Unprotected Receptive Anal Intercourse Among Men Who have Sex with Men in Brazil

Gustavo Machado Rocha · Lígia Regina Franco Sansigolo Kerr · Ana Maria de Brito · Ines Dourado · Mark Drew Crosland Guimarães

Abstract The aim of this study was to assess factors associated with unprotected receptive anal intercourse (URAI) in a sample of MSM recruited by respondent driven sampling in Brazil. Among 3,449 participants, 36.5 % reported URAI. Final logistic model indicated that living with a male partner, illicit drug use, having stable partnership, having sex with men only, having few friends encouraging condom use, and high self-perceived risk for HIV infection were characteristics independently associated with URAI. Intervention strategies should focus on the role of anal sex practices on HIV transmission, address illicit drug use, stigma and expansion of HIV testing and care.

Keywords HIV · Sexual behavior · Vulnerable populations · Brazil

G. M. Rocha (✉)
Campus Centro-Oeste Dona Lindu, Federal University of São João Del-Rei, Sebastião Gonçalves Coelho, 400-Chanadour, Divinópolis, Minas Gerais 35501-296, Brazil
e-mail: gusrocha.mg@gmail.com

L. R. F. S. Kerr
Department of Community Health, Federal University of Ceará, Fortaleza, Brazil

A. M. de Brito
Aggeu Magalhães Research Center, Oswaldo Cruz Foundation, Recife, Brazil

I. Dourado
Institute of Collective Health, Federal University of Bahia, Salvador, Brazil

M. D. C. Guimarães
Department of Preventive and Social Medicine, Federal University of Minas Gerais, Belo Horizonte, Brazil

Introduction

According to reports from the National Department of STD, AIDS and Viral Hepatitis of the Brazilian Ministry of Health (ND-STD/AIDS) [1], HIV prevalence is estimated in 0.6 % among the general adult Brazilian population. Nonetheless, the HIV epidemic is considered to be concentrated with men who have sex with men (MSM) as the main affected group, despite high prevalence among other vulnerable populations such as injection drug users and female sex workers in some regions of the country [1]. Unprotected receptive anal intercourse is known to be the riskiest practice for acquisition of HIV infection during sexual intercourse, as the entrance of the virus in the host is enhanced by the fragility of the rectal mucosa and by the absence of local humoral immune protection. In a meta-analysis of studies that evaluated HIV risk transmission among serodiscordant couples [2], most of them among MSM, the probability of transmission due to unprotected receptive anal intercourse was estimated in 1.4 % (95 % CI 0.2–2.5 %) per-act, and in 40.4 % (95 % CI 6.0–74.9 %) per-partner. This could help explain the disproportionate HIV disease burden among MSM worldwide [3].

Recent data show decreasing rates of condom use by MSM worldwide, possibly indicating that preventive strategies may not be effectively working. In Brazil, a comparison of results from four different surveys (1995, 1998, 2002, and 2005) among MSM in the city of Fortaleza (400, 200, 401 and 406 participants, respectively), the proportion of risky sexual behavior varied from 31.4 to 54.6 % [4]. Reasons for the potential decrease in condom use and the high rates of unprotected sex among MSM may include an increasing optimism related to antirretroviral treatment efficacy, the emergence of the internet as potential risky environment for sexual encounters, and

structural deficiencies in the organization of health services offered to MSM [3].

Many characteristics have been associated with inconsistent condom use by MSM, including sociodemographics (e.g., low income and schooling), behavioral (e.g., alcohol and illicit drug use), personality traits (e.g., sensation-seeking, impulsivity), contextual (e.g., poverty, homophobia and racism) and factors related to the social network (e.g., having supportive relationships). Fisher and Fisher (1992) [5] proposed a comprehensive theoretical model in which information (e.g., HIV transmission and prevention knowledge), motivation (e.g., perceived social support, self-perception of vulnerability), and behavioral skills (e.g., ability to negotiate with partner, to act publicity, to refuse to use drugs before sexual contacts) would be the major determinants of safer sexual behavior.

In Brazil, surveillance of the HIV epidemics is mostly based on reporting of AIDS cases rather than on HIV infection, except for specific groups such as pregnant women. This potentially limits grasping the real extent of the epidemic in the general population and in several vulnerable subgroups. In this regard, the ND-STD/AIDS gave priority for monitoring and evaluation of the HIV/AIDS epidemic [1], and recent studies were conducted among MSM, female sex workers and illicit drug users in order to establish behavioral and prevalence baseline data for future monitoring. Knowing the characteristics of sexual behavior among MSM and its determinants is crucial to determine the burden of the problem and to plan new strategies for preventing HIV and other sexually transmitted diseases (STD) transmission. Thus, the purpose of this paper was to describe overall sexual behavior characteristics and to analyze correlates of unprotected receptive anal intercourse in a sample of MSM in ten Brazilian cities. Moreover, the results can be used as a reference for future research to be developed to monitor the dynamics of sexual behavior in this population in Brazil.

Methods

Study Design

Cross-sectional analysis of data obtained from a national study of MSM in 10 Brazilian cities in 2008–2009 [6]. The main objectives of the national study were to assess sexual behavior, attitudes and practices of MSM and to estimate the prevalence of HIV and syphilis infections. The project was approved by Ceará State University Ethical Committee, the National Ethical Council (CONEP no. 14494), and by all institutions involved. All participants signed an informed consent before answering the questionnaire.

Population and Procedures

Respondents were MSM with at least 18 years old who lived in the following cities: Manaus, Recife, Salvador, Belo Horizonte, Rio de Janeiro, Santos, Curitiba, Itajaí, Brasília, and Campo Grande. The cities were a priori defined by the ND-STD/AIDS taking into account regional, socioeconomic, and cultural diversity. Potential participants should have had at least one sexual relationship with another man in the twelve months preceding the interview. For this analysis, only participants who reported a sexual contact with a man in the previous six months were included.

Due to the difficulty of accessing MSM in surveys, alternative sampling techniques are necessary to obtain satisfactory results. Therefore, Respondent Driven Sampling (RDS) was used to obtain the desired sample in each center (previously defined between 250 and 350 participants per city). RDS [7] is a sampling technique used to address hard to reach populations, where recruitment is carried out by participants themselves using a dual incentive system, starting with previously chosen participants, i.e., seed participants. In this study, the seeds were selected during a preliminary formative research, when subjects of different age and socioeconomic classes were included. In each city each participant received three unique coupons, non-falsifiable, to distribute to their peers. Individuals who came to the study site (usually HIV Testing and Counseling Centers) with a valid coupon and who met the inclusion criteria were considered the first "wave" of the study. After carrying out research procedures, each participating subject also received three coupons to invite new acquaintances, repeating this process thereafter until the desired sample size was reached in each city.

Data collection was conducted through a semi-structured face-to-face interview, and it was composed of questions regarding sociodemographic data, sexual behavior and drug use, network and social context, health care, access to condoms, HIV testing and information about STDs. Patients were also invited for HIV and Syphilis testing.

Outcome and Explanatory Variables

For this analysis, the outcome of interest was defined as unprotected receptive anal intercourse (URAI), i.e., no condom use during all receptive anal intercourse in the six months preceding the interview.

Explanatory variables were evaluated in four main groups:

1. Sociodemographic: age, race, schooling, conjugal situation (single/living alone, married/living with a female partner, or living with a male partner);
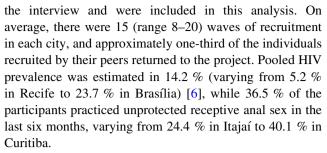2. Behavioral: current alcohol intake (never/eventual and two or more times per week) and any illicit drug use,

number of sexual partners in the six months preceding the interview, gender (male, female, transvestite), and type of sexual partnership (stable, casual or commercial);

3. Characteristics related to social context: receiving encouragement from friends to use condoms, and self-reported sexual identity, which was categorized as heterosexual, bisexual or homosexual/MSM/Gay;

4. Characteristics related to health services: self-perceived risk of HIV infection, HIV transmission knowledge, and prior HIV testing. Self-perceived risk of HIV infection was assessed by a direct question with four response options, and then classified into two categories (no/little or moderate/high risk). HIV transmission knowledge was assessed by ten questions about HIV transmission and prevention. Knowledge was considered sufficient when participant correctly answered eight or more questions.

Statistical Analysis

Analysis was weighted in order to take into account the sampling design because the probability of an individual participating in a RDS survey depends on the individual's social network size [7]. As initially proposed, estimates were weighted by the inverse probability of individual selection proportional to size of social network reported by the respondent. Moreover, as the analysis was conducted considering the ten cities simultaneously, the sample was also weighted [8] by the proportion of MSM in each city, relative to the total sample, estimated for the Brazilian Population aged 15–64 years old [9]. Chi square test was used to evaluate differences in proportion. The magnitude of the associations was estimated through weighted odds ratios (wOR) with 95 % confidence interval. Weighted binomial logistic regression was used to evaluate the independent effect of potential explanatory variables, with a significance level of 0.05. Initially, each one of the four main groups of variables (with p value less than 0.20 in the univariate analysis) was modeled separately (intermediate model). Final logistic regression model was then developed using variables with p value less than 0.10 obtained from each of the intermediate models. Final model goodness of fit was assessed by Hosmer and Lemeshow test. SAS® software (SAS Inst., Cary, USA) was used for analysis.

Results

Among 4048 MSM who showed up for the interviews, 188 (4.6 %) were ineligible and only one refused to participate, resulting in 3,859 participants. Of these, 3,449 (89.4 %) reported sex with another man in the six months preceding the interview and were included in this analysis. On average, there were 15 (range 8–20) waves of recruitment in each city, and approximately one-third of the individuals recruited by their peers returned to the project. Pooled HIV prevalence was estimated in 14.2 % (varying from 5.2 % in Recife to 23.7 % in Brasília) [6], while 36.5 % of the participants practiced unprotected receptive anal sex in the last six months, varying from 24.4 % in Itajaí to 40.1 % in Curitiba.

Most of the sample (57.5 %) consisted of MSM over 25 years old (24.1 % in Manaus, 33.4 % in Salvador, 46.1 % in Campo Grande, 47.1 % in Itajaí, 49.4 % in Recife, 52.3 % in Belo Horizonte, 65.3 % in Curitiba, 66.3 % in Brasília, 69.4 % in Santos, 76.4 % in Rio de Janeiro), and identified themselves as non-white (ranging from 56.0 % in Itajaí to 92.1 % in Salvador). Higher level of education (12 or more years of schooling) was reported by 65.2 % of the sample in Belo Horizonte, 61.6 % in Campo Grande, 31.9 % in Curitiba, 30.9 % in Recife, 30.6 % in Itajaí, 27.5 % in Salvador, 21.4 % in Rio de Janeiro, 13.9 % in Manaus, 11.5 % in Brasília, and 8.4 % in Santos. Most respondents were single or were living alone (84.5 %), varying from 74.9 % in Recife to 88.2 % in Manaus, while 10.8 % of the overall sample reported living with a male partner (from 3.2 % in Curitiba to 18.3 % in Recife).

Alcohol use at least twice a week was reported by 63.6 % of participants while 43.5 % reported using any illicit drug (Table 1). Most participants (77.4 %) reported having more than one sexual partner in the last six months, while stable partnership was reported by 57.0 %, casual partnership by 69.3 %, and commercial partnership by 31.8 %. Among those reporting relationship with stable partners, 69.1 % also reported sex with casual and/or commercial partners. A considerable proportion of MSM reported that most of their friends encouraged the use of condoms (53.9 %), while sexual identity was reported as homosexual/MSM/Gay by 64.7 % and as bisexual by 26.5 %. Almost half of the respondents considered their risk of becoming infected with HIV as low, while 28.9 % considered this risk as high, and 24.1 % did not know how to answer to this question. Approximately half of the respondents were never tested for HIV, and 40.2 % had insufficient knowledge about HIV transmission. The vast majority reported having received any information about STD and AIDS in health services (92.0 %).

Univariate analysis (Table 2) indicated that 34.1 % of MSM who were single/living alone did not use condom consistently in receptive anal intercourse in the last six months, compared to 58.4 % among those living with a male partner (OR = 2.71, 95 % CI = 2.17–3.39, $p < 0.01$), and 29.5 % among MSM who were married/living with a female partner (OR = 0.81, 95 %

Table 1 Selected baseline descriptive characteristics of the sample (N = 3,449)

Characteristics	N[a]	% Weighted[b]
Age		
≤25 years old	1,829	42.5
>25 years old	1,606	57.5
Skin color		
White	418	15.7
Non-white	3,029	84.3
Schooling		
12+ years	1,217	30.4
9–11 years	1,224	30.2
≤8 years	993	39.4
Conjugal situation		
Single/living alone	2,879	84.4
Married/living with a female partner	163	4.7
Living with a male partner	406	10.9
Alcohol use		
Never/eventual	1,395	36.4
2+ times per week	2,052	63.6
Illicit drug use in the last 6 months		
No	2,074	56.5
Yes	1,365	43.5
Number of sexual partners in the last 6 months		
5+	1,068	27.8
2–5	1,569	49.6
1	798	22.6
Partnership type in the last 6 months		
Only casual and/or commercial	1,293	43.0
Stable and others (casual and/or commercial)	1,427	39.4
Only stable	677	17.6
Sexual contact only with male partners in the last 6 months		
No	1,012	33.5
Yes	2,436	66.5
Friends who encourage condom use		
All/most	1,943	53.9
Few/none	1,505	46.1
Self-reported sexual identity		
Heterosexual	265	8.8
Bisexual	1,005	26.5
Homosexual/gay/MSM	2,176	64.7
Self-perceived risk of HIV infection		
None/low	1,913	47.0
Moderate/high	926	28.9
Did not know how to answer	610	24.1
HIV transmission knowledge		
Sufficient	1,984	59.8
Insufficient	1,463	40.2
Location of receiving information about STD and AIDS		
Health services	2,982	92.0

Table 1 continued

Characteristics	N[a]	% Weighted[b]
Non-governmental organizations	393	5.9
School	55	1.6
Other places	15	0.5
Previous anti-HIV testing		
Yes	1,832	53.3
No	1,617	46.7
Unprotected receptive anal intercourse in the last 6 months		
No	2,129	63.5
Yes	1,320	36.5

[a] Excluding missing data

[b] Weighted proportion according to the social network size and proportion of MSM in the city related to total sample

CI = 0.57–1.15, $p = 0.23$). URAI was found to be associated with type of sexual partners (28.7 % among MSM with casual/commercial partners only, 40.1 % among those with mixed stable and casual/commercial partners [OR = 1.66, 95 % CI = 1.42–1.95, $p < 0.01$], and 50.8 % among those with stable partners only [OR = 2.96, 95 % CI = 2.10–3.13, $p < 0.01$]). In addition, MSM who reported sexual intercourse only with male partners were found to more frequently engage in URAI (OR = 1.96, 95 % CI = 1.67–2.23, $p < 0.01$).

As shown in Table 2, 38.7 % of MSM who reported alcohol intake two or more times per week and 39.5 % of those with a history of illicit drug use were more likely to have an unprotected receptive anal intercourse (OR = 1.30, 95 % CI = 1.12–1.51 and OR = 1.26, 95 % CI = 1.09–1.45, respectively; $p < 0.01$). URAI was also more frequent when the respondents reported having none or few friends who encouraged them to use condoms (OR = 1.75, 95 % CI = 1.51–2.01, $p < 0.01$). Less than one-third of participants who self-identified themselves as heterosexual were found to engage in URAI, compared to 40.4 % of those who self-identified as homosexual/MSM/gay (OR = 1.78, 95 % CI = 1.36–2.34, $p < 0.01$). Finally, 46.6 % of subjects who considered to be at high or moderate risk for HIV infection practiced URAI, compared to 32.5 % of those who considered to be at low or no risk (OR = 1.81, 95 % CI = 1.54–2.14, $p < 0.01$).

Final multivariate weighted logistic model (Table 3) showed that living with a male partner (OR = 1.80, 95 % CI = 1.21–2.68, $p < 0.01$), use of illicit drugs (OR = 1.50, 95 % CI = 1.16–1.95, $p < 0.01$), having only stable partners (OR = 2.46, 95 % CI = 1.71–3.54, $p < 0.01$) or having stable and casual/commercial partners (OR = 1.89, 95 % CI = 1.42–2.52, $p < 0.01$), reporting a history of sexual intercourse only with male partners (OR = 1.94, 95 % CI = 1.41–2.68, $p < 0.01$), having

Table 2 Factors associated with unprotected receptive anal intercourse (URAI), univariate analysis (N = 3,449)

Characteristics	N^a	$(\%)^b$	wOR^c (95 % CI)	χ^2 (p value)
Age				
≤25 years old	501	(35.2)	1.00	1.78
>25 years old	721	(37.4)	1.10 (0.96–1.27)	(0.18)
Skin color				
White	177	(33.8)	1.00	1.98
Non-white	1,047	(37.0)	1.01 (0.86–1.18)	(0.16)
Schooling				
12+ years	392	(38.4)	1.00	2.50
9–11 years	365	(36.1)	0.91 (0.76–1.08)	(0.28)
≤8 years	466	(35.3)	0.87 (0.74–1.04)	(0.12)
Conjugal situation				
Single/living alone	965	(34.1)	1.00	85.71
Married/living with a female partner	46	(29.5)	0.81 (0.57–1.15)	(0.23)
Living with a male partner	213	(58.4)	2.71 (2.17–3.39)	(< 0.01)*
Alcohol use				
Never/eventual	399	(32.7)	1.00	12.07
2+ times per week	825	(38.7)	1.30 (1.12–1.51)	(<0.01)*
Illicit drug use in the last 6 months				
No	647	(34.2)	1.00	9.92
Yes	574	(39.5)	1.26 (1.09–1.45)	(<0.01)*
Number of sexual partners in the last 6 months				
5+	341	(36.7)	1.00	29.04
2–5	545	(32.9)	0.85 (0.71–1.00)	(0.05)*
1	335	(44.2)	1.37 (1.13–1.67)	(<0.01)*
Partnership type in the last 6 months				
Only casual and/or commercial	407	(28.7)	1.00	94.58
Stable and others (casual and/or commercial)	521	(40.1)	1.66 (1.42–1.95)	(<0.01)*
Only stable	296	(50.8)	2.56 (2.10–3.13)	(<0.01)*
Sexual contact only with male partners in the last 6 months				
No	298	(26.6)	1.00	71.72
Yes	926	(41.5)	1.96 (1.67–2.29)	(<0.01)*
Friends who encourage condom use				
All/most	553	(30.6)	1.00	59.64
Few/none	671	(43.5)	1.75 (1.51–2.01)	(<0.01)*
Self-reported sexual identity				
Heterosexual	81	(27.5)	1.00	40.42
Bisexual	267	(30.0)	1.13 (0.84–1.52)	(0.41)
Homosexual	876	(40.4)	1.78 (1.36–2.34)	(<0.01)*
Self-perceived risk for HIV infection				
None/low	513	(32.5)	1.00	60.36
Moderate/high	451	(46.6)	1.81 (1.54–2.14)	(<0.01)*
Did not know how to answer	260	(32.1)	0.98 (0.82–1.18)	(0.87)
HIV transmission knowledge				
Sufficient	756	(37.7)	1.00	3.20
Insufficient	468	(34.7)	0.88 (0.76–1.01)	(0.07)
Previous anti-HIV testing				
Yes	637	(35.6)	1.00	1.27
No	587	(37.5)	1.08 (0.94–1.25)	(0.26)

[a] Number of participants reporting URAI in each category

[b] Weighted proportion according to the social network size and proportion of MSM in the city related to total sample

[c] Weighted odds ratios

Table 3 Weighted odds ratio and 95 % confident intervals of unprotected receptive anal intercourse (URAI) obtained from intermediate and final logistic regression models (N = 3,449)

Characteristics	Socio-demographic	Behavioral	Social context	Health services	Final model[a]
Conjugal situation					
Single/living alone	1.00				1.00
Married/living with a female partner	0.81 (0.56–1.14)				0.74 (0.39–1.38)
Living with a male partner	2.71 (2.17–3.39)**				1.80 (1.21–2.67)**
Illicit drug use in the last 6 months					
No		1.00			1.00
Yes		1.62 (0.97–2.69)			1.50 (1.16–1.95)**
Sexual partnership type in the last 6 months					
Only casual and/or commercial		1.00			1.00
Stable and other		1.91 (1.10–3.32)*			1.89 (1.41–2.52)**
Only stable		2.45 (1.23–4.86)*			2.46 (1.71–3.53)**
Sexual contact only with male partners in the last 6 months					
No		1.00			1.00
Yes		2.16 (1.22–3.84)**			1.94 (1.41–2.67)**
Friends who encouraged condom use					
All/most			1.00		1.00
Few/none			1.83 (1.50–2.24)**		1.80 (1.41–2.31)**
Self-reported sexual identity					
Heterosexual			1.00		1.00
Bisexual			1.31 (0.87–1.97)		1.24 (0.74–2.05)
Homosexual/gay/MSM			2.08 (1.42–3.03)**		1.58 (0.97–2.58)
Self-perceived risk of HIV infection					
None/low				1.00	1.00
Moderate/high				1.82 (1.54–2.14)**	1.96 (1.46–2.62)**
Didn't know how to answer				0.99 (0.82–1.18)	0.96 (0.70–1.32)**

Weighted odds ratios according to the social network size and proportion of MSM in the city related to total sample

* $p < 0.05$; ** $p < 0.01$

[a] Hosmer–Lemeshow Test: $\chi^2 = 10.30$; $p = 0.24$

none or few friends who encouraged condom use (OR = 1.80, 95 % CI = 1.41–2.32, $p < 0.01$), self-identifying themselves as homosexual/Gay/MSM (OR = 1.58, 95 % CI = 0.98–2.60, $p = 0,07$), and those who considered to be at high or moderate risk for HIV infection (OR = 1.96, 95 % CI = 1.46–2.63, $p < 0.001$) were found to be independently associated with URAI.

Discussion

Our results indicate a high proportion of URAI in this sample of MSM in Brazil, with 36.5 % of participants reporting inconsistent condom use during receptive anal intercourse in the six months preceding the interview. This result is consistent with other studies conducted in Brazil, despite different methodologies used by many studies [4].

In general, a higher proportion of inconsistent use of condoms with stable partners is reported when compared with casual partners [4]. Similarly, URAI among the studied MSM was significantly higher among those living with a male partner or reporting having a stable partner, although most participants reported multiple sexual partners in the period analyzed. Furthermore, a high proportion of those with stable partners also reported sex with a casual or commercial partner simultaneously.

Considering that the HIV epidemic in Brazil is concentrated among MSM, it is of extreme public health concern the combination of a high HIV prevalence (14.2 %) [6] and a high proportion of URAI (36.6 %) among this sample of MSM in Brazil. It is likely that a considerable proportion of new infections may have occurred through unprotected receptive anal intercourse among these men. Moreover, we should emphasize a strong

statistical association ($\chi^2 = 9.74$; $p < 0.01$) between URAI and prevalent HIV infection in this sample. The odds of MSM having prevalent HIV infection was 1.40 higher among those practicing URAI as compared to those who reported consistent condom use (OR = 1.40; 95 % CI = 1.13–1.73). As shown in Australia by Guy et al. (2011) [10], approximately two-thirds of new infections in that country could have been avoided if unprotected anal sex among men with a HIV-positive or unknown status partner were eliminated, with a large impact on costs.

A high proportion of alcohol and illicit drug use was found in our sample with a positive association with URAI. Other studies also indicate substance use as an important factor associated with unprotected sex. Often, the combination of drugs and sex may be an attempt to justify participation in risky sexual behavior. Moreover, some personality traits like sensation seeking, risk taking and impulsivity may lead people both to use substances and to engage in riskier sexual practices [11].

The association between sexual identity and condom use is controversial in the literature. In our analysis, URAI was higher among those who self-identified as homosexual/MSM/Gay, with a borderline association in the final model. One possible explanation is that men who maintain bisexual relationships but identify themselves as heterosexuals practice safe sex more frequently in order to conceal their homosexual relations. Our finding that those who reported only male partners were more likely to be engaged in URAI reinforce this hypothesis. However, information bias may have occurred, assuming that men who had sex with men but identified themselves as heterosexual may have reported more frequently condom use considering this answer to be more socially acceptable.

Our results also point out the role of MSM social networks, especially friends, in motivating condom use. Having fewer friends who encouraged condom use was independently associated with URAI. Lower levels of condom use among this population may be associated with reduced HIV discussion and social support for safe sex, and greater acceptance of unprotected sex among peers. This is also consistent with the Information, Motivation and Behavioral Skills Model [5], which emphasizes the importance of social support and approval from peers as characteristics of motivation to adopt safer sexual practices.

Although low HIV risk perception has been associated with inconsistent condom use among MSM [5], our results indicated that MSM with higher risk perception had a higher frequency of URAI. This association, potentially found in cross-sectional, may actually reflect recent unsafe sexual practices. Nevertheless, we should highlight the high proportion of MSM who classified their risk of acquiring HIV infection as low (47.0 %) or did not know

how to rate their risk (24.1 %), in view of massive prevention campaigns aimed at this population in Brazil.

Although this is a unique sample of adult Brazilian MSM obtained from 10 Brazilian cities from different states, we should point out some limitations. Different sociocultural, geographical and epidemiological contexts may not warrant representativeness of the general Brazilian MSM population and RDS sampling technique is potentially subject to selection bias. Sample characteristics may be influenced by seed selection, and individuals with certain characteristics may tend to invite peers with similar characteristics. [12] Moreover, because of the design effect, variability of RDS estimators tends to be larger. However, theoretically, estimates obtained through RDS are robust and tend to eliminate bias when the sample reaches the equilibrium state after successive waves of recruitment [7]. As we used data from ten independent samples to produce a pooled analysis, we cannot be completely certain that sociodemographic and behavioral characteristics found are representative of the overall population being studied. Aggregating the independent networks to generate a single sample could violate a RDS assumption that a sample forms one complete network component. However, pooling the data is acceptable if each city is considered a stratum weighted according to their respective estimated MSM population size as proposed. Moreover, by pooling the data a larger sample is obtained, thus reducing the effect of the design when compared to single site RDS studies [8]. Finally, pooled data is more suitable for the overall purpose of behavioral surveillance monitoring at a national level, as originally proposed.

Despite such limitations, it is of public health concern the high rates of URAI among this Brazilian sample of MSM shown. The potential for HIV spread is high and public messages may not have effectively reached most at risk populations in Brazil. More direct and specific intervention strategies should be aimed at this group, focusing on condom use in all practices, particularly receptive anal sex, greater availability of anal lubricants, and upon risk assessment, recommendation for antiretroviral pre-exposure prophylaxis. Furthermore, the role of public campaigns and non-governmental organizations cannot be undermined, and should include fighting against stigma and prejudice experienced by the MSM population in Brazil, expanding access to HIV testing, and the development of public services focused on MSM sexual health, with a multidisciplinary team and support of civil organizations.

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