



# Impact of COVID-19 Pandemic on Sexual Minority Populations in Brazil: An Analysis of Social/Racial Disparities in Maintaining Social Distancing and a Description of Sexual Behavior

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## Abstract

We conducted a web-based survey to understand the impact of social distancing measures on Brazilian MSM and transgender/non-binary lives. A total of 3486 respondents were included in this analysis and the great majority were cismen (98%). The median age was 32 years (IQR: 27–40), 44% non-white, 36% low schooling and 38% low income. Most of participants reported HIV negative/unknown status (77%). Participants on-PrEP reported more condomless anal sex than those off-PrEP. Conversely, 24% off-PrEP were at substantial HIV-risk. PrEP/ART continuation were reported by the majority, despite reports of impediments to medication refill. Transgender/non-binary reported more mental health problems and challenges to access health care. Social and racial disparities were associated with unattainability of maintaining social distancing. Tailored social and economic support policies during COVID-19 pandemic should be made available to these populations. Challenges for PrEP/ART access will demand the implementation of innovative solutions to avoid the expansion of the HIV epidemic.

**Keywords** MSM · Transgender people · PrEP · Covid-19 · Brazil

## Introduction

On March 11, 2020 the World Health Organization (WHO) recognized the novel coronavirus (SARS-CoV-2) disease 2019, or “COVID-19”, as a pandemic months after the initial reports from Wuhan, China in December, 2019 [1]. Brazil at the present has the second-highest number of confirmed SARS-CoV-2 cases in the world. From February 26, 2020 to July 30, 2020 there have been more than 2,500,000 confirmed cases and more than 90,000 deaths in the country [2]. The Southeast region account for the largest number of cases, although incidence and mortality rate per 100,000/inhabitants is higher in the North region [2].

To avoid the spread of COVID-19 and the collapse of the health system, the Brazilian Ministry of Health, Brazilian States Governors and City Mayors have adopted social distancing and community containment measures since March 2020. These measures have been criticized by part of the Federal government, albeit the continuous rise of new cases, no availability of effective treatment nor prevention and limited availability of hospital and intensive care units [3]. Despite the importance of such measures, low income Brazilians may face barriers to adhere to social distancing measures, especially due to financial constraints. Almost 14 million Brazilians live in low-income communities (favelas or “slums”) [4] mostly concentrated in metropolitan areas of big cities, such as Rio de Janeiro and São Paulo. These communities are highly populated and have precarious living conditions, with limited access to hygiene and sanitation, posing sanitary recommendations as a challenge, thus increasing vulnerability to COVID-19 infection. Moreover, Brazil has a great proportion of informal jobs, especially among low-income individuals, with no possibility of doing home office, what may impact in adhering to social distancing. During the first quarter of 2020, unemployment rate was

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12.2% corresponding to 12.9 million Brazilians unemployed [5], and it may increase between 50 and 100% due to the COVID-19 pandemic impact [6], especially considering the limited social support measures adopted by the Brazilian government.

Adding to economic and social challenges, sexual minorities such as cisgender gay, bisexual and other men who have sex with men (MSM) and transgender/non binary (TGNB) individuals may be facing other vulnerabilities during the COVID-19 pandemic, such as lack of access to HIV prevention, treatment and care [7]. Brazil accounts for almost half of HIV cases in Latin America [8], with a disproportional prevalence of infection among some sexual minorities, such as MSM (18%) and transgender women who have sex with men (31%) [9–12]. Brazil has long been at the forefront of HIV treatment and prevention in Latin America [13]. The Brazilian Public Health System (SUS) provides free of charge antiretroviral therapy (ART) to HIV-infected individuals since 1996 and daily oral pre-exposure prophylaxis (PrEP) with emtricitabine and tenofovir disoproxil fumarate (FTC/TDF) to those at substantial HIV risk since December, 2017 [14]. In addition, sexual minorities, especially transgender women, often present housing instability that may impact in adherence to social distancing measures [15].

In this context, we conducted a web-based survey targeting Brazilian MSM and TGNB individuals to understand how social distancing measures and the COVID-19 pandemic are impacting their personal lives, sexual behavior, and PrEP/ART access and use. In addition, we assessed the factors associated with unattainability of maintaining social distancing.

## Methods

### Study Design

This cross-sectional web-based study, conducted during social distancing period (April 16 to May 31, 2020), recruited MSM and TGNB using a geosocial networking (GSN) app for sexual encounters (Hornet), WhatsApp groups and Facebook. Individuals who met eligibility criteria (age  $\geq 18$  years, MSM and TGNB individuals, Brazilian resident) and acknowledged reading the informed consent were directed to the online questionnaire programmed on SurveyGizmo®. Cisgender men self-identifying heterosexual and cisgender women were excluded from this analysis. The Instituto Nacional de Infectologia Evandro Chagas (INI-Fiocruz) institutional review board (#CAAE 82021918.0.0000.5262) reviewed and approved this study. No identification of participants was collected and no incentives were provided.

### Survey Instrument

The survey instrument was composed of six sections (55 questions) addressing: sociodemographic information, social distancing/COVID-19 pandemic impact in personal life, substance use, HIV testing, PrEP and ART use/access and sexual behavior.

### Variables

#### Socio-demographic

Variables were as following: age at the time of the survey (categorized in 3 brackets: 18 to 24; 25 to 35 and  $> 35$  years); gender in cisgender men, transgender men, transgender women, and non-binary/gender fluid; sexual orientation in gay, bisexual, heterosexual or other (e.g. pansexual, asexual); race/color (categorized in white, black, *pardo* or mixed-black, native or indigenous and Asian); schooling (categorized in low [ $\leq 12$  years or completed secondary school or less] and high [ $> 12$  years or more than secondary school]). We also collected data on family monthly income, grouped into the following strata considering Brazilian minimum wage (MW) in 2020 (R\$998 or US\$268): low (up to 2 MW), middle ( $> 2$ –6 MW), and high ( $> 6$  MW). Region was defined according to the Brazilian administrative division: North (7 states), Northeast (9 states), Central-west (3 states and Federal District), South (3 states) and Southeast (4 states); individuals living in the metropolitan area of the State Capital were considered as resident of metro area.

#### Social Distancing/COVID-19 Pandemic Impact In Personal Life

Fear to be infected by COVID-19 had 5 categories: high, moderate, low, none or infected or previously infected by COVID-19. We asked how concerned individuals were if a close relative or friend got infected by COVID-19 (rate between 0 and 100); answers were stratified in 100, 99–75, 74–50,  $< 50\%$ . Participants also answered how much social distancing measures impacted their personal life (high, medium, low/none) and which aspect was the most affected (economic, affective/sexual, family/friendship, or none). We also assessed challenges during social distancing/COVID-19 pandemic presented in a pre-determined list: access to hand sanitizer and water, salary/job reduced or lost, transportation availability, access to food, access to health/mental care support, access to daily medication/hormones and housing. Respondents could answer

yes/no to any of the challenges. The question: “Were you unable to maintain recommended social distancing due to any reason, such as work or housing challenges?” (yes/no) assessed unattainability of maintaining social distancing.

### Mental Health, Binge Drinking and Substance Use

Mental health problems were assessed by the question: “Have you felt depressed, lonely, angry, nightmares, panic attack, sleeping or concentration problems during the social distancing period?” (yes/no). Participants were also asked about suicidal thoughts and physical/sexual/emotional abuse (yes/no). Binge drinking [16] was evaluated with the question “During the social distancing period, did you drink 5 or more drinks in a couple of hours?” (yes/no). Tobacco and any illicit drug use during social distancing period were dichotomized into yes/no. Individuals answered about the habit of using alcohol, tobacco and illicit drug during that period (increased, decreased, or the same).

### HIV Testing

HIV self-reported status derived from the question “Have you ever had an HIV test?”, whose potential answers were positive, negative, or never.

### Pre-exposure Prophylaxis (PrEP)

Participants self-reporting HIV negative/unknown status answered if they were using oral PrEP before the issuance of social distancing recommendations. Those on PrEP prior to social distancing answered if they stopped PrEP (no FTC/TDF refill) after such recommendations and choose the main reason to stop from a selected list of options (including an open field for other reasons). Those who continued using PrEP answered about PrEP regimen (daily, event-driven PrEP, or [ED]-PrEP and other nonstandard regimens). We assessed awareness and intention to use PrEP for those not on PrEP prior to social distancing recommendations. Awareness was defined as a positive answer to the question “Have you ever heard of PrEP?”. A brief explanation about PrEP was provided after this question. Intention to use PrEP was defined as the “High interest” answer to the question “Would you be using PrEP currently available at the Brazilian Public Health System (SUS) to prevent HIV?” with a five-point Likert scale as potential answers.

### Antiretroviral Therapy (ART)

Participants self-reporting HIV-positive status answered about ART use (yes/no) and the impact of social distancing recommendations on ART refill. Those reporting “yes” also had to select the main reason to stop from pre-existing

options (including an open field for other reasons). They rated ART adherence from 0 (missed all ART doses during social distancing period) to 100 (no missing dose). We dichotomized self-reported ART adherence in complete (rating = 100) and poor (rating < 100).

### Sexual Behavior, PrEP Eligibility Criteria and HIV Perceived Risk

Participants self-reporting HIV-negative/unknown status answered questions on sexual behavior during social distancing period, including sex frequency, steady partner HIV status [HIV-negative, -unknown, -positive with undetectable viral load (VL), -positive with detectable/unknown VL, no steady partner], number of casual partners, condomless receptive anal sex with steady and casual partners, and transactional sex. Sex abstinence was defined as no physical contact with partners. Participants were also asked if the number of casual partners has changed during this period and the main venue used to find them.

PrEP eligibility criteria was based on Brazilian recommendations for PrEP use [17] and defined as one of the following during social distancing period: (1) condomless receptive anal sex, (2) sex with HIV-positive partner, and/or (3) transactional sex. The question “In your opinion, what is your risk of getting HIV during social distancing period?”, which had five possible options (“No risk”, “Low risk”, “Moderate risk/50%”, “High risk”, and “Certain/100%”), assessed the HIV perceived risk. We categorized that variable into three groups: “No risk”, “Low risk”, and “High risk” (which included the categories “Moderate risk/50%”, “High risk” and “Certain/100%”), as previously described [18].

### Statistical Analysis

Sociodemographic characteristics and HIV self-reported status were described considering the entire sample. We used chi-square test to compare sexual behavior, PrEP eligibility criteria and HIV perceived risk between PrEP users during social distancing period (on PrEP vs not on PrEP). We compared social distancing/COVID-19 pandemic impact in personal life, binge drinking and substance use according to gender (cisgender men vs. TGNB) using chi-square or Fisher’s exact test when appropriate. Finally, we used logistic regression modeling to assess the factors associated with unattainability of maintaining social distancing. Variables were included in the adjusted model regardless of significant p-value thresholds in univariate analysis. To build the model, race was dichotomized into white/Asian vs. non-white (black/mixed-black/native), and country region was dichotomized into Southeast/South vs. other, following previous study conducted among Brazilian MSM [18].

Analyses were performed using Software R version 4.0.0 [19].

## Results

A total of 5490 individuals accessed the questionnaire, 715 (13.0%) did not meet inclusion criteria or did not consent, and 3486 (63.5%) completed it and were included in this analysis (Fig. 1). Median age was 32 years (interquartile range [IQR 27–40]); 505 (14.5%) participants were aged 18–24 years; 61.3% ( $n=2137$ ) were recruited on Hornet. The great majority of respondents were cisgender men (3400; 97.5%), self-identified as gay (2961; 84.9%) and lived in the Southeast Brazil (2784; 80.4%). Non-white individuals accounted 44.0% ( $n=1534$ ), about a third (1252; 35.9%) had low schooling and 38.0% ( $n=1323$ ), low family income (Table 1).

### Social Distancing/COVID-19 Pandemic

About one quarter of participants reported unattainability of maintaining social distancing (917/3486; 26.3%). Most of individuals had high/moderate fear to get infected by

COVID-19 (2699; 77.4%), and 72.3% were very worried (scale: 75–100) about close relatives/friends getting infected (2519; 72.3%) (Table 2). Only 61 (1.7%) reported had being infected by COVID-19. Social distancing measures had highly impacted most of participants' lives (2195; 63.0%), and the economic aspect was the most affected (1474; 42.3%). Challenges more frequently reported during social distancing were: salary/job reduced or lost (1575; 45.2%), access to hand sanitizer (1201; 34.5%), and transportation availability (676; 19.4%). Compared to MSM, TGNB individuals had more challenges to access food, hormones, health/mental care, medication refill, and higher frequency of unsafe housing ( $p < 0.01$ ).

### Mental Health and Substance Use

TGNB individuals reported more mental health problems during the social distancing period, access to mental health care, and suicidal thoughts ( $p < 0.001$ ). Among respondents reporting alcohol use ( $n=2181$ ), 29.7% ( $n=647$ ) reported an increased use during social distancing period. Almost half of the overall sample reported binge drinking (48.9%,  $n=1705/3486$ ), (Table 3). Among tobacco smokers, 49.4% (397/804) increased its use during this period. Any illicit

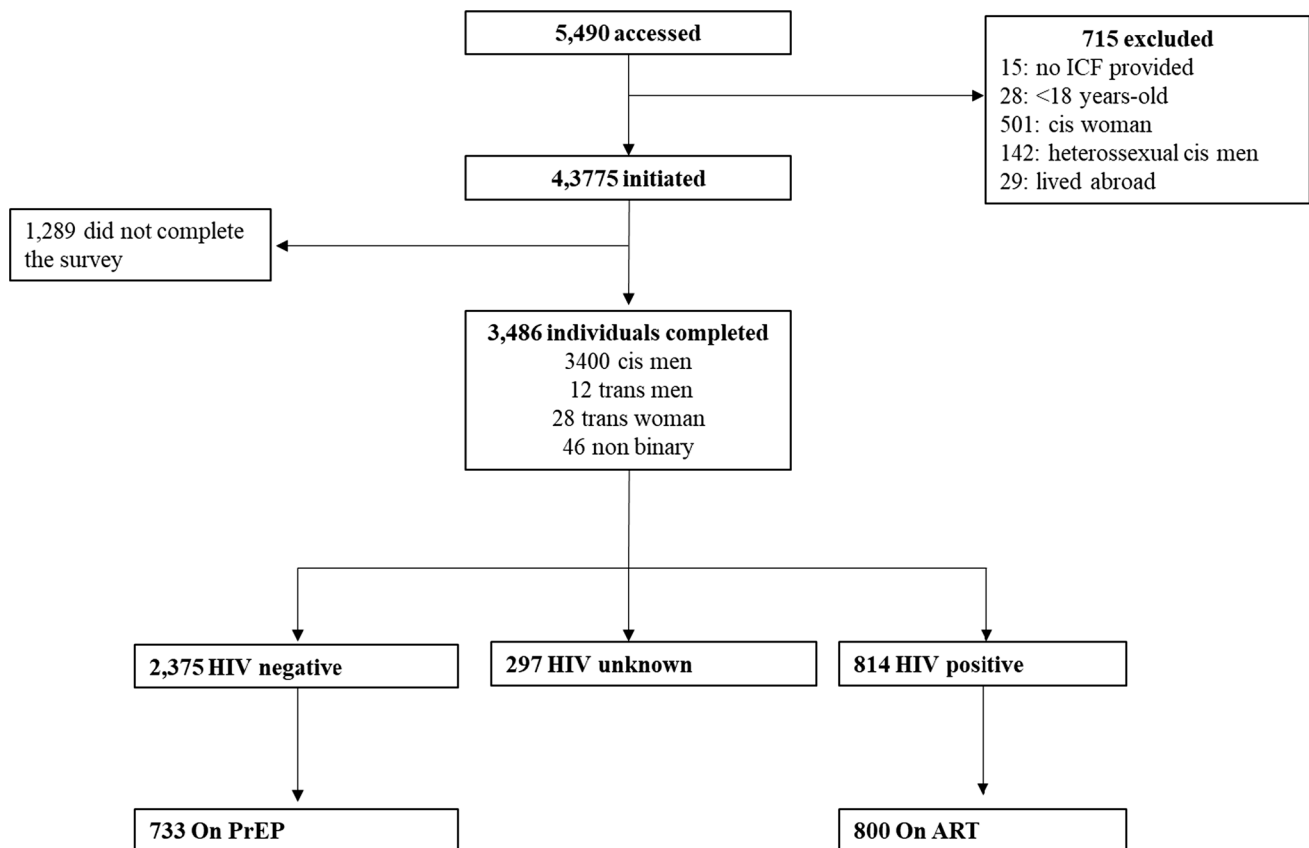


Fig. 1 Study flow-chart. Brazil, 2020

**Table 1** Characteristics of study population

	N = 3486 (%)
Age (years)	
Median	32(IQR: 27–40)
18–24	505 (14.5)
25–35	1627 (46.7)
> 35	1354 (38.8)
Recruitment	
Hornet	2137 (61.3)
WhatsApp	1098 (31.5)
Facebook	251 (7.2)
Gender	
Cisgender men	3400 (97.5)
Transgender men	12 (0.3)
Transgender women	28 (0.8)
Non binary/gender fluid	46 (1.3)
Sexual orientation	
Gay	2961 (84.9)
Bisexual	438 (12.6)
Heterosexual	17 (0.5)
Other	70 (2.0)
Race	
White	1927 (55.3)
Black	494 (14.2)
Pardo/Mixed-black	1005 (28.8)
Native	35 (1.0)
Asian	25 (0.7)
Schooling	
Low	1252 (35.9)
High	2234 (64.1)
Family monthly income	
Low	1323 (38.0)
Middle	1404 (40.3)
High	759 (21.8)
Region	
Southeast	2784 (80.4)
South	313 (9.0)
Central-west	165 (4.8)
Northeast	166 (4.8)
North	33 (1.0)
Resident of metro area	
Yes	2636 (76.2)
No	825 (23.8)
HIV self-reported status	
Negative	2375 (68.1)
Positive	814 (23.4)
Unknown	297 (8.5)

Brazil, 2020  
N = 3486

drug use was reported by 23.1% (n = 806), and the most common were marijuana (586; 16.8%) and cocaine (233; 6.7%); 30.4% reported increased use of illicit drugs during social distancing period. Comparing to MSM, TGNB people reported more tobacco and illicit drug use (p < 0.001).

### HIV Status/PrEP and ART Access During Pandemic

Most respondents reported to be HIV-negative (2375/3486; 68.1%) and 8.5% (n = 297) reported unknown HIV status. Among HIV-negative respondents, 30.9% (n = 733) were on oral PrEP before social distancing recommendations, mostly through the Public Health System (SUS) [PrEP SUS (342/733; 46.7%) and the ImPrEP study (338/733; 46.1%)]. A total of 68.5% (502/733) maintained daily oral PrEP during social distancing period, while 27.8% (204/733) stopped it completely, 1.5% (11/733) used ED-PrEP, and 2.2% (16/733), nonstandard PrEP regimens. Main reasons for stopping PrEP use were: impediments to pick up PrEP refill at the health service (95/204; 46.6%) and sexual abstinence (81/204; 39.7%). Main reasons for continuing PrEP were: fear of HIV infection (327/529; 61.8%), sex with casual partners (90/529; 17.0%), HIV-positive partner (63/529; 11.9%), and belief that PrEP protected against COVID-19 (49/529; 9.3%).

The large majority of participants self-reporting HIV-positive status were on ART (800/814; 98.2%), and 18.2% (146/800) reported poor ART adherence during social distancing period. Only 17.2% (138/800) reported impact of social distancing measures on ART refill; most frequent reasons were: fear of going out (68/138; 49.2%), non-availability of public transportation (29/138; 21.0%), and closing of health care unit (21/138; 15.2%). Considering only those with poor adherence, 37.7% (55/146) reported impact on ART refill.

### Sexual Behavior

Table 4 describes sexual behavior characteristics among HIV-negative/unknown status according to PrEP use during social distancing period. Overall, almost half of participants (1213/2672; 45.4%) reported sex abstinence during social distancing period; among these, 28.8% (349/1213) reported virtual sex. Most of participants reported decreased number of sexual partners during social distancing period. More than three quarters of respondents reported finding casual partners mainly online (779/1012; 76.8%). Almost half of individuals who maintained any regimen of PrEP during social distancing period reported having sex (273/529; 51.6%) and, compared to those not on PrEP, more condomless receptive anal sex, number of

**Table 2** Social distancing and COVID-19 pandemic impact in personal life according to gender

	Total N = 3486	Transgender / non binary N = 86 (2.5%)	Cisgender MSM N = 3400 (97.5%)	p-value
Fear to get infected by COVID-19				0.05
High	1176 (33.7)	36 (41.9)	1140 (33.5)	
Moderate	1523 (43.7)	30 (34.9)	1493 (43.9)	
Low	495 (14.2)	17 (19.8)	478 (14.1)	
No	231 (6.6)	1 (1.2)	230 (6.8)	
Infected or previously infected by COVID-19	61 (1.7)	2 (2.3)	59 (1.7)	
Concerned if close relatives/friends get infected by COVID-19				0.60
100	1435 (41.2)	40 (46.5)	1395 (41.0)	
99–75	1084 (31.1)	27 (31.4)	1057 (31.1)	
74–50	669 (19.2)	12 (14.0)	657 (19.3)	
< 50	298 (8.5)	7 (8.1)	291 (8.6)	
Impact of social distancing measures in personal life				0.37
High	2195 (63.0)	59 (68.6)	2136 (62.8)	
Medium	894 (25.6)	21 (24.4)	873 (25.7)	
Low/no	397 (11.4)	6 (7.0)	391 (11.5)	
Aspect most impacted				0.11
Economic	1474 (42.3)	47 (54.7)	1427 (42.0)	
Affective/sexual	988 (28.3)	17 (19.8)	971 (28.6)	
Family/friendship	914 (26.2)	20 (23.3)	894 (26.3)	
None	110 (3.2)	2 (2.3)	108 (3.2)	
Challenges				
Salary/job reduced or lost	1575 (45.2)	44 (51.2)	1531 (45.0)	0.26
Access to hand sanitizer	1201 (34.5)	35 (40.7)	1166 (34.3)	0.22
Transportation availability	676 (19.4)	23 (26.7)	653 (19.2)	0.08
Access to food	451 (12.9)	19 (22.1)	432 (12.7)	0.01
Access to health care	396 (11.4)	23 (26.7)	373 (11.0)	<0.001
Access to mental health care	319 (9.2)	26 (30.2)	293 (8.6)	<0.001
Access to daily medication	215 (6.2)	15 (17.4)	200 (5.9)	<0.001
Access to hormones	54 (1.5)	15 (17.4)	39 (1.1)	<0.001
Access to water	43 (1.2)	3 (3.5)	40 (1.2)	0.06
Unable to find housing	22 (0.6)	0 (0)	22 (0.6)	0.45
Unsafe Housing	21 (0.6)	4 (4.7)	17 (0.5)	<0.001

Brazil, 2020

N = 3486

casual partners and transactional sex ( $p < 0.001$ ). Almost a quarter of those not on PrEP (23.9%; 513/2143) were eligible for PrEP and 10.5% ( $n = 225$ ) reported condomless receptive anal sex with casual partner, but only 8.5% (183/2143) reported high HIV perceived risk. Among those who stopped PrEP during the social distancing period, 33.3% (68/204) maintained PrEP eligibility and could have continued its use. Considering those not on PrEP prior to this period, 86.6% were aware of PrEP (1679/1939), and 22.9% (445/1939) had PrEP eligibility, among whom 48.1% (214/445) reported intention to use PrEP.

### Factors Associated with Unattainability of Maintaining Social Distancing

Black/*Pardo*/native race (adjusted odds ratio [aOR] 1.23; 95% confidence interval [CI] 1.05–1.44), lower schooling (aOR 1.47; 95% CI 1.23–1.75), lower income (aOR 1.30; 95% CI 1.03–1.66), and binge drinking (aOR 1.28; 95% CI 1.09–1.49) were associated with unattainability of maintaining social distancing in the logistic multivariate analysis (Table 5). There was no difference in the unattainability of maintaining social distancing according to self-reported HIV status nor gender/sexual orientation.

**Table 3** Mental health, binge drinking and substance use during social distancing according to gender

	Total N = 3486	Transgender/ non binary N = 86 (2.5%)	Cisgender MSM N = 3400 (97.5%)	p-value
Mental health problems	2290 (65.7)	76 (88.4)	2214 (65.1)	<0.001
Suicidal thoughts	400 (11.5)	23 (26.7)	377 (11.1)	<0.001
Physical, sexual or emotional abuse	78 (2.2)	2 (2.3)	76 (2.2)	0.96
Alcohol use (yes)	2181 (62.6)	52 (60.5)	2129 (62.6)	0.68
Frequency of Alcohol use				0.34
Increased	647 (29.7)	13 (25.0)	634 (29.8)	
Same	893 (40.9)	19 (36.5)	874 (41.1)	
Decreased	641 (29.4)	20 (38.5)	621 (29.2)	
Binge drinking	1705 (48.9)	43 (50.0)	1662 (48.9)	0.84
Tobacco smoking	804 (23.1)	32 (37.2)	772 (22.7)	0.002
Tobacco smoking frequency				0.10
Increased	397 (49.4)	13 (40.6)	384 (49.7)	
Same	198 (24.6)	6 (18.8)	192 (24.9)	
Decreased	163 (20.3)	12 (37.5)	151 (19.6)	
Started	46 (5.7)	1 (3.1)	45 (5.8)	
Any illicit drug use	806 (23.1)	33 (38.4)	773 (22.7)	<0.001
Illicit drug use frequency				0.991
Increased	245 (30.4)	10 (30.3)	235 (30.4)	
Same	223 (27.7)	10 (30.3)	213 (27.6)	
Initiated other illicit drugs	20 (2.5)	1 (3.0)	19 (2.5)	
Decreased	274 (34.0)	10 (30.3)	264 (34.2)	
Started using illicit drugs	44 (5.5)	2 (6.1)	42 (5.4)	

Brazil, 2020

N = 3486

## Discussion

In this study, we have shown that maintaining social distancing is a challenge among MSM and TGNB surveyed. Socioeconomic (low schooling and low income) and racial disparities were associated with unattainability in maintaining social distancing among these groups. Social distancing measures had highly impacted most of participants' lives, and TGNB populations reported more mental health problems and more challenges to access health care than cisgender MSM.

Non-white, low schooling, and low income MSM and TGNB had higher odds of unattainability in maintaining social distancing. Our findings reinforce that social and racial inequalities are also of utmost importance among sexual minorities. Brazil is a highly stigmatized, transphobic, and homophobic country [20, 21], and the adverse context surrounding sexual minorities populations in the country may act synergistically with the social disruption linked to the pandemic and disproportionately affect MSM and TGNB. Moreover, despite being the 9th largest economy by nominal Gross Domestic Product (GDP = US\$ 1.9 trillion), Brazil is the 9th most unequal

country in the world and the 1st in the Americas according to GINI index from The World Bank [22, 23]. Inequality is a major challenge regardless of the population group, and racial disparities, which have been historical since the inception of the country, have now reached one of their worst periods according to some authors [24, 25]. This unfair system forces low income people, mostly of black and *Pardo* race and of lower schooling, to maintain their professional activities, which are frequently informal or unstable, even during social distancing recommendations. For those people, home office and social distancing are not an option [26]. Besides that, Brazilian social policies have been dismantled, and the governmental support during the epidemic is very limited. Recent data has shown that 37% of favela inhabitants who requested the Federal COVID-19 emergency support (US\$120 for 3 months) have not received it, although 73% of these families have lost half or the entire family income [27]. The COVID-19 pandemic emphasizes the relationship between social/racial disparities and health outcomes [28], as seen in recent studies conducted in Brazil, which identified that adults with lower schooling presented higher prevalence of risk factors for severe COVID-19 compared to university

**Table 4** Sexual behavior, PrEP eligibility criteria and HIV perceived risk among individuals reporting negative/unknown HIV status according to PrEP use during social distancing period

	Total N = 2672	Not on PrEP N = 2143 (80.2%)	On PrEP N = 529 (19.8%)	p-value
Sex during social distancing period				
Yes, with any partner	1012 (37.9)	739 (34.5)	273 (51.6)	<0.001
Yes, only with steady partners	447 (16.7)	326 (15.2)	121 (22.9)	
Sex abstinence	1213 (45.4)	1078 (50.3)	135 (25.5)	
Steady partners				<0.001
No	1736 (65.0)	1458 (68.0)	278 (52.6)	
Yes, HIV negative	647 (24.2)	495 (23.1)	152 (28.7)	
Yes, HIV positive undetectable VL	150 (5.6)	82 (3.8)	68 (12.9)	
Yes, HIV positive detectable/unknown VL	14 (0.5)	8 (0.4)	6 (1.1)	
Yes, HIV unknown	125 (4.7)	100 (4.7)	25 (4.7)	
Condomless receptive anal sex with steady partners				<0.001
No	2244 (84.0)	1874 (87.4)	370 (69.9)	
Yes	428 (16.0)	269 (12.6)	159 (30.1)	
Number of casual partners				<0.001
No	1673 (62.6)	1415 (66.0)	258 (48.8)	
1	381 (14.3)	302 (14.1)	79 (14.9)	
2 to 5	505 (18.9)	357 (16.7)	148 (28.0)	
> 5	113 (4.2)	69 (3.2)	44 (8.3)	
Condomless receptive anal sex with casual partner				<0.001
No	2292 (85.8)	1918 (89.5)	374 (70.7)	
Yes	380 (14.2)	225 (10.5)	155 (29.3)	
Change in number of sexual partners				0.086
Increased	91 (3.4)	75 (3.5)	16 (3.0)	
Same	837 (31.3)	691 (32.2)	146 (27.6)	
Decreased	1744 (65.3)	1377 (64.3)	367 (69.4)	
Transactional sex				0.003
No	2594 (97.1)	2092 (97.6)	502 (94.9)	
Yes	78 (2.9)	51 (2.4)	27 (5.1)	
Main venue to find casual partners (n = 1012)				0.357
Online	779 (76.8)	574 (77.6)	205 (74.8)	
Other	235 (23.2)	166 (22.4)	69 (25.2)	
PrEP eligibility criteria				<0.001
No	1857 (69.5)	1630 (76.1)	227 (42.9)	
Yes	815 (30.5)	513 (23.9)	302 (57.1)	
HIV perceived risk				<0.001
No risk	1581 (59.2)	1306 (60.9)	275 (52.0)	
Low risk	870 (32.6)	654 (30.5)	216 (40.8)	
High	221 (8.3)	183 (8.5)	38 (7.2)	

Brazil, 2020

N = 2,672

graduated [29] and that black and *Pardo* populations had higher risk of mortality compared to white Brazilians [30].

Social distancing measures had highly impacted sexual minorities, and gender disparities were observed. Challenges related to access to hand sanitizer and economic issues have been equally reported regardless of gender. However, TGNB

reports of challenges in accessing health care are worrisome. Transgenders usually face relevant barriers in accessing health care that may be magnified when compared to other groups [31]. In a qualitative study among Brazilian transgender women, past experiences of transgender-identity related discrimination was the most prominent barrier to seek for



**Table 5** Factors associated with unattainability of maintaining social distancing

	Unattainability of maintaining social distancing		aOR (95%CI)
	Yes (n=917)	No (n=2,569)	
Age (years)	32 (IQR: 26–38)	33 (IQR:27–41)	0.99 (0.98–1.00)
Gender			
Cisgender men	891 (97.2)	2509 (97.7)	1.01 (0.63–1.67)
Transgender/non binary	26 (2.8)	60 (2.3)	Ref
Sexual orientation			
Gay	755 (82.3)	2206 (85.9)	0.83 (0.68–1.03)
Other	162 (17.7)	363 (14.1)	Ref
Race			
White/Asian	453 (49.4)	1499 (58.3)	Ref
Black/Pardo/Native	464 (50.6)	1070 (41.7)	<b>1.23 (1.05–1.44)</b>
Schooling			
Low	414 (45.1)	838 (32.6)	<b>1.47 (1.23–1.75)</b>
High	503 (54.9)	1731 (67.4)	Ref
Income			
Low	399 (43.5)	924 (36.0)	<b>1.30 (1.03–1.66)</b>
Middle	372 (40.6)	1032 (40.2)	<b>1.34 (1.08–1.68)</b>
High	146 (15.9)	613 (23.9)	Ref
Region			
Southeast/South	798 (87.6)	2299 (90.2)	0.79 (0.62–1.01)
Other	113 (12.4)	251 (9.8)	Ref
Self-reported HIV status			
Positive	208 (22.7)	606 (23.6)	Ref
Negative	618 (67.4)	1757 (68.4)	1.03 (0.85–1.24)
Unknown	91 (9.9)	206 (8.0)	1.04 (0.76–1.41)
Binge drinking			
No	422 (46.0)	1359 (52.9)	Ref
Yes	495 (54.0)	1210 (47.1)	<b>1.28 (1.09–1.49)</b>
Illicit drug use			
No	721 (78.6)	1959 (76.3)	Ref
Yes	196 (21.4)	610 (23.7)	0.85 (0.70–1.02)

Brazil, 2020. N = 3,486

Bold values indicate  $p < 0.01$ 

aOR adjusted OR, IQR interquartile range

PrEP or health care in general [32]. Of note, Brazil is the country with the highest rate of murders against transgenders, 118.5 cases per year since 2008 [20]. Our findings on mental health problems, suicidal thoughts and tobacco/illicit drug use, although restricted to this online sample, indicate that social distancing measures may be disproportionately affecting TGNB individuals. Transphobia and stigma may lead to the high rates of mental health problems and substance use among transgender women in Brazil [9, 33], and the COVID-19 pandemic may be an additional burden for this population. In-depth assessments among transgender populations are necessary to better understand such associations. Moreover, online mental health support specific for these populations could be implemented by the Public Health System.

Another concern related to the COVID-19 pandemic relates to HIV vulnerability, access to HIV care and prevention. Although HIV high-risk behavior was more frequent among participants on PrEP compared to those not on PrEP during the social distancing period, almost a quarter of individuals not on PrEP were at substantial HIV risk. Most of respondents continued their medications (PrEP or ART), but an important percentage of people reported barriers to pick up medication refill. Among those reporting impediments to pick up PrEP refill at the health service, 40% (38/95) maintained PrEP eligibility criteria and could have continued its use. We identified a high percentage of poor ART adherence (20%), considering the short period since social recommendations initiation, which is consistent with ART adherence data before COVID-19 pandemic [34]. People living with

HIV in China also reported difficulties to access ART during the COVID-19 pandemic [7]. In Central and Eastern Europe, there have been concerns regarding a shortage of resources and an inevitable impact on HIV care. To avoid PrEP/ART shortage, the Brazilian Ministry of Health has recommended an extension of the PrEP refill dispensation from 90- to 120-days and for ART from 90- to 180-days [35]. In addition, telemedicine and HIV self-testing have been used as options to maintain PrEP programs, including in Brazil [36–38]. These and other initiatives such as PrEP/ART home delivery would be essential to avoid medication shortage. Future impacts of COVID-19 pandemic on HIV epidemics are yet to be established.

Our results show that more than half of MSM and TGNB reported sexual activity during social distancing period, although the majority decreased the number of sexual partners. In a large web-based survey conducted among 11,367 MSM in Brazil before COVID pandemic, only 8% reported no sex in previous 6 months [39]. Although the recall time frames used in the surveys are different, this indicates a strong change in sexual behavior among this population. This is corroborated by the fact that 30% had PrEP eligibility criteria in the present survey, while 70% had the same criteria in the previous survey [39]. Almost half of PrEP users engaged in higher risk behaviors, indicating that health services in Brazil should continue PrEP provision for those populations. However, some PrEP users were not at substantial HIV risk and could have stopped PrEP. In such cases, ED-PrEP currently recommended by WHO [40] could be an option [17]. Awareness of PrEP among non-PrEP users was higher than previously reported [39, 41–43], showing that efforts of non-governmental, civil society, and projects such as ImPrEP [44] to advertise PrEP information on social media and dating apps have been effective. Conversely, only half of respondents not on PrEP showed interest in using PrEP. This could be explained by the misinformation on PrEP efficacy or side effects [43] and by the fact that daily oral pills may be a regimen not suitable for all individuals. These individuals could be benefited by other prevention technologies on the pipeline, such as long-acting injectable PrEP [45], and by continuous education programs on PrEP.

This study has limitations. First, web-based studies are not probabilistic sampling strategies, precluding the generalization of the findings to all Brazilian MSM and TGNB populations. Moreover, our findings are based on those who have access to cellphones and who use GSN apps or social media, thus they are not generalizable to all MSM and TGNB in Brazil. Nevertheless, recent data show that 85% of Brazilians have mobile phones [46] and 79% have access to internet connection [47]. Also, the cross-sectional study design precludes to infer causality and the direction of association. In addition, we do not have pre-COVID-19 period data for some of the measures. Subsequent surveys

are planned to understand sexual behavior and PrEP use during relaxing of social distancing measures and post-COVID-19 pandemic period in Brazil. Other limitation is that all collected data were self-reported by participants and may be subject to bias. However, individuals tend to be more open and honest through web-based surveys, thereby reducing social desirability bias [48]. Lastly, other issues specific to LGBTQI+ populations (e.g. discrimination, stigma or homonegativity) were not explored in this study.

## Conclusion

Maintaining social distancing is challenging, particularly for the most vulnerable MSM and TGNB people, likely increasing their risk of acquiring COVID-19. Furthermore, these individuals may also suffer the biggest consequences of the COVID-19 pandemic on the health care system, thus impacting their HIV care and prevention and ultimately the Brazilian HIV epidemic control. Tailored social, economic and mental health support policies during the COVID-19 pandemic should be made available to those individuals. In the context of the COVID-19 pandemic, challenges for PrEP and ART access will demand the implementation of innovative solutions to fulfill the needs of prevention and treatment and avoid the expansion of the HIV epidemic in Brazil.

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