

# Seroprevalence, Knowledge and Behavioral Factors Associated with HIV Infection Among Men Who have Sex with Men (MSM) in Benin

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**Abstract:** Most of HIV infections among adults in sub-Saharan Africa have been acquired through unprotected sex, including with sex workers and through sex between men. Unprotected sex between men promotes the transmission of STIs and HIV in particular. Unprotected anal penetration is a high-risk route of transmission. The study will estimate HIV prevalence and describe the risk factors associated among MSM population. From January to April 2016, 414 participants were enrolled in the study by the "Respondent-Driven Sampling"; the variables measured were biological, behavioral and HIV knowledge factors. Univariate and multivariate analysis were conducted and the results were weighted. MSM are predominantly young: 50.4% (41.7- 59.2) are between 20 and 24 years old, the weighted HIV prevalence is 21.8% (95% CI: 13.5 - 30.7). More than half of participants 54.4% (43.9 - 64.8) did not have accurate knowledge of HIV. Condom use during the last anal sex is significantly associated with HIV AOR (adjusted odd ratios) 0.47 (95% CI: 0.36-0.62),  $p < 0.0001$  adjusted on potentially confounding factors. This is about those below 25 years AOR 0.7 (95%CI: 0.55-0.90,  $p < 0.0005$ ), the educational level AOR 22.18 (95% CI: 9.49-59.75,  $p < 0.0001$ ), living in couple, AOR: 2.01 (95% CI: 1.54-2.63)  $p < 0.0001$ ; frequency of condom use with lubricant, AOR: 1.3 (95% CI: 1.03-1.65,  $p < 0.029$ ). This study highlights a high HIV prevalence among the MSM population and therefore shows the need to develop specific high-impact prevention programs towards this key target group while promoting an environment of protection and respect for human right.

**Keywords:** HIV, Epidemiology, Men Sex Men, Risk Factors, Africa

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## 1. Introduction

In sub-Saharan Africa, the number of new HIV infections remains high [1, 2]. Worldwide, 36.7 million people are living with HIV and 1.8 million people were infected with HIV in 2016, including 600,000 and 370,000 people respectively in West and Central Africa [3]. As for target populations and their sexual partners, they are responsible for 47% of new HIV infections worldwide, and 16% of new HIV infections in Eastern and Southern Africa [2, 3].

Although the HIV epidemic varies considerably from one country or region to another, Sub-Saharan Africa remains the most affected region, with nearly 1 in 20 adults (4.9%) living with HIV and representing 69% of people living with HIV worldwide [4]. Most of HIV infections among adults in sub-Saharan Africa have been acquired through unprotected sex, including with sex workers and during sex between men [1]. Unprotected sex between men promotes the transmission of STIs and HIV in particular; unprotected anal penetration is a high-risk route of transmission [2, 4, 5]. The risk of contracting HIV is 27 times higher among men who have sex with men (MSM); [2, 6]. A meta-analysis of monitoring data from low- and middle-income countries, found that MSM are 19.3 times more likely to be infected with HIV than people in the general population. The same source reveals that the incidence of HIV infection among MSM ranges from 1.2 to 14.4 per 100 people per year [4, 5]. Recent studies conducted in sub-Saharan Africa and reported in the UNAIDS report found among MSM, HIV prevalence ranging from 6% to 37% [4, 5].

Like most countries in the sub-Saharan sub-region, homosexuality is considered an "illegal" practice in Benin, and sex between men is perceived as a social deviance [7, 8]. This situation exposes MSM to stigma and discrimination and makes them particularly vulnerable to violence of all kinds [8, 9]. Benin is a mixed epidemic country that has conducted very few scientific studies on the dynamics of the epidemic among HIV targets: injecting-drug users (IDUs) and MSM [11-13]. However, it has studies on HIV transmission patterns at the level of key populations (MoT) [6, 14]. MSM populations remain a concern of the national response to HIV infection. Therefore, they are part of the key targets of the various national HIV strategic plans in Benin [15]. The purpose of this study is to determine the prevalence of HIV infection and to analyze behavioral factors and knowledge associated with HIV.

## 2. Methods

### 2.1. Type and Scope of the Study

This is a cross-sectional study carried out from December 2015 to March 2016. The sites covered were primarily located in the principal cities of the departments, particularly those selected in the study entitled: Analysis of the situation of MSM and IDUs in the fight against STI/HIV/AIDS in Benin

in 2012 [10]. In order to take part in the study, one must be a biological male aged at least 18, and must have had at least once anal (receptive or insertive) or oral (fellatio and/or anilingus) sex with a male partner over the 12 months preceding the survey.

### 2.2. Sampling Method

The sampling method, known as "respondent-driven sampling" (RDS), is also called respondent-determined sampling or snowballing sampling [16-19]. This method is suitable for recruiting hidden or stigmatized populations. First of all, it consisted in choosing, in a reasoned manner, the first participants as the starting point of the recruitment chain. They are called "Seeds". They have been selected to participate in the study mainly for their ability to recruit and mobilize people from their networks. They were diversified according to age and socio-economic conditions [19]. These first nine (09) respondents, after their interview, recruited other people. This first set of respondents recruited by the first participants in the survey constitutes the first wave. This first wave engaged in turn, other people who will constitute the second wave of participants and so on until the sample size is reached.

After the interview, each respondent received serial numbered coupons called "reference coupons". These coupons will be used by a MSM who has already been interviewed and who refers some of his peers to participate in the survey. The recruited person keeps this coupon and shows it before participating in the survey. Each participant has received three serial numbered recruitment coupons to be given to his peers individually known to him and homosexuals or bisexuals. When a coupon was rejected, the recruiter completed a rejection questionnaire to assess the conditions for refusal and then identified a replacement in order to match the sample size. Reference numbers and coupons will not allow identifying respondents. The interviews took place in specific adapted sites selected for the study. The first respondents called recruiters or "Seeds" are in compliance with the heterogeneity principle of the sample. To achieve this, the research team ensured beforehand that all categories of MSM have been taken into account during the first recruitment, particularly homosexuals and bisexuals (active, passive or versatile). A second coupon serves as travel expense reimbursement coupon. It's also called a receipt coupon or simply a receipt. It's kept by the recruiter who uses it to claim travel expenses. These fees, which are fixed at a flat rate, range from \$2 to \$10, depending on places of recruitment and interview.

### 2.3. Sample Size

The calculation of the number of subjects required for the study was made on the basis of the following estimates: for an HIV prevalence of 17% and an accuracy of 5%, with a confidence interval of 95% of the expected prevalence that varies between 10% and 30%, and a cluster effect of 2 [6]. The estimated sample size is 434 MSM [20].

## 2.4. Data Collection

A standardized, pre-tested and structured questionnaire was used to collect data [21-23]. It addressed socio-demographic characteristics, including level of education, sexual knowledge, behavior or practices, opinions and attitudes towards STIs and HIV/AIDS; types of sexual intercourses; use of condoms and lubricant gels; alcohol and drug use, voluntary testing and HIV.

Participation in HIV testing was not mandatory, but was strongly encouraged. At the end of the behavioral investigation and achievement of informed consent, trained laboratory technicians carried out the screening test at the study site, in accordance with national standards and procedures and also with references for the confirmation of positive or undetermined cases. Concerning the referrals, a partnership has been concluded with care sites within each city hosting the collection sites for the effective management of positive cases.

The HIV screening algorithm used is that of Strategy II recommended by WHO and UNAIDS, namely: Determine HIV1&2® (3rd generation test) which is a first line and high sensitivity test and SD Bioline HIV1/2 which allows discrimination of HIV type for positive samples [12, 24, 25]. The results were shared with all MSM who gave their consent and accepted to know their HIV status with respect to ethical rules according to the Belmont report.

All the tests subjects were systematically taken on blotting paper for quality control, which was carried out in the reference laboratory of the Health Program for the Fight against AIDS.

## 2.5. Variables

The presence of anti-HIV antibodies was the dependent variable, it is a binary variable of being infected (HIV+) or not (HIV-).

The explanatory variable was the use of condoms and lubricant gels during the last anal intercourse, which is a dichotomous variable: Yes / No.

The other variables were socio-demographic, behavioral and knowledge-related variables.

Socio-demographic variables: age in years (less than 20, 20-24, 25-29, 30 and over), Marital status (Married/divorce, single), Living in couple (no, with a man, with a woman), Level of education (non-academic, primary, secondary, higher), Profession (Craftsman, Salesman, civil servant, pupils/students), Type of homosexuality (homosexual, bisexual) Sexual role (active/insertive, passive/ receptive, versatile) Behavioral variables (frequency of condom use for these anal intercourse, age at first anal intercourse with a male partner, frequency of condom use with a lubricant, condom use during last anal intercourse with a male partner, drug consumption, Knowledge-related variables (knowledge of the serological status of your regular partner knowledge level of HIV infection, knowledge of the mode of transmission.

Complete/accurate knowledge of HIV is identified through a composite variable relating to the knowledge of two means of prevention and the rejection of three misconceptions by the targets [27-30]. These are 5 Yes/No binary variables. All MSM who answered properly all questions have a complete or accurate knowledge of HIV and the others do not.

## 2.6. Data Processing and Analysis

Data were input with version 3.1. of EPI DATA software. The clearance program automatically generated an error list that was corrected. The statistical analysis was performed with RDSAT, version 5.6 [31] and SPSS version 24.0. Homophily is an indicator for measuring the fact that seeds and recruiters prefer to recruit directly from their own group rather than randomly. It has been estimated with socio-demographic variables [31, 32].

Percentage comparisons were made with Pearson's Chi-square test or the exact Fisher test. Multivariable logistic regression was used to build measures estimated between the association of HIV infection and exposure to condom and gel use, according to potentially confounding variables. The multivariate model was constructed by using both literature data and descending order data with associations of variables with a  $P < 20\%$  which are: age at first intercourse, knowledge of HIV status, age, marital status, education level, living in couple, sexual orientation, All estimates were weighted according to network size.

## 2.7. Ethical Considerations

Ethical rules were respected during the enrolment process of MSM, in accordance with ethical provisions according to the ethical opinion issued by Comité National d'Ethique pour la Recherche en Santé (National Ethics Committee for Health Research). Thus, in addition to providing travel expenses, free condoms and lubricants were given to all participants. These various costs have been converted into a minimum fee which cannot constrain participation in the survey, nor motivate participants to engage in possible double participation biases, or to induce some of them to make misleading statements in order to circumvent the non-inclusion criteria.

# 3. Results

## 3.1. Seed Characteristics

The post-data clearance study identified 414 valid participants. Of the 434 participants initially enrolled, only 414 were selected in the study, that's. 95.40%. Failures to enroll related to totally incomplete and/or double counting files (Table 1). The sizes of MSM seed social network range from 3 at Porto Novo site to 56 in second site of Cotonou (Figure 1).

Table 1. Presentation of the characteristics of the study seeds (N-9) for RDS sampling.

Seed & Collection site	Size of Social Network	Age	Sexual preference	Sex role	Instruction	HIV Status	Number of recruits	Number of waves	% of sample (n=4141)
1Co	41	26	Bisexual	Insertive	Secondary	Positive	64	4	15.46
2Co	1	20	Homosexual	Insertive	Secondary	Positive	11	3	2.66
3Co	56	24	Homosexual	Receptive	Secondary	Negative	80	4	19.32
4PN	3	25	Bisexual	Receptive	Primary	Negative	46	4	11.11
5AC	13	30	Homosexual	Insertive	High	Negative	43	4	10.40
6AC	06	22	Homosexual	Receptive	High	Negative	57	4	13.77
7Oh	44	25	Homosexual	Receptive	High	Negative	33	4	7.97
8Boh	52	24	Bisexual	Insertive	Primary	Negative	41	4	9.90
9Pk	06	23	Homosexual	Receptive	High	Positive	39	3	9.42

+ Co=city of Cotonou (3 seeds); AC: City of Abomey-Calavi (2 seeds); Oh: city of Ouidah (1 seed), PN: city of Porto Novo (1 seed); Boh: city of Bohicon (1 seed); Pk: city of Parakou (1 seed).

Regarding socio-demographic characteristics of MSM in the study, one in two MSM is under 25 years of age. 50.4% (95%CI: 41.7- 59.2), 52.83% (95%: 41.7 - 59.2) had their first anal sex with a male partner between 15 and 19 years of age. They are mostly single: 89.6% with a 95% CI from 82.7% to 96.7% (Table 2).

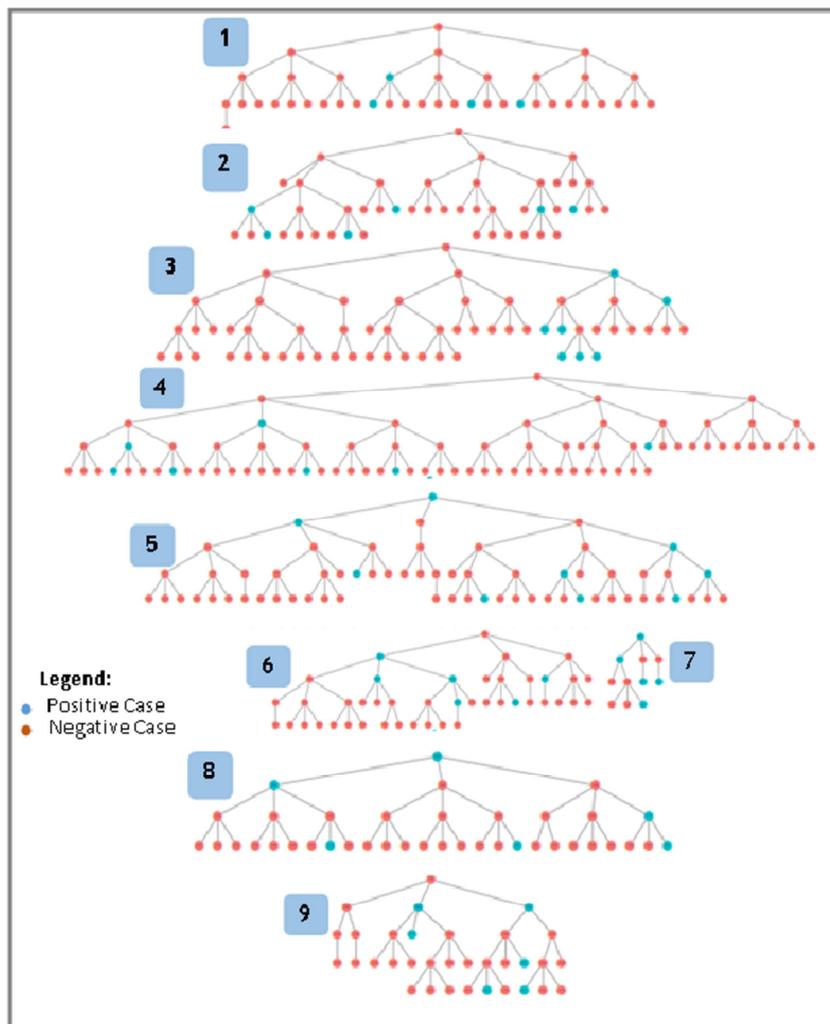


Figure 1. Graphic representation of different recruitment chains of MSM under RDS.

### 3.2. Prevalence of HIV Infection

The weighted prevalence of HIV infection is 21.8% (13.5 - 30.7). More than half of the participants 54.4% (43.9 - 64.8) didn't have good knowledge of HIV prevention and 13.3% (6.7 - 19.9) think that apparently healthy person can't be HIV positive. Of the MSM surveyed, 46.2% (37.6-54.7) consider the anal route as the sexual way with the highest risk for contracting HIV and 6.0% (3.2-9.0) consume drugs (Table 3).

**Table 2.** Descriptive characteristics of study participants.

Variables	n	Unweighted (%)	RDS-weighted (CI 95%)	Homophily
Age (years)				
under 20	55	13.3	11.1 (6.7–15.7)	0.95
20 to 24	215	51.9	50.4 (41.7–59.2)	0.90
25 to 29	120	29.0	31.3 (2.0–39.5)	1.04
30 and more	24	5.8	7.1 (2.2–12.0)	0.60
Marital status				
Married/divorced	25	6.03	10.4 (3.3–17.3)	1.02
Single	389	93.96	89.6 (82.7– 96.7)	0.97
Living in couple				
No	295	71.26	69.2 (60.7–77.7)	1.07
Yes, with a man	80	19.32	20.9 (13.3–28.4)	1.09
Yes, with a woman	36	8.70	10.0 (4.7– 5.2)	0.81
Educational level				
Out-of-school	8	1.93	0.7 (0.1–1.3)	0.86
Primary	35	8.45	7.8 (4.4–11.1)	1.06
Secondary	171	41.3	48.4 (40.1–56.9)	0.98
High level	200	48.31	43.1 (34.9–51.2)	1.02
Profession				
Craftsman	98	23.67	22.6 (15.7–29.6)	1.10
Salesman	22	5.31	4.6 (1.9–7.4)	0.96
Official	47	11.35	13.1 (7.4–18.7)	1.06
Students	247	59.66	59.7 (51.1–68.1)	1.05
Homosexuality Type				
Homosexual	260	62.8	56.4 (45.9– 66.8)	1.01
Bisexual	154	37.2	43.6 (33.2–54.1)	0.98
Sexual Role				
Active/Insertive	224	54.11	60.8 (52.3– 69.2)	0.96
Passive/Receptive	128	30.92	30.3 (22.3– 38.4)	1.10
Versatile	55	13.29	8.8 (0.8 – 11.9)	0.95
Age at first intercourse				
15 - 19 years	227	54.83	52.8 (41.7– 59.2)	0.99
20 - 24 years	187	45.17	47.2 (38.4– 55.9)	0.99
Use of condom during last anal intercourse				
Yes	307	74.15	71.5 (62.4– 80.6)	0.98
No	107	25.84	28.4 (19.4– 37.6)	1.10

### 3.3. Level of Knowledge and HIV Risk Factors in MSM

**Table 3.** Level of knowledge and HIV risk factors in MSM.

Variables	n	Unweighted (%)	RDS-weighted (CI 95%)
Sexual route with the highest risk of contracting HIV			
Manual	3	0.72	0.7 (0.0– 1.9)
Oral	12	2.90	2.1 (0.6– 3.6)
Vaginal	214	52.69	51.0 (42.3– 59.6)
Complete/accurate knowledge of HIV			
Yes	155	39.3	45.6 (35.2– 56.1)
No	239	60.7	54.4 (43.9 – 64.8)
Sexual orientation			
Active or insertive	224	54.11	60.7 (52.2 – 69.3)
Passive or receptive	128	30.92	30.4 (22.3 – 38.5)
Versatile (one or the other)	55	13.29	8.9 (5.9–11.8)
Most risky type of anal sex			
Anal active	27	6.52	7.9 (2.3 – 13.4)
Anal passive	210	50.72	52.6 (43.7 – 61.5)
Both have the same level of risk	177	42.75	39.5 (31.3 – 47.8)
Liquids produced by the human body that can transmit HIV in men			
Sperm	389	93.96	96.5 (94.6 – 98.5)
Blood	414	100.00	1.00 (---)
Saliva	100	24.15	24.7 (16.6 – 32.9)
Gateways of HIV in men bodies			
Sexual	406	98.07	98.5 (97.3– 99.8)
Blood	402	97.10	97.1 (95.0 – 99.1)
Anal	360	86.96	86.7 (80.7 – 92.8)
Oral	228	55.07	60.0 (51.7 – 68.2)
Wounds	329	79.47	76.6 (68.8 – 84.3)

Variables	n	Unweighted (%)	RDS-weighted (CI 95%)
Drug consumption			
Yes	37	8.94	6.0 (3.2 – 9.0)
No	377	91.06	93.9 (91.0 – 96.8)
Types of drugs (n=37)			
Gue/Indian Hemp /cannabis	35	94.59	96.6 (92.1– 00.0)
Cocaine/Heroin	2	5.41	3.4 (3.0 – 4.1)

### 3.4. Use of Condoms and Lubricating Gels

MSM who used the condom every time when having anal sex, to protect themselves, were 89.3% (83.0 - 96.0). But during the last anal sex with a man only 7 out of 10, or 71.5% (63.3 - 80.0) use it. Percentage of condom use during the last vaginal or anal intercourse with a woman is 45.9% (37.2 - 54.6). The water-based lubricant is the most used with condoms by MSM, 66.2% (57.3-75.1) (Table 4).

### 3.5. Univariate and Multivariate Analysis

Several socio-demographic variables have been associated with HIV infection (Table 5). It's the marital status (RDS-weighted OR: 0.15, 95%CI: 0.15 – 0.18), educational level (RDS-weighted OR: 2.15, 95% CI: 1.67 - 2.81), the fact

that the MSM lives in couple (RDS- 95%CI 1.21-1.59), full knowledge of HIV (RDS-weighted OR: 2.2, 95% CI: 1.96 - 2.49). The final multivariate model included: condom use at last anal intercourse, age, marital status, education level, couple life, sexual orientation, age at first intercourse, testing and knowing the result. Condom use at last anal sex is significantly associated with HIV infection (adjusted AOR RDS: 0.47 95%CI: 0.36-0.62), p<0.0001) adjusted on potentially confounding factors. It's about the age of less than 25 years (adjusted AOR RDS: 0.7; 95%CI: 0.55-0.90), p<0.0005, education level (adjusted AOR RDS: 22.18, 95%CI: 9.49-59.75) p<0.0001, lives in couple, (adjusted AOR RDS: 2.01 95%CI: 1.54-2.63) p<0.0001; frequency of condom use with lubricant, (adjusted AOR RDS: 1.3; 95% CI: 1.03-1.65) p<0.029.

**Table 4.** Distribution of men who have sex with men according to their use of male condom and lubricant use.

Variables	n	Unweighted (%)	RDS-weighted (CI 95%)
Used the condom at every anal sex to protect himself (N=414)	389	93.96	89.3 (83.0 – 96.0)
Has used the condom during the last anal intercourse with a man (N=414)	307	74.15	71.5 (63.3 – 80.0)
Condom in the last 12 months has torn during sex (N=414)	69	16.67	10.3 (6.5 – 14.2)
Has used condom during the last vaginal or anal intercourse with a woman (N=411)			
Yes	210	50.72	45.9 (37.2 – 54.6)
No	81	19.57	25.3 (16.6 – 34.0)
Never with a woman	120	28.99	28.8 (21.0 – 36.6)
Type of lubricant used together with condom (N=404)			
Saliva	40	9.66	6.9 (4.2 – 9.6)
Vaseline, ointment	67	16.18	17.0 (10.2 – 23.8)
Water-based lubricant	274	66.18	66.2 (57.3 – 75.1)
Shea butter	10	2.42	2.6 (0.0 – 5.3)
Body milk	13	3.14	7.2 (1.0 – 13.4)
Frequency use of water-based lubricant (N=414)			
Always	203	49.03	43.4 (34.7 – 52.1)
Sometimes	153	36.96	41.3 (32.5 – 50.1)
Never	58	14.01	15.3 (8.1 – 22.4)
Frequency use of condom together with lubricant (N=414)			
Both always together	210	50.72	42.6 (34.0 – 51.0)
Both sometimes together	204	49.28	57.3 (49.0 – 66.0)
Reasons for not using condoms with your partners (N=182)			
Reduces feelings	58	14.01	33.4 (21.5 – 45.5)
Reduces pleasure	68	16.43	37.1 (23.7 – 50.6)
Limited availability	13	3.14	6.5 (2.1 – 11.0)
Faithfulness to my partner	27	6.52	14.9 (5.0 – 24.8)
Know the HIV-status of my partner	16	3.86	7.3 (1.2 – 13.4)

**Table 5.** Bivariate and multivariate analysis of HIV sociodemographic and risk factors in men having sex with men in Benin.

	HIV-Positive (n1=56)		HIV-negative (n2=358)		OR (Unweighted)		OR (RDS Weighted)	
	n	%	n	%	OR	CI 95%	OR	CI 95%
Age (years)								
25 and more	20	35.7	124	34.6				
under 25	36	64.3	234	65.2	0.95	0.52-1.71	1.04	0.92-1.18
Marital Status								
Married/divorced	5	8.93	20	5.59				
Single	51	91.07	338	94.41	0.6	0.22-1.68	0.15	0.13-0.18

	HIV-Positive (n1=56)		HIV-negative (n2=358)		OR (Unweighted)		OR (RDS Weighted)	
	n	%	n	%	OR	CI 95%	OR	CI 95%
Educational Level								
Out-of-school/primary	4	9.3	39	90.7				
Secondary	29	17.0	142	83.0	1.99	0.73-7.01	2.15	1.67-2.81
High	23	11.8	177	88.5	1.27	0.46-4.50	1.11	0.85-1.45
Living in couple								
No	36	94.9	259	88.4				
Yes, with a woman	2	5.3	34	11.6	0.42	0.10-1.84	2.83	2.45-3.25
Yes, with a man	17	89.5	63	64.5	1.94	1.03-3.69	0.07	0.03-0.12
Sexual Orientation								
Active/insertive	24	43.6	200	56.8				
Passive/receptive	24	43.6	104	29.5	1.92	1.04-3.55	1.39	1.21-1.59
Versatile	7	12.7	48	13.6	1.22	0.5-2.95	1.48	1.19-1.83
Homosexuality Type								
Pure Homo	38	14.6	222	85.4				
Bisexual	18	11.7	136	88.3	0.77	0.42-1.39	1.14	1.01-1.29
Has made his test and knows his result								
No	7	35.0	13	65				
Yes	33	12.7	226	83.7	0.27	0.10-0.77	0.13	0.10-0.16
Condom use during last anal sex with a male partner								
No	24	42.9	83	23.2				
Yes	32	57.1	275	76.8	0.4	0.22-0.72	0.19	0.16-0.21
Age at first intercourse (years)								
14-19	36	15.9	91	84.1				
20-24	20	10.7	167	89.3	0.64	0.35-1.13	0.85	0.75-0.96
Complete knowledge of HIV								
No	34	13.1	5	86.9				
Yes	34	14.2	133	85.9	0.1	0.61-1.94	2.2	1.93-2.49
Know his partner's HIV status								
No	30	13.2	197	86.8				
Yes	26	13.9	161	86.1	1.06	0.60-1.87	2.29	2.02-2.61
Frequency of condom use with lubricant								
Both are always use together	29	14.2	175	85.2				
Not always together	27	12.9	183	87.1	0.89	0.51-1.56	0.69	0.61-0.79

Table 5. Continued.

	Multivariate AOR (unweighted)			Multivariate RDS weighted AOR		
	OR	CI 95%	P	OR	CI 95%	P
Age (years)						
25 and more						
under 25	1.31	0.56-3.04	0.526	0.7	0.55-0.90	0.005
Marital Status						
Married/divorced						
Single	0.19	0.02-1.44	0.123	0.006	0.003-0.013	0.001
Educational Level						
Out-of-school/primary						
Secondary	6.38	1.02-128.90	0.101	78.33	33.64-211.18	0.000
High	4.1	0.66-82.49	0.211	22.18	9.49-59.75	0.000
Living in couple						
No						
Yes, with a woman	2.14	0.88-5.09	0.085	2.01	1.54-2.63	0.000
Yes, with a man	0.23	0.02-1.66	0.209	0.002	0.0008-0.007	0.000
Sexual Orientation						
Active/insertive						
Passive/receptive	1.88	0.84-4.23	0.122	0.65	0.50-0.84	0.001
Versatile	0.86	0.22-2.69	0.804	1.27	0.91-1.77	0.154
Homosexuality Type						
Pure Homo						
Bisexual						
Has made his test and knows his result						
No						
Yes	0.3	0.088-1.05	0.054	0.34	0.23-0.50	0.000
Condom use during last anal sex with a male partner						
No						
Yes	0.62	0.26-1.49	0.267	0.47	0.36-0.62	0.000

	Multivariate AOR (unweighted)			Multivariate RDS weighted AOR		
	OR	CI 95%	P	OR	CI 95%	P
Age at first intercourse (years)						
14-19						
20-24	0.38	0.16-0.84	0.021	0.66	0.52-0.83	0.000
Complete knowledge of HIV						
No						
Yes						
Know his partner's HIV status						
No						
Yes						
Frequency of condom use with lubricant						
Both are always use together						
Not always together	0.72	0.32-1.60	0.416	1.3	1.03-1.65	0.029

## 4. Discussion

### 4.1. Strengths and Assets of the Study

The study highlighted the very high prevalence of HIV infection among the MSM population compared to the general population (almost 20 times higher) [34]. Several factors such as age, condom use and the use of condoms and lubricant gels are associated with this high prevalence of HIV infection among MSM. It shows the contributory nature of MSM to new HIV infections at the national level by confirming their status as key populations. This situation challenges the actors of the national response to HIV infection for setting up specific programs with a high impact of prevention, such as combined prevention (pre-exposure prophylaxis) and HIV infection for the benefit of this target group.

### 4.2. Comparison with Other Studies in Terms of Similarities and Differences

More than 60% of MSM are under 25 years of age and this result is similar to those found in several sub-Saharan African countries [10, 11, 35-37]. Young homosexuals currently tend to experience more easily their sexual orientation, thanks to the conducive global environment for the defense and protection of human rights and the easy accessibility to new communication and information technologies. This facilitating and favorable environment would explain this result [1, 4, 14]. A significant proportion of MSM reported being the receptive partner during anal sex. This result is comparable to that found in other studies in Malawi [5] and Cameroon [10] and shows the increased risk of HIV exposure associated with unprotected receptive anal sex (RDS-weighted OR: 0.65, 95%CI: 0.50-0.84),  $P < 0.001$ . One out of five MSM is HIV-positive and this is significantly higher than HIV prevalence in the general population [11, 25] but consistent with that observed in most similar studies and ranges from 17.4% to 25.5 in the following countries, Cameroon, Togo and Nigeria [4, 10, 35]. The high level of HIV prevalence can be explained by anal sexual risk factors, low coverage of interventions in prevention packages and by the social exclusion and "hidden" lifestyle of homosexuals due to discrimination and stigmatization displayed by the general population

towards them [11, 36, 38]. Bisexuality is shared by 17% of MSM who live transversally their sexual lives in the general population and are thus a significant source of new infections [3, 4, 39]. This bisexual behavior is sometimes a constraint for MSM who are compelled to hide to live peacefully their homosexuality in culturally hostile societies, but they say they never feel comfortable [8, 18, 40]. This situation varies from one country to another and ranges from 14.6% to 58.9% in Togo, Uganda, Mozambique and Gambia [35, 38, 39, 41] and is closely linked to the high stigmatization of this target among the general population. The minimum age at first anal intercourse with another man is 19 years, which indicates early anal intercourse. It's 15 years in Mozambique [39]. It should be noted in this context that there are very few HIV prevention programs specific to this age group, to address this issue [44, 45]. Very few MSM in the study use condoms with lubricant, which are true means of preventing HIV infection and especially preventing condom tearing and mucosal damages (potential transmission opportunity, if the partner is HIV-positive) during anal sex. For MSM who consistently use condoms and lubricants, they are 1.3 times more protected than those who sometimes use both OR: 1.3 (95% CI: 1.03-1.65). Access to lubricant is difficult for MSM populations, only 11.3% have access to it in Gambia and 16.8% use water-based lubricants, compared to 43.04% in Benin [38]. Condom use by MSM at last anal intercourse is 71.5 (62.4 - 80.6) compared to 66.2% in a study realized in Gambia, 76.0% (70.0-81.2) in Mali and 76.1 (70.5-81.2) in Mozambique, indicating an average protection level against HIV infection for MSM. But this performance falls when it comes to using condoms combined with lubricating gels. With regard to the level of complete knowledge on HIV infection, less than half of MSM 45.6% (35.2 - 56.1) have it, and those with a level of complete knowledge are 2.2 times more likely to be protected from HIV infection than others. They can also benefit from new combination prevention strategies such as Pre-Exposure Prophylaxis of HIV infection in men who have sex with men (PrEP) and/or preventive treatment of infected people (screening and treatment).

### 4.3. Limitations

The results of our study concerned mostly young MSM

with a relatively high level of education; this may not reflect the entire MSM population, so there may be a problem with generalizing the study results, but with the Responding Driven Sampling (RDS) method, and the characteristics of initial seeds selection, this bias is minimized [14, 17]. This is a cross-sectional study, and it does not allow a causal link between the associations with HIV infection [39, 46, 47], but this study has the advantage of presenting, in a descriptive way, the situation of HIV infection among MSM population. MSM are people who live hidden, by reason of stigma and discrimination, especially in African countries, which may limit their participation in the study. But the fact that we have worked with the two major networks and with all MSM associations and the use of RDS [14, 17] have completely reduced this selection bias.

## 5. Conclusion

This bio-behavioral study showed a high prevalence of HIV infection among MSM populations in Benin with strongly associated behavioral factors. These results of the study call for the national response system to HIV infection at several levels: managerial, design and implementation of interventions for the benefit of the MSM target, taking into account the specificity of this target in a complex social, cultural, religious and legal environment, monitoring and evaluation of interventions in order to verify whether it really allows, from year to year, the reversal of the trend of the HIV epidemic in the population in general and in particular in the MSM population.

With regard to the managerial level: it is urgent to include this target in the national epidemiological surveillance system and to give it all the necessary attributes. As for the design of interventions in an environment marked by stigma and discrimination, particular emphasis must be placed on projects and programs that are accepted by communities and that will make it possible, in time and space, to remove socio-cultural, religious and legal barriers to access to the HIV prevention and care package. Interventions for this key population for HIV infection must be designed by experts into a comprehensive package of high-impact, cost-effective interventions that can reverse the epidemic among this population of MSM.

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