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Factors associated to HIV prevalence among adolescent men who have sex with men in Salvador, Bahia State, Brazil: baseline data from the PrEP1519 cohort

Fatores associados à prevalência do HIV entre homens adolescentes que fazem sexo com homens em Salvador, Bahia, Brasil: dados da linha de base da coorte PrEP1519

Factores asociados a la prevalencia de VIH entre hombres adolescentes que tienen sexo con hombres en Salvador, Bahia, Brasil: datos de referencia de la cohorte PrEP1519

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Abstract

Adolescent men who have sex with men (AMSM) are at a heightened vulnerability for human immunodeficiency virus (HIV). This study aimed to estimate the prevalence of HIV and associated individual, social, and programmatic factors among AMSM in Salvador, Bahia State, Brazil. This is a cross-sectional study which analyzed baseline data from the PrEP1519 cohort in Salvador. Descriptive, bivariate, and multivariate analyses were conducted using the dimensions of vulnerability to HIV as hierarchical levels of analysis. Logistic regression models were used to estimate the odds ratios (OR) of the association between predictor variables and HIV infection. The prevalence of HIV infection among the 288 AMSM recruited to the project was 5.9% (95%CI: 3.7-9.3). Adjusted analysis showed a statistically significant association between self-identifying as a sex worker (OR = 3.74, 95%CI: 1.03-13.60) and HIV infection. Other associations with borderline statistical significance were the use of application programs to find sexual partners (OR = 3.30, 95%CI: 0.98-11.04), low schooling level (OR = 3.59, 95%CI: 0.96-13.41), failing to be hired or being dismissed from a job because of sexual orientation (OR = 2.88, 95%CI: 0.89-9.28), and not using health services as a usual source of care (OR = 3.14, 95%CI: 0.97-10.17). We found a high HIV prevalence among AMSM in Salvador. Furthermore, our study found that individual, social, and programmatic factors were associated with HIV infection among these AMSM. We recommend intensifying HIV combined-prevention activities for AMSM.

Men Who Have Sex With Men; Adolescent; HIV; Prevalence

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Introduction

The first decade of the HIV/AIDS epidemic was marked by a prejudicial association between AIDS and the male gay community. This association raised significant social and programmatic consequences for this population [1,2]. As knowledge advanced, it became clear that everyone can be at risk of HIV, depending on sexual practices, behaviors, and contexts of social and programmatic vulnerability [3]. Nevertheless, HIV infection is still disproportionally higher among gay men or men who have sex with men (MSM) [4,5].

In Latin America and the Caribbean, estimates from the late 2000s indicated that the prevalence of HIV among MSM was around 14.9% and 25.4%, respectively [5]. Additionally, in 2019, it was estimated that 44% of the new cases of HIV were among MSM in Latin America [6]. In Brazil, a 2009 epidemiological study, conducted in ten cities, using respondent-driven sampling (RDS) found an estimated HIV prevalence, among MSM, of 14.2% [7]. More recently, in 2016, another MSM-RDS study in 12 cities estimated a prevalence of 18.4% [8], about 23% higher than the prevalence found in 2009. This figure is far higher than the 0.8% HIV prevalence rate among males from the general population in Brazil [9]. This means that the HIV epidemic in Brazil is concentrated in the key MSM population.

The literature has drawn attention to aspects of individual vulnerability among MSM, which include the number of sexual partners, unprotected sex, ulcers and inflammation caused by other sexually transmitted infections (STI), and the sharing of syringes [5,10]. However, individual Sexual behaviors can be determined by aspects of social vulnerability which reflect social, economic, organizational inequalities, and political power [1,5,10], not to mention the stigma and experiences of violence associated with sexual orientation in heteronormative societies [11,12,13,14,15].

The dimension of programmatic vulnerability to HIV among MSM is also noteworthy. Worldwide, as in Brazil, government responses to MSM's health needs are still inadequate, especially concerning HIV/AIDS prevention, treatment, and care [1]. This population also faces barriers in their access to health services, primarily because of the stigma and discrimination associated with non-heterosexual orientations [16,17]. Finally, in recent years there has also been a notable drop in funding for AIDS nongovernmental organizations (AIDS-NGO), which are important for local community responses to the epidemic [18,19]. Since the past decade (2009-2019), official epidemiological data suggest that adolescents in general [20] and young Brazilian MSM are increasingly at risk for HIV infection [21,22]. Despite the high estimates of HIV prevalence among adult and young adult MSM in this period, a recent systematic review indicated the scarcity of data on HIV prevalence among adolescent MSM (AMSM) [22], and no study has been published, to date, on the factors associated with HIV infection among this population in Latin America. Therefore, we aim to estimate the prevalence of HIV among AMSM in Salvador, Bahia State, Brazil, and to analyze individual, social, and programmatic factors.

Methods

Study design and study population

From April 2019 to February 2021, a cross-sectional analysis was conducted with baseline data from the AMSM PrEP1519 cohort project. Analysis included only AMSM due to the limited number of adolescent transgender women included in the cohort to date and the specificities of this population [23]. Sexually active AMSM aged 15-19 years who lived in Salvador or its metropolitan area and agreed to take an HIV screening test were included in this study. Further details on the complete methodology for the PrEP1519 project can be found in Dourado et al. [24].

During the COVID-19 pandemic, the municipality of Salvador adopted quarantine and social isolation guidelines, including reductions in public transportation and suspension of many non-essential health services. Despite this, PrEP1519 decided to continue its work during the pandemic and was able to quickly adapt to the new situation due to social media and a telemonitoring infrastructure. Further details about this adaptation can be found in Dourado et al. [25] and Magno et al. [26].

PrEP1519 project: contact and recruitment of the target population

PrEP1519 undertakes interventions to raise awareness, to create demand, and to encourage the use of pre-exposure prophylaxis (PrEP) and other HIV preventive measures among AMSM and adolescent transgender women (ATGW) aged 15-19 years at increased risk of HIV. It is the first PrEP demonstration cohort study taking place in three Brazilian capitals: Belo Horizonte (Minas Gerais State), Salvador, and São Paulo. Its primary aim is to estimate the effectiveness of daily oral PrEP use among AMSM and ATGW aged 15-19 years who are at high risk for HIV infection [24,25]. The data included in this study will be from the Salvador only.

Previous formative research used in-depth interviews with key-informants (health workers and local LGBTQI+ leaders), focus groups, and field observations. These procedures aimed to enable a comprehensive understanding of the fieldwork process. Formative research took place from August 2018 to January 2019 with three purposes: (i) to understand the dynamics of social interactions among AMSM and ATGW in the venues where they gathered, (ii) to assess AMSM and ATGW's needs and perceptions regarding study implementation, and (iii) to analyze AMSM and ATGW's sexual behaviors; contexts that contribute to increasing their vulnerability to HIV, and their acceptability of PrEP [27].

In Salvador, the results of this formative study inspired the organization of the PrEP1519 clinic entitled "PrEPara Salvador" [a play on words between PrEP and "prepara" – Get ready!] outside traditional health services, financed by PrEP1519, but embedded in an initiative to promote the human rights of the LGBTQI+ population by the Bahia State Department for Justice, Human Rights, and Social Development, supported by the local health service network of the Bahia State Health Department and the Salvador Municipal Health Department.

PrEPara Salvador operates inspired by primary health care principles, offering comprehensive care, an interdisciplinary approach, broad training for health workers, and follow-up by care navigators from the LGBTQI+ community. In April 2019, the active recruitment of the target population for PrEP enrollment used different demand-generation strategies designed by the project. Several virtual platforms were used (e.g., Facebook, WhatsApp, Instagram, Twitter, YouTube, and Spotify) and peer educators engaged with potential participants on dating and hook-up application programs (e.g., Grindr, Hornet, Tinder, and Badoo). Face-to-face initiatives involved peer education led by adolescents and young adults who systematically and periodically worked with groups of adolescents in the identified social venues (e.g., bars, parks, beaches, streets, etc.). These face-to-face initiatives were adapted during the COVID-19 pandemic. Other strategies included referrals from a health service and/or NGO and word-of-mouth referrals from PrEP users [28,29,30]. Adolescent MSM reached by these recruitment activities and those who met the inclusion criteria described above were included in this study. All participants who arrived at the clinic and participated in the research received a reimbursement of BRL 30 (≈ USD 6) for their transportation and food expenses.

Data collection

Figure 1 shows the general flow of data collection. Sociobehavioral information was obtained for the three months prior to interviews via a structured questionnaire containing questions on demographic information, sexual practices, preventive methods, use of alcohol and other drugs, STI history, and experiences of discrimination and violence. All the information was recorded by health professionals and interviewers who received training in how to input the data in an electronic recording platform. Interviews were conducted at the PrEPara Salvador clinic, lasting, on average, for 40 minutes.

Laboratory diagnoses of HIV were conducted using the Brazilian Ministry of Health algorithm [31]. Participants were screened for HIV via a rapid test on their first visit to the clinic, establishing the baseline prevalence of HIV for the PrEP1519 cohort. To determine infection, two rapid tests by different manufacturers were used to detect HIV-1 or HIV-2 antibodies and p24 antigens. All positive rapid test results were confirmed by viral load quantification tests. All participants received counselling before and after the tests. Those diagnosed with HIV received psychosocial, medical, and/or nursing care at the time of diagnosis. Moreover, the project team contacted specialized services to ensure the linkage of these participants to care and start of antiretroviral therapy (ART).

Figure 1

General flow of data collection for the study of HIV prevalence among adolescents men who have a sex with men (AMSM) in Salvador, Bahia State, Brazil, 2019-2021.

PrEP: pre-exposure prophylaxis; STI: sexually transmitted infections; SUS: Brazilian Unified National Health System.

Study variables

We used the concept of health vulnerability specifically to HIV/AIDS [32,33,34]. This concept may be understood by analyzing three interrelated components: (i) individual vulnerability, to identify physical, mental or behavioral factors via risk assessments and/or other approaches; (ii) social vulnerability, to analyze the cultural, moral, political, economic, and institutional dimensions that may determine exposure to illness or death; and (iii) programmatic vulnerability, to examine the ways policies,

programs, and services affect people's social and individual situations. Vulnerability highlights the responsibility of governments and public policies as an integral part of the determinants of health and disease. In this study, the use of this concept guided the analysis beyond individual and behavioral factors associated to the risk of HIV to enable a more integral approach, encompassing issues such as barriers to access to health services, stigma, and discrimination.

The outcome variable was an HIV infection detected at baseline on the PrEP1519 cohort-Salvador site. Predictor variables were combined at hierarchically distinct levels of vulnerability for HIV (Figure 2). The most proximal level (individual vulnerability dimension) includes the following variables: age (15-17 years/18-19 years), age at the first sexual intercourse (< 15 years / ≥ 15 years), condom use at the first sexual intercourse (yes/no); use of hook-up apps (no/yes); and the following information for the three months prior: sexual partners (none/just steady partner/just casual partners/steady and casual partners); condom use during anal sex (always/not always with steady partner/not always with casual partner/not always with steady and casual partners); age of casual sexual partners (up to 5 years older/more than 5 years older); number of casual partners (none/1 to 4 /5 or more); whether condoms broke or slipped off during sex (never/at least once); group sex (no/yes); whether alcohol use ever interfered in condom use during sex (never/at least once). In this dimension, the HIV prevention practices used with steady and casual partners were also described by statements classified as always/frequently or sometimes/rarely/never: "I asked my partner to remove his penis before ejaculating"; "I used lubricant"; "I avoided being receptive during anal sex"; "my partner and I took an HIV test"; "I had sex without penetration"; and "I avoided having anal sex".

At the intermediate level (social vulnerability dimension) the following variables were included: race/skin color (black was classified from self-reporting as *pardo* – i.e., brown-skinned – and black, and non-black were categorized from self-reported white, Asian, and indigenous); schooling level (high school and higher education/primary school, middle school, and youth and adult education); sexual orientation (homosexual, gay, lesbian/bisexual, heterosexual); exchanging money or favors for sex (never/at least once); self-identification as sex worker (no/yes); failure to be selected or being dismissed from a job because of sexual orientation (never/at least once); and exclusion or marginalization from family settings because of sexual orientation (never/at least once).

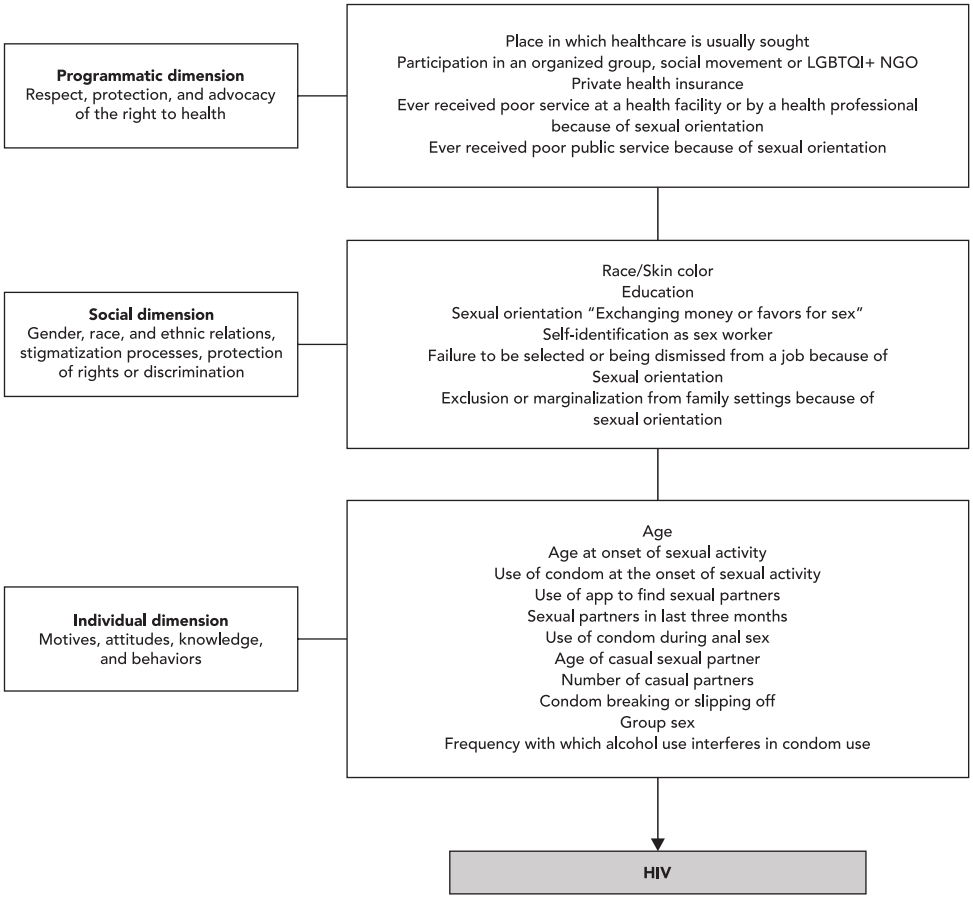
The distal level (programmatic vulnerability dimension) included: usual source of care (primary healthcare facility, pharmacy, hospital, doctor/nowhere, friends or relatives); participation in an organized group, social movement or LGBTQI+ NGO (no/yes); access to private health insurance (no/yes); ever received poor service at a health facility or by a health professional because of sexual orientation (never/at least once); ever received poor public service because of sexual orientation (never/at least once).

Data analysis

Initially, analysis was carried out to describe the characteristics of the sample and stratify them by age groups (15-17 years and 18-19 years). A bivariate analysis was conducted to assess differences in the distribution of participants' characteristics vis-à-vis HIV infection, using the chi-squared test or Fisher's exact test, with their descriptive levels of significance set at $p = 0.05$. For the multivariate analysis, logistic regression models were used to estimate the odds ratios (OR) of the association between predictor variables and HIV infection, variables for which a $p \leq 0.20$, in the bivariate analysis, were included in the model for each dimension of HIV vulnerability, starting with the most distal (programmatic) to the most proximal level (individual). In the final model, the variables with $p \leq 0.10$ at each hierarchical level of vulnerability (individual, social, and programmatic), and a satisfactory residual plot were maintained as adjustment variables for the next level. The final model was evaluated for goodness-of-fit using the Hosmer & Lemeshow test. These analyses were performed using the Stata software version 15 (https://www.stata.com).

Figure 2

Conceptual model of the multivariate analysis based on different dimensions of vulnerability for HIV in adolescent men who have sex with men. PrEP1519, Salvador, Bahia State, Brazil, 2019-2021.



NGO: nongovernmental organizations.

Ethics assessment

Our research protocol was approved by the Ethics Research Committee of the World Health Organization (protocol ID: Fiotec-PrEP Adolescent study) and of the Federal University of Bahia (# 3,224,384). Participants aged 18 or older provided written informed consent. For those under 18, enrollment was by one of two routes: (i) written informed consent provided by a parent or guardian and signing of an informed assent form by the adolescent; or (ii) only the signing of an informed assent form by the adolescent in cases in which the team psychologist and social worker judged their family ties to have been severed or that they were at risk of physical, psychological or moral violence due to their sexual orientation. This latter enrollment option was made feasible thanks to a favorable judicial ruling in response to a petition filed by the Public Prosecution Service of Bahia and was approved by the Ethics Research Committees. All participants could withdraw consent at any stage of the process or skip any questions perceived as too sensitive, personal or distressing.

Results

From April 2019 to February 2021, 288 AMSM were recruited. In total, 17 had a positive HIV test, wielding a baseline prevalence of 5.9% (95%CI: 3.7-9.3%), and all participants, except two, were unaware of their HIV status. The project team referred all cases to the specialized health service. Out of these, two participants who were aware of their HIV status were already linked to the health service and taking ART. To date, 12 AMSM have initiated ART, whereas the three who have refused treatment continue to be monitored by the project team and are encouraged to start it.

Most participants were aged 18 and 19 years (85.1%), were aged less than 15 years at their first sexual intercourse (50.2%), failed to use a condom at their first sexual intercourse (57%), and used "hook-up apps" (54.5%). In the three months before the interview, 11.5% reported having had no sexual partners, 21.9% said they had just steady partner, 34% had just casual partners, and 32.6% had steady and casual partners. As for condom use during anal sex, 29% said they always used it, 26.5% reported they did not always use it with their steady partner, 25.7% did not always use it with casual partners, and 18.8% did not always use it, whether the partner was steady or casual. Over half of the participants who had a casual partner reported this partner to be up to five years older than them and that they had engaged with one to four partners in the previous three months. Overall, 27.4% of participants reported having a condom break or slip off, 17% said they had group sex, 10.4% claimed they had exchanged money or favors for sex, and 22.5% stated that alcohol use had interfered in condom use (Table 1).

Most (86.3%) AMSM were black, 91.3% were in high school or higher education, 67.4% self-identified as homosexual or gay, 32.6% said they were bisexual and/or heterosexual, and 7.3% self-identified as sex workers. In total, 13.2% of respondents reported discrimination due to sexual orientation in an employment situation (failing to be hired or being dismissed from a job) and 42% in a family setting (exclusion or marginalization). Close to 87.5% of participants usually sought health services as a usual source of care, 18.7% had private health insurance, and 11.5% took part in an organized group, social movement or LGTBQI+ NGO. Overall, 7.3% of participants reported receiving a poor service at a health facility or by a health worker because of their sexual orientation, and 17.7% receiving poor public service because of sexual orientation (Table 1).

Differences between the two age strata were found for the variables age at the first sexual intercourse (15-17 years old and 18-19 years old), schooling level, and having private insurance: younger AMSM showed earlier first sexual intercourse, lower schooling level, and a smaller private health insurance prevalence than older adolescents (Table 1).

Considering the dimensions of vulnerability to HIV, its prevalence was significantly higher among AMSM who exchanged money or favors for sex (16.7%, OR = 4.10, 95%CI: 1.34-12.58), who had lower schooling level (16%, OR = 3.66, 95%CI: 1.10-12.23) and who regarded themselves as sex workers (19.1%, OR = 4.60, 95%CI: 1.35-15.63) at the social dimension; and failed to use health services as a usual source of care (13.9%, OR = 3.23, 95%CI: 1.06-9.77) at the programmatic dimension (Table 2).

The HIV prevention practice most used by adolescents during sex with steady and casual partners was lubricants (63.6% and 61.5% for AMSM aged 15-17, and 72.6% and 72.2% for those aged 18-19, respectively). The second most used practice for younger adolescents was avoiding being passive during anal sex with steady partners (18.2%) and asking partners to remove their penises before ejaculating when having sex with casual partners (34.6%). This last practice was also used by 32.6% and 44% of the adolescents aged 18-19 years old with steady and casual partners, respectively (Figure 3).

In the multivariate analysis, we found an association between self-identifying as a sex worker and HIV prevalence (OR = 3.74, 95%CI: 1.03-13.60). Other variables whose significance levels were borderline were using hook-up apps (OR = 3.30, 95%CI: 0.98-11.04), lower schooling level (OR = 3.59, 95%CI: 0.96-13.41), not usually using health services as a usual source of care (OR = 3.14, 95%CI: 0.97-10.17), and failing to be hired or being dismissed from a job because of sexual orientation (OR = 2.88, 95%CI: 0.89-9.28) (Table 3).

Table 1

Characteristics of the adolescent men who have sex with men (n = 288) recruited to the PrEP1519 project, stratified by age. Salvador, Bahia State, Brazil, 2019-2021.

Characteristics	Total sample		15-17 years		18-19 years		p-value
	n	%	n	%	n	%	
Individual dimension							
Age (years)							
15-17	43	14.9					
18-19	245	85.1					
Age at first sexual intercourse (years)	M = 13.9; SD = 3.1		M = 13.7; SD = 2.0		M = 14.0; SD = 3.2		0.020
< 15	139	50.2	28	66.7	111	47.2	
≥ 15	138	49.8	14	33.3	124	52.8	
Used a condom at first sexual intercourse							0.246
Yes	122	43.0	15	34.9	107	44.4	
No	162	57.0	28	65.1	134	55.6	
Uses apps to find sexual partners							0.071
No	131	45.5	25	58.1	106	43.3	
Yes	157	54.5	18	41.9	139	56.7	
Sexual partners in last three months							0.477 *
None	33	11.5	5	11.6	28	11.4	
Just steady partners	63	21.9	12	27.9	51	20.8	
Just casual partners	98	34.0	16	37.2	82	33.5	
Steady and casual partners	94	32.6	10	23.3	84	34.3	
Uses condoms during anal sex							0.412
Always	71	29.0	9	25.7	62	29.5	
Not always with steady partners	65	26.5	8	22.9	57	27.1	
Not always with casual partners	63	25.7	13	37.1	50	23.8	
Not always with steady and casual partners	46	18.8	5	14.3	41	19.5	
Age of casual sexual partners (years)							0.802
Up to 5	99	51.6	14	53.9	85	51.2	
More than 5	93	48.4	12	46.1	81	48.8	
Number of casual partners							0.711
None	98	34.0	17	39.5	81	36.0	
1 to 4	139	48.3	19	44.2	120	49.0	
5 or more	51	17.7	7	16.3	44	18.0	
Condom broke or slipped off in last three months							0.861
Never	170	72.6	25	71.4	145	72.9	
At least once	64	27.4	10	28.6	54	27.1	
Group sex							0.563
No	239	83.0	37	86.0	202	82.4	
Yes	49	17.0	6	14.0	43	17.6	
How often alcohol use interferes in condom use							0.585
Never	169	77.5	26	81.3	146	76.9	
Has interfered at least once	49	22.5	6	18.7	43	23.1	

(continues)

Table 1 (continued)

Characteristics	Total sample		15-17 years		18-19 years		p-value
	n	%	n	%	n	%	
Social dimension							
Race/Skin color							0.873
Non-black	38	13.2	6	13.9	32	13.1	
Black	250	86.8	37	86.1	213	86.9	
Schooling level							0.005 *
High school and higher education	263	91.3	34	79.1	229	93.5	
Primary/Middle school and youth & adult education	25	8.7	9	20.9	16	6.5	
Exchanged money or favors for sex in last three months							0.099 *
Never	258	89.6	35	81.4	223	91.0	
At least once	30	10.4	8	18.6	22	9.0	
Sexual orientation							0.990
Homosexual or gay	194	67.4	29	67.4	165	67.3	
Bisexual, heterosexual	94	32.6	14	32.6	80	32.7	
Self-identification as sex worker							0.217 *
No	267	92.7	38	88.4	229	93.5	
Yes	21	7.3	5	11.6	16	6.5	
Failed to be selected or was dismissed from a job because of sexual orientation							0.873
Never	250	86.8	37	86.1	213	86.9	
At least once	38	13.2	6	13.9	32	13.1	
Excluded or marginalized from family settings because of sexual orientation							0.304
Never	167	58.0	28	65.1	139	56.7	
At least once	121	42.0	15	34.9	106	43.3	
Programmatic dimension							
Usual source of care							0.070
Primary healthcare facility, pharmacy, hospital, doctor	252	87.5	34	79.1	218	89.0	
Nowhere, friends or relatives	36	12.5	9	20.9	27	11.0	
Participates in an organized group, social movement or LGBTQI+ NGO							0.300 *
No	254	88.5	36	83.7	218	89.3	
Yes	33	11.5	7	16.3	26	10.7	
Has private health insurance							0.043
No	230	81.3	38	92.7	192	79.3	
Yes	53	18.7	3	7.3	50	20.7	
Ever received poor service at a health facility or by a health professional because of sexual orientation							0.532 *
Never	267	92.7	39	90.7	228	93.1	
At least once	21	7.3	4	9.3	17	6.9	
Ever received poor public service because of sexual orientation							0.867
Never	237	82.3	35	81.4	202	82.4	
At least once	51	17.7	8	18.8	43	17.6	

M: mean; NGO: nongovernmental organizations; SD: standard deviation.

* p-value estimated by Fisher's exact test.

Table 2

Bivariate analysis for the baseline prevalence of HIV among adolescent men who have sex with men (n = 288) recruited to the PrEP1519 project. Salvador, Bahia State, Brazil, 2019-2021.

Characteristics	HIV prevalence				
	n	%	p-value	OR	95%CI
Individual dimension					
Age (years)			0,726 *		
15-17	3	7.0		1.00	-
18-19	14	5.7		0.81	0.22-2.94
Age at first sexual intercourse (years)			0.434		
< 15	9	6.5		1.00	-
≥ 15	6	4.5		0.66	0.23-1.90
Used a condom at first sexual intercourse activity			0.245		
Yes	5	4.1		1.00	-
No	12	7.4		1.87	0.64-5.46
Uses apps to find sexual partners			0.061		
No	4	3.1		1.00	-
Yes	13	8.3		2.87	0.91-9.01
Sexual partners in last three months			0.910 *		
None	1	3.0		1.00	-
Just steady partners	3	4.8		1.60	0.16-16.01
Just casual partners	7	7.1		2.46	0.29-20.79
Steady and casual partners	6	6.4		2.18	0.25-18.83
Uses a condom during anal sex			1.000 *		
Always	4	5.6		1.00	-
Not always with steady partners	4	6.2		1.10	0.26-4.58
Not always with casual partners	4	6.4		1.13	0.27-4.74
Not always with steady and casual partners	3	6.5		1.17	0.25-5.48
Age of casual sexual partner (years)			0.328		
Up to 5	5	5.1		1	-
More than 5	8	8.6		1.77	0.56-5.62
Number of casual partners			0.945 *		
None	5	5.1		1.00	-
1-4	9	6.5		1.29	0.42-3.97
5 or more	3	5.9		1.16	0.27-5.07
Condom broke or slipped off in last three months			0.075 *		
Never	5	2.9		1.00	-
At least once	6	9.4		3.41	1.00-11.61
Group sex			0.181 *		
No	12	5.0		1.00	-
Yes	5	10.2		2.15	0.72-6.41
How often alcohol use interferes in condom use			1.000 *		
Never	8	4.7		1.00	-
Has interfered at least once	2	4.1		0.86	0.18-4.17

(continues)

Table 2 (continued)

Characteristics	HIV prevalence				
	n	%	p-value	OR	95%CI
Social dimension					
Race/Skin color			0.709 *		
Non-black	1	2.6		1.00	-
Black	16	6.4		2.53	0.33-19.65
Schooling level			0.049 *		
High school and higher education	13	4.9		1.00	-
Primary/middle school and youth & adult education	4	16.0		3.66	1.10-12.23
Sexual orientation			0.409		
Homosexual or gay	13	6.7		1.00	-
Bisexual, heterosexual	4	4.3		0.62	0.20-1.95
Exchanged money or favors for sex in last three months			0.022 *		
Never	12	4.7		1.00	-
At least once	5	16.7		4.10	1.34-12.58
Self-identification as sex worker			0.027 *		
No	13	4.9		1.00	-
Yes	4	19.1		4.60	1.35-15.63
Failed to be selected or was dismissed from a job because of sexual orientation			0.057 *		
Never	12	4.8		1.00	-
At least once	5	13.2		3.00	1.00-9.07
Excluded or marginalized from family settings because of sexual orientation			0.148		
Never	7	4.2		1.00	-
At least once	10	8.3		2.06	0.76-5.57
Programmatic dimension					
Usual source of care			0.046 *		
Primary healthcare facility, pharmacy, hospital, doctor	12	4.8		1.00	-
Nowhere, friends or relatives	5	13.9		3.23	1.06-9.77
Participates in an organized group, social movement or LGBTQI+ NGO			0.426 *		
No	14	5.5		1.00	-
Yes	3	9.1		1.71	0.47-6.31
Has private health insurance			0.748 *		
No	15	6.5		1.00	-
Yes	2	3.8		0.56	0.12-2.54
Ever received poor service at a health facility or by a health professional because of sexual orientation			1.000 *		
Never	16	6.0		1.00	-
At least once	1	4.8		0.78	0.10-6.22
Ever received poor public service because of sexual orientation			0.195 *		
Never	12	5.1		1.00	-
At least once	5	9.8		2.04	0.68-6.06

95%CI: 95% confidence interval; NGO: nongovernmental organizations; OR: odds ratio.

* p-value calculated by Fisher's exact test.

Table 3

Multivariate analysis to ascertain the baseline prevalence of HIV among the adolescent men who have sex with men (N = 288) recruited to the PrEP1519 project. Salvador, Bahia State, Brazil, 2019-2021.

Characteristics	p-value	$OR_{adjusted}$	95%CI
Individual dimension			
Uses apps to find sexual partners	0.053		
No		1.00	-
Yes		3.30	0.98-11.04
Social dimension			
Schooling level	0.057		
High school and higher education		1.00	-
Primary/Middle school and youth & adult education		3.59	0.96-13.41
Self-identification as sex worker	0.045		
No		1.00	-
Yes		3.74	1.03-13.60
Failure to be selected or dismissal from a job because of sexual orientation	0.077		
Never		1.00	-
at least once		2.88	0.89-9.28
Programmatic dimension			
Usual source of care	0.057		
Primary healthcare facility, pharmacy, hospital, doctor		1.00	-
Nowhere, friends or relatives		3.14	0.97-10.17

95%CI: 95% confidence interval; OR: odds ratio.

Discussion

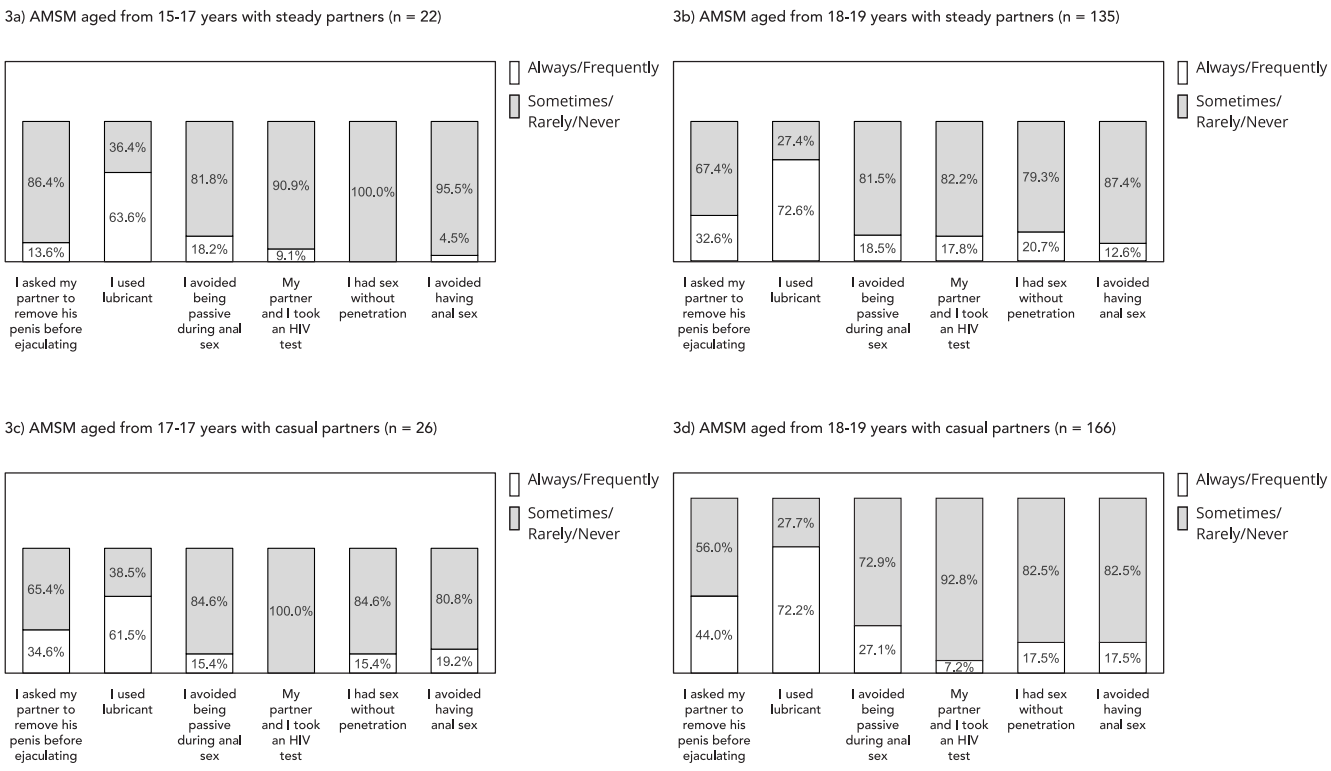
The estimated prevalence of HIV (5.9%) among AMSM on the Salvador website of the PrEP1519 study is much higher than the prevalence estimated for the overall male population in Brazil (0.8%) [9]. Other studies have also indicated a high burden of HIV infection among young and adolescent MSM in Latin America and Brazil. A recent systematic review of the HIV prevalence among young MSM in Latin America and the Caribbean found it to be higher than 5% among those aged under 25 years in half of the analyzed studies [22]. In Brazil, a literature review has also found a disproportionately high prevalence and incidence of HIV among this population vis-à-vis the general population of the same age group [21].

A comparison of HIV prevalence in two national HIV surveillance studies found an upward trend among MSM aged 18 to 25 years, rising from 4% in 2009 to 9.4% in 2016 [35]. Brazilian studies that have monitored HIV prevalence among adolescent conscripts to the Armed Forces over two decades, estimate a higher prevalence among those who identify as MSM than those who identify as heterosexual, also finding an upward trend in that prevalence among AMSM over time: 0.56% in 2002 [36], 1.23% in 2007 [37], and 1.32% in 2016 [38]. In line with this trend, official data published by the Brazilian Ministry of Health show a significant increase in the rate of detection of AIDS cases among male adolescents aged 15 to 19 years, with a rising from 3.7 cases per 100,000 inhabitants in 2009 to 6.1 cases per 100,000 inhabitants in 2019 [20].

As for the HIV care continuum, only two of the AMSM recruited for PrEP1519 knew their HIV status, a far cry from the 90% set in the first target of the 2020 The Joint United Nations Programme on HIV/AIDS (UNAIDS) 90-90-90 strategy, by which 90% of people living with HIV should be aware of their HIV status [39], and way below the 85% already reached in Brazil [40]. This means that most participants were not using ART, a treatment which could have a positive effect not only on them individually by improving their clinical status [41], but also collectively by preventing the transmis-

Figure 3

Baseline prevention practices used with steady partners and casual partners by adolescent men who have sex with men (AMSM) recruited to the PrEP1519 cohort in Salvador, Bahia State, Brazil, 2019-2021.



sion of the virus when viral loads reach undetectable levels [42,43,44]. Nevertheless, the project team was successful in getting most participants diagnosed with HIV linked to specialized health services. Unfortunately, three participants rejected all team efforts to link them to health services and ART.

Studies show that access to HIV testing is incipient among adult Brazilian MSM in general [45,46,47]. A 2009 study with adult MSM in Salvador found that 63% had never taken an HIV test [48]. In 2016, a study with adult MSM in 12 cities across Brazil found that 44% of its participants who had taken a test and were diagnosed with HIV were unaware of their HIV status [49]. Stigma and discrimination related to sexual orientation have been described in the literature as possible barriers to access to testing services [50,51]. That is why it is important to promote HIV testing among AMSM in different ways than traditional ones, using, for example, community initiatives at social venues with peer-educators [52] and HIV self-testing [25,45,53], which is a simple option, recommended by the World Health Organization [54], but it is still little known and only moderately accepted among Brazilian MSM aged 18 years and over [45,55].

In our study, whose inclusion criterion was sexual activity, the mean age at first sexual intercourse was found to be 13.9 years old (± 3.1), with over half reporting failing to use protection on these occasions. In Brazil, individuals' average age at first sexual intercourse is during adolescence [56,57], and national studies have shown that the age is decreasing among boys in the general population: from 14.7 years old in the sexual behavior survey of the Brazilian population conducted in 2005 [57] to 12.9 years old in the national school health survey in 2015 [58]. The survey of knowledge, attitudes, and practices in the Brazilian population, conducted by the Brazilian Ministry of Health in 2013, showed

that 34.9% of men indicated that they had started their sexual life before they were aged 15 years [59]. Furthermore, some of our AMSM reported sexual intercourse with steady and casual partners in the three months prior to the interviews, averaging 4.5 (± 5.5) casual partners, which could reflect the sexual fluidity typical at this stage in life. Another point is the high proportion of participants who reported not always using condoms during anal sex (71%), which is consistent with the findings of other studies of Brazilian adolescents [36,38,58,60]. The *National Adolescent School-based Health Survey* found a reduction in the proportion of condom use at their last sexual intercourse among Brazilian adolescents in the general population from 75.9% in 2009 to 66.2% in 2015 [58].

In the individual vulnerability dimension, an association was found between using an app to find sexual partners and HIV prevalence, although the statistical significance of the association was borderline (p-value slightly over 0.05).

The literature indicates that mobile apps are increasingly used by MSM to seek out and hook up with sexual partners [61,62]. The association between app use and HIV infection among MSM is still debatable, requiring further investigation. Although some studies show a negative or non-existent association [63,65], one study found a direct association [66], and others have found the use of these apps and the Internet to seek partners to be associated with other STIs [65,67,68] and with sexual practices of higher risk for HIV [69,70], especially among young MSM [71]. Interestingly, however, many of these studies failed to analyze data on young and adolescent MSM. Age seems to be a significant factor in the use of these technologies [61]. A qualitative study with adolescents from the LGBTQI+ community in the United States found that many individuals used the Internet for dating in general for the anonymity it offered, fear of rejection and judgement upon revealing their sexual orientation to straight people, and fear of stigma and discrimination in face-to-face dates [72].

Our study also showed that elements from the social (self-identifying as a sex worker, low schooling level, and discrimination), and programmatic dimensions (not using official healthcare services) were associated with the prevalence of HIV infection.

When referring to adolescents aged less than 18 years, strictly speaking, the term "sex worker" is inadequate because, in this case, according to the Brazilian legislation, having sex for money constitutes sexual exploitation [73] – a "multidimensional" phenomenon of "extreme violation of human rights" that calls for the combined efforts of different sectors of society [74]. There is little research on adolescent sex work, which is a complex topic both legally and ethically. Even so, some studies indicate that many adult MSM who are sex workers began working at a very young age, sometimes via sexual exploitation involving the use of coercion or violence [75]. Studies indicate that adult MSM who are sex workers report more cases of unprotected anal sex, a high number of sexual partners, and greater exposure to social and programmatic vulnerability to HIV, with limited access to health services. Furthermore, they experience intersectional stigma (relative to their sexual orientation and their sex work), violence, and legal complications, which makes them a key population for HIV, one that has not received due attention by HIV prevention services [75,76,77]. Worldwide, violations against sex workers' human rights are recorded, including the criminalization of sex work and police violence, all of which makes this population's vulnerability to HIV even greater [77].

Other studies have noted the complexity of the programmatic vulnerability faced by adolescents in general, such as limited access to health services and few initiatives to promote sexual health [78,79]. Thus, the data from our study justify an intersectoral approach to sexual health initiatives, involving not just the health sector but also education and human rights. Sex education in schools is effective in imparting knowledge on HIV, encouraging greater autonomy in condom use, and delaying the first sexual intercourse [80]. A study of the effects of comprehensive sex education programs in schools in Mexico found that students who took part in them were more likely to try to convince a sexual partner to use a condom [81]. In Bangladesh, teacher-led classroom training in HIV/AIDS increased adolescents' understanding of how HIV is transmitted and can be prevented [82].

Brazil has regulations, policies, and programs that could be used for a similar end. For example, the Brazilian 1990 Statute of the Child and Adolescent is an important legislative milestone for championing adolescent health and holding the State accountable for providing means for their protection without any type of discrimination [73]. Its public health system has had a national policy for the comprehensive care of adolescents and youth since 2005, which includes sexual health and the need

for educational initiatives [83]. Since 2007, the *Programa Saúde na Escola* (Health at School Program) has provided healthcare and other disease prevention and health promotion measures, including sexual health [84].

However, HIV and STI prevention in Brazil is being hampered by a curtailment of open discussions for adolescents about sex education in schools, especially because of rising political and religious conservatism in the last decade or so [85,86,87]. Furthermore, moral factors influence the care offered by health workers at specialized HIV/AIDS health services [88], which makes it harder for public policies to promote HIV prevention, especially among AMSM. Moreover, these contexts of vulnerability may have been further aggravated by the COVID-19 pandemic, as it affected the worldwide access to HIV prevention and testing services among MSM [89,90].

The limits of this study include its small convenience sampling, the distribution of the events in comparisons, which may have influenced analytical statistical power, and the baseline population for a cohort targeting HIV and STI prevention, which could have selected other people at increased vulnerability to be included in this study. Moreover, the limitation of the statistical model restricted to the collection of individual data is noteworthy, having as its theoretical scope a concept of vulnerability implying contextual analysis. Despite this, our study has the advantage of covering adolescents at higher risk of infection who attend partner meeting places, allowing for a better understanding of groups that should be priorities for public policies.

Conclusions

We identified a high prevalence of HIV among the AMSM recruited to the PrEP1519 project in Salvador. Furthermore, our study found that factors from the individual (use of apps to find sexual partners), social (sex work, education and discrimination), and programmatic dimensions (place in which healthcare was sought) were associated with the prevalence of HIV infection, albeit some of those showed borderline statistical significances.

The investigation of the dimensions of vulnerability for HIV among AMSM is important to identify what factors are behind not only the relationship between the etiological agent and the individual but also the role of the sociocultural and political environment and the intersubjective context, which are all implicated in the illness [32].

The debate surrounding sexuality and HIV prevention must transpose the moral and religious sphere in which it is currently framed in Brazil, to a context that considers the scientific evidence about what interventions are effective for tackling the vulnerability of this population to HIV. We suggest ramping up HIV combined prevention activities and offering positive sexual health initiatives in LGBTQI+ social venues and schools by local health services in conjunction with key actors, such as teachers, universities, NGOs, LGBTQI+ entities, the judicial branch, and the public prosecution. Moreover, we recommend expanding conventional HIV testing and self-testing to enable the early diagnosis of new infections, as well as strengthening specialized services, so that AMSM already living with HIV can get access to ART. Finally, daily oral PrEP is a promising prevention technology for adolescents aged under 18 years, which can expand the set of choices for combination prevention programs.

Contributors

L. Magno contributed to the study design, data interpretation, writing, and review; and approved the final version of the manuscript. D. S. Medeiros contributed to the data analysis and interpretation and writing; and approved the final version of the manuscript. F. Soares contributed to the data collection and analysis and review; and approved the final version of the manuscript. A. Grangeiro contributed to the data interpretation and review; and approved the final version of the manuscript. P. Caires contributed to the data collection and analysis and review; and approved the final version of the manuscript. T. Fonseca contributed to the data collection and analysis and review; and approved the final version of the manuscript. M. R. Westin contributed to the data collection and analysis and review; and approved the final version of the manuscript. I. Dourado contributed to the data interpretation and review; and approved the final version of the manuscript.

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Resumo

Homens adolescentes que fazem sexo com homens (AHSH) apresentam vulnerabilidade aumentada ao HIV. O estudo teve como objetivo estimar a prevalência de HIV e fatores individuais, sociais e programáticos entre AHSH em Salvador, Bahia, Brasil. O estudo transversal foi baseado na análise dos dados da linha de base da coorte PrEP1519 em Salvador. Foram realizadas análises descritivas, bivariadas e multivariadas, usando as dimensões de vulnerabilidade ao HIV como níveis analíticos hierárquicos. Foram usados modelos de regressão logística para estimar as razões de chances (OR) da associação entre as variáveis preditoras e a infecção pelo HIV. A prevalência de infecção pelo HIV entre os 288 AHSH recrutados pelo projeto foi de 5,9% (IC95%: 3,7-9,3). A análise ajustada mostrou uma associação estatisticamente significativa entre a autoidentificação como profissional do sexo (OR = 3,74, IC95%: 1,03-13,60) e a infecção pelo HIV. Outras associações com significância estatística limítrofe foram: uso de aplicativos para achar parceiros sexuais (OR = 3,30, IC95%: 0,98-11,04), menor escolaridade (OR = 3,59, IC95%: 0,96-13,41), história de não ter sido contratado ou de ter sido demitido em função da orientação sexual (OR = 2,88, IC95%: 0,89-9,28) e falta de uso de serviços de saúde como fonte usual de cuidados (OR = 3,14, IC95%: 0,97-10,17). Foi encontrada uma alta prevalência de HIV entre AHSH em Salvador. Além disso, o estudo mostrou que fatores encontrados nas dimensões individual, social e programática estiveram associados à infecção pelo HIV entre esses AHSH. Recomendamos a intensificação das atividades de prevenção combinada entre AHSH.

Homens que Fazem Sexo com Homens; Adolescente; HIV; Prevalência

Resumen

Los hombres adolescentes que tienen sexo con hombres (AHSH) sufren más vulnerabilidad ante el VIH. El objetivo de este estudio fue estimar la prevalencia de VIH y los factores asociados individuales, sociales, y programáticos asociados entre AHSH en Salvador, Bahia, Brasil. Se trata de un estudio transversal, basado en el análisis de los datos de referencia de la cohorte PrEP1519 en Salvador. Se realizaron análisis descriptivos, bivariados, y multivariados usando las dimensiones de vulnerabilidad respecto al VIH, como los niveles jerárquicos de análisis. Los modelos de regresión logística se usaron para estimar las odds ratios *(OR) de la asociación entre las variables predictoras y la infección por VIH. La prevalencia de infección por VIH entre los 288 AHSH reclutados para el proyecto fue 5,9% (IC95%: 3,7-9,3). El análisis ajustado reveló una asociación estadísticamente significativa entre autoidentificarse como un trabajador sexual (OR = 3,74, IC95%: 1,03-13,60) y la infección por VIH. Otras asociaciones con una significación estadística marginal fueron: uso de apps para encontrar pareja sexual (OR = 3,30, IC95%: 0,98-11,04), menos años de educación (OR = 3,59, IC95%: 0,96-13,41), no estar contratado o ser despedido de un trabajo debido a la orientación sexual (OR = 2,88, IC95%: 0,89-9,28), y no usar los servicios de salud como recurso habitual de atención sanitaria (OR = 3,14, IC95%: 0,97-10,17). Se identificó una alta prevalencia de VIH entre AHSH en Salvador. Asimismo, nuestro estudio halló que los factores desde una perspectiva individual, dimensión social, y dimensión programática estuvieron asociados con una infección por VIH entre AHSH. Recomendamos que se intensifiquen las actividades combinadas de prevención contra el VIH para AHSH.*

Hombres que Hacen Sexo con Hombres; Adolescente; VIH; Prevalencia

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