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HIV risk and preventive interventions in transgender women sex workers

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Worldwide, transgender women who engage in sex work have a disproportionate risk for HIV compared with natal male and female sex workers. We reviewed recent epidemiological research on HIV in transgender women and show that transgender women sex workers (TSW) face unique structural, interpersonal, and individual vulnerabilities that contribute to risk for HIV. Only six studies of evidence-based prevention interventions were identified, none of which focused exclusively on TSW. We developed a deterministic model based on findings related to HIV risks and interventions. The model examines HIV prevention approaches in TSW in two settings (Lima, Peru and San Francisco, CA, USA) to identify which interventions would probably achieve the UN goal of 50% reduction in HIV incidence in 10 years. A combination of interventions that achieves small changes in behaviour and low coverage of biomedical interventions was promising in both settings, suggesting that the expansion of prevention services in TSW would be highly effective. However, this expansion needs appropriate sustainable interventions to tackle the upstream drivers of HIV risk and successfully reach this population. Case studies of six countries show context-specific issues that should inform development and implementation of key interventions across heterogeneous settings. We summarise the evidence and knowledge gaps that affect the HIV epidemic in TSW, and propose a research agenda to improve HIV services and policies for this population.

Introduction

Emerging data show the disproportionate burden of HIV in transgender women and transgender women sex workers (TSW) compared with other populations.^{1–3} Worldwide, HIV prevalence is about 19·1% in transgender women, with an odds ratio of 48·8 (95% CI 21·2–76·3) compared with the general adult populations.¹ This prevalence is greater for TSW who have an estimated worldwide HIV prevalence of 27·3%.²

Key messages

- Transgender women sex workers (TSW) face disproportionate risk for HIV, but have received little attention in the published literature
- TSW have a unique combination of risk factors, including biological (eg, illicit hormone and silicone injection), individual (eg, need for gender affirmation), interpersonal (eg, high-risk male partners), and structural (eg, systemic discrimination and violence based on gender expression, perceived sexuality, and occupation)
- HIV research on TSW in Africa, eastern Europe, and central Asia is urgently needed
- Evidence-based HIV prevention, care, and treatment interventions for TSW are urgently needed (eg, transgender-affirming HIV educational material, and integration of gender care into HIV care)
- Substantial reductions in the number of new infections could be accomplished with small changes in risk factors in this population by combination prevention approaches tailored to the setting

Laboratory-confirmed HIV data for transgender women is available from only 15 countries (one in North America, six in Asia Pacific, five in Latin America, three in Europe), which emphasises the need for greater attention to the HIV-related requirements of transgender women and TSW. In view of these data, TSW have been identified by UNAIDS as a key population at risk for HIV within the worldwide epidemic response.⁴

The term transgender refers to a diverse population whose gender identity or expression differs from their assigned sex at birth.⁵ Language about and recognition of this population vary by geography, ethnic origin, and culture, and continue to change over time. Transgender people are culturally recognised with specific social roles in some countries; in others, they receive little public acknowledgment.^{6,7} A subset of terms used for this population is presented in the appendix (p 1).

TSW have been reported in every continent, often in urban HIV epicentres. However, TSW and their partners and clients, have been largely absent from HIV national surveillance and programme interventions. Invisibility of TSW could be due to misclassification as men who have sex with men (MSM) or natal female sex workers, or attributable to systematic neglect. Sampling, methodological, and theoretical limitations in studies of TSW further undermine an effective public health response to the needs of this population.

The proportion of transgender women who sell sex is uncertain, because estimates are limited by non-probability sampling methods and different definitions of sex work. A US-based meta-analysis of HIV in transgender populations estimated that 24–75%

of transgender women sell sex.⁸ A report by United Nations Development Programme (UNDP) on transgender rights and HIV in Asia estimated that 54–80% of Asian transgender women had a history of sex work, although inconsistent definitions of sex work were used by studies cited in the report.⁹ Similarly, a global meta-analysis of HIV in transgender women noted that studies often did not report or disaggregate data by history of sex work, and that many studies used sampling methods (eg, time-location sampling) that could inflate estimates of sex work.¹ These problems have restricted the quantity and quality of data specific to TSW, and thus restricted our knowledge of risks and appropriate interventions for this population.

To address knowledge gaps about TSW, we review the HIV epidemiology and risk factors at the structural, interpersonal, and individual levels, and describe the prevention interventions for TSW. Our Review focuses specifically on sex work in transgender women, individuals categorised as male at birth who identify or express themselves as women irrespective of anatomy or medical interventions. Few data exist on sex work in transgender men, people assigned female at birth who identify or express themselves as men; thus, they are not included in our Review.^{8,10} We use mathematical modelling to assess the effect of various HIV prevention interventions on TSW in two distinct settings: Lima, Peru and San Francisco, CA, USA. Projections identify potential combination prevention interventions that are needed to halve the number of new infections within a 10-year period. Case-study scenarios provide descriptions of six regionally and epidemiologically diverse countries (India, Kyrgyzstan, Peru, South Africa, Thailand, and the USA) to show how structural, social, and epidemic contexts relate to HIV in TSW. First-person accounts emphasise why TSW must be included in the formulation of local and national HIV strategies.

HIV vulnerability: a complex interaction of multilevel risks

Structural risks: global discrimination

Because transgender women challenge gender norms, they are often socially, economically, politically, and legally marginalised.^{11–13} Discrimination against TSW stems from many forms of stigma relating to gender identity, gender expression, perceived sexual orientation, and involvement in sex work. Stigma could also be related to poverty, refugee or migration status, ethnic origin, substance misuse, and other factors. Published work from all regions has described the relation of stigma and discrimination with the general health and wellbeing of transgender women (appendix, p 3).

Legal environments worldwide express and sustain stigma for transgender women. In most countries, transgender people are either unable to obtain gender-appropriate legal identification or must undergo surgery to do so. Some transgender women do not want surgery

Search strategy and selection criteria

For the review of HIV risks we searched PubMed (MEDLINE), EBSCOhost, and Cumulative Index to Nursing and Allied Health Literature (CINAHL) for English language articles. Additional sources included publicly available reports, health surveys, and needs assessments done in transgender communities by governmental and non-governmental organisations, including the US Department of State, the International Lesbian and Gay Association, the International Lesbian and Gay Human Rights Commission, and The UN Development Programme. Medical subject headings (MeSH) terms for transgender (including “transsexual”, “cross dresser”, “transvestite”, and “Travesti”) were cross-referenced with terms for sex work (including “sex workers”, “prostitution”); “HIV or AIDS”; “sexually transmitted diseases”; and “silicone or soft tissue fillers”. We searched for country reports in Google Scholar using “transgender” AND (country or region). This search engine was used to investigate structural risks for transgender women and transgender women sex workers cross-referenced against the key terms “stigma”, “discrimination”, “criminalization”, and “structural risks.” Abstract reviews were done on unduplicated references for relevance, with subsequent full-text review for data abstraction. Using the AACODS checklist, three reviewers (DO, MBD, AR) assessed non-peer reviewed reports to assess quality, including transparency of methods and presence of disaggregated data for transgender women or transgender women sex workers.

For the review of interventions we searched PubMed, Embase, Global Health, Scopus, PsycINFO, Sociological Abstracts, CINAHL, and Web of Science for peer-reviewed studies. Additionally, we searched the Center for Disease Control’s Compendium of Evidence-based HIV Prevention Interventions. Conference abstracts were searched from the online archives of the International AIDS Conference. The search included terms for HIV and terms for sex work (including “prostitution”), and terms associated with transgender (appendix). Active studies were searched on the NIH RePORTER database using the term “transgender”. Studies published or presented between Jan 1, 2009, and Jan 20, 2014 were included. The search was not limited by language, country, or setting. However, to meet inclusion criteria, the study had to assess an intervention for transgender women using a before and after design or comparison groups and measure one of the several outcomes: HIV testing, HIV infection, sexually transmitted infections, condom use, frequency of condomless anal intercourse, use of illicit injectable hormones or soft tissue fillers (eg, silicone). Three reviewers (TP, ASS, SIK) independently assessed the full-text articles of all selected abstracts for eligibility and data were extracted using standardised forms. Study quality was assessed based on an eight-point rigour score developed for HIV behavioural intervention systematic reviews.

to change their bodies. However, for those who want such procedures, the surgeries might not be covered by health insurance (either private or socialised). Undergoing surgery can be costly relative to the income of many transgender women, and few surgeons are trained to undertake genital reconstruction.

The absence of either a legally authorised or a gender-appropriate identification could heighten the risk of discrimination.¹⁴ Absence of a gender-congruent identification could affect access to a range of services, such as health care, education, employment, and voting rights.^{14,15} Many jurisdictions offer no effective and enforceable legal protections against such discrimination.^{16,17} These sociopolitical factors marginalise transgender women and can precipitate entrance into sex work.^{15,18}

Stigma, discrimination, and no legal status of transgender identity restrict economic opportunities for transgender women.¹⁹ The financial benefits of sex work

See Online for appendix

For AACODS checklist see http://dSPACE.flinders.edu.au/jspui/bitstream/2328/3326/4/AACODS_Checklist.pdf

for transgender women who have little access to the formal labour market have been reported.²⁰ For example, sex work provides funds for livelihood and to pay for gender-affirming hormones, injections, and surgeries; and a more feminine appearance was reported to increase sex work earning power. Non-financial benefits of sex work for transgender women include a sense of community and social support from other TSW, and a sense of gender validation from male clients seeking their sexual services.^{21–24} Despite these potential benefits, sex work, particularly street-based sex work, could increase exposure to abuse and violence.²⁵ Studies have reported an association between violence, reduced rates of condom use, and increased risk of sexually transmitted infections in TSW.^{25–27}

TSW face many of the same structural risks as other sex workers.²⁸ Police harassment, exploitation, arrest, and violence against TSW have been reported in many countries, particularly where sodomy laws and criminalisation of sex work are used to oppress TSW.²⁹ Compared with male and natal female sex workers, TSW face greater violence from both police and clients.^{25,30} Furthermore, TSW might be at the bottom of the hierarchy of sex workers, because they receive lower pay than other sex workers despite engagement in higher risk activity.³¹ In addition to the laws used against male and female sex workers, laws prohibiting cross-dressing or impersonation of another sex are used to suppress the activities of TSW.³²

Possession of condoms is often used by law enforcement as evidence of sex work.³³ Consequences of this police practice include reduced access to condoms during sex work, reduced condom negotiation with clients, and increased condomless sexual intercourse in sex workers.^{33,34} Transgender women detained or imprisoned in connection with sex work are often placed in male facilities, where they are subject to both sexual and injection risks.³⁵ These factors create a climate of intimidation and reduce the likelihood of adherence to safer sexual practices.¹⁸ Finally, TSW often report that sexual health services ignore their needs, focusing instead on other at-risk populations such as natal female sex workers or MSM.^{11,36}

Relationship risks: partners of transgender women

The primary route for HIV transmission in transgender women is through condomless intercourse with male partners, including clients and stable and casual partners.^{1,37,38} Several studies have described how male partners can be an important source of gender validation for transgender women,^{15,21,23,24} which can undermine their intentions to engage in safer sex behaviour.^{38,39}

Despite the crucial part played by male partners and clients in HIV risk in TSW,⁴⁰ these men have been largely absent from the research literature or HIV prevention programmes.^{40–43} To our knowledge, no data specific to male clients of TSW have been reported. The sexual relationship patterns of men who have sex with

transgender women show many concurrent partners in diverse sexual networks, including natal women, men, and transgender women.^{42–44} These diverse partnerships present opportunities for HIV transmission across populations.^{42–45} Emerging data suggest that male partners of transgender women might be more likely to engage in high-risk drug-using behaviour (eg, injecting drugs, selling drugs, injecting in prison) than drug users who do not partner with transgender women.⁴⁶

Relationship status also affects sexual behaviour. TSW are more likely to have condomless receptive anal intercourse with stable partners than with clients.^{39,47–49} Within stable relationships, condomless receptive anal intercourse might show a sense of intimacy, but it has also been linked to higher rates of substance misuse and lower self-esteem and self-efficacy in transgender women.^{39,48} Additionally, many TSW report not knowing the HIV status of their partners.³⁹ Thus, stable relationships could be an important source of HIV infection for TSW.

Unprotected sex with male partners is the primary proximal HIV risk for TSW. We need research to understand the diverse sexual behaviours, identities, and methods needed to reach both TSW and their partners. Similar to natal female sex workers, TSW are less likely to use condoms with stable partners. Thus, the feasibility and acceptability of couples-focused interventions for TSW and their partners should be assessed.^{40,50}

Personal vulnerabilities: mental health and gender validation

Stigma, violence, and no social support have been associated with many mental health issues, including anxiety, depression, suicidality, and substance misuse.^{12,29,51–53} Over 60% of transgender women with a history of sex work had attempted suicide in one study.⁵³ Life stressors, depression, low self-esteem, discrimination, and substance misuse have been linked to increased sexual risk taking in transgender women.^{26,54,55} High levels of drug use have been reported in transgender women, and drugs are often used in the context of sex with partners and clients.^{29,51}

Transgender women who wish to feminise their appearance usually need hormone treatment and can undergo breast augmentation, facial feminisation surgeries, and genital surgeries.⁵ Transgender women face many barriers to accessing gender-related health care, including stigma and discrimination in medical settings, costly surgical interventions (often not covered by insurance), and few appropriately trained clinicians.^{14,52} Faced with these barriers, many use hormones without medical supervision and feminise their appearance with soft tissue fillers, such as industrial silicone, injected into the hips, buttocks, and breasts.⁵⁶ Contaminated needles for hormone or silicone injections pose a potential risk for HIV transmission; however, reported frequency of needle sharing for hormones is low, and no confirmed reports of HIV transmission through this practice have been documented.^{8,51}

Biological risks: shared and unique

Anal sex, particularly condomless receptive anal intercourse, is a highly efficient mechanism for HIV infection.⁵⁷ TSW engage in condomless receptive anal intercourse and insertive anal sex with clients and partners.^{8,48,58,59} Hormones used for feminisation can result in erectile dysfunction and interfere with correct condom use, thereby increasing HIV risk during anal insertive sex.²⁴ New data suggest that medroxyprogesterone acetate (a hormonal contraceptive) can increase HIV acquisition and viral shedding in natal women;⁶⁰ however, the effect of hormones used by transgender women on the susceptibility of the anal epithelium to HIV is unknown.

Only 11–16% of transgender women undergo vaginoplasty (appendix p 2).^{39,61} However, those who have had vaginoplasty could have additional risks through condomless receptive neovaginal intercourse.³⁹ Although the intact stratified squamous keratinised epithelium of the neovagina might be resistant to some sexually transmitted infections such as gonorrhoea and chlamydia, the use of urethral mucosa or sigmoid colon in constructing the neovagina could confer an increased risk of infection. The mechanical (ie, abrasion) and physiological (ie, accumulation of sebum and retained semen or lubricant) factors to which the neovaginal lining is exposed could increase the risk of microtears, especially for TSW who have frequent sexual intercourse. Post-operative granulation tissue, which can persist after the initial healing period, is another biological risk.⁶²

Interventions to prevent HIV infection

Early HIV interventions for transgender women were behaviourally based and had mixed success.^{63–65} During the past 5 years, HIV prevention has changed substantially, with increasing evidence for the effectiveness of biomedical interventions such as microbicides, pre-exposure prophylaxis (PrEP), and early treatment. Evidence-based HIV interventions for transgender women include six peer-reviewed journal articles, two International AIDS Society (IAS) Conference abstracts, and five ongoing NIH-funded studies (figure 1). Details of each journal article are summarised in the appendix (pp 6–12). These studies took place in Peru, Laos, Thailand, the USA, and India. None were highly rigorous, with methodological rating scores⁶⁶ ranging from 1 to 3 out of 8, and none focused exclusively on TSW.

The study of TSW in Lima, Peru compared characteristics of those seeking HIV testing at mobile outreach units with a fixed clinical site, and noted that the mobile unit was more likely to reach transgender women and to identify previously undetected HIV in this population.⁶⁷ There were no data on the proportion of transgender women who engaged in sex work; however, findings from another study in the same city noted that 64% of transgender women report sex work as their main economic activity.³⁶ The study in Laos

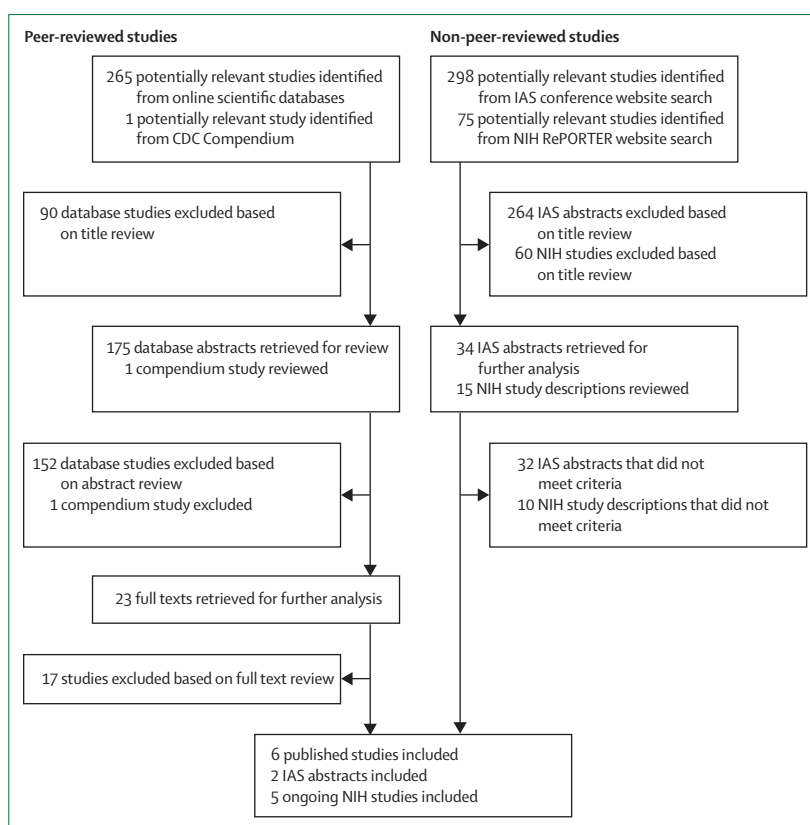


Figure 1: HIV prevention intervention systematic search protocol and results
CDC=Centers for Disease Control and Prevention. IAS=International AIDS Society. NIH=National Institutes of Health.

assessed the effect of an integrated social marketing approach to HIV prevention in kathoey (a Thai term for transgender women), who were not asked about sex work.⁶⁸ Intervention exposure was associated with a higher likelihood of condom use at last anal sex with casual partners and with greater use of water-based lubricant. However, the intention to use condoms with casual partners was reduced when water-based lubricant was available. Exposure to the Sisters programme in Thailand, a TSW-led HIV prevention programme that emphasises safe spaces and peer outreach, was associated with increased condom use at last sex with clients but not casual or stable partners. Greater than 90% of the study sample were sex workers.⁶⁹ The pilot study in the USA assessed Girlfriends, a group-level HIV behavioural risk reduction intervention for adults.⁷⁰ 38% of participants had engaged in sex work in the previous 3 months. After completion of the group sessions, participants reported fewer sexual partners and were less likely to have condomless anal sex with clients or condomless sex at last vaginal or anal sex with female and male partners.

Two studies in India (Andhra Pradesh and Tamil Nadu provinces) assessed the Avahan programme. Avahan is a well known large-scale HIV-prevention intervention for key populations worldwide.⁷¹ Established in 2003, Avahan

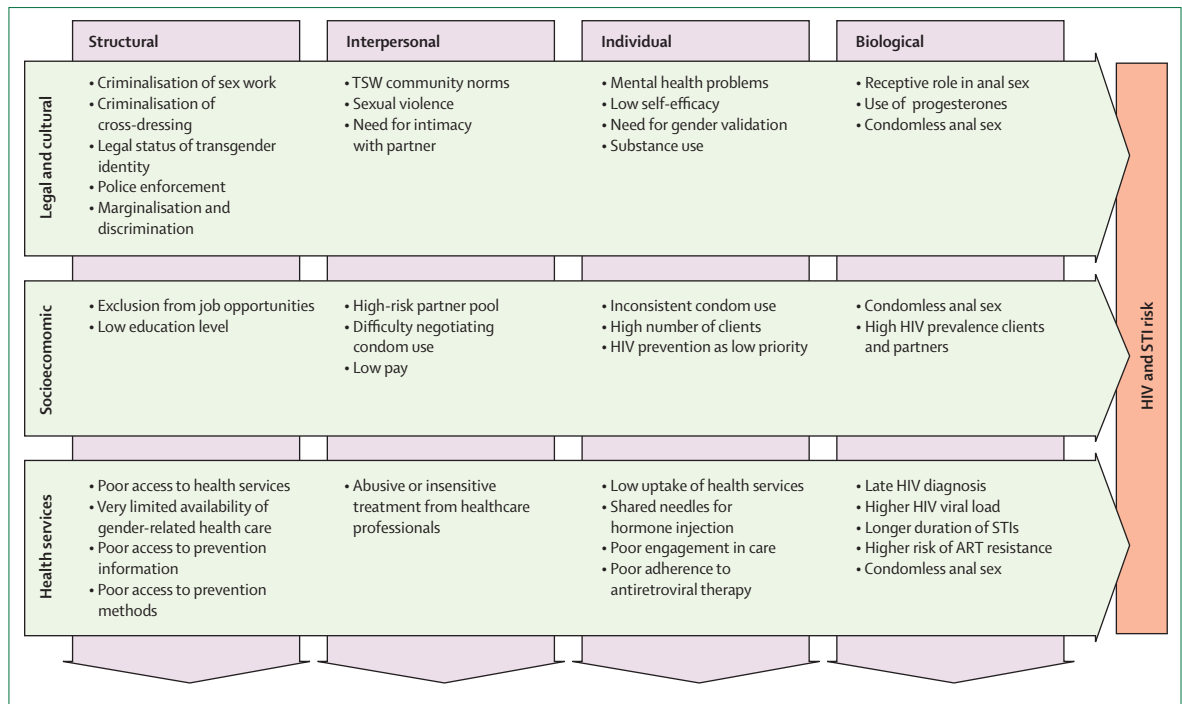


Figure 2: Conceptual framework for selected factors leading to increased HIV infection risk in TSW

Horizontal arrows show the association between higher level and biological factors, whereas vertical arrows show how effects in one domain can propagate to other domains. TSW=transgender women sex workers. STI=sexually transmitted infection. ART=antiretroviral therapy.

includes community engagement and empowerment, peer outreach, treatment of sexually transmitted infections, condom and lubricant distribution, community mobilisation, and advocacy for an enabling environment.⁷¹ In Andhra Pradesh, transgender women and MSM were more likely to report consistent condom use after Avahan implementation compared with baseline; the proportion HIV-positive after implementation did not change.⁷² Whereas only 4% of the sample reported sex work as their main occupation, 38–52% reported ever having a paying male partner. In Tamil Nadu, transgender women (20–40% were TSW) had reductions in both syphilis and HIV prevalence after implementation of the programme compared with baseline.⁷³

The CDC compendium of evidence-based behavioural interventions has none tailored for transgender women. However, the website provides a link to information about adapting the SISTA intervention for transgender women of colour.⁷⁴ SISTA is a group-level intervention shown to increase condom use in African-American women. T-SISTA, the adaptation guide, includes transgender-specific HIV vulnerability, sex work, adaptation examples and suggestions, and a Sheroes transgender pride campaign. No assessment of T-SISTA was reported in the published literature.

Two studies were identified in IAS abstracts from 2009 to 2013, one from the USA and the other was multinational. The USA-based study described an

assessment of the Transgender Family Programme,⁷⁵ which included the implementation of transgender-friendly clinic policies, standards, and training, and integration of HIV and gender care in a medical home model. The investigators did not describe the proportion of TSW, but they did report a significant decrease in sex work, needle sharing, unregulated hormone injections, and an increase in regular condom use in transgender women after participation in the programme. HIV prevalence in programme participants fell from 44% in 2007 to 38·3% in 2011 with one seroconversion during that period.

The other study was a secondary analysis of findings from the iPrex multinational study of PrEP in MSM and transgender women.⁷⁶ In the 366 iPrex participants (15%) who self-identified as transgender women or who reported using feminising hormones, there was no difference in new infections (n=11) in the treatment versus placebo group. PrEP was estimated to increase risk by 4% for transgender women and decrease risk by 49% for MSM; however, this difference was not statistically significant (p=0·13). Although the presenters suggested various reasons for the difference, no data were provided.

In the NIH database of active studies, there are five studies designed to test or assess HIV interventions in transgender women: a feasibility study of an antistigma intervention in health-care providers in Mumbai, India to improve access to HIV services for hijra (a south Asian term for transgender women); a feasibility study of a

	Lever	Size	Effectiveness	Coverage	Scale-up	Interventions
A	Higher condom use with clients	20%	80%	100% TSW and TSW-SP	Immediate	Periodic condom inundation coupled with condom negotiation skills; reduction in sexual violence through development and enforcement of protective laws and no police harassment; reduction of financial need
B	Higher condom use with stable partners	20%	80%	100% TSW-SP	Immediate	Periodic counselling to improve self-esteem and value health; condom erotisation skills; reduction in sexual violence
C	Fewer commercial transactions	20%	100%	100% TSW and TSW-SP	Immediate	Cash transfers or alternative economic activities to supplement sex work income; protective legal environment allowing to charge more
D	PrEP in TSW	..	44%	20% TSW and TSW-SP	2 years	Community mobilisation coupled with improved access to health services to prescribe PrEP, monitor HIV status, and provide strong adherence support
E	Early ART in TSW and stable partners	Lima, 2 years after infection; San Francisco, CA, 1 year after infection	92%	Lima, 40%; San Francisco, CA, 80% TSW, TSW-SP, and stable partners	Lima, 5 years; San Francisco, CA, 2 years	Community mobilisation coupled with improved access to health services to ensure frequent testing, linkage to care, and adherence monitoring; alternative testing strategies such as mobile clinics or home-based testing could lead to higher testing frequency

Changes are relative to the baseline. TSW=transgender women sex workers who are single. TSW-SP=transgender women sex workers who have a stable partner. PrEP=pre-exposure prophylaxis. ART=antiretroviral therapy.

Table: Description of changes in proximate factors modelled and associated interventions by code

telemedicine approach to improve engagement in care in transgender women of colour in Washington, DC; a randomised controlled trial of the LifeSkills programme (a six-session, peer-led, group intervention for sexually active transgender women aged 16–24 years) in Boston and Chicago (although not restricted to TSW, the sessions address survival sex and sex work);⁷⁷ a randomised controlled trial of T-Talk, a peer-led harm reduction and social support intervention for transgender women in New York City, NY, including TSW; and a pilot randomised controlled trial of Sheroes, a five-session group intervention based on gender affirmation in the USA.

Testing and adherence in the midst of other health priorities

Knowledge of HIV status and treatment adherence is essential for effective interventions based on antiretroviral therapy. In studies from Canada and Thailand only half of transgender women had ever been tested for HIV.^{10,54} Findings from other studies show that transgender women with HIV were less likely to receive antiretroviral therapy⁷⁸ and less likely to report adherence⁷⁹ than non-transgender participants. Transgender women who engage in sex work could face barriers to HIV testing and antiretroviral adherence due to similar structural factors that increase their vulnerability to HIV.⁸⁰ Stigma, past negative experiences, prioritisation of hormone therapy, and concerns about drug interactions between antiretroviral drugs and hormone therapy affect adherence in transgender women.⁸¹ During a WHO consultation on HIV prevention in sex workers, TSW identified the need for recognition of their specific health-care requirements (eg, hormone therapy and gender-appropriate education materials) within HIV strategies and services.⁸² Culturally competent, gender-affirming HIV care that integrates transition-related needs could be an effective facilitator of engagement in care and antiretroviral adherence for TSW.⁸³

Assessment of HIV preventive interventions for TSW by mathematical modelling

Mathematical modelling was used to identify the combination of interventions needed to halve the number of new infections within 10 years in TSW in two diverse social and epidemiological settings for which sufficient data were available: Lima, Peru and San Francisco, CA, USA. This is a development goal of the UN General Assembly, and is a crucial first step to guide programmatic planning for HIV prevention. The cities differ in HIV care coverage, patterns of sexual positioning in TSW, and income level. We built a deterministic model of HIV transmission in TSW, their male clients, and male stable partners, accounting for sexual positioning and differences in behaviour in TSW with each partner type. The model was parameterised with and fit to data from each setting, and intervention effects were based on the findings of our Review and relevant interventions shown to be effective in other populations (ie, PrEP and early antiretroviral therapy; appendix, pp 13–30).

We assessed the effect of realistic changes in proximate determinants that directly affect infection (condom use, number of partners, infectiousness) and that can be quantified in a model. However, changes in proximate determinants can only be made through appropriate interventions that consider the upstream psychosocial, social, and structural factors as shown in our conceptual framework (figure 2). For example, legal rights and better working conditions could allow TSW to earn a higher income with fewer clients, thereby decreasing their risk, especially in settings where TSW have a high client volume. The table gives a description of the changes in the proximate factors modelled, their size relative to the baseline value, associated effectiveness, coverage, and the type of interventions that would be needed. Interventions were systematically tested to identify which coverage levels and combinations could reach the desired aim. Cost was not included in this analysis because our focus was

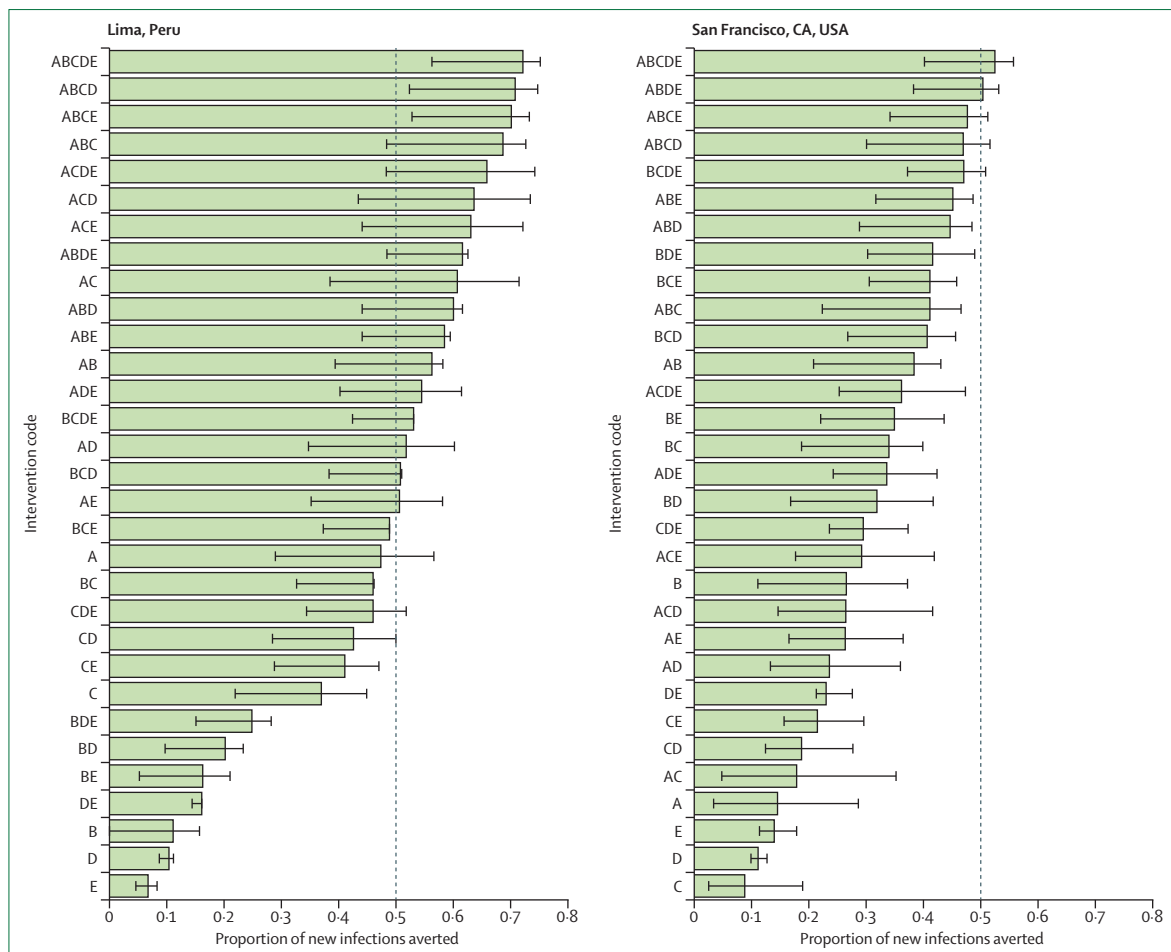


Figure 3: Proportion of new infections averted in transgender women sex workers (TSW) over 10 years with each intervention in isolation and in combination in Lima, Peru and San Francisco, CA, USA

The histograms are the best-fitting baseline epidemiological scenario. The error bars are the minimum and maximum effects obtained for the ten best epidemiological scenarios. A=condom use with clients (+20%). B=condom use with stable partners (+20%). C=number of commercial transactions (-20%). D=pre-exposure prophylaxis to 20% of all TSW (44% effectiveness). E=test and treat in TSW and stable partners (40% 2 years after infection in Lima, 80% 1 year after infection in San Francisco).

achieving substantial reduction in new infections in TSW. In Lima, when realistic coverage and effectiveness estimates are considered, the individual interventions with the greatest effect on incidence were increased condom use with clients (A) and decreased number of commercial transactions (C; figure 3). 50% reduction in new infections was achieved with a 20% increase in condom use with clients in combination with one of any of the other interventions. In the absence of an increase in condom use with clients, the combination of at least three interventions including a 20% reduction in commercial transactions, a 20% increase in condom use with stable partners, and PrEP use in 20% of TSW was needed, suggesting that reducing condomless sex with clients might be essential to achieve the proposed goal in this setting. In San Francisco, where coverage of antiretroviral therapy is higher and the number of clients lower, a 50% reduction in new infections needs the combination

of at least four interventions. A 20% increase in condom use with clients and stable partners, a 20% PrEP coverage, and treatment of 80% of HIV-positive patients 1 year after infection would be needed, although other combination prevention scenarios result in similar reductions. In isolation, the most effective intervention is an increase in condom use with stable partners. A high proportion of TSW in San Francisco report having a stable partner (nearly 70%) and condom use is lower with partners than with clients.

Although early treatment can reduce HIV transmission in discordant heterosexual couples,⁹ no studies have examined its effectiveness in TSW. Our models estimate that test and treat of TSW would achieve more than 10% reduction in new infections in San Francisco and less in Peru due to lower coverage and testing frequency. Therefore, a combination of interventions that can include, but are not restricted to, early treatment might be

most appropriate for TSW. These modelling analyses showed that a 50% decrease in HIV incidence in 10 years is an achievable goal in these two settings when implementing a tailored combination of feasible interventions. However, sustainability is crucial as these

interventions must be maintained throughout the entire period for the effect to be evident. Lasting change is best achieved through TSW-led strategies that address the distal (eg, violence) and proximal (eg, substance misuse) barriers to making those changes.

Panel: Community voices

Gulam, a peer educator with SWEAT, a local sex workers organisation, in Cape Town

I became a sex worker at the age of 19. I had finished school and my family left me alone in Cape Town. I had nowhere to go. I was living with people here, but I needed to have some income. I got into sex work through some of my friends at the time. I had never thought before when I had sex that people would pay something. But one guy paid me and that gave me a little bit of hope because in those days work was scarce and I did not have qualifications and skills. I realised that sex work is a type of work that you can do. It was so unexpected and it helped me a lot to get a stable life and to support myself, to pay my way through life.

But there are challenges—we face a lot of challenges, from client abuse to police harassment, and interpartner relationships. It is difficult, especially when the community start discriminating against you. There is a lot of stigma that goes around. Transgender women get that unwelcome feeling, they feel rejected at the clinics and the health-care service, and they feel discriminated against. Sometimes they do not attend their own clinics in their communities—they would rather go somewhere else, or they call us, so that one of us can go fetch them and take them to a friendly clinic, because we run a support group for transgender sex workers. For us, the coordinators and facilitators, we need to be strong, because somebody needs to be strong for them, so that at the end of the day when they leave our group they can feel relieved.

We do sensitisation at the clinics, from the receptionists up to the sister in charge. We want to show them that all people are human beings, and health care is there for everybody. Because who knows what the face of a sex worker looks like? To me, everybody is a sex worker. The best thing for me about being a peer educator is when we go out and we give our services to the sex workers, the faces that you see, the relief, they do not even have words to say thank you because they are too overwhelmed with the help that we give them. We help them at the Department of Home Affairs, assist them to attend clinics, assist them at hospitals, and assist them if the police arrest them. We make our voices heard—on what basis do these people have to suffer, they are human beings and they obey the law.

So it gives me great pleasure at the end of the day to say, “another day, another job well done”. You do not need a medal, just a simple thank you. I love my job and I love what I am doing, and I will still be doing it for many years to come, even when I am old and grey and retired my voice will still be there to be heard.

Joya Sikder: the journey of a hijra (transgender) from a sex worker to President of the National Platform of Sex Workers and President of Somporker Noya Setu, a national community based organisation (CBO) working for the rights of sexual minorities, in Dhaka, Bangladesh

I realised I was different when I was 8 or 9 years old. I loved cross-dressing, playing with girls, and being feminine. The ridicule started from my family and continued at school. When I was only 12 years old, I was raped by a neighbour on my way to school. It was a terrible experience, and I stopped going to school after that because of fear, denial, and guilt.

Later, I met some hijra and for the first time, I realised that I am a hijra. I used to visit them every day, and I learnt their special language called *ulti*. At age 16, I came to Dhaka with my family, and we were unexpectedly stricken by extreme poverty. There, I found some hijra who became my best friends. Once, I visited a hijra's residence and two hijra were counting money, lots of money! My friends told me that this money came from the sex trade and it was their earnings from one night only! I was so convinced that I became a sex worker.

Life as a sex worker was full of humiliations. Forced sex, physical abuse, and theft were common. Stigma was overwhelming, and I might even be sent to prison for having sex with males. I did not want to accept this situation, so when CARE approached hijras to work with us in 1998, I became an outreach worker for my community. Initially, when I gave condoms to other hijras, they made fun of me, saying condoms are to prevent pregnancy. That changed in 1999 when a national surveillance study found that a lot of us had syphilis.

We started thinking about how to address stigma and protect ourselves from HIV and other sexually transmitted infections. In 2000, we formed *Badhan Hijra Sangha*, a CBO for the hijra community. I learnt a lot in the process of forming this CBO. I also worked on surveillance studies and with a DFID-funded research project with International Centre for Diarrhoeal Disease Research, Bangladesh (*icddr*,b). This was a wonderful experience for me. I learnt about professionalism, management, networking, adaptability, and it shaped my leadership skills. I formed and led a hijra improvisational theatre group, *Rongberongthat*, that performed in front of national and international audiences. I joined the global fund project of *icddr*,b in 2010 and have been continuing with this project through which I have received an opportunity to directly work for the hijra community of Bangladesh.

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For Sex Workers Education and Advocacy Task Force in South Africa (Cape Town) see <http://www.sweat.org.za/>

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I have attended workshops and represented the hijra community in several countries. These experiences helped to shape my dream: a society free of stigma and discrimination against sexual minorities. In 2009, I was elected as the President of the Sex Workers Network of Bangladesh and was able to work for all sex workers, including hijra sex workers.

With this experience, I formed another CBO in 2010, Somporker Noya Setu. Through this CBO, I address developmental needs, health issues, stigma reduction, and capacity building for all sexual minorities, not just hijra.

Stigma persists. Some of my family members still do not accept me as a hijra. But, at the end of the day, I forget all this pain when I think about the love and respect I have received not only from the hijra community, but from all sex workers and sexual minorities and from many others who work for our community. It will take time to eliminate stigma and for society to acknowledge people outside the male–female gender dichotomy. However, the movement has started and we are on the right track. The Government of Bangladesh has officially approved the existence of hijra as a separate gender category in November 2013. Now I dream that based on this official approval, the hijra of Bangladesh will enjoy their gender identity along with males and females and their rights in all aspects as separate gender will be preserved and their lives will be protected.

Rose's story, Nepal

Growing up, my family did not have a lot of money or social status in the city in Nepal where we lived. My family tried to give my sister and me a good education and life, but when I was 15 I started being harassed in school because I was more feminine than the other boys. I could not share this situation with my family, so instead I started skipping school to deal with the abuse.

When I realised at 17 that I wanted to become a woman—that I was transgender—I left school. I started staying overnight with my transgender friends in Kathmandu where I felt freer, and soon I had moved out from my home to a shared house with other transgender people. Slowly they introduced me to sex work as a means of getting money—because I did not have

educational qualifications and now needed to support myself, it was the only way to make money. I also feared stigma and discrimination if I tried to get another job—I was dressing like a woman but the transition was not complete and they would know I was transgender.

I would sell sex every night, and I had to go everywhere and deal with clients of all ages. Once I was physically harassed by someone in the military—I was forced to have a sexual relationship with him, and as a younger person I did not know how to deal with the situation. I was too young to know I could say no. He threatened me that if I said no he would take me to the police.

I am still afraid to go to the health services because I am transgender. They do not understand and do not want to provide services to me. There is no specific place to go and have a check-up. I cannot access hormone treatment so I use contraceptive pills—I have taken two pills per day for 2 years.

Because of the stress of sex work, I decided to go abroad to the Middle East for work. My parents were pressuring me as their only son to make more money to support the family. I worked in domestic work but I was raped. Because I had been a sex worker I did not think I could report it, so I never told anyone. The household owner sent me back to Kathmandu where I now live.

My family still does not know I am transgender; when I go home, I wear my hair up and dress like a boy. I lead a double life, and it is really hard to manage.

There are many young transgender people like me who want to pursue an education, but they cannot due to the bullying and harassment. We are stuck in society, outside the social norms and without options for our future. Many young transgender sex workers try to commit suicide due to this stigma and discrimination. We have low self-esteem and other issues that are hard to overcome.

I would love to see laws and policies being implemented that protect our rights. I hope in the future that there is gender equality, so we do not have to hide and we can just be who we are. We want to access the things other young people access—education and employment.

Country case studies: examining TSW risks in context

Case studies provide contextual information that is essential for appropriate design and implementation of programmes for TSW. Six countries (India, Kyrgyzstan, Peru, South Africa, Thailand, and the USA) were selected to represent heterogeneous political, social, and epidemic contexts, and present data and gaps in knowledge. Countries were selected on the basis of geographical, epidemic, and demographic diversity, and whether there were data available from peer-reviewed publications or programmatic reports on transgender women or TSW from that country. Structural, social, and individual level

data for each of these six countries were reviewed and are described in the appendix (pp 38–40). The case studies describe how comprehensive interventions identified by the modelling could be implemented in each setting.

Recent data related to the epidemic context for TSW have been identified in India, Thailand, Peru, and the USA. An early understanding of HIV risks and prevalence in transgender women in these settings arose from HIV research in MSM, although epidemiology and intervention research has begun to focus separately on transgender women, and particularly TSW. In these settings, there are opportunities to better understand the specific HIV-related risks and needs of TSW, and to test acceptable,

For **Sex Workers Network of Bangladesh** see <http://www.swnob.com/>

For **Somporker Noya Setu** see <http://www.bengalfoundation.org/index.php?view=event/EventInfo.php&eventID=71> and <http://www.newagebd.com/detail.php?date=2012-06-08&nid=12978#UciHbjvtAUJ>

comprehensive, HIV prevention interventions. Thailand and India provide cultural contexts as countries in which transgender women have social (and now legal recognition, in India) as a third gender.

In countries such as Kyrgyzstan and South Africa, the understanding of HIV epidemiology in TSW is still nascent. Community-based and human rights organisations have increased visibility and mitigated stigma and violence against transgender people, including TSW. More research on HIV epidemiology and appropriate interventions for TSW are needed in these settings, ideally in collaboration with the community groups and human rights defenders already working towards the wellbeing of TSW. Detailed case-study descriptions for each country are provided in the appendix (pp 31–45).

Common themes, common struggles

TSW bear a disproportionate burden of HIV compared with other key populations worldwide (panel). Rigorous research, tailored interventions, and an improved environment for accessing HIV services have not progressed quickly enough. Although our aim was to identify and synthesise findings from studies worldwide, HIV research with transgender populations is scarce in sub-Saharan Africa, eastern Europe, and central Asia. Research is needed to understand the epidemiology and social context for TSW, and should begin by engaging existing transgender advocates and communities in those regions, and ensuring that data are disaggregated by sex, gender, and sex work status.

Where data were available, we note that stigma, discrimination, and exclusion from social and economic opportunities were common and served as the impetus for many transgender women to sell sex.⁴ For some TSW, sex work provides a way to find community and affirm their femininity.^{21,23,24,84} Within the context of sex work, economic distress and social disadvantage make it difficult for many TSW to protect themselves from HIV.⁸⁵ The intersection of legal and social discrimination based on sex work, gender identity, and perceived sexual orientation form barriers to HIV prevention and care. Stigma, discrimination, and violence against TSW need to be addressed to enable them to protect their health.

Mathematical modelling has shown that reductions in sexual violence against natal female sex workers can lead to substantial reductions in new HIV infections,⁸⁶ and the same outcome is probable for TSW. Victimization, substance use, and psychological distress promote HIV risk in TSW.^{87,88} Lessons learned from large-scale interventions, such as Avahan, emphasise the importance of multilevel approaches that address structural and individual risks.^{79,89} Access to legal gender change, economic and community empowerment, strong support networks, culturally competent mental and behavioural health services, and appropriate gender-related care are key components of effective HIV interventions for TSW.^{13,16,90,91}

Few evidence-based behavioural interventions exist for transgender women, and no interventions have been specifically designed for TSW. Although some NIH-funded studies are underway that might include TSW as a subset of transgender women, all but one are taking place in the USA, underscoring the need for intervention research in TSW outside North America.

Stratification by transgender and sex work status as the foundation for constructing scientific evidence

The lower effectiveness of PrEP in transgender women than MSM in the iPrex⁹² substudy raises questions about the best way to use this new HIV prevention approach. In our mathematical models, 20% PrEP coverage resulted in a 8–13% reduction in new infections in TSW. Strategically prioritising transgender women and high-risk MSM for PrEP could be a cost-effective intervention in some settings.^{93,94} However, both models assumed that PrEP was equally effective for MSM and transgender women. Acceptability of microbicides has been reported as greater than 90%⁹⁵ but only 37% for PrEP.⁹⁶ Research to confirm these findings and better understand the reasons for differences in effectiveness and acceptability is essential for the strategic use of PrEP in TSW.

Conclusions

Our Review, including the modelling analysis, was constrained by the limited quantity and quality of published research on HIV in TSW. Funders need to prioritise the research gaps for this population. An analysis of funding patterns at NIH⁹⁸ showed that only 0·1% of all NIH-funded studies addressed lesbian, gay, bisexual, and transgender health concerns and, of that 0·1%, less than 7% studied transgender populations. The near absence of NIH-funded research helps to perpetuate health disparities.⁹⁸ A greater prioritisation of TSW in HIV research, prevention, care, and treatment is necessary to address the gaps in data and services in this population that is burdened by HIV.

Contributors

TP and DO designed the Review and wrote the initial conceptual outline. TP wrote the first full draft of the manuscript. AR, SW, DO, MBD, and AS-S undertook the comprehensive literature review of HIV risk. TP, AS-S, and SIK did the systematic review of HIV prevention interventions. AB designed, completed, and described the modelling exercises. ALW developed and wrote the country case studies. All authors contributed to the interpretation of the findings and each author reviewed, edited, and approved the final manuscript.

Declaration of interests

We declare no competing interests.

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