



Published in final edited form as:

J Acquir Immune Defic Syndr. 2010 December 1; 55(Suppl 1): S17–S22. doi:10.1097/QAI.0b013e3181f9c04c.

HIV among People who Use Drugs: A Global Perspective of Populations at Risk

Jamila K. Stockman, PhD, MPH and Steffanie A. Strathdee, PhD

University of California San Diego, Division of Global Public Health, Department of Medicine

Abstract

This paper examines the epidemiology of HIV among selected subgroups of drug users around the world who are ‘most at risk’ - men who have sex with men (MSM), female sex workers (FSWs), prisoners, and mobile populations. The underlying determinants of HIV infection among these populations include stigma, physical and sexual violence, mental illness, social marginalization, and economic vulnerability. HIV interventions must reach beyond specific risk groups and individuals to address the micro- and macro- level determinants that shape their risk environments. Public health interventions that focus on the physical, social, and health policy environments that influence HIV risk-taking in various settings are significantly more likely to impact the incidence of HIV as well as other blood-borne and sexually transmitted infections across larger population groups.

Keywords

HIV; injection drug use; men who have sex with men; female sex workers; prisoners; mobile populations

Introduction

Illicit drug use, particularly injection drug use, accounts for significant proportions of new HIV infections in Eastern Europe, South America, and east and southeast Asia,¹ where the estimated prevalence of HIV infection among some IDU subpopulations exceeds 40%.¹ In this paper, we focus on the epidemiology of HIV among some of the most vulnerable populations, including men who have sex with men, male-to-female transgendered persons, female sex workers, incarcerated individuals and mobile populations. We also highlight the role of shared contextual factors and aspects of the risk environment that contribute to the spread of HIV among these groups since their commonality may suggest opportunities for the development of new interventions.

Men Who Have Sex with Men (MSM)

In the U.S., HIV surveillance data show MSM to be the only behavioral risk group with increasing incidence.² Estimates of HIV incidence in MSM averages 1.55 per 100 persons per year,³ but is likely higher among MSM who are ethnic minorities and MSM who inject drugs (MSM-IDU).

Corresponding Author: Steffanie A. Strathdee, PhD, University of California San Diego, Division of Global Public Health, Department of Medicine, 9500 Gilman Drive, MC 0507, La Jolla, CA 92093-0507, Phone: (858) 822-1952; Fax: (858) 534-7566, sstrathdee@ucsd.edu.

MSM are vulnerable to HIV for many reasons, including social marginalization, stigma, sexual abuse and victimization, suicidality, and high levels of drug and alcohol use, especially among men who do not identify as gay or bisexual.⁴ MSM-IDU may be doubly stigmatized and isolated because of their dual identities, experiencing homophobia by IDU because they are MSM, and stigma from MSM because they are IDU. The recent increase in HIV among MSM in the U.S., particularly among young MSM of color, has been attributed to several factors, including safer sex fatigue and a reduced concern about HIV now that effective antiretroviral therapies (ART) are available.⁵ However, increases in use of methamphetamine and other 'club drugs' are also critical factors. Methamphetamine is typically snorted or smoked, or injected, and more rarely, inserted rectally. Rates of methamphetamine injection vary widely by region and subgroup.⁶ In a sample of HIV-positive MSM methamphetamine users in San Diego, CA, 42% had ever injected drugs, and those who did so were more likely to be bisexual, report more health and social problems, and score higher on measures of impulsivity, low social support, and social rejection.⁷ In San Francisco, 52% of MSM at two HIV outpatient clinics reported injection methamphetamine use,⁸ and in Los Angeles County, 39% of MSM who had used methamphetamine in the lifetime reported injection drug use.⁹

Methamphetamine use among MSM, including gay, bisexual, non-identifying MSM and male-to-female transsexuals, is prevalent in the U.S., Australia, and western Europe,³ and the incidence of HIV is two to three times higher among MSM who use methamphetamine/amphetamines compared MSM who don't.³ In the U.S., 13% of adult MSM residing in Chicago, Los Angeles, New York and San Francisco, reported using methamphetamine in the past six months.¹⁰ Among MSM ages 15–22 years surveyed in 7 U.S. urban areas, 20% reported methamphetamine use in the prior six months.¹¹ The Sydney Gay Community Period Survey in Australia found that, between 2002 and 2005, methamphetamine use in the past six months increased from 26% to 39% among HIV-positive MSM, and from 14% to 22% among HIV-negative men.¹² In London, England, researchers found that methamphetamine use among MSM ranged from 19.5% for men surveyed in gyms, 12.6% for those in HIV treatment, and 8.3% for those in HIV testing clinics.¹³ Methamphetamine use has been associated with increased risks for transmission of multi-drug-resistant HIV.³ MSM who use methamphetamine often engage in high risk behaviors, including unprotected sex with multiple partners, marathon sex, and polydrug use.^{14–17} A recent review found that methamphetamine use was causally associated with HIV infection, although the evidence was inconclusive as to whether the causal pathway was direct, indirect or both.¹⁸

The epidemiology of HIV among MSM in the U.S. and other developed countries has been well characterized, while that among MSM in sub-Saharan Africa is only now garnering attention. In 2007, the prevalence of male same-sex behavior in the general population was estimated at 0.03–0.9% in Kenya, 0.06–3.6% in South Africa, and 2.3% in Tanzania.¹⁹ HIV prevalence among African MSM was estimated to range from 7.8% in Sudan to 34.3% in Cape Town,¹⁹ and the estimated incidence of HIV was 20.4 per 100 person-years among MSM in Mombasa, Kenya, most of whom were male sex workers.¹⁹

Few studies have examined potential linkages between the epidemic of HIV and the epidemic of drug abuse in Africa.²⁰ Among drug-using MSM in Cape Town, Durban, and Pretoria, South Africa, considerable overlap was found for drug use and sexual risk behaviors, with high rates for use of crack cocaine and heroin, risky sexual behavior, and HIV transmission.²⁰ Recent attempts to criminalize homosexuality in Uganda and Kenya are likely to drive the behavior underground but not end it and to undermine public health efforts in HIV prevention. Such policies subvert the health and human rights of sexual minorities and will only help to fuel the HIV epidemic.

Unfortunately, few of the interventions for MSM who use drugs have proven efficacious or sustainable. Interventions for non-identifying MSM may benefit from addressing community norms, sexual identity, and stigma as underlying factors that contribute to drug use and sexual risk behaviors.²¹ Interventions for bisexual and non-identifying MSM-IDUs should consider race/ethnicity as well as social and contextual factors, such as internalized homophobia and fear of disclosure.²² Consideration should also be given to the potential risks of HIV transmission to their male sexual partners and their female sexual partners and heterosexual IDUs.^{21, 23–24}

HIV prevention research focused on MSM-IDUs of color in the U.S. should consider the cumulative effects of racism, stigma, and homophobia, as well as contextual, structural, and socioeconomic factors, including class, income and education.²⁵ Higher rates of HIV incidence among Black MSM despite comparable rates of drug use as other racial/ethnic groups need to be understood if the Nation's efforts to fight HIV are to succeed. Recent literature suggests that the risk network may play a role. For example, partner concurrency and assortative mixing among Black MSM may limit partner selection and concentrate risks for HIV transmission within the network, especially when background HIV prevalence is high.^{26–27} Of course, HIV is an equal opportunity virus, transmitted by anyone who comes in contact with infected blood, whether through syringe sharing, unsafe sex, or unsafe injection behaviors with intimate partners.²³

Male-to-Female Transgendered Populations

Male-to-female (MTF) transgendered persons are at risk for drug abuse and HIV, and many have been found to inject hormones but not to have undergone sex reassignment. Data on HIV prevalence and drug use among MTF transgendered persons are sparse. In a review of 29 studies focusing on MTF transgendered persons, HIV prevalence was high, but ranged widely from 16% to 68%.²⁸ Across studies, MTF transgendered persons reported comparable rates of injecting hormones (weighted mean, 27.0%) or silicone (weighted mean, 24.7%) and a much lower rate of injecting street drugs (e.g., heroin, crack) (weighted mean, 12.0%). Nine studies reported low levels of sharing needles when injecting drugs (weighted mean, 2.0%), or when injecting hormones or silicone (weighted mean, 6.0%);²⁸ however, 26.7% reported using crack or other illicit drugs.²⁸ Extreme marginalization of many MTF transgendered persons may lead to sex work, which poses other risks, including violence, HIV, and STI acquisition through unprotected sex. Interventions targeting drug using MTF transgendered persons should address a multiplicity of risk factors, including psychosocial and behavioral factors, and the stigma associated with gender identity and ethnicity, particularly as it relates to ethnic minority MTF transgendered persons.²⁹

Female Sex Workers

Sex workers play a unique role in HIV and STI epidemics as they are at risk of both acquiring and transmitting infections from and to their clients and non-commercial sex partners, serving as an “epidemiological bridge” between high-risk groups to the general population.³⁰ Sex workers often report histories of sexual/physical abuse, and re-victimization by intimate partners, pimps, clients, and police, which can predispose towards psychological distress, depression, anxiety, disempowerment, and substance use.^{31–33} Criminalization of sex work in most countries displaces street prostitution to less visible areas, increasing their vulnerability to violence and assault.^{34–35} The multiple vulnerabilities faced by sex worker populations, including entrenched poverty, substance abuse, repeated violence and sexual assault, stigma, and mental illness, may directly or indirectly increase their risks of HIV infection. While female, male, and transgendered sex workers all

experience higher rates of HIV infection relative to the general population, most epidemiologic studies have focused on female sex workers (FSWs).

High levels of substance use among FSWs may be antecedents or sequela of the harsh realities of survival sex work, or both. In some cases, stimulants such as cocaine and methamphetamine may be used to conserve energy or stay awake during long work hours.³⁶ In many settings, overlap between FSW and IDU populations is considerable, making them at dual risk for infection through both the sexual and parenteral routes. Studies in some countries have found HIV prevalence among FSWs who inject drugs to range from 1.4% in Lithuania, 12.3% in Mexico, 2.0%–35.4% in Europe, 16.6%–65.0% in Russia, and 10.0%–22.4% in the United States.³⁷

Injection and non-injection drug use are associated with HIV infection among FSWs. In Yunnan, China, lifetime injection and non-injection drug use were independently associated with HIV infection among FSWs.³⁸ Among FSWs in the Mexico-US border cities of Tijuana and Ciudad Juarez, Mexico, injection of cocaine and snorting/smoking methamphetamine were associated with HIV infection.³⁹ In San Francisco, sex work was the strongest predictor of HIV infection among female IDUs, who had a five-fold elevated odds of HIV seroconversion.²³

Analyses of data from 70 countries suggest that the number of HIV-infected FSWs is the strongest predictor of country-wide HIV prevalence in the general population.⁴⁰ The global sex industry has been increasing⁴¹ but, as estimated by the World Health Organization, fewer than 15% of FSWs have adequate access to HIV prevention resources.⁴² These findings underscore the pressing need for interventions to reduce HIV incidence among FSWs and their contacts, especially in low-resource settings. Such interventions should include safer sex negotiation skills within the context of ongoing drug use so women can protect themselves from infection by their regular partners and clients,³⁷ and link to referrals for drug treatment, HIV testing, HIV treatment, and care.^{43–45}

Interventions are needed that reflect the heterogeneity of the FSW population in terms of culture, geographic space, social context, and socio-demographic characteristics. Interventions for those engaged in survival sex work will likely differ from those who are trafficked or controlled by pimps/managers or others.⁴⁶ Sex workers who are also mothers will likely have special needs if they have dependent children at home. Interventions appropriate for commercial venues (e.g., brothels, hotels, bars, massage parlors) will likely be less so in public or semi-public spaces (e.g., streets, parks, cars). Sensitivity to violence, sexual assault histories, trauma, abuse, and mental illness should always be a priority because many FSWs have had or are having these types of experiences and will have special needs.^{47–48} Addressing such complexities while also addressing HIV requires an ethical, holistic, and nonjudgmental approach that empowers FSWs to protect themselves by using female condoms and vaginal microbicides,^{49–50} while also building self-esteem, promoting new skills, and facilitating alternative economic opportunities.^{43, 51}

Clients of FSWs are at risk of acquiring HIV, transmitting it to their partners, and diffusing it to the wider population. Few HIV prevention interventions have targeted FSW clients, although their knowledge of condoms and regular use of them with their commercial and other sex partners will impact their safety and the potential wider spread of disease.^{52–54} Similarly, few programs have focused on the intimate (non-paying) partners of sex workers although unprotected sex is common among FSWs and their intimate partners.^{53, 55–59} These relationships and the influences they can have on risk behaviors need further study^{32, 60} because of their potential public health impact on HIV diffusion from unprotected sex and drug use between FSWs, their intimate partners, and/or their paying clients.

Incarcerated Populations

Incarceration, illicit drug use, and HIV constitute a multiplicity of risk. In the U.S., this trifecta particularly afflicts African American men whose incarceration rates for drug-related and other crimes far exceed those for non-Blacks.⁶¹ In 2003, African Americans were five times more likely than whites to have been to jail, and 44% of the prisoners under federal or state jurisdiction were African Americans.⁶²

Incarceration is a marker and a risk factor for HIV infection. It disrupts social networks and family relationships and leads to economic vulnerability, cumulative disadvantage, and limited access to educational opportunities and social and risk reduction services.^{63–65} HIV vulnerability among incarcerated populations, both in and out of prisons, come from multiple sources, including needle sharing among incarcerated IDU, unsafe and unprotected sex between incarcerated men, drug use and unprotected sex upon prison release, resumption of risky and criminal activity (trading sex for money or drugs, or drug dealing) after release, and little if any use of HIV prevention and treatment services, which may be due to drug use relapse, difficulty accessing appropriate services, or continued stigma associated with being an ex-convict.^{61–62, 66–69} Exposure to contaminated tattooing equipment and forced sex may also be a risk factor for HIV infection.^{70–72} In most countries, there is no access to sterile syringes, condoms or opiate substitution therapy for incarcerated populations. In countries where these services are available, reductions in HIV risk behaviors among incarcerated IDUs have been documented.⁷³

A range in HIV prevalence among IDU prisoners has been reported in developing and transitional countries: 3.0% in Mexico, 9.9% in Brazil, 42% in China, 46% in Russia, 50% in Serbia, 56% in Indonesia, 60% in Libya, 63% in Iran and 80% in Manipur.⁷⁴ Few data exist that document the risk of acquiring HIV while under detention. However, in a serological study of 499 male IDU incarcerated in Tehran, Iran, the prevalence of HIV at intake was 24.4% and the incidence of HIV upon release was 16.8%.⁷⁵

Interventions are needed to reduce injection and syringe sharing among prisoners, and to reduce risks for sexual acquisition and transmission among drug using men who have sex with other men while incarcerated.⁷⁶ These are highly sensitive and complicated matters, but in many countries, there is a deep-seated reluctance to adapt evidence-based interventions for prison populations, such as needle and syringe programs, bleach and decontamination strategies, and opioid substitution therapies (OST). The fact is that many prisoners are released back to their families and communities, which means they will bring their infections, illnesses, and diseases with them. This is why such reluctance must be overcome, not only for the health of individual prisoners, but also for the wider public health of their communities.

Mobile Populations

Mobile populations include migrants, refugees, deportees, temporary workers, victims of human or sex trafficking, and those displaced by war, famine, political and social upheaval, and man-made and natural disasters. Mobile populations often experience physical, social, and cultural isolation, homelessness, poverty, and a greater sense of vulnerability and anonymity, which can heighten risks for HIV and other infections.^{77–80} Mobility itself can increase the chance of encountering HIV-positive persons⁸¹ who bridge higher to lower risk populations that ordinarily would not interact.⁸² Mobility can also influence membership and change within sexual networks.⁸³ Transportation routes, interstate highways, and borders are natural pathways for the diffusion of HIV and other diseases.⁸⁴ Stressors and environmental conditions (e.g., loss of traditional social environment, physical, social and/or cultural isolation, long work hours)^{85–86} that lead to homelessness and transiency may

increase intermixing with others at risk, leading to drug use, sex trading, violence victimization, HIV, and other social ills.

Prevalence estimates of illicit drug use are difficult to obtain and vary widely among diverse migrant populations. The prevalence of IDU has been estimated at 2.1% among migrant FSWs in the U.S. Virgin Islands,⁸⁷ 22.0% among migrant Mexican middle school students in Texas, U.S.,⁸⁸ and 12.6% among male and 16.6% among female migrants in Mexico.⁸⁹ Crack or cocaine use was recently estimated at 16.7% among returning migrants in Mexico.⁹⁰

Migration has been reported as a risk factor for HIV in China, where migrant MSM and FSWs report high rates of IDU and needle sharing.^{91–92} Numbers of temporary migrants seeking employment in China have also grown, from 11 million in 1982 to 79 million in 2000.

A recent study of IDU in Tijuana, Mexico found that males deported from the U.S. had four-fold higher odds of HIV infection.⁹³ In contrast, female IDU migrating to Tijuana had higher odds of HIV infection with increased time in Tijuana,⁹³ suggesting that they acquired the infection there. HIV risks seem to vary by the types and reasons for migration, by gender and age, and by other social and economic factors. Understanding these variations can lead to improved HIV interventions for migrants, tailored to their cultural and socio-economic contexts and communities. In border settings, a coordinated binational response will help to ensure that HIV interventions reflect shared commitments to immigration and public health policies while working to reduce barriers and engage those at risk to seek drug treatment and HIV testing and treatment services.⁹⁴ Mobile clinics are an innovative approach for providing mobile, hard-to-reach, and remote populations with access to health services, including HIV testing and counseling, and condom and syringe distribution,⁸⁴ as well as health promotion information mental health, prevention screening, and managing stressors associated with substance abuse.⁸⁴

Conclusions

The high prevalence of HIV among drug using populations is a substantial source of morbidity and mortality around the world and results from shared risk factors and environmental conditions, typically characterized by physical and sexual violence, mental illness, poverty, stigma, neglect, isolation, and discrimination, i.e., underlying determinants that are exogenous to the individual.^{95–96} HIV interventions must reach beyond specific risk groups and individuals to address the micro- and macro- level determinants that shape their risk environments. Public health interventions that focus on the physical, social, and health policy environments that influence HIV risk-taking in various settings are significantly more likely to impact the incidence of HIV as well as other blood-borne and sexually transmitted infections across larger population groups, especially in low resource settings.^{97–98}

Acknowledgments

This work was supported by National Institutes of Health (NIH) grants R25 DA025571 and T32 DA023356 from the National Institute on Drug Abuse. The authors also thank Thomas Patterson and Irene Iuppa for their assistance. The contents of this manuscript are solely the responsibility of the authors and do not necessarily represent the official views of the NIH or National Institute on Drug Abuse.

References

1. Mathers BM, Degenhardt L, Phillips B, et al. Global epidemiology of injecting drug use and HIV among people who inject drugs: a systematic review. *Lancet*. 2008; 372:1733–1745. [PubMed: 18817968]
2. Centers for Disease C, Prevention. Subpopulation estimates from the HIV incidence surveillance system--United States, 2006. *MMWR*. 2008; 57:985–989. [PubMed: 18784639]
3. Shoptaw S, Reback CJ. Methamphetamine use and infectious disease-related behaviors in men who have sex with men: implications for interventions. *Addiction*. 2007; 102 (Suppl 1):130–135. [PubMed: 17493062]
4. Operario D, Smith CD, Kegeles S. Social and psychological context for HIV risk in non-gay-identified African American men who have sex with men. *AIDS Edu Prev*. 2008; 20:347–359.
5. Ostrow DE, Fox KJ, Chmiel JS, et al. Attitudes towards highly active antiretroviral therapy are associated with sexual risk taking among HIV-infected and uninfected homosexual men. *AIDS*. 2002; 16:775–780. [PubMed: 11964534]
6. Degenhardt L, Mathers B, Guarinieri M, et al. Meth/amphetamine use and associated HIV: Implications for global policy and public health. *Int J Drug Policy*. 2010 (In press).
7. Semple SJ, Patterson TL, Grant I. A comparison of injection and non-injection methamphetamine-using HIV positive men who have sex with men. *Drug Alcohol Depend*. 2004; 76:203–212. [PubMed: 15488344]
8. Marquez C, Mitchell SJ, Hare CB, et al. Methamphetamine use, sexual activity, patient-provider communication, and medication adherence among HIV-infected patients in care, San Francisco 2004–2006. *AIDS Care*. 2009; 21:575–582. [PubMed: 19444665]
9. Wohl AR, Frye DM, Johnson DF. Demographic characteristics and sexual behaviors associated with methamphetamine use among MSM and non-MSM diagnosed with AIDS in Los Angeles County. *AIDS Behav*. 2008; 12:705–712. [PubMed: 17968649]
10. Stall R, Paul JP, Greenwood G, et al. Alcohol use, drug use and alcohol-related problems among men who have sex with men: the Urban Men's Health Study. *Addiction*. 2001; 96:1589–1601. [PubMed: 11784456]
11. Thiede H, Valleroy LA, MacKellar DA, et al. Regional patterns and correlates of substance use among young men who have sex with men in 7 US urban areas. *Am J Public Health*. 2003; 93:1915–1921. [PubMed: 14600066]
12. Rawstorne P, Digiusto E, Worth H, et al. Associations between crystal methamphetamine use and potentially unsafe sexual activity among gay men in Australia. *Arch Sex Behav*. 2007; 36:646–654. [PubMed: 17690971]
13. Bolding G, Hart G, Sherr L, et al. Use of crystal methamphetamine among gay men in London. *Addiction*. 2006; 101:1622–1630. [PubMed: 17034442]
14. Semple SJ, Zians J, Strathdee SA, et al. Sexual marathons and methamphetamine use among HIV-positive men who have sex with men. *Arch Sex Behav*. 2009; 38:583–590. [PubMed: 18185990]
15. Mimiaga MJ, Reisner SL, Vanderwarker R, et al. Polysubstance use and HIV/STD risk behavior among Massachusetts men who have sex with men accessing Department of Public Health mobile van services: implications for intervention development. *AIDS Patient Care STDS*. 2008; 22:745–751. [PubMed: 18754704]
16. Semple SJ, Strathdee SA, Zians J, et al. Sexual risk behavior associated with co-administration of methamphetamine and other drugs in a sample of HIV-positive men who have sex with men. *Am Journal Addict*. 2009; 18:65–72. [PubMed: 19219667]
17. Fisher DG, Reynolds GL, Napper LE. Use of crystal methamphetamine, Viagra, and sexual behavior. *Curr Opin Infect Dis*. 2010; 23:53–56. [PubMed: 19918176]
18. Drumright LN, Patterson TL, Strathdee SA. Club drugs as causal risk factors for HIV acquisition among men who have sex with men: a review. *Subst Use Misuse*. 2006; 41:1551–1601. [PubMed: 17002993]
19. Smith AD, Tapsoba P, Peshu N, et al. Men who have sex with men and HIV/AIDS in sub-Saharan Africa. *Lancet*. 2009; 374:416–422. [PubMed: 19616840]

20. Parry C, Petersen P, Dewing S, et al. Rapid assessment of drug-related HIV risk among men who have sex with men in three South African cities. *Drug Alcohol Depend.* 2008; 95:45–53. [PubMed: 18242881]
21. Washington TA, Galai N, Cohn S, et al. The relationship between self-reported sexual orientation and behavior in a sample of middle-aged male injection drug users. *Arch Sex Behav.* 2006; 35:67–74. [PubMed: 16502154]
22. Saleh LD, Operario D. Moving beyond “the down low”: a critical analysis of terminology guiding HIV prevention efforts for African American men who have secretive sex with men. *Soc Sci Med.* 2009; 68:390–395. [PubMed: 19006674]
23. Kral AH, Bluthenthal RN, Lorvick J, et al. Sexual transmission of HIV-1 among injection drug users in San Francisco, USA: risk-factor analysis. *Lancet.* 2001; 357:1397–1401. [PubMed: 11356437]
24. Washington TA, Meyer-Adams N. HIV Prevention Needs of Sex-Trade Injection Drug-Using Black Men Who Have Sex With Both Men and Women. *Am J Mens Health.* 2009 (In press).
25. Peterson JL, Jones KT. HIV prevention for black men who have sex with men in the United States. *Am J Public Health.* 2009; 99:976–980. [PubMed: 19372510]
26. Morris M, Kurth AE, Hamilton DT, et al. Concurrent partnerships and HIV prevalence disparities by race: linking science and public health practice. *Am J Public Health.* 2009; 99:1023–1031. [PubMed: 19372508]
27. Golden MR, Brewer DD, Kurth A, et al. Importance of sex partner HIV status in HIV risk assessment among men who have sex with men. *J Acquir Immune Defic Syndr.* 2004; 36:734–742. [PubMed: 15167293]
28. 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. [PubMed: 17694429]
29. Nemoto T, Sausa LA, Operario D, et al. Need for HIV/AIDS education and intervention for MTF transgendered persons: responding to the challenge. *J Homosex.* 2006; 51:183–202. [PubMed: 16893831]
30. Barrington C, Latkin C, Sweat MD, et al. Talking the talk, walking the walk: social network norms, communication patterns, and condom use among the male partners of female sex workers in La Romana, Dominican Republic. *Soc Sci Med.* 2009; 68:2037–2044. [PubMed: 19356834]
31. Panchanadeswaran S, Johnson SC, Sivaram S, et al. Intimate partner violence is as important as client violence in increasing street-based female sex workers’ vulnerability to HIV in India. *Int J Drug Policy.* 2008; 19:106–112. [PubMed: 18187314]
32. Shannon K, Kerr T, Allinott S, et al. Social and structural violence and power relations in mitigating HIV risk of drug-using women in survival sex work. *Soc Sci Med.* 2008; 66:911–921. [PubMed: 18155336]
33. Vanwesenbeeck I. Another decade of social scientific work on sex work: a review of research 1990–2000. *Annu Rev Sex Res.* 2001; 12:242–289. [PubMed: 12666742]
34. Wechsberg WM, Luseno WK, Lam WK. Violence against substance-abusing South African sex workers: intersection with culture and HIV risk. *AIDS Care.* 2005; 17 (Suppl 1):S55–64. [PubMed: 16096118]
35. Shannon K, Kerr T, Bright V, et al. Drug sharing with clients as a risk marker for increased violence and sexual and drug-related harms among survival sex workers. *AIDS Care.* 2008; 20:228–234. [PubMed: 18293134]
36. Strathdee SA, Philbin MM, Semple SJ, et al. Correlates of injection drug use among female sex workers in two Mexico-U.S. border cities. *Drug Alcohol Depend.* 2008; 92:132–140. [PubMed: 17714888]
37. Strathdee SA. Female sex workers who inject drugs and their risk of HIV infection: A kaleidoscopic review. 2009 (Submitted).
38. Wang H, Chen RY, Ding G, et al. Prevalence and predictors of HIV infection among female sex workers in Kaiyuan City, Yunnan Province, China. *Int J Infect Dis.* 2009; 13:162–169. [PubMed: 18718801]

39. Patterson TL, Semple SJ, Staines H, et al. Prevalence and correlates of HIV infection among female sex workers in 2 Mexico-US border cities. *Journal Infect Dis.* 2008; 197:728–732. [PubMed: 18260766]
40. Talbott JR. Size matters: the number of prostitutes and the global HIV/AIDS pandemic. *PLoS One.* 2007; 2:e543. [PubMed: 17579715]
41. Ward H, Aral SO. Globalisation, the sex industry, and health. *Sex Trans Infect.* 2006; 82:345–347.
42. Evans, C. Toolkit for targeted HIV prevention and care in sex work settings. Geneva, Switzerland: World Health Organization, Department of HIV/AIDS; 2005.
43. Shahmanesh M, Patel V, Mabey D, et al. Effectiveness of interventions for the prevention of HIV and other sexually transmitted infections in female sex workers in resource poor setting: a systematic review. *Trop Med Int Health.* 2008; 13:659–679. [PubMed: 18266784]
44. Hong Y, Li X. HIV/AIDS behavioral interventions in China: a literature review and recommendation for future research. *AIDS Behav.* 2009; 13:603–613. [PubMed: 19015973]
45. Kerrigan D, Moreno L, Rosario S, et al. Environmental-structural interventions to reduce HIV/STI risk among female sex workers in the Dominican Republic. *Am J Pub Health.* 2006; 96:120–125. [PubMed: 16317215]
46. Hoffmann O, Boler T, Dick B. Achieving the global goals on HIV among young people most at risk in developing countries: young sex workers, injecting drug users and men who have sex with men. *World Health Organ Tech Rep Ser.* 2006; 938:287–315. discussion 317–241. [PubMed: 16921923]
47. Greenberg JB. Childhood sexual abuse and sexually transmitted diseases in adults: a review of and implications for STD/HIV programmes. *Int J STD AIDS.* 2001; 12:777–783. [PubMed: 11779366]
48. Senn TE, Carey MP. HIV, STD, and Sexual Risk Reduction for Individuals with a Severe Mental Illness: Review of the Intervention Literature. *Curr Psychiatry Rev.* 2008; 4:87–100. [PubMed: 18584060]
49. Witte SS, el-Bassel N, Wada T, et al. Acceptability of female condom use among women exchanging street sex in New York City. *Int J STD AIDS.* 1999; 10:162–168. [PubMed: 10340196]
50. Jivasak-Apimas S, Saba J, Chandeying V, et al. Acceptability of the female condom among sex workers in Thailand: results from a prospective study. *Sex Transm Dis.* 2001; 28:648–654. [PubMed: 11677387]
51. Rekart ML. Sex-work harm reduction. *Lancet.* 2005; 366:2123–2134. [PubMed: 16360791]
52. Jin X, Smith K, Chen RY, et al. HIV prevalence and risk behaviors among male clients of female sex workers in Yunnan, China. *J Acquir Immune Defic Syndr.* 2010; 53:131–135. [PubMed: 19730110]
53. Spina M, Mancuso S, Sinicco A, et al. Human immunodeficiency virus seroprevalence and condom use among female sex workers in Italy. *Sex Transm Dis.* 1998; 25:451–454. [PubMed: 9800254]
54. Strathdee SA, Lozada R, Semple SJ, et al. Characteristics of female sex workers with US clients in two Mexico-US border cities. *Sex Transm Dis.* 2008; 35:263–268. [PubMed: 18032996]
55. Voeten HA, Egesah OB, Varkevisser CM, et al. Female sex workers and unsafe sex in urban and rural Nyanza, Kenya: regular partners may contribute more to HIV transmission than clients. *Trop Med Int Health.* 2007; 12:174–182. [PubMed: 17300623]
56. Rosenthal D, Oanha TT. Listening to female sex workers in Vietnam: influences on safe-sex practices with clients and partners. *Sex Health.* 2006; 3:21–32. [PubMed: 16607971]
57. Philpot CR, Harcourt CL, Edwards JM. A survey of female prostitutes at risk of HIV infection and other sexually transmissible diseases. *Genitourin Med.* 1991; 67:384–388. [PubMed: 1743710]
58. Green ST, Goldberg DJ, Christie PR, et al. Female streetworker--prostitutes in Glasgow: a descriptive study of their lifestyle. *AIDS Care.* 1993; 5:321–335. [PubMed: 8218467]
59. Mills S, Benjarattanaporn P, Bennett A, et al. HIV risk behavioral surveillance in Bangkok, Thailand: sexual behavior trends among eight population groups. *AIDS.* 1997; 11 (Suppl 1):S43–51. [PubMed: 9376100]

60. Jackson LA, Augusta-Scott T, Burwash-Brennan M, et al. Intimate relationships and women involved in the sex trade: perceptions and experiences of inclusion and exclusion. *Health (London)*. 2009; 13:25–46. [PubMed: 19103714]
61. Lichtenstein B. Drugs, incarceration, and HIV/AIDS among African American men: a critical literature review and call to action. *Am J Mens Health*. 2009; 3:252–264. [PubMed: 19477743]
62. Blankenship KM, Smoyer AB, Bray SJ, et al. Black-white disparities in HIV/AIDS: the role of drug policy and the corrections system. *J Health Care Poor Underserved*. 2005; 16(4 Suppl B): 140–156. [PubMed: 16327113]
63. Wohl DA, Rosen D, Kaplan AH. HIV and incarceration: dual epidemics. *AIDS Read*. 2006; 16:247–250. 257–260. [PubMed: 16764066]
64. Adimora AA, Schoenbach VJ. Social context, sexual networks, and racial disparities in rates of sexually transmitted infections. *J Infect Dis*. 2005; 191 (Suppl 1):S115–122. [PubMed: 15627221]
65. Beckwith CG, Zaller ND, Montague BT, et al. Opportunities to diagnose, treat, and prevent HIV in the criminal justice system. *J Acquir Immune Defic Syndr*. 2010 (In press).
66. Milloy MJ, Wood E, Small W, et al. Incarceration experiences in a cohort of active injection drug users. *Drug Alcohol Rev*. 2008; 27:693–699. [PubMed: 19378451]
67. Milloy MJ, Buxton J, Wood E, et al. Elevated HIV risk behaviour among recently incarcerated injection drug users in a Canadian setting: a longitudinal analysis. *BMC Public Health*. 2009; 9:156. [PubMed: 19473508]
68. Hayashi K, Milloy MJ, Fairbairn N, et al. Incarceration experiences among a community-recruited sample of injection drug users in Bangkok, Thailand. *BMC Public Health*. 2009; 9:492. [PubMed: 20042105]
69. Dufour A, Alary M, Poulin C, et al. Prevalence and risk behaviours for HIV infection among inmates of a provincial prison in Quebec City. *AIDS*. 1996; 10:1009–1015. [PubMed: 8853735]
70. Samuel MC, Doherty PM, Bulterys M, et al. Association between heroin use, needle sharing and tattoos received in prison with hepatitis B and C positivity among street-recruited injecting drug users in New Mexico, USA. *Epidemiol Infect*. 2001; 127:475–484. [PubMed: 11811881]
71. Wolff N, Shi J. Feelings of safety inside prison among male inmates with different victimization experiences. *Violence Vict*. 2009; 24:800–816. [PubMed: 20055216]
72. Hensley C, Koscheski M, Tewksbury R. Examining the characteristics of male sexual assault targets in a Southern maximum-security prison. *J Interpers Violence*. 2005; 20:667–679. [PubMed: 15851535]
73. Jurgens R, Ball A, Verster A. Interventions to reduce HIV transmission related to injecting drug use in prison. *Lancet Infect Dis*. 2009; 9:57–66. [PubMed: 19095196]
74. Dolan K, Kite B, Black E, et al. HIV in prison in low-income and middle-income countries. *Lancet Infect Dis*. 2007; 7(1):32–41. [PubMed: 17182342]
75. Jahani MR, Kheirandish P, Hosseini M, et al. HIV seroconversion among injection drug users in detention, Tehran, Iran. *AIDS*. 2009; 23:538–540. [PubMed: 19182678]
76. Pollini RA, Alvelais J, Gallardo M, et al. The harm inside: injection during incarceration among male injection drug users in Tijuana, Mexico. *Drug Alcohol Depend*. 2009; 103:52–58. [PubMed: 19386448]
77. Deren S, Kang SY, Colon HM, et al. Migration and HIV risk behaviors: Puerto Rican drug injectors in New York City and Puerto Rico. *Am J Public Health*. 2003; 93:812–816. [PubMed: 12721149]
78. Lagarde E, Schim van der Loeff M, Enel C, et al. Mobility and the spread of human immunodeficiency virus into rural areas of West Africa. *Int J Epidemiol*. 2003; 32:744–752. [PubMed: 14559743]
79. Organista KC, Carrillo H, Ayala G. HIV prevention with Mexican migrants: review, critique, and recommendations. *J Acquir Immune Defic Syndr*. 2004; 37 (Suppl 4):S227–239. [PubMed: 15722865]
80. Parrado EA, Flippen CA, McQuiston C. Use of commercial sex workers among Hispanic migrants in North Carolina: implications for the spread of HIV. *Perspect Sex Reprod Health*. 2004; 36:150–156. [PubMed: 15321781]

81. Kottiri BJ, Friedman SR, Neaigus A, et al. Risk networks and racial/ethnic differences in the prevalence of HIV infection among injection drug users. *J Acquir Immune Defic Syndr*. 2002; 30:95–104. [PubMed: 12048369]
82. Paschane DM, Fisher DG. Etiology of limited transmission diseases among drug users: does recent migration magnify the risk of sharing injection equipment? *Soc Sci Med*. 2000; 50:1091–1097. [PubMed: 10714929]
83. Aral SO, Lipshutz J, Blanchard J. Drivers of STD/HIV epidemiology and the timing and targets of STD/HIV prevention. *Sex Transm Infect*. 2007; 83 (Suppl 1):i1–4. [PubMed: 17664361]
84. Rachlis B, Brouwer KC, Mills EJ, et al. Migration and transmission of blood-borne infections among injection drug users: understanding the epidemiologic bridge. *Drug Alcohol Depend*. 2007; 90:107–119. [PubMed: 17485179]
85. Carballo M, Grocutt M, Hadzihasanovic A. Women and migration: a public health issue. *World Health Stat Q*. 1996; 49:158–164. [PubMed: 9050196]
86. Apostolopoulos Y, Sonmez S, Kronenfeld J, et al. STI/HIV risks for Mexican migrant laborers: exploratory ethnographies. *J Immigr Minor Health*. 2006; 8:291–302. [PubMed: 16791539]
87. Surratt H. Sex work in the Caribbean Basin: patterns of substance use and HIV risk among migrant sex workers in the US Virgin Islands. *AIDS Care*. 2007; 19:1274–1282. [PubMed: 18071971]
88. Cooper SP, Weller NF, Fox EE, et al. Comparative description of migrant farmworkers versus other students attending South Texas schools: demographic, academic, and health characteristics. *Tex Med*. 2005; 101:58–62. [PubMed: 17236321]
89. Magis-Rodriguez C, Lemp G, Hernandez MT, et al. Going North: Mexican migrants and their vulnerability to HIV. *J Acquir Immune Defic Syndr*. 2009; 51 (Suppl 1):S21–25. [PubMed: 19384097]
90. Borges G, Medina-Mora ME, Orozco R, Fleiz C, et al. The Mexican migration to the United States and substance use in northern Mexico. *Addiction*. 2009; 104:603–611. [PubMed: 19215601]
91. Wong FY, Huang ZJ, He N, et al. HIV risks among gay- and non-gay-identified migrant money boys in Shanghai, China. *AIDS Care*. 2008; 20:170–180. [PubMed: 18293125]
92. Yang X, Derlega VJ, Luo H. Migration, behaviour change and HIV/STD risks in China. *AIDS Care*. 2007; 19:282–288. [PubMed: 17364411]
93. Strathdee SA, Lozada R, Ojeda VD, et al. Differential effects of migration and deportation on HIV infection among male and female injection drug users in Tijuana, Mexico. *PloS One*. 2008; 3:e2690. [PubMed: 18665250]
94. Morin SF, Carrillo H, Steward WT, et al. Policy perspectives on public health for Mexican migrants in California. *J Acquir Immune Defic Syndr*. 2004; 37 (Suppl 4):S252–259. [PubMed: 15722867]
95. Rhodes T, Simic M. Transition and the HIV risk environment. *BMJ*. 2005; 331:220–223. [PubMed: 16037463]
96. Rhodes T, Singer M, Bourgois P, et al. The social structural production of HIV risk among injecting drug users. *Soc Sci Med*. 2005; 61:1026–1044. [PubMed: 15955404]
97. Strathdee SA, Hallett TB, Bobrova N, et al. HIV and the Risk Environment among People Who Inject Drugs: Past, Present, and Projections for the Future. *Lancet*. 2010 (In press).
98. Vlahov D, Robertson AM, Strathdee SA. Prevention of HIV infection among injection drug users in resource-limited settings. *Clin Infect Dis*. 2010; 50 (Suppl 3):S114–121. [PubMed: 20397939]