

TITLE PAGE:

**PREDICTORS OF KNOWLEDGE AND ACCESS TO BIOMEDICAL PREVENTION  
AMONG MSM AND TGM IN LATIN AMERICA: RESULTS FROM THE LATIN  
AMERICAN INTERNET SURVEY**

**Running head: Awareness of HIV biomedical prevention in MS/TGW**

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## **KEYWORDS**

Pre-exposure prophylaxis; Post-Exposure Prophylaxis; highly active antiretroviral therapy; undetectable = untransmissible; sexual and gender minorities; transgender persons

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**ABSTRACT**

**Introduction:** HIV is still a central public health issue in Latin America, disproportionately affecting key populations. Knowledge and access to biomedical prevention strategies, including treatment as prevention (TASP) or undetectable=untransmissible (U=U), pre-exposure prophylaxis (PrEP), and post-exposure prophylaxis (PEP) are the first step to increase uptake. We used data from the Latin American MSM Internet Survey (LAMIS) to describe knowledge and access to biomedical HIV prevention strategies among gay, bisexual, transgender, and other men-who-have-sex-with-men (MSM) living in 18 Latin American countries.

**Methods:** We compared LAMIS data across countries and according to age categories using frequencies and percentages. We also used multivariable models to explore whether age, gender identity, sexual identity, steady partnership, HIV status and education were independently associated with outcomes.

**Results:** 55,924 participants were included. Most were cisgender (99%) and identified as gay/homosexual (77%) or bisexual (17%). Schooling levels were very high, with 89% reporting highest attained education as tertiary level, university, or post-graduation. In total, 16% had been previously diagnosed with HIV; of those, rates of undetectable viral load varied from 60% in Venezuela, to 83% in Brazil. Overall, 54%, 54% and 52% of participants already knew about PEP, PrEP and U=U, respectively. Participants from

Brazil and those aged between 26 and 55 years, living with diagnosed HIV and having a gay/homosexual identity had greater levels of awareness about biomedical prevention strategies.

**Conclusion:** Our study highlights gaps in HIV prevention campaigns directed to MSM in Latin America resulting in low uptake of biomedical prevention methods.

## INTRODUCTION

Despite significant improvements in prevention and care, HIV persists as a central public health issue worldwide. The Joint United Nations Program on HIV/AIDS (UNAIDS) reported that 38 million individuals were living with HIV globally, and an estimated 1.7 million new infections occurred in 2019. In the same year, estimated data from Latin America indicated that 2.1 million people lived with HIV, and 120,000 new HIV infections were diagnosed (1).

Globally, key populations such as gay men and other men who have sex with men (MSM), intravenous drug users, sex workers, and transgender people, represent approximately 62% of all new HIV infections (1). This proportion is even higher in Latin America, where key populations represent 77% of the incident HIV infections (1, 2). As seen in most non-African countries, HIV is concentrated in a smaller subgroup of more vulnerable and stigmatized populations in Latin America. For instance, some studies report HIV prevalence between 8% to 30% among MSM in Latin American countries, while estimated overall HIV prevalence lies below 1% (3-8). Those disparities highlight the challenges regarding access to health information, prevention, and care for the most vulnerable populations. These challenges may be graver in settings with socioeconomic inequities and health systems that offer services of heterogeneous quality to different populations, as seen in Latin America. Most Latin American countries have segmented health systems that provide unequal benefits for users, based on income and labor status (9).

Although a range of HIV prevention strategies have been implemented in several Latin American countries, knowledge and access to such strategies is not homogenous across different age groups and in all countries (10-12). These differences may impact

on the HIV incidence rates and should be considered for strategically planning information and education programs.

In this study, we used data from LAMIS to describe knowledge and access to biomedical HIV prevention strategies among gay, bisexual, transgender, and other MSM living in 18 Latin American countries. We compared data across countries and according to age categories. We also used multivariable models to explore whether age, gender identity, sexual identity, steady partnership, HIV diagnosis and education were independently associated with knowledge about post-exposure prophylaxis (PEP), pre-exposure prophylaxis (PrEP), and treatment as prevention (TASP) or undetectable=untransmissible (U=U) using the complete sample. In addition, among participants living with diagnosed HIV, we also explored independent predictors of self-reported undetectable HIV viral load.

## **METHODS**

LAMIS (the Latin American Men-who-have-sex-with-men Internet Survey) was a multicenter, internet-based anonymous survey directed at men ( $\geq 18$  years old and including transgender men) having sex with men or being sexually attracted to men, living in 18 Latin American countries.

Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela included  $\geq 1,500$  respondents and were incorporated in the country-level analysis.

This survey was adapted from the European MSM Internet Survey (EMIS-2017 (13-15)). The surveys included questions about demographics, sexual behavior, HIV and other sexually transmitted infections (STI) prevention practices, knowledge about prevention strategies including PrEP and PEP, recreational drug use, access to health services, among other variables.

Recruitment was achieved through dating apps (76%), social media (10%), and advertising on websites of academic/research institutions and non-governmental organizations (4%). Responses were collected between January and May 2018.

LAMIS received approval from the ethics committees of the Universidad Peruana Cayetano Heredia (612-19-17), the Salvador Allende School of Public Health, Faculty of

Medicine, University of Chile (009-2017), Santa Casa de Misericordia de Sao Paulo, Brazil (2,457,744), the National Committee for Health Ethics, Guatemala (39-2017) and the Faculty of Psychology and Neuroscience of the University of Maastricht, The Netherlands (18-01-12-2017). All participants provided informed consent before any questionnaire responses were collected.

For this analysis, we have selected variables related to knowledge and access to biomedical prevention, including PrEP, U=U, and PEP, and demographic characteristics.

### **Statistical methods**

Demographic characteristics of study participants are presented as medians and interquartile ranges or frequencies and percentages. Knowledge/access variables are described as frequencies and percentages, along with their 95% confidence intervals (CI). The associations between demographic variables and knowledge/access were explored using multivariable logistic models. Knowledge/access variables were originally collected as 5-category responses and were recategorized as binary responses for the multivariable logistic models. We selected variables for the multivariable analysis based on causal diagrams. We used Stata 15.1 (StataCorp College Station, TX: StataCorp LP) with alpha error of 0.05 for all analyses.

### **RESULTS**

64,655 participants were included in the study between January and May, 2018; after the exclusion of 8,731 participants with inconsistent data on age and partnership, the final sample for our study comprised 55,924 participants. Demographics and HIV status are presented in Table 1. Most participants were cisgender male (99%) who identified as gay/homosexual (77%) or bisexual (17%). Median age was 28 years (range 18-81) and schooling levels were very high, with 89% reporting highest attained education as tertiary level, university or post-graduation. In total, 8,774 (16%) had been previously diagnosed with HIV, and 26% reported having a steady partner. Most participants were

from the most populous participating countries Brazil (28%) and Mexico (23%), and Colombia (13%).

Awareness of and access to PEP, PrEP, antiretroviral treatment, and knowledge about U=U were explored with close-ended questions as described in Table 2. Although knowledge about PEP and PrEP was reported by 54%, less than 10% reported having tried to get PEP or PrEP and less than 5% had ever taken one of these. Among participants living with diagnosed HIV, 88% reported to be on antiretroviral treatment, and 77% had undetectable viral load. Knowledge about U=U was declared by 52% of respondents.

Figure 1 shows the percentage of participants reporting knowledge of / access to PrEP, antiretroviral treatment, and U=U, along with 95% confidence intervals, for the seven countries with more than 1,500 respondents.

Participants from Brazil had the highest rates of knowledge about PrEP; however, the percentage of participants who had ever taken PrEP was very low across all countries, with highest rates in Peru (2%) and Brazil (2%). In contrast, more than 50% of participants in all countries reported they were quite/very likely to use PrEP if available/affordable. Among participants living with diagnosed HIV, the percentage reporting undetectable viral load varied from 60% in Venezuela, to 83% in Brazil. Knowledge about U=U was highest in Brazil (64%) and varied between 42 and 49% in the remaining countries.

Knowledge/access to PrEP, antiretroviral treatment, and U=U was also addressed across age groups. Figure 2 shows the percentage of participants reporting knowledge of / access to PrEP, antiretroviral treatment, and U=U, along with 95% confidence intervals, for age groups. Knowledge and access to PrEP were lower in the youngest ( $\leq 25$  years old) and oldest ( $> 55$  years old) age groups. Although less than 3% of participants reported taking PrEP previously, more than 50% declared they were quite/very likely to use PrEP if available/affordable in all age categories, similarly to what had been shown in the analysis per country. Among participants living with diagnosed HIV, viral suppression increased across age groups, from 57% among

respondents  $\leq 25$  years old to 92% among those  $\geq 56$  years old. Knowledge about U=U was also lower in the youngest ( $\leq 25$  years old) and oldest ( $> 55$  years old) age groups compared to other age groups.

**Figure 1: Knowledge of and access to biomedical prevention across seven Latin American countries with  $\geq 1500$  LAMIS respondents**

**Figure 2: Knowledge of and access to biomedical prevention across age groups among all LAMIS respondents**

We explored whether age, gender identity, sexual identity, steady partnership, HIV diagnosis and education were independently associated with knowledge about PEP, PrEP, U=U, and reporting undetectable HIV viral load using multivariable logistic regression models. Results are presented in Table 3. Compared to participants aged 18-25 years old, those aged 26-55 were more likely to declare that they had heard about PEP; participants aged 26-45 were also more likely to have heard about PrEP than those aged  $\leq 25$  or those  $> 56$  years old. Older age was associated with higher odds of having undetectable HIV viral load. The odds of knowing U=U was higher among participants aged 26-35 years and lower for older participants.

Compared to participants identifying as “a man”, those identifying as “a trans man” had statistically significant lower odds of having heard of PEP/PrEP and reporting undetectable HIV viral load. Regarding sexual identity, compared to those identifying as gay/homosexual, those declaring to be bisexual, heterosexual, or other orientations had lower odds of knowing about PEP, PrEP, and U=U. Bisexually and heterosexually identifying participants with diagnosed HIV had, respectively, 0.70 (95% CI 0.58-0.84) and 0.29 (95% CI 0.11-0.76) times the odds of having undetectable HIV viral load compared to HIV-diagnosed respondents who identified as gay/homosexual. Steady partnership was associated with higher odds of knowing about PEP, U=U and having undetectable HIV viral load. Participants with diagnosed HIV had more than 2 times the odds of being aware about PEP, PrEP and U=U compared to HIV negative individuals.



Finally, higher education was consistently associated with knowledge about PEP and PrEP, with  $p < 0.001$  in the trend test, suggesting a linear increase in knowledge with increasing schooling. Among respondents with diagnosed HIV, education was not significantly associated with reporting undetectable viral load or with knowledge about U=U in these models.

## **DISCUSSION**

In this large-scale anonymous online survey including gay, bisexual, transgender, and other MSM living in 18 Latin American countries, we found a reported HIV prevalence of 16% and quite variable levels of knowledge and access to biomedical HIV prevention strategies across participating countries and age groups. Overall, 54%, 54% and 52% of participants were aware of PEP, PrEP and U=U, respectively. Participants from Brazil, those aged between 26 and 55 years, living with diagnosed HIV, those identifying as “a man”, and those identifying as gay/homosexual had greater awareness of these prevention strategies.

The advantages of online recruitment with anonymous reporting are both the wide outreach of the study, which included more than 64,000 participants, and the convenience to address intimate and stigmatized issues with privacy. Online surveys were used previously to assess topics related to HIV and prevention among European MSM (13, 15), but in Latin America the available data refers only to smaller studies with country-specific information.

MSM are one of the most important key populations for the HIV/AIDS epidemic in Latin America. In 2013, a systematic review including 48 studies addressing HIV prevalence among MSM in this region found a median estimate of 10.6%, varying from 0.6 to 31.1% (16). In our analysis, we found a higher overall prevalence (16%) possibly influenced by the large percentage of participants recruited in Brazil, Mexico and Colombia, three countries with high HIV prevalence in this group, reaching 18.4%, 16.9% and 12.1%, respectively (17-19). Additional possible explanations for the higher prevalence found in our study are the privacy to disclose the HIV status through an anonymous self-completion questionnaire; the recruitment strategy using dating apps and social media groups organized by non-governmental organizations dealing with

sexual minorities and/or HIV prevention; and a time-series effect as HIV prevalence in 2018 is likely to be higher than in 2013, with continuous increase in new infections and lower mortality.

Participants living with diagnosed HIV from Argentina, Brazil, Chile, Colombia and Mexico reported undetectable viral load in 81.4%, 82.8%, 76.4%, 75.1% and 77.6% of responses, respectively, all close to the 81% target suggested by UNAIDS in the 90-90-90 goals (20). Interestingly, in our multivariable model adjusted for age, gender identity, sexual identity, and steady partnership, education had no statistically significant association with being undetectable. One of the main factors that likely facilitated the achievement of these results is the availability of free-of-charge HIV care and treatment in all five countries.

PrEP and PEP awareness is critical to promote biomedical HIV prevention, but it varies substantially in different settings. In Latin America, we showed that Brazil, Chile, and Peru had the highest levels of awareness about PEP and PrEP. Brazil and Peru have been participating in several PrEP trials and demonstration projects in the last decade, potentially helping disseminate awareness and knowledge of this prevention method among MSM. PrEP was first approved by the Food and Drug Administration in 2012, with approval in Latin American countries occurring in subsequent months to years. By 2018, when this survey was conducted, it is likely that awareness and access to this relatively new intervention was still increasing. The same cannot be assumed for PEP, which has been available for decades.

In a study published in 2017, 29.7% of MSM living in low- and middle-income countries were aware of PrEP and 64.4% of them were interested in initiating PrEP if available (21). In another study, predictors of willingness to use PrEP among MSM in Brazil, Mexico and Peru included PrEP awareness, free-of-charge PrEP dispensation and prior testing for HIV (12).

Our results indicated lower PEP and PrEP awareness among participants younger than 26 years old. This data is of special concern because of the rising incidence rates of HIV infection in Latin America for younger MSM in the last decade (22). The knowledge of PrEP was also lower among MSM older than 55 years, another group with increasing numbers of new HIV diagnoses in Brazil. Awareness is the first step to increase PrEP

uptake. This explains why only 0.9% and 1.3% of participants younger than 25 and older than 55 years have ever taken PrEP, compared to 2.5% of those between 36 and 45 years old.

Significantly lower knowledge about HIV biomedical prevention was also seen among men identifying as trans men and those with a non-gay/homosexual sexual identity. Although the percentage of trans men in our study was small, precluding definitive conclusions, the absolute number (314 participants) is certainly one of the highest presented in the literature. Transgender and bisexual people may face different types of stigma and discrimination, potentially impacting on their access to healthcare and information (23, 24).

Promotion of the U=U concept is an important part of prevention education. Our data shows that 52% of participants in Latin America were aware of U=U, while 18% did not know and 8% did not believe in it. In an online survey study conducted in New York and published in 2019, 6.1% of participating MSM were unaware of U=U, and 39.1% believed in its efficacy (25). As seen in our study, U=U knowledge was higher among participants living with diagnosed HIV and identifying as gay/homosexual. In a study conducted in Brazil, only 17% of participants from the general population and 79% of participants with diagnosed HIV perceived U=U as completely accurate (26). Studies suggest that even healthcare providers may be unaware of or unconfident about U=U, and even those who are aware of U=U may deliberately omit this information from patients assuming this message could lead people to engage in multiple sexual relationships (27, 28). The skepticism and misunderstanding of U=U is a challenge that must be addressed in order to better control the HIV epidemic while also reducing stigma against people living with HIV (29).

This study has a few limitations. Participation was restricted to people with access to internet, which may partially account for the very high schooling levels in the study sample. Our results may reflect the awareness levels of a restricted subgroup of more educated MSM in countries included in the analysis, which limits extrapolation of data to all MSM in Latin America; it is plausible to assume that knowledge and access to biomedical HIV prevention strategies are significantly lower in the overall MSM population. The questionnaire had multiple questions and some participants may have

withdrawn or left incomplete answers, particularly those with time restraints or poor internet connection. All variables were self-reported, therefore clinical outcomes such as HIV diagnosis, HIV viral load and antiretroviral treatment could not be confirmed using medical charts or laboratory reports. Despite these limitations, this was a large-scale and comprehensive survey providing essential information on multiple aspects of HIV and STI prevention strategies for Latin America.

The results of our study highlight important gaps in the HIV prevention campaigns directed to key populations in Latin America and the resulting low uptake of biomedical prevention methods. Improving awareness on these prevention strategies among gay, bisexual, other MSM and transgender men is a critical step to increase uptake. Policy makers and stakeholders in Latin America should invest on education programs targeting vulnerable populations, particularly young MSM, aiming to increase awareness and access to these highly effective biomedical methods for HIV prevention.

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