

Acceptability of HIV self-testing is low among MSM who have not tested: a study with respondent-driven sampling in Brazil

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Abstract

Background: Brazil has a lot of people living with HIV (PLWH) that are still unaware of their own serostatus and has recently integrated HIV self-test (HIVST) into its public health system and offered to key populations such as men who have sex with men (MSM). This study estimates HIVST acceptability among Brazilian MSM and its associated factors.

Methods: Respondent-driven sampling (RDS) was used in behavioral and biological surveillance to recruit 4,176 MSM in 12 Brazilian cities in 2016. Descriptive, bivariate and multivariate analyses were conducted. Overall proportions were weighted according to Gile's estimator using RDS Analyst Software and 95% confidence intervals were calculated. The analyses of HIVST acceptability were stratified by prior HIV testing (never or at least once in a lifetime).

Results: We included 3,605 MSM who did not previously know they were PLWH. The HIVST acceptability was 49.1%, lower among those had done HIV test during lifetime compared to those who have never done it (42.7% vs 50.1%), especially among who are in a less vulnerable social context. In the subgroups of MSM who had never had an HIV test, those with complete secondary or incomplete higher school, who reported discrimination, who with a medical appointment in the last 12 months, with high levels of knowledge of HIV/AIDS and who took part in LGBT nongovernmental organization (LGBT-NGO) had higher HIVST acceptability. Among MSM who had taken an HIV test, those who took part in LGBT NGOs had greater HIVST acceptability. We observed a dose-response effect of schooling and knowledge of HIV/AIDS on HIVST acceptability: an increase in both levels was associated with greater acceptability.

Conclusions: The findings highlight that it is necessary to improve information about HIVST among MSM more vulnerable in Brazil. Given the acceptability of self-testing and its current adoption in Brazil, we can also point to the need for policies that build on this and enhance timely access to health services and prevention information.

Introduction

Routine testing to detect HIV infection is an important measure for a combined HIV prevention strategy [1] since it entails three levels of intervention. Firstly, the biomedical level, since technology is used to detect the virus, which is the gateway to antiretroviral treatment in health services, breaking the chain of transmission [2]. Secondly, the behavioral level, because individual and social group decisions are required to take the test, depending on cultural beliefs, preventive attitudes and perception of risk [3]. Finally, it depends on structural aspects, in terms of access to testing services, which generally involve important barriers, such as stigma, discrimination and test availability [4, 5].

People unaware of their positive status may significantly contribute to the increase in new infections [6]. In the United States (USA), it is estimated that 49% of new infections may be attributed to 20% of people living with HIV (PLWH) but unaware of their positive status [7]. In many countries, men who have sex with men (MSM) are considered a key population as they face much higher rates of HIV and AIDS than the general population and are most at risk for contracting HIV [8]. In the USA, the number of people living with HIV who do not have suppressed viral loads is often higher between MSM compared to male and female heterosexuals. Furthermore, the number of MSM who do not have suppressed viral loads and who practice unprotected sex with partners with a different HIV

status was 8 times higher than the number of heterosexual men and more than twice the number of high-risk heterosexual women [9]. Given this scenario, it is necessary to expand HIV testing among MSM.

According to the 90-90-90 UNAIDS goals [10], the largest gap in Brazil is found for the initial target, which is for 90% of people living with HIV/AIDS to know their HIV status. Estimates for Brazil of 900,000 PLHIV and approximately 135,000 are still unaware of their positive status, corresponding to 85% of the 90% target of diagnosed individuals [11]. These estimates are worse when compared with some African countries such as Namibia (91%), Rwanda (94%) and South Africa (90%), but it is better when compared to other countries in Latin America [11].

Among Brazilian MSM the estimates are lower: a 2016 study undertaken with MSM in 12 state capitals demonstrated that of those who were diagnosed with HIV during the study, 42.7% had been unaware of their positive status [12]. A similar study, conducted in 2009 in 10 cities around the country, demonstrated that almost half (48%) of MSM had never previously been tested for HIV [13]. In a comparison between the 2009 and 2016 studies, there was a drop in the proportion of MSM who had never been tested, from 49.8% in 2009 to 33.8% in 2016, and a rise in the proportion of those who stated that they had been tested during the last 12 months, from 21.2–43.3% [14]. In Salvador, a city in the country's most impoverished region, in 2009, 62.8% of MSM said they had never had an HIV test [13]; and in Curitiba, a city in a high-income region of Brazil, this proportion among MSM was much smaller: 24.3% [15], showing an important social and regional disparity.

The provision of testing outside health services is an additional resource to diagnose the infection and this is made possible with HIV self-testing (HIVST). The incorporation of HIVST by several countries, including Brazil, follows a 2016 recommendation from the World Health Organization [16]. HIVST is simple, easy to use, allows the individual to carry out their testing, may be administered through an oral fluid or blood sample, and the interpretation of results may be undertaken with or without help from a trained individual [16]. This technology should be made available as complementary to other available options [17].

Through this technology, HIV testing has become more accessible, confidential, private and anonymous [18, 19]. By enabling testing outside health services, for example, in the home, in social venues, and sex work arenas and streets, HIVST decentralizes testing and strengthens people's autonomy [16, 20]. Furthermore, it may facilitate an increase in testing frequency among individuals at high risk of HIV infection and in populations with less frequency of testing in traditional services, by providing an opportunity for the individual to test themselves on their own, weeks after a negative HIV test [18]. Studies demonstrate that HIVST also has positive impacts on care, early treatment [21, 22] and perception of risk 2014 [23].

There are few studies about the acceptability of HIVST in middle-income countries [19]. In Brazil, two online surveys based on MSM hookup apps estimated HIVST awareness ranged from 26.0% in 2016 to 33.0% in 2017, and willingness from 50.0–42.0%, respectively [24]. However, there are no studies of HIVST acceptability among a large community sample of Brazilian MSM. Therefore, this article aims to estimate the acceptability of HIVST among MSM from 12 Brazilian cities and to ascertain the factors associated with acceptability.

Methods

Study location, design, and population

This is a behavioral and biological surveillance study entitled “A nationwide study of the behaviors, attitudes, practices, and prevalence of HIV, Syphilis and Hepatitis B and C among MSM”, undertaken in 2016 in 12 state capitals: Manaus (AM) and Belém (PA) in the Northern region; Fortaleza (CE), Recife (PE) and Salvador (BA), in the Northeast; Brasília (DF) and Campo Grande (MS) in the Central-West; Belo Horizonte (MG), Rio de Janeiro (RJ) and São Paulo (SP) in the Southeast region; and Curitiba (PR) and Porto Alegre (RS) in the South.

The study sample was composed of men who reported having sexual intercourse with another man in the 12 months at least once before the study. Other inclusion criteria were: aged equal to or over 18 years; not identifying as a female transgender; residing, studying or working in one of the study cities; and agreeing to invite other MSM to participate in the study.

Data collection

Respondent-driven sampling (RDS) methods were used to recruit participants. We conducted a qualitative formative study to collect data in each city before the survey, to ascertain the specific behavior of MSM, discuss the research location, establish the incentive amount, and identify both seeds in the community and support for the study. During the formative study, we conducted semi-structured interviews and focus group discussions. In the survey, to start the recruitment process, we purposively selected six MSM, known as “seeds”, who had relatively large social networks of MSM and belong to different sociodemographic characteristics. Next, we asked each of these “seeds” to invite three other MSM from their social network using three coupons provided by the study for each participant. This procedure was repeated in sequence until the desired sample size was reached, estimated *a priori* as 350 participants per city. Participants received BRL 25.00 (US\$ 7.40) for their participation and for each recruited participant (up to a total of BRL 100.00) as a means of reimbursing their expenses for transport and food. Data was collected through structured interviews or self-completed questionnaires using tablets. We recruited 4,176 MSM in 12 Brazilian cities who signed the informed consent and received counseling, educational materials, and condoms. The Research Ethics Committee of the Federal University of Ceará approved the research project. More details about the methodology may be found in the protocol published by Kendall et al. [25].

Variables

A descriptive analysis was performed for the following variables: (1) socio-demographic: age (< 25 years and \geq 25 years), self-declared race (white, black, brown/mixed race, indigenous/native, Asian origin), schooling (primary and incomplete secondary education, complete secondary education and incomplete higher education, complete higher education) and marital status (single, separated or widowed; married or living together); (2) socio-economic status: three economic groups were created (A-B/high; C/middle; D-E/low) based on the Brazilian Economic Classification Criteria [26]; (3) discrimination: self-reported discrimination due to sexual orientation during lifetime (yes, no); (4) health services: medical appointment in the 12 months before the study (yes, no), having taken part in any workshop about sexually transmitted infections (STI) and HIV/AIDS in the 12 months before the study (yes, no); HIV test during lifetime was determined by responses to the following question: “have you ever been tested for HIV/AIDS in your life?” (yes, no); and the time since the last HIV test (< 1 year; 1–2 years; > 2 years; and never has taken the test); (5) knowledge about HIV/AIDS (low, middle and high) was analyzed according to item response theory (IRT), measured by 12 questions (items) about transmission and prevention (i.e. there are medicines for HIV-negative people to take to prevent HIV; an HIV-infected person who is taking AIDS medication has a lower risk of transmitting the virus, etc.), as described in Guimarães et al. [27]; (6) perception of risk (low, middle and high), in response to the question: “how do you assess your chance of becoming infected with HIV during your lifetime?”; (7) participation in an LGBT nongovernmental organization (NGO) (yes, no); and (8) condomless receptive anal

sex in past six months (always used condoms and irregular use of condoms). The outcome variable of HIVST acceptability (yes, no) was structured according to the following question: “would you take an HIV/AIDS diagnosis test that you applied to yourself?”. The reasons for the decision to use or not use HIVST were collected.

Data analysis

People who were aware of their HIV serostatus were excluded from the analysis. The data analysis is among 3,605 MSM. It took into account the dependence between observations resulting from recruitment chains in RDS, the probability of unequal selection, and the different sizes of each participant’s contact network [28]. The Gile’s estimator [29] was used to weigh the proportion estimates with a 95% confidence interval using RDS Analyst [30]. We performed all data analyses from the 12 cities aggregated into one database with each city treated as an analysis stratum.

The weighted data were analyzed using the complex sample routines in STATA 15 (StataCorp, College Station, TX, USA). Descriptive, bivariate analyses were conducted using frequency distributions of the variables of interest and the differences between the analyzed proportions using Pearson’s χ^2 test. Analyses were stratified according to prior HIV testing (never or at least once in a lifetime). A multivariate logistical regression model was constructed to estimate the Odds Ratio (OR) as a measure of association between the potential associated factors and HIVST acceptability. This procedure began with the selection of variables that reached a $p < 0.15$ value in the bivariate analysis and through a literature review concerning factors associated with HIVST acceptability. Those variables with a p -value of < 0.05 remained in the final model. We assessed the moderating role of prior HIV testing by analysis of interaction using the likelihood-ratio test (p -value < 0.05) comparing models with and without interaction terms.

Results

Of 3,605 MSM who did not previously know they were PLWH, most were under 25 years of age (61.3%), black or brown/mixed race (64.8%), with complete secondary or incomplete higher education (57.5%), belonged to the high economic group (A-B) (43.4%), were single, separated or widowed (87.6%). The majority (64.6%) reported having experienced discrimination during their lifetime. In terms of health services, 80.7% said they had seen a doctor in the last 12 months, 80.5% had not participated in any workshop about STI and HIV/AIDS in the previous 12 months, and 37.2% reported never having taken an HIV test. Of those who have been tested for HIV in their lifetime, 42.3% have done it less than a year, 11.8% from one to two years and 8.7% from more than 2 years. Less than one fifth (17.0%) had taken part in some LGBT NGO. Thirty-six percent reported irregular use of condoms during receptive anal sex in the past six months (Table 1).

Table 1
Population characteristics of MSM in 12 Brazilian cities, 2016.

Variables	%¹	95%CI²	
Age			
< 25 years	61.3	57.4	65.1
≥ 25 years	38.7	34.9	42.6
Race			
White	31.6	28.0	35.2
Black	23.8	20.4	27.5
Brown/mixed race	41.0	37.6	44.8
Indigenous/native	1.6	0.9	3.0
Asian origin	2.0	1.4	3.0
Schooling			
Primary/Incomplete Secondary education	31.8	28.5	35.4
Complete Secondary/Incomplete Higher education	57.5	53.7	61.2
Complete Higher education	10.7	8.6	13.2
Socio-economic status groups			
D-E (Low)	15.9	13.4	18.8
C (Middle)	40.7	37.0	44.6
A-B (High)	43.4	39.6	47.1
Marital status			
Single/separated/widowed	87.6	85.1	89.7
Married/living together	12.4	10.3	14.9
Self-reported discrimination during the lifetime			
No	35.4	32.0	38.9
Yes	64.6	64.6	68.0
Medical appointment in the last 12 months			
Never had appointment	0.2	0.1	0.4
> 12 months	19.1	19.2	22.1
≤ 12 months	80.7	77.7	83.3

¹Gile-SS weighted estimate

Variables	% ¹	95%CI ²	
Took part of any workshop on STI and HIV/AIDS in the last 12 months			
No	80.5	77.1	83.6
Yes	19.5	16.5	22.9
HIV test during lifetime			
No	37.2	33.5	41.1
Yes	62.8	58.9	66.5
Time since the last HIV test			
≤ 1 year	42.3	38.6	46.2
1–2 years	11.8	9.4	14.7
> 2 years	8.7	6.9	10.9
Never has taken the test	37.2	33.5	41.1
Took part of LGBT NGO			
No	83.0	79.8	85.8
Yes	17.0	14.2	20.2
Condomless receptive anal sex (past 6 months)			
Always used condoms	63.3	59.7	66.8
Irregular use of condoms	36.7	33.7	40.3
¹ Gile-SS weighted estimate			

HIVST acceptability was 47.3% (CI 95%: 43.5–51.1). Reported reasons for its use were: curiosity (31.3%), as a routine test (27.8%), practicality (17.8%), believes to be at risk for HIV infection (16.6%), and not wanting anyone else to know test result (11.3%). On the other hand, reported reasons for not use it: fear (42.7%), did not see why use it (23.8%), unawareness (2.3%), to believe to be at low or no risk for HIV infection (1.8%) and because it has never been offered (1.6%) (Table 2). The HIVST acceptability was lower among those never tested for HIV during lifetime compared to those who have been tested (42.7% vs 50.1%, p-value = 0.07).

Table 2
Acceptability of HIVST and reasons for use/non-use.

Variables	N ¹	% ²	95%CI ²	
Acceptability of HIVST				
Yes	1951/3605	47.3	43.5	51.1
No	1654/3605	52.7	48.9	56.5
Reasons to use HIVST				
Curiosity	775/1951	31.3	26.7	36.4
As a routine test	874/1951	27.8	24.2	31.7
It is more practical	183/1951	17.8	13.6	22.8
Believes to be at risk for HIV infection	424/1951	16.6	13.5	20.4
Not wanting anyone else to know the result	220/1951	11.3	8.5	14.9
Reasons to not use HIVST				
Fear	687/1654	42.7	37.2	48.3
Does not see any reason to use it	449/1654	23.8	20.0	27.9
Not knowing where to take the test	76/1654	2.3	1.6	3.3
Believes to be at low or no risk for HIV infection	44/1654	1.8	1.0	3.0
Because it has never been offered	49/1654	1.6	1.0	2.6
¹ Crude				
² Weighted by Gile-SS				

Table III. Acceptability of HIVST among an RDS sample of MSM, stratified by the report of prior HIV testing in 12 Brazilian cities, 2016.

Variables	HIV test during lifetime							
	Never taken	p-value	Taken	p-value	Never taken	Taken	Never taken	Taken
	Accepts HIVST (42.7% ¹)		Accepts HIVST (50.1% ¹)		(OR ¹)	(OR ¹)	(Adjusted OR ¹)	
Age								
>=25 years	34.2	0.07	48.3	0.53	1.00	1.00		
< 25 years	48.3		51.4		1.79 (0.93– 3.45)	1.13 (0.76– 1.66)		
Race								
Black	34.6	0.30	49.9	0.09	1.00	1.00		
Brown/mixed race	44.5		44.0		1.51 (0.83– 2.74)	0.78 (0.45– 1.36)		
White	48.6		57.4		1.79 (0.33– 3.70)	1.35 (0.76– 2.40)		
Schooling								
		0.008		< 0.001				
Primary/Incomplete Secondary	35.5		30.1		1.00	1.00	1.00	1.00
Complete Secondary/Incomplete Higher	53.1		53.7		2.05 (1.16– 3.64)	2.69 (1.70– 4.26)	1.74 (1.01– 3.01)	2.17 (1.34– 3.51)
Complete Higher	20.4		67.4		0.46 (0.11– 1.93)	4.80 (2.58– 8.92)	0.86 (0.27– 2.76)	3.39 (1.75– 6.56)
Socio-economic status groups								
D-E	32.5	0.07	26.0	<0.001	1.00	1.00		
C	40.6		48.5		1.41 (0.67– 2.96)	2.54 (1.47– 4.36)		
A-B	52.6		56.1		2.30 (1.08– 4.89)	3.45 (2.02– 5.88)		
Marital status								
Married/living together	43.7	0.91	55.2	0.33	1.00	1.00		

Table III. Acceptability of HIVST among an RDS sample of MSM, stratified by the report of prior HIV testing in 12 Brazilian cities, 2016.								
Single/separated/widowed	42.6		49.2		0.95 (0.42– 2.16)	0.78 (0.47– 1.28)		
Self-report of discrimination during the lifetime								
No	29.3	< 0.001	38.8	0.001	1.00	1.00	1.00	
Yes	54.4		54.6		2.87 (1.69– 4.87)	1.89 (1.27– 2.82)	2.00 (1.18– 3.38)	
Medical appointment in the last 12 months								
No	33.6	0.01	48.6	0.75	1.00	1.00	1.00	
Yes	49.9		50.7		1.96 (1.12– 3.40)	1.08 (0.64– 1.82)	1.74 (1.01– 2.99)	
Took part of any workshop on STI and HIV/AIDS in the last 12 months								
No	39.1	0.03	53.1	0.03	1.00	1.00		
Yes	58.3		41.2		2.17 (1.03– 4.57)	0.61 (0.39– 0.96)		
Knowledge about HIV/AIDS (IRT score)²								
Low	38.3	0.06	31.7	< 0.001	1	1	1	1
Middle	39.8		52.6		1.06 (0.57– 1.98)	2.39 (1.37– 4.14)	1.13 (0.66– 1.96)	2.38 (1.44– 3.92)
High	59.9		61.2		2.41 (1.08– 5.37)	3.39 (1.85– 6.24)	2.45 (1.05– 5.70)	2.79 (1.58– 4.93)
Perception of risk								
Low	38.0	0.67	37.3	0.11	1.00	1.00		
Middle	45.9		51.7		1.38 (0.72– 2.62)	1.79 (0.95– 3.37)		
High	42.6		56.4		1.21 (0.40– 3.64)	2.17 (0.91– 5.15)		

Table III. Acceptability of HIVST among an RDS sample of MSM, stratified by the report of prior HIV testing in 12 Brazilian cities, 2016.								
Took part of LGBT NGO								
No	39.5	0.02	46.6	< 0.001	1.00	1.00	1.00	1.00
Yes	65.0		64.1		2.84 (1.12–7.17)	2.04 (1.23–3.39)	3.26 (1.29–8.25)	2.06 (1.44–3.92)
Condomless receptive anal sex (past 6 months)								
Always used condoms	42.5	0.96	45.1	0.01	1.00	1.00		1.00
Irregular use of condoms	42.6		56.5		1.01 (0.57–1.76)	1.58 (1.09–2.28)		1.46 (1.00–2.15)
¹ Gile-SS weighted estimate; ² Score obtained through analysis of Item Response Theory								

Table 3 contains the bivariate and multivariate analyses stratified by testing history. In the bivariate analysis, when we analyzed the MSM subgroups of those who had never taken an HIV test, we observed greater HIVST acceptability among those with the following characteristics: complete secondary/incomplete higher school, compared to with primary/incomplete secondary school; higher socio-economic status (A-B) compared to lower (D-E); having felt discriminated against because of their sexual orientation during their lifetime, compared to those who had not; those who had been to a medical appointment in the last 12 months, compared to those who had not; those who had participated of any workshop on STI and HIV/AIDS in last 12 months, compared to those who had not; high level of knowledge about HIV/AIDS, compared to a low level; and having taken part in an LGBT NGO, compared to those who had not. It is noteworthy that among those who have never been tested, complete higher education was not associated with increased acceptability of HIVST.

On the other hand, among those who had taken an HIV test, we observed greater HIVST acceptability for MSM with higher levels of schooling, compared to those with lower levels; higher socio-economic status (C or A-B) compared to lower (D-E); having felt discriminated against because of their sexual orientation during their lifetime, compared to those who had not; middle and high level of knowledge about HIV/AIDS, compared to a low level; having taken part in an LGBT NGO, compared to those who had not; having inconsistent condoms use in last 6 months, compared to those with consistent use. It is noteworthy that the only negative association was among those who participated in any workshop on STI and HIV/AIDS: with lower acceptability of HIVST, compared to those who did not.

In the multivariate analysis, in the subgroups of MSM who had never had an HIV test and those who had, we observed that those with complete secondary or incomplete higher school, high levels of knowledge of HIV/AIDS and who had taken part in an LGBT NGO were more likely to accept HIVST, compared to those with primary or incomplete secondary school, low levels of knowledge and those that did not participate in any such NGO, respectively.

Only within the subgroup of those who had never taken an HIV test, we found that MSM who had suffered discrimination and had a medical appointment in the last 12 months had greater HIVST acceptability than those who had never suffered discrimination and had not a medical appointment. And only within the subgroup of those who had taken an HIV test, we found that those MSM with inconsistent condom uses condoms in the last 6 months had greater HIVST acceptability than those with consistent condom used; moreover, in this same subgroup, we observed a dose-response effect of schooling on HIVST acceptability: those with secondary or incomplete higher education and with complete higher education had greater acceptability than those who only had primary education or had not completed secondary school; likewise of knowledge of HIV/AIDS: those with high and middle knowledge had greater acceptability than those who had low knowledge.

Discussion

The results indicate that almost half of the MSM accepted the HIVST, but this is lower among who never been tested for HIV and are in a less vulnerable social context (i.e. who had a high level of education and socio-economic status, who had high HIV/AIDS knowledge and more access to medical appointment). The planning actions and information about HIVST directed to MSM must be focus on more vulnerable people.

Figuroa et al. [19], in a review of the literature regarding attitudes and HIVST acceptability, demonstrated that, of the 14 studies analyzed, eight indicated high acceptability ($\geq 67\%$), five moderate (between 34–66%), and one low ($\leq 33\%$). The moderate acceptability found in our study may be because since at the time of the RDS investigation (2016), HIVST kits were not yet available in Brazil, neither commercially nor through the public health system. The commercialization of this product in Brazil took place in November 2015, when the National Health Surveillance Agency (*Agência Nacional de Vigilância Sanitária: ANVISA*) approved the sale of HIVST in pharmacies. In 2017, the first HIVST registration took place. The product has been commercially available since then, in both physical and online pharmacies and drugstores in all Brazilian states, at a cost of BRL 70.00 (21.90 US\$) to BRL 80.00 (25.00 US\$) per kit (7–8% of the minimum wage). We note that, even among those disposed to use the HIVST, its high cost may act as an access barrier and compromise the potential impact of this strategy, particularly in low-income contexts, thereby justifying their free distribution to key and priority populations [31].

Brazil has a long track record in successfully implementing a public HIV prevention and treatment interventions through of Brazilian Health Care System (*SUS*) [32–34]. In 2019, Brazil began offering free HIVST in select 14 cities and now is expanding to other cities. The strategies initially adopted was the distribution of HIVST in sociable places to key-population, to sexual partnerships PLWH and people in high vulnerability to HIV infection [35]. The implementation of HIVST to free distribution and as a public health policy may promote the increase of testing frequency among high-risk MSM [36]. Moreover, it has been considering as a technology with good cost-effectiveness [37, 38].

The HIVST has been put forward as a strategy to extend HIV diagnoses that may contribute to the reduction of transmission by enabling early diagnosis, access to care and treatment, and reduced viral load [20, 39, 40]. Our results suggest that the acceptability of HIVST is higher precisely among those who have already tested for HIV, and thus justify ample promotion of HIVST, particularly to MSM who are not used to routine testing.

We also found greater acceptability related to increased knowledge about HIV/AIDS, participation in LGBT NGOs and recent medical appointments. This highlights the fact that HIVST in itself is not enough to increase prevention opportunities (e.g. accessing information, increasing knowledge, being recommended by health services, NGOs). HIVST should be jointly available with reinforced HIV/AIDS prevention activities that promote HIVST within a

combined prevention strategy, including strengthening and extending health services, targeted health education campaigns and support for community-based organizations and NGOs [41].

Of that MSM we interviewed who had never taken an HIV test, self-reported discrimination was one of the factors that increased the likelihood of HIVST acceptability. As pointed out in the literature, stigma, and concerns about confidentiality and privacy are among the barriers to testing confronted by MSM [4, 41–43]. Those who have not yet been tested, or were tested a long time ago, may resort to HIVST as a strategy to avoid potential discrimination or confidentiality fears in health services.

On the other hand, among MSM who had taken an HIV, those who reported a recent condomless receptive anal sex were much likely to accept HIVST. A study conducted in Spain documented that MSM with high-risk infection behaviors had high intentions to do a future HIV testing [44]. Furthermore, this phenomenon in our research may be due to the high-risk perception found among this subgroup (data not showed). A study among the population, in general, had shown that higher perceived risk of HIV was associated with higher HIV testing [45], while a study among MSM showed just the opposite [46].

“Fear” is given as the main reason for not taking the HIVST. However, “fear” is not limited to HIVST technology, given that fear is also seen as a barrier to conventional testing conducted in health services [47]. This is about the fear of the stigma of taking the test since it might imply both homosexuality and the fact that discover that is a PWLH [4, 48, 49].

Further, although our data do not allow us to examine in-depth the meaning of fear as a reason for not taking the test, we could argue that such fear is related to more general aspects referred to in other studies. Specifically, in the case of HIVST, the literature refers to the fear of a positive result without being properly linked to a health service [42, 48, 50]. As Flowers et al. [43] suggest, in research conducted with MSM in the United Kingdom, HIVST has the potential to reduce certain barriers related to traditional testing but may promote other complicating factors, such as a reduction in commitment to health services and professionals to follow up test results and access services, and fewer opportunities for health prevention and education regarding risk behaviors.

Our analysis is not without limitations, including the potential selectivity of the recruited network, the potential non-representativeness of the MSM population in the cities or a set of 12 cities. But the participants are those MSM in a social network and can be reached by prevention activities. The questionnaires had not constructed to only measure the HIVST theme and we did not have deep questions about previous knowledge, uptake and usability. Further, this is a cross-sectional study with evident limitations for producing causal inferences and generalizations.

Conclusion

Our data suggest greater acceptability of HIVST precisely within the group of MSM who have already taken the test and are in a less vulnerable social context. We can describe the importance of HIVST for this large sample of MSM distributed across Brazil. Given the acceptability of self-testing and its current adoption in Brazil, we can also point to the need for policies that build on this and enhance timely access to health services and prevention information, as well as the development of an epidemiological surveillance system capable of incorporating the results of tests taken at home. In future studies, it is worth examining knowledge, acceptance, and availability of health professionals to recommend HIVST to ensure its dissemination and the availability of services for follow-

up. The growing availability of HIVST in Brazilian pharmacies and the public health system may affect an already challenged access-to-treatment system. Future studies should also explore price-sensitivity since currently HIVST available in the commercial sector is too expensive for repeated use (i.e. after each risky sexual episode) for many MSM.

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Declarations

Ethics approval and consent to participate

The research project was approved by the Research Ethics Committee of the Federal University of Ceará. (n° CAAE-43133915.9.0000.5054 and n° 1.024.053). The written consent was obtained for each participant.

Consent for publication

“Not applicable”

Availability of data and materials

The data that support the findings of this study are available from Ministry of Health of Brazil, in Department of Chronic Disease and Sexuality Transmitted Infections, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Ministry of Health of Brazil.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

LM conceptualized, analyzed and interpreted data, and was a major contributor in writing the manuscript the article; AFL supervised the fieldwork, interpreted data and writing the manuscript; DK supervised the fieldwork, interpreted data and writing the manuscript; ID supervised the fieldwork, analyzed and interpreted data and substantively revised it; MDC supervised the fieldwork, analyzed and interpreted data and writing the manuscript; EPS reviewed the manuscript; TJ reviewed substantially the manuscript; GMR supervised the fieldwork and reviewed substantially the manuscript; MAV supervised the fieldwork and reviewed substantially the manuscript; CK supervised the fieldwork and reviewed substantially the manuscript; AKP supervised the fieldwork and reviewed substantially the manuscript; AMB supervised the fieldwork and reviewed substantially the manuscript; LK coordinated the research and reviewed substantially the manuscript;

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