

Transgender HIV and sexually transmissible infections

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Abstract. Transgender women across a range of different populations and settings have a high prevalence of HIV infection. There are fewer and often poorer quality studies of sexually transmissible infection (STI) prevalence. There are fewer studies in transgender men and, in general, the prevalence of HIV and STIs is lower than that of transgender women. Susceptibility to HIV and STI infection is inextricably linked to the increased vulnerability of transgender populations, a consequence of a lack of legal and social recognition that results in reduced access to educational and employment opportunities, which can result in high rates of transactional sex. Other measures of disadvantage, such as substance abuse and mental health problems, also increase the risk of HIV and STIs and have an effect on access to health care, highlighting the need for transgender-friendly multidisciplinary services offering individualised risk assessment, prevention advice and testing for STI and HIV.

Additional keywords: transwoman, transman.

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Introduction

Transgender is a term with a wide spectrum of meanings, but which generally refers to an individual's gender identity or expression when it differs from their birth sex. Sociocultural factors play a significant role in the expression and understanding of transgender identity, and labels applied to gender categories can change over time.

So, understanding the epidemiology of sexually transmissible infections (STIs) and HIV among transgender people is limited by adequately defining the population and sampling biases.¹ Compared with other groups, transgender women have been more often included in recent epidemiological HIV surveys of men who have sex with men (MSM), so there is more data about them than transgender men. Recent studies have highlighted that transgender men may be at particular risk of HIV and STIs if they are sexually active with men who have sex with men.

Transgender women

Epidemiology of HIV and STIs

The epidemiology of HIV and STIs among transgender women varies widely across different populations and settings. Most studies focus on HIV infection alone with relatively few examining STI prevalence or incidence. In many settings, the prevalence of HIV in transgender women is similar to or higher than that of MSM in the same setting. Some studies include only self-reported HIV status.

HIV

Global HIV prevalence

In 2013, a systematic review and meta-analysis reported that the overall pooled prevalence of HIV infection in transgender women globally was 19.1% (95% CI 17.4–20.7).² The prevalence in low- and middle-income countries varied from 2.2% in Pakistan to 43.7% in India. In high-income countries, the prevalence varied from 4.5% in Australia to 24.5% in Italy. All the countries included in the study had predominantly male HIV epidemics and only studies where HIV status was laboratory confirmed were included.

In 2008, another systematic review and meta-analysis compared HIV prevalence among transgender women who were and were not sex workers, male sex workers and female sex workers.³ This study found a HIV prevalence of 27.3% among transgender female sex workers (TFSW), 14.7% in transgender women not engaging in sex work, 15.1% in male sex workers and 4.5% in female sex workers. Although the substantial heterogeneity between studies was noted, those with a more rigorous study design had higher HIV prevalence among TFSW.

HIV prevalence in resource-rich settings

In 2008, a systematic review and meta-analysis reviewed 22 studies of transgender women in the US.⁴ The average HIV prevalence was 11.8% via self-report, and 27.7% in those papers with laboratory confirmed infection. Prevalence

was higher in African Americans (30.8% self-report, 56.3% laboratory confirmed) than White, Hispanic or other races. Most of the studies in this analysis were conducted in the late 1990s. A 2010 respondent-driven study of 314 transgender women in San Francisco found 39.5% were HIV positive based on laboratory testing. Associations with being HIV positive were being of a non-White race, current injecting drug use and low educational attainment.⁵ In a Los Angeles county-wide risk assessment survey conducted in 2004,⁶ of 107 transgender women, 43 of 82 (52.4%) reported being HIV positive, whereas in a sample of over 2000 transgender women recruited via outreach in Los Angeles between 2005 and 2011, 13.6% self-reported being HIV positive.⁷ In the latter study, variables associated with HIV positivity included recent methamphetamine or crack cocaine use, injecting drug/hormone use, any non-Hispanic racial minority and condomless anal sex during sex work.

HIV prevalence in Australia

The prevalence of HIV infection among transgender women in Australia has been reported in few relatively small studies based on sexual health clinic attendees. At the Melbourne Sexual Health Centre between 2011 and 2014, of 77 self-identified transgender women, seven (9%) reported being HIV positive, and one new diagnosis was made during the study.⁸ A private sexual health practice in Sydney reported a HIV prevalence of 4.2% among 131 transgender women attending between 2004 and 2011.⁹ Three of 36 (8%) transgender women attending the Sydney Sexual Health Centre between 1990 and 2006 were HIV positive.¹⁰

HIV prevalence in resource-poor settings

Since the 2013 meta-analysis and systematic review,² most studies have been from South and South East Asia and Latin America, and lower smaller numbers are from Sub-Saharan Africa, the Pacific Islands or the Middle East.

In China, an online survey recruited 52 transgender women, and although HIV testing rates were low – only 34.6% reported being tested – HIV prevalence was 11.1%.¹¹ A venue-based survey conducted in 2005 in Thailand of 484 transgender women found a HIV prevalence of 13.5%.¹² A recent study in Cambodia of 891 transgender individuals found a HIV prevalence of 4.15%.¹³ The Avahan HIV prevention program in Tamil Nadu, India, reported a non-significant decline in HIV prevalence among transgender women in the two rounds of the study, from 12% in 2006 to 9.8% in 2009.¹⁴ In Jakarta, Indonesia, the prevalence of confirmed HIV infection in community-recruited transgender sex workers was 22% in 2002,¹⁵ and ranged between 13 and 25% by 2007 across several large cities.¹⁶ In Pakistan, a HIV prevalence of 22% was reported in 306 transgender female sex workers.¹⁷ In Ho Chi Minh City, Vietnam, HIV prevalence was 18% in a sample of transgender women recruited during 2015 via snowball sampling.¹⁸

A 2016 study from West Africa revealed that HIV prevalence in transgender women recruited through respondent-driven sampling (RDS) ranged from 5.1% in Burkina Faso, to 18.8% in Togo and 23.5% in Cote d'Ivoire.¹⁹ The HIV

prevalence in Latin American countries in recent studies ranges from 18% in Colombia (RDS),²⁰ 16.9% in Peru recruited via snowball sampling,²¹ 31.2% pre-existing infection and 7% newly diagnosed in Brazil (RDS),²² and 34.1% in transgender sex workers in Argentina.²³

HIV incidence

In Peru, HIV incidence was reported as 2.3% (95% CI 2.1 to 2.5) per 100 person-years during 2008–09 among transgender women, although data was combined with MSM for this neighbourhood randomised controlled trial,²¹ and in Argentinian transgender sex workers, the incidence was 10.7% per 100 person-years,²³ while earlier in New York City, between 2004 and 2007, the cumulative HIV incidence was 2.8% (nine cases/316 person-years of follow-up).²⁴ Only 0.8% (1/131) of transgender women were diagnosed with acute HIV infection from 2008 to 2014 in a community-based study in San Diego, California, USA.²⁵

Transgender men

Relatively few and small studies describe the HIV and STI prevalence in transgender men. As for transgender women, some studies only include self-reported data.

HIV prevalence

A recent community survey in San Francisco found no HIV infection in 122 transgender men,²⁶ while a previous small survey in 1997 found 2% (2/123) of transgender men diagnosed with HIV.²⁷ A review of data from publically funded HIV testing sites in San Francisco in 2009 also found none of 59 transgender men tested were HIV positive.²⁸ However, a study of 69 transgender men and 223 transgender women attending the San Francisco STD (sexually transmitted disease) clinic between 2006 and 2009 found no difference in risk behaviours or HIV prevalence (pre-existing: 10.1–11.2%, $P=0.77$; new: 2.7–14%, $P=0.34$) between the two groups.²⁹

Between 2008 and 2014, 3% (1/30) of transgender men were diagnosed with HIV in an acute HIV study in San Diego.²⁵

From 2011 to 2015 in New York City, 4% of newly diagnosed HIV infections in transgender people were for transgender men, while transgender people comprise 1% of overall New York City HIV diagnoses.³⁰ A self-reported HIV prevalence of 0.6% was found among Canadian transgender men in a respondent-driven survey during 2009–10, where only 51% reported ever HIV testing.³¹

HIV incidence

We were unable to find reports of HIV incidence in the literature for transgender men.

Sexually transmissible infections

The few studies investigating STI prevalence and incidence among transgender people are summarised in Tables 1–3 below. Self-reported STI diagnoses have been excluded because they are more easily misclassified than HIV diagnoses. Two studies have reported STI prevalence in transgender men and one study has reported on STI incidence in transgender women.

More recent publications benefit from the use of improved STI testing technology at more anatomical sites.

Vulnerability to HIV and STIs in transgender women and men

A recent publication suggests it is important ‘not to conceptualise transgender people as an inherently vulnerable population; but rather, view this community as a population facing sex- and gender-related situated vulnerabilities for different health conditions’.¹

Here, we highlight several factors contributing to the increased vulnerability, particularly of transgender women, to HIV and STI infection. There are few published studies about the vulnerability of transgender men.

Transactional sex

High rates of stigma and discrimination result in limited educational and employment prospects for many transgender women. Lack of social and legal recognition are also drivers of HIV and STI risk in transgender women. As a consequence, many transgender women engage in transactional sex with estimates ranging from 24 to 75%.⁴ Transactional sex is more

likely to be street-based sex work and with higher rates of condomless sex with both paying and non-paying partners compared with cisgender female sex worker counterparts.^{32,33} There is emerging evidence that the non-paying partners of transgender sex workers may be at high risk of HIV through drug use and participation in other diverse sexual networks.³⁴ Several studies have reported that transgender women, who are identified as high risk for HIV infection through their self-reported behaviours, perceive their own risk as low.⁴

Two North American studies of transgender men reported high rates of sex work. In an Ontarian study, 15% of transgender women and men reported a history of sex work,³¹ and in a San Francisco STD clinic study, transactional sex was reported in 23% of the transgender men.²⁸

Psychosocial and sexual disadvantage

Transgender women encounter other disadvantage intersecting with HIV and STI risk, including increased rates of substance abuse, violence, homelessness and mental health diagnoses.³⁴⁻³⁷

More recently, additional STI and HIV risk has been identified for transgender men whose partners are transgender women and MSM, suggesting prevention priorities should encompass all of these groups.²⁶

Table 1. Sexually transmissible infection (STI) prevalence among transgender people in Australia

STD, sexually transmitted disease; NR, not reported; TV, trichomonas vaginalis; HSV, herpes simplex virus. Data are presented as prevalence %

STI	Sydney, STD clinic, 1990–2006, ^{10,A} Transwomen, n = 36	Melbourne, STD clinic, 2011–14, ⁸ Transwomen, n = 77	Melbourne, STD clinic 2011–14, ⁸ Transmen, n = 28
Gonorrhoea	3	4	9
Chlamydia	11	6	8
Genital warts	11	NR	NR
Syphilis	3	8	0
TV	0	NR	NR
HSV	3	NR	NR

^AThe data from six transmen reported in this study are not presented here.

Table 2. Sexually transmissible infection (STI) prevalence among transgender people in resource-rich settings

Data are presented as prevalence %

STI	San Francisco, STD clinic, 2006–09, ²⁹ Transwomen, n = 223	San Francisco, STD clinic, 2006–09 ²⁹ Transmen, n = 69
Gonorrhoea – anal	6.3	3.7
Gonorrhoea – pharyngeal	3.5	4.9
Gonorrhoea – urogenital	2	0
Chlamydia – anal	4.2	11.1
Chlamydia – pharyngeal	2.1	2.4
Chlamydia – urogenital	0	4.2
Syphilis	2.4	2.1

Table 3. Sexually transmissible infection (STI) prevalence/incidence among transgender women in resource-poor settings

NR, not reported; HSV, herpes simplex virus. Results are presented as percentages

STI	Lima, Peru, 2009, ²¹ n = 208 55% Sex workers (‘compensated sex’), Prevalence	Lima, Peru, 2009–20, ²¹ n = 208 55% Sex workers (‘compensated sex’), Incidence per 100 person-years ^B	Rio De Janiero, Brazil, 2015–16, ²² n = 345, Prevalence	Buenos Aries, Argentina, 2006–09, ²³ n = 80, Sex workers, Prevalence	Hi Chi Minh City, Vietnam, 2015, ¹⁸ n = 734, Community convenience sample, 35% sex workers, Prevalence	Indonesia, Java, 23 cities, 2007, ¹⁶ n = 748, Sex workers (‘waria’), Prevalence
Gonorrhoea – anal	12.3	15.3	13.5	NR	NR	20–37
Gonorrhoea – pharyngeal	9.7	8.6	NR	NR	NR	NR
Chlamydia – anal	20.2	16.9	14.6	5	NR	23–35
Chlamydia – pharyngeal	6.8	3.4	NR	NR	NR	NR
Syphilis ^A	NR	NR	28.9	50.4	18	25–30
HSV-2	80.7	12.2	NR	NR	NR	NR

^ABased on both treponemal and any titre non-treponemal seropositivity.

^BData combined with men who have sex with men (MSM) data to calculate the incidence within this neighbourhood randomised controlled trial.

HIV and STI healthcare access

HIV testing

Numerous barriers to health care can exist for transgender populations. These include refusal of care and a lack of competence among providers. This can translate into low levels of HIV testing among high-risk populations. In a national study in Canada conducted via respondent-driven sampling, 46% said they had never tested for HIV.³¹ Among transgender female sex workers interviewed in Bangkok, 50% reported never being tested.³²

HIV care

Retention in care, use of antiretroviral therapy (ART) and rates of HIV suppression in transgender patients were analysed from 13 HIV clinics in the US between 2001 and 2011.³⁸ There was no difference noted between transgender people living with HIV (PLWH) and non-transgender PLWH across these three care domains, although others have reported a delay in achieving viral suppression among transgender women compared with MSM³⁹ and that transgender women are less likely to report >90% adherence to ART than other respondents.⁴⁰

HIV pre-exposure prophylaxis

An international HIV pre-exposure prophylaxis (PrEP) study recruited 339 (14%) transgender women among whom adherence was poor, resulting overall in no significant prevention benefit to treatment.⁴¹ However, as with other study participants, predominantly MSM, transgender women who took >4 PrEP doses per week were highly protected against HIV. Interestingly, high-risk behaviour did not predict high adherence among transgender women as it did among MSM. Also, if PrEP study drug was not detected, the HIV incidence among transgender women was 4.9 per 100 person-years (3.0–7.7), while among MSM, it was 2.8 per 100 person-years (1.8–3.7), suggesting a much greater overall HIV risk for transgender women.

Conclusion

Transgender people are vulnerable to HIV and STI through a range of intersecting psychosocial factors, including having sex with each other and MSM. As a consequence, transgender people bear a very high burden of HIV and STI, especially in resource-poor countries, although transgender men remain understudied everywhere. Vulnerability and the high incidence of HIV and STI need to be addressed at broader cultural and systemic levels. However, health services can improve access to STI and HIV testing, care and prevention through developing transgender-friendly multidisciplinary services,⁴² including individualised risk assessment, prevention advice and clinical care. In the absence of stand-alone services, best practice models of care for transgender people provide clear and simple guidance and adoption by existing sexual health services should be a priority.⁴³

References

- 1 Reisner SL, Poteat T, Keatley J, Cabral M, Mothopeng T, Dunham E, *et al.* Global health burden and needs of transgender populations: a review. *Lancet* 2016; 388(10042): 412–36. doi:10.1016/S0140-6736(16)00684-X

- 2 Baral SD, Poteat T, Stromdahl S, Wirtz AL, Guadamuz TE, Beyrer C. Worldwide burden of HIV in transgender women: a systematic review and meta-analysis. *Lancet Infect Dis* 2013; 13(3): 214–22. doi:10.1016/S1473-3099(12)70315-8
- 3 Operario D, Soma T, Underhill K. Sex work and HIV status among transgender women: systematic review and meta-analysis. *J Acquir Immune Defic Syndr* 2008; 48(1): 97–103. doi:10.1097/QAI.0b013e31816e3971
- 4 Herbst JH, Jacobs ED, Finlayson TJ, McKleroy VS, Neumann MS, Crepaz N. Estimating HIV prevalence and risk behaviors of transgender persons in the United States: a systematic review. *AIDS Behav* 2008; 12(1): 1–17. doi:10.1007/s10461-007-9299-3
- 5 Rapues J, Wilson EC, Packer T, Colfax GN, Raymond HF. Correlates of HIV infection among transfemales, San Francisco, 2010: results from a respondent-driven sampling study. *Am J Public Health* 2013; 103(8): 1485–92. doi:10.2105/AJPH.2012.301109
- 6 Edwards JW, Fisher DG, Reynolds GL. Male-to-female transgender and transsexual clients of HIV service programs in Los Angeles County, California. *Am J Public Health* 2007; 97(6): 1030–3. doi:10.2105/AJPH.2006.097717
- 7 Reback CJ, Fletcher JB. HIV prevalence, substance use, and sexual risk behaviors among transgender women recruited through outreach. *AIDS Behav* 2014; 18(7): 1359–67. doi:10.1007/s10461-013-0657-z
- 8 Bellhouse C, Walker S, Fairley CK, Vodstrcil LA, Bradshaw CS, Chen MY, *et al.* Patterns of sexual behaviour and sexual healthcare needs among transgender individuals in Melbourne, Australia, 2011–2014. *Sex Transm Infect* 2016. doi:10.1136/sextrans-2016-052710
- 9 Pell C, Prone I, Vlahakis E. Comparison for male to female (MTF) and female to male (FTM) transgender patients attending Taylor Square Clinic (TSPC), Sydney, Australia: clinical audit results [abstract]. Proceedings of the 20th World Congress of Sexual Health; 2011 June 12–16; Glasgow, United Kingdom, *J Sex Med* 2011; 8(Suppl 3) Abstract nr 386.
- 10 Hounsfeld VL, Freedman E, McNulty A, Bourne C. Transgender people attending a Sydney sexual health service over a 16-year period. *Sex Health* 2007; 4(3): 189–93. doi:10.1071/SH07020
- 11 Best J, Tang W, Zhang Y, Han L, Liu F, Huang S, *et al.* Sexual behaviors and HIV/syphilis testing among transgender individuals in China: implications for expanding HIV testing services. *Sex Transm Dis* 2015; 42(5): 281–5. doi:10.1097/OLQ.0000000000000269
- 12 Guadamuz TE, Wimonasate W, Varangrat A, Phanuphak P, Jommaroeng R, McNicholl JM, *et al.* HIV prevalence, risk behavior, hormone use and surgical history among transgender persons in Thailand. *AIDS Behav* 2011; 15(3): 650–8. doi:10.1007/s10461-010-9850-5
- 13 Weissman A, Ngak S, Srean C, Sansothy N, Mills S, Ferradini L. HIV prevalence and risks associated with HIV infection among transgender individuals in Cambodia. *PLoS One* 2016; 11(4): e0152906. doi:10.1371/journal.pone.0152906
- 14 Subramanian T, Ramakrishnan L, Aridoss S, Goswami P, Kangaswami B, Shajan M, *et al.* Increasing condom use and declining STI prevalence in high-risk MSM and TGs: evaluation of a large-scale prevention program in Tamil Nadu, India. *BMC Public Health* 2013; 13: 857. doi:10.1186/1471-2458-13-857
- 15 Pisani E, Girault P, Gultom M, Sukartini N, Kumalawati J, Jazan S, *et al.* HIV, syphilis infection, and sexual practices among transgenders, male sex workers, and other men who have sex with men in Jakarta, Indonesia. *Sex Transm Infect* 2004; 80(6): 536–40. doi:10.1136/sti.2003.007500
- 16 Prabawanti C, Bollen L, Palupy R, Morineau G, Girault P, Mustikawati DE, *et al.* HIV, sexually transmitted infections, and

- sexual risk behavior among transgenders in Indonesia. *AIDS Behav* 2011; 15(3): 663–73. doi:10.1007/s10461-010-9790-0
- 17 Akhtar H, Badshah Y, Akhtar S, Kanwal N, Akhtar MN, Zaidi NU, *et al.* Prevalence of human immunodeficiency virus infection among transgender men in Rawalpindi (Pakistan). *Virol J* 2012; 9: 229. doi:10.1186/1743-422X-9-229
 - 18 Colby D, Nguyen NA, Le B, Toan T, Thien DD, Huyen HT, *et al.* HIV and syphilis prevalence among transgender women in Ho Chi Minh City, Vietnam. *AIDS Behav* 2016; 20(S3): 379–85. doi:10.1007/s10461-016-1485-8
 - 19 Stahlman S, Liestman B, Ketende S, Kouanda S, Ky-Zerbo O, Lougue M, *et al.* Characterizing the HIV risks and potential pathways to HIV infection among transgender women in Cote d'Ivoire, Togo and Burkina Faso. *J Int AIDS Soc* 2016; 19(3, Suppl 2): 20774.
 - 20 Zea MC, Reisen CA, del Rio-Gonzalez AM, Bianchi FT, Ramirez-Valles J, Poppen PJ. HIV prevalence and awareness of positive serostatus among men who have sex with men and transgender women in Bogota, Colombia. *Am J Public Health* 2015; 105(8): 1588–95. doi:10.2105/AJPH.2014.302307
 - 21 Castillo R, Konda KA, Leon SR, Silva-Santisteban A, Salazar X, Klausner JD, *et al.* HIV and sexually transmitted infection incidence and associated risk factors among high-risk MSM and male-to-female transgender women in Lima, Peru. *J Acquir Immune Defic Syndr* 2015; 69(5): 567–75. doi:10.1097/QAI.0000000000000667
 - 22 Grinsztejn B, Jalil EM, Monteiro L, Velasque L, Moreira RI, Garcia ACF, *et al.* Unveiling of HIV dynamics among transgender women: a respondent-driven sampling study in Rio de Janeiro, Brazil. *Lancet HIV* 2017; 4(4): e169–176.
 - 23 Dos Ramos Fariás MS, Garcia MN, Reynaga E, Romero M, Vaulet ML, Fermepin MR, *et al.* First report on sexually transmitted infections among trans (male to female transvestites, transsexuals, or transgender) and male sex workers in Argentina: high HIV, HPV, HBV, and syphilis prevalence. *Int J Infect Dis* 2011; 15(9): e635–40. doi:10.1016/j.ijid.2011.05.007
 - 24 Nuttbrock L, Bockting W, Rosenblum A, Hwahng S, Mason M, Macri M, *et al.* Gender abuse and incident HIV/STI among transgender women in New York City: buffering effect of involvement in a transgender community. *AIDS Behav* 2015; 19(8): 1446–53. doi:10.1007/s10461-014-0977-7
 - 25 Green N, Hoenigl M, Morris S, Little SJ. Risk behavior and sexually transmitted infections among transgender women and men undergoing community-based screening for acute and early HIV infection in San Diego. *Medicine* 2015; 94(41): e1830. doi:10.1097/MD.0000000000001830
 - 26 McFarland W, Wilson EC, Raymond HF. HIV prevalence, sexual partners, sexual behavior and HIV acquisition risk among trans men, San Francisco, 2014. (in press). *AIDS Behav* 2017. doi:10.1007/s10461-017-1735-4
 - 27 Clements-Nolle K, Marx R, Guzman R, Katz M. HIV prevalence, risk behaviors, health care use, and mental health status of transgender persons: implications for public health intervention. *Am J Public Health* 2001; 91(6): 915–21. doi:10.2105/AJPH.91.6.915
 - 28 Chen S, McFarland W, Thompson HM, Raymond HF. Transmen in San Francisco: what do we know from HIV test site data? *AIDS Behav* 2011; 15(3): 659–62. doi:10.1007/s10461-010-9859-9
 - 29 Stephens SC, Bernstein KT, Philip SS. Male to female and female to male transgender persons have different sexual risk behaviors yet similar rates of STDs and HIV. *AIDS Behav* 2011; 15(3): 683–6. doi:10.1007/s10461-010-9773-1
 - 30 HIV Epidemiology and field services program, New York City department of health and mental hygiene (US). HIV among people identified as transgender in New York City, 2011–2015 New York City Department of Health and Mental Hygiene, (NY) 2016: <http://www1.nyc.gov/assets/doh/downloads/pdf/dires/hiv-in-transgender-persons.pdf>
 - 31 Bauer GR, Travers R, Scanlon K, Coleman TA. High heterogeneity of HIV-related sexual risk among transgender people in Ontario, Canada: a province-wide respondent-driven sampling survey. *BMC Public Health* 2012; 12: 292. doi:10.1186/1471-2458-12-292
 - 32 Nemoto T, Iwamoto M, Perngarn U, Areesantichai C, Kamitani E, Sakata M. HIV-related risk behaviors among kathoey (male-to-female transgender) sex workers in Bangkok, Thailand. *AIDS Care* 2012; 24(2): 210–9.
 - 33 Nemoto T, Operario D, Keatley J, Han L, Soma T. HIV risk behaviors among male-to-female transgender persons of color in San Francisco. *Am J Public Health* 2004; 94(7): 1193–9. doi:10.2105/AJPH.94.7.1193
 - 34 Poteat T, Wirtz AL, Radix A, Borquez A, Silva-Santisteban A, Deutsch MB, *et al.* HIV risk and preventive interventions in transgender women sex workers. *Lancet* 2015; 385(9964): 274–86. doi:10.1016/S0140-6736(14)60833-3
 - 35 Nuttbrock L, Hwahng S, Bockting W, Rosenblum A, Mason M, Macri M, *et al.* Lifetime risk factors for HIV/sexually transmitted infections among male-to-female transgender persons. *J Acquir Immune Defic Syndr* 2009; 52(3): 417–21. doi:10.1097/QAI.0b013e3181ab6ed8
 - 36 Nuttbrock L, Bockting W, Rosenblum A, Hwahng S, Mason M, Macri M, *et al.* Gender abuse, depressive symptoms, and HIV and other sexually transmitted infections among male-to-female transgender persons: a three-year prospective study. *Am J Public Health* 2013; 103(2): 300–7. doi:10.2105/AJPH.2011.300568
 - 37 Wilson EC, Santos GM, Raymond HF. Sexual mixing and the risk environment of sexually active transgender women: data from a respondent-driven sampling study of HIV risk among transwomen in San Francisco, 2010. *BMC Infect Dis* 2014; 14: 430. doi:10.1186/1471-2334-14-430
 - 38 Yehia BR, Fleishman JA, Moore RD, Gebo KA. Retention in care and health outcomes of transgender persons living with HIV. *Clin Infect Dis* 2013; 57(5): 774–6. doi:10.1093/cid/cit363
 - 39 Wiewel EW, Torian LV, Merchant P, Braunstein SL, Shepard CW. HIV diagnoses and care among transgender persons and comparison with men who have sex with men: New York City, 2006–2011. *Am J Public Health* 2016; 106(3): 497–502. doi:10.2105/AJPH.2015.302974
 - 40 Sevelius JM, Carrico A, Johnson MO. Antiretroviral therapy adherence among transgender women living with HIV. *J Assoc Nurses AIDS Care* 2010; 21(3): 256–64. doi:10.1016/j.jana.2010.01.005
 - 41 Deutsch MB, Glidden DV, Sevelius J, Keatley J, McMahan V, Guanira J, *et al.* HIV pre-exposure prophylaxis in transgender women: a subgroup analysis of the iPrEx trial. *Lancet HIV* 2015; 2(12): e512–9. doi:10.1016/S2352-3018(15)00206-4
 - 42 Wylie K, Knudson G, Khan SI, Bonierbale M, Watanyusakul S, Baral S. Serving transgender people: clinical care considerations and service delivery models in transgender health. *Lancet* 2016; 388(10042): 401–11. doi:10.1016/S0140-6736(16)00682-6
 - 43 Coleman E, Bockting W, Botzer M, Cohen-Kettenis P, DeCuypere G, Feldman J, *et al.* Standards of care for the health of transsexual, transgender, and gender-nonconforming people, Version 7. *Int J Transgenderism* 2012; 13(4): 165–232. doi:10.1080/15532739.2011.700873