

# HIV Prevention Among Transgender Populations: Knowledge Gaps and Evidence for Action

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## Abstract

**Purpose of Review** The purpose of this review is to summarize the available evidence-based HIV prevention interventions tailored for transgender people.

**Recent Findings** A limited number of evidence-based HIV prevention interventions have been tested with transgender populations. Most existing interventions target behavior change among transgender women, with only one HIV prevention program evaluated for transgender men. Studies addressing biomedical interventions for transgender women are ongoing. Few interventions address social and structural barriers to HIV prevention, such as stigma, discrimination, and poverty.

**Summary** Evidence-based multi-level interventions that address the structural, biomedical, and behavioral risks for

HIV among transgender populations, including transgender men, are needed to address disparities in HIV prevalence. Future research should address not only pre-exposure prophylaxis uptake and condom use but also structural barriers that limit access to these prevention strategies.

**Keywords** Transgender · HIV prevention · Stigma · Structural determinants · Behavioral interventions · Biomedical interventions

## Introduction

The term “transgender” describes a diverse population whose gender identity differs from the sex they were assigned at birth [1]. The sex assigned at birth is typically based on the appearance of external genitalia and recorded on the birth certificate. Gender has been conceptualized in a variety of ways across cultures, regions, and over time [2••]. This review will focus on the published, peer-reviewed HIV literature in which the term “transgender women” refers to people who were assigned male at birth and have a feminine or female gender identity. “Transgender men” refers to people assigned female at birth who have a masculine or male gender identity. While studies of transgender women and men sometimes include people who identify outside the male-female binary, there are very limited HIV data disaggregated for this population; therefore, this review focuses on transgender women and men.

The most recent global data synthesis estimates that 25 million people around the world are transgender [3]. In the USA, where more than 30 states have begun collecting data on gender identity, 0.6% of the population (approximately 1.4 million people) are estimated to be transgender [4]. Scientific inquiry into the health of transgender people has increased exponentially over the last 5 years with a significant

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focus on HIV [5]. At the same time, transgender individuals have become increasingly visible as leaders of transgender health research and destigmatizing approaches to research and clinical practice [6, 7].

The majority of HIV research among transgender people has been with transgender women [8]. Across 15 countries where data were available, transgender women had an estimated HIV prevalence of 19%—a 49-fold increased odds of HIV compared with the general population of reproductive age adults [9]. Additionally, transgender women sex workers were more likely to have HIV than cisgender (non-transgender) female or male sex workers [10]. In most countries, however, seroprevalence data remain unavailable [11]. HIV vulnerability is not distributed evenly across transgender populations. Within the USA, African-American and Latina transgender women bear the heaviest burden [8, 12]. Incidence rates among transgender women of color are high [8]; and testing data suggest that infection often occurs early, during adolescence [6]. The few existing HIV studies among transgender men have been limited by very small sample sizes [8]. The largest study, based on US Centers for Disease Control (US CDC) data, found 0.5% positivity among testing events known to be among transgender men, higher than the 0.3% national HIV prevalence [12].

## HIV Vulnerabilities

### Sexual Risk

Multiple studies from around the world have described elevated rates of sexual risk behavior among transgender women. Transgender women who have sex with cisgender (non-transgender) men are more likely than men who have sex with men (MSM) to assume a receptive role during anal intercourse, less likely to use a condom, and have a higher number of sexual partners [13–15]. Emerging evidence suggests that transgender women have a limited pool of cisgender male partners and those men have elevated HIV risk [16, 17]. We were unable to identify studies of HIV risk among transgender women who partner with transgender men or other women (cisgender or transgender).

Findings from studies of transgender men are heterogeneous, and almost entirely limited to Canada and the USA. In a recent review, estimates of recent condomless vaginal or anal intercourse ranged from 7 to 69% [18]. The inclusion in many studies of transgender men regardless of the sex of their partners contributes to this variability, as most of their sexual partners are cisgender women [19]. Within the sub-group of transgender men sexually active with cisgender men, approximately one third indicated past-year HIV sexual risk in a Canadian study [20]. While little is known about the characteristics of male sexual partners of transgender men in most settings, one US-based study found that the majority also had sex with other cisgender men [21]. Condomless vaginal

intercourse appears more frequent than condomless anal intercourse among transgender men [19, 22]. While this may contribute to lower HIV risk, transgender men using testosterone therapy may experience vaginal tissue changes (similar to menopausal cisgender women [23]) that may increase susceptibility to HIV infection [18].

### Injection Risk

The literature is sparse on transgender people and HIV risk through needle sharing. Exposure to contaminated needles and other paraphernalia may occur during injection of recreational drugs, hormones, or loose soft tissue fillers, such as silicone. Despite significant health risks [24–27], soft tissue fillers are commonly injected in the face, breast, and hips and/or buttocks of transgender women to feminize the contour of the face and body [28]. High rates of substance use have been reported in studies of both transgender women and transgender men [29, 30]. In one study, transgender women reporting substance use of any nature were more likely to report needle use to inject drugs, injecting silicone, and sharing needles [29]. Injection drug use has been associated with testing positive for HIV among transgender women [12]. In settings where needles and syringes are readily available via pharmacies and exchange programs, very little needle sharing has been identified [31]. More research is needed to characterize injection and needle sharing practices among transgender people.

### Syndemic Risk

Syndemic theory posits that a concentration of negative psychosocial factors interact to increase vulnerability to preventable diseases [32]. Psychosocial syndemic drivers of HIV have been described for multiple populations [33]. These drivers have included stigma, substance use, poor mental health, and exposure to abuse and/or violence. A limited number of studies have corroborated these factors as syndemic drivers of HIV among transgender people [8]. This approach to understanding HIV risk begins to move beyond the individual behavioral-level risk to examine other factors that may be driving HIV disparities for transgender people.

### Multi-level Risk

HIV vulnerability is often driven by risks at multiple socioecological levels ranging from structural (laws and policies that create barriers to health care) to network (high-risk sexual partners) to proximal factors (condomless anal intercourse) [34, 35]. Derived from empirical data with transgender women of color, the Gender Affirmation Framework models how the social contexts of racism, sexism, and transphobia intersect to produce unique circumstances that lead to elevated HIV risk in this population [36]. In short,

stigma and discrimination reduce access to employment and health care as well as social, legal, and medical gender affirmation [5]. Under these circumstances, sex work is often the only option available for income [35•]. At the same time, anti-transgender stigma also increases the felt need for gender affirmation. Both social oppression and psychological distress produced under these circumstances increase engagement in high-risk contexts such as exchange sex, sex to obtain gender affirmation, and illicit injections of hormones or silicone. Research with transgender men who have sex with men indicates that stigma, syndemic conditions, and gender affirmation may also play important roles in their sexual risk behavior [37].

## HIV Prevention Interventions

Few evidence-based HIV prevention interventions have been developed for and tested among transgender people [38•, 39]; and only one intervention from the US Centers for Disease Control compendium of evidence-based prevention interventions, SISTA, has been formally adapted for transgender women (T-SISTA) [40]. Table 1 provides the results of a scoping review of evidence-based transgender-specific HIV prevention interventions, organized by intervention approaches: (1) *behavioral*: interventions that primarily employ individual behavior change approaches to target knowledge, attitudes, and HIV risk behaviors; (2) *biomedical*: interventions that promote use of biomedical HIV prevention and care methods such as pre-exposure prophylaxis (PrEP) as well as engagement, retention, and adherence to HIV treatment (i.e., treatment as prevention or TasP); and (3) *structural*: interventions that address social and institutional drivers of HIV vulnerability (e.g., socioeconomic hardship, medical distrust, desire for gender affirmation, discriminatory laws and policies). Table 2 describes transgender-specific HIV prevention interventions currently under study.

### Behavioral Interventions

Most transgender-specific HIV prevention interventions for which outcomes data are available target transgender women and are behaviorally focused. These interventions entail a time-limited series of small group sessions that combine didactic and participatory learning (e.g., role playing). The curricula provide education on topics like HIV transmission, condom and lubricant use, condom negotiation, the importance of regular HIV testing, and HIV treatment. Studies of these interventions have focused on outcomes such as number of sex partners, consistency of condom and lubricant use, and knowledge about HIV risk and safer sex practices. Only two studies of behavioral interventions enrolled both transgender women and men, and one focused on transgender men who have sex

with men (TMSM). Prioritization of transgender women for HIV prevention is consistent with the heavy burden of HIV in this population and the focus on individual risk behavior is consistent with the high estimated per-act relative risk of acquiring HIV during receptive anal intercourse compared with vaginal intercourse [41, 42]. However, the limited attention to TMSM who may engage in receptive anal intercourse as well as the relatively limited attention to distal factors that drive HIV risk behavior represents an important gap in HIV prevention research.

While outcome measures for most behavioral interventions focused on individual HIV risk behaviors, several interventions also addressed psychosocial factors. For example, some interventions included small group sessions on transgender pride, skill building (e.g., how to access medical care, employment, and housing), communication and respect [39], as well as sessions on substance use [43, 44], social support [44, 45], and personal growth [44]. A few interventions also facilitated referral to social services [43, 45, 46], including substance abuse treatment [43], and met practical needs such as showers or clothing [43]. However, these aspects of the intervention were often not specifically evaluated. When psychosocial factors were evaluated, they seldom resulted in significant improvements [39]. The short-term and individual nature of these behavioral interventions may have limited their ability to meaningfully address more distal psychosocial drivers of HIV. Table 2 points to a shift in interventional focus from purely behavioral to combination behavioral and biomedical approaches, with the behavioral component targeting outcomes like retention in HIV care or prevention services and treatment adherence.

### Biomedical Interventions

PrEP has emerged as a potentially powerful biomedical prevention strategy, and is currently recommended by the World Health Organization for all individuals at substantial risk for HIV [47••]. The seminal study of oral tenofovir disoproxil fumarate-emtricitabine (TDF-FTC) for PrEP, the iPrEx trial, was designed to assess PrEP efficacy among men who have sex with men but did not exclude transgender women [48]. A sub-analysis of data on transgender women ( $n = 339$ ) in this trial (Table 1) demonstrated no PrEP efficacy among transgender women, in an intent-to-treat analysis [49••]. Adherence among transgender women was remarkably low at 18%. None of the transgender women who had blood levels of TDF consistent with taking at least four pills a day seroconverted; and none of the transgender women who seroconverted had detectable levels of TDF in their blood.

Of note, iPrEx participants who were taking hormone therapy had lower levels of TDF detected than those who did not, suggesting that transgender women either prioritized hormone therapy over PrEP or that a drug-drug interaction may exist [49••]. While there is no evidence of drug-drug interactions

**Table 1** Evidence-based HIV prevention interventions for transgender populations

Intervention	Sample population	Key findings	Source
Behavioral ( <i>N</i> = 11) Transgender Resources and Neighborhood Space (TRANS) 18 workshops, offered in English and Spanish, about (1) sex, relationships, and health; (2) substance use and coping skills; and (3) life needs. Participants have access to resources available at intervention site (e.g., showers, resource closet) and referrals to substance abuse treatment and other social services.	Transgender women residing or working in San Francisco, 18 years and older. <i>N</i> = 109 completed 10 workshops and completed evaluation. 359 completed pre-test risk assessment. 206 enrolled in program.	- <i>Pre- and post-test.</i> - Significant reductions in sexual risk in the last 30 days, perceived barriers to substance abuse treatment program, and depression. - Marginal reductions in unprotected receptive anal intercourse (URAI) and alcohol use in the last 30 days. - No changes in illicit drug use, HIV knowledge, self-esteem, and transgender community involvement.	Nemoto et al. [43]
HIV Prevention Workshop 4-hour workshop, grounded in the Health Belief Model and the Eroticizing Safer Sex approach. Combined lectures, videos, a panel, discussion, role-play exercises (e.g., practicing condom negotiation), and personal prevention planning.	Transgender people residing in the Minneapolis/St. Paul metropolitan area. <i>N</i> = 59 participants (majority white transgender women) completed evaluation. 71/86 completed pre- and post-tests. Twelve non-transgender significant others participated (excluded in analysis).	- <i>Pre-, post-, and follow-up test.</i> - Trend toward increased knowledge of and positive attitudes toward AIDS and safer sex, but effects diminished over time. - No significant decrease in unsafe sexual or needle use practices likely due to sample size constraints and low frequency of risk behaviors (74% reported no sex partners; 0% reported needle sharing). - Increase in masturbation (n. sig.) and mutual masturbation (sig.). - Significant increase in time spent with other transgender people between pre- and follow-up tests.	Bockting et al. [66]
1-day prevention program for transgender women by South Beach AIDS Project (SoBAP) Guest speakers invited to present on topics like transgender history, HIV risk reduction, and public health responses to HIV in the transgender community. Brought transgender women and HIV-related community-based organizations (CBOs) together to build community and awareness of programs and services available. Aimed to educate CBOs about HIV-related needs of transgender women.	Transgender women residing in South Miami Beach, Florida. <i>N</i> = 50 transgender women, 10 representatives from CBOs and Miami-Dade County Health Department HIV Prevention Programs.	- <i>Formal evaluation not conducted for pilot project.</i> - Anecdotal evaluation: participants, speakers, and CBO representatives reported positive comments to SoBAP staff. - Participants requested future programs on discrimination by law enforcement, sex work, societal discrimination, employment, fear of HIV infection, relationship issues, etc. - SoBap staff reviewed the program goals and determined that they had been met.	De Santis et al. [67]
Girlfriends Group-level HIV behavioral intervention. Four weekly sessions that focused on transgender stress, stigma and risks, drugs and alcohol, personal growth, and social support.	Transgender women, have identified as such for a min. of 3 months, 18 years and older, residing in NY metropolitan area, reported oral or anal sex with a man in the last 3 months. <i>N</i> = 63 transgender women enrolled in study (mostly Black or Hispanic), 32 completed all 4 sessions, 55 completed follow-up assessment.	- <i>Baseline assessment, post-test intervention acceptability surveys, and 3-month post-test follow-up.</i> - At 3-month follow-up, participants had significantly fewer sexual partners and were significantly less likely to have any UAI with male sex work partners and unprotected sex at last vaginal or anal sex episode with male and female partners.	Taylor et al. [44]
Life Skills Three-week behavioral HIV prevention intervention consisting of 6 group sessions. Sessions focused on (1) transgender pride, (2) communication and respect, (3) skill building, (4) sexual health and HIV/AIDS, (5) partner negotiation, and (6) HIV testing and resource fair. Participants also completed 1 to 5 individual sessions to develop personal risk reduction action plans.	Transgender women, 16 to 24 years. <i>N</i> = 51 young transgender women, 39 completed pre-test and attended at least 1 intervention session, 12 did not attend sessions.	- <i>Pre-test and 3-month post-test follow-up.</i> - High curriculum acceptability and willingness to recommend Life Skills to other transgender women. - Primary outcomes, frequency of URAI and number of sex partners, trended in the desired direction (n.sig.). - Frequency of URAI with casual partners and number of main sex partners decreased significantly at 3-month post-test follow-up. - No significant changes in depression, self-esteem, and communication skills	Garofalo et al. [39]
Life Skills 4 Men Four consecutive weekly small-group sessions about (1) identity recognition and affirmation; (2) communication and partner negotiation; (3) sex, barriers, and HIV/STIs; and (4) tying it all together.	Transgender men who have sex with men, 18 to 29 years, residing in Boston. <i>N</i> = 17 transgender men who have sex with men.	- <i>Mixed methods pre-test (i.e., qualitative interview and survey) and mixed methods 4-month post-test follow-up.</i> - Improvements in mental health (n.sig.), internalized stigma (n.sig.), integration within the transgender community (sig.), condom self-efficacy (sig.), and HIV- and STI-related risk behaviors (n.sig.) at 4-month post-test follow-up. - LS4M highly acceptable to participants, based on attendance, participation rates, and feedback.	Reisner et al. [68]
Kathoy-specific Social Marketing Intervention Integrated the following intervention strategies: (1) peer-led interpersonal outreach about condom use and condom negotiation with partners; (2) launched a condom brand extension to raise awareness about lubrication; (3) peer educators distributed condoms, lubricant, and informational pamphlets; (4) offered programs and kathoy-specific health	Kathoy (male-assigned-at-birth and identify as female), 15 to 35 years, reported oral or anal sex with a man in the last 6 months, residing in 3 urban centers in Laos. <i>N</i> = 415 kathoy in 2006 and 288 in 2004 recruited for evaluation.	- <i>Time-series evaluation with participants recruited by time-location sampling, dose-response analysis.</i> - Significant increase in condom use with casual partner at last anal sex (attributable to int.), condom use with boyfriend at last anal sex (not attributable to int.), water-based lubricant use for anal sex (not attributable to int.), awareness about condom availability (not attributable to int.), belief that using condoms is important for HIV prevention (not attributable to int.) - Significant decline in knowledge items: oil-based lubricants increase condom breakage, having an STI can increase	Longfield et al. [46]

**Table 1** (continued)

Intervention	Sample population	Key findings	Source
<p>information and referrals at 2 drop-in centers; (5) biannual camping trip focused on life skills training related to HIV prevention; and (6) some social network meetings.</p> <p>Sisters Program</p> <p>HIV prevention program with a focus on building social support. Use a social marketing approach to address facilitators and barriers to HIV risk reduction. Sisters offers counseling, social services, HIV and STI testing and counseling at a drop-in center. Conduct targeted peer outreach to promote awareness of Sisters and to distribute condoms and lubricant. Also conduct home visits to provide counseling and referrals to gender transition care, and accompany participants to appointments, services, etc.</p>	<p>Transgender women residing in city of Pattaya, Thailand.</p> <p><i>N</i> = 308 transgender women participated in study.</p>	<p>likelihood of contracting HIV, and a healthy-looking person can have HIV.</p> <p>- 80% of kathy reported that they had heard of the intervention activities.</p> <p>- <i>Cross-sectional evaluation, with participants recruited by time-location sampling, used coarsened exact matching to create samples of participants and non-participants.</i></p> <p>- 75% of participants had received any Sisters services in the last 12 months.</p> <p>- In the matched sub-sample, engagement with Sisters outreach services was significantly associated with consistent condom and/or water-based lubricant use with commercial sex partners.</p> <p>- Attendance at the Sisters drop-in center was significantly associated with receiving an HIV test.</p> <p>- No evidence that Sisters influenced condom and lubricant use with casual or regular partners (likely due to small sample size).</p>	<p>Pawa et al. [45]</p>
<p>All Gender Health</p> <p>Two-day seminar that incorporates prevention strategies into comprehensive sexuality education. Curriculum delivered through lectures, panel discussions, videos, activities, small group discussions, etc.</p>	<p>Transgender people, 18 years and older, residing in the state of Minnesota.</p> <p><i>N</i> = 181 (141 transgender women and 34 transgender men provided data).</p>	<p>- <i>Pre-test, post-test, and 3-month post-test follow-up.</i></p> <p>- Significant improvements in attitudes toward condom use and in safer sex self-efficacy at post-test and in attitudes toward condom use, increased monogamy, and decreased sexual risk behavior at 3-month follow-up.</p>	<p>Bocking et al. [69]</p>
<p>T-SISTA</p> <p>Five-session peer-led group intervention that focuses on ethnic and gender pride, HIV knowledge, and skills training around sexual risk reduction behaviors and decision-making.</p>	<p>SISTA is an HIV prevention intervention for Black cisgender women, designated as evidence-based by the US Centers for Disease Control and Prevention</p>	<p>- <i>SISTA evaluation materials available to adapt.</i></p>	<p>T-SISTA Adaptation Guide, Center of Excellence for Transgender Health (<a href="http://www.transhealth.ucsf.edu/pdf/TSISTAResourceGuide.pdf">http://www.transhealth.ucsf.edu/pdf/TSISTAResourceGuide.pdf</a>)</p> <p>Collier et al. [70]</p>
<p>Healing Our Women (HOW)</p> <p>Eleven session group-level HIV risk-reduction intervention adapted from HOW intervention for women of color. Aims to address the role of prior sexual trauma in HIV risk and protective behaviors. Incorporate topics such as (1) reflection on personal sexual risk behaviors, (2) breast health and hormones, (3) importance of HIV/STI screening, (4) coping and social networks, (5) self-care and mental wellness, and (6) empowerment in healthcare settings.</p>	<p>Transgender women of color, residing in New York City, known HIV status by means of a recent HIV test, history of sexual victimization as an adult or child, and no mental health or drug overdose hospitalizations in the past 30 days.</p> <p><i>N</i> = 21 transgender women of color enrolled in program and evaluation research.</p>	<p>- <i>Pre- and post-test.</i></p> <p>- Participant satisfaction was consistently high, as well as attendance.</p> <p>- Participants reported wanting more time to discuss session topics, appreciated opportunity for sisterhood and social interaction, expressed commitment to goals set during HOW.</p> <p>- Increase in HIV knowledge, condom use self-efficacy, and condom use (n. sig.).</p> <p>- Lower levels of depressive symptoms and higher levels of positive coping (sig.).</p>	<p>Deutsch et al. [49]</p>
<p>Biomedical (<i>N</i> = 1)</p> <p>iPrEx Trial: sub-analysis of Transwomen RCT of oral FTC/TDF PrEP versus placebo among men who have sex with men and transgender women, followed by an open-label extension.</p>	<p>People assigned male-sex-at-birth, regardless of current gender identity.</p> <p><i>N</i> = 339 transgender women.</p>	<p>- <i>RCT evaluation design</i></p> <p>- Among transgender women, 11 HIV infections in the active arm and 10 in placebo arm (intention-to-treat analysis).</p> <p>- Among active arm participants, drug was detected in none of the transgender women at the seroconversion visit, 18% (6/37) of seronegative transgender woman (<i>p</i> = 0.31), and 52% (58/111) of seronegative MSM (<i>p</i> &lt; 0.0001).</p> <p>- Barriers to adherence among transgender women.</p>	<p>Deutsch et al. [49]</p>
<p>Structural (<i>n</i> = 1)</p> <p>Legal name change as a structural intervention</p>	<p>Transgender women of color recruited through no-cost legal clinic in New York, either currently enrolled in legal name change process or had completed in the last 9 months.</p> <p><i>N</i> = 37 pre-name change and 28 post-name change.</p>	<p>- <i>Cross-sectional group comparison approach.</i></p> <p>- Post-name change group was significantly more likely to have a higher monthly income and stable housing than the pre-name change group.</p> <p>- No significant differences in general healthcare utilization, but significantly greater percentage of transgender women in the pre-name change group reported postponing medical care due to gender identity.</p> <p>- Significantly larger proportion of transgender women in the pre-name change group reported using non-prescribed hormones injected by friends and experiencing verbal harassment by family and friends compared to transgender women in the post-name change group.</p>	<p>Hill et al. [71]</p>

between TDF and estrogen-containing oral contraceptives medications [50], there are tissue specific in vitro differences in TDF pharmacokinetics in the presence of estrogen [51–53]. Therefore, it is feasible that use of exogenous estradiol for medical gender affirmation may affect the pharmacokinetics of TDF in colon tissue—a critical site for PrEP efficacy among people who engage in receptive anal intercourse. We identified one ongoing study focused on assessing pharmacokinetics of TDF in colon tissue of transgender women on hormone therapy (Table 2).

As of May 2017, more than 33 PrEP demonstration projects are underway that include transgender people, typically transgender women [54]. However, in these projects, transgender women are usually subsumed within studies tailored for MSM or cisgender female sex workers, and sample sizes are often insufficient for meaningful statistical inference. Only three of these demonstration projects are transgender-specific (Table 2), and all take place in California. Collectively, these projects, funded by the California HIV/AIDS Research Program, aim to identify effective strategies for increasing PrEP uptake and adherence among transgender populations as well as to assess drug-drug interactions between hormone therapy and PrEP [55]. As of June 1, two NIH-funded transgender-specific PrEP-focused intervention studies are underway [56]. One of these studies, TransPrEP, seeks to pilot a social network-based PrEP adherence intervention for transgender women in Lima, Peru, using a combination of individual counseling, group workshops, social media-based network interactions, and practical support. The other study, TransLife in Chicago, focuses on social and structural determinants of health, providing a drop-in center where participants can access legal and employment services, transgender-affirming health education, and linkage to medical care as well as transcultural competency training for social service and medical providers.

Treatment as Prevention (TasP) is another powerful biomedical tool for HIV prevention. Rigorous studies have demonstrated lack of HIV transmission from people with HIV whose viral loads are below the level of detection [57, 58]. Studies across the USA are underway to determine effective strategies for specifically engaging transgender women of color in HIV care and treatment adherence. From 2012 to 2017, the Health Services and Resources Administration's (HRSA) Special Programs of National Significance (SPNS) funded nine demonstration projects under the Enhancing Engagement and Retention in Quality HIV Care for Transgender Women of Color Initiative [59, 60]. Now nearing completion, most of the HRSA SPNS funded projects combine peer-led community outreach with a variety of other approaches (e.g., case management, small group sessions, motivational interviewing) to engage transgender women of color in the HIV care continuum. Four of the community sites partnered with local clinics to provide access to integrated gender-affirming and HIV-related health care. Several HRSA SPNS projects included behavioral interventions designed to

improve ART adherence. For example, Just One of the Girls (JOG), a component of the Infinit-T intervention, aimed to improve linkage to and retention in HIV care using a five-module curriculum during a two-day retreat. The retreat focused on pride and self-esteem coupled with HIV knowledge and awareness of healthcare options. The Alexis Project also used a biobehavioral approach through their contingency management strategy designed to encourage retention in HIV care and reaching treatment milestones through increasing valuable incentives (e.g., gift cards), in conjunction with peer navigation.

### Structural Interventions

Structural HIV interventions are less commonly studied than behavioral and biomedical interventions [61]. They can be complex to design and challenging to implement. They generally require more funding than behavioral interventions, may necessitate a change in widespread societal norms and significant political commitment, and are oftentimes politically controversial [62]. However, structural interventions may also have the greatest potential for population-level impact [34]. There are currently no outcome data available on HIV-specific structural interventions with transgender populations; however, several such interventions are now under study.

The *Feminas* Project in Lima, Peru is an ongoing study to assess the impact of concurrent access to hormone therapy and HIV prevention and treatment services for transgender women. Preliminary data suggest that participants feel more empowered to pursue HIV care in a context where their gender is affirmed [63, 64]. Through a pathway of gender affirmation, access to hormone therapy may also lead to decreased engagement in sexual risk behaviors and better mental health [36, 63]. Girlfriends Connect is another structural intervention underway. This study links high-risk transgender women who are returning to their communities after incarceration to case management-like services. During six planning sessions (pre- and post-release), transgender women receive one-on-one support and linkage to general health care, gender affirming medical care, and transitional needs like housing and employment. They also develop personal risk reduction plans, which are reassessed and revised depending on post-release experiences. The third identified structural intervention under study, the Brandy Martell Project (BMP) offers legal aid to participants facing legal barriers to seeking or adhering to HIV care and treatment, and it facilitates access to job training, mentorship, and other personal growth opportunities. Each of these structural interventions seeks to facilitate individual participant's access to gender affirmation, social resources, and health care, thereby addressing significant social drivers of HIV for transgender women. However, the individual-level approaches employed by the structural interventions currently under study do not affect legal and policy changes most likely to have a population-level impact [65].

**Table 2** HIV prevention interventions for transgender populations currently under study

Intervention	Sample population	Source
<p><b>Behavioral</b> (<i>n</i> = 3)</p>	<p><b>Healthy Divas</b> Pilot aims to optimize engagement in HIV care for transgender women at elevated risk for virologic failure and consequential morbidity, mortality, and transmission of HIV. Uses a small group behavioral intervention design but focuses on viral suppression.</p> <p><b>SHEROES</b> Peer-led multi-session group-level intervention that addresses common lived experiences of HIV-negative, HIV-positive, and unknown status transgender women. Aims to reduce sexual risk behaviors (unprotected anal sex) and increase HIV and STI testing rates.</p> <p><b>The Princess Project</b> (also called the Butterfly Project) Trans-health educators work with black transgender women who are HIV-positive to assess individual needs and set personal goals. Participants receive motivational enhancement sessions. Also offer weekly support group sessions.</p>	<p>HIV-positive transgender women residing in San Francisco and Los Angeles. <a href="http://transhealth.ucsf.edu/trans/?page=programs-healthy-divas">http://transhealth.ucsf.edu/trans/?page=programs-healthy-divas</a></p> <p>High-risk transgender women in San Francisco. <a href="http://transhealth.ucsf.edu/trans/?page=programs-sheroes-intervention">http://transhealth.ucsf.edu/trans/?page=programs-sheroes-intervention</a></p>
<p><b>Biomedical</b> (<i>n</i> = 12)</p>	<p><b>Transgender Women</b> Phase I open-label pharmacokinetic study of steady-state tenofovir pharmacokinetics to compare concentrations of tenofovir and its metabolites between transgender women and cisgender men</p> <p><b>The Infimi-T Project</b> A collaboration with NYC's largest agency serving LGBT youth. Infimi-T aims to (1) ensure early identification of new HIV cases among young transgender women of color, (2) ensure timely entry into co-located transgender HIV care, (3) provide early engagement in mental health services for HIV-positive and high-risk HIV-negative young transgender women of color with unmet mental health needs, (4) increase the retention rates of young transgender women of color already receiving HIV medical care, (5) re-link HIV-positive young transgender women of color to care who were previously in care, but lost to follow-up, and (6) retain HIV-negative young transgender women of color with significant risk factors for acquiring HIV in transgender care at HEAT Clinic (Health Education Alternatives for Teens). Also provide access to case management with social workers, healthcare navigation supports, linkage to HIV testing, and referrals. Have hired a trans-identified peer youth advocate for program.</p> <p><b>The Alexis Project</b> Eighteen-month intervention that combines application of Contingency Management (CM) and Peer Health Navigation. Aims to improve linkage to and retention in HIV primary care, and achieve viral load suppression among HIV-infected transgender women of color. Participants can earn CM rewards for confirmed linkage to HIV primary care, retention in HIV care, and reaching HIV milestones.</p>	<p>Black transgender women who are HIV-positive, residing in Oakland, CA. <a href="https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spms-transgender-women-color">https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spms-transgender-women-color</a></p> <p>Transgender women on oral estradiol and cisgender males not taking hormones. <a href="http://hopkinscfar.org/funding-opportunities/faculty-development-awards/">http://hopkinscfar.org/funding-opportunities/faculty-development-awards/</a></p> <p>Transgender girls and women of color, age 13–24 years, residing in the New York metropolitan area, enrolled in care with HEAT Clinic or another partnering agency. <a href="https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spms-transgender-women-color">https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spms-transgender-women-color</a></p> <p>HIV-positive transgender women of color residing in Los Angeles. <a href="https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spms-transgender-women-color">https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spms-transgender-women-color</a></p>

Table 2 (continued)

Intervention	Sample population	Source
<p>The TRIUMPH Collaborative</p> <p>Culturally relevant, community-led PrEP demonstration project. Aims to develop (1) an efficient PrEP delivery system within a network of clinics and community-based organizations through programming designed specifically to serve transgender communities and (2) a culturally relevant, adaptive intervention to increase PrEP uptake and support adherence among transgender communities.</p> <p>PrEP-T: Advancing PrEP Delivery in the Transgender Community</p> <p>Plan to use a patient-centered medical home approach to develop and evaluate a comprehensive PrEP education, access, and support package for HIV-negative transgender women and transgender men. Research will determine acceptability of the tools, PrEP uptake and adherence, most useful support strategies, and measure any social harms and benefits of PrEP use. Will also investigate potential drug-drug interactions between PrEP and hormone use.</p> <p>PrEP Linkage and Pharmacology in Transgender Persons</p> <p>Plan to test if a trans-focused case management approach to contextualize PrEP within the needs of the whole person can improve PrEP linkage in the transgender population. Will also examine possible drug-drug interactions between PrEP and feminizing hormones by using the daily reporting of doses taken by text messaging to confirm whether the same drug levels expected to be protective for HIV are achieved by transgender women on hormone therapy, and if taking PrEP is associated with any changes in hormone levels.</p> <p>TransPrEP Study</p> <p>Developing and piloting a social network-based PrEP adherence intervention for transgender women in Lima, Peru. The intervention will use a combination of individual counseling, group workshops, social media-based network interactions, and practical support tools to promote PrEP adherence among transgender women.</p> <p>TransActivate</p> <p>Multiple activities to improve engagement of transgender women in HIV care. Uses a peer navigation approach to engage transgender women in health care. Offer services like accompanying participants to appointments, addressing barriers to engagement in care, modeling behavior when interacting with medical staff, increasing knowledge related to behaviors affecting health, and providing referrals for services to help participants address life challenges.</p> <p>T.W.E.T (Transgender Women Entry and Engagement To) Care Project</p> <p>Peer leaders conduct outreach and “teach backs” to engage transgender women of color in HIV care, whether they are newly diagnosed or dropped out of care at some point. “Teach back” sessions involve transgender women teaching each other about HIV prevention, care, and treatment.</p> <p>After Hours</p>	<p>Transgender people, with focus on transgender women of color, residing in San Francisco and Sacramento.</p> <p>At least 40% of the sample will be persons of color and at least 20% Black.</p> <p>Transgender women and transgender men residing in the San Francisco Bay Area.</p> <p>Plan to enroll 250 transgender people, with a particular focus on transgender women and people of color who are at high risk.</p> <p>Transgender women and transgender men enrolled through 5 sites in California.</p> <p>Plan to enroll 300 transgender people for 48 weeks at 5 study sites.</p> <p>Transgender women residing in Lima, Peru.</p> <p>Pilot trial to be conducted with 100 transgender women.</p> <p>Latina transgender women of color living with HIV, residing in LA County, California.</p> <p>Transgender women of color living with HIV, residing in New York City.</p>	<p><a href="http://www.californiaaidsresearch.org/files/award-abstracts/prevention-and-linkage-to-care/triumph.html">http://www.californiaaidsresearch.org/files/award-abstracts/prevention-and-linkage-to-care/triumph.html</a></p> <p><a href="http://www.californiaaidsresearch.org/files/award-abstracts/prevention-and-linkage-to-care/sfdph-prep-t.html">http://www.californiaaidsresearch.org/files/award-abstracts/prevention-and-linkage-to-care/sfdph-prep-t.html</a></p> <p><a href="http://www.californiaaidsresearch.org/files/award-abstracts/prevention-and-linkage-to-care/tucsdp-prep-trans.html">http://www.californiaaidsresearch.org/files/award-abstracts/prevention-and-linkage-to-care/tucsdp-prep-trans.html</a></p> <p><a href="https://projectreporter.nih.gov/project_info_description.cfm?aid=9119194&amp;icde=35033916&amp;ddparam=&amp;ddvalue=&amp;ddsub=&amp;ct=1&amp;csb=default&amp;cs=ASC&amp;pball=">https://projectreporter.nih.gov/project_info_description.cfm?aid=9119194&amp;icde=35033916&amp;ddparam=&amp;ddvalue=&amp;ddsub=&amp;ct=1&amp;csb=default&amp;cs=ASC&amp;pball=</a></p> <p><a href="https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spms-transgender-women-color">https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spms-transgender-women-color</a></p> <p><a href="https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spms-transgender-women-color">https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spms-transgender-women-color</a></p>



**Table 2** (continued)

Intervention	Sample population	Source
<p>Twice monthly evening drop-in clinic. Considered a trans-only community space. After Hours offers: walk-in access to primary medical and behavioral health care, hormone therapy, sexual health and sexually transmitted infection testing and treatment, linkage to HIV care, case management, and resource advocacy. Also used SPNS funding to strengthen 2 support groups that were already underway, assess state of trans-affirming care at their institution, and revise hormone therapy protocols to increase access for transgender participants.</p>	<p>Transgender and gender non-conforming people, residing in Chicago.</p>	<p><a href="https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spns-transgender-women-color">https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spns-transgender-women-color</a></p>
<p>Trans-Access Used SPNS funding to work with local CBO to support existing support groups and other services at local drop-in center, as well as a community mobilization HIV testing effort. Offer access to HIV primary care at CBO, peer navigation services, wrap around services, and linkage to care. Also run a transgender leadership and speakers bureau.</p>	<p>Transgender people residing in San Francisco.</p>	<p><a href="https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spns-transgender-women-color">https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spns-transgender-women-color</a></p>
<p>Feminas This intervention integrates access to HIV prevention and treatment and access to hormone therapy for transgender women.</p>	<p>Transgender women residing in Lima, Peru.</p>	<p>Reisner et al. [64]</p>
<p>Structural (<i>n</i> = 4) Girlfriends Connect Six one-on-one sessions (2 pre-release and 4 post-release, start 2 months pre-release and continue for 3 months post-release) that focus on (1) post-release linkage to overall health care (including transition-related care), (2) transitional needs (e.g., housing, employment), and (3) individual risk behaviors (e.g., HIV/STI testing, PrEP referrals). Participants develop a reentry plan and linkage to care and risk reduction plan. Receive referrals based on needs and goals. Plans are reassessed and revised during post-release sessions.</p>	<p>Transgender women returning to the community after incarceration.</p>	<p><a href="http://transhealth.ucsf.edu/trans?page=programs-girlfriends-connect">http://transhealth.ucsf.edu/trans?page=programs-girlfriends-connect</a></p>
<p>TransLife Center Conduct community outreach and provide a transgender-affirming environment and programming to address social and structural determinants of health. At drop-in center, participants can access legal services, employment services, transgender-affirming health education, and linkage to medical care. Also conduct cultural competency provider training for social service and medical providers.</p>	<p>Transgender people residing in Chicago.</p>	<p><a href="https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spns-transgender-women-color">https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spns-transgender-women-color</a></p>
<p>Brandy Martell Project Legal clinic to help participants address legal barriers to seeking or adhering to HIV care and treatment. Also offer “Living Real” sessions, which are workshops about topics like HIV treatment, legal rights, transgender history, and transgender health care. BMP can help connect participants to professional skills training, internships, mentors, and job placements. Also facilitate enrollment at a health clinic.</p>	<p>Black and Latina transgender women who are HIV-positive, residing in Alameda County, California, and other neighboring counties.</p>	<p><a href="https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spns-transgender-women-color">https://hab.hrsa.gov/about-ryan-white-hiv-aids-program/spns-transgender-women-color</a></p>

## Conclusion

HIV disproportionately impacts transgender populations, particularly racial/ethnic minority transgender women and potentially transgender men who have sex with cisgender men. Gender disparities in HIV are driven by multi-level factors that include structural stigmas on the bases of gender, sexual orientation, race, and sex work that lead to community and individual-level risks (e.g., sexual networks with higher prevalence of untreated HIV, condomless sex). Therefore, multi-level sustained interventions are needed to have a population level impact [35]. Interventions which concurrently address health, psychosocial, and economic needs, as well as legal and policy reforms, may have the greatest potential to curtail new infections in transgender communities. In addition, following from the Gender Affirmation Framework, interventions that address community-identified needs related to social and medical gender affirmation may be particularly effective, as these unmet needs can interfere or compete with HIV prevention and treatment uptake and adherence.

Existing data provide a road map for interventions that can be implemented now. Organizations can implement transgender-specific group-based interventions with skilled facilitators, preferably individuals of transgender experience. HIV prevention and care services should ensure gender-affirming policies and practices, and explore provision of parallel services valued by transgender persons (e.g., hormone therapy) [1]. In the US context, policy and advocacy are needed to maintain Affordable Care Act provisions mandating anti-discriminatory care and coverage, which are essential to HIV prevention in this population. In consultation with local communities, transgender-focused strategies to increase PrEP and ART adherence can be developed and tested, including providing accurate information about drug interactions with hormones used for medical affirmation. Such interventions can be refined as the results of ongoing studies become available.

While research on transgender health and HIV continues to accumulate [5], knowledge is limited on HIV transmission and acquisition vulnerabilities among partners of transgender people, effective interventions for transgender men, and specific structural interventions to reduce HIV incidence in transgender populations. Our scoping review pointed to a number of gaps in the predominantly behavioral HIV prevention and care intervention research with transgender populations conducted to date. Specifically, these gaps include: (1) a significant dearth of research focused on transgender men and other transgender sub-populations (e.g., people with non-binary gender identities) who may experience unique HIV risk dynamics, (2) widespread inclusion of small samples of transgender women in intervention studies designed for MSM, and (3) limited research on structural, multi-level, and/or integrated intervention models with transgender populations. Given

this HIV prevention landscape, future intervention research and implementation should prioritize the following:

- (1) Ensure that all data collection (e.g., national censuses, demographic and health surveys, research enrollment tables) identifies and disaggregates data for transgender people and allows for selection of gender identity options beyond the male-female binary.
- (2) Tailor interventions for transgender people, including understudied sub-populations.
- (3) Design and evaluate innovative multi-level, biobehavioral, and/or integrated intervention models that address HIV in conjunction with gender affirmation.
- (4) Design and evaluate multi-level structural interventions that address HIV by prioritizing distal structural and social drivers of HIV risk.
- (5) Adapt and evaluate existing evidence-based HIV interventions (e.g., from the US CDC compendium of evidence-based interventions) for transgender populations.
- (6) Where transgender-specific research is not possible, ensure recruitment strategies, study design, and intervention components are trans-inclusive and powered to provide meaningful data for transgender people.

Using insights gained from existing data and being generated by ongoing research, it is feasible to significantly reduce the impact of HIV on transgender communities by preventing new infections and ensuring access to full engagement along the HIV care continuum.

## Compliance with Ethical Standards

**Conflict of Interest** Ayana Elliot has served on the speakers' bureau for Gilead Sciences Inc.

Tonia Poteat, Mannat Malik, and Ayden Scheim declare that they have no competing interests.

**Human and Animal Rights and Informed Consent** This article does not contain any studies with human or animal subjects performed by any of the authors.

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- Of importance
- Of major importance

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