


Research Articles

Results from a peer-based digital systems navigation intervention to increase HIV prevention and care behaviors of young trans women in Rio de Janeiro, Brazil

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Background

This study aimed to determine the efficacy of an evidence-based peer and mHealth delivered systems navigation intervention for increasing human immunodeficiency virus (HIV) testing, pre-exposure prophylaxis (PrEP) and HIV care behaviors among young trans women.

Methods

The “Brilhar e Transcender” (BeT) pilot study was conducted between 19 September 2019 and 26 November 2020 in a trans-affirming public health clinic in Rio de Janeiro, Brazil. Participants were recruited using convenience sampling through outreach and referral. Twenty-seven were screened for inclusion and 18 participants completed the study and were included in this analysis. Participants were recruited through community outreach. All participants identified as trans women, were aged 18-24 years old, lived in Rio de Janeiro, Brazil, and were not on PrEP or not engaged in HIV care. Over the course of three months, participants developed a systems navigation plan and were engaged in three peer-navigator sessions, asynchronous digital interactions in between sessions, and received automated information they could use to address services access barriers. We measured HIV testing, PrEP use and HIV care outcomes. HIV care engagement included linkage to care, visit attendance, antiretroviral therapy use, and/or undetectable viral load for those living with HIV.

Results

All young trans women without HIV (n=13) were regularly tested for HIV and engaged in PrEP by the end of the intervention. All participants living with HIV (n=5) were engaged in HIV care, but one participant had a detectable viral load post intervention.

Conclusions

The BeT intervention demonstrated preliminary efficacy for improving HIV prevention and care behaviors among young trans women in a low- and middle-income country (LMIC) setting. A trial is planned for implementation to establish efficacy with a large sample of young trans women and a comparator group.

Studies show that trans women in low- and middle-income countries (LMICs) have the highest population-specific rates of HIV with the least access to HIV prevention and care. Brazil is a resource constrained country with a large and rising HIV epidemic among key populations.¹ Recent research with adult trans women found an HIV prevalence of 30-31.2%, making this population one of the most highly impacted in Brazil.^{2,3} Youth are also highly affected by HIV. A recent study found that 24.2% of young trans women ages 18-24 years old in Brazil were living with HIV,

higher than any other population of young trans women published.^{4,5} In the same study, young trans women had three times as many unrecognized HIV infections as adults, lower HIV risk perception and twice as many condomless sex encounters, speaking to an urgent need for Intervention.^{3,6} Previous research has identified anti-trans stigma in the Brazilian public health care system (SUS) as the main barrier to HIV prevention and care among adult

trans women in Brazil.⁷ For youth, additional barriers related to low risk perception, low health literacy and lack of systems navigation skills may exacerbate existing discrimination-based HIV prevention and care service barriers.^{8,9}

Interventions to address HIV among young trans women are limited. Only three HIV prevention interventions were found in the literature that have been specifically designed and tested with young trans women.^{10–12} Two were multi-session group-based interventions requiring frequent in-person visits while another was to promote home HIV testing. In person interventions present challenges for young trans women who face competing needs and access barriers due to stigma and discrimination.¹³ These disparities are acute in Brazil where discrimination against trans people in health care where HIV prevention and care is provided is pervasive.^{7,14} Researchers have pointed out that disenfranchised youth are at especially high risk of HIV and interventions are needed in LMICs like Brazil.¹⁵

Our project, “*Brilhar e Transcender*” is one of eight sponsored research projects chosen to be a part of this NICHD-funded PATC³H consortium. BeT combines knowledge and experience gained through the first population-based study of HIV risk and PrEP awareness among trans women in Brazil (*Transcender*), and capitalizes on the youth development related needs in prior observational research with young trans women in the U.S. (*SHINE*).¹⁶ We adapted an evidence-based peer and mHealth delivered systems navigation intervention for implementation digitally using social media and text messaging to interact with participants.¹⁷ Our approach was designed in response to the enormous challenges young trans women face in accessing HIV prevention and care in Brazil and leverages prior successes with mHealth to engage young trans women in research and interventions.^{18,19} This analysis describes the results of our pilot BeT intervention to improve engagement of Brazilian young trans women in HIV prevention and HIV care.

METHODS

PARTICIPANTS AND PROCEDURES

Participants were referred by word of mouth, peers or by our community education team and all youth resided in Rio de Janeiro city or the larger metropolitan area. The pilot study took place at the Evandro Chagas National Institute of Infectious Diseases (INI)-FIOCRUZ, in Rio de Janeiro, Brazil, between 19 September 2019 and 26 November 2020. Inclusion criteria for the pilot intervention were self-identification as trans women, aged 18-24 years, and living in Rio de Janeiro, Brazil. Criteria for HIV prevention was that participants were not living with HIV and not on PrEP, had PrEP indication, and had no contraindication to use PrEP. Participants living with HIV had an HIV diagnosis and at least one of the following: 1) not on ART, 2) detectable viral load (self-report), 3) not linked to health care, or 4) a missing visit in the past six months. The study provided mobile phones for digital interactions for participants that did not have one.

This study was a collaboration between researchers at the San Francisco Department of Public Health in the U.S.

and FIOCRUZ in Brazil. The pilot protocol was approved by each site’s institutional review board (IRB), and a certificate of confidentiality was obtained from the National Institutes of Health. INI-FIOCRUZ IRB (CAAE 05018818.0.0000.5262) and the University of California, San Francisco Committee on Human Research (#18-26770) reviewed and approved the study. Peer navigators explained the study to potential participants and obtained written informed consent from those interested in participating. Retention strategies included reminder calls at different times of the day and outreach on social media platforms. This intervention was still in the follow-up phase when social distancing measures due to coronavirus disease (COVID-19) were put into place in Brazil. Ride share transportation was arranged for participants who needed visits onsite and all other visits were moved to being conducted remotely.

INTERVENTION

Using data from a formative phase with 10 young trans women and with advisory group input, we adapted a US Center for Disease Control and Prevention (CDC) evidence-based, individual-level, multi-session, time-limited, system navigation intervention for use in BeT.¹⁷ The intervention, Anti-Retroviral Treatment and Access to Services (ARTAS), was adapted to the cultural and healthcare system context and to include both people living with HIV and those vulnerable to HIV. We also adapted it for delivery by peers and using mHealth methods, to build upon ways in which young people engage with the world using mobile phones. Our 3-month intervention included 3 behavioral sessions (2 in person and 1 mHealth) with peer navigators, weekly digital interactions with peer-navigators, and asynchronous text messages in between sessions.

DATA COLLECTION

Surveys were conducted at baseline and follow-up visits at 3, 6, 9, and 12 months. Participants received tiered incentives over the three months to motivate continued participation in the intervention activities and retention in the study, starting at US\$10 in mobile phone credits, increasing US\$5 every two weeks (US\$10 for week 1-2, US\$20 for week 2-4, US\$25 for week 5-6, etc.) for a total of US\$160 in mobile phone credits over the course of three months. Incentives were also given for completion of questionnaires at baseline, three, six, nine and 12- months in the form of paying for transportation, providing a meal and entering them into a raffle for a computer or other technology gift worth US\$100.

MEASURES

Surveys contained questions on sociodemographic data, sexual behavior, sex work engagement, violence, alcohol and drug use, and mental health. Trans women were defined as using feminizing hormone therapy (FHT) if they reported any estrogen-containing regimen, which could have included hormones they acquired in non-medical settings and without a prescription. Participants were asked specifically if they had ever used non-prescribed FHT, whether they

were currently on FHT of any type, whether they had ever used fillers such as “industrial silicone” for feminization and whether or not they had even undergone a gender-affirming surgery and if it occurred outside a medical setting by an unlicensed provider.

We assessed gender-based discrimination using the General discrimination scale.²⁰ Gender-based discrimination in a healthcare setting was assessed as proposed by Costa et al.¹⁴ We used a trans-adapted version of the Group-Based Medical Mistrust Scale (GBMMS), a 12-item scale, to measure suspicion of health care services, health professionals, and the treatment provided.²¹ Intimate partner violence (IPV) was evaluated asking concerns about her physical safety due to anger or threats from a partner, sexual assault by partner or non-consensual sexual act, or attitudes not-compatible with her gender identity (e.g., hiding makeup) forced by partner. We screened psychological distress with the Patient Health Questionnaire (PHQ)-4, composed by two subscales, one for depression and the other for anxiety.²² Participants were asked if they had ever had suicidal thoughts and were also asked if they had ever attempted suicide. We used the Alcohol Use Disorders Identification Test-Concise (AUDIT-C),²³ as well as the Alcohol to assess alcohol intake, as well as the Smoking and Substance Involvement Screening Test (ASSIST) to screen for all levels of problem or risky substance use in adults.²⁴

We assessed HIV knowledge using the HIV Knowledge Scale (HKQ-10).²⁵ Evaluation of negative attitudes at HIV testing used the components as proposed by Kalichman & Simbayi.²⁶ HIV testing self-efficacy, which refers to the level of confidence of a person to have HIV testing, was measured as proposed by Zhou et al.,²⁶ adapted to trans women. Scores ranged from 1-4; higher scores indicated higher HIV testing self-efficacy. Risk perception was estimated using a 5-point response scale as previously described.²⁷ Scores ranged from 4-20, and higher scores indicate higher self-perceived risk. We used the HIV Risk Behavior score,²⁸ adapted to trans women. The score assessed sexual behavior (number of cisgender men partners and condomless anal sex) for each type of sexual partnership (stable, casual, and commercial). Overall score was the sum of the score for each type of sexual partner and ranged from 0-48 points. Individuals were classified as low (0-2), medium (3-8) and high risk (9+). We also assessed sexually transmitted infections (STI) using laboratory results for syphilis, rectal CT and NG at the baseline and final visits.

OUTCOMES

For participants not living with HIV, our main outcomes were HIV testing and PrEP use in the last 3 months. For participants living with HIV, we focused on HIV care engagement, a combined outcome composed of HIV linkage to care, HIV care attendance, ART use, and undetectable viral load (VL). All outcomes were self-reported, except VL, which was collected after enrollment. HIV care engagement is defined as ‘yes’ if youth changed their status from baseline to final visit regarding any of the following: reported that they were linked to HIV care, had not missed a HIV care appointment in the last 6 months, were currently on ART or were virologically suppressed. We considered study reten-

tion as attending to the 9-month visit.

STATISTICAL ANALYSIS

We described baseline characteristics and compared study outcomes (HIV prevention and care) and other behaviors at pre- and post-intervention (i.e., baseline vs. 12-month visit). Descriptive analysis used medians and interquartile ranges (IQR) for numeric variables and absolute number and proportions for categorical variables. We used Fisher exact test, Ranksum test, or t-test used, as appropriate, to compare study outcomes and other behaviors at pre- and post-intervention. Pre/post data analysis was conducted with a per protocol approach. All analyses were performed using R Software version 4.0.3.

RESULTS

We screened 27 individuals; 4 were ineligible (2 without PrEP indication, one was already using PrEP, and one had an ineligible gender identity), 3 were discontinued (2 withdrawn consent, and 1 moved to another region), and 20 were enrolled as participants (13 not living with HIV, 7 living with HIV). Among these, 19 completed the intervention (13 not living with HIV, 6 living with HIV) and 18 were retained until the last study visit (13 not living with HIV, 5 living with HIV). Retention in the study took place during the Covid-19 pandemic and was 90% to 9 months.

At baseline, overall median age was 21 years (IQR 19-23); most participants were Black or *Parda* (n=16, 80.0%), 45.0% (n=9) of participants had 8 years of schooling or less, 80.0% (n=16) were experiencing food insecurity, and all had an extremely low monthly income (Table 1). Almost one-third (40.0%, n=8) were currently engaged in sex work. All participants reported experiencing discrimination due to their gender identity in general (n=20, 100%) and by healthcare professionals (n=16, 80.0%). 60% had suffered IPV (n=12), and half had suicidal thoughts (n=10, 50.0%). A quarter had suffered sexual violence (n=5, 25.0%), and 57.9% reported that the impact of the political context in Brazil had a negative impact on them (n=11). Use of non-prescribed FHT ever was high (90.0%, 16 out of 18 ever on hormones), and 55.0% (n=11) were currently on FHT at baseline. Only two participants (10.0%) had undergone a gender-affirming procedure, both of them outside of medical care. Only one participant (5.0%) reported having injected illicit silicone. About one-third of young trans women were living with HIV (n=7, 35.0%) at baseline. At baseline, 66.7% of young trans women had ever been diagnosed with syphilis (n=11/18) and 7 (38.9%) had an active case of syphilis, 17.6% (n=3/17) had rectal chlamydia trachomatis, and 11.8% (n=2/17) had Neisseria gonorrhoea.

At baseline, all participants not living with HIV were PrEP naïve and eligible for PrEP (n=13), of which 61.5% (n=8) were knowledgeable about PrEP and all (100.0%) reported high willingness to use PrEP after a brief explanation (Table 2). Most (84.6%) young trans women not living with HIV had been tested for HIV previously (n=11), but only 46.2% had been tested for HIV in the last three months (n=6). The majority (76.9%) of participants had negative attitudes about HIV testing (n=10), although the median HIV

Table 1. Characteristics of young trans women ages 18-24 years old enrolled in the BeT pilot study. Rio de Janeiro, Brazil, 2019-2020.

| Characteristics | N% |
|--|----------------------|
| Total | 20 (100) |
| <i>Social Determinants of Health</i> | |
| Age | 21.0 (19.0,23.0) |
| Race | |
| Black | 6 (30.0) |
| Parda | 10 (50.0) |
| White | 4 (10.0) |
| Monthly per capita income ¹ | 84.13 (64.27,115.25) |
| Schooling, years | |
| 0-8 | 9 (45.0) |
| 9+ | 11 (55.0) |
| Cannot get by on current income | 14 (70.0) |
| Housing | |
| Own | 4 (20.0) |
| Rent | 9 (45.0) |
| Live with Family | 7 (35.0) |
| Food insecurity | 16 (80.0) |
| Currently doing sex work | 8 (40.0) |
| Prior arrested | 4 (20.0) |
| <i>Discrimination</i> | |
| Gender-based discrimination | 20 (100.0) |
| Gender-based discrimination in healthcare | 16 (80.0) |
| Group-based medical mistrust | 29.0 (20.0,33.0) |
| Negative Impact of Brazilian political context | 11 (57.9) |
| <i>Violence</i> | |
| Ever suffered sexual violence | 5 (25.0) |
| Ever suffered intimate partner violence | 12 (60.0) |
| <i>Mental Health</i> | |
| PH-4 score | 6.0 (2.5, 8.5) |
| Positive anxiety screening ³ | 11 (57.9) |
| Positive depression screening ³ | 9 (45.0) |
| Ever had suicidal thoughts | 10 (50.0) |
| Ever attempted suicide | 5 (25.0) |
| <i>Medical care access</i> | |
| Ever used hormones | 18 (90.0) |
| Ever used non-prescribed hormones ² | 16 (94.1) |
| Currently on hormones ² | 11 (68.8) |
| Filler use | 1 (5.0) |
| Feminizing surgery by unlicensed providers | 2 (10.0) |
| <i>Living with HIV (HIV positive)</i> | 7 (35.0) |

1. Conversion rate: USD1.00=5.64, 2. Denominator: participants that reported ever using hormones.

testing self-efficacy score for the sample was 3.5 (3.1,4.0), and median self-perceived risk score was 14.0 (11.0,16.0). Most participants (11, 84.6%) had a medium/high risk behavior score at baseline. Condomless receptive anal sex was frequent at baseline (92.3%, n=12). Among those living with

HIV, 71.4% (n=5) had been linked to care, 14.3% (n=1) had recently missed a HIV care visit, 57.1% (n=4) were currently using ART, and only 1 (14.3%) of those living with HIV had an undetectable VL.

Post intervention, all participants not living with HIV

Table 2. HIV prevention, care, knowledge and related behaviors

| Characteristics | N (%) |
|--|------------------|
| Ever tested for HIV ¹ | 11 (84.6) |
| Tested for HIV in the last 3 months ¹ | 6 (46.2) |
| Currently using PrEP ^{1*} | 0 (0.0) |
| Engaged in HIV care ² | 5 (71.4) |
| Missed any HIV care visit (prior 6 mos) ² | 1 (14.3) |
| Current ART use ² | 4 (57.1) |
| Undetectable HIV viral load ² | 1 (14.3) |
| Negative attitudes at HIV testing ¹ | 10 (76.9) |
| HIV testing self-efficacy score ¹ | 3.5 (3.1,4.0) |
| HIV knowledge score ¹ | 5.0 (5.0,7.0) |
| PrEP knowledge ¹ | 8 (61.5) |
| PEP knowledge ¹ | 5 (38.5) |
| Risk perception score ¹ | 14.0 (11.0,16.0) |
| Sexual risk score ¹ | |
| Low | 2 (15.4) |
| Medium | 7 (53.8) |
| High | 4 (30.8) |
| Condomless receptive anal sex ¹ | 12 (92.3) |

PrEP: Pre-Exposure Prophylaxis, ART: Antiretroviral therapy, ¹ Denominator: HIV-negative participants, ² Denominator: Participants living with HIV. *Participants were not eligible for the intervention if they were already on PrEP.

Table 3. Primary outcomes of BeT pilot intervention

| Characteristics | Pre-intervention N (%) | Post-intervention N (%) | p-value ¹ |
|--|---------------------------|----------------------------|----------------------|
| HIV test in the last 3 months ² | 6 (46.2) | 13 (100) | <0.01 |
| Current PrEP use ² | 0 (0.0) | 13 (100.0) | <0.001 |
| HIV care engagement ³ | 0 (0.0) | 5 (100.0) | <0.010 |
| HIV care ³ | 3 (60.0) | 5 (100.0) | 0.440 |
| Missed any HIV care visit ³ | 1 (20.0) | 1 (20.0) | 1 |
| Current ART use ³ | 2 (40.0) | 5 (100.0) | 0.170 |
| Undetectable HIV viral load ³ | 1 (20.0) | 4 (80.0) | 0.210 |

PrEP: Pre-Exposure Prophylaxis, ART: Antiretroviral therapy, ¹ Fisher exact test, Ranksum test, or t-test used as appropriate, ² Denominator: HIV-negative participants, ³ Denominator: Participants living with HIV.

(n=13) were regularly tested for HIV resulting in a change from 46.2% having been tested for HIV prior to 100% being recently tested (Table 3). We observed 100% uptake of PrEP among participants who were not living with HIV, and no participants seroconverted over the course of the study. All participants living with HIV (n=5) were engaged in HIV care by post intervention, with the most notable improvements being in ART use improving from 40% to 100% and having an undetectable VL improving from 20% to 80% of participants. The VL of the one participant with a detectable result was 201 copies/mL. At the final study visit, no young trans women had active syphilis, 11.8% (n=2/17) tested positive for rectal chlamydia trachomatis, and 11.8% (n=2/17) had Neisseria gonorrhoea.

Results from the pre/post analysis show that significantly fewer young trans women experienced discrimination overall post intervention (100.0% pre-intervention and 55.6% post-intervention, p<0.01) and had significantly less medical discrimination (77.8% pre-intervention and 11.1% post-intervention, p<0.001) post intervention (Table 4). HIV knowledge score significantly increased among young trans women from pre to post intervention (5.5 pre-intervention to 7 post-intervention, p<0.01), and HIV risk perception was significantly lower post intervention (13.2 pre-intervention to 8.5 post intervention, p<0.001). Lastly, there were significantly fewer young trans women who screened positive for anxiety post intervention than pre-intervention (55.6% pre-intervention and 22.2% post-inter-

Table 4. Pre- and post-intervention assessments among trans women in the BeT pilot study. Rio de Janeiro, Brazil, 2019-2020 (N=18).

| Characteristics | Pre-intervention N (%) | Post-intervention N (%) | p-value ¹ |
|--|------------------------|-------------------------|----------------------|
| <i>Experienced/reported discrimination</i> | | | |
| Gender-based discrimination | 17 (100) | 10 (55.6) | <0.010 |
| Discrimination score | 9 (3,13) | 1 (0,2.8) | <0.001 |
| Gender-based discrimination in healthcare | 14 (77.8) | 2 (11.1) | <0.001 |
| Group-based medical mistrust | 30.0 (21.2,33.0) | 18.5 (14.5,33.2) | 0.160 |
| <i>HIV-related knowledge and behavior</i> | | | |
| Negative attitudes at HIV testing ² | 8 (72.7) | 6 (54.5) | 0.660 |
| HIV testing self-efficacy score ² | 3.5 (3.2,4) | 3.7 (3.3,4.0) | 0.600 |
| HIV knowledge score | 5.5 (5,7) | 7 (7,8) | <0.010 |
| PrEP knowledge | | | |
| PEP knowledge | | | |
| Risk perception score ² | 13.2 (3.8) | 8.5 (2.3) | <0.001 |
| Sexual risk score ² | | | 0.260 |
| Low | 2 (15.4) | 5 (38.5) | |
| Medium | 7 (53.8) | 7 (53.8) | |
| High | 4 (30.8) | 1 (7.7) | |
| Condomless receptive anal sex ² | 12 (100) | 9 (69.2) | 0.100 |
| <i>Mental Health</i> | | | |
| PH-4 score | 5.5 (1.8,8.8) | 2 (0,5.8) | 0.140 |
| Positive anxiety screening ³ | 10 (55.6) | 4 (22.2) | 0.040 |
| Positive depression screening ³ | 9 (50) | 6 (33.3) | 0.310 |
| <i>Medical care access</i> | | | |
| Current hormone use ⁴ | 11 (61.1) | 16 (88.9) | 0.120 |

¹ Fisher exact test, Rank sum test, or t-test used as appropriate, ² Denominator: HIV-negative participants, ³ Derived from PH-4 score, ⁴ Denominator: participants that reported ever using hormones.

vention, p=0.04).

DISCUSSION

The “*Brilhar e Transcender*” (BeT) intervention resulted in improvements in all three areas of intervention, including HIV testing, PrEP use and HIV care engagement with lasting effects nine months post intervention. All young trans women participants not living with HIV engaged in PrEP, and all but one participant who was living with HIV had an undetectable VL at follow-up. Moreover, evidence of similar rates of STIs at baseline to follow up provide evidence that young trans women continued having condomless sex while in the intervention, but risk for HIV was likely mitigated by PrEP use.

This is the first intervention, to our knowledge, that has demonstrated success in improving HIV prevention and care outcomes using peer navigation with young trans women in a LMIC. Peer navigators have been central to reducing health care barriers related to stigma and discrimination, like medical mistrust and unfamiliarity with systems, in many marginalized populations.^{29,30} Peer-based delivery has also been related to improved HIV care and

prevention outcomes among trans women adults.^{31–33} Our application presents preliminary evidence of the positive impact of peer delivery in systems navigation to improve HIV prevention and care behaviors among young trans women.

Our intervention may have also impacted factors known to influence HIV risk.³⁴ We found less anxiety in the pilot sample post intervention, lower HIV risk perception scores and higher HIV knowledge scores among participants. We also found significantly less experienced discrimination overall and in healthcare settings among young trans women. Co-location of HIV care services onsite with digital peer navigation has been found to facilitate engagement in biomedical prevention and care in another intervention implementing ARTAS.³⁵ The BeT intervention offered co-location of health care services that also were also trans-affirming. We believe that offering services convenient to youth and in a de-stigmatized and trans-affirming manner was a key component of our pilot intervention. The use of mobile phones for sexual and reproductive health interventions is an increasingly effective way to reach adolescents and young adults in LMICs.³⁶ The digital delivery of a health intervention is a new approach in HIV prevention with young trans women that may overcome stigma-related

obstacles to participation like fears of taking public transportation and anticipation of discrimination.

Our study was also able to achieve 90% retention of participants. Follow up of trans women participants in HIV research is usually 3 months or less.³⁷ Strong study retention could be attributed to the availability of digital peer navigators asynchronously to help maintain engagement and support for young trans women participants. Our ability to maintain high study retention in the midst of a global pandemic and maintain a lasting effect on HIV prevention and care behaviors among young trans women is promising evidence of impact of the BeT intervention.

LIMITATIONS

The primary limitation to this study was the small sample size overall limiting the ability to calculate tests for significance in changes pre- and post-intervention, although the number of participants we enrolled is consistent with pilot interventions. Our design was also not a randomized clinical trial, which was not appropriate at this stage of the intervention development. Although this is the only HIV prevention and care intervention with young trans women in a LMIC context, findings may not be generalizable to other countries.

CONCLUSIONS

This pilot points to the BeT intervention as a promising approach for improving HIV prevention and care behaviors of young trans women in Brazil and fills a major gap in interventions for young trans women in LMICs. An important next step in this research is to test the intervention in a larger efficacy trial in Brazil and testing it in other countries with similar epidemics and stigma-based barriers to engagement in HIV prevention and care.

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DATA ACCESS, RESPONSIBILITY AND ANALYSIS

Dr. Emilia Jalil and Dr. Beatriz Grinsztejn had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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AUTHORSHIP CONTRIBUTIONS

ECW, BG, EMJ, and VGV conceived the study and interpreted the findings. EW and EMJ drafted the manuscript. EMJ did the statistical analyses with aid from ECW and BG. CMJ, CRVC, ALNF, NFM, IM, CO, DB, ECN, and LM helped with data acquisition, interpretation of the findings, and drafting the manuscript. VGV was involved in revising the manuscript for important intellectual content. All authors read and approved the final manuscript.

COMPETING INTERESTS

The authors completed the Unified Competing Interest form at <http://www.icmje.org/disclosure-of-interest/> (available upon request from the corresponding author) and declare no conflicts of interest.

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REFERENCES

1. Ministério da Saúde SdVeS. Boletim Epidemiológico. HIV AIDS 2017. Published online 2017.
2. Bastos FI, Bastos LS, Coutinho C, et al. HIV, HCV, HBV, and syphilis among transgender women from Brazil: Assessing different methods to adjust infection rates of a hard-to-reach, sparse population. *Medicine (Baltimore)*. 2018;97(1S Suppl 1):S16-S24. doi:10.1097/MD.00000000000009447
3. 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. *The Lancet HIV*. 2017;4(4):e169-e176. doi:10.1016/S2352-3018(17)30015-2
4. Wilson EC, Garofalo R, Harris RD, et al. Transgender Female Youth and Sex Work: HIV Risk and a Comparison of Life Factors Related to Engagement in Sex Work. *AIDS and Behavior*. 2009;13:902-913.
5. Garofalo R, Deleon J, Osmer E, Doll M, Harper GW. Overlooked, misunderstood and at-risk: exploring the lives and HIV risk of ethnic minority male-to-female transgender youth. *The Journal of adolescent health: official publication of the Society for Adolescent Medicine*. 2006;38(3):230-236.
6. Wilson EC, Jalil EM, Moreira RI, et al. High risk and low HIV prevention behaviours in a new generation of young trans women in Brazil. *AIDS Care*. Published online 2020:1-5. doi:10.1080/09540121.2020.1844859
7. Wilson EC, Jalil EM, Castro C, Martinez Fernandez N, Kamel L, Grinsztejn B. Barriers and facilitators to PrEP for transwomen in Brazil. *Glob Public Health*. 2019;14(2):300-308. doi:10.1080/17441692.2018.1505933
8. Navarra AM, Neu N, Toussi S, Nelson J, Larson EL. Health literacy and adherence to antiretroviral therapy among HIV-infected youth. *The Journal of the Association of Nurses in AIDS Care: JANAC*. 2014;25(3):203-213. doi:10.1016/j.jana.2012.11.003
9. Harper GW, Jadwin-Cakmak LA, Popoff E, et al. Transgender and Other Gender-Diverse Youth's Progression Through the HIV Continuum of Care: Socioecological System Barriers. *AIDS Patient Care STDS*. 2019;33(1):32-43. doi:10.1089/apc.2018.0078
10. Stephenson R, Todd K, Kahle E, et al. Project Moxie: Results of a Feasibility Study of a Telehealth Intervention to Increase HIV Testing Among Binary and Nonbinary Transgender Youth. *AIDS Behav*. 2020;24(5):1517-1530. doi:10.1007/s10461-019-02741-z
11. Garofalo R, Kuhns LM, Reisner SL, Biello K, Mimiaga MJ. Efficacy of an Empowerment-Based, Group-Delivered HIV Prevention Intervention for Young Transgender Women: The Project LifeSkills Randomized Clinical Trial. *JAMA Pediatr*. 2018;172(10):916-923. doi:10.1001/jamapediatrics.2018.1799
12. Clark L. Integrating prevention and services for issues of risk and resilience among transgender youth. In: *American Public Health Association Annual Conference*. San Diego, CA; 2008.
13. Ramos M, Jalil E, Lessa C, et al. Evaluation of syndemics in transgender women using pre-exposure prophylaxis (PrEP) for HIV prevention: Preliminary findings. *AIDS 2020*. Published online 2020.
14. Costa AB, da Rosa Filho HT, Pase PF, et al. Healthcare Needs of and Access Barriers for Brazilian Transgender and Gender Diverse People. *J Immigr Minor Health*. 2018;20(1):115-123. doi:10.1007/s10903-016-0527-7
15. Rotheram-Borus MJ, Davis E, Rezaei R. Stopping the rise of HIV among adolescents globally. *Curr Opin Pediatr*. 2018;30(1):131-136. doi:10.1097/MOP.0000000000000580
16. Wilson EC, Chen YH, Arayasirikul S, et al. Differential HIV risk for racial/ethnic minority trans*female youths and socioeconomic disparities in housing, residential stability, and education. *Am J Public Health*. 2015;105 Suppl 3:e41-7. doi:10.2105/AJPH.2014.302443
17. Centers for Disease Control and Prevention (CDC). *HIV/AIDS Prevention Research Synthesis Project - Compendium of Evidence-Based Interventions and Best Practices for HIV Prevention*.
18. Arayasirikul S, Chen YH, Jin H, Wilson E. A Web 2.0 and Epidemiology Mash-Up: Using Respondent-Driven Sampling in Combination with Social Network Site Recruitment to Reach Young Transwomen. *AIDS Behav*. 2016;20(6):1265-1274. doi:10.1007/s10461-015-1234-4

19. Arayasirikul S, Turner C, Trujillo D, Le V, Wilson EC. Efficacy and Impact of Digital HIV Care Navigation in Young People Living With HIV in San Francisco, California: Prospective Study. *JMIR Mhealth Uhealth*. 2020;8(5):e18597. doi:10.2196/18597
20. Scandurra C, Amodeo AL, Valerio P, Bochicchio V, Frost DM. Minority stress, resilience, and mental health: A study of Italian transgender people. *Journal of Social Issues*. 2017;(73):563-585.
21. Thompson HS, Valdimarsdottir HB, Winkel G, Jandorf L, Redd W. The Group-Based Medical Mistrust Scale: psychometric properties and association with breast cancer screening. *Prev Med*. 2004;38(2):209-218.
22. Lowe B, Wahl I, Rose M, et al. A 4-item measure of depression and anxiety: validation and standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general population. *J Affect Disord*. 2010;122(1-2):86-95. doi:10.1016/j.jad.2009.06.019
23. Bush K, Kivlahan DR, McDonnell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test. *Arch Intern Med*. 1998;158(16):1789-1795. doi:10.1001/archinte.158.16.1789
24. Who Assist Working Group. The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): development, reliability and feasibility. *Addiction*. 2002;97(9):1183-1194. doi:10.1046/j.1360-0443.2002.00185.x
25. Oglesby WH, Alemagno SA. Psychometric properties of an HIV knowledge scale administered with populations at high risk for HIV infection. *Health Promot Pract*. 2013;14(6):859-867. doi:10.1177/1524839912470453
26. Kalichman SC, Simbayi LC. HIV testing attitudes, AIDS stigma, and voluntary HIV counselling and testing in a black township in Cape Town, South Africa. *Sex Transm Infect*. 2003;79(6):442-447. doi:10.1136/sti.79.6.442
27. Lauby JL, Bond L, Eroglu D, Batson H. Decisional balance, perceived risk and HIV testing practices. *AIDS Behav*. 2006;10(1):83-92. doi:10.1007/s10461-005-9029-7
28. Rocha GM, Kerr L, Kendall C, Guimaraes MDC. Risk behavior score: a practical approach for assessing risk among men who have sex with men in Brazil. *Braz J Infect Dis*. 2018;22(2):113-122. doi:10.1016/j.bjid.2018.02.008
29. Shommu NS, Ahmed S, Rumana N, Barron GR, McBrien KA, Turin TC. What is the scope of improving immigrant and ethnic minority healthcare using community navigators: A systematic scoping review. *Int J Equity Health*. 2016;15:6. doi:10.1186/s12939-016-0298-8
30. Natale-Pereira A, Enard KR, Nevarez L, Jones LA. The role of patient navigators in eliminating health disparities. *Cancer*. 2011;117(15 Suppl):3543-3552. doi:10.1002/cncr.26264
31. Sun CJ, Garcia M, Mann L, Alonzo J, Eng E, Rhodes SD. Latino sexual and gender identity minorities promoting sexual health within their social networks: process evaluation findings from a lay health advisor intervention. *Health Promot Pract*. 2015;16(3):329-337. doi:10.1177/1524839914559777
32. Wongkanya R, Pankam T, Wolf S, et al. HIV rapid diagnostic testing by lay providers in a key population-led health service programme in Thailand. *J Virus Erad*. 2018;4(1):12-15.
33. Wilson EC, Turner C, Arayasirikul S, et al. HIV Care Engagement Among Trans Women of Color in San Francisco Bay Area Demonstration Projects: Findings from the Brandy Martell Project and TransAccess. *AIDS Behav*. Published online 2019. doi:10.1007/s10461-019-02697-0
34. Martinez O, Lopez N, Woodard T, Rodriguez-Madera S, Icard L. Transhealth Information Project: A Peer-Led HIV Prevention Intervention to Promote HIV Protection for Individuals of Transgender Experience. *Health Soc Work*. 2019;44(2):104-112. doi:10.1093/hsw/hlz008
35. Craw J, Gardner L, Rossman A, et al. Structural factors and best practices in implementing a linkage to HIV care program using the ARTAS model. *BMC Health Serv Res*. 2010;10:246. doi:10.1186/1472-6963-10-246
36. Ippoliti NB, L'Engle K. Meet us on the phone: mobile phone programs for adolescent sexual and reproductive health in low-to-middle income countries. *Reprod Health*. 2017;14(1):11. doi:10.1186/s12978-016-0276-z
37. Garofalo R, Kuhns LM, Reisner SL, Mimiaga MJ. Behavioral Interventions to Prevent HIV Transmission and Acquisition for Transgender Women: A Critical Review. *J Acquir Immune Defic Syndr*. 2016;72 Suppl 3:S220-5. doi:10.1097/QAI.0000000001084