


Preferences for PrEP modalities among gay, bisexual, and other men who have sex with men from Brazil, Mexico, and Peru: a cross-sectional study

Thiago S. Torres* , Alessandro R. Nascimento*, Lara E. Coelho, Kelika A. Konda, E Hamid Vega-Ramirez, Oliver A. Elorreaga, Dulce Diaz-Sosa, Brenda Hoagland, Juan V. Guanira, Cristina Pimenta, Marcos Benedetti, Carlos F. Caceres, Valdilea G. Veloso and Beatriz Grinsztejn

Abstract

Background: Pre-exposure prophylaxis (PrEP) scale-up is urgent to reduce new HIV cases among gay, bisexual, and other men who have sex with men (MSM) in Latin America. Different PrEP modalities may increase PrEP uptake and adherence, especially among young MSM.

Objectives: To assess preferences for PrEP modalities among MSM from Brazil, Mexico, and Peru.

Design: Cross-sectional web-based study (March–May 2018) targeting MSM through advertisements on Grindr, Hornet, and Facebook. We included MSM aged ≥ 18 years and who reported HIV-negative status.

Methods: We assessed preferences for PrEP modalities with the following question: ‘Considering that all following PrEP modalities were available, which one would you prefer considering a scale from 1 to 3 (1 = most preferred): daily oral PrEP, event-driven PrEP (ED-PrEP), and long-acting injectable PrEP’. We assessed factors associated with each most preferred PrEP modality per country using multivariable logistic regression models.

Results: A total of 19,457 MSM completed the questionnaire (Brazil: 58%; Mexico: 31%; Peru: 11%); median age was 28 years [interquartile range (IQR): 24–34]. Overall, injectable PrEP was the most preferred modality [42%; 95% confidence interval (CI): 41–43], followed by daily PrEP (35%; 95% CI: 34–35), and ED-PrEP (23%; 95% CI: 23–24). In multivariable models, preferring injectable PrEP was associated with PrEP awareness in all three countries, while PrEP eligibility only in Brazil. Preferring daily PrEP was associated with younger age and lower income in Brazil and Mexico, and lower education only in Brazil. The odds of preferring ED-PrEP were lower among MSM aware and eligible for PrEP in Brazil and Mexico.

Conclusions: Long-acting injectable PrEP was the preferred PrEP modality among MSM in Brazil, Mexico, and Peru, especially those aware and eligible for PrEP. Public health interventions to increase PrEP modalities literacy and availability in Latin America are urgent especially among MSM of young age, lower income, and lower education.

Keywords: cabotegravir, HIV prevention, men who have sex with men, Latin America, PrEP, sexual and gender minorities

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Background

In 2021, approximately 2.2 million people were living with human immunodeficiency virus (HIV)

in Latin America, and new yearly infections continue to increase among gay, bisexual, and other cisgender men who have sex with men (MSM),

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Correspondence to:

Thiago S. Torres
Instituto Nacional de
Infecologia Evandro
Chagas, Fundação
Oswaldo Cruz (INI-
Fiocruz), Avenida Brasil,
4365 Manguinhos, Rio de
Janeiro 21040-360, Brazil.
thiago.torres@ini.fiocruz.br

Alessandro R. Nascimento
Lara E. Coelho
Brenda Hoagland
Marcos Benedetti
Valdilea G. Veloso
Beatriz Grinsztejn
Instituto Nacional de
Infecologia Evandro
Chagas, Fundação
Oswaldo Cruz (INI-
Fiocruz), Rio de Janeiro,
Brazil

Kelika A. Konda
Oliver A. Elorreaga
Juan V. Guanira
Carlos F. Caceres
Universidad Peruana
Cayetano Heredia, Lima,
Peru

E Hamid Vega-Ramirez
Dulce Diaz-Sosa
National Institute of
Psychiatry Ramon de la
Fuente Muñiz, Mexico City,
Mexico

Cristina Pimenta
Ministry of Health,
Brasília, Brazil

*Contributed equally as
joint first authors.

especially among the youngest.^{1,2} At the outset of the COVID-19 pandemic, Latin American and the Caribbean nations reported about 4000 fewer diagnoses of HIV in the first 6 months of 2020 compared with the same period in 2019.³ However, the number of people living with HIV in the region continues to increase. In 2021, people living with HIV in Brazil, Mexico, and Peru were estimated at 960,000, 360,000, and 98,000, respectively.⁴⁻⁶ Although tenofovir-based oral HIV pre-exposure prophylaxis (PrEP) is available either *via* public health programs or for purchase, additional strategies for MSM are crucial to avoid the increase of new HIV infections that exceeds 4000 per day worldwide.¹

Tenofovir-based oral PrEP can be taken daily⁷ or before and after sexual contact,⁸ also known as event-driven PrEP (ED-PrEP), recommended by the World Health Organization (WHO) since 2019.⁹ Moreover, alternatives to oral PrEP are continuing to be developed.¹⁰ While oral PrEP is slowly scaled-up in Latin America, other PrEP modalities, such as long-acting injectable PrEP has been recognized as an effective strategy for the prevention of HIV infection that will expand PrEP options.¹¹

Cabotegravir formulated as a long-acting injectable suspension for intramuscular administration has been evaluated under two large, randomized, multi-country, double-blind, phase 3 efficacy trials (HPTN 083 and HPTN 084).^{12,13} Both studies compared the efficacy of injectable long-acting cabotegravir administered every 8 weeks to daily oral PrEP with tenofovir disoproxil fumarate and emtricitabine 200 mg (TDF/FTC). Although daily oral TDF/FTC is highly effective against HIV infection when used as prescribed,¹⁴ HPTN 083 results showed that cabotegravir was superior to daily oral TDF/FTC in preventing HIV infection among MSM and transgender women,¹² leading to US Food and Drug Administration (FDA) approval in December 2021¹⁵ and WHO recommendation in 2022.¹⁶ However, the logistics involved in cabotegravir provision in low-income settings such as Latin America will require new implementation studies, and issues around cost remain to be determined.¹⁷

The Implementation PrEP Project (ImPrEP), the first and largest transnational project in Latin America, provided evidence on feasibility, acceptability, and cost-effectiveness of daily oral PrEP

among MSM and transgender women in Brazil, Mexico, and Peru.¹⁸⁻²³ Results from ImPrEP have been considered for decision making to incorporate oral PrEP as part of combination HIV prevention in Mexico²⁴ and to provide information for the maintenance and surveillance of PrEP policy in Brazil, where PrEP has been provided through the public health system (Sistema Único de Saúde [SUS]) since December 2017 with no direct cost to PrEP users.²⁵ Results from the ImPrEP demonstration study have shown that same-day oral PrEP provision was feasible for MSM and transgender women in Brazil, Mexico, and Peru.²³ However, HIV incidence during the study was higher among non-white and younger (18–24 years) individuals and those non-adherent to daily oral PrEP. The odds of adherence to PrEP were higher among participants of younger age, lower education, and engaging in HIV high-risk behavior such as condomless anal sex and having more than 10 sex partners in prior 3 months. These results indicate that other PrEP modalities, such as long-acting oral PrEP, could overcome these social, structural, and behavior determinants of HIV vulnerability.

In this context, understanding the preferences for different PrEP modalities and the social, structural, and behavior characteristics involved in the preference of different populations such as MSM in Latin America is essential to provide information for the PrEP implementation and access, and for the update of public health policies. Therefore, as part of ImPrEP Project, this study aimed to assess preferences for PrEP modalities and its associated factors among MSM from Brazil, Mexico, and Peru.

Methods

Study design

This was a cross-sectional web-based survey conducted through March to May 2018 targeting MSM through advertisements on dating apps (Grindr and Hornet) and Facebook. Another survey targeting only transgender women has been conducted independently, being described elsewhere.²⁶ We included MSM aged 18 years or older; resident of Brazil, Mexico, or Peru; and who self-reported HIV negative status. The questionnaire was administered in Portuguese (Brazil) and Spanish (Mexico and Peru). Details of the study design are described elsewhere.¹⁹

Preferences for PrEP modalities

Preferences for PrEP modalities were assessed through the following question:

Considering that all following PrEP modalities were available, which one would you prefer in a scale from 1 to 3 (1 = most preferred, 2 = second preferred, 3 = third preferred): daily oral PrEP (use of one pill per day), event-driven PrEP (use of pills before and after an HIV risk episode); long-acting injectable PrEP (use of injectable drug at each two months).

The PrEP modality ranked as '1' was considered the most preferred for each participant. From this ranking, we created three main dichotomic (yes/no) outcomes one for each most preferred PrEP modality.

Variables

Age was categorized into three brackets: '18–24', '25–35', or '>35' years old. Race was dichotomized in 'White' or 'Other' (Black, *Pardo*, Asian, or Indigenous) from Brazil and Peru, and for Mexico, individuals were asked if they were Indigenous (yes/no), following previous studies.^{19,27,28} Education was graded as 'Low' for those who had less than or complete secondary education and 'High' for those reporting any post-secondary education. Individuals were asked about their monthly income by the time of survey completion. Income was stratified in 'low', 'middle', and 'high' according to each country definition detailed in previous analysis,²⁸ which considered the minimum wage value per month in June 2018 (Brazil: 954 BRL or 185 USD; Mexico: 2686 MXN or 135 USD; Peru: 850 PEN or 220 USD). For Brazil, participants were stratified in 'low' if the family monthly income was equivalent or inferior to three minimum wages; in 'middle' if between 3 and 10 minimum wages; in 'high' if superior to 10 minimum wages. For Mexico and Peru, participants were stratified in 'low' if individual monthly income was less than three minimum wages; 'middle' if between three and five minimum wages; and high if superior to five minimum wages. HIV Incidence Risk Index for MSM (HIRI-MSM) scale was developed to predict HIV seroconversion among MSM,²⁹ being previously used in studies conducted in Latin America.^{27,30,31} HIRI-MSM scale is an impartial score dependent on respondent's behavior, rather than being based on one's HIV risk perception.^{32,33} HIRI-MSM scale scores of

10 points or higher indicate that individuals are in higher vulnerability to HIV, and are potentially eligible for PrEP. For this analysis, we dichotomized participants into 'Not eligible for PrEP' (<10 points) and 'Eligible for PrEP' (10+ points). PrEP awareness was assessed with the question: 'Have you ever heard of PrEP?' with possible answers: 'No' or 'Yes'. After PrEP awareness question, we provided a brief explanation about daily oral PrEP, its recommendation by WHO and Ministry of Health (Brazil only), and that PrEP requires medical appointments and HIV/STI (sexually transmitted infection) screening at each 3 months.

Statistical analysis

Study population characteristics were described and compared according to the most preferred PrEP modality for each country using chi-square test. We used multivariable logistic regression models to assess the factors associated with each most preferred PrEP modality separately for each country. We provided results from the models in adjusted odds ratio (aOR) and 95% confidence interval (95% CI). Models were fit for all variables regardless of statistical significance, based on an *a priori* theoretical/conceptual model. We wanted to verify whether social, structural, and behavior determinants of HIV vulnerability measured by age, race, education, income, PrEP eligibility (HIRI-MSM scale), and awareness of PrEP were associated with preference for each PrEP modality. Missing data were omitted from models due to the large sample size and assuming missing at random. All analyses were performed using Software R version 4.2.1.³⁴

Results

A total of 43,687 MSM accessed the questionnaire and 20.1% were ineligible (8790/43,687). Reasons for being ineligible were not identified as MSM (2866; 32.6%); participated previously in this study (1444; 16.4%); were not living in Brazil, Mexico, or Peru (139; 1.6%); aged less than 18 years (416; 4.7%); and self-reported HIV positive status (3925; 44.7%). Of 34,897 eligible MSM who initiated the survey, 19,457 (55.8%) completed the questionnaire and were included in the analyses. The majority were from Brazil (11,285; 58%), followed by Mexico (6031; 31%) and Peru (2140; 11%) (Table 1). Overall, median age was 28 years [interquartile range (IQR):

Table 1. Study population characteristics according to the most preferred PrEP modality: Brazil, Mexico, and Peru, 2018.

	Total N = 19,457 (%)	Brazil N = 11,367 (58.4%)	Mexico N = 5934 (30.5%)	Peru N = 2156 (11.1%)	p value
Age (years)					<0.001
18–24	5877 (30.2)	3222 (28.3)	1766 (29.8)	889 (41.2)	
25–35	9325 (47.9)	5364 (47.2)	2991 (50.4)	970 (45.0)	
>35	4254 (21.9)	2780 (24.5)	1177 (19.8)	297 (13.8)	
Race					<0.001
White ^a	12,194 (63.0)	6004 (52.8)	5783 (98.1)	407 (19.6)	
Other ^b	7147 (37.0)	5363 (47.2)	112 (1.8)	1672 (80.4)	
Education					<0.001
Low	6234 (32.3)	4378 (38.9)	1395 (23.5)	461 (21.7)	
High	13,090 (67.7)	6887 (61.1)	4539 (76.5)	1664 (78.3)	
Income					<0.001
Low	7390 (39.6)	5136 (45.2)	1544 (28.8)	710 (36.8)	
Middle	7087 (38.0)	4700 (41.4)	2400 (44.8)	948 (49.1)	
High	4183 (22.4)	1531 (13.5)	1419 (26.5)	272 (14.1)	
PrEP eligibility ^c					<0.001
No (low HIV risk)	9292 (47.8)	5403 (47.5)	2893 (48.8)	996 (46.2)	
Yes (high HIV risk)	10,165 (52.2)	5964 (52.5)	3041 (51.2)	1160 (53.8)	
PrEP awareness					<0.001
No	6804 (35.1)	3531 (31.2)	2125 (35.9)	1148 (53.4)	
Yes	12,592 (64.9)	7794 (68.8)	3796 (64.1)	1002 (46.6)	

HIRI-MSM, HIV Incidence Risk Index for men who have sex with men; PrEP, pre-exposure prophylaxis.

^aFor Mexico, not Indigenous.

^bFor Brazil and Mexico: Black, *Pardo* or *Mestizo*, Asian and Indigenous. For Mexico, Indigenous.

^cHIRI-MSM scale; individuals were potential eligible for PrEP if scores were 10+ points. Missing data: age ($n = 1$; 0.005%); race ($n = 116$; 0.6%); education ($n = 133$; 0.6%); income ($n = 0$); PrEP eligibility ($n = 0$); PrEP awareness ($n = 61$; 0.3%).

24–34], 30.2% were aged 18–24 years, 63.0% were White, 32.3% reported low education and 39.6% low income.

Overall, injectable PrEP was the most preferred modality (first option for 41.9%, 95% CI: 41–43), followed by daily PrEP (34.8%, 95% CI: 34–35) and ED-PrEP (23.3%, 95% CI: 23–24). Injectable PrEP was the most preferred modality in Brazil and Peru (first option for 44.6% and 41.0%,

respectively), followed by daily PrEP (33.4% and 33.3%, respectively). In Mexico, an almost equal proportion selected daily PrEP 37.9% and injectable PrEP 37.0% as their first option. ED-PrEP was the least chosen by participants in all three countries (25.6% in Peru, 25.1% in Mexico, and 21.9% in Brazil) ($p < 0.001$ for comparisons). Characteristics of study population according to the most preferred PrEP modality in Brazil, Mexico, and Peru are shown in Table 2. In Brazil

Table 2. Study population characteristics according to the most preferred PrEP modality: Brazil, Mexico, and Peru, 2018.

	Brazil				Mexico				Peru			
	Daily PrEP 3802 (33.4)	ED-PrEP 2494 (21.9)	Injectable PrEP 5071 (44.6)	p value	Daily PrEP 2250 (37.9)	ED-PrEP 1491 (25.1)	Injectable PrEP 2193 (37.0)	p value	d-PrEP 719 (33.3)	ED-PrEP 553 (25.6)	Injectable PrEP 884 (41.0)	p value
Age (years)				<0.001				<0.001				0.004
18-24	1188 (36.9)	701 (21.8)	1333 (41.4)		805 (45.6)	433 (24.5)	528 (29.9)		317 (35.7)	251 (28.2)	321 (36.1)	
25-35	1758 (32.8)	1118 (20.8)	2488 (46.4)		1069 (35.7)	753 (25.2)	1169 (39.1)		307 (31.6)	230 (23.7)	433 (44.6)	
>35	855 (30.8)	675 (24.3)	1250 (45.0)		376 (31.9)	305 (25.9)	496 (42.1)		95 (32)	72 (24.2)	130 (43.8)	
Race				0.52				0.097				0.802
White ^a	1989 (33.1)	1341 (22.3)	2674 (44.5)		2189 (37.9)	1446 (25)	2148 (37.1)		137 (33.7)	108 (26.5)	162 (39.8)	
Other ^b	1813 (33.8)	1153 (21.5)	2397 (44.7)		46 (41.1)	35 (31.2)	31 (27.7)		559 (33.4)	421 (25.2)	692 (41.4)	
Education				<0.001				<0.001				0.044
Low	1604 (36.6)	974 (22.2)	1800 (41.1)		593 (42.5)	356 (25.5)	446 (32.0)		170 (36.9)	125 (27.1)	166 (36.0)	
High	2153 (31.3)	1503 (21.8)	3231 (46.9)		1657 (36.5)	1135 (25)	1747 (38.5)		543 (32.6)	415 (24.9)	706 (42.4)	
Income				<0.001				<0.001				0.021
Low	1873 (36.5)	1166 (22.7)	2097 (40.8)		684 (44.3)	390 (25.3)	470 (30.4)		244 (34.4)	209 (29.4)	257 (36.2)	
Middle	1494 (31.8)	1004 (21.4)	2202 (46.9)		909 (37.9)	600 (25)	891 (37.1)		312 (32.9)	231 (24.4)	405 (42.7)	
High	435 (28.4)	324 (21.2)	772 (50.4)		450 (31.7)	340 (24)	629 (44.3)		91 (33.5)	60 (22.1)	121 (44.5)	
PrEP eligibility ^c				<0.001				0.010				0.523
No (low HIV risk)	1830 (33.9)	1273 (23.6)	2300 (42.6)		1059 (36.6)	776 (26.8)	1058 (36.6)		332 (33.3)	266 (26.7)	398 (40)	
Yes (high HIV risk)	1972 (33.1)	1221 (20.5)	2771 (46.5)		1191 (39.2)	715 (23.5)	1135 (37.3)		387 (33.4)	287 (24.7)	486 (41.9)	
PrEP awareness				<0.001				<0.001				0.005
No	1244 (35.2)	909 (25.7)	1378 (39.0)		860 (40.5)	591 (27.8)	674 (31.7)		400 (34.8)	314 (27.4)	434 (37.8)	
Yes	2539 (32.6)	1572 (20.2)	3683 (47.3)		1386 (36.5)	894 (23.6)	1516 (39.9)		318 (31.7)	237 (23.7)	447 (44.6)	

ED-PrEP, event-driven PrEP; HIRI-MSM, HIV Incidence Risk Index for men who have sex with men; PrEP, pre-exposure prophylaxis.

^aFor Mexico, not Indigenous.

^bFor Brazil and Mexico: Black, *Pardo* or *Mestizo*, Asian, and Indigenous. For Mexico, Indigenous.

^cHIRI-MSM scale; individuals were potential eligible for PrEP if scores were 10+ points.

and Mexico, a higher proportion of individuals aged 25–35 years, high education, high income, PrEP eligible, and PrEP aware preferred injectable PrEP ($p < 0.001$, for all). Similar characteristics were observed for Peruvian participants, except that PrEP eligibility was not associated with injectable PrEP ($p = 0.523$). A higher proportion of young MSM aged 18–24 years and MSM having lower education (all three countries) and lower income (Brazil and Mexico only) preferred daily oral PrEP. Finally, more MSM aged > 35 years in Brazil and not eligible for PrEP in Brazil and Mexico preferred ED-PrEP.

In multivariate logistic models for Brazil, the odds of preferring injectable PrEP were higher among MSM eligible for PrEP (aOR: 1.16, 95% CI: 1.07–1.25) and aware of PrEP (aOR: 1.32, 95% CI: 1.21–1.43), while the odds of preferring this PrEP modality were lower among MSM having low (aOR: 0.73, 95% CI: 0.65–0.83) or middle (aOR: 0.88, 95% CI: 0.78–0.99) income and low education (aOR: 0.91, 95% CI: 0.83–0.99) (Table 3). The odds of preferring daily PrEP were higher among MSM of younger age (aOR: 1.15, 95% CI: 1.02–1.29), low income (aOR: 1.31, 95% CI: 1.14–1.50), and low education (aOR: 1.15, 95% CI: 1.05–1.25). The odds of preferring ED-PrEP were lower among MSM of younger age (18–24 years: aOR: 0.85, 95% CI: 0.74–0.97; 25–35 years: aOR: 0.83, 95% CI: 0.74–0.93), eligible for PrEP (aOR: 0.85, 95% CI: 0.74–0.97), and aware of PrEP (aOR: 0.73, 95% CI: 0.66–0.81).

In Mexico, the odds of preferring injectable PrEP were higher among MSM aware of PrEP (aOR: 1.25, 95% CI: 1.10–1.41), while the odds of preferring this PrEP modality were lower among MSM of younger age (aOR: 0.68, 95% CI: 0.57–0.81), and low (aOR: 0.71, 95% CI: 0.60–0.84) or middle income (aOR: 0.83, 95% CI: 0.72–0.96). In contrast, the odds of preferring daily PrEP were higher among MSM of younger age (aOR: 1.55, 95% CI: 1.29–1.85), low (aOR: 1.37, 95% CI: 1.15–1.63) and middle income (aOR: 1.19, 95% CI: 1.03–1.37). The odds of preferring ED-PrEP were lower among MSM eligible for PrEP (aOR: 0.83, 95% CI: 0.73–0.94) and aware of PrEP (aOR: 0.80, 95% CI: 0.70–0.91).

In Peru, the odds of preferring injectable PrEP were higher among MSM aware of PrEP (aOR:

1.23, 95% CI: 1.01–1.49); no variables were associated with preferences for daily PrEP or ED-PrEP.

Discussion

In this study, we compared preferences for different PrEP modalities among MSM from three countries in Latin America using a web-based survey. Long-acting injectable PrEP was the most preferred modality by most of the respondents, even though no studies confirming the efficacy and safety of this modality were available at the time of data collection. Injectable PrEP presents several benefits that can explain this finding, such as its dosage schedule and once the dose is administered the absence of additional action to achieve adherence. Long-acting injectable PrEP with cabotegravir is given first as two initiation injections administered 1 month apart, and every 2 months thereafter.¹⁵ The cabotegravir long-acting dosage is considered the main advantage of this PrEP modality,³⁵ while effectiveness of oral PrEP depends on adherence to medication, a critical factor in certain groups, such as young MSM, which are less likely to adhere to daily PrEP.^{23,36–38} In descriptive choice experiment (DCE) studies conducted among sexual and gender minorities in Brazil and Peru during 2020–2021, long-acting presentations and frequency of taking PrEP were important attributes in choosing PrEP modality.^{20,21,39} Our findings provide additional information about preferences for alternative modalities to oral PrEP such as injectable PrEP among MSM in Latin America.

The odds of preferring injectable PrEP were higher among MSM aware of PrEP in all three countries. A study conducted in the United States during 2018 has also shown the relationship between PrEP awareness and preference for long-acting injectable PrEP among MSM.⁴⁰ Half of MSM living in New York city area had heard of injectable PrEP and 30.8% specifically preferred injectable PrEP, and the odds of preferring injectable PrEP were higher among MSM with more concerns about the level of protection and drug half-life had lower.⁴⁰ This reinforces the importance of creating campaigns to disseminate information on PrEP modalities among MSM to demand creation and to scale-up PrEP. Advertisements using online strategies on social media and dating apps, widely used among MSM

Table 3. Factors associated with each most preferred PrEP modality: Brazil, Mexico, and Peru, 2018.

	Brazil			Mexico			Peru		
	Daily PrEP aOR (95% CI)	ED-PrEP aOR (95% CI)	Injectable PrEP aOR (95% CI)	Daily PrEP aOR (95% CI)	ED-PrEP aOR (95% CI)	Injectable PrEP aOR (95% CI)	Daily PrEP aOR (95% CI)	ED-PrEP aOR (95% CI)	Injectable PrEP aOR (95% CI)
Age (years)									
18–24	1.15 (1.02–1.29)*	0.85 (0.74–0.97)*	0.99 (0.88–1.11)	1.55 (1.29–1.85)***	0.92 (0.76–1.13)	0.68 (0.57–0.81)***	1.22 (0.87–1.71)	1.00 (0.70–1.44)	0.82 (0.60–1.14)
25–35	1.06 (0.96–1.18)	0.83 (0.74–0.93)**	1.08 (0.98–1.19)	1.17 (1.00–1.37)	0.98 (0.83–1.16)	0.88 (0.76–1.02)	1.00 (0.74–1.36)	0.91 (0.66–1.27)	1.07 (0.80–1.43)
>35	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Race									
White ^a	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Other ^b	0.96 (0.88–1.04)	0.94 (0.86–1.03)	1.09 (1.01–1.18)*	1.06 (0.70–1.58)	1.35 (0.87–2.04)	0.71 (0.45–1.09)	1.00 (0.78–1.28)	0.92 (0.71–1.20)	1.07 (0.84–1.36)
Education									
Low	1.15 (1.05–1.25)**	0.96 (0.87–1.07)	0.91 (0.83–0.99)*	1.06 (0.92–1.22)	1.00 (0.85–1.17)	0.94 (0.81–1.09)	1.14 (0.88–1.49)	0.95 (0.71–1.26)	0.88 (0.63–1.23)
High	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Income									
Low	1.31 (1.14–1.50)***	1.12 (0.96–1.30)	0.73 (0.65–0.83)*	1.37 (1.15–1.63)***	1.04 (0.86–1.27)	0.71 (0.60–0.84)***	0.84 (0.59–1.19)	1.44 (0.98–2.14)	0.88 (0.63–1.23)
Middle	1.13 (1.00–1.29)	1.04 (0.90–1.20)	0.88 (0.78–0.99)*	1.19 (1.03–1.37)*	1.04 (0.89–1.22)	0.83 (0.72–0.96)*	0.89 (0.66–1.21)	1.13 (0.81–1.60)	1.02 (0.76–1.36)
High	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
PrEP eligibility ^c									
No (low HIV risk)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Yes (high HIV risk)	0.95 (0.88–1.03)	0.87 (0.79–0.95)**	1.16 (1.07–1.25)***	1.09 (0.97–1.21)	0.83 (0.73–0.94)**	1.07 (0.96–1.20)	1.00 (0.82–1.22)	0.86 (0.66–1.06)	1.13 (0.93–1.36)
PrEP awareness									
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Yes	0.95 (0.87–1.03)	0.73 (0.66–0.81)***	1.32 (1.21–1.43)***	0.97 (0.86–1.09)	0.80 (0.70–0.91)***	1.25 (1.10–1.41)***	0.85 (0.69–1.03)	0.94 (0.75–1.16)	1.23 (1.01–1.49)*

aOR, adjusted odds ratio; CI, confidence interval; ED-PrEP, event-driven PrEP; HIRI-MSM, HIV Incidence Risk Index for men who have sex with men.

^aFor Mexico, not Indigenous.

^bFor Brazil and Mexico: Black, *Pardo* or *Mestizo*, Asian, and Indigenous. For Mexico, Indigenous.

^cHIRI-MSM scale; individuals were potential eligible for PrEP if scores were 10+ points.

p* < 0.01; *p* < 0.001; ****p* < 0.0001.

from Latin America, should be considered by policy makers.^{41,42}

In Brazil and Mexico, the odds of preferring daily PrEP were higher among MSM of younger age and low income. In addition, the odds of preferring daily PrEP were higher among MSM of lower education in Brazil. In Latin America, new HIV infections continue to rise among young MSM and those at vulnerable socioeconomic status.^{2,28} However, results from the ImPrEP study showed that adherence to daily oral PrEP and long-term engagement to PrEP service were lower among MSM of younger age (<30 years) and lower education.²³ Information on efficacy of injectable PrEP should be available to all MSM to increase knowledge and interest for this PrEP modality, especially among those who would benefit the most, such as young MSM and those with intersecting social vulnerabilities.

Brazilian respondents eligible for PrEP according to HIRI-MSM scale were more likely to choose injectable PrEP, while participants not eligible for PrEP (lower scores at HIRI-MSM scale) preferred ED-PrEP in Brazil and Mexico. These associations may be explained by individuals' own HIV risk perception, which is strongly correlated with sexual behavior,⁴³ suggesting the importance of having different PrEP modalities available for different needs. A study conducted in the United States demonstrated that protection against HIV infection was an important motivator for PrEP adoption, and the link between the desire of taking PrEP and PrEP eligibility.⁴⁴ In a systematic review evaluating studies in low- and middle-income countries, MSM with more sex partners were more likely to choose daily PrEP than ED-PrEP, which indicate an interest for the PrEP regimen more suitable to maintain adherence and increase effectiveness.⁴⁵

This study has limitations, and our findings should be interpreted with caution: (1) we recruited a convenience sample of respondents who have access to smartphones and Internet connection and use apps or social media, precluding the generalization to all MSM from Brazil, Mexico, and Peru; (2) income was defined differently in each country, but followed previous studies conducted in Brazil, Mexico, and Peru^{19,28}; (3) all collected data were self-reported by participants and may be subject to recall and

response bias, even though individuals tend to be more open on online anonymous surveys, reducing social desirability bias⁴⁶; (4) at the time of data collection (2018), only information about oral PrEP efficacy was available, and information about ongoing cabotegravir clinical trials was limited, indicating that MSM mostly likely preferred injectable PrEP based on dose regimen (at each 2 months) information provided in the survey; (5) as a cross-sectional survey, conclusions cannot be made regarding the causality of the most preferred PrEP modality.

Conclusion

Long-acting injectable PrEP modality was preferred by MSM in Brazil, Mexico, and Peru, especially among those aware and eligible for PrEP and those in higher vulnerability to HIV. MSM not eligible for PrEP or in lower vulnerability to HIV preferred ED-PrEP, indicating the importance of different PrEP modalities according to individual's own needs. Public health interventions to increase PrEP modalities literacy and availability in Latin America are urgent especially among MSM of young age, lower income, and lower education.

Declarations

Ethics approval and consent to participate

An ethical review board in each country approved the study: in Brazil, INI Evandro Chagas-FIOCRUZ institutional review board (#CAAE 82021918.0.0000.5262); in Mexico, the research ethics committee of the National Institute of Psychiatry Ramón de la Fuente Muñiz (#CEI/C/038/2018); and in Peru, Universidad Peruana Cayetano Heredia Ethical Committee for Research with Human Subjects (#101460). All study participants provided their informed consent electronically before initiating the web-based survey. No identification of participants was collected.

Consent for publication

Not applicable.

Author contributions

Thiago S. Torres: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Supervision; Writing – original draft.

Alessandro R. Nascimento: Investigation; Writing – original draft.

Lara E. Coelho: Formal analysis; Writing – review & editing.

Kelika A. Konda: Conceptualization; Data curation; Investigation; Methodology; Supervision; Writing – review & editing.

E Hamid Vega-Ramirez: Data curation; Investigation; Methodology; Resources; Supervision; Writing – review & editing.

Oliver A. Elorreaga: Data curation; Project administration; Writing – review & editing.

Dulce Diaz-Sosa: Data curation; Project administration; Writing – review & editing.

Brenda Hoagland: Investigation; Writing – review & editing.

Juan V. Guanira: Investigation; Writing – review & editing.

Cristina Pimenta: Conceptualization; Project administration; Supervision; Writing – review & editing.

Marcos Benedetti: Project administration; Writing – review & editing.

Carlos F. Caceres: Investigation; Writing – review & editing.

Valdilea G. Veloso: Funding acquisition; Investigation; Supervision; Writing – review & editing.

Beatriz Grinsztejn: Investigation; Supervision; Writing – review & editing.

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Competing interests

KAK declares that she has worked for UCLA and UPCH in the past year. All remaining authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Availability of data and materials

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

ORCID iD

Thiago S. Torres  <https://orcid.org/0000-0002-2557-601X>

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