Perceived Risk of HIV Infection and Acceptability of PrEP among Men Who Have Sex with Men in Brazil

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**Introduction**

In Latin America, the HIV epidemic disproportionately affects men who have sex with men (MSM), who accounted for 40% of new HIV infections in 2018 (UnAids, 2019). In Brazil, in two nationwide surveys of MSM aged 18 and older conducted seven years apart, the prevalence of HIV among this age range was estimated to be 14.2% in 2009 and 18.4% in 2016 (Kerr et al., 2018; Kerr et al., 2013). Analyses of the data from these surveys show that MSM have little knowledge of HIV prevention, transmission, and treatment (Guimarães et al., 2019), or which sexual practices increase the risk of HIV, as well as low perceived risk of HIV (Guimarães et al., 2018).

In this context, pre-exposure prophylaxis for HIV (PrEP) adds value to a set of combination prevention measures for MSM. Oral PrEP is available for daily use or as an event-driven antiretroviral for individuals who are HIV negative (World Health Organization, 2012, 2019). Its efficacy has been proven in different clinical trials (Baeten et al., 2012; Grant et al., 2010; J. M. Molina et al., 2017; Thigpen et al., 2012), and its effectiveness has been shown in demonstration studies (Cohen et al., 2015; Grinsztejn et al., 2018; Liu et al., 2016; Molina et al., 2019; Montgomery et al., 2016). In 2018, daily oral PrEP was included in the Brazilian national health system (Sistema Único de Saúde or SUS), for free, as part of the national public policy for HIV prevention targeting key population groups (PrEP-SUS) (BRASIL, 2017).

Nonetheless, despite the progress seen in HIV prevention in recent years, the prevalence of HIV among MSM is still high (Saffier et al., 2017). As for PrEP, socio-structural and contextual barriers have been observed, such as access to health services, fear of disclosing sexual orientation, HIV-related stigma, and fear of being perceived as promiscuous (da Silveira et al., 2021), as well as individual barriers, such as uncertainty about the efficacy of PrEP, concerns about side effects, low perceived risk of HIV (Magno et al., 2019), the incorporation of daily medication in the routine, and the impact on their social lives due to HIV stigma (Zucchi et al., 2021).

Risk perception may be understood as a potential susceptibility assimilated by an individual of being affected by a danger, disease or injury, under certain behavioral conditions (Brewer et al., 2007). It is determined by multiple factors, including access to information, years of schooling, participation in HIV/AIDS NGO and HIV knowledge (Williams & Noyes, 2007). It is generally agreed that the likelihood of an individual changing his/her behavior and adopting protective attitudes is largely influenced by their state of mind in assessing a risk, danger, or severity of an outcome (Rogers, 1983). It’s important to consider that risk is not a neutral concept (Lupton, 1999), but has symbolic, cultural and moral dimensions which affect how people evaluate their behaviors and practices. In addition, values and meanings of risk also contribute to the way people position themselves in their practices and relationships.

Studies have shown that high perceived risk of HIV among MSM is associated with the adoption of preventive measures like HIV testing (Khawcharoenporn et al., 2019; Stephenson et al., 2015), and PrEP use (Golub et al., 2013; Peng et al., 2018). Condom use is long known to be effective and associated with safer sex among MSM (Klein & Kaplan, 2012). Shaefer et al. (Schaefer et al., 2020) reported an association of high-risk perception of HIV and lack of condom use and also showed that an increase in condom use leads to a decrease in risk perception. However, a direct correlation between risk perception and real risk of HIV is highly complex (Plotzker et al., 2017), since other studies have shown that individuals at higher risk may perceive themselves at low or no risk of infection (Khawcharoenporn et al., 2019; MacKellar et al., 2007; Rutstein et al., 2020).

HIV risk perception is considered an important predictor of HIV preventive measures. However, studies on the association of perceived risk of HIV and the acceptability of daily oral PrEP among MSM are still scarce in Latin America. In this paper, we aimed at investigating this association among MSM residing in 12 capital cities in Brazil.

**Method**

**Study Design**

This study reports findings from a cross-sectional biological and behavioral survey among MSM, conducted in 12 Brazilian capital cities in the five regions of Brazil, from June to December 2016: Manaus, Belém (North Region), Fortaleza, Recife, Salvador (Northeast Region), Brasilia, Campo Grande (Central-West Region), Belo Horizonte, Rio de Janeiro, São Paulo (Southeast Region), Curitiba, and Porto Alegre (South Region). Participants were eligible for the study if they self-identified themselves as cisgender men; 18 years of age or older; had at least one sexual intercourse with another man or transgender woman in the past 12 months; reported spending most of their time in the selected city (i.e., living, studying, and/or working there); and received a valid study coupon. Each study participant was screened for eligibility prior to enrollment. The study was approved by the Research Ethics Committee of the Federal University of Ceará and registered with the National Ethics Research Committee (n. 1.024.053). As mentioned, written informed consent was asked and obtained from all participants, who could withdraw consent at any stage of the process or skip
any questions perceived as too sensitive, too personal, or distressing.

Data Collection

Participants were recruited using respondent-driven sampling (RDS) as a sampling method aiming at obtaining a more robust and diverse sample (Gile & Handcock, 2010; Heckathorn, 1997). The formative phase of the study comprised group discussions with local MSM leaders, non-governmental organizations (NGO), potential participants, and local researchers. It aimed at identifying HIV risk-related behaviors, social and geographic organization of the MSM communities, potential limitations to recruitment, and decide on study operational issues, including the selection of seeds to start recruitment.

As required by the RDS methods, 5 to 7 initial participants in each city—called seeds—were chosen purposively, following formative qualitative research. After participating in the interview and testing, each seed received three non-reproducible coupons to distribute to other MSM from their social networks. The interviewees recruited by the seeds were defined as the first wave of the study. This process was repeated until the a priori defined sample size was achieved in each site. Other methodological details may be found in Kendall et al. (Kendall et al., 2019).

Measures

The outcome variable in this analysis was acceptability of daily oral PrEP, as elicited in the question: “Are you willing to use PrEP?” (yes; no). It was explained to the participants that PrEP consisted of taking daily HIV-prevention drugs for those who were HIV negative to keep them free of the virus. MSM who self-reported HIV-positive at the time of the interview were excluded from the analysis because PrEP is recommended only for people who are HIV-negative. Also, at the time of data collection, PrEP was not yet available in Brazil. Therefore, the number of participants who had used PrEP before the study was too small (n = 46) for actually affecting the results, and they were not excluded from this analysis.

The main exposure variable was perceived risk of HIV at the time of the interview (none; low; moderate; high). Because the proportions of acceptability among those with low or moderate risk perception were very similar, we decided to collapse these into one category due to power considerations for the multivariate analysis.

Other covariates were selected from a literature review: i-sociodemographics: age (< 25 years; ≥ 25 years); race (black; non-black); schooling (<12 or 12+ years of formal education); stable partnership (yes; no); and socioeconomic class (A-B—higher; C-D-E—lower)—defined by the Brazilian Association of Research Organizations (Critério de Classificação Econômica Brasil., 2016); ii-sociobehavioral: condom use in receptive anal sex in the previous 6 months (always used; irregular use); any illicit drug use (cannabis, cocaine, crack, amphetamines, glue, solvents, ecstasy) within the last 6 months (yes; no); commercial sex in the last 6 months (yes; no); history of forced sexual intercourse (yes; no); at least one symptom of a STI—secretion, wart, ulcer, or lesion on penis or anus—in the previous 12 months (yes; no); previous HIV test in the lifetime (yes; no); history of discrimination due to sexual orientation in a lifetime (yes; no); number of sexual partners in the last 6 months (≤ 4; > 4 to ≤10; > 10); used online platforms to find partners in the last 6 months (yes; no); iii-HIV and prevention related variables: ever heard of PrEP (yes; no); self-reported participation in HIV/AIDS non-governmental organizations (NGOs) (yes; no); previous post-exposure prophylaxis (PEP) use (yes; no); and an indicator of HIV knowledge (low; medium; high). The knowledge score was based on 12 questions about HIV transmission and prevention, using item response theory, and dividing the answers into < 25%, 25% to 75%, and > 75% for low, medium, and high knowledge, respectively (Guimarães et al., 2019); iv-PrEP variables related to barriers to PrEP use and risk compensation (evaluated by stopping condom use while taking PrEP) were: would have trouble remembering to take PrEP daily (yes; no); is afraid of side effects (yes; no); is afraid of people thinking he is HIV-positive (yes; no); fear of getting other STI if using PrEP (yes; no); would not use PrEP if regular HIV testing was required (yes; no); would stop using condom if using PrEP (yes; no).

Data Analysis

The analysis was weighted due to the dependence between observations resulting from referral chains, and the probabilities of unequal selections due to the different sizes of each participant’s network (Heckathorn, 1997). Each one of the 12 cities was defined as a stratum. In each stratum, the weighting was inversely proportional to the size of each participant’s network, totaling the stratum size. The questions in the questionnaire that measured the network size of each MSM were: “How many men do you know and who also know you, who have sex with other men (oral or anal) in the last 12 months, live, study and/or work in [municipality], are 18 years old or older, you encountered or spoke with in the last two months?” Overall proportions were weighted with Gile’s estimator in RDS Analyst software (Kendall et al., 2019). The analysis was conducted using the library for complex samples of STATA software version 15 (College Station, TX: StataCorp LLC).

A descriptive analysis of the weighted frequency of acceptability of daily oral PrEP use, risk compensation, and potential barriers to PrEP use was conducted. In the analysis
of the association between perceived risk of HIV and acceptability of PrEP, we fitted independent models yielding odds ratios adjusted for potential confounding factors, as well as their respective 95% confidence intervals (CIs). Variables with a $p$-value $\leq .10$ in the bivariate analysis or considered epidemiologically relevant were chosen to start multivariate modeling. Percent change in the effect of unadjusted to adjusted OR was used to evaluate confounding (Rothman et al., 2008). Only variables with $p < .05$ remained in the final model.

**Results**

A total of 4,176 MSM were recruited in the study, and those who were known to be HIV-positive were excluded from this analysis ($n = 303$). In addition, those who did not answer the question “Are you willing to use PrEP? ($n = 329$)” were also excluded, leaving 3,544 MSM available for this analysis. The proportion of PrEP acceptability was 69.7%. When asked about their perceived risk of HIV, 23.5% declared none, 67.2% said it was low or moderate, and 9.3% said it was high. Most participants were black (66.1%), less than 25 years old (61.0%), had no stable partnership (86.9%), and they were of a lower socioeconomic class (57.0%). The PrEP acceptability was highest among those who also reported a high perceived risk of HIV (88.0%), followed by those who reported a low or moderate perceived risk (72.8%), and lowest among those who believed they had no risk of HIV (57.4%) ($p = 0.001$) (Table 1).

The acceptability of daily oral PrEP use was higher among MSM under 25 years of age, who reported condomless anal intercourse, experienced discrimination due to their sexual orientation, who used online platforms to find partners, and who had previously used PEP ($p < .05$), and it was lower among who participate in HIV/AIDS NGOs ($p < .05$). The acceptability of PrEP was also higher among MSM who had experienced sexual violence ($p = .06$), although of borderline statistical significance at $p$-value level of .05 (Table 1).

Regarding risk compensation, and potential barriers to PrEP use, 27.6% reported they would have trouble remembering to take PrEP every day, and 25.6% indicated they would not use PrEP if regular HIV testing was required. As for the fears associated with PrEP use, 61.6% reported fear of side effects, 34.2% feared they could be mistaken for having HIV, and 73.4% feared getting other STI upon using PrEP. Only 18.6% said they would stop using condoms if they were using PrEP. When analyzing this by the practice of condom use, it was observed that among those who used condoms irregularly 26.2% would not use condoms if on PrEP, while 14.5% would stop it among those who always used condoms in anal sex (Table 2).

In the multivariate analysis, a dose–response relationship was observed between acceptability of PrEP and self-reported risk: PrEP acceptability was two times higher (OR 1.88; 95% CI: 1.24–2.85) among MSM whose perceived risk of HIV infection was low or moderate, and six times higher (OR 5.68; 95% CI: 2.54–12.73) among MSM who self-reported high risk compared to MSM reporting no HIV risk (Table 3).

**Discussion**

PrEP is an effective preventive strategy for reducing the risk of HIV infection among MSM (BRASIL, 2017). In this study, a dose–response relationship was observed, whereby MSM with the highest risk perception of HIV reported higher rates of PrEP acceptability.

Perceived risk of HIV infection varies across population groups and contexts (Cardona et al., 2012; Golub et al., 2013), while acceptability of a preventive technology is a complex, multidimensional phenomenon determined by the socioeconomic, political, and cultural context (Mensch et al., 2012). In low- and middle-income countries, in a context of limited use of PrEP and socioeconomic inequalities, specific factors tend to determine how acceptable PrEP is among MSM, such as level of schooling, knowledge of PrEP, and HIV risk perception (Yi et al., 2017). Individuals who believe they are at risk of acquiring a disease are more likely to adapt their behavior in order to reduce such a risk, while those who feel less at risk may be unlikely to adopt protective behaviors (MacKellar et al., 2007).

It is important to stress that perceived and actual risk of acquiring HIV are not directly associated (MacKellar et al., 2007; Plotzker et al., 2017). A study conducted in northeastern Brazil found that transgender women who had condomless anal intercourse were almost seven times less likely to use PrEP (Soares et al., 2019) than the ones who always used a condom, indicating that involvement in contexts of increased vulnerability to HIV does not necessarily prompt increased interest in this prevention strategy.

There is evidence that a significant proportion of people who seroconvert may perceive themselves to be at no or low risk of HIV (Corneli et al., 2014; MacKellar et al., 2005), which suggests that individuals who engage in sexual practices that involve a substantial risk of acquiring HIV may not perceive their context and/or sexual behavior as risky (MacKellar et al., 2005; Plotzker et al., 2017), leading to underestimation of real risk. For example, in this analysis, we observed that a lower proportion of participants who did not have commercial sex perceived themselves to be at a higher risk of HIV infection (7.87%), as compared to those who had commercial sex (17.84%) ($p < .05$) (Data not shown). However, those who did not have commercial sex were more
Table 1 Proportion of acceptability of daily oral PrEP according to sociodemographic and behavioral characteristics among MSM, Brazil, 2016 (N = 3544)

| Variables                                                                 | Total | PrEP acceptability | OR<sup>†</sup> (95% CI) |
|--------------------------------------------------------------------------|-------|--------------------|-------------------------|
|                                                                           | N<sup>a</sup> | %<sup>b</sup> | n<sup>c</sup> | %<sup>d</sup> | p -Value<sup>e</sup> |
| **Perceived risk of HIV infection**                                       |       |                   |             |             |                    |
| None                                                                      | 706   | 23.5              | 471         | 57.4        | .001               | 1.0                   |
| Low to moderate                                                           | 2453  | 67.2              | 1819        | 72.8        | 1.9 (1.3–3.1)      |
| High                                                                     | 252   | 9.3               | 213         | 88.0        | 5.5 (2.5–12.1)     |
| **Sociodemographic**                                                     |       |                   |             |             |                    |
| Schooling                                                                |       |                   |             |             |                    |
| < 12 years                                                                | 822   | 31.9              | 606         | 69.5        | .88                | 1.06 (0.71–1.58)      |
| 12+ years                                                                | 2690  | 68.0              | 1962        | 70.1        | 1.06 (0.71–1.58)   |
| **Age**                                                                  |       |                   |             |             |                    |
| < 25 years                                                                | 2235  | 61.0              | 1675        | 73.5        | .01                | 1.06 (0.71–1.58)      |
| ≥ 25 years                                                               | 1277  | 38.9              | 893         | 64.1        | .04 (0.45–0.92)    |
| **Race**                                                                 |       |                   |             |             |                    |
| Non-black                                                                | 1252  | 33.9              | 906         | 66.6        | .28                | 1.22 (0.85–1.75)      |
| Black                                                                    | 2276  | 66.1              | 1672        | 70.8        | .97 (0.60–1.56)    |
| **Stable partnership**                                                   |       |                   |             |             |                    |
| Yes                                                                      | 441   | 13.1              | 322         | 70.2        | .90                | 1.22 (0.85–1.75)      |
| No                                                                       | 3095  | 86.9              | 2265        | 69.6        | 0.97 (0.60–1.56)   |
| **Socioeconomic class**                                                  |       |                   |             |             |                    |
| Higher (A-B)                                                             | 1661  | 42.9              | 1234        | 71.5        | .38                | 1.22 (0.85–1.75)      |
| Lower (C-D-E)                                                            | 1883  | 57.0              | 1358        | 68.2        | 0.86 (0.60–1.21)   |
| **Socio-behavioral**                                                     |       |                   |             |             |                    |
| Condom use in receptive anal sex in the previous 6 months                |       |                   |             |             |                    |
| Always used                                                              | 2022  | 63.0              | 1147        | 66.4        | .01                | 1.08 (1.08–2.08)      |
| Irregular use                                                            | 1504  | 37.0              | 1436        | 74.7        | 1.52 (0.98–2.36)   |
| Illicit drug use in previous 6 months                                    |       |                   |             |             |                    |
| No                                                                       | 1695  | 46.9              | 1229        | 67.2        | .20                | 1.25 (0.88–1.77)      |
| Yes                                                                      | 1803  | 53.0              | 1338        | 71.9        | 1.25 (0.88–1.77)   |
| History of forced sexual intercourse                                     |       |                   |             |             |                    |
| No                                                                       | 2780  | 78.9              | 2016        | 67.9        | .06                | 1.52 (0.98–2.36)      |
| Yes                                                                      | 742   | 21.1              | 562         | 76.3        | 1.52 (0.98–2.36)   |
| STI symptoms                                                             |       |                   |             |             |                    |
| Yes                                                                      | 628   | 17.7              | 481         | 66.2        | .43                | 1.25 (0.88–1.77)      |
| No                                                                       | 2909  | 82.3              | 2106        | 70.4        | 0.83 (0.51–1.33)   |
| Previous HIV test in the lifetime                                        |       |                   |             |             |                    |
| No                                                                       | 1072  | 35.2              | 795         | 69.1        | .83                | 1.52 (0.98–2.36)      |
| Yes                                                                      | 2470  | 64.8              | 1795        | 69.9        | 1.04 (0.73–1.49)   |
| History of discrimination due to sexual orientation in a lifetime        |       |                   |             |             | .001               |
| No                                                                       | 1037  | 63.6              | 744         | 63.1        | 1.04 (0.73–1.49)   |
| Yes                                                                      | 2494  | 65.4              | 1842        | 73.2        | 1.59 (1.12–2.27)   |
| Number of sexual partners in previous 6 months                           |       |                   |             |             |                    |
| ≤ 4                                                                      | 1998  | 59.8              | 1426        | 68.2        | .66                | 1.16 (0.78–1.76)      |
| > 4 to ≤ 10                                                              | 836   | 23.5              | 629         | 71.4        | 1.16 (0.78–1.76)   |
| > 10                                                                     | 710   | 16.7              | 537         | 72.3        | 1.21 (0.71–2.07)   |
| Used online platforms to find partners                                   |       |                   |             |             |                    |
| No                                                                       | 1133  | 36.9              | 815         | 63.1        | .01                | 1.21 (0.71–2.07)      |
| Yes                                                                      | 2373  | 63.0              | 1754        | 73.3        | 1.60 (1.11–2.31)   |
| Self-reported participation in HIV/AIDS NGO                              |       |                   |             |             |                    |
| No                                                                       | 3176  | 90.4              | 2335        | 71.2        | .01                | .51 (0.29–0.89)       |
| Yes                                                                      | 347   | 9.6               | 245         | 56.1        | 1.04 (0.73–1.49)   |
willing to use PrEP, as indicated in Table 1. After adjustment for the perception of risk, this variable remains in the multivariate analysis (Table 3).

Since the 1970s, the perceived risk of acquiring a disease has been shown to be an important motivator for diagnostic testing and an important component of health behaviors and interventions designed to protect or improve health (Kowalewski et al., 1997). Risk perception is therefore an important pre-condition for intention to use HIV prevention methods including PrEP (Chakrapani et al., 2021; Holloway et al., 2017).

It is known that, when a protective health measure is relatively simple for the target public to adopt, the association between perceived risk and the measure tends to be stronger. However, the opposite also applies: When a measure is overly complex, the association tends to be weaker, because decisions about whether to adopt such a measure tend to be influenced by multiple factors (Brewer et al., 2007). In the case of PrEP, important issues have to be considered as it involves incorporating a routine—the daily ingestion of a pill; concerns with side effects and social impacts due to the stigma associated with HIV (Chan et al., 2016; Galea et al., 2011; Holloway et al., 2017; Meyers et al., 2014; Peng et al., 2018; Plotzker et al., 2017).

Not withstanding the barriers and resistance to the daily use of PrEP, such as fear of getting other STIs when

### Table 1 (continued)

| Variables | Total | PrEP acceptability | OR^f (95% CI) |
|-----------|-------|--------------------|---------------|
|           | N^{a} | %^{b}              | n^{c} (%^{d}) | p -Value^{e} |
| **Commercial sex in previous 6 months** | | | |
| Yes       | 557 | 14.9 | 405 (61.2) | .07 | 1 |
| No        | 2955 | 85.1 | 2170 (71.1) | 1.56 (0.96–2.54) |
| **HIV prevention** | | | |
| **Ever heard of PrEP** | | | |
| No        | 2608 | 69.6 | 1908 (68.7) | .44 | 1 |
| Yes       | 917 | 30.4 | 670 (71.9) | 1.16 (0.79–1.72) |
| **Previous PEP use** | | | |
| No        | 3369 | 94.9 | 2458 (68.9) | .001 | 1 |
| Yes       | 175 | 5.0 | 134 (83.7) | 2.3 (1.28–4.17) |
| **HIV knowledge** | | | |
| Low       | 792 | 27.9 | 563 (72.9) | .57 | 1 |
| Medium    | 1883 | 46.9 | 1379 (68.2) | 0.79 (0.52–1.23) |
| High      | 869 | 25.1 | 650 (68.8) | 0.82 (0.49–1.37) |

^aTotal in each category for each variable

^bWeighted distribution of categories according to each variable, considering that missing data varies

^cNumber of participants with PrEP acceptability in each category of each variable

^dWeighted proportion of PrEP acceptability according to each category of each variable

^e p-value comparing PrEP acceptability for each variable

^fUnivariate Weighted Odds Ratio of PrEP acceptability with 95% confidence interval for each variable

### Table 2

Prevalence of acceptability and knowledge of daily oral PrEP, risk compensation, and barriers to PrEP use among men who have sex with men. Brazil, 2016

| Variable | N | %^{a} |
|----------|---|-------|
| Acceptability of daily PrEP use | 2592 | 69.7 |
| Trouble remembering to take PrEP daily | 1007 | 27.6 |
| Would not use PrEP if regular testing was required | 838 | 25.6 |
| Afraid of side effects | 2137 | 61.6 |
| Fear of people thinking they are HIV-positive | 1092 | 34.2 |
| Fear of getting other STIs if using PrEP | 2563 | 73.4 |
| Would stop using condom if use PrEP | 622^{b} | 18.6 |
| Among those who always use condom in receptive anal sex | 285 | 14.5 |
| Among those who used condoms irregularly in receptive anal sex | 335 | 26.2 |

^{a}Weighted using Gile’s estimator

^{b}2 participants did not have receptive anal sex in the last 6 months
using PrEP, side effects, or being perceived as having HIV because of the use of antiretrovirals, a high proportion of the participants who felt they were at moderate or high risk of HIV infection reported they would accept daily PrEP. Furthermore, a small proportion (18.6%) declared they would not use a condom if they were using PrEP. However, we should note that the practice of anal sex without always using condoms was reported by a large proportion of MSM interviewed in our study (37%). In this group, 26.2% would not use condoms if on PrEP, as compared to 14.5% among those who always used condoms in anal sex in the past six months. This illustrates why HIV prevention programs should guide users about the available methods and their specificities, even when using PrEP. Programs should encourage MSM to make conscious decisions about their sexual health and affinities (Terto, 2015).

While risk perceptions are dynamic and mutable as sexual behaviors and context change (Rutstein et al., 2020), the main driver behind people’s decision to not take PrEP in our study appears to be a low self-perception of HIV risk as part of routine HIV prevention services (Mansergh et al., 2012).

### Limitations

The limitations of studies involving RDS have been described widely in the literature (Gile & Handcock, 2010). As the sampling was non-random and depended on chain-referrals via contact networks, the results of this article cannot be generalized to the MSM in the 12 cities studied. It is important to note that, as found in other studies investigating PrEP acceptability, a stated intention to use does not necessarily translate into actual use. The participants may misclassify their answers to the questions of PrEP acceptability because it is hard for people to accurately know exactly what they would do in hypothetical situations. The data were self-reported, which could mean under- or over-reporting the acceptability of daily PrEP, especially because these questions were asked when PrEP was not yet available in the public health service and the previous knowledge about PrEP was limited among the participants. In order to reduce such bias, a brief explanation of PrEP was given before the questions about it were asked.

Furthermore, during the study, questions were asked about sexual experiences and behaviors that are subject to social desirability bias, which could be a weakness given that the data were gathered in face-to-face interviews. To counteract this bias, interviews were conducted in an MSM-friendly environment and fieldworkers were trained to remain neutral and supportive throughout the interview.

### Conclusion

In this study, risk perception was found to be associated with the acceptability of daily PrEP. This suggests that the development of HIV prevention measures designed to increase risk perception among MSM who are vulnerable to HIV should be considered, whether through communication campaigns about the PrEP services on offer at the public health service or through health education initiatives run by health workers or NGOs. In addition, it is necessary to promote strategies of communication that do not increase PrEP stigma or HIV anxiety, but rather focus on the positive aspects associated with its use, including sexual autonomy and health empowerment, among others.

At a time when global concern for HIV has been somewhat diminished by both effective treatments and the current COVID-19 pandemic, the need for HIV guidance designed to help MSM re-assess their own risk is important, especially for those who may underestimate or deny such risks, in order to enable the identification of MSM who could benefit from incorporating PrEP into their daily routine. This implies tackling the challenge of helping individuals at higher risk

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### Table 3

Multivariate analysis of the association between perceived risk of HIV infection and acceptability of daily oral PrEP among men who have sex with men. Brazil, 2016

| Variable                            | Acceptability of PrEP (N = 3,345) | OR ± 95%CI | p-Values |
|-------------------------------------|-----------------------------------|------------|----------|
| **Perceived risk of HIV infection**|                                    |            |          |
| None                                | 1.00                              | –          | –        |
| Low to moderate                     | 1.88                              | 1.24–2.85  | .00      |
| High                                | 5.68                              | 2.54–12.73 | .00      |
| **Race**                            |                                    |            |          |
| Non-black                           | 1.00                              | –          | –        |
| Black                               | 1.44                              | 1.00–2.07  | .05      |
| **Used online platforms to find partners**|                                 |            |          |
| No                                  | 1.00                              | –          | –        |
| Yes                                 | 1.68                              | 1.17–2.41  | .00      |
| **Commercial sex in previous 6 months**|                                 |            |          |
| Yes                                 | 1.00                              | –          | –        |
| No                                  | 1.80                              | 1.06–3.06  | .03      |
| **Previous PEP use**                |                                    |            |          |
| No                                  | 1.00                              | –          | –        |
| Yes                                 | 1.87                              | 0.99–3.54  | .05      |

*a* Weighted by Gile’s estimator  
*b* Due to missing variables, the final model had a reduction in the number of observations
of infection to gain awareness of their status and ensuring the availability of PrEP as a viable, effective option at their disposal.

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Declarations

Conflict of interest The authors have no conflict of interest to declare that are relevant to the content of this paper.

Ethical Approval The study was approved by the Research Ethics Committee of the Federal University of Ceará and registered with the National Ethics Research Committee (n. 1.024.053). This study was performed in accordance with the ethical standards established in the 1964 Declaration of Helsinki and its amendments. Written informed consent was asked and obtained from all participants.

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