

Awareness, Willingness, and PrEP Eligibility Among Transgender Women in Rio de Janeiro, Brazil

Emilia M. Jalil, PhD,* Beatriz Grinsztejn, MD,* Luciane Velasque, PhD,†
Alessandra Ramos Makkeda, BSocSc,‡ Paula M. Luz, PhD,* Ronaldo I. Moreira, BSc,*
Luciana Kamel, MSc,* Nilo M. Fernandes, PhD,* Ana Cristina G. Ferreira, MD,*
Brenda Hoagland, PhD,* Sandra Wagner, PhD,* Albert Liu, MD,§ Willi McFarland, PhD,||¶
Susan Buchbinder, MD,§||¶ Valdilea G. Veloso, MD,* and Erin Wilson, DrPH,§
for Transcender Study Team

Background: HIV epidemics disproportionately affect transwomen worldwide. Trans-specific guidance, outreach, and interventions to increase pre-exposure prophylaxis (PrEP) use among transwomen are scarce.

Setting: Rio de Janeiro, Brazil.

Methods: We measured awareness and willingness to use PrEP and examined factors associated with those outcomes among transwomen in Rio de Janeiro and estimated how many transwomen would be eligible for PrEP. Data originate from *Transcender* study, a respondent-driven sampling survey conducted from August 2015 to January 2016. We performed regression models for PrEP awareness and willingness.

Results: One hundred thirty-one (38.0%) of 345 participants had heard of PrEP. Among transwomen who self-reported as HIV-negative, 162 (76.4%, N = 212 with available data) reported willingness to use it and 163 (66.8%, N = 244) met PrEP behavioral eligibility criteria. Transwomen with health access in the previous 6 months who reported HIV-infected sexual partner and with 8+ years of schooling had increased odds of PrEP awareness. Lower PrEP awareness was associated with condomless anal intercourse and newly diagnosed HIV infection. Younger age and perceiving themselves at risk of HIV infection increased the odds of PrEP willingness. Lower odds of PrEP willingness were associated with concerns about long-term effects of PrEP and with difficulties in getting access to health care due to transphobia.

Conclusion: Combination of low awareness, high willingness, and substantial PrEP eligibility corroborates transwomen as a key population for HIV prevention. PrEP is a promising and empowering strategy for HIV prevention among transwomen, but trans-specific recommendations are needed to effectively implement PrEP in this population.

Key Words: transgender person, HIV, pre-exposure prophylaxis, HIV infections/prevention and control, health knowledge, attitudes, practice

(*J Acquir Immune Defic Syndr* 2018;79:445–452)

Received for publication March 8, 2018; accepted July 18, 2018.

From the *STD and AIDS Clinical Research Laboratory, Evandro Chagas National Institute of Infectious Diseases, Oswaldo Cruz Foundation, Rio de Janeiro, RJ, Brazil; †Departamento de Matemática e Estatística, Federal University of the State of Rio de Janeiro, Rio de Janeiro, RJ, Brazil; ‡Rio de Janeiro Federal Institute of Education, Science and Technology, Niterói, RJ, Brazil; §Bridge HIV, San Francisco Department of Public Health, San Francisco, CA; and Departments of ||Medicine; and ¶Epidemiology and Biostatistics, UCSF, San Francisco, CA.

Supported in part by Brazilian Research Council (470056/2014-2) and NIAID-NIH (UM1AI069496). B.G. and P.M.L. acknowledge funding from Brazilian Research Council (CNPq) and Scientific Development and Research Funding Agency of the State of Rio de Janeiro. The authors acknowledge the CNPq and the National Institute of Allergy and Infectious Diseases (NIAID-NIH) for funding this study.

Presented in part at the HIV Research for Prevention 2016; October 17, 2016; Chicago, IL.

The authors have no funding or conflicts of interest to disclose.

Authors' contributions: B.G., E.M.J., W.F., E.W., S.B., and V.G.V. conceived the study and interpreted the findings. B.G., E.M.J., E.W., and V.G.V. drafted the manuscript. L.V. performed the statistical analyses with aid from R.I.M., E.M.J., E.W., and P.M.L. L.V., R.I.M., A.C.G.F., and P.M.L. helped with data acquisition, interpretation of the results, and drafting the manuscript. A.R.M., S.W., and B.H. helped with interpretation of the results and drafting the manuscript. W.F., A.L., and S.B. were involved in revising the manuscript for important intellectual content. All authors read and approved the final manuscript.

Correspondence to: Emilia M. Jalil, MD, PhD, Evandro Chagas National Institute of Infectious Diseases, Oswaldo Cruz Foundation, Avenida Brasil, 4365 Manguinhos, Rio de Janeiro, RJ 21040-360, Brazil (e-mail: emilijalil@gmail.com).

Copyright © 2018 Wolters Kluwer Health, Inc. All rights reserved.

INTRODUCTION

HIV epidemics disproportionately affect transgender women, travesties and other gender identities of the feminine spectrum (transwomen) worldwide. A global HIV prevalence of 19% was estimated in a meta-analysis of studies of transwomen along with 49-fold greater odds of HIV infection compared with the general population.¹ Brazilian data indicate that transwomen have a higher HIV prevalence than any other key population.² To date, there is no intervention designed specifically for transwomen with proven efficacy for promoting and facilitating HIV prevention tools in this population in Brazil or elsewhere.

The iPrEx trial was the first pre-exposure prophylaxis (PrEP) intervention that included transwomen. The study demonstrated a 44% reduction in HIV incidence and an

estimated >90% efficacy among those with detectable drug levels; however, only 339 (14%) of the 2499 participants in the study were transwomen, and adherence was quite low among this population.^{3,4} Only 15% of transwomen in iPrEx had detectable drug levels at all visits, and none of the 10 transwomen who seroconverted had detectable drug levels at the time of first evidence of HIV infection.⁴ Despite the promise of PrEP, few transwomen have initiated the use of PrEP, and several studies demonstrate low PrEP awareness in trans communities.^{5–7}

High HIV vulnerability in Brazilian transwomen, comparable with those in other parts of the world, has been described, including multiple partners, sex work, and high sexually transmitted infections (STIs) prevalence.² Brazil is in the process of national PrEP implementation as a public health policy for HIV infection prevention through the Brazilian public health system. However, like elsewhere in the world, trans-specific guidance, outreach, and intervention for PrEP with transwomen are not available. The question remains as to the reach that PrEP will have among transwomen in Brazil. This study was conducted to estimate PrEP awareness and willingness, and to examine factors associated with awareness and willingness to take PrEP. We also used recommendations recently released in Brazil⁸ and previous Centers for Disease Control and Prevention (CDC) recommendations⁹ to estimate how many transwomen in Rio de Janeiro, Brazil, would be considered eligible for PrEP based on these recommendations.

METHODS

Data originate from the *Transcender* study, a respondent-driven sampling (RDS) survey conducted from August 2015 to January 2016. Details of the methods have been previously described.² Briefly, inclusion criteria were as follows: self-identification as a transwomen, living in Rio de Janeiro or the metropolitan area, and being 18 years or older. After a formative assessment phase, we selected 12 seeds with diverse characteristics (eg, age, race/skin color, trans identities, education, geography, HIV status, history of sex work, and risk behaviors). Each participant received up to 5 coupons to recruit peers until the target sample size was reached, and equilibrium was achieved on the same characteristics listed above. Equilibrium was reached when the sample composition from 1 wave to the next differed by less than 2%.¹⁰ Incentives for study participation included snacks, sexual health materials, make up, and a medical visit scheduled after enrollment.

Ethical approval was obtained from the Evandro Chagas National Institute of Infectious Diseases-FIOCRUZ Institutional Review Board. Participants provided written informed consent. This study was sponsored by the Brazilian Research Council (CNPq) and the National Institute of Allergy and Infectious Diseases (NIAID-NIH).

Measures

Measures for the current study were obtained through a face-to-face administered questionnaire by trained interviewers. The instrument included sociodemographics, sexual

behavior, drug and hormone use, awareness and attitudes toward PrEP, and access to care. PrEP awareness was assessed with a yes/no response to the question: “Before today, have you ever heard of people who do not have HIV regularly taking antiretroviral medicines to keep from getting HIV?” After a brief explanation, we assessed willingness to take PrEP with the question: “What would be your level of interest in using PrEP if it were available in *SUS* (Brazilian public health system)?” Possible responses were “not interested,” “slightly interested,” “somewhat interested,” and “very interested.” For PrEP-specific analyses, we considered willingness as “very interested” to estimate a more conservative measure, as previously described.^{11–13} We also asked about preferences on the route of PrEP administration (possible answers: a daily pill, 3-monthly intramuscular injection, 2-monthly intravenous injection, and any of them). Concerns about PrEP were assessed using 3 separate items (“I am worried about medication side effects,” “I am worried about medication long-term effects,” and “I am worried about interactions with my hormone therapy”). A Likert-type response to each item included the following 5 options: “not concerned with this,” “slightly concerned about this,” “somewhat concerned about this,” “very concerned about this,” and “I will not take PrEP for this reason.” Those defined as concerned about PrEP included those who answered “very concerned with this” and “I will not take PrEP for this reason” so as to provide a more conservative measure.

Factors we considered potentially associated with awareness and willingness to take PrEP included sociodemographic information (age, race/color, income, and education), current use of hormones (yes/no), reported access to health care in the past 6 months (yes/no), reported access to trans-specific health care (yes/no), and engagement in sex work (current/past/never). Questions to assess sexual risk for HIV acquisition were the number of sexual partners in the past 6 months (more or less than or equal to 4), whether or not any of their last 3 partners were living with HIV and whether or not they had condomless anal intercourse with their last 3 sexual partners. We assessed perceived likelihood of becoming HIV-infected through the question “What is your chance of getting HIV in the next year?” with possible options grouped as “none” and “any chance” (low, some, high, and certainly). The question “Have you ever heard of people who do not have HIV taking antiretroviral medicines after sex to keep from getting HIV?” evaluated postexposure prophylaxis (PEP) awareness. We also assessed whether or not they had trouble accessing health care due to antitrans stigma. Substance use measures assessed were the use of any illicit drugs in the past 12 months, including sniffed cocaine and binge drinking. We screened for depression with the 10-item Center for Epidemiologic Studies Depression Scale.

HIV testing was performed after the completion of the survey and followed the Brazilian Ministry of Health algorithm and approved assays.¹⁴ Syphilis screening was performed with the venereal disease research laboratory test (VDRL), and positive results were confirmed using a micro-hemagglutination assay for *Treponema pallidum* (MHA-TP). Rectal *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoea* (NG) infections were screened using the Abbott Real

TABLE 1. Correlates of PrEP Knowledge Among Transwomen in the *Transcender* Study, Rio de Janeiro, Brazil, 2015–2016*

Characteristic	Aware of PrEP (n = 131), %	Univariable		Multivariable	
		Odds Ratio	P	Adjusted Odds Ratio	P
Age†					
18–24	26 (27.4)	0.5 (0.3–0.9)	0.023		
25–35	60 (41.4)	0.9 (0.6–1.6)	0.82		
36–45	45 (42.9)	1			
Self-declared race/color					
White	36 (45.6)	1			
Mixed/other	67 (36.8)	0.6 (0.3–1.1)	0.19		
Black	28 (33.3)	0.7 (0.4–1.2)	0.11		
Monthly income (in US\$)†‡					
≤130.00	47 (33.6)	0.6 (0.4–1.2)	0.14		
131.00–260.00	41 (37.6)	0.8 (0.4–1.4)	0.40		
>260.00	32 (43.8)	1			
Years of education†					
8 or less	91 (43.3)	1		1	
8+	40 (29.6)	1.8 (1.2–2.9)	0.01	1.5 (1.0–2.5)	0.079
Currently taking hormones					
Yes	58 (34.1)	0.8 (0.5–1.2)	0.22		
No	63 (40.6)	1			
Health care access in the past 6 mo					
Yes	91 (45.7)	2.2 (1.4–3.6)	0.0006	2.1 (1.3–3.4)	0.004
No	40 (27.4)	1		1	
Access to trans-related health care					
Yes	28 (54.9)	2.3 (1.2–4.1)	0.008		
No	103 (35.0)	1			
Engagement in sex work					
Current	68 (40.7)	1.3 (0.7–2.3)	0.41		
Ever (not currently)	37 (35.6)	1.0 (0.5–1.9)	0.95		
Never	26 (35.1)	1			
Illicit drug use in the past 12 mo					
Yes	67 (35.3)	0.8 (0.5–1.2)	0.25		
No	64 (41.3)	1			
Sniffed cocaine in the past 12 mo					
Yes	30 (34.5)	0.8 (0.5–1.4)	0.44		
No	101 (39.1)	1			
Binge drinking§					
Yes	85 (37.4)	0.9 (0.6–1.5)	0.78		
No	46 (39.0)	1			
Depression					
Yes	88 (37.0)	0.9 (0.6–1.5)	0.67		
No	41 (39.0)	1			
No. of sex partners in the past 6 mo†					
4 or less	33 (34.4)	1			
More than 4	88 (38.4)	1.2 (0.7–2.0)	0.49		
HIV-positive status among last 3 partners					
Yes	18 (29.0)	1.6 (0.9–3.0)	0.11	2.0 (1.0–3.9)	0.042
No	113 (39.9)	1		1	
Condomless anal intercourse with last 3 partners					
Yes	55 (30.9)	0.5 (0.3–0.8)	0.005	0.6 (0.3–1.0)	0.04
No	76 (45.5)	1		1	

(continued on next page)

TABLE 1. (Continued) Correlates of PrEP Knowledge Among Transwomen in the *Transcender* Study, Rio de Janeiro, Brazil, 2015–2016*

Characteristic	Aware of PrEP (n = 131), %	Univariable		Multivariable	
		Odds Ratio	P	Adjusted Odds Ratio	P
HIV status					
HIV-negative	81 (39.7)	1		1	
Known HIV-infected	42 (41.6)	1.1 (0.7–1.8)	0.75	0.8 (0.4–1.5)	0.48
Newly diagnosed HIV-infected	8 (20.0)	0.4 (0.2–0.8)	0.02	0.4 (0.2–0.9)	0.035

*Proportions calculated for valid data; missing excluded.
†Continuous variables were reclassified as categorical.
‡US\$1.00 = R\$3.85.
§Defined as 6 or more alcohol drinks on any occasion.

Time platform and the NG/CT Amplification Reagent Kit (Abbott Molecular, Des Plaines, IL). All indeterminate results for rectal CT/NG were repeated using the same tests on the same sample. We provided treatment for any diagnosed STI and offered linkage to care, specialized HIV care, and combination antiretroviral therapy to all participants who tested positive for HIV.

We adapted criteria from the CDC⁹ and Brazilian recommendations⁸ to determine how many transwomen would be considered eligible. Transwomen were considered eligible for PrEP if they self-reported as HIV-negative, had any male sex partners in the past 12 months, were not in a monogamous partnership, and had one of the following: (1) any anal sex without condoms (receptive or insertive) in the past 12 months; (2) STI diagnosis (eg, any reported STI) in the past 12 months or a current diagnosed STI (syphilis, rectal CT, or NG); or (3) had a known HIV-infected sexual partner among the last 3 partners.

Data Analysis

We used RDS-unadjusted data. The first step in the analysis was to characterize transwomen who were aware of PrEP at the time of the survey and identify significant differences from those not previously aware of PrEP. The second and third analysis were, respectively, to assess factors associated with willingness to take PrEP and to identify eligible transwomen among those who self-reported as HIV-negative at the time of the interview. χ^2 tests were first conducted and variables with *P* values <0.20 in univariable analysis were included in multivariable analyses, removing terms of greatest nonsignificance until a final model was reached. Bivariable and multivariable analysis was performed using R Software version 3.0.2.

RESULTS

Of 345 participants offered HIV testing, 204 (59.1%) were HIV-negative, 101 (29.3%) had previously been diagnosed with HIV, and 40 (11.6%) were newly diagnosed as HIV-infected. Overall, 131 (38.0%) had heard of PrEP at the time of the survey, and 168 (48.7%) had heard of PEP. Of the 244 transwomen who were not known to be HIV-infected at the time of the interview, 15 (6.1%) had taken PEP at least once. The final adjusted logistic regression model found that

transwomen who accessed health service in the past 6 months {adjusted odds ratio [aOR] 2.1 [95% confidence interval (CI): 1.3 to 3.4], *P* = 0.004}, those who reported at least 1 known HIV-infected sexual partner among the last 3 partners [aOR 2.0 (95% CI: 1.0 to 3.9), *P* = 0.04], and those with more than 8 years of schooling [aOR 1.5 (95% CI: 1.0 to 2.5), *P* = 0.079] had higher odds of PrEP awareness (Table 1). Lower PrEP awareness was associated with condomless anal intercourse [aOR 0.6 (95% CI: 0.3 to 1.0), *P* = 0.04] and a newly diagnosed HIV infection [aOR 0.4 (95% CI: 0.2 to 0.9), *P* = 0.035] (Table 1).

Data from the participants who self-reported to be HIV-negative were assessed for PrEP willingness (N = 212 with available data) and eligibility (N = 244). The majority of transwomen who self-reported to be HIV-negative reported concerns with interactions between hormones and PrEP (76.5%), PrEP long-term (75.8%), and side effects (78.3%). After a brief explanation about PrEP, 162 (76.4%) reported willingness to use it. In multivariable analysis, being younger [aOR 3.7 (1.4–10.4), *P* = 0.011 among those aged 18–24 years, and aOR 3.3 (1.4–7.7), *P* = 0.006 among those aged 25–35 years] and identifying themselves at risk of becoming HIV-infected increased the odds of PrEP willingness [aOR 2.9 (95% CI: 1.4 to 6.1), *P* = 0.006] (Table 2). Lower odds of PrEP willingness was associated with concerns about the long-term effects of PrEP [aOR 0.4 (95% CI: 0.1 to 1.0), *P* = 0.07] and with difficulties in getting health care access due to transphobia [aOR 0.5 (95% CI: 0.2 to 1.0), *P* = 0.05] (Table 2).

Overall, 163 of the 244 transwomen who self-report as HIV-infected (66.8%) met the criteria for PrEP eligibility. Among those HIV-infected who were not aware of their HIV status (N = 40), 31 met the behavioral criteria for PrEP (77.5%). Transwomen were eligible for PrEP most commonly because of condomless anal sex (147, 90.2%), current or past STI (88, 54.6%), or having a known HIV-infected sexual partner (4, 2.4%). The majority preferred intramuscular (63, 38.7%) or oral (57, 35.0%) PrEP (Fig. 1). Among transwomen who would be eligible for PrEP, the majority reported fillers in the buttock region (97, 59.5%).

DISCUSSIONS

Our results point to low awareness, but high willingness to take PrEP among transwomen in Brazil. Thirty-eight

TABLE 2. Correlates of PrEP Willingness Among HIV-Negative Transwomen in *Transcender*, Rio de Janeiro, Brazil, 2015–2016*

Characteristic	Willing to Use PrEP (n = 162), %	Univariable		Multivariable	
		Odds Ratio	P	Adjusted Odds Ratio	P
Age†					
18–24	57 (81.4)	3.1 (1.4–7.3)	0.007	3.7 (1.4–10.4)	0.011
25–35	77 (81.9)	3.2 (1.5–7.1)	0.003	3.3 (1.4–7.7)	0.006
36–45	28 (58.3)	1		1	
Self-identified race/color					
White	38 (77.6)	1			
Mixed/other	80 (74.1)	0.8 (0.4–1.8)	0.76		
Black	44 (80.0)	1.2 (0.4–3.0)	0.64		
Monthly income (in US\$)†‡					
≤130.00	70 (80.5)	1.5 (0.6–3.4)	0.35		
131.00–260.00	46 (78.0)	1.3 (0.5–3.1)	0.59		
>260.00	36 (73.5)	1			
Years of education†					
<8	105 (78.9)	1			
8+	57 (72.2)	1.4 (0.8–2.8)	0.26		
Currently taking hormones					
Yes	89 (74.8)	0.8 (0.4–1.5)	0.42		
No	63 (79.7)	1			
Health access in the past 6 mo					
Yes	84 (77.1)	1.1 (0.6–2.0)	0.82		
No	78 (75.7)	1			
Access to trans-related health care					
Yes	17 (53.1)	0.3 (0.1–0.6)	0.001		
No	145 (80.6)	1			
Trouble getting health access for being trans					
Yes	46 (69.7)	0.6 (0.3–1.2)	0.137	0.5 (0.2–1.0)	0.05
No	114 (79.2)	1		1	
Engagement in sex work					
Current	83 (81.4)	2.3 (1.0–5.0)	0.045		
Ever (not currently)	50 (75.8)	1.6 (0.7–3.8)	0.26		
Never	29 (65.9)	1			
Illicit drug use in the past 12 mo					
Yes	65 (67.0)	2.7 (1.4–5.2)	0.0036		
No	97 (84.3)	1			
Sniffed cocaine in the past 12 mo					
Yes	35 (85.4)	2.0 (0.8–5.6)	0.14		
No	127 (74.3)	1			
Binge drinking§					
Yes	116 (78.4)	1.4 (0.7–2.8)	0.31		
No	46 (71.9)	1			
Depression					
Yes	111 (78.2)	1.4 (0.7–2.7)	0.33		
No	49 (72.1)	1			
No. of sex partners in the past 6 mo†					
4 or fewer	35 (66.0)	1			
More than 4	123 (83.7)	2.6 (1.3–5.4)	0.008		
HIV-positive status among last 3 partners					
Yes	16 (80.0)	0.8 (0.2–2.3)	0.69		
No	146 (76.0)	1			
Condomless anal intercourse in the past 12 mo	116 (79.5)	1.7 (0.9–3.2)	0.123		
HIV-positive test	31 (91.2)	3.7 (1.2–15.7)	0.039		

(continued on next page)

TABLE 2. (Continued) Correlates of PrEP Willingness Among HIV-Negative Transwomen in *Transcender*, Rio de Janeiro, Brazil, 2015–2016*

Characteristic	Willing to Use PrEP (n = 162), %	Univariable		Multivariable	
		Odds Ratio	P	Adjusted Odds Ratio	P
Any perceived likelihood of becoming HIV-infected	96 (84.2)	2.5 (1.3–5.0)	0.008	2.9 (1.4–6.1)	0.006
PrEP aware					
Yes	61 (74.4)	0.8 (0.4–1.6)	0.58		
No	101 (77.7)	1			
Concerned about side effects of PrEP	123 (75.9)	0.8 (0.3–1.7)	0.522		
Concerned about long-term effects of PrEP	118 (74.2)	0.5 (0.2–1.1)	0.1	0.4 (0.1–1.0)	0.07
Concerned about interactions between hormones and PrEP	121 (76.1)	0.7 (0.3–1.5)	0.32		

*Proportions calculated for valid data; missing excluded.
 †Continuous variables were reclassified as categorical.
 ‡US\$1.00 = R\$3.85.
 §Defined as 6 or more alcohol drinks on any occasion.

percent of all transwomen heard of PrEP before our study, while almost 80% of transwomen who self-reported as HIV-uninfected were willing to use it after a brief explanation. Moreover, almost 70% of transwomen who self-reported as HIV-negative were candidates for PrEP based on CDC and Brazilian Ministry of Health criteria. Very few studies have evaluated PrEP awareness, willingness, and eligibility specifically in transwomen. To the best of our knowledge, this is the first study to assess these 3 outcomes simultaneously in Latin American transwomen.

Our finding of low awareness of PrEP among transwomen is consistent with other studies of marginalized populations from low- and high-income settings.^{15–17} Other studies enrolling only transwomen in the United States have previously described similarly low PrEP awareness rates,^{6,18} which points to the need for focusing

on transwomen as a stand-alone group in PrEP awareness campaigns and social marketing. PrEP Brasil, a demonstration study for men who have sex with men (MSM) and transwomen conducted in Brazil, identified higher rate of PrEP awareness, which may be due to differences in the study sample (transwomen comprised only 5% of the total study population).¹⁹ Strategies should be directed to the increase of PrEP awareness among transwomen. Peer-delivered information could be an effective strategy, given the high level of transwomen disbelief in the health care system. For example, campaigns that show transwomen champions in advertisements are important for shifting the perceived indications that this is only a medication for MSM or other groups, and messaging that addresses concerns transwomen may have about taking PrEP are needed. Targeted interventions to increase PrEP awareness in the trans community will be critical, so that the full benefit of this intervention can be achieved.

PrEP awareness is an essential step in the path to accessing this important HIV prevention tool. Our findings demonstrate that transwomen reporting a known HIV-infected sexual partner had higher PrEP awareness. Wilson et al⁶ also observed higher knowledge on PrEP associated with a sexual partner’s HIV-positive status. Transwomen with a known HIV-infected sexual partner may identify themselves as being at a higher risk of HIV acquisition. PrEP is an important strategy for preventing transmission within HIV serodiscordant partnerships.²⁰ Transwomen who reported recent condomless anal intercourse and who were newly diagnosed as HIV-infected had lower PrEP awareness. This reinforces the need to develop communication strategies tailored specifically to highly vulnerable transwomen in order for PrEP implementation to succeed.

We identified higher willingness to use PrEP than in other studies of transwomen.^{6,11,12,18} However, we still found that one-quarter of participants were unwilling to use PrEP. Many transwomen who were unwilling to use PrEP also reported difficulties in getting access to health services due to transphobia. This is consistent with other studies involving transwomen.^{7,21,22} Discrimination in health care settings is a common

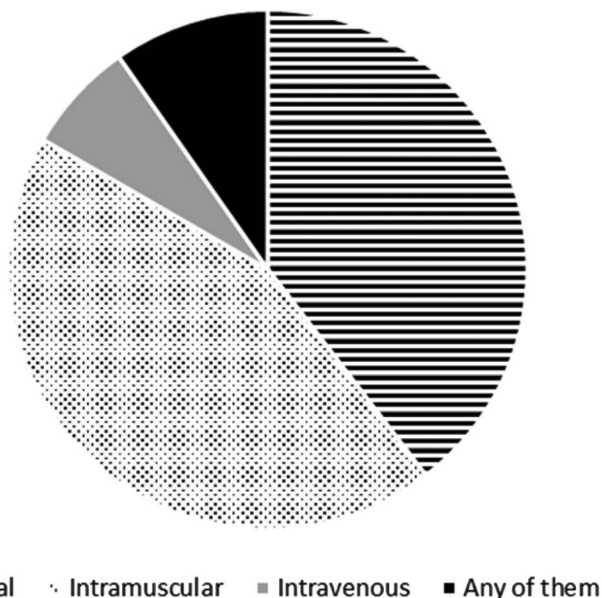


FIGURE 1. The majority of transwomen preferred intramuscular (63, 38.7%) or oral (57, 35.0%) PrEP.

reason transgender people give for avoiding health services.^{7,23–25} Such barriers may ultimately impact PrEP implementation. In the United States, where PrEP is already available, inequities in PrEP access and education have been described, with disproportionately low uptake among those most at need.²⁶

As found in another study,¹⁶ many who were unwilling to use PrEP were concerned with long-term effects of PrEP. Drug interactions between hormones and PrEP were a major concern among transwomen currently using hormones, although concerns with those potential interactions did not seem as a reason for not willing to use PrEP. An iPREG subanalysis found lower levels of PrEP drug concentrations in transwomen using hormone therapy, compared with those not using hormones and MSM, possibly because of adherence issues.⁴ The authors hypothesized that low PrEP adherence might be related to concerns about negative effects of PrEP drugs on feminizing therapy. In another analysis using this data set, we found that hormone use was reported by more than half of transwomen (56.8%) in Rio de Janeiro.² Although there is some information about the concomitant use of hormonal contraception and PrEP by cisgender women, there are no specific data for transwomen.^{27–29} Studies evaluating the interaction of PrEP and feminizing hormones are underway (NCT03220152).

We found that younger transwomen and those who perceived themselves at risk were more likely to be willing to use PrEP. Wang et al¹¹ identified a moderate perceived HIV risk among Chinese transfemale sex workers and a strong association between those who perceived themselves at risk and PrEP acceptability. It may be the case that transwomen who would most benefit from PrEP are those most likely to be willing to take it. Based on our results, almost 70% of transwomen who self-reported as HIV-negative were candidates for PrEP, most of them because of condomless anal sex. High frequencies of PrEP indication among transwomen were also described by other authors,^{6,18,30} and speaks to the high vulnerability of transwomen to have HIV because of social inequities they face due to their gender identity, which restrict their education opportunities, their access to the formal labor market, their ability in condom use negotiation, and HIV risk management.³¹

Our study has several limitations. This was cross-sectional study, so that we cannot infer causality. The RDS methods used for sampling in this study also presented biases to the sample composition that require caution for generalizing to the transwomen population as a whole. For example, research with transwomen has found that RDS-based studies may represent data from lower income transwomen and miss those in high-income networks.³² Also, our data collection occurred between 2015 and 2016, and the current Brazilian scenario might have changed since that period. Finally, PrEP willingness may not be related to PrEP actual use. Further studies are needed to identify PrEP use among transwomen as PrEP moves into routine practice.

Despite limitations, our study collected important information on the awareness and willingness to take PrEP in a highly stigmatized population, and our results could significantly inform PrEP implementation programs. Concerns for PrEP drugs being a barrier for PrEP implementation

are tapered by our finding that those most at risk were willing to take PrEP. Transwomen may have fewer PrEP options as buttock fillers preclude injectable PrEP so far, and industrial silicone injections are a common practice among Brazilian transwomen.^{2,33} The combination of low awareness, high willingness, and substantial PrEP eligibility corroborates transwomen as a key population for HIV prevention, especially in Brazil. PrEP is a promising and empowering strategy for HIV prevention among transwomen, but trans-specific recommendations might be necessary to implement PrEP successfully in this highly vulnerable population.

ACKNOWLEDGMENTS

The authors acknowledge all Transcender team and participants.

REFERENCES

1. Baral SD, Potat T, Strömdahl S, et al. Worldwide burden of HIV in transgender women: a systematic review and meta-analysis. *Lancet Infect Dis*. 2013;13:214–222.
2. Grinsztejn B, Jalil EM, Monteiro L, et al. Unveiling of HIV dynamics among transgender women: a respondent-driven sampling study in Rio de Janeiro, Brazil. *Lancet HIV*. 2017;4:e169–76.
3. Grant RM, Anderson PL, McMahan V, et al. Uptake of pre-exposure prophylaxis, sexual practices, and HIV incidence in men and transgender women who have sex with men: a cohort study. *Lancet Infect Dis*. 2014; 14:820–829.
4. Deutsch MB, Glidden DV, Sevelius J, et al. HIV pre-exposure prophylaxis in transgender women: a subgroup analysis of the iPREG trial. *Lancet HIV*. 2015;2:e512–e519.
5. Wilson EC, Jalil E, Siqueira BH, et al. PrEP adherence among trans women in Brazil—access needed for this key population. *Lancet HIV*. 2016;3:e200.
6. Wilson EC, Jin H, Liu A, et al. Knowledge, indications and willingness to take pre-exposure prophylaxis among transwomen in San Francisco, 2013. *PLoS One*. 2015;10:e0128971.
7. Sevelius JM, Deutsch MB, Grant R. The future of PrEP among transgender women: the critical role of gender affirmation in research and clinical practices. *J Int AIDS Soc*. 2016;19(suppl 6):21105.
8. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância, Prevenção e Controle das Infecções Sexualmente Transmissíveis, do HIV/Aids e das Hepatites Virais. Protocolo Clínico e Diretrizes Terapêuticas para Profilaxia Pré-Exposição (PrEP) de Risco à Infecção pelo HIV [Internet]. 2017. Available at: http://www.aids.gov.br/system/tdf/pub/2017/64510/pdct_prep_12_2017.pdf?file=1&type=node&id=64510&force=1. Accessed July 14, 2017.
9. Centers for Disease Control and Prevention. *Preexposure Prophylaxis for the Prevention of HIV Infection in the United States—2014* [Internet]. 2014. Available at: <https://www.cdc.gov/hiv/pdf/prepguidelines2014.pdf>. Accessed July 14, 2017.
10. Wejnert C, Heckathorn DD. Web-based network sampling: efficiency and efficacy of respondent-driven sampling for online research. *Sociol Methods Res*. 2008;37:105–134.
11. Wang Z, Lau JTF, Yang X, et al. Acceptability of daily use of free oral pre-exposure prophylaxis (PrEP) among transgender women sex workers in Shenyang, China. *AIDS Behav*. 2017;21:3287–3298.
12. Yang D, Charialertsak C, Wongthanee A, et al. Acceptability of pre-exposure prophylaxis among men who have sex with men and transgender women in Northern Thailand. *PLoS One*. 2013;8:e76650.
13. Veloso VG, Mesquita F, Grinsztejn B. Pre-exposure prophylaxis for men and transgender women who have sex with men in Brazil: opportunities and challenges. *J Int AIDS Soc*. 2015;18(suppl 3):20010.
14. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de DST/Aids e Hepatites Virais. Manual técnico para o diagnóstico da infecção pelo HIV [Internet]. 2013. Available at: <http://>

- bvms.saude.gov.br/bvs/publicacoes/manual_tecnico_diagnostico_infeccao_hiv.pdf. Accessed May 20, 2017.
15. Garnett M, Hirsch-Moverman Y, Franks J, et al. Limited awareness of pre-exposure prophylaxis among black men who have sex with men and transgender women in New York City. *AIDS Care*. 2018;30:9–17.
 16. Draper BL, Oo ZM, Thein ZW, et al. Willingness to use HIV pre-exposure prophylaxis among gay men, other men who have sex with men and transgender women in Myanmar. *J Int AIDS Soc*. 2017;20:21885.
 17. Eaton LA, Matthews DD, Driffin DD, et al. A multi-US city assessment of awareness and uptake of pre-exposure prophylaxis (PrEP) for HIV prevention among black men and transgender women who have sex with men. *Prev Sci*. 2017;18:505–516.
 18. Kuhns LM, Reisner SL, Mimiaga MJ, et al. Correlates of PrEP indication in a multi-site cohort of young HIV-uninfected transgender women. *AIDS Behav*. 2016;20:1470–1477.
 19. Grinsztejn B, Hoagland B, Moreira RI, et al. Retention, engagement, and adherence to pre-exposure prophylaxis for men who have sex with men and transgender women in PrEP Brasil: 48 week results of a demonstration study. *Lancet HIV*. 2018;5:e136–e145.
 20. Ware NC, Wyatt MA, Haberer JE, et al. What's love got to do with it? Explaining adherence to oral antiretroviral pre-exposure prophylaxis for HIV-serodiscordant couples. *J Acquir Immune Defic Syndr*. 2012;59:463–468.
 21. Zalazar V, Aristegui I, Kerr T, et al. High willingness to use HIV pre-exposure prophylaxis among transgender women in Argentina. *Transgender Health*. 2016;1:266–273.
 22. Poteat T, Wirtz AL, Radix A, et al. HIV risk and preventive interventions in transgender women sex workers. *Lancet*. 2015;385:274–286.
 23. Bradford J, Reisner SL, Honnold JA, et al. Experiences of transgender-related discrimination and implications for health: results from the Virginia Transgender Health Initiative Study. *Am J Public Health*. 2013;103:1820–1829.
 24. Poteat T, German D, Kerrigan D. Managing uncertainty: a grounded theory of stigma in transgender health care encounters. *Soc Sci Med*. 2013;84:22–29.
 25. Cruz TM. Assessing access to care for transgender and gender non-conforming people: a consideration of diversity in combating discrimination. *Soc Sci Med*. 2014;110:65–73.
 26. Calabrese SK, Krakower DS, Mayer KH. Integrating HIV preexposure prophylaxis (PrEP) into routine preventive health care to avoid exacerbating disparities. *Am J Public Health*. 2017;107:1883–1889.
 27. Costa EMF, Mendonca BB. Clinical management of transsexual subjects. *Arq Bras Endocrinol Metabol*. 2014;58:188–196.
 28. Fabris B, Bernardi S, Trombetta C. Cross-sex hormone therapy for gender dysphoria. *J Endocrinol Invest*. 2015;38:269–282.
 29. The World Professional Association for Transgender Health. *Standards of Care for the Health of Transsexual, Transgender, and Gender Nonconforming People [Internet]*. 2012. Available at: http://www.wpath.org/site_page.cfm?pk_association_webpage_menu=1351&pk_association_webpage=3926. Accessed July 1, 2017.
 30. Oldenburg CE, Le B, Toan T, et al. HIV pre-exposure prophylaxis indication and readiness among HIV-uninfected transgender women in Ho Chi Minh City, Vietnam. *AIDS Behav*. 2016;20:365–370.
 31. Poteat T, Scheim A, Xavier J, et al. Global epidemiology of HIV infection and related syndemics affecting transgender people. *J Acquir Immune Defic Syndr*. 2016;72:S210–S219.
 32. Raymond HF, Wilson EC, McFarland W. Transwoman population size. *Am J Public Health*. 2017;107:e12.
 33. Pinto TP, Teixeira FDB, Barros CRDS, et al. Use of industrial liquid silicone to transform the body: prevalence and factors associated with its use among transvestites and transsexual women in São Paulo, Brazil [in Portuguese]. *Cad Saude Pública*. 2017;33:e00113316.