can enter polygynous marriages through concurrent partnerships.

### *Shortcomings and needed data*

While the number of papers studying concurrency steadily increased over time, the increase is not as great for polygyny. The overall image gathered from the studies reviewed is that the empirical evidence for the concurrency hypothesis is not strong[16,41], and that stems in part from the methodological challenges in measuring different types of partnership concurrency and their effects. Of particular concern is that studies largely focussed on the role of concurrency as a risk factor for HIV acquisition in non-marital sexual partnerships, but failed to test the key hypothesis that concurrency has a measured effect on the transmission in polygynous marriages. There is need for studies focused on the measurement of incidence of HIV infection in polygynous marriages to verify the source of infection among the individuals and their duration in the polygyny/union. Sawers et al.[16] have suggested mapping out sexual networks by interviewing all partners in polygynous marriages to determine if people whose partners have other partners are more likely to become infected with HIV than people whose partners have no other partners. Such a study may be used to distinguish the likelihood of HIV infection between individuals in a long-term partnership such as polygyny and other forms of multiple partnering. Additional studies are also needed that are focused on determinants of polygyny, specifically extra-marital affairs and concurrent partnerships (these are not exclusive to polygynous unions but are also found in monogamous unions[42]. However, empirical evidence of the effectiveness of studies such as these has to be obtained from field studies to capture contextual aspects of polygyny as well as cultural/spiritual practices that increase vulnerability of polygynists to HIV infection. The dynamic nature of cultural/spiritual polygyny needs to be examined through mixed method studies. While the majority of the studies reviewed are informative, they are not specific to the case of polygyny.

## Conclusion

The studies reviewed suggest that polygyny as an institution is perhaps less of a concern; but rather, the implications seem to be that men who choose to marry polygynously are also more likely to engage in extra-marital sex, raising secondary questions about such men's patterns of sexual networking and sexual desires. There is also the point that polygyny is protective against HIV since some studies have demonstrated that communities with high polygynous marriages tend to have lower HIV infection rates. However, empirical evidence that polygyny is protective at individual-level through factors such as coital dilution is weak, especially after controlling for potential confounders such as extra-marital affairs and duration of partnering. It is highly unlikely that polygyny in its totality is protective against HIV and we rightfully argue that the role of polygyny in spreading HIV epidemic should be reviewed and be examined separately from other forms of concurrency. Currently, there is no convincing evidence that polygyny is less of a risk factor than other forms of concurrency in HIV transmission. Whether polygyny is to be distinguished from non-marital concurrency in HIV prevention policy should depend, in part on the evaluation of levels of sexual risk behaviour of polygynous men and women, in comparison with

counterparts in monogamous unions and those in non-marital concurrent partnerships.

## Acknowledgement

The research presented here was part of a scoping study for the project 'Evolving HIV/ADS epidemic in most affected communities of Eastern and Southern Africa: understanding the role of culture and global civil society'. The project was undertaken by an international interdisciplinary team of researchers in the UK, Kenya, Malawi and South Africa. The study was supported through the University of Hull's QR-GCRF (Global Challenges Research Fund) pump-priming fund from Research England. The authors acknowledge the contribution of other network members (especially Dr Elsbeth Robson, University of Hull, and Dr Shane Doyle, University of Leeds) for their invaluable comments/feedback on earlier drafts of this paper.

## Contribution of Authors

Martin Gazimbi (Lead author): co-ordinated the systematic review process, developed the search strategy, undertook data extraction and screening, drafted most of the manuscript and incorporated the contributions of other co-authors in the manuscript.
Monica Magadi (corresponding author): conceptualized and designed the systematic review, contributed to the design of the search strategy, checked the data extraction process, drafted parts of the manuscript and undertook critical review of earlier drafts of the manuscript.
Washington Onyango-Ouma: contributed to the design of the search strategy, drafted parts of the manuscript and undertook critical review of earlier drafts of the manuscript.
Elizabeth Walker: contributed to the design of the search strategy, drafted parts of the manuscript and undertook critical review of earlier drafts of the manuscript.
Rosemary Cresswell: contributed to the design of the search strategy, drafted parts of the manuscript and undertook critical review of earlier drafts of the manuscript.
Margaret Kaseje: contributed to the design of the search strategy, drafted parts of the manuscript and undertook critical review of earlier drafts of the manuscript.
Charles Wafula: contributed to the design of the search strategy, drafted parts of the manuscript and undertook critical review of earlier drafts of the manuscript.
All authors mentioned above approved the final manuscript.

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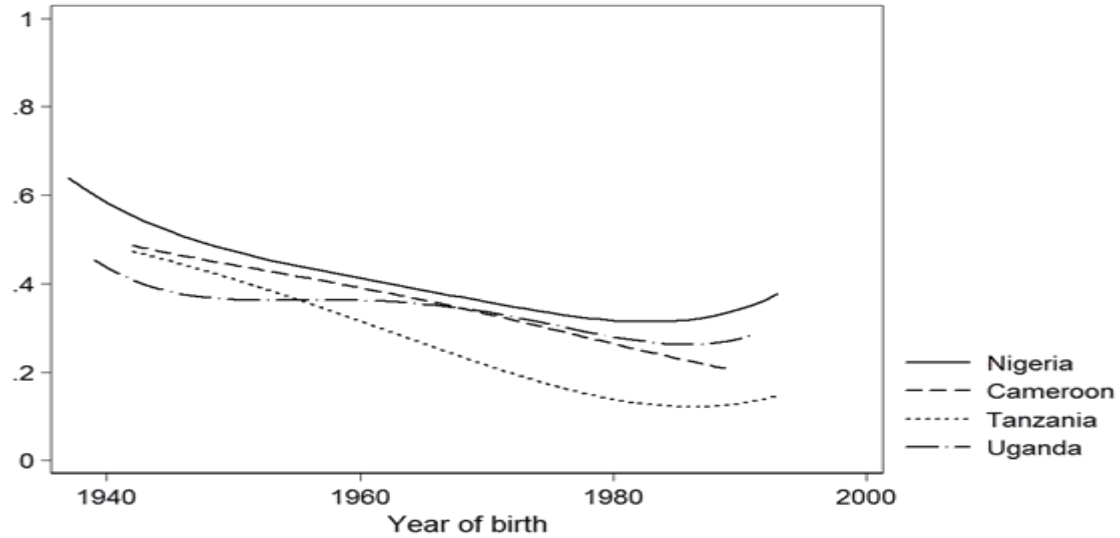


Source**: Fenske, 2013 (**https://voxeu.org/article/african-polygamy-past-and-present**)**

**Appendix 1:** Predicted polygamy by year of birth for 30-year-old women