

# HIV Prevalence, Sexual Partners, Sexual Behavior and HIV Acquisition Risk Among Trans Men, San Francisco, 2014

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**Abstract** We surveyed 122 trans men using a hybrid sampling method that included randomly selected physical and online venues and peer referral to measure HIV prevalence and risk behaviors. HIV prevalence was 0% (one-sided 97.5% confidence interval 0–3.3%). Of 366 partnerships described, 44.8% were with cisgender women, 23.8% with cisgender men, 20.8% with trans men, and 10.7% with trans women. Condomless receptive anal and front hole/vaginal sex averaged one to three episodes per six months. HIV prevalence in trans men is likely closer to heterosexual cisgender men and women in San Francisco than trans women or MSM. Prevention prioritizing trans women and MSM, coupled with individualized and relevant sexual health education for trans men with partners from these populations, may best address the HIV prevention needs of trans men. Systematic collection of transgender status in Census and health data is needed to understand other health disparities among trans men.

**Keywords** Trans men · Sexual behavior · HIV prevalence

## Introduction

HIV infection disproportionately affects sexual, gender, and racial/ethnic minorities in the US and internationally [1–3]. A synthesis of HIV prevalence studies further indicates that no population has borne a relatively higher burden of HIV than trans women (persons born male who

identify as other than male currently), with odds of infection 48.8 times that of the general population and HIV prevalence as high as 40% in many places including San Francisco [3–5]. However, data on HIV prevalence among trans men (persons born female who identify other than female currently) are scant, based on small and selective samples, and therefore highly uncertain [6–10].

Meanwhile, many studies have raised concern for high risk of HIV acquisition among trans men [4, 7–14]. Qualitative studies, service delivery data, and surveys designed primarily to recruit other lesbian, gay, bisexual, transgender, and intersex (LGBTI) populations find trans men participating in sexual networks that overlap populations disproportionately affected by HIV, such as men who have sex with men (MSM) and trans women [7–17]. For example, in San Francisco’s publicly funded HIV testing programs, 61% of trans men had recent sex with men and 64% identified as gay men [10]. In Ontario, Canada, 63.3% of 227 trans men recruited through the social networks of trans women identified as gay men or had sex with men [16]. Another study found trans men reporting unprotected sex with HIV-positive MSM partners [17]. HIV and other sexually transmitted infections (STI) among trans men have been identified in clinics and reported to the health department in San Francisco [9, 18].

Unfortunately, studies of trans men face challenges. Trans men do not meet sex or transmission risk categories in the surveillance system of the US Centers for Disease Control and Prevention (CDC) and therefore HIV and AIDS cases (or other reportable diseases) among trans men are not tracked nationally [1]. In local jurisdictions that do track transgender status in HIV/AIDS surveillance data, such as San Francisco [18], information depends on medical records that may not be complete in recording transgender status. Trans men are also not a key population of the CDC-

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coordinated National HIV Behavioral Surveillance (NHBS) surveys [19] and therefore data on prevalence and related risk behaviors using standardized sampling methods are not available. Trans men are often not included in other research on LGBTI populations in sufficient numbers for statistical inference [6]. As was the case with other populations at risk for HIV at the beginning of the epidemic, research on trans men is limited by the hidden nature of the population stemming from marginalization in society, extreme minority status in the general population, data originating from convenience and clinic samples, and theoretical and logistical challenges in obtaining representative, probability-based samples [20–22].

We therefore set out to conduct a large survey designed specifically for trans men with the most rigorous sampling design feasible to obtain as precise and accurate measures of HIV and risk behaviors among trans men as we could. We present HIV prevalence and partner-by-partner sexual risk behavior in a survey of 122 trans men recruited in San Francisco in 2014 using a hybrid sampling methodology.

## Methods

### Study Population and Sampling Design

Our survey's target population was trans men age 18 years and above who live, work, or frequent San Francisco and reside in one of the ten San Francisco Bay Area counties. Trans men were defined as persons assigned a female sex at birth and currently identify as something other than the typically associated gender (i.e. woman). Our targeted sample size was 125, gauged to be the largest study of trans men conducted in San Francisco to date (a prior survey in 1997 had  $N = 123$ ) [23]), and to provide sufficient precision around an HIV point prevalence estimate to conclude whether prevalence is below or above 5%.

We used a hybrid sampling design to maximize efficiency of reaching trans men, foster diversity of enrollment, avoid self-selection bias, and approximate a probability basis. The sampling method comprised three sequential phases, capitalizing on venue- and peer- referral based recruitment approaches.

The study began with a formative investigation that included focus group discussions, key informant interviews, literature review, and field observation to identify and map the places and times where trans men congregate. "Brick and mortar" venues included bars, cafés, social support groups, and events where at least four trans men could be found in a 4 h period. The list of potential venues was refined to determine the peak hours of attendance by trans men. The first phase of recruitment used the roster of venues and peak time periods as a sampling frame.

Recruitment events were randomly selected from a list of all possible four-hour venue–day–time periods. At the selected venue–day–time event, potential participants (i.e. all persons who appeared in any way to be male) were intercepted and assessed for eligibility. If eligible and consenting to the study, participants were interviewed and tested for HIV in a private location near the venue or scheduled at the study site. This phase of recruitment was similar to the time-location sampling method used by the CDC in the National HIV Behavioral Surveillance Surveys for MSM [19].

Social media applications used for dating were incorporated into the second recruitment phase. Prior studies found many trans men locate partners on dating applications [21, 24]. To include online venues, formative data were collected through participant observation to develop a list of social media dating applications with members who indicated they were trans men on their profiles. We identified locations around the city of San Francisco in which trans men could be found seeking partners within a 0.5 mile radius at different days and times. The roster of all such radius–day–time periods was added to the sampling frame of "brick and mortar" venue–day–time periods that were randomly selected in the second recruitment phase. When a radius–day–time period was selected, the recruiter-interviewers positioned themselves at the center of the circle and consecutively approached persons online with trans man listed on their profile. The use of the application required membership and an appealing picture as an "avatar" as done for outreach programs in nearby San Mateo county [25]. When contact was made, the recruiter-interviewers identified themselves and the purpose of the study, as done for physical venue recruitment.

The third phase of recruitment continued the venue and social media recruitment as described above and added peer referral. The peer referral methods resembled respondent-driven sampling as done for the National HIV Behavioral Surveillance Surveys for people who inject drugs [19] in that each participant was given three to five coupons used to refer eligible trans men from their social circles to the study. Persons receiving the coupons called the number provided to schedule an appointment for the interview and HIV testing at the study site. These participants were in turn given three to five coupons for referrals. The three methods were added sequentially and continued until recruitment slowed as we approached the targeted sample size, at which point we stopped the venue and online events and no further referrals presented themselves.

### Measures

HIV testing was done using the Insti-Rapid assay (bioLytical technologies, Vancouver, Canada). The testing

procedures would have used a second rapid test for confirming initially positive or indeterminate results; however, this did not occur and all participants tested negative on the one test. STI history was elicited by self-report. The questionnaire was interviewer administered. The present analysis focuses on HIV prevalence, demographic characteristics, partner types, and sexual behavior. Formative data including input from trans men community members was used to develop measures for the study. Sexual behaviors were measured by asking about sexual acts in the last six months with up to three partners each for cisgender women, cisgender men, trans men, and trans women (i.e. up to 12 partners total). In the event, few participants had more than three of any partner type. “Receptive” sex was defined as when the respondent reported there was penetration of their front hole/vaginal or anus by a sexual partner, without defining what was used for penetration. “Insertive” sex was taken as however the respondent defined it without asking them to specify what they inserted. Respondents were asked to total the number of sexual acts by type, per partner, and the number for which condoms were used over the six month period. This partner-by-partner, act-by-act approach has been used in surveys of other populations at risk for HIV [26].

### Statistical Methods

The present study uses descriptive statistics only, given the small sample size. A one-sided 97.5% confidence interval on the 0% HIV prevalence was constructed assuming a Poisson distribution.

### Ethical Considerations

All participants provided written informed consent to enroll in the study, with the option to separately decline HIV testing (chosen by nine of 122). A cash incentive of \$50 was given for the interview (with or without HIV testing), and \$10 for each successful referral of others trans men to the study.

### Results

A total of 122 trans men were enrolled in the survey. The first 11 were recruited from physical venue-day-time periods randomly selected from the sampling frame (phase 1). An additional ten were recruited when randomly selected area-day-time social media dating application periods were added to the sampling frame (phase 2). An additional 101 were enrolled during the period when peer referral was added to the recruitment methods (phase 3). For the whole recruitment period, 79 participants were

recruited through random intercept at venues, 11 through random intercept on social media dating applications, and 32 through peer referral.

The largest proportion of trans men enrolled (47.5%) were in their 20s (Table 1). The majority were white (77.1%) and self-identified as “trans male” (74.6%) as opposed to “male” (25.4%). Approximately half had a college degree or higher education (49.2%) and lived with family or friends (50.8%). Nearly one in 20 (4.9%) lived in a homeless shelter or single room occupancy hotel. There were no significant differences in demographic characteristics when comparing trans men recruited at venues (including online) versus through peer referral. Any medical or surgical steps taken towards gender transition was reported by 88.5%, with 81.9% currently taking testosterone, and 49.2% having had any gender transition surgical procedure (58 top surgery, 20 bottom surgery, 2 phalloplasty). Very few participants reported having syphilis, gonorrhea or Chlamydia in the past 12 months (<3% for all STIs).

All participants self-reported being HIV negative. Of 113 agreeing to test, none (0%) were HIV positive (one-sided 97.5% confidence interval 0–3.3%, Poisson exact).

Table 2 arrays the partnerships reported by the 122 trans men in the preceding six months, by partner gender. A total of 366 partnerships were described. In terms of partnership types, 38.0% were main partners, 58.5% were casual partners, and 1.1% were exchange or partners that were not classified. The largest proportion (44.8%) was cisgender women. Of 87 cisgender male partners (23.8% of all partners), 73 (19.9% of all partners and 83.4% of cisgender male partners) were known to have other cisgender male sexual partners (i.e. they were MSM). These cisgender MSM included the only partners known to be HIV positive, 4 or 1.1% of partnerships overall. The majority of partnerships (79.5%) were reported to be HIV negative; for 16.7%, the respondent did not know the partner’s HIV status. One in five (20.8%) partnerships of trans men were other trans men; 10.7% were trans women. There was no difference in the number of partners of trans men recruited at venues (including online) compared to those of trans men referred to the study by peers.

In terms of sexual acts, oral sex (performing or receiving) was the most common for all partner types, with condoms seldom used (Table 3). Mean acts of oral sex ranged from receiving oral sex 3.1 times in six months from cisgender men to performing oral sex 15.1 times in six months for cisgender women. Mean acts of receptive front hole/vaginal sex was highest among trans men with trans women partners, at 4.6 times in the preceding six months with 2.8 being without a condom. For trans men with cisgender male partners, mean episodes of front hole/vaginal sex was 2.4 in six months, with 1.3 being

**Table 1** Demographic characteristics, gender transition, and HIV status among trans men in San Francisco, 2014

Characteristics	N = 122	
	n	%
Age group in years		
18–20	10	8.2
21–29	58	47.5
30–39	40	32.8
40+	14	11.5
Race/ethnicity		
Asian	6	4.9
Black	8	6.6
Hispanic	4	3.3
White	94	77.1
Other/mixed	10	8.2
Current gender identity		
Male	31	25.4
Trans male	91	74.6
Education, highest level completed		
Up to high school or GED	14	11.5
Some college	48	39.3
Bachelor degree or higher	60	49.2
Living situation		
Own home	12	9.8
Live alone, rent	10	8.2
Live with sex partner	24	19.7
Live with friends or family	62	50.8
Hotel, single room occupancy hotel, shelter	6	4.9
Other	8	6.6
Income per year (USD)		
0–12,040	36	29.5
12,041–36,234	46	37.7
36,235–71,544	30	24.6
71,545+	10	8.2
Taken any steps towards gender transition	108	88.5
Currently taking testosterone	100	81.9
Any surgical procedures for gender transition	60	49.2
HIV status (study test result)		
Negative	113	92.6
Positive	0	0
Not tested	9	7.4

without a condom. Trans men reported a mean of 1.3 acts of receptive anal sex in the preceding six months among those with trans women partners, with a mean of 0.9 acts being condomless. The corresponding means were 0.8 and 0.8 with cisgender male partners. By recruitment method, behaviors with cis women did not differ by whether trans men were recruited at venues or by referral. Behaviors with cis men, trans men, and trans women partners were

significantly higher among trans men recruited at venues compared to those recruited through peers (*t* test, all *p*-values < 0.05).

## Discussion

Our survey designed to recruit a large, sample of trans men in San Francisco found no HIV infections. Statistically, our sample size places the likely prevalence of HIV among trans men between 0 and 3.3%—provided that recruitment is reasonably unbiased. The latter concern and lessons learned from the history of the HIV epidemic call for strong caution before concluding that trans men are at low risk for acquiring HIV infection. Therefore, we carefully consider the context, our limitations, risk behavior, and other data available for trans men to date.

Of 35,868 people diagnosed with HIV or AIDS in San Francisco since 1981 [27], five cases were trans men (personal communication, Dr. Susan Scheer, June 2016). This compares to 643 trans women [27]. Of note, transgender status has been systematically recorded in surveillance data only since 1996 and may be missed if not explicitly documented in medical records. The largest study of HIV prevalence among trans people in San Francisco, conducted in 1997, found 2 infections among 123 trans men tested for a prevalence of 1.6% (95% confidence interval 0.2–5.9%) [23]. Seventeen years later, the current study's estimate is not significantly different (Fisher's exact test, *p* = 0.498). A study of patient visits to the San Francisco's municipal STD clinic from 2006 through 2009 found seven records with HIV-positive status noted among 69 records from trans men [9]. However, the data did not distinguish unique individuals from clinic visits, leaving the possibility of duplicate records, and the clinic is also a large provider of HIV care. Of publicly funded HIV tests performed in San Francisco in 2009, no HIV-positive cases were detected among 59 records from trans men [10].

HIV prevalence figures for trans men from elsewhere are comparable. HIV case reporting in New York City from 2006 to 2011, counted 264 of 23,805 persons diagnosed with HIV as transgender, of whom 2% (*N* = 5) were trans men [28]. A review of published studies through January 2007 found five measuring HIV prevalence among trans men [6]. Three found no trans men self-reporting as HIV positive with sample sizes of 31, 32, and 33. A fourth had two of 60 (3.3%) self-reporting as HIV positive. The fifth, in San Francisco already cited above [23], tested HIV prevalence at 1.6% (two of 123). In two prevalence studies subsequent to the review, one of 69 trans men (1.4%) self-reported as HIV positive in an online survey [7], and one of 30 (3.3%) trans men

**Table 2** Sexual partnerships of trans men in last six months, San Francisco, 2014 (N = 122 respondents)

Partnerships	All n (%*)	Cisgender women n (%)	Cisgender men n (%)	Trans men n (%)	Trans women n (%)
Total partnerships	366 (100)	164 (44.8)	87 (23.8)	76 (20.8)	39 (10.7)
Mean number	3.0 (SD 1.4)	1.3 (SD 1.0)	0.7 (SD 1.2)	0.6 (SD 1.0)	0.1 (SD 0.7)
Type					
Main	139 (38.0)	82 (22.4)	30 (8.2)	17 (4.6)	10 (0.3)
Casual	214 (58.5)	77 (21.0)	54 (14.8)	56 (15.3)	27 (7.4)
Exchange	3 (0.8)	0 (0)	3 (0.8)	0 (0)	0 (0)
Don't know	10 (0.3)	5 (1.4)	0 (0)	3 (0.8)	2 (0.5)
Partner HIV status					
Negative	291 (79.5)	130 (35.5)	60 (16.4)	65 (17.8)	36 (9.8)
Positive	4 (1.1)	0 (0)	4 (1.1)	0 (0)	0 (0)
Unknown	61 (16.7)	34 (9.3)	23 (6.3)	11 (3.0)	3 (0.8)
Partner has sex with cisgender men	199 (54.4)	51 (13.9)	73 (19.9)	54 (14.8)	21 (5.7)

\* All percentages are of all partnerships, N = 366

**Table 3** Mean sexual acts in the last six months by partner gender, trans men in San Francisco, 2014 (N = 122 respondents)

Sexual act	Cis women Mean (SD)	Cis men Mean (SD)	Trans men Mean (SD)	Trans women Mean (SD)
Performed oral sex	15.1 (22.8)	4.4 (9.5)	8.7 (23.1)	9.8 (19.8)
Without condom	14.9 (20.7)	4.4 (9.5)	8.7 (23.1)	9.8 (19.8)
Received oral sex	11.9 (19.4)	3.1 (5.5)	9.2 (26.3)	8.7 (17.8)
Without condom	10.6 (15.9)	3.1 (5.5)	9.2 (26.3)	8.7 (17.8)
Receptive vaginal/"front hole" sex	na	2.4 (5.9)	unk*	4.6 (9.7)
Without condom	na	1.3 (3.8)	unk*	2.8 (8.6)
Receptive anal sex	na	0.8 (2.6)	unk*	1.3 (5.0)
Without condom	na	0.8 (2.6)	unk*	0.9 (3.4)

\* The questionnaire did not distinguish if the sexual act was done with phalloplasty, metoidioplasty, or other phallus

volunteering for screening of acute HIV infection in San Diego tested HIV positive [8]. The cumulative evidence of our study and the literature to date are consistent with our study's HIV prevalence being between 0 and 3.3%, and consistent in that trans men, including trans MSM, have not experienced the level of HIV infection of trans women or MSM.

Our sexual behavior data do corroborate the potential for HIV acquisition noted in other studies from partners who are MSM, trans women, and HIV positive [4, 7–17]. In our study, a plurality of the partners of trans men were cisgender women, but substantial numbers of partners were trans women and MSM. Among the MSM partners, four were known to be HIV positive. Fortunately for the present, we found that condomless front hole/vaginal and anal sex with these partners, occurring on average only one to three times per six months, has not translated into higher HIV prevalence. In comparison, oral sex, which conveys much lower risk of HIV transmission [29], was far more common for all partner types.

We acknowledge limitations to our study which stem from the global challenges to research among trans men and our specific shortcomings. The most serious is the threat to external validity; that is, uncertainty in how representative our sample is of all trans men. Given the relatively small population size, with male and female trans gender persons together estimated to be 0.76% of the adult population of California [30], a true probability-based sample of trans men in a survey of the whole population would have to be very large in order to include a sufficient number of trans men. Such an undertaking should be done on national and local levels, but was unfortunately beyond our resources. Instead, we sought to efficiently obtain the largest sample of trans men in San Francisco to date while including random sampling of venues and a probability basis and reducing potential bias by not recruiting from facilities such as STD clinics, HIV care sites, HIV counseling and testing sites, or trans health clinics. Our sample is also not based on self-referral, online or otherwise.

Without true census data to characterize trans men, we do not know if our mixed sampling methods achieved or approximated a representative sample. For example, relying on the profile for those recruited online may bias toward individuals who are “out” as trans men. We observe that trans men in our study were younger, whiter, more educated, and had lower income than the general population of San Francisco [31]. These observations might be explained by migration of young trans men to San Francisco, a city that has historically attracted sexual and gender minorities from all parts of the US [32]. For example, with respect to race/ethnicity, our sample composition of 77.1% white matches the 2015 census projections for the US being 77.1% white [33]. Nonetheless, uncertainty remains as to whether our sample represents the true prevalence and risk for HIV. It is possible that trans men with known or likely HIV-positive status were less likely to participate in our study. On the other hand, studies based in STD clinics, HIV testing programs, and care providers may over-estimate prevalence and risk behavior as they serve populations at higher risk or persons known to be HIV positive [6, 8–12, 20].

Another limitation is the small sample size. Although we set out to conduct the largest survey of trans men in San Francisco to date, we fell three short of our targeted sample size and one short of the largest survey in San Francisco [23]. Small sample size is a challenge of all studies of trans men with few achieving more than 100 [20, 23, 34]. The impact of the small sample size in our survey is reflected in the width of the 97.5% confidence interval (0–3.3%). This likely range places HIV prevalence among trans men below the 4.8% estimated for at-risk heterosexual, non-injection drug using cis-gender men (i.e. their risk for HIV is only from having partners at risk) [18]. For comparison, the prevalence of HIV among trans women in San Francisco was 39% in 2010 [5], 24% among cisgender MSM in 2014 and estimated to be 0.09% among cisgender women who were not PWID in 2010 [35]. Small sample sizes are able to detect effects of this magnitude; therefore, our survey provides evidence that the risk for HIV among trans men is likely much lower than for trans women and cisgender MSM [18].

We also recognize limitations in our measures and mode of data collection. Based on community input, we did not ask respondents what they meant by “insertive” vaginal or anal sex, whether by phalloplasty, metoidioplasty, dildo, or other meaning. Similarly, we did not ask respondents to clarify what “receptive” front hole/vaginal or anal sex meant when their partner was a trans man or trans woman. We chose instead to let them include whatever each term meant to them deferring to community input, the need for cultural competence in this first study of its kind, the complexity of the timing of events and surgeries, and the

time imposition of a lengthy questionnaire. Unfortunately, our choice left us unable to assess what potential risk for HIV these acts might have entailed. We also acknowledge that data collection asking about risk partner-by-partner, counting sexual episodes with each, taxes recall [26]. Lastly, we acknowledge that interviewer administered surveys may not capture sensitive information such as sexual behavior as well as other modes of survey administration.

We believe the limitations of the present study do not reverse our conclusion that the current prevalence of HIV infection among trans men does not place them among our city’s most affected populations. The interpretation of low HIV prevalence among trans men is based not only on the current data, but also the prevalence found in 1997 [23], the cumulative surveillance case reports from 1996 to present [27], and the published literature from San Francisco [10]. Our data concur with the body of literature that many trans men have sexual partners who are trans women and cisgender MSM—populations who are the most severely affected—and therefore the potential for HIV acquisition does exist. However, given the demonstrably higher levels of HIV infection among MSM and trans women, prioritizing treatment and prevention of onward transmission from these is likely to be the most effective prevention approach for trans men. In addition, relevant sexual health education on reducing acquisition risk among trans men who have sexual partners from these populations is also warranted. Lastly, including transgender identity in the US Census and in disease surveillance reporting would help detect and strengthen our understanding of disparities in other areas of health for trans men as well as being able to monitor any future changes in HIV prevalence in this population.

**Disclaimer** The views expressed herein do not necessarily reflect the official policies of the City and County of San Francisco; nor does mention of the San Francisco Department of Public Health imply its endorsement.

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#### Compliance with Ethical Standards

**Conflict of interest** All authors declare no conflicts of interest.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

## References

- Centers for Disease Control and Prevention. HIV Surveillance Report, 2014; vol. 26. <http://www.cdc.gov/hiv/library/reports/surveillance/> (2015). Accessed 28 Sept 2016.
- van Griensven F, van Wijngaarden JWL, Baral S, Grulich A. The global epidemic of HIV infection among men who have sex with men. *Curr Opin HIV AIDS*. 2009;4(4):300–7.
- 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.
- Poteat T, Scheim A, Xavier J, Reisner S, Baral S. Global epidemiology of HIV infection and related syndemics affecting transgender people. *J Acquir Immune Defic Syndr*. 2016;72(Suppl 3):S210–9.
- Santos GM, Wilson EC, Rapues J, Macias O, Packer T, Raymond HF. HIV treatment cascade among transgender women in a San Francisco respondent driven sampling study. *Sex Transm Infect*. 2014;90(5):430–3.
- Herbst JH, Jacobs ED, Finlayson TJ, et al. Estimating HIV prevalence and risk behaviors of transgender persons in the United States: a systematic review. *AIDS Behav*. 2008;12:1–17.
- Scheim AI, Santos GM, Arreola S, et al. Inequities in access to HIV prevention services for transgender men: results of a global survey of men who have sex with men. *J Int AIDS Soc*. 2016;19(3 Suppl 2):20779.
- 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.
- 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.
- Chen S, McFarland W, Raymond HF. Male transgenders in San Francisco: what do we know from HIV test site data? *AIDS Behav*. 2010;15:569–620.
- Reisner SL, White JM, Mayer KH, Mimiaga MJ. Sexual risk behaviors and psychosocial health concerns of female-to-male transgender men screening for STDs at an urban community health center. *AIDS Care*. 2014;26(7):857–64.
- Reisner SL, Hughto JM, Pardee DJ, et al. LifeSkills for Men (LS4 M): pilot evaluation of a gender-affirmative HIV and STI prevention intervention for young adult transgender men who have sex with men. *J Urban Health*. 2016;93(1):189–205.
- Sevelius J. “There’s no pamphlet for the kind of sex I have”: HIV-related risk factors and protective behaviors among transgender men who have sex with nontransgender men. *J Assoc Nurses AIDS Care*. 2009;20:398–410.
- Bockting W, Huang C-Y, Ding H, Robinson B, Rosser BRS. Are transgender persons at higher risk for HIV than other sexual minorities? A comparison of HIV prevalence and risks. *Int J Transgenderism*. 2005;8:123–31.
- Bockting W, Benner A, Coleman E. Gay and bisexual identity development among female-to-male transsexual in North America: emergence of a transgender sexuality. *Arch Sex Behav*. 2009;38:688–701.
- Bauer GR, Redman N, Bradley K, Scheim AI. Sexual health of trans men who are gay, bisexual, or who have sex with men: results from Ontario, Canada. *Int J Transgenderism*. 2013;14:66–74.
- Rowniak S, Chesla C, Rose CD, Holzemer WL. Transmen: the risk of gay identity. *AIDS Educ Prev*. 2011;23:508–20.
- San Francisco Department of Public Health. HIV/AIDS Epidemiology Annual Report 2010 <https://www.sfdph.org/dph/files/reports/RptsHIVAIDS/HIVAIDAnnRpt2010.pdf> Accessed 28 Sept 2016.
- Gallagher KM, Sullivan PS, Lansky A, Onorato IM. Behavioral surveillance among people at risk for HIV infection in the U.S.: the national HIV Behavioral Surveillance System. *Public Health Rep*. 2007;122(Suppl 1):32–8.
- Bauer GR, Scheim AI. Sampling bias in transgender studies. *Lancet Infect Dis*. 2013;13(10):832.
- Reisner SL, Perkovich B, Mimiaga MJ. A mixed methods study of the sexual health needs of New England transmen who have sex with nontransgender men. *AIDS Patient Care STDS*. 2010;24(8):501–13.
- Kupper LE, Nussbaum R, Mustanski B. Exploring the diversity of gender and sexual orientation identities in an online sample of transgender individuals. *J Sex Res*. 2012;49:244–54.
- 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;91:915–21.
- Benotsch EG, Zimmerman RS, Cathers L, et al. Use of the internet to meet sexual partners, sexual risk behavior, and mental health in transgender adults. *Arch Sex Behav*. 2016;45(3):597–605.
- Lampkin D, Crawley A, Lopez TP, Mejia CM, Yuen W, Levy V. Reaching suburban men who have sex with men for std and hiv services through online social networking outreach: a public health approach. *J Acquir Immune Defic Syndr*. 2016;72(1):73–8.
- Pinkerton SD, Galletly CL, McAuliffe TL, DiFranceisco W, Raymond HF, Chesson HW. Aggregate versus individual-level sexual behavior assessment: how much detail is needed to accurately estimate HIV/STI risk? *Eval Rev*. 2010;34(1):19–34.
- San Francisco Department of Public Health. HIV/AIDS Epidemiology Annual Report 2015 <https://www.sfdph.org/dph/files/reports/RptsHIVAIDS/AnnualReport2015-20160831.pdf> Accessed 28 Sept 2016.
- 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.
- Page-Shafer K, Dilley J, McFarland W, et al. Risk of HIV infection attributable to oral sex among men who have sex with men and in the population of men who have sex with men. *AIDS*. 2002;16:2350–2.
- Flores AR, Herman JL, Gates GJ, Brown TNT. How many adults identify as transgender in the united states? Los Angeles, CA: The Williams Institute, June 2016. <http://williamsinstitute.law.ucla.edu/wp-content/uploads/How-Many-Adults-Identify-as-Transgender-in-the-United-States.pdf> Accessed 11 Aug 2016.
- United States Census Bureau. <http://www.census.gov/quickfacts/table/PST045215/06075.00> Accessed 28 Sept 2016.
- Black D, Gates G, Sanders S, Taylor L. Why do gay men live in San Francisco? <http://sfpl.org/pdf/main/glc/glbtsfdemographics.pdf> Accessed 28 Sept 2016.
- United States Census Bureau. <http://www.census.gov/quickfacts/table/PST045215/00> Accessed 28 Sept 2016.
- Wierckx K, Elaut E, Van Hoorde B, et al. Sexual desire in trans persons: associations with sex reassignment treatment. *J Sex Med*. 2014;11(1):107–18.
- San Francisco Department of Public Health. HIV/AIDS Epidemiology Annual Report 2010. <https://www.sfdph.org/dph/files/reports/default.asp>. Accessed 3 Jan 2017.