

Profiles of Willingness to Use Pre-Exposure Prophylaxis Modalities among Brazilian, Mexican and Peruvian Sexual and Gender Minorities: A Cross-Sectional Online Survey

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Abstract

Background: Despite recent advances, pre-exposure prophylaxis (PrEP) scale-up remains slow in Latin America. Understanding PrEP modality preferences can help design effective implementation.

Objective: The aim of this study was to describe willingness to use different PrEP modalities among sexual and gender minorities (SGM) aged 18+ years from Brazil, Mexico and Peru, and factors associated with willingness to use four PrEP modalities.

Methods: We conducted a cross-sectional online survey in 2021. We used multivariate Poisson regression to estimate prevalence ratios, identifying differences in willingness to use daily oral, event-driven oral, monthly oral and bimonthly injectable PrEP. Models for each PrEP modality were adjusted for age, country, race, education, income, HIV risk score, HIV testing, and HIV risk perception.

Results: Among 27,589 individuals who initiated the survey, 16,951 were included (Brazil: 61.3%; Mexico: 29.5%; Peru: 9.3%). Mean age was 32 years, and 67.8% had more than secondary education. Most respondents were willing to use monthly oral (74.4%), daily oral (65.8%), and bimonthly injectable (60.2%), while only 38.0% were willing to use event-driven oral PrEP. Across modalities, willingness was higher among those with increased HIV risk perception and high HIV sexual exposure. Willingness was lower among Peruvian respondents for all modalities, except event-driven PrEP. Participants with lower education had lower willingness to use monthly oral and bimonthly injectable PrEP.

Conclusions: Our results suggest a preference for long-acting formulations among SGM in Latin America. Further research is needed to address gaps in the understanding of prevention modalities and to guide potential users in selecting the most suitable PrEP modality available.

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Original Manuscript

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Abstract

Background

Despite recent advances, pre-exposure prophylaxis (PrEP) scale-up remains slow in Latin America. Understanding PrEP modality preferences can help design effective implementation.

Objective

The aim of this study was to describe willingness to use different PrEP modalities among sexual and gender minorities (SGM) aged 18+ years from Brazil, Mexico and Peru, and factors associated with willingness to use four PrEP modalities.

Methods

We conducted a cross-sectional online survey in 2021. We used multivariate Poisson regression to estimate prevalence ratios, identifying differences in willingness to use daily oral, event-driven oral, monthly oral and bimonthly injectable PrEP. Models for each PrEP modality were adjusted for age, country, race, education, income, HIV risk score, HIV testing, and HIV risk perception.

Results

Among 27,589 individuals who initiated the survey, 16,951 were included (Brazil: 61.3%; Mexico: 29.5%; Peru: 9.3%). Mean age was 32 years, and 67.8% had more than secondary education. Most respondents were willing to use monthly oral (74.4%), daily oral (65.8%), and bimonthly injectable (60.2%), while only 38.0% were willing to use event-driven oral PrEP. Across modalities, willingness was higher among those with increased HIV risk perception and high HIV sexual exposure. Willingness was lower among Peruvian respondents for all modalities, except event-driven PrEP. Participants with lower education had lower willingness to use monthly oral and bimonthly injectable PrEP.

Conclusions

Our results suggest a preference for long-acting formulations among SGM in Latin America. Further research is needed to address gaps in the understanding of prevention modalities and to guide potential users in selecting the most suitable PrEP modality available.

Keywords: Pre-exposure prophylaxis; PrEP modalities; HIV prevention; Sexual and Gender Minorities; Latin America

Introduction

In 2023, an estimated 2.3 million people were living with HIV in Latin America [1]. Latin America is one of the few regions where HIV incidence has risen, with a 9% increase from 2010 to 2023, including significant rises of 81% in Peru, 9% in Mexico, and 5% in Brazil [2]. The incidence of HIV continues to be disproportionality higher among sexual and gender minorities (SGM), accounting for 66% of cases in Latin America. HIV prevalence among gay, bisexual and other men who have sex with men (MSM) and transgender persons aged 15-49 years (2019-2023) was 10% and 9.5%, respectively [1]. Additionally, in a study conducted in Brazil and Peru found high HIV incidence among SGM not using PrEP (3.9%, 95% CI: [2.9 - 4.9]), being higher among participants from Peru, aged 18-30 years and reporting lower incomes [3].

Currently, the World Health Organization (WHO) recommends daily or on-demand oral emtricitabine 200mg and tenofovir disoproxil fumarate 300mg (FTC/TDF), long-acting injectable cabotegravir 600mg (CAB-LA) and dapivirine vaginal ring as effective HIV pre-exposure prophylaxis (PrEP) modalities [4]. By July 2024, 152 countries worldwide have adopted oral PrEP into their national guidelines [5]. In Latin America, oral PrEP was implemented as part of public policy in most of the countries, with Brazil initiating the provision of PrEP through the public health system in 2017, Mexico in 2021, and Peru in 2023 [6–8]. Despite some improvements in PrEP scale up in the last five years, fewer than 5% of those in need are currently covered by PrEP in Latin America. In 2023, 167,275 persons were using PrEP in the region, with Brazil accounting 66% of them [9]. In addition to regional disparities, more is needed to reach those who are at higher vulnerability to HIV. During the ImPrEP study, the largest PrEP implementation study in Latin America, participants of younger age, black or mixed-race, lower education and transgender women had higher HIV incidence, and increased odds to discontinue PrEP, of lower adherence and of lower persistence [10,11]. Similarly, PrEP uptake and persistence are worse among young, indigenous and black Brazilians according to Brazil national data [12]. In response to implementation concerns with existing oral PrEP regimen, long-acting products need to be offered and accessible to those who need most.

In 2021, CAB-LA was shown to be a highly effective alternative to daily oral FTC/TDF for HIV prevention among cisgender women, cisgender MSM and transgender women [13,14]. The frequency of administration, an intramuscular injection of 600mg every four weeks for the first two injections and every eight weeks thereafter, is attractive for people who have difficulty adhering to an oral pill regimen. However, barriers to implementing injectable PrEP need to be considered, such as

cost-effectiveness, potential barriers to implementation such as staffing, acceptability and preferences of potential users, as well as factors influencing timely attendance to injection visits, the prolonged sub-therapeutic pharmacokinetic effect, and alternative administration sites to the gluteal muscle [15,16]. While CAB-LA is not available in Latin America, Brazil is conducting the ImPrEP CAB Brasil study to evaluate the implementation of CAB-LA for SGM aged 18-30 years within the public health system [17,18].

Different PrEP technologies such as infusion of monoclonal antibodies, topical microbicides and other long-acting products are being developed [16]. Subdermal implants, for instance, have several advantages such as easy removal, biodegradability, minimal healthcare system interaction, lower daily dosage, and more consistent, predictable drug release [16,19]. Islatravir delivered through a subdermal implant, demonstrated promise as a potentially effective and well-tolerated approach for HIV prevention [20]. Recently, subcutaneous lenacapavir twice-yearly was superior to FTC/TDF among cisgender women and SGM in phase 3 clinical trials PURPOSE 1 and PURPOSE 2, showing potential to be the next PrEP option available [21,22].

PrEP urgently needs to be scaled-up among SGM in Latin America, including the provision of long-acting products such as CAB-LA [1]. In this sense, understanding the willingness to use PrEP modalities could provide information for future adaptations or implementation of HIV prevention policies. We aimed to describe willingness to use different PrEP modalities and factors associated with willingness to use four PrEP modalities: daily oral, event-driven oral, monthly oral, and bimonthly injectable among SGM in Brazil, Mexico and Peru.

Methods

Study design

A cross-sectional online survey was conducted between April and August 2021 among individuals self-identified as SGM and aged 18 years or older from Brazil, Peru, and Mexico. Respondents found the survey advertisements in dating apps such as Grindr (19.1%) and Hornet (37.8%), social networks such as Facebook (19.9%), Instagram (17.7%) and WhatsApp (2.5%), and other sources (3.0%). They were asked to provide their informed consent and then to answer a computer-based survey that included information on socio-demographics, behavior, HIV testing and prevention. We excluded participants reporting to be living with HIV.

Variables

Outcomes

Participants were asked to report their willingness to use each of the PrEP modalities with the question: “*Considering that all PrEP modalities are available, how likely would you be to use them?*” with answers recorded using a 4-point Likert scale: very unlikely, unlikely, likely, very likely. *Very likely* answers were classified as “willing”, following definition from previous studies [23,24]. We evaluated willingness to use for the following PrEP modalities: daily oral, event-driven oral, monthly oral, bimonthly injectable in gluteus, daily topical, event-driven topical, patch, implant, infusion monoclonal antibodies, subcutaneous monoclonal antibodies. We also inquired participants if they were willing to use an HIV preventive vaccine. Only factor associated with four PrEP modalities (daily oral, event-driven oral, monthly oral, bimonthly injectable) were reported, as these are currently available, implemented or under investigation in Latin American when the survey has been launched.

Socio-demographics

For gender identity, participants answer the question “*What gender do you currently identify with?*” with the following possible options: cisgender man, cisgender woman, transgender woman, transgender man, queer/non-binary, other. Age was categorized as 18-24, 25-30 and more than 30 years old. Ethnicity or race was classified as White, Mixed-race (*Pardo* or *Mestizo*), and Black/Asian/Indigenous/Other. Level of education was dichotomized as complete secondary or less (lower education) and more than secondary (higher education). Regarding the individual monthly income, we considered the minimum wage per country in 2021 (Brazil 213 USD/month, Mexico 215 USD/month and Peru 257 USD/month) and dichotomized as minimum wage or less (lower income) and more than minimum wage (higher income).

Perceived risk for HIV acquisition, HIV Incidence Risk Index, HIV testing

The perceived risk for HIV was evaluated with the question “*Considering your current sexual practices, in your opinion, what is your risk of acquiring HIV in the next 12 months?*”, which was recategorized as low (none/low/moderate) and high (high/certainty of infection). The HIV Incidence Risk Index (HIRI) was constructed by combining sexual behavior and substance use variables as described previously [25]. Scores equals to or greater than 10 were considered as “engaging in high HIV sexual exposure”. Regarding HIV testing, participants answer to “*When was the last time you took an HIV test?*” which was categorized as never, 6 or less month and more than 6 months.

Statistical analysis

Frequencies and percentages of sociodemographic and behavior characteristics, and HIV testing were compared by country (Brazil, Mexico and Peru) using chi-square test. We also described these

variables according to the willingness of use of four PrEP modalities (daily oral, event-driven oral, monthly oral, and bimonthly injectable) for each country. We conducted multivariate Poisson regression estimating prevalence ratios (PR) to determine differences in willingness to use each PrEP modality. Models were developed for each PrEP modality. Models were adjusted for: age, country, race, education, income, HIRI score, HIV testing, and HIV risk perception.

Results

A total of 35,541 individuals accessed the online questionnaire, of whom 7952 (22.4%) were ineligible due to the following reasons: did not provide informed consent (23.9%), previously participated (19.2%), self-identify as cisgender woman (8.6%), were younger than 18 years (0.8%), men who did not self-identify as SGM (11.3%), and reporting to be living with HIV (36.2%) (see Figure 1). Among 27,589 eligible individuals, 10,638 (38.6%) were excluded for not answering questions about PrEP modalities. Overall, 16,951 respondents were included in this analysis, 10,385 (61.3%) Brazilians, 4996 (29.5%) Mexicans and 1570 (9.3%) Peruvians. Most (95.5%) self-identified as cisgender men, 0.6% as transgender women, 0.4% as transgender men, 2.5% as non-binary/queer person, and 1% as other. Median age was 32 years (Interquartile range [IQR]: 26 - 39); almost half (46.0%) self-declared mixed-race, and more than three quarters (76.5%) received more than one minimum wage per month (higher income). In addition, 61.2% respondents were identified as having high HIV sexual exposure according to the HIRI, 11.6% had never been tested for HIV, and 39.6% had their last HIV test more than six months ago.

Participants accessing the
questionnaire
N = 35,541

Ineligible: 7952 (22.4%)
1,903 (23.9%) not provided informed consent
1,523 (19.2%) participate previously
686 (8.6%) cisgender women
62 (0.8%) < 18 years old
895 (11.3%) non SGM
2883 (36.2%) People living with HIV

Participants who initiated the
questionnaire
N = 27,589 (77.6%)

Participants who did not answer the PrEP
modalities questions
N = 10,638 (38.6%)

Participants who completed the
questionnaire and were included in
the analysis
N = 16,951 (61.4%)

Figure 1: Study flow-chart

Study population characteristics were compared by country (see Table 1). More Peruvians self-identified as transgender or non-binary person (10.5%) compared to Brazilians and Mexicans (2.2% and 7.6%, respectively), and were aged 18-24 years (Peru: 45.6%; Mexico: 21.2%; Brazil: 12.6%). Regarding race, most of Brazilians self-defined as White (56.5%), while in Mexico and Peru as Mixed-race (75.0% and 70.6%, respectively). Most individuals in Brazil and Mexico received more than minimum wage monthly (78.8% and 79.0%, respectively) compared to Peru (50.9%). In addition, more Peruvians perceived themselves to be at high risk of acquiring HIV (15.1%) compared to Brazilians and Mexicans (9.3% and 8.8%, respectively); conversely, more Brazilians had high HIV sexual exposure according to HIRI scale (64.3%) than Mexicans and Peruvians (59.4% and 47.0%, respectively). Additionally, more Peruvians had never been tested for HIV (21.1%) compared to Mexicans and Brazilians (15.2% and 8.4%, respectively).

Table 1: Characteristics of an online sample of Sexual and Gender Minorities from Brazil, Mexico, and Peru, 2021

Characteristics	Total	Brazil N=10,385 (61.3)	Mexico N=4,996 (29.5)	Peru N=1570 (9.3)	p value
Gender Identity					<.001
Cisgender men	16,183 (95.5)	10,160 (97.8)	4617 (92.4)	1406 (89.5)	
Transgender/non-binary person	767 (4.5)	224 (2.2)	379 (7.6)	164 (10.5)	
Age (years)					<.001
18 - 24	3077 (18.1)	1304 (12.6)	1057 (21.2)	716 (45.6)	
25 - 30	4604 (27.2)	2712 (26.1)	1456 (29.1)	436 (27.8)	
> 30	9270 (54.7)	6369 (61.3)	2483 (49.7)	418 (26.6)	
Race					<.001
White	6879 (42.2)	5873 (56.5)	808 (18.7)	198 (12.6)	
Mixed-race	7483 (46.0)	3125 (30.1)	3249 (75.0)	1109 (70.6)	
Black/Asian/Indigenous	1923 (11.8)	1387 (13.4)	273 (6.3)	263 (16.8)	
Education level					<.001
≤ secondary education	5455 (32.2)	3419 (32.9)	1474 (29.5)	562 (35.8)	
> secondary education	11,496 (67.8)	6966 (67.1)	3522 (70.5)	1008 (64.2)	
Monthly income					<.001
≤ minimum wage	3882 (23.5)	2206 (21.2)	991 (21.0)	685 (49.1)	
> minimum wage	12,627 (76.5)	8179 (78.8)	3738 (79.0)	710 (50.9)	
HIV risk perception					<.001
None/Low/moderate	14,992 (90.5)	9421 (90.7)	4557 (91.2)	1014 (84.9)	
High	1583 (9.5)	964 (9.3)	439 (8.8)	180 (15.1)	
HIRI-SGM					<.001
Low risk	6572 (38.8)	3709 (35.7)	2031 (40.6)	832 (53.0)	
High risk	10,379 (61.2)	6676 (64.3)	2965 (59.4)	738 (47.0)	
Last HIV test					<.001
Never	1961 (11.6)	876 (8.4)	757 (15.2)	328 (21.1)	
≤ 6 months	8258 (48.8)	5543 (53.4)	2055 (41.3)	660 (42.6)	
> 6 months	6688 (39.6)	3966 (38.2)	2160 (43.4)	562 (36.3)	

HIRI-SGM: HIV Incidence Risk Index for sexual and gender minorities

Regarding PrEP modalities, most of the respondents were willing to use monthly oral (74.4%), daily

oral (65.8%), and bimonthly injectable (60.2%), while only 38.0% event-driven PrEP. Other PrEP modalities received lower willingness levels: 25.1% for daily topical, 18.8% for event-driven topical, 31.7% for a patch, 35.9% for an implant, 28.4% for infusion monoclonal antibodies, and 31.3% for subcutaneous monoclonal antibodies. Additionally, 82.8% of participants reported willingness to use an HIV preventing vaccine. Figure 2 shows the percentages of willingness to use these less common PrEP modalities and an HIV vaccine in each country.

If the following PrEP modalities are available, how likely would you be to use them?

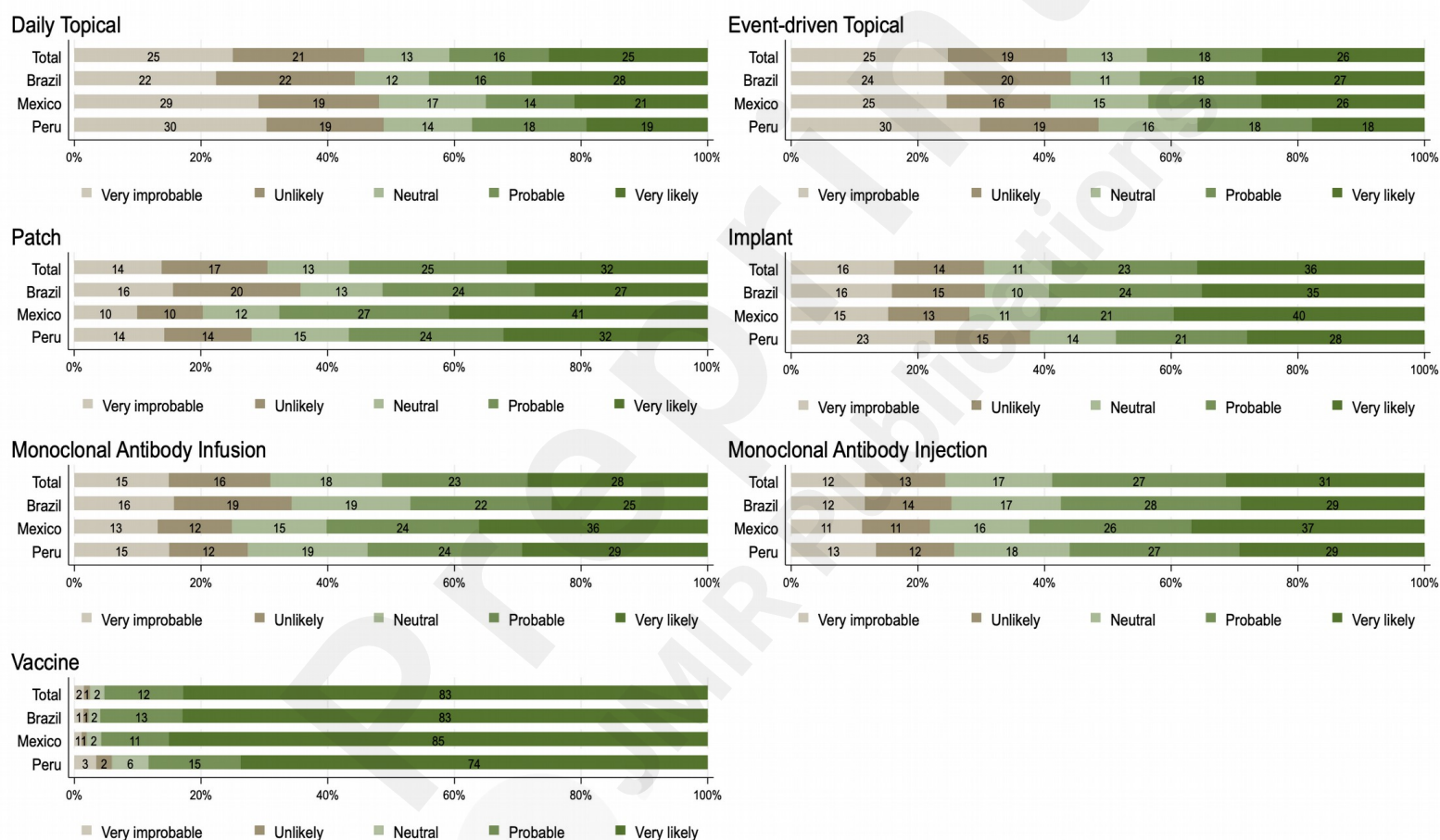


Figure 2: Percentages of the willingness to use new PrEP modalities among Sexual and Gender Minorities from Brazil, Mexico, and Peru

We also found country differences in the willingness to use any of the four PrEP modalities evaluated (daily oral, event-driven oral, monthly oral and bimonthly injectable) with Mexicans reporting the highest willing (90.7%), followed by Brazilians (89.4%) and Peruvians (84.0%). Within each country, there were significant differences in the willingness to use each of these four PrEP

modalities. Peruvians were less willing to use daily oral (53.1%), monthly oral (62.5%) and bimonthly injectable (45.9%) compared to Brazilians and Mexicans. Willingness to use event-driven was lower for Brazilians (36.1%).

In all three countries, cisgender MSM were more willing to use monthly oral PrEP compared to transgender/non-binary participants (see Table 2). In Brazil and Mexico, White individuals were more willing to use monthly oral PrEP (75.7% and 78.6%, respectively), while in Peru, Mixed-race individuals showed higher willingness (64.1%). In Mexico and Peru, White participants were more willing to use bimonthly injectable PrEP (59.5% and 47.6%, respectively), whereas in Brazil, Black, Asian, or Indigenous individuals showed greater willingness (64.7%). In Brazil and Mexico, daily oral PrEP was more preferred among individuals with lower education (68.7% and 68.8%, respectively) and lower income (67.3% and 68.5%), while in Peru, it was more preferred among participants with higher education (54.2%) and income (56.3%). In Brazil and Mexico, participants who had an HIV test within the past six months showed greater willingness to use monthly oral PrEP (75.9% and 78.4%, respectively), while in Peru, this modality was more preferred by people who had an HIV test more than six months ago (63.8%).

Table 2: Characteristic of Sexual and Gender Minorities from Brazil, Mexico, and Peru according to each PrEP modality, 2021

Characteristics	Brazil				Mexico				Peru	Total
	Daily oral 6082 (66.8)	Event-driven 3162 (36.1)	Monthly oral 7640 (74.9)	Injectable 6450 (63.3)	Daily oral 3242 (67.8)	Event-driven 1958 (41.0)	Monthly oral 3728 (76.5)	Injectable 2805 (57.5)		
Gender Identity										
Cisgender men	5953 (66.9)	3088 (36.1)	7477 (75.0)	6316 (63.3)	2995 (67.8)	1812 (41.1)	3473 (77.2)	2603 (57.8)	723 (53.6)	5311 (53.1)
Trans/non-binary	129 (62.6)	74 (37.2)	163 (73.8)	134 (60.6)	247 (66.9)	146 (40.0)	255 (68.0)	202 (53.9)	76 (48.1)	531 (53.1)
Age (years)										
18 – 24	817 (66.8)	401 (34.1)	947 (74.0)	763 (59.6)	724 (70.2)	431 (43.3)	783 (76.2)	533 (51.9)	359 (51.4)	2700 (51.4)
25 – 30	1689 (70.1)	876 (37.8)	2017 (75.9)	1706 (64.2)	1008 (70.9)	599 (42.5)	1098 (77.1)	855 (60.0)	217 (52.7)	1611 (64.2)
> 30	3576 (65.3)	1885 (35.8)	4676 (74.7)	3981 (63.6)	1510 (64.7)	928 (39.1)	1847 (76.2)	1417 (58.5)	223 (56.5)	1531 (63.6)
Race										
White	3296 (64.6)	1755 (35.6)	4376 (75.7)	3609 (62.4)	510 (67.1)	327 (42.3)	619 (78.6)	469 (59.5)	92 (48.2)	788 (64.6)
Mixed-race	1915 (69.1)	946 (35.8)	2275 (74.6)	1957 (64.2)	2107 (67.6)	1280 (41.1)	2456 (77.5)	1872 (59.1)	574 (54.0)	4231 (69.1)
Black/Asian/Indigenous	871 (70.9)	461 (38.7)	989 (72.4)	884 (64.7)	186 (71.5)	126 (47.6)	193 (71.8)	138 (51.3)	133 (53.0)	833 (70.9)
Education level										
≤ secondary education	2165 (68.7)	1057 (35.3)	2368 (71.0)	1976 (59.3)	983 (68.8)	587 (42.0)	1054 (73.2)	784 (54.4)	280 (51.1)	2233 (68.7)
> secondary education	3917 (65.8)	2105 (36.5)	5272 (76.8)	4474 (65.2)	2259 (67.3)	1371 (40.6)	2674 (77.9)	2021 (58.8)	519 (54.2)	3611 (65.8)

Monthly income

≤ minimum wage	1368 (67.3)	708 (36.7)	1543 (71.7)	1256 (58.3)	664 (68.5)	401 (42.6)	721 (74.6)	520 (53.8)	340 (51.1)	255
> minimum wage	4714 (66.6)	2454 (35.9)	6097 (75.8)	5194 (64.6)	2428 (68.2)	1462 (40.8)	2810 (77.0)	2153 (59.0)	378 (56.3)	274

HIV risk perception

None/Low/moderate	5345 (64.9)	2809 (35.4)	6851 (74.1)	5730 (62.0)	2887 (66.0)	1734 (39.8)	3364 (75.7)	2501 (56.3)	517 (52.8)	409
High	737 (84.9)	353 (42.3)	789 (83.2)	720 (76.0)	355 (87.0)	224 (53.0)	364 (84.9)	304 (70.9)	131 (79.4)	90

HIRI-SGM

Low risk	1972 (56.8)	1114 (33.7)	2523 (69.7)	1950 (53.9)	1190 (59.8)	746 (38.6)	1423 (72.0)	1018 (51.5)	367 (45.8)	277
High risk	4110 (72.9)	2048 (37.5)	5117 (77.8)	4500 (68.4)	2052 (73.4)	1212 (42.6)	2305 (79.5)	1787 (61.7)	432 (61.4)	307

Last HIV test

Never	545 (62.7)	280 (34.7)	597 (70.8)	443 (52.6)	470 (62.7)	272 (38.6)	537 (74.1)	350 (48.3)	130 (40.6)	108
≤ 6 months	2983 (69.2)	1544 (37.1)	4148 (75.9)	3684 (67.5)	1363 (73.1)	851 (43.0)	1576 (78.4)	1299 (64.6)	362 (59.2)	262
> 6 months	2554 (65.0)	1338 (35.2)	2895 (74.4)	2323 (59.7)	1398 (65.1)	830 (40.0)	1600 (75.5)	1144 (54.0)	298 (53.8)	207

HIRI-SGM: HIV Incidence Risk Index for sexual and gender minorities

In the multivariable analysis (Table 3), willingness to use each of the four PrEP evaluated modalities was positively associated with high HIV self-perceived risk and higher HIRI scores. Peruvian respondents showed lower willingness to use three modalities (daily oral: aPR=0.83 [95% CI: 0.76 – 0.91], monthly oral: aPR=0.86 [95% CI: 0.79 – 0.93], and injectable: aPR=0.78 [95% CI: 0.71 – 0.86]. Mexicans and Peruvians respondents reported higher willingness to use event-driven oral (aPR=1.18 [95% CI: 1.10 – 1.26], and aPR=1.16 [95% CI: 1.04 – 1.29, respectively] compared to Brazilians. Having secondary or less education was associated with lower willingness for monthly oral and bimonthly injectable PrEP (aPR=0.93 [95% CI: 0.89 – 0.97] and aPR=0.94 [95% CI: 0.90 – 0.99], respectively). Never been tested for HIV and testing for HIV more than six months ago were associated with lower willingness for daily oral PrEP (aPR=0.91 [95% CI: 0.85 – 0.98], and aPR=0.96 [95% CI: 0.91 – 0.99], respectively), and bimonthly injectable PrEP (aPR=0.81 [95% CI: 0.75 – 0.87], and aPR=0.91 [95% CI: 0.87 – 0.95], respectively).

Table 3: Characteristics associated with willingness to use each PrEP modality among Sexual and Gender Minorities from Brazil, Mexico, and Peru, 2021

Characteristics	Daily oral aPR [95% CI]	Event-driven aPR [95% CI]	Monthly oral aPR [95% CI]	Injectable aPR [95% CI]
Country				
Brazil	Ref.	Ref.	Ref.	Ref.
Mexico	1.03 [0.98-1.08]	1.18 [1.10-1.26]	1.03 [0.99-1.08]	0.95 [0.90-1.00]
Peru	0.83 [0.76-0.91]	1.16 [1.04-1.29]	0.86 [0.79-0.93]	0.78 [0.71-0.86]
Age (years)				
18 - 24	1.01 [0.95-1.08]	1.00 [0.92-1.09]	1.04 [0.98-1.11]	0.96 [0.90-1.02]
25 - 30	1.04 [0.99-1.09]	1.04 [0.97-1.11]	1.02 [0.97-1.06]	0.99 [0.95-1.04]
> 30	Ref.	Ref.	Ref.	Ref.
Race				
White	Ref.	Ref.	Ref.	Ref.
Mixed	1.03 [0.98-1.08]	0.99 [0.93-1.05]	0.99 [0.95-1.03]	1.02 [0.97-1.07]
Black/Asian/Indigenous	1.07 [1.00-1.14]	1.06 [0.97-1.15]	0.95 [0.89-1.01]	1.01 [0.94-1.08]
Education level				
≤ secondary education	1.02 [0.98-1.07]	0.97 [0.91-1.04]	0.93 [0.89-0.97]	0.94 [0.90-0.99]
> secondary education	Ref.	Ref.	Ref.	Ref.
Monthly income				
≤ minimum wage	0.98 [0.93-1.03]	1.03 [0.96-1.11]	0.97 [0.92-1.02]	0.96 [0.91-1.01]
> minimum wage	Ref.	Ref.	Ref.	Ref.
HIV risk perception				
None/Low/moderate	Ref.	Ref.	Ref.	Ref.
High	1.25 [1.17-1.33]	1.21 [1.11-1.32]	1.10 [1.03-1.16]	1.16 [1.09-1.24]
HIRI-SGM				
Low risk	Ref.	Ref.	Ref.	Ref.
High risk	1.22 [1.16-1.27]	1.07 [1.01-1.13]	1.09 [1.05-1.14]	1.20 [1.15-1.26]
Last HIV test				
Never	0.91 [0.85-0.98]	0.93 [0.85-1.02]	0.96 [0.90-1.03]	0.81 [0.75-0.87]
≤ 6 months	Ref.	Ref.	Ref.	Ref.
> 6 months	0.96 [0.91-0.99]	0.96 [0.91-1.02]	0.99 [0.95-1.03]	0.91 [0.87-0.95]

HIRI-SGM: HIV Incidence Risk Index for sexual and gender minorities

Discussion

In this manuscript, we provide information about willingness to use PrEP modalities among SGM from three countries in Latin America. Overall, participants were more interested in monthly oral PrEP, with daily oral and bimonthly injectable PrEP also been widely accepted, and event-driven oral PrEP the least preferred. Participants perceiving themselves

at higher HIV risk and engaging in higher HIV sexual exposure were more willing to use all four PrEP modalities. Individuals with lower education were less willing to use long-acting PrEP (monthly oral and bimonthly injectable). Participants who had never tested for HIV or had their last test more than six months ago were less willing to use daily oral PrEP and bimonthly injectable. Our study provides insight on PrEP preferences among SGM in Latin America and guide the implementation of new PrEP modalities into prevention programs.

Higher willingness to use monthly oral and bimonthly injectable PrEP indicates preference for long-acting formulations among SGM in Latin America. In a discrete-choice experiment conducted in Brazil, SGM preferred long-acting PrEP as long as efficacy and side effects were similar or lower than oral PrEP [26]. Previous studies identified injectable PrEP as the most preferred modality; however, they did not consider monthly oral PrEP as an option [27–29]. Currently, monthly oral PrEP is not available, although it was explored as an alternative to daily oral PrEP. Unfortunately, in 2021, phase III trials of once-monthly oral Islatravir were discontinued by Merck company due to safety concerns, specifically regarding changes in total lymphocyte and CD4+ T cells counts [30]. No further studies have been conducted to evaluate the efficacy of this modality. Conversely, long acting injectables have been considered highly acceptable among SGM populations for HIV prevention [31], although its implementation has only recently been evaluated in Latin America [17]. Long-acting injectables offer potential advantages, such as reducing the frequency of clinic visits and improving adherence compared to daily oral PrEP [32]. However, concerns about the side effects of injectables remain, particularly because, once administered, the product cannot be removed [33]. Our study also revealed that individuals with lower education were less willing to use long-acting PrEP formulations, similar to findings related to injectable PrEP in Brazil [27]. This suggest that persons using PrEP need accessible information to better understand the important features of these modalities.

Daily oral PrEP was also widely accepted; however, Peruvians were less likely to willing to use this modality compared to Brazilians and Mexicans. This result is consistent with results from the ImPrEP study, which reported lower continuation and adherence to daily oral PrEP among MSM and transgender women from Peru compared to Brazil [10,11].

Possible contributing factors included low awareness of oral PrEP, HIV-related stigma during sexual transmitted infections (STI) clinic visits, and concerns about medication efficacy and side-effects [23]. These concerns may be more noticeable with newer PrEP modalities, particularly long-acting formulations, due to the lack of information and perceived loss of autonomy in administration, leading to a preference for the daily oral modality [29,34]. Additionally, the familiarity and routine of taking a daily oral pill could also have contributed to this preference [34].

Event-driven oral PrEP was the least acceptable among our participants. This finding aligns with previous studies [27,28], except for a study conducted in the United States, in which MSM reported that most of condomless anal sex events are either infrequent or can be anticipated [35]. In contrast, participants in the ImPrEP study showed low interest in switching from daily oral to event-driven oral PrEP [36]. Reasons included that fewer than 25% reported having sex less than two days per week (indicating infrequent sex), most were satisfied with daily regimen, considered event-driven PrEP a difficult regimen to follow, and had concerns about its efficacy and anxiety about their own HIV risk [36].

Individuals who perceived themselves at high risk for HIV and engaging in high HIV sexual exposure were more likely to use any PrEP modality. A high perceived risk of HIV has been identified as a facilitator of PrEP acceptability, and willingness to use it [37–39]. For example, in Mexico, transgender women reported high willingness to use daily oral PrEP (95.5%) if they had high HIV risk perception [40]. Additionally, Torres *et al.* reported that higher HIRI-MSM scores increased the willingness of use injectable PrEP, while lower HIRI-MSM scores were associated with a preference for event-driven PrEP in Brazil and Mexico. In other Latin American study, Assaf *et al.* found that a higher risk for HIV was associated with PrEP awareness in Brazil, but not among MSM in Mexico and Peru [41]. Importantly, awareness of PrEP has been associated with willingness to use it in a study from Brazil [23], indicating the importance of continuous education campaigns about HIV prevention, including current and future PrEP modalities.

PrEP modalities involving topical agents, patches, implants and monoclonal antibodies received lower willingness to use compared the oral and injectable modalities. In contrast,

HIV vaccines were widely accepted by participants. Many of these PrEP formulations are still in clinical research phase [16,42], while no HIV vaccine has been efficacious to date. Limited awareness of the options still under study could have generated distrust. However, previous studies have reported acceptability among SGM for topical agents or gels, patches, and implants [42,43]. Although there is currently no approved HIV vaccine, the MOSAICO study (HPX3002/HVTN706) enrolled Latin American participants before being discontinued due to lack of efficacy [44]. Nevertheless, previous studies from Brazil found high willingness to use for a hypothetical effective HIV vaccine, even if it was not free of charge [45,46].

We acknowledge that this study has certain limitations. Participants accessed the online survey using smartphones or any internet-connected device, which means the sample may not be representative of all SGM from Brazil, Mexico and Peru. Also, the cross-sectional design of our study limited us in establishing causality. Notably, when the data were collected in 2021, only daily oral PrEP was available in these countries. However, oral PrEP information was more widely disseminated in Brazil, where it had been included into their public healthcare system since 2017 [47]. Finally, all responses were based on participant's self-reports, and social desirability bias may have occurred; however, online anonymous data collection could reduce this.

We concluded that SGM from Latin America were more willing to use long-acting PrEP, but daily oral PrEP was also highly accepted. Research and education are needed to better understand and to address the gaps in knowledge of prevention modalities. The availability of additional choices to better address the prevention needs of SGM populations could empower individuals to use these methods. Tools to guide the choice process are needed as additional PrEP modalities are included in HIV prevention programs.

Ethics consideration

Ethical approval for the study was obtained from the respective ethical review boards in each country. In Brazil, the study was approved by the Institutional Review Board of INI

Evandro Chagas-FIOCRUZ (#CAAE 82021918.0.0000.5262); in Mexico, by the Research Ethics Committee of the National Institute of Psychiatry Ramón de la Fuente Muñiz (#CEI/C/038/2018); and in Peru, by the Ethical Committee for Research with Human Subjects at Universidad Peruana Cayetano Heredia (#101460).

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Conflicts of interest

The authors have no conflicts of interest to report.

Data Availability

Study's final deidentified dataset and dictionary will be made available with publication of the manuscript upon reasonable request. A proposal should be submitted to the corresponding author's e-mail, who will evaluate and approve the request. No additional documents will be made available.

Abbreviations

CAB-LA: long-acting injectable cabotegravir

FTC: emtricitabine

HIRI: HIV incidence risk index

MSM: men who have sex with men

PR: prevalence ratios

PrEP: pre-exposure prophylaxis

SGM: sexual and gender minorities

TDF: tenofovir disoproxil fumarate

WHO: World Health Organization

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Supplementary Files

Figures

Percentages of the willingness to use new PrEP modalities among Sexual and Gender Minorities from Brazil, Mexico, and Peru.

