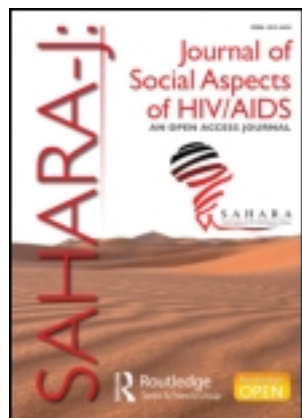




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A decade of research involving men who have sex with men in sub-Saharan Africa: Current knowledge and future directions

Nicholas Muraguri, Marleen Temmerman, Scott Geibel

Abstract

It has been just over 10 years since the first large behavioral survey of men who have sex with men (MSM) was implemented in Senegal in 2001. Since then, behavioral and/or HIV prevalence surveys have been conducted in over 14 other countries in sub-Saharan Africa. Current available evidence and review have established that HIV prevalence among MSM in these countries are significantly higher than corresponding general populations, that MSM engage in sexual risk behaviors that place them and sexual partners at higher risk, and that issues of discrimination and stigmatization inhibit HIV interventions for MSM. This paper summarizes the existing knowledge, describes limitations of this evidence, and proposes new and enhanced research approaches to fulfill needed gaps to inform national HIV responses for MSM populations.

Keywords: men who have sex with men, male sex workers, Africa, HIV/AIDS, sexually transmitted infections, epidemiology

Résumé

Il y a juste 10 ans depuis qu'une première large enquête comportementale sur les hommes ayant des rapports sexuels avec les hommes a été mise en œuvre au Sénégal en 2001. Depuis lors, des enquêtes comportementales et/ou de prévalence du VIH ont été conduites dans plus de 14 autres pays d'Afrique Sub-saharienne. Les preuves actuelles disponibles et les bilans faits ont établi que la prévalence du VIH parmi les HSH dans ces pays est significativement plus élevée que celle de la population correspondante en général, que les HSH sont engagés dans des comportements sexuels à risque qui placent leurs partenaires sexuels et eux-mêmes à un risque très élevé, et que les problèmes de discrimination et stigmatisation jouent un rôle inhibiteur dans les interventions en faveur des HSH. Cette présentation donne un résumé de connaissances existantes, décrit les limites de cette évidence, et propose des approches nouvelles et améliorées pour combler les lacunes afin d'apporter des réponses nationales éclairées au VIH en faveur des populations des HSH.

Mots clés: hommes ayant des rapports sexuels avec des hommes, travailleurs du sexe hommes, Afrique, VIH/SIDA, infections sexuellement transmissibles, épidémiologie

Background

Sex between men occurs in every culture and society, although its extent and public acknowledgement varies from region to region. UNAIDS estimates that men who have sex with men (MSM) account for about 5–10% of the global burden of HIV, with considerable variation between countries and regions (UNAIDS 2006). MSM are a recognized high-risk group for HIV infection in Western Europe, North America, and Australia, and HIV epidemics among MSM are well described in some low- and medium-income countries in Latin America and Asia (Beyrer, Baral, Walker, Wirtz, Johns & Sifakis 2010; Cáceres, Konda, Segura & Lyerla 2008).

However, it's only recently that there has been attention to HIV among African MSM (Smith, Tapsoba, Peshu, Sanders & Jaffé 2009). The first large behavioral survey of MSM in sub-Saharan Africa was conducted in Senegal just over 10 years ago in 2001 (Niang, Tapsoba, Weiss, Diagne, Niang, Moreau, *et al.* 2003). Since then, survey activities have been conducted in several African countries, providing needed epidemiologic data for a previously unknown and ignored at-risk population. Upon completion of a desk review and consultation with experts in the field, we identified 39 area-specific and currently citable behavioral, bio-behavioral, or cohort study surveys which have been conducted

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in 14 sub-Saharan African countries since 2001. In light of this emerging body of evidence, we aim here to review the existing knowledge, describes limitations of this evidence, and outline new and/or enhanced research and programmatic approaches to fulfill needed gaps in national HIV responses to MSM.

Current knowledge

Biological measurements

Previous review of some of these results have established that—even in the generalized HIV epidemics of Eastern and Southern Africa—MSM are more likely to be HIV infected than corresponding general adult populations (Baral, Sifakis, Cleghorn & Beyrer 2007; Smith *et al.* 2009). Beyrer, Baral, *et al.* (2010), using a comparative pooled adjusted odds ratio approach, estimated that MSM in Africa were 3.8 times (95% confidence interval [CI]: 3.3, 4.3) more likely to be HIV positive than men of reproductive age within the general populations. Several surveys (Table 1) have found very high HIV prevalence rates amongst diverse populations of MSM including in Abidjan, Cote D'Ivoire (50.0%; Vuylsteke, Semde, Sika, Crucitti, Ettiegne Traore, Buve, *et al.* 2012); Johannesburg, South Africa (49.5%; Rispel, Metcalf, Cloete, Reddy & Lombard 2011); Federal Capital Territory, Nigeria (37.6%; Federal Ministry of Health [FMOH] 2011); Mombasa, Kenya (24.5%; Sanders, Graham, Okuku, van der Elst, Muhaari, Davies, *et al.* 2007); Blantyre and Lilongwe in Malawi (21.4%; Baral *et al.* 2007); Dakar, Senegal (21.8%; Wade, Larmarange, Diop, Diop, Gueye, Marra, *et al.* 2010); Gaborone, Botswana (19.7%; Baral *et al.* 2007); Nairobi, Kenya (18.2%; Geibel, Okal, Tun, Sheehy, Broz, Mutua, *et al.* 2011); and Lagos, Nigeria (15.8%; FMOH 2011) (Table 1).

Figure 1 shows HIV prevalence among MSM reported in various bio-behavioral studies. HIV rates in several studies have been measured above 10–50% throughout the continent, even in West Africa where the HIV epidemic has remained relatively low among the general population. This indicates that the HIV epidemics in these lower-prevalence countries are likely more concentrated among high risk populations including MSM.

Despite the recent preponderance of prevalence data, however, HIV incidence has only been reported in one study from Nairobi and Mombasa, Kenya. HIV incidence in these men was high—6.8 per 100 person-years (95% CI: 4.9–9.2)—among MSM recruited for vaccine trial preparation cohorts (Price, Rida, Mwangome, Mutua, Middelkoop, Roux, *et al.* 2012).

These HIV prevalence and incidence results need to be treated with caution, however, as some surveys used non-representative snowball recruitment methodologies or may also be biased towards male sex worker subgroups. Table 1 summarizes the MSM surveys, methodologies used, participant information, and biological and behavioral results by country and geographic location.

Limited numbers of studies tested MSM for sexually transmitted infections (STIs), with varied results. *Treponema pallidum* (syphilis) rates were as low as 0.0% in three states of Nigeria

(Merrigan, Azeez, Afolabi, Chabikuli, Onyekwena, Eluwa, *et al.* 2011), 0.2% in Zanzibar (Dahoma, Johnston, Holman, Miller, Mussa, Othman, *et al.* 2011) and ranging from 0.7% to 3.5% in Kenya (Geibel *et al.* 2011; Plenty, Bailey, Geibel, & Adinya-Achola, 2011; Sanders *et al.* 2007). Relatively higher syphilis rates were recorded in Senegal at 4.7% in 2004 (Wade, Kane, Diallo, Diop, Gueye, Mboup, *et al.* 2005) and 3.4% in 2007 (Wade *et al.* 2010). *Neisseria gonorrhoea* (NG) and *Chlamydia trachomatis* (CT) rates tended to be higher, ranging from 2.6% to 4.8% in Senegal, and from <1% in Kisumu, Kenya to 7.1% in Nairobi, Kenya. NG and CT rates have been found to be higher among limited studies of male sex workers. A subpopulation of male sex workers in Nairobi, Kenya had higher rates of NG (9.2% vs. 5.6%) and CT (7.7% vs. 1.7%) than MSM who did not report selling sex (Muraguri, Tun, Okal, Broz, Raymond, Kellogg, *et al.* 2012). Among a smaller population of male sex workers in Abidjan, Cote D'Ivoire, 14.9% tested positive for gonorrhea or chlamydia (Vuylsteke *et al.* 2012).

Behavioral measurements

Some studies have found that general correct knowledge about HIV and other STIs are lower than desirable amongst MSM (Fay, Baral, Trapence, Motimedi, Umar, Ipinge, *et al.* 2011; Moreau, Tapsoba, Ly, Niang & Diop 2007). Perceptions that anal sex pose no risk of HIV transmission, and that such behaviors might be actively sought after because of this misconception has been documented (Geibel, Luchters, King'ola, Esu-Williams, Rinyiru & Tun 2008). However, it is uncertain how widespread such misconceptions may be influencing risky sexual behavior.

Evidence indicates that many MSM in Africa are involved in HIV-related risk behaviors including insertive and receptive anal sex with multiple and concurrent male sexual partnerships, and with no or inconsistent condom use. Table 1 summarizes available data on sexual risk behavior measures among MSM in Africa. In MSM populations surveyed, many reported existence of multiple partnerships, some of which were concurrent in time and bisexual as well. The proportion of respondents reporting multiple partnerships varied between studies, with some reporting that as high as 86% had more than five partners in the last 6 months (FMOH 2011). Even studies that had a shorter reference period of 1 month, still showed that multiple partnership was common with one documenting that up to 33% of the respondents were engaged in receptive anal sex with more than one non-paying partner over that period (Dahoma *et al.* 2011).

Promotion of consistent use of condoms is a key HIV prevention intervention. Although some studies have found self-reported condom use to be elevated amongst certain MSM populations, consistent condom use as reported in many studies may be lower than needed to reduce HIV infections. As shown in Table 1, reported consistent condom use among MSM in Africa varies widely, with some of the studies documenting rates as low as 9% (past 1 month; Dahoma *et al.* 2011). Of the studies reviewed, the highest rates of consistent condom use were reported in Pretoria by 80% of respondents over the past 2 months (Tun, Kellerman, Maimane, Fipaza, Sheehy, Vu, *et al.* 2012).

Table 1. MSM research in Africa: study characteristics, participant information, and biological and behavioral measurements.

Study characteristics						Participant information		Biological measurements			Behavioral measurements		
Location	Year(s) of study	Source	Type of study	Number of surveys	Recruitment method	Number of participants	Median age	HIV prevalence % (95% CI)	HIV incidence % (95% CI)	STI tests performed	Reported multiple male sex partners % (time period)	Reported consistent condom use % (time period)	Reported payment for sex or sex work % (time period)
<i>Botswana</i>													
Gaborone	2008	Baral et al. (2009)	Bio-behavioral, cross-sectional	1	Snowball	117	24	19.7 (12.5–26.9)	–	–	13 (≥ 5 , past 6 months)	NR	NR
<i>Cameroon</i>													
Douala	2008	Henry, Marcellin, Yomb, Fugon, Nemande, Gueboguo, et al. (2010)	Behavioral, cross-sectional	1	Snowball	168	26	–	–	–	65 (past 6 months)	43 (past 6 months)	NR
<i>Cote D'Ivoire</i>													
Abidjan	2007–2008	Vuytsteke et al. (2012)	Bio-behavioral, cross-sectional	1	Snowball	96	27	50.0 (39.6–60.4)	–	CT,NG,TV	NR	69 ("always") ^a	100 (NR)
<i>Kenya</i>													
Nairobi	2004	Onyango-Ouma, Birungi and Geibel (2005)	Behavioral, cross-sectional	1	Snowball	500	26	–	–	–	79 (past 12 months)	58 (past 12 months)	52 (past 12 months)
Mombasa, Nairobi	2005–2008	Price et al. (2012)	Cohort, vaccine preparedness	NA	Volunteer cohort	327	NR	–	6.8 (5.0–9.3)	TP	NR	NR	NR
Mombasa	2006	Sanders et al. (2007)	Cohort, vaccine preparedness	NA	Volunteer cohort	285	27 to 28 ^b	24.5 (19.7–30.7)	–	TP	NR	18 (past 3 months)	74 (past 3 months)
Mombasa	2006–2008	Geibel et al. (2012)	Intervention, cross-sectional	2	Time-location	425/442	26/23	–	–	–	74/63 (past 7 days)	36/50 (past month)	87/81 (past 7 days)
Nairobi	2010	Geibel et al. (2011)	Bio-behavioral, cross-sectional	1	RDS	563	28	18.2 (13.1–23.6)	–	TP,CT, NG	60 (past 12 months) ^c	25 (past 1 month)	40 (past 2 months)
Kisumu	2010	Plenty et al. (2011)	Bio-behavioral, cross-sectional	1	RDS	415	21	11.1 (7.5–15.9)	–	TP, CT, NG, HSV,TV	92 (past 12 months)	40 (past 1 month)	67 (past 2 months)
<i>Lesotho</i>													
NR	2009	Baral, Adams, Lebana, Kaibe, Letsie, Tshehlo, et al. (2011) ^a	Bio-behavioral, cross-sectional	1	Snowball	252	26.3 (mean)	–	–	–	28 (≥ 5 , past 12 months)	NR	NR
<i>Malawi</i>													
Blantyre, Lilongwe	2008	Baral et al. (2009)	Bio-behavioral, cross-sectional	1	Snowball	201	25	21.4 (15.7–27.1)	–	–	18 (≥ 5 , past 6 months)	NR	NR
<i>Nambia</i>													
Windhoek	2008	Baral et al. (2009)	Bio-behavioral, cross-sectional	1	Snowball	218	23	12.4 (8.1–16.8)	–	–	15 (≥ 5 , past 6 months)	NR	NR
<i>Nigeria</i>													
Lagos	2007	Merrigan et al. (2011)	Bio-behavioral, cross-sectional	1	RDS	293	22	17.4 (12.3–23.2)	–	TP	NR	46 (past 6 months) ^d	24 (past 6 months)

(Continued)

Table 1. Continued.

Study characteristics						Participant information		Biological measurements			Behavioral measurements		
Location	Year(s) of study	Source	Type of study	Number of surveys	Recruitment method	Number of participants	Median age	HIV prevalence % (95% CI)	HIV incidence % (95% CI)	STI tests performed	Reported multiple male sex partners % (time period)	Reported consistent condom use % (time period)	Reported payment for sex or sex work % (time period)
Kano	2007	Merrigan <i>et al.</i> (2011)	Bio-behavioral, cross-sectional	1	RDS	293	22	9.3 (5.7–15.4)	–	TP	NR	24 (past 6 months) ^d	36 (past 6 months)
Cross River	2007	Merrigan <i>et al.</i> (2011)	Bio-behavioral, cross-sectional	1	RDS	293	22	1.1 (0.1–2.2)	–	TP	NR	30 (past 6 months) ^d	35 (past 6 months)
Abuja	2008	Strömdahl, Onigbanjo Williams, Eziefule, Emmanuel, Iwuagwu, Anene, <i>et al.</i> (2012)	Behavioral, cross-sectional	1	Snowball	297	26	–	–	–	28 (≥ 5 , past 6 months) ^e	53 (past 6 months)	NR
Lagos	2010	FMOH (2011)	Bio-behavioral, cross-sectional	1	RDS	215	NR	15.8 (NR)	–	–	79 (past 6 months) ^f	43 (past 6 months) ^g	37 (past 6 months)
Kano	2010	FMOH (2011)	Bio-behavioral, cross-sectional	1	RDS	299	NR	8.3 (NR)	–	–	86 (past 6 months) ^f	7 (past 6 months) ^g	64 (past 6 months)
Cross River	2010	FMOH (2011)	Bio-behavioral, cross-sectional	1	RDS	313	NR	2.4 (NR)	–	–	82 (past 6 months) ^f	16 (past 6 months) ^g	18 (past 6 months)
Federal Capital Territory	2010	FMOH (2011)	Bio-behavioral, cross-sectional	1	RDS	199	NR	37.6 (NR)	–	–	78 (past 6 months) ^f	49 (past 6 months) ^g	39 (past 6 months)
Kaduna	2010	FMOH (2011)	Bio-behavioral, cross-sectional	1	RDS	286	NR	16.2 (NR)	–	–	84 (past 6 months) ^f	40 (past 6 months) ^g	32 (past 6 months)
Oyo	2010	FMOH (2011)	Bio-behavioral, cross-sectional	1	RDS	233	NR	3.3 (NR)	–	–	70 (past 6 months) ^f	48 (past 6 months) ^g	26 (past 6 months)
<i>Rwanda</i>													
Kigali	2008–2009	Binagwaho, Chapman, Koleros, Utazirubanda and Pegurri (2009)	Behavioral, cross-sectional	1	Snowball	99	24	–	–	–	65 (past 12 months)	37 (past 12 months)	10 (past 12 months)
<i>Senegal</i>													
Dakar	2001	Niang <i>et al.</i> (2003)	Behavioral, cross-sectional	1	Snowball	250	25	–	–	–	21 (past month)	27 (past month)	9 (last sex)
Dakar	2003/2005	Geibel <i>et al.</i> (2010)	Intervention, cross-sectional	2	Snowball	258/290	27/26	–	–	–	26/27 (past month)	52/58 (past 12 months)	26/17 (past month)
Dakar, Theis, Mbour, Kaolack, Saint-Louis	2004	Wade <i>et al.</i> (2005)	Bio-behavioral, cross-sectional	1	Snowball	463	24	21.5 (17.8–25.6)	–	TP, CT, NG, HSV	59 (≥ 3 , past 12 months)	58 (past 12 months) ^f	23 (past month)
Dakar, Theis, Mbour, Saint-Louis	2007	Wade <i>et al.</i> (2010)	Bio-behavioral, cross-sectional	1	Snowball	501	NR	21.8 (18.3–25.7)	–	TP, CT, NG, HSV	NR	75 (past month) ^f	27 (past month)
<i>South Africa</i>													
Gauteng, Kwazulu-Natal, Western Cape	2003–2005	Sandfort, Nel, Rich, Reddy and Yi (2008)	Behavioral, cross-sectional	1	Snowball	1045	29.9 (mean)	–	–	–	NR	NR	NR

Gauteng province	2004–2005	Lane <i>et al.</i> (2008)	Behavioral, cross-sectional	I	Snowball	199	NR	–	–	–	NR	41 (past 6 months)	NR
Pretoria	2008	Knox, Sandfort, Yi, Reddy and Maimane (2011)	Behavioral, cross-sectional	I	Snowball	300	26.1 (mean)	–	–	–	NR	NR	NR
Soweto	2008	Lane <i>et al.</i> (2009)	Bio-behavioral, cross-sectional	I	RDS	363	23	13.2 (12.4–13.9)	–	–	NR	28 (past 6 months)	49 (ever) ^h
Johannesburg, Durban ^c	2008	Rispel <i>et al.</i> (2011)	Bio-behavioral, cross-sectional	I	RDS ⁱ	204	22	49.5 (42.5–56.5), 27.5 (17.0–38.1)	–	–	NR	49 (past 12 months)	NR
Cape Town	2008	Burrell, Mark, Grant, VWood and Bekker (2010)	Bio-behavioral, cross-sectional	I	Snowball	542	27	10.4 (NR)	–	–	NR	54 (past 12 months)	6 (past 12 months)
Cape Town peri-urban area	2009	Baral, Burrell, Sheibe, Brown, Beyrer and Bekker (2011) ^b	Bio-behavioral, cross-sectional	I	Snowball	200	24	25.5 (NR)	–	–	18 (>5, past 6 months)	52 ('always')	12 (NR)
Pretoria	2009	Tun <i>et al.</i> (2012)	Behavioral, cross-sectional	I	RDS	307	24	–	–	–	39 (past 2 months)	80 (past 2 months)	18 (past 6 months)
<i>Swaziland</i>													
NR	2011	Baral (2011)	Behavioral, cross-sectional	I	RDS	328	23	–	–	–	67 (past 12 months)	51 (NR 'always')	26 (past 12 months)
<i>Tanzania</i>													
Ugunga (Zanzibar)	2007	Dahoma <i>et al.</i> (2011)	Bio-behavioral, cross-sectional	I	RDS	509	28	12.3 (8.7–16.3)	–	TPHBV,HCV	33 (past month) (fg)	9 (past month) (fg)	59 (ever)
<i>Uganda</i>													
Kampala	2004	Kajubi, Kanya, Raymond, Chen, Rutherford and Mandel (2008)	Behavioral, cross-sectional	I	RDS	224	NR	–	–	–	82 (lifetime)	63 (past 6 months)	27 (ever)
Kampala	2009	Hladik <i>et al.</i> (2012)	Bio-behavioral, cross-sectional	I	RDS	295	25	13.7 (7.9–20.1)	–	TPCT, NG	47 (>10, past 6 months)	NR	NR

CI, confidence interval; NR, not reported; TP, Treponema pallidum; CT, Chlamydia trachomatis; NG, Nesseriah gonorhea; HSV, herpes simplex virus type 2; HBV, hepatitis B virus; HCV, hepatitis C virus; FMOH, Federal Ministry of Health; RDS, respondent-driven sampling.

^aWith paying clients.

^bResults were disaggregated by MSM only and MSM who have sex with both men and women.

^cRegular male partners only.

^dNon-commercial anal sex only.

^eReported both male and female partners.

^fWith insertive male partners only.

^gNon-paying partners only.

^hReported as transactional and not necessarily formal sex work.

ⁱAuthors did not adjust analysis for RDS; HIV results were disaggregated by city, other results were combined.

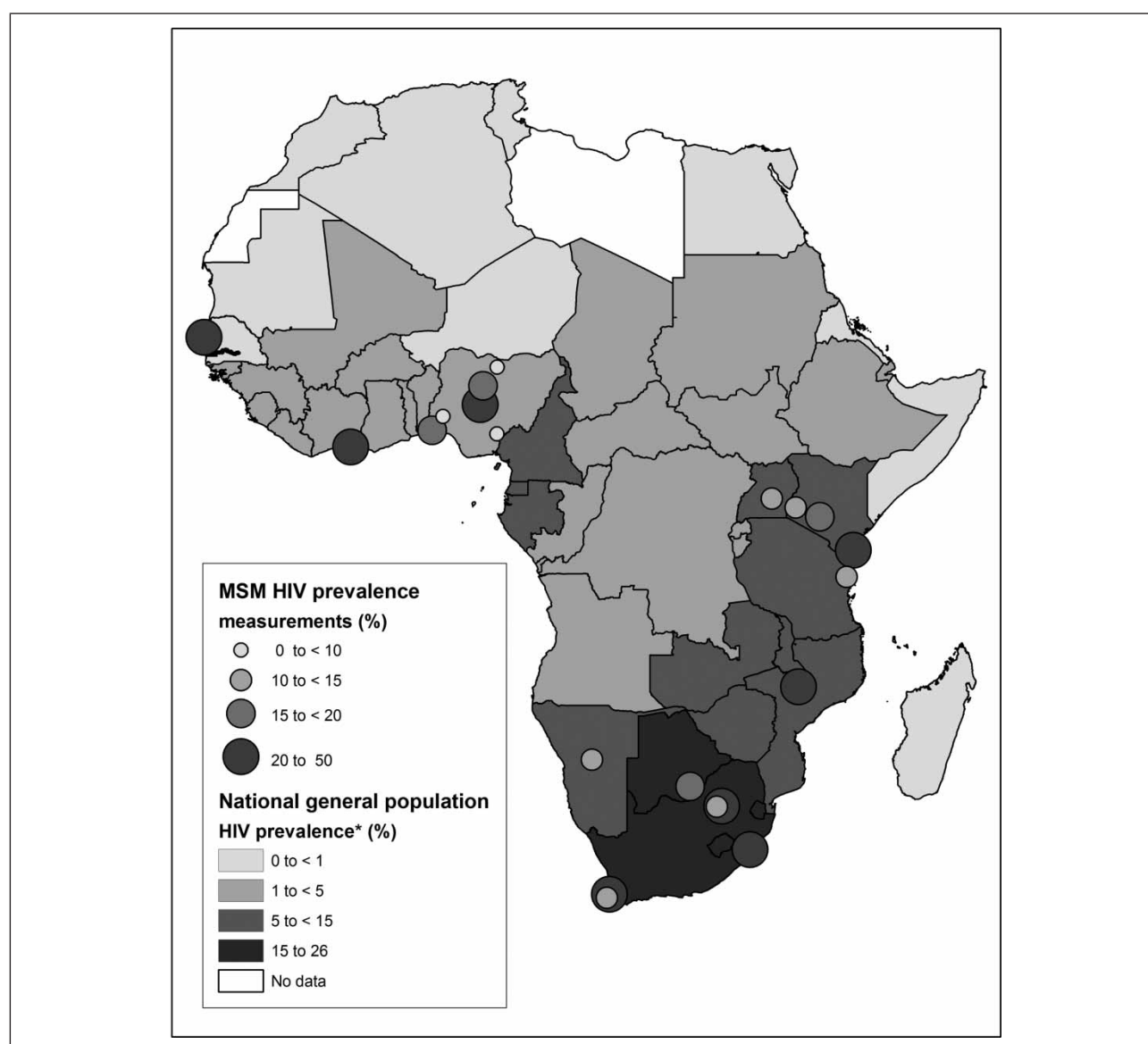


Fig. 1. MSM HIV prevalence rates reported by city or area-specific bio-behavioral surveys in sub-Saharan Africa. *Source: UNAIDS (2010).

Further, these surveys seem to be reaching disproportionate (except for surveys in Mombasa and Abidjan where male sex workers were specifically targeted) numbers of MSM who engage in commercial anal sex, which exposes them to risk of HIV particularly in an environment of multiple partners and inconsistent condom use. As shown in Table 1, respondents reporting payment for anal sex or being engaged in sex work ranged from 6% to 74%, albeit over various reported timeframes.

Studies on sexual behavior of MSM in Africa frequently report bisexual, often concurrent, relationships. This indicates that MSM may be playing a role in the overall African epidemic, even in the context of heterosexual transmission of HIV. Many MSM are married to, or in a long-term relationship with, a woman and some do this to conceal their true sexual orientation. (Beyrer, Trapence, *et al.* 2010; Broz, Okal, Tun, Sheehy, Mutua, Muraguri, *et al.* 2011). Bisexuality and close links with heterosexual networks are further supported by viral genetic studies that shows similarities of HIV subtypes from MSM and from

heterosexual populations in same geographic areas (Ndiaye, Toure-Kane, Vidal, Niama, Niang-Diallo, Dièye, *et al.* 2009; Tovanabutra, Sanders, Graham, Mwangome, Peshu, McClelland, *et al.* 2010).

Several studies have documented high usage of petroleum products, baby oils, and other lotions for lubrication during anal sex (Baral, Trapence, Motimedi, Umar, Lipinge, Dausab, *et al.* 2009; Chapman, Koleros, Delmont, Pegurri, Gahire & Binagwaho 2011; FMOH 2011; Onyango-Ouma, Birungi & Geibel 2005). Use of these products has been significantly associated with ever experiencing condom breakage in at least one African study (Geibel *et al.* 2008), and this finding is consistent with limited documentation of condom breakage when used with lubricants containing mineral or vegetable oils (Rosen & Rosen 1999; Voeller, Coulson, Bernstein, Nakamura 1989). Usage in Africa of petroleum, mineral, or food oil-based products is likely due to a number of factors including ignorance of effect of the oils on latex condoms, scarcity of the water based lubricants, and prohibitive expense and inappropriate packaging of the commodity

(Moreau *et al.* 2007). The potential epidemiologic impact of such breakage, however, remains uncertain.

Alcohol use and abuse have been reported in some surveys (Parry, Petersen, Dewing, Carney, Needle, Kroeger, *et al.* 2008; Rispel *et al.* 2011), which may be increasing the risk of HIV infection among MSM. Two studies from South Africa and Kenya have reported associations with alcohol use and inconsistent or no condom use (Lane, Shade, McIntyre & Morin 2008; Luchters, Geibel, Syengo, Lango, King'ola, Temmerman, *et al.* 2011). While some studies report limited drug use, overlap with injecting drug use risk behavior is not as common as in mixed epidemics reported in other regions of the world. Sanders *et al.* (2007) reported less than 2% of their cohort injected drugs, and 2% was reported in South Africa (Lane *et al.* 2008).

Prevalence of same-sex sexual behavior and MSM population size estimation

Estimating overall prevalence of male same-sex sexual behavior within general populations is difficult in most countries and cultural contexts, particularly in Africa where stigma associated with homosexuality and HIV is rife. Limited measurements of male same-sex sexual behavior within youth study populations have been documented; including 3.6% in a survey in South Africa (Jewkes, Dunkle, Nduna, Levin, Jama, Khuzwayo, *et al.* 2006) and 2.3% in a study in Tanzania (Mwakagile, Mmari, Makwaya, Mbwana, Biberfeld, Mhalu, *et al.* 2001). These few available proportions informed published estimates of lifetime prevalence of male same-sex activity at about 2% (Cáceres *et al.* 2008).

Given awareness of the African MSM HIV epidemic, however, it is critical to attempt reasonable population size estimates of MSM for prevention, treatment, and care program planning. Unfortunately, very few studies have collected such data, and the currently documented estimations were of only male sex worker subgroups. Male sex workers population size estimations have been reported in Mombasa, Kenya (793; Geibel, van der Elst, King'ola, Luchters, Davies, Getambu, *et al.* 2007); the Hillbrow area of Johannesburg, South Africa (424; Kellerman, Fipaza, Bagnol, Scorgie & Geibel 2009); and in the three Nigerian cities of Lagos (865), Kano (641), and Port Harcourt (358; Karlyn, Adebajo, Nwachukwu, Tocco, Abiodun, Anene, *et al.* 2010). These size estimations are useful in that they indicate the possible existence of similar populations of male sex workers in other major African cities, as well as pointing to a much broader population of MSM including those who do not sell and/or pay for sex (van Griensven 2007). Studies to date have not attempted to estimate ratios of male sex workers to their clients. Some have reported median numbers of two clients in past 7 days in Mombasa (Geibel *et al.* 2008) and one client on their last working day in Abidjan (Vuylsteke *et al.* 2012), but client network analysis is lacking.

HIV testing and access to services

HIV testing and counseling (HTC) is an entry point to HIV prevention, care, and treatment and forms one of the key interventions provided as part of package by most national HIV programs. Although HIV testing services were designed for

heterosexual populations, there are now limited government and non-governmental specialized HTC programs available to MSM in some locations including Kenya and South Africa (National AIDS Control Council of Kenya & Population Council 2009). Various studies have shown that the HIV testing rates amongst MSM is very low, resulting in many HIV positive MSM not knowing their status. For example, one recent study found that the number of HIV positive MSM who knew their HIV status was only 4.7% in Malawi, 17.4% in Botswana and 59.2% in Namibia (Baral *et al.* 2009). The low testing rates among MSM are partly due to general lack of targeted services and other barriers created by unfavorable social, political and legal environments.

Behavior change interventions

To date, there is limited information available on the effectiveness of interventions aiming to reduce HIV risk behaviors among African MSM. In Senegal, a pre-post intervention study—using snowball recruitment methods—reported increases in HIV testing and consistent condom use after implementation of MSM peer education programs (Moreau *et al.* 2007). A similar study in Mombasa used a more rigorous time-venue sampling of male sex workers to measure the impact of peer education. While the Mombasa study found statistically significant improvements in consistent condom use, use of water-based lubricants, and HIV knowledge; the interventions had limited reach among the total estimated population of male sex workers. The authors thus suggested that more comprehensive interventions are likely needed to effectively reduce incidence among male sex workers in Mombasa (Geibel, King'ola, Temmerman & Luchters 2012).

There have been very few studies that have reported on service coverage and efficacy of interventions targeting MSM in Africa. This gap is related to general lack of health programs targeting MSM due to lack of prioritization and the challenging social, political and legal environments. In addition, even when countries are willing to develop programs for MSM, policy makers may not be certain of the appropriate evidence-based package of interventions leading to procrastination in programming. Overall, the few studies that have evaluated access to HIV services among MSM populations have generally documented limited access due to unavailability of services and other structural barriers such as widespread stigma and discrimination (Moreau *et al.* 2007; Onyango-Ouma *et al.* 2005).

Currently, this trend seems likely to improve with increasing recognition of the need to better understand the local diversity of HIV burden and transmission dynamics in countries. Specifically, UNAIDS has advocated for use of new epidemiological tools such as the epidemiological modes of transmission model to help countries get better insight on sources of new infections and the role of various subgroups in HIV transmission even in generalized epidemics (Gouws, White, Stover & Brown 2006). Subsequently, a number of HIV programs have reviewed their national responses to include strategies targeting MSM after realization of the epidemiologic importance of these groups and the inadequacy of the current responses (Geibel *et al.* 2010).

Studies on strategic use of anti-retroviral therapy among MSM for HIV prevention

Recently, there have been encouraging multicounty studies on the potential use of anti-retroviral therapy for prevention that involved MSM from Africa. The global iPrEx study enrolled 2500 MSM, including South African participants, and results showed that daily use of a pre-exposure prophylaxis (PrEP) could reduce the risk of sexual transmission of HIV by 44% (Grant, Lama, Anderson, McMahan, Liu, Vargas, *et al.* 2010). In this study, efficacy was shown to be correlated closely with drug adherence. Recognizing the strategic importance of adherence in determining the efficacy of PrEP, attempts have also been made to try and identify other dosing regimens that could promote adherence and are more feasible than daily use of drugs. A study in Kenya also found out that adherence to intermittent dosing regimens, particularly coitally dependent doses, may result in poorer adherence than with daily dosing. It also reported high acceptability of PrEP, regardless of dosing regimen, indicating potential to roll out PrEP among MSM in Africa (Mutua, Sanders, Mugo, Anzala, Haber, Bangsberg, *et al.* 2012).

Human rights and HIV among MSM

Overall the unfavorable political, cultural, and religious hostility towards MSM thus mediates risk and vulnerability to HIV, and also presents a major barrier to implementing effective policy, and health programs for African MSM. MSM form one of the most stigmatized of all HIV risk groups in sub-Saharan Africa and are often subjected to homophobia, harassment, discrimination, and criminalization by various state agents, health workers, or even their family members (Geibel *et al.* 2010; Smith *et al.* 2009). Male same sex sexual behavior is illegal in thirty-one sub-Saharan countries and potentially attracts the death penalty in four (Otto 2010).

A number of studies have documented the public health consequences of widespread human rights abuses among MSM including increased risk of HIV acquisition and limiting access to lifesaving HIV services. For example, a study in Kampala found out that MSM who suffered homophobic abuse were five times as likely to be HIV-infected as those who were unexposed (Hladik, Barker, Ssenkusu, Opio, Tappero, Hakim, *et al.* 2012). Exposure to discrimination or violence has also been reported among MSM in three Southern African countries (Baral *et al.* 2009), and associated with inconsistent or no condom use in Kenya (Geibel *et al.* 2012). Additionally, experiencing discrimination has been associated with limitation of access to, and uptake of, HIV services (Fay *et al.* 2011).

Challenges and limitation of the MSM studies in Africa

There have been a considerable number of new biological and behavioral survey measurements and studies on MSM in Africa, which have formed an important basis for policy dialogue. However, the studies have many methodological, social, and structural challenges. These limitations reflect practical difficulties in engaging with highly stigmatized populations in Africa, and

unfortunately limits utility of some of the findings and impairs generalizability across studies and countries.

Terminologies and typologies of MSM and sexual identities

While the use of the terminology 'MSM' underscores the behavioral aspects of biological males having sex with other biological males, it overshadows their diversity and often overlapping typologies and social constructs (Khan & Khan 2006; Young & Meyer 2005). Therefore categories of sexual orientations and categories used in studies across the region may have different meanings, making comparison and interpretation challenging and may lead to technical flaws.

Most studies often describe MSM as one homogenous group when in fact there are differences in sexual risks and vulnerability, depending on a number of social economic and behavioral factors. Small sample sizes may not be able to identify any differences among some epidemiologically important subgroups such as those who are sex workers, bisexuals, married to females, injecting drugs users, and those living with HIV.

Possible over-representation of male sex workers in survey populations

Many of the reviewed studies appear to often over sample male sex workers for reasons including (a) ease of identification and location, (b) eagerness to participate in studies, and (c) leveraging their engagement with civil society groups as an entry point for some surveys. Thus, HIV prevalence data are usually estimated from samples of MSM recruited from these male sex workers and their high-risk networks—thus possibly overestimating the number of HIV-positive MSM in some locations. The true burden of HIV in the general MSM populations is therefore uncertain, and has been an issue of contention in some countries for MSM communities who are not engaged in sex work. Over-sampling from high-risk groups also biases other sexual behavioral indicators that are usually monitored in bio behavioral studies. Studies using the respondent-driven sampling (RDS) method may be compensating for this effect through statistical adjustments, as RDS adjusts for the larger sexual networks of sex worker populations. This is evidenced by higher reported HIV rates in some studies which recruited through snowball methods, particularly in Senegal; Cote D'Ivoire; Malawi, and some cities in South Africa (Table 1).

Recruitment methodologies and diversity of indicators

There have been inconsistencies in recruitment methodologies, HIV-testing protocols, definitions of indicators, and reference periods for sexual risk behaviors. As shown in Table 1, this sometimes affects comparability across studies, including variability of HIV results and behavioral indicators. Many of the studies use snowball methods due to ease of administration, and there are inherent biases in this non-probability sampling method. Illegal nature of same-sex behavior, homophobia, discrimination and human rights violations pose challenges for research, and thus limit the use of more robust research recruitment methods such as time-location and respondent driven sampling. Time-location

sampling was used in one study, and this application is probably best suited for male sex workers in areas where client-seeking is concentrated in definable public venues. The primary limitation of using time-location for broader MSM populations is the inability of this method to locate and survey non venue-based MSM (Johnston, Sabin & Prybylski 2010). RDS, however, is probably the most desirable methodology for MSM in Africa, as it has been proven feasible in over six countries, and RDS analysis adjusts results to provide estimates which may be more representative of broader MSM populations.

Geography and demography of survey populations

Further, most MSM studies are usually done in major urban areas, and these data are unfortunately often reported as national data, and even reported to UNAIDS as national estimates. There are usually limited representations of MSM outside major urban cities and therefore are more difficult to access. Also the current published studies show that the median age of study participants range from 22 to 29 years, clearly showing that little is known about the older MSM populations in the region.

Finally, despite progress being made in positioning the epidemiological importance of MSM in regional HIV epidemics, a majority of African countries have failed to undertake any bio-behavioral studies on MSM. Reasons for this range from lack of political will, denial of existence of MSM, lack or recognition of MSM as an epidemiologically important group that needs to be prioritized, fear of legal consequences of conducting research, and underfunding. As Figure 1 shows, the localized HIV epidemics among MSM appear to require attention regardless of the severity of associated general HIV epidemics—especially in lower prevalence countries.

Future directions for research Improve and harmonize surveillance and research methodologies and indicators

While recognizing progress made in research on MSM in Africa, there is potential for improvement in research methods so as to produce good quality data for policy dialogue, and to inform planning of HIV prevention and care services for MSM. Improvements can be made in the following areas: (a) consensus on methodologies for undertaking size estimations and important characteristics of the sub populations, (b) standardization of indicators measured in surveys for assessment of sexual practices (and time periods in which measured practices take place), and (c) expansion and standardization of MSM HIV surveillance, research designs, and data gathering strategies.

Qualitative studies to enhance understanding of survey findings

While this review has concentrated on larger quantitative surveys of MSM, a limited number of studies have reported qualitative investigation of MSM behavior and health risks in places including Senegal (Teunis 2001), Namibia (Lorway 2006), Kenya (Okal, Luchters, Geibel, Chersich, Lango & Temmerman 2009), and Nigeria (Allman, Adebajo, Myers, Odumuye & Ogunsola 2007). Qualitative information is needed to help explain several findings

from the surveys reviewed here, and to explore issues and contexts which quantitative surveys cannot generally explain. Some priority studies are: (a) sexual identities and various typologies, (b) various social and cultural contexts in which male same-sex sexual behavior takes place, and (c) practice of anal sex as part of broader societal or heterosexual contexts.

Cohort recruitment for scientific research

Considering the growing demand for evidence-informed HIV prevention and treatment programs, there is need to recruit cohorts of MSM to support scientific research. This could support studies on treatment adherence and outcomes, prevention studies, feasibility/acceptability studies for new technologies, (e.g. rectal microbicides), future vaccine trials, and other intervention studies.

STI research and presumptive treatment for bacterial STI

Recognizing the role of STIs in HIV transmission, and profiles of co-morbidities associated with HIV, there is need to expand our understanding of the burden of the bacterial STIs and important viral STIs such as hepatitis types B and C to inform development of appropriate health services packages for MSM. Studies on the etiology and drug resistant patterns for common bacterial STI can inform the development of appropriate syndromic management of STIs among MSM, noting the limited lab capacity for etiological diagnosis of STIs in most health systems in sub-Saharan Africa. Further investigation of the effectiveness of presumptive STI treatment for anorectal NG and CT infections among MSM in Africa is needed.

Confirm safety of water-based lubricants

Further research on safety of water based lubricants—a key prevention supplied by many MSM health programs in Africa—needs to be further assessed and evaluated. Recent evidence suggests some water-based lubricants may possibly increase risk for anal transmission of HIV and STIs (Begay, Jean-Pierre, Abraham, Chudolij, Seidor, Rodriguez, *et al.* 2011; Gorbach, Weiss, Jeffries, Fuchs, Hezerah, Brown, *et al.* 2010; Russo, Rohan, Moncla, Ayudhya, Wang, Cost, *et al.* 2010).

Continue study of PrEP as an intervention for high-risk MSM

The latest advances in potential role of ARVS for HIV prevention following finalization of the IPReX, CAPRISA 004, HPTN-052 and partners prep studies creates additional opportunities to apply these findings to prevent HIV among MSM in Africa. Therefore, real-world application of the effectiveness of topical versus oral PrEP, or the role of treatment as prevention for sero-discordant male couples, are likely to be important components of the future HIV prevention research agenda among MSM in Africa (Baral, Scheibe, Sullivan, Trapence, Lambert, Bekker, *et al.* 2012).

Conclusion

Despite the methodological and other limitations noted in studies on MSM in Africa, the current body of evidence across the content clearly establishes that there is widespread existence of

MSM groups, and that they are at high risk of acquiring HIV due to behavioral, social, cultural, and structural factors. The evidence of behavioral links with the heterosexual networks has been reported and further supported by the phylogenetic studies. The few studies conducted, and health services established for MSM needs, operate within an often hostile social-political environment due to criminalization of same sex sexual behavior. With growing evidence of the epidemiologic importance of MSM in the region, there is therefore need for continued support for expansion of studies and packaging the results for policy advocacy and for informing program and service development for MSM. Further, there is urgent need to not only support development of appropriate interventions for MSM in Africa but also to invest in addressing the structural barriers that may impede access to services in the future.

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