UNODC
United Nations Office on Drugs and Crime

Systematic Literature Review on Stimulant use and HIV (A)

Part 3/5

Cocaine and Crack-Cocaine Risk and Transmission

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This report is part of a series of five documents:

A. Stimulant use: HIV risk and transmission

1. Systematic Literature Review on HIV and Stimulant use: Methodology and summary of the findings of
2. Systematic Literature Review on HIV and Stimulant use: ATS and HIV Risk and Transmission
3. Systematic Literature Review on HIV and Stimulant use: Cocaine use and HIV Risk and Transmission
4. Systematic Literature Review on HIV and Stimulant use: NPS and HIV Risk and Transmission

B. Prevention of HIV, HCV & HBV and treatment

5. Systematic Literature Review on HIV and Stimulant use: Treatment and Prevention of HIV, HCV & HBV and treatment

Recommended citation

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Contents

1. Overview

Out of 1,048 full-texts examined, a total of 83 studies on cocaine and crack-cocaine use and HIV, HCV and HBV risk and transmission were initially included in the present review. The great majority of the studies were cross-sectional surveys (63), followed by longitudinal cohort studies (10), case-control studies (8) and systematic literature reviews (2) (Figure 1). Most studies were published between 2005 and 2010 (Figure 2).

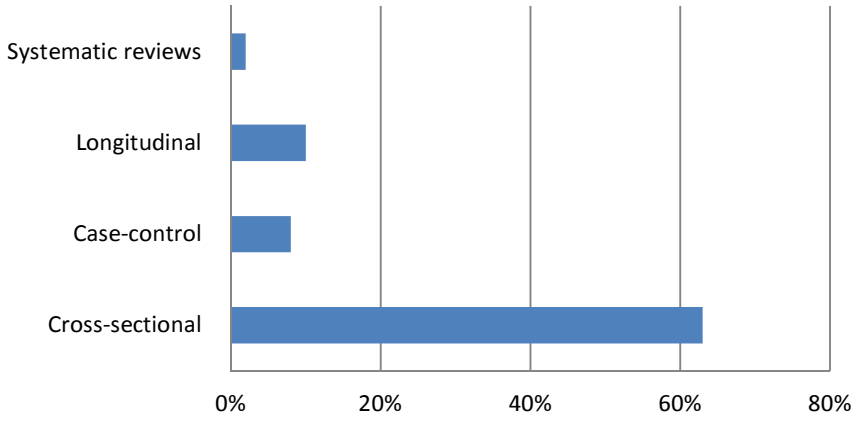

Figure 1: Study Designs

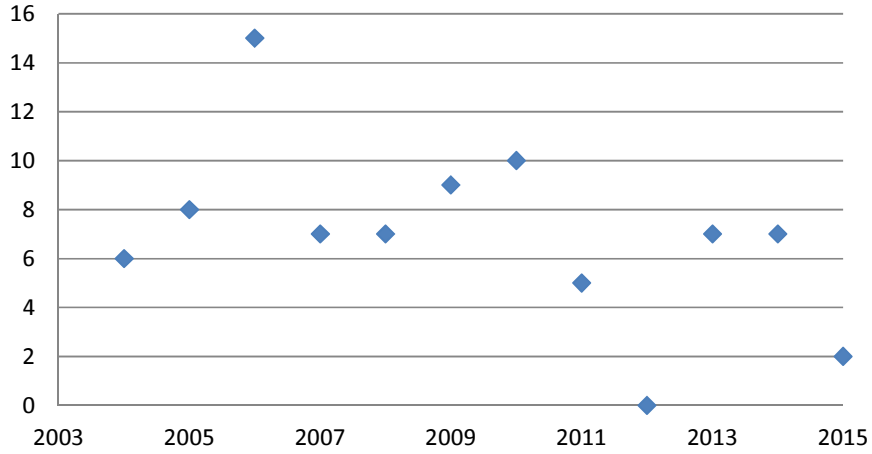

Figure 2: Year of Publication

The figure below shows in which countries the studies took place. There are 11 countries represented. About a third of the studies (27) took place in 4 countries with low to upper-middle income economies and two-thirds (55) took place in 7 countries with high income economies (Figure 3). One systematic literature review with a worldwide focus was also included.

Figure 3: Countries in which the studies took place

In order to analyse the evidence in more detail, the studies were divided into subcategories in accordance to the type of population they targeted. The categories are: non-injecting drug users (NIDUs), people who inject drugs (PWID), men who have sex with men (MSM) and sex workers (SWs). Most of the studies focused on non-injecting drug use populations, followed by non-injecting drug users.

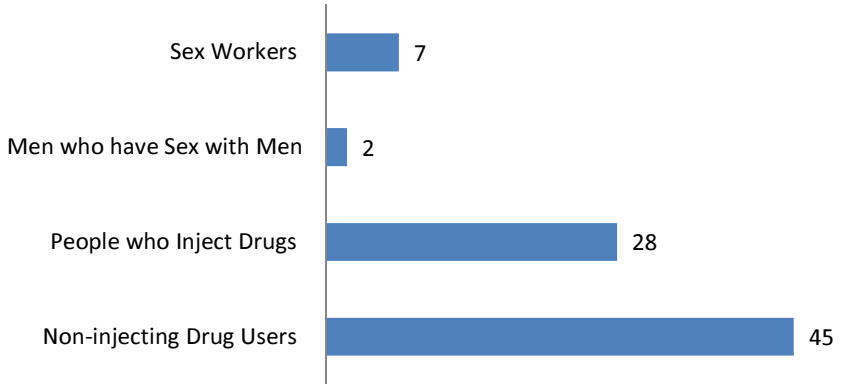

Figure 4: Target Populations

2. Non-Injecting Drug Users

There were 45 studies whose participants mainly used non-injecting drugs (smoke crack or snorted cocaine). The average pooled age distribution of the participants was around 33 years old (mean or median ranging from 21 to 47). Most commonly, two-thirds of the study samples were male.

Brazil (12 studies):

Findings of a national study with 7,381 crack users recruited at open drug scenes using Time-Location-Sampling identified HIV prevalence of 4.97% (IC95% 3.47-6.56) (Bastos and Bertoni 2014). HIV prevalence was higher among females (8.17%, IC95% 5.55-11.88) than among males (4.01%, IC95% 2.72-5.88) p=0.009. HIV prevalence was higher among those who exchange sex for drugs/money (6.55%, IC95% 4.62-9.19) than among those who did not 2.89% (IC95% 1.95-4.25) p<0.0001. HCV prevalence was 2.63% (IC95% 1.69-4.07). HCV prevalence was higher among those who were 31 years or older (4.67%, IC95% 2.83-7.62) than in those who were between 18 and 30 years old (1.08%, IC95% 0.49-2.35) p=0.001. HCV was also higher among those who reported sharing smoking equipment in the past 30 days (3.02%, IC95% 1.81-5.00) than among those who did not 1.83% (IC95% 1.00-3.32). Risk behaviour was also reported: about half (42.17%) exchanged sex for drugs/money in the past 30 days. Among those who had sex in the past 30 days, inconsistent use of condom was reported in 64.15% of vaginal sex, 79.05% of oral sex and 62% of anal sex. 5.50% reported having sex with someone they knew to be HIV-positive. Nearly 10% of the sample ever injected drugs; of theses about a third reported sharing injecting equipment.

Bertoni et al (2014) explored gender differences among young crack users in Brazil (Bertoni et al. 2014). Men and women indicated long histories of frequent daily crack use, but practically no drug injection histories. More women than men were HIV-positive (18.9% women; 4.1% men). Also more women than men exchanged sex-for-drug (28.6% women; 4% men). HCV prevalence was 3% among women and 0% among men. HBV prevalence was 28.1% among women and 13.9% among men. About two thirds of the total sample reported having sex without a condom in the past 30 days.

In Porto Alegre, Southern Brazil, 60 intranasal cocaine users were tested for HCV infection (Galperim et al. 2004). Intranasal cocaine use alone was not a significant risk factor for HCV infection in this sample. The study found an anti-HCV prevalence of 25%, of these 75% had detectable HCV-RNA. Those who were anti-HCV positive were older and had a longer drug user career. Presence of anti-HCV antibodies was highly correlated with intravenous drug use and duration of drug use.

Von Diemen et al (2010) assessed HCV and HIV seroprevalence among 73 female crack users from Porto Alegre (von Diemen et al. 2010). A high HIV rate of 35% was found among this sample. HCV seroprevalence was 27.7% and 15.1% of the sample was co-infected with HIV and HCV. Having four years or less of schooling and having had three or more HIV tests in the past were associated with HIV infection.

A cross-sectional survey identified HIV prevalence rate of 6.6% (CI 95% 4.0–10.2) among 350 drug users attending treatment clinics in São Paulo (de Carvalho and Seibel 2009). 22% reported having contracted sexually transmissible diseases. 40% reported never using a condom and the rest of the sample reported inconsistent condom use. Sex in exchange of drugs/money was reported by 14% of the sample.

De Azevedo et al. (2007) compared 132 crack users and 109 injectable cocaine users from clinical setting in the city of Campinas (De Azevedo et al. 2007). Crack users had higher rates of risky sexual activity. HIV seroprevalence among crack users was lower than for injecting cocaine users (11% vs. 33%). Some crack cocaine users included in this sample had a past history of injecting drugs. If these participants were excluded from the sample than the seroprevalence among crack users dropped to 7%. Injectable cocaine users had a seroprevalence relative risk of 3.11 that of crack users (95% CI 1.77-5.47).

Diehl et al (2014) assessed sexual risk behaviour among 299 drug users from São Paulo (Diehl et al. 2014). Nearly 40% of the participants reported high risk sexual behaviour. Participants also reported past STIs and HIV testing. Participants who used alcohol and cocaine presented higher sexual risk behaviours than crack users. Those with more severe drug use had 3.64 times greater high of reporting sexual risk behaviours.

Dias et al. (2011) followed 131 crack cocaine users admitted to a detoxification unit in the city of from São Paulo, Brazil (Dias et al. 2011). Participants were followed up in three occasions: 1995-96, 1998-99, and 2005-06. Safe sexual behaviour (condom use) was correlated with stable abstinence (p=0.001). Positive HIV test upon admission, use of snorted cocaine in the last year, and lifetime use of snorted cocaine (132 months or longer) were associated with long term use of crack cocaine.

Santos Cruz et al (2013) assessed 160 crack users from the cities of Rio de Janeiro and Salvador (Santos Cruz et al. 2013). Over 60% of the participants reported sharing crack smoking implements in the past 30 days. About 40% of participants in Rio, and 25% in Salvador had been tested for HIV prior to the study. Serological testing confirmed that a total of 12 participants (7.5%) were HIV-positive. In addition, 5 participants in Rio were HBV-positive, and 1 in Salvador was HCV-positive. Over 60% of the sample reported unprotected sex in the past 30 days and 12.5% reported exchanging sex for money/drugs.

A cross-sectional survey with 125 female crack-cocaine users in Salvador, Bahia found a low prevalence of HIV 1.6%, HCV 2.4%, HBV 0.8%, HTLV I/II 4.0%, and syphilis 4.0% (Nunes et al. 2007). A third reported exchanging sex for money/drugs, and over a half reported not using condoms during intercourse in the last 30 days.

De Sa et al (2013) assessed seroprevalence of Hepatitis C and associated factors among 353 crack user from Teresina, Piauí (de Sa et al. 2013). The prevalence of Anti-HCV was 1.4% and 1.1% for the RNA-HCV. There was a statistically significant association between hepatitis C and age, living at home, length crack use, interruption of crack use, and sharing crack pipes.

A cross-sectional survey among 384 cocaine users from Para State (Brazilian Amazon) found 32.3 % had anti-HCV antibodies and 31.3% had RNA-HCV (Oliveira-Filho et al. 2013). An association was identified between HCV infection and having tattoos, shared use of paraphernalia, daily cocaine use, and a long history of cocaine use.

Uruguay and Argentina (4 studies):

HBV infection and sexual behaviour were assessed among 824 non-injecting cocaine users (NICUS): in from Buenos Aires and Montevideo (Zocratto et al. 2010). HIV prevalence was 6.19%. HBV prevalence

was 10.8% and it was similarly distributed across both cities. NICUs living in Uruguay showed a higher risk of being previously infected by HBV than residents in Buenos Aires. HBV prevalence was also higher among male participants, those older than 26, those employed and those who had been arrested at some point. Age of first used cocaine was the only variable strongly associated with HBV previous infection ($p < .01$). Subjects whose sexual partners were MSM and HIV seropositive had a higher risk of HBV infection. Subjects whose sexual partners were HIV seropositive and NIDUs showed an even higher risk. For NICUs infected by HIV, the risk of being infected by HBV was almost nine times higher than for HIV-negatives ($p < .01$). A dose-response relationship between the use of condoms and the risk of HBV was observed. Subjects who report safe sexual practices in both anal and vaginal intercourses showed a smaller risk of being HBV seropositive in comparison with those using condoms in either sexual practice.

A cross-sectional study interviewed 871 non-injecting cocaine users from Buenos Aires and Montevideo metropolitan areas (Caiaffa et al. 2011). HIV prevalence rate was 7.9% (95% CI: 6.1–9.7) and 8.8% (95%CI, 6.9–10.8) for HCV. In comparison to HIV mono-infected, HCV mono-infected (4.9%) were more like to have been in prison, arrested, shared straws, and had intercourse with someone who was HIV-positive and to have current or past HBV infection. HIV mono-infected were more likely to have had intercourse with PWID and someone who was HIV-positive, to have current or past HBV infection and to have syphilis. HCV-infected individuals were twice as likely as HCV–HIV seronegatives to have shared straws for cocaine snorting or sniffing.

Rossi et al (2008) further report on Argentinian subsample included in the study above. Seroprevalence rates were: HIV (6.3%), HBV (9%), HCV (7.5%), and VDRL (4.2%) (Rossi et al. 2008). The risk of being infected with HIV, HBV, and HCV was significantly associated with having had a sex partner who was either a drug injector or who was known to be HIV positive. HIV and HCV infections were associated with former imprisonment, and HCV was associated with having been tattooed.

A Government Funded Report by the health ministry of Uruguay estimated 6.3% of HIV prevalence (CI 95% 2.6–11.3) based on a survey with 318 crack users from Montevideo and its metropolitan area (Ministry of Health, Uruguay 2013).

Caribbean (2 Studies)

A report led by Day from the Caribbean Drug Abuse Research Institute was published in 2007 (Day 2007). Of the 106 crack cocaine users from Saint Lucia tested, 7.5% were HIV-infected compared to none in a control group of 45 non-crack users. There were no differences in the test results for Hepatitis B and HTLV1 between drug users and non-drug users. Women who were drug users were significantly more likely to test positive for VDRL than women non-drug users (94.4% vs. 66.7%, $p=0.046$); the same trend was observed among men (50.0% vs. 30.3%). Drug users were more likely to report always having unprotected sex than were non-drug users (30.8% vs. 12.0%, $p=0.045$). Female drug users compared to non-drug users were more likely to report exchanging sex for money or crack (76.5% vs. 25%, $p=0.049$). Males were more likely to report always having unprotected sex when compared to male non-drug users (31.5% vs. 5.3%, $p=0.008$).

Reid (2006) assessed 121 female in-patient substance abusers in Trinidad and Tobago (Reid 2006). HIV seroprevalence was 19.8%. The following factors were associated with HIV infection: poor

educational achievement, history of STI and use of crack cocaine. In the multivariate analysis, only poor educational attainment and history of an STI were independently associated with HIV seroprevalence.

USA (22 studies):

Deren et al. (2004) followed 723 drug users from Harlem (in New York) and Bayamon (in Puerto Rico) for about 4 years and compared their HIV incidence (Deren et al. 2004). There were a total of 32 seroconverters, 9 in NY and 23 in PR, for seroconversion rates of 0.88/100 person-years at risk in NY (pyr; 95% CI, 0.31–1.45) and 3.37/100 pyr in PR (95% CI,2.02–4.72; p< 0.001). In Puerto Rico, variables significantly related to seroconversion were younger age and using shooting galleries. Being in methadone treatment was protective against seroconversion. In New York, crack use was significantly related to seroconversion.

Des Jarlais et al. (2014) conducted a retrospective cohort study (1983-2011) which analysed data of over 7,000 individuals who did not inject drugs (mainly crack-cocaine users) entering a medical treatment centre in New York City (Des Jarlais et al. 2014) . HIV prevalence doubled from 8% (during 1995-1999) to 16% (2005-2011). Prevalence of HSV-2 was significantly associated with HIV prevalence. The authors suggested that the following factors contributed to the HIV rate increase over the year: a pre-existing HIV epidemic among injectors, a crack cocaine epidemic, mixing injectors and crack users, policy responses not centred on public health, and herpes-simplex virus 2 facilitating HIV transmission.

Tortu et al. (2004) identified sharing of no-injection drug-use implements as a risk factor for HCV (Tortu et al. 2004). The study included 123 women drug users from East Harlem, New York City. Prevalence of HCV and HIV infections was 19.5% and 14.6%, respectively. Significant associations between sharing non-injection drug-use implements and HCV infection were identified. The strongest association was found among HIV positive individuals.

Rees et al (2006) assessed risks for HIV infection among users (N=546) and sellers (N=91) of crack, powder cocaine and heroin in central Harlem (Rees Davis et al. 2006). Nearly a quarter (23.9%) of all respondents was HIV positive. Drug injectors were more than 2.5 times more likely to have HIV infections than other respondents. Those who were separated divorced or widowed; had multiple sex partner and female were more likely to be HIV-positive.

Hagan et al. (2011) assessed sexual risk and HIV infection among 102 injection and non-injection users of heroin, cocaine, or crack in New York (Hagan et al. 2011). The study found a considerable overlap and transitioning between crack smoking and injecting. Crack users were also significantly more likely to be gay, lesbian, or bi-sexual than other drug users. HIV infection was independently associated with crack use and with being gay or bisexual.

Kang et al. (2005) assessed among Puerto Rican crack users living in New York (N= 383) and in Puerto Rico (N= 165) (Kang et al. 2005). Compared with New York participants, crack users in Puerto Rico reported larger risk networks and were more likely to engage in sex risk behaviours with strangers or acquaintances.

In San Francisco, 1,148 homeless and marginally housed individuals were interviewed. Of these over two thirds (67%) ever used crack (Weiser et al. 2006). 39% of women and 30% of men reported ever

exchanging sex for drugs/money. Methamphetamine use and greater length of homelessness were positively associated with a history of sex trade among women. Heroin use, recent mental health treatment, and homosexual or bisexual orientation were significantly associated with sex trade for men. Crack use was correlated with sex trade for both genders. About 14% of the total sample was HIV-positive. HIV prevalence was higher among men (15% versus 10%, p=0.05).

Brewer et al. (2007) assessed 178 crack-cocaine using women from Miami, Florida (Brewer et al. 2007). Sixty-one HIV-positive and 117 HIV-negative women were enrolled. HIV-positive women were significantly more likely to be African-American. HIV-positive women were less likely to engage in unprotected sex compared with HIV-negative women. Among HIV-positive women, unprotected sex was negatively associated with stronger beliefs regarding the protective value of condoms and concurrent injection-drug use.

Surratt et al (2005) assessed the link between substance abuse and HIV infection in St. Croix, US Virgin Islands (Surratt et al. 2005). The study included 254 long term drug and alcohol problem users. Crack was recently used by 78.6% of women and by 34.1% of men. Cocaine was recently used 8.4% of women and 7.3% men. Women also reported a significantly higher number of sexual partners in the past month and significantly more occasions of unprotected vaginal sexual contact. Rates of self-reported HIV infection were higher among women as well (8.8% vs. 1.4%). Overall self-reported HIV prevalence was 5.12%.

Wright et al. (2014) assessed correlates of HIV testing among 251 rural African American cocaine users (Wright et al. 2014). HIV testing was strongly associated with being female, of younger age; having been tested for sexually transmitted diseases or hepatitis, ever having been incarcerated; and having had one sex partner the past 30 days.

De Pesa et al. (2015) assessed predictors of condom use in 312 women receiving court-mandated drug and alcohol treatment (DePesa et al. 2015). Perception of relationship commitment, condom outcome expectancies, and age significantly affected condom use for women in the sample. Condom use was least likely when women reported to be in a stable relationship, when they were older and when they reported more positive condom outcome expectancies.

Koblin et al. (2010) assessed correlates of anal intercourse 404 HIV-negative non-injection drug using women (Koblin et al. 2010). At baseline, 41.7% reported anal intercourse in the prior 3 months; of these, 88.2% reported unprotected anal intercourse (UAI). Factors associated with UAI varied by partner type: UAI with a steady partner was associated with younger age, depressive symptoms, and experience of physical violence; UAI with casual partners was associated with younger age, cocaine use and negative outcome expectancies for condom use; UAI with exchange partners was associated with cocaine use, negative outcome expectancies for condom use and depressive symptoms. Younger women were more likely to report unprotected anal intercourse if they did not use birth control.

Atkinson et al. (2010) assessed multiple sexual partnerships in a sample of 692 African-American crack smokers living in Houston, TX (Atkinson et al. 2010). Results indicate that while many partnerships were based on trading sex for money or drugs, many participants reported partners they considered a spouse or friend.

Timpson et al. (2010) investigated sexual activity in 137 HIV-positive African American crack cocaine smokers in Houston, TX (Timpson et al. 2010). Participants reported having 1,266 different partners in the 30 days prior to the interview and 68% had traded sex for money or drugs. Rates of consistent condom use across partnerships were low.

Harzke et al. (2009) looked at binge use of crack cocaine and sexual risk behaviours among 303 African-American, HIV-positive users in Houston, TX (Harzke et al. 2009). Fifty-one percent reported a recent crack binge. The typical crack binge lasted 3.7 days and involved smoking 40 rocks on average. Seventy-two percent had sex during the last binge, with an average of 3.1 partners. Recent bingers had more sex partners in the last six months and they were more likely to have never used a condom in the last 30 days. Recent bingers were more likely to report lifetime trading of sex for drugs.

Pallonen et al. (2008) assessed consistent condom among 449 urban sexually active, heterosexual, African American crack smokers from two inner-city neighbourhoods in Houston, Texas (Pallonen et al. 2008). Over 90% of participants did not use condoms, consistently.

Schonnesson et al (2008) assessed drug use and sexual HIV risks behaviour among 258 HIV-positive crack cocaine smokers in Houston, Texas (Schonnesson et al. 2008). The cluster analysis produced three distinct groups based on five HIV drug use and sexual risk behaviours. The highest risk group had a higher proportion of illegal sources of income, higher proportion of binged crack use, frequent, daily, alcohol use, same gender sex partners, and scored higher on depressive symptoms. Members of the consistent condom use group were more likely to have been HIV diagnosed for a shorter time, to have HIV serodiscordant casual sex partners, higher psychological motivation for condom use, and a lower frequency of vaginal sex. Members of the inconsistent condom use group were more likely to have a main sex partner, to be married, to be on public assistance, to know the HIV serostatus of their casual partner, and less likely to conceal their HIV serostatus. A large number of participants inconsistently used condoms with HIV serodiscordant sex partners.

Ross et al. (2004) assessed condom use among 163 persons in treatment for cocaine use disorder (Ross and Schumacher 2004). Only 40% of the sample correctly used condom. There was no correlation between frequency of condom use and condom use skill.

Some 259 male heterosexual crack smokers with multiple sex partners were included in a cross-sectional survey to assess predictors of condom use (Bowen et al. 2006). Condom use at last sex and personal responsibility for condom use were predictors of intention to use condoms at next sex. Perceived partner responsibility was an additional positive predictor. Personal responsibility interacted with intimacy: only men who indicated the highest levels of intimacy were more likely to intend to use condoms.

Lejuez et al. (2005) compared sexual risk behaviour across primary users of (a) 35 heroin and not crack/cocaine users, (b) 55 crack/cocaine and not heroin users , and (c) 33 both heroin and crack/cocaine users. Impulsivity was assessed as a mediator of drug choice and sexual risk behaviour (Lejuez et al. 2005). Results indicated that sexual risk behaviour was higher in primary crack/cocaine users than in primary heroin users, with those using both drugs showing intermediate levels of sexual risk behaviour. A similar pattern across drugs was found for impulsivity. Impulsivity mediated the relationship between drug choice and sexual risk behaviour.

Cavazos-Rehg et al. (2009) conducted a case-control study comparing 459 cocaine dependent individuals recruited at inpatient and outpatient treatment centres in the St. Louis area with 459 community-based participants matched by age, ethnicity, gender, and zip code of residence (Cavazos-Rehg et al. 2009). Nearly half of cocaine-dependent participants in treatment had traded sex for drugs/money and over one-third had more than 10 sexual partners in 1 year with a risk concentrated among African Americans even after controlling for confounders. Participants recruited from the community with some exposure to cocaine reported similar rates of high risk sexual behaviours as the cocaine dependent subjects from treatment settings.

Kopetz et al. (2010) attempted to unntangle the relationship between cocaine (as compared to heroin) and sexual behaviour (Kopetz et al. 2010). The study examined 46 inner-city drug users, who reported a history of regular use of both cocaine and heroin and used a within subject's design to compare their results. The results indicated that compared to heroin, cocaine had negative effects on participants' perceived sexual desire and performance. Despite this, cocaine was more frequently used with an intimate partner than heroin. Participants did not differ in the extent to which they used the two drugs in other social contexts.

Canada (2 studies):

Chavoshi et al. (2010) reported sexual vulnerabilities among aboriginal 605 young people involved in illegal drug use in two Canadian cities (Cedar Project) (Chavoshi et al. 2010). Prevalence of inconsistent condom use during insertive sex was 59% (women) and 46% (men). Inconsistent condom use among women was significantly associated with ever being enrolled in a drug/alcohol treatment program and ever being sexually abused. Among men, inconsistent condom use was significantly associated with having more than 20 lifetime sex partners.

Fischer et al. (2006) reported risk behaviour practices among 148 primary crack-cocaine users from three mid-sized communities in Canada (Fischer et al. 2010). The majority of the sample frequently shared crack-use paraphernalia; and obtained crack pipe paraphernalia from makeshift items.

Spain (2 studies):

Macias et al. (2008) evaluated the prevalence of and factors associated with HCV infection among 182 PWID from Seville, Southern Spain (Macias et al. 2008). HCV infection was detected in 23 (12.6%) participants. Sharing the inhalation tube of crack cocaine, presence of tattoos and age 34 years or older were independently associated with HCV infection.

Brugal et al. (2009) examined injecting, sexual risk behaviours and HIV infection in 1,720 young cocaine and heroin users in Spain: 720 cocaine users, of whom 586 had never used heroin, and 991 heroin users (Brugal et al. 2009). Only 0.9% of cocaine users had ever injected versus 64.3% of heroin users; none had ever injected with borrowed syringes versus 25%; 2.2% had an injecting steady partner in the last 12 months versus 24.9%; 4.8% had ever traded sex versus 16.0%. However, 31.0 of cocaine users versus 12.7% of heroin users had unprotected sex with more than two occasional partners in the last 12 months; 45% versus 21.9% had sniffed through tubes used by more than 10 persons. Only 32.3% of cocaine users knew their HIV status versus 80.3% of heroin users; 0.4 versus 18.1% were HIV positive; 0.9 versus 51.9% were HCV positive, and 1.5 versus 17.0% were HBV positive.

Australia (1 study):

Shearer et al. (2007) interviewed cocaine users in the two largest Australian cities of Sydney (n=88) and Melbourne (n=77) (Shearer et al. 2007). One group was made of young, employed, well-educated individuals who used recreational intranasal cocaine. A second group of socially and economically marginalised users, living in Sydney, injected cocaine often in conjunction with heroin. This group reported significantly higher levels of cocaine use, cocaine dependence, criminal behaviour and HIV risk-taking behaviour. Heroin use was found to predict independently higher levels of cocaine use, criminal behaviour, and needle sharing and physical problems in this sample.

3. People who Inject Drugs

There were 28 studies focused on people who inject cocaine and crack-cocaine. Some studies also include people who inject drugs and also smoke crack-cocaine ('dual users'). The average pooled age distribution of the participants was around 33 years old (central distribution ranging from 21 to 43). Studies included an average of 76% of male participants.

An important systematic review and meta-analysis looked at the influence of different drugs on HIV risk in people who inject drugs (Tavitian-Exley et al. 2015). The risks of HIV acquisition among PWID varied by drug type, but differences were not statistically significant. Compared to non-injectors, the risk of acquiring HIV was 3.6 (95% CI=2.8–4.7) times higher for cocaine injectors; it was 3.0 (95% CI=2.2–4.1) for ATS injectors and 3.5 (95% CI=2.3–5.2) for heroin injectors in Asia and Europe. Cocaine and ATS injectors had a consistently high risk of HIV acquisition.

Canada (7 studies):

DeBeck et al. (2009) found that smoking of crack cocaine was an independent risk factor for HIV seroconversion among people who were injecting drug users. This study followed 1,048 injecting drug users from Greater Vancouver to assess whether smoking of crack increased risk of HIV infection (DeBeck et al. 2009). The study was divided the study into 3 periods: period 1 (1996-1999), period 2 (1999-2002) and period 3 (2002–2005). Some 137 acquired HIV infection during follow-up (13.1%). The overall incidence of HIV infection was 2.7 (95% CI 2.2–3.1) per 100 person-years. The mean proportion of participants who reported daily smoking of crack cocaine increased from 11.6% in period 1 to 39.7% in period 3. It was found that the risk of HIV seroconversion among participants who were daily crack smokers increased over time.

Bruneau et al. (2011) followed 2,137 PWID who were HIV-negative in Montreal (Bruneau et al. 2011). Within 4 years, 148 participants became HIV-positive: 3.3 per 100 person-years (95% CI 2.8, 3.9). An annual HIV incidence of 0.06 cases per 100 person-years prior to 2000 was followed by 0.24 cases per 100 person-years during and after 2000. Increasing cocaine and heroin use were observed. HIV seroconversion was associated with male gender, unstable housing, intravenous cocaine use, and sharing syringes or having sex with an HIV-positive partner. HIV incidence has declined in this cohort, with a greater HIV reduction after 2000.

De et al. (2007) compare the drug-injecting network characteristics of cocaine and heroin injectors associated with a risk of HIV and hepatitis C virus (De et al. 2007). Of 282 IDUs, 228 (81%) used cocaine and 54 (19%) used heroin as their primary injected drug. A difference in HIV and HCV infection risk was identified between cocaine and heroin injectors. Self-reported HIV prevalence was 23% among cocaine and 4.1% among heroin ($p= 0.003$); HCV prevalence was 71.1% among cocaine injectors and 38.8% among heroin injectors ($p<0.001$). HIV-HCV co-infection was 22.4% among cocaine injectors and 4.3% among heroin injectors ($p=0.004$). Cocaine injectors were more likely to live in unstable housing, self-report HCV infection, and have a greater number of IDUs in their social network and were less likely to be polydrug users and to have social support. The authors argue that difference on HIV and HCV infection risk can be attributed to the characteristics of an IDU's social and drug-injecting networks. The injecting networks of cocaine users were more likely to have members who were older, had a history of shooting gallery use, and had shorter relationships with the subject.

Wylie et al. (2006) conducted a cross-sectional survey with 435 injection drug users in Winnipeg (365 participants provided blood specimen) (Wylie et al. 2006). HIV prevalence was 7.2%, HCV prevalence was 54.2% and HBV prevalence was 30.5%. Variables positively associated with serostatus for all three pathogens were: years of ID use, aboriginal ethnicity, and injection at a shooting gallery, ever reporting the use of someone else's used syringe; injecting someone else; and having opposite-sex client partners.

De et al. (2009) evaluated HIV and HCV discordant injecting partners and their association to drug equipment sharing (De et al. 2009). PWID were recruited from syringe exchange and methadone treatment programmes in Montreal (67% injected primarily cocaine in the past 6 months). Self-reported HIV prevalence was 19% and self-reported HCV prevalence was 62%. Among 159 participants and 245 injecting partners, sharing of syringes and drug preparation equipment did not differ between concordant or discordant partners, although HIV-positive subjects did not share with HIV-negative injectors. Factors such as large injecting networks, frequent mutual injections, younger age, and male gender were stronger predictors of equipment sharing. The authors concluded that PWID do not discriminate drug equipment sharing partners based at least on their HCV infection status only.

Levesque et al. (2013) found that psychological distress increased needle sharing among cocaine users (Levesque et al. 2013). The study was a cross-sectional survey among 589 cocaine smokers or injectors were recruited in community-based and addiction treatment programs located in Montreal. Severe psychological distress was reported by 34.3% participants. The prevalence of sharing was: 14.8% for needles, 24.9% for other injection equipment and 68.3% for smoking material. Multivariate analysis showed that injectors with severe psychological distress were more likely to report needle sharing.

Shannon et al. (2008) assessed HIV and HCV prevalence and gender-specific risk profiles of 437 crack cocaine smokers and dual users of injection drugs (Shannon et al. 2008b). Of 437 crack smokers, 246 (56%) were dual users (crack smokers who inject drugs) while 191 (44%) were never injectors. HIV prevalence was higher among dual users when compared to never injectors (31% versus 19%; $p = 0.016$). HCV prevalence was also higher among dual users when compared to never injectors (85% versus 46%; $p<0.001$). Dual use among female crack smokers was associated with HCV infection, exchanging sex for money, drugs, or shelter while using crack, having a casual partner who injects, having equipment broken or confiscated by police without being arrested, and HIV infection. Among male crack smokers, dual use was associated with HCV infection, exchanging sex for money, drugs, or shelter, crack use history ≥ 5 years, and smoking in a group of unknown people.

USA (8 studies):

Huo and Ouellet (2009) examined the impact of a needle exchange program (NEP) on sexual risk behaviours of 889 injecting drug users in Chicago, Illinois. NEP users were compared with NEP non-users (Huo and Ouellet 2009). NEP users had a similar number of sex partners over time, but had 49% higher odds of using condoms with their main partners ($p=0.047$). At baseline, there was no difference between NEP users and non-users in episodes of vaginal intercourse, but over time the odds of having a higher number of unprotected instances of vaginal intercourse were reduced by 26% per year for NEP users but only 10% per year for non-users ($p=0.02$).

McCoy et al. (2005) assessed a cohort of 111 PWIDU injection drug users and their partners in Miami, Florida. The cohort was assessed in 1988 and then ten years later (McCoy et al. 2005). In 1988 the HIV prevalence among the IDUs was 25% and 4% among the sex partners. Among the 88 individuals who

were HIV negative in 1988, 18 (20%) seroconverted at some time during the 10-year period for an annual rate of approximately 2%. 10-year incidence was 4.1 per 100 person years HIV incidence was twice as high for sex partners (37.5%) as for IDUs (18.0%). Drug and needle use risk behaviours, except crack use, showed decreases; sexual risk behaviours were more difficult to change. Knowledge significantly increased among the long-term HIV negatives and seroconverters but not among those HIV positive in 1988.

Corsi et al. (2006) located a sample of 561 IDUs (a significant promotion used crack) in about 7 years after completing baseline measures (Corsi et al. 2006). Significant improvement was observed in most high-risk injection and sex behaviours. However, over half the sample reported having sex without a condom at follow-up. Sex without a condom at baseline, not having previously participated in drug treatment, being of an ethnicity other than African American, smoking crack, and having sex with a drug injector were all significantly related to having sex without a condom at follow-up.

Khan et al. (2013) measure associations between non-injection crack-cocaine and injection drug use and sexually transmitted infection (Khan et al. 2013). The study used the National Longitudinal Study of Adolescent Health (N= 14,322) and categorised participants in three groups: injection drug users, non-injection crack-cocaine users, or non-users of crack-cocaine or injection drugs. Injection drug use was independently associated with over twice the prevalence of biologically-confirmed STI, and non-injection crack-cocaine use was associated with moderate elevations in infection. Non-injection crack-cocaine use remained an independent correlate of STI when adjusting. Injection drug use was strong association with STI appeared to be mediated by sex with STI infected partners rather than by sexual risk behaviours.

McCoy et al. (2004) explored the independent and dual risks of injection practices and crack smoking for HIV infection (McCoy et al. 2004). The study examined HIV seroprevalence rates among 3,555 drug user group from urban Miami and rural Belle Glade and Immokalee, Florida. HIV seroprevalence rates were 45.1% for IDUs, 30.5% for dual users, 20.1% for crack smokers and 7.3% for controls. When compared with controls odds ratios for HIV seropositivity were 9.81 for IDUs, 5.27 for dual users, and 2.24 for crack smokers. Among women: 48.3% of those who reported crack use only and 53.8% of those who were dual users reported exchanging sex for money/drugs compared with 29.4% of women who were IDUs and 2% of women who were in the control group ($p<0.0001$). Dual users were more likely than the other drug user groups and the control group to engage in high risk sexual practices including unprotected sex, have more than one sex partner, exchange sex for money/drugs, and have a history of STDs. This study demonstrates a clear pattern of risk even after adjusting for demographic and risk behaviour variables.

Deren et al. (2008) examined baseline predictors of changes in sex risk at 6- and 36-month follow–up interviews among 837 high-risk IDUs from New York (n = 573) and Puerto Rico (n = 264) (Deren et al. 2008). In New York, predictors of higher sex risk were being younger, having primary partners, having more sex partners, never exchanging sex, having lower self–efficacy for reducing sex risk behaviours and being HIV–negative. In Puerto Rico, short–term predictors included being male, having primary partners, never exchanging sex, lower sex risk norms and lower self–efficacy. Only having primary partners was significant in longer–term behaviours.

Buchanan et al. (2006) compared demographic, HIV risk behaviour, and health status characteristics of injection drug users who have injected crack-cocaine with IDUs who have not in three New England

cities. Nine percent (n=89) of participants reported “ever” injecting crack cocaine and 4.2% (n=42) reported injecting crack in the past 30 days. Lifetime and current crack injectors did not differ significantly on any demographic characteristics. Lifetime and current crack injectors did not differ on gender, age or marital status from PWID who have never injected crack. Significant differences were found on race, education, employment and residence, with crack injectors more likely to be white, employed, better educated and living in New Haven than PWID who have never injected crack. After adjusting for current (past 30 day) speedball and powder cocaine injection, crack injectors reported higher rates of risky drug use behaviours and female crack injectors reported higher rates of risky sexual behaviours. Crack injectors reported higher rates of abscesses, mental illness and Hepatitis C infection (42% vs 31.7%), but not Hepatitis B (25% vs 23%) or HIV infection (25% vs 26%).

Santibaneza et al (2005) analysed data from the second Collaborative Injection Drug Users Study from six US cities (Santibanez et al. 2005). Crack-cocaine injection was reported by 329 (15%) of 2198 participants. Prevalence varied considerably by site (range, 1.5–28.0%). No participants injected only crack-cocaine. At four sites where crack-cocaine injection prevalence was greater than 10%, recent (past 6 months) crack-cocaine injection was correlated with recent daily injection and sharing of syringes, equipment, and drug solution. Lifetime crack-cocaine injection was correlated with using shooting galleries, initiating others into drug injection, and having serologic evidence of hepatitis B virus and hepatitis C virus infection.

Brazil (12 studies):

Malta et al. (2010) conducted a systematic review and meta-analysis of studies assessing HIV prevalence among MSM, FSW and drug users in Brazil (Malta et al. 2010). Twenty-nine studies targeting drug users were identified (13,063 participants). Those studies consistently identified injection drug use and syringe/needle sharing as key predictors of HIV-infection, as well as engagement in sex work and male-to-male sex. The combined HIV prevalence across studies targeting drug users was 23.1 (95% CI: 16.7-30.2).

A cross-sectional survey with 205 PWID from public health clinics in the city of São Paulo found Hepatitis B and C prevalence were 55% (95% CI: 49;63) and 83% (95% CI: 78;88), respectively (Marchesini et al. 2007). The vast majority of the sample (80%) never heard of Hepatitis B and C before starting to inject drugs.

De Boni et al. (2005) assessed risks differences of HIV infection between injection drug users between Rio de Janeiro and Porto Alegre (De Boni et al. 2005). Both samples presented high level of injecting and sexual risk behaviour. But there were no statistically significant differences between the two samples in terms of demographic characteristics. The Porto Alegre sample reported more frequent cocaine injection and more injecting risk behaviours. The Rio de Janeiro sample was older, had more sexual risk behaviours and more frequent use of both alcohol and snorted cocaine.

Zocratto et al. (2006) assessed 272 IDUs from five Brazilian cities (Zocratto et al. 2006). This data was collected in 1998. IDUs were clustered in four groups: seronegative (37.9%), HCV mono-infected (10.3%), HIV mono-infected (9.2%), and co-infected (42.6%). The majority of the IDUs who reported ever having received/borrowed (78.8%) or given/lent syringes (77.4%) to other IDUs belonged to one of the infected groups. Active sharing of injecting equipment was associated with HCV infection (p =

0.001). Sexual behaviour variables, especially male same-sex sexual relations, were consistently associated with HIV infection. Some 60% reported not having used condoms in their sexual relations with partners of the opposite sex. HCV/HIV co-infection was associated with both sexual and drug use variables.

Oliveira et al. (2005) assessed 609 IDUs from Rio de Janeiro and identified a decline in rates of hepatitis B virus infection among injection drug users (Oliveira et al. 2005). The prevalence of HBV infection was 27.1%, with 3.4% of the sample positive for HbsAg (active infection) and 0.8% positive for anti-HBs (indicating previous HBV vaccination) (Oliveira et al. 2005). Most interviewees (81.3%) were aware of at least one form of viral hepatitis and received information from many different sources. 96.7% of the interviewees stated they had never been vaccinated against hepatitis B, but almost all unvaccinated interviewees (97.8%) said they would volunteer to be vaccinated if HBV vaccination were available.

Oliveira et al. (2006) recruited 606 IDUs in "drug scenes" (public places, bars) in Rio de Janeiro (Oliveira et al. 2006). Sharing of needles/syringes was more prevalent at the first injection (51.3%) than at the baseline interview (36.8%). Those who shared syringes/needles at first injection were more likely to be currently engaged in direct/indirect sharing practices. Among young injectors (< 30 years), those reporting sharing of needles/syringes at the first injection were about four times more likely to have been infected by HCV. Hepatitis C virus prevalence among active IDUs (n = 272) was 11%. Prison history and longer duration of drug injection were identified as independent predictors of HCV infection.

Oliveira et al. (2009b) assessed trends HCV prevalence, risk factors and distribution of viral genotypes in 770 injecting drug users in Rio de Janeiro (Oliveira et al. 2009b). HCV trends were examined in two cross-sectional studies (1994–1997 and 1999–2001). A substantial decline in the prevalence of HCV infection was found over the years (75% in 1994 vs. 20.6% in 2001, P<0.001) that may be a consequence of the significant reduction in the overall frequencies of drug injection and needle-sharing, as well as the participation of IDUs in initiatives aimed at reducing drug-related harm.

Oliveira et al. (2009a) compared HCV transmission among young/short-term (ST) and long-term (LT) IDUs in Rio de Janeiro (Oliveira et al. 2009a). ST were more likely to engage into needle-sharing (p = .021) and LT to attend Needle Exchange Programs (p = .006). HCV prevalence was 10.1% vs. 23.4% among initiates and LT, respectively (p < .001). Older age vs. imprisonment and longer duration of IDU career were independent predictors for HCV infection among ST and LT, respectively. Among the latter, NEP attendance was inversely associated with viral infection.

Silva et al. (2010) investigated serological and virological parameters among 194 IDUs, 94 ex-IDUs and 95 non-IDUs in Salvador, Brazil (Silva et al. 2010). Anti-HCV screening revealed that 35.6%, 29.8% and 5.3% of samples from IDUs, ex-IDUs and non-IDUs, respectively, were seropositive. HCV-RNA detection confirmed that the prevalence of infection was 29.4%, 21.3% and 5.3% for IDUs, ex-IDUs and non-IDUs, respectively.

Pechansky et al. (2006) pooled data from five studies to describe associations between drug use and HIV (Pechansky et al. 2006). The study included 1,449 subjects who were divided into categories based on their pattern of drug use: (1) injection drug users (IDUs), (2) crack smokers, (3) frequent drug users, and (4) infrequent drug users. Half of the subjects reported frequent condom use, and exchanges involving drugs, sex, and money were infrequent but more common in groups 1 and 2. The overall

seroprevalence was 20.6%, and the prevalence was different across the four groups, showing a linear decrease from group 1 (57.1%) to group 4 (11.7%). The PWID and crack-smoking groups showed similarities in their risk levels when compared with the other two groups. After controlling for all other risk factors, PWID, males having sex with males, and crack use were highly associated with HIV.

Caiaffa et al. (2006) assessed 1,144 IDUs from two from Brazilian multi-center studies. Over half of the participants (52%) were HIV-infected in the first study (Ajude I, 1998) and 36.5% in the second study (Ajude II, 2000/2001) (Caiaffa et al. 2006). In both studies, HIV infection was independently associated with: mean background HIV prevalence for each site, HCV seropositive status, and men who reported ever having sex with other men. Incarceration and 8 or more years of injecting drug were also associated with HIV in AjUDE II.

Pechansky et al. (2004) examined risk factors for HIV transmission in 420 drug users from Porto Alegre (Pechansky et al. 2004). Overall HIV seropositivity was 22.6%; 70.0% of the sample reported no prior drug injection. 39.3% of the subjects infected were at least 30 years old, and 69.5% were males.

Colombia (1 study):

Berbesi et al. (2014) surveyed 796 IDUs from three main cities in Colombia. Estimated HIV prevalence for the studied population was 2.6% for men and 3.1% for women. The data suggest a recent introduction of HIV into networks and a high degree of risk behaviour for HIV spread in networks and used syringes (Berbesi et al. 2014). People who reported sharing syringes, were at greater risk of not using a condom when having sex with casual partners, this factor is increased when controlling for other variables.

4. Men who have Sex with Men (MSM) Only

There were two studies focused on men who have sex with men. The average pooled age distribution of the participants was around 34 years old (central distribution ranging from 29 to 31).

USA (2 studies)

Brocato et al. (2014) interviewed 106 adult African American women of sex-trading Men Who Have Sex with Men and Women about sexual practices and HIV risk behaviours (Brocato et al. 2014). Nearly 90% of participants reported unprotected vaginal sex and using crack cocaine in the previous 3 months. The recent use of heroin was significantly associated inconsistent condom use. Over half percent of the participants (58.5) did not know their HIV status.

Tobin et al. (2011) compared social and sexual networks of crack-using and non-crack using African American men who have sex with men (Tobin et al. 2011). Of 230 enrolled AAMSM, 37% (n=84) reported crack use. The sexual networks of crack-using African American MSM were composed of a greater number of HIV-positive sex partners, exchange partners, and partners who were both sex and drug partners and fewer networks with whom they always use condoms as compared to non-crack using African American MSM. Crack use was independently associated with increased odds of bisexual identity and networks with a greater number of exchange partners, overlap of drug and sex partners, and less condom use.

5. Sex Workers

There were 7 studies focused on sex workers. The average pooled age distribution of the participants was around 35 years old (mean or median ranging from 32 to 39).

Australia (1 study)

Degenhardt et al. (2006) analysed police data to examine links between cocaine use and street-based sex work in New South Wales, Australia (Degenhardt et al. 2006). The study identifies an increase in cocaine use among IDUs in 2001. An increase in prostitution offences was also observed around this time. Subsequent reductions in cocaine availability led to decreased cocaine use and possession offenses, along with reductions in prostitution offenses.

Canada (2 studies)

Duff et al. (2013) examined the correlates of sex-for-crack exchanges and associated effects on sexual risk outcomes among 206 street-based female sex workers, who use drugs in Vancouver (Duff et al. 2013). Of 206 SWs, 101 (49%) reported sex-for-crack exchanges over 18 months of follow-up. Sharing a crack pipe with a client and smoking crack in a group of strangers were independently correlated with sex-for-crack exchanges. After controlling for confounders, exchanging sex for crack remained significantly associated with having a greater number of clients per week.

Shannon et al. (2008) explored the association between sharing illicit drugs with clients and sexual and drug-related harms among 198 survival sex workers (Shannon et al. 2008a). Based on diagnostic testing, the overall HIV prevalence was 26%. Self-reported HCV prevalence was 59% and 11% reported a recent STI diagnosis (gonorrhoea, chlamydia, syphilis). Of the total, 117 (59%) reported sharing drugs with clients in the last six months and crack-cocaine was the primary drug shared (n=108). Sharing drugs with clients was associated with borrowing a used crack pipe, intensive/daily crack cocaine smoking and inconsistent condom use by a client.

USA (3 studies)

Risser et al. (2006) assessed 93 African American female crack cocaine users who traded sex for money in Houston, Texas (Risser et al. 2006). Current traders were less likely to have a main sexual partner, more likely to have a casual sexual partner, and more likely to smoke larger quantities of crack. There was a significant trend towards current traders reporting lower self-esteem, greater depression and anxiety, poorer decision-making confidence, more hostility, less social conformity, greater risk taking behaviours, and more problems growing up, compared to previous and never traders.

Inciardi et al. (2005) assessed the effect of serostatus on HIV risk behaviour change among 407 women sex workers in Miami, Florida (Inciardi et al. 2005). About 73% of the sample used crack in the past month and 21.9% of the total sample were HIV-positive. Overall, at follow-up, the HIV-positive women were 2.4 times more likely than the HIV-negative women to have entered residential treatment for drug abuse, 2.2 times more likely to have decreased the number of their sex partners, 1.9 times more likely to have decreased the frequency of unprotected sex, 1.9 times more likely to have reduced their levels of alcohol use, and 2.3 times more likely to have decreased their crack use.

Edwards et al. (2006) assessed correlates of exchanging sex for drugs or money 669 among women who use crack-cocaine (Edwards et al. 2006). The results indicate that heavier crack use, homelessness, and unemployment are associated with trading sex. In addition, childhood abuse is associated with trading sex and this relationship is, in part, mediated by psychological distress.

Mexico (1 study)

Patterson et al. (2006) compared sexual and drug use behaviours between 295 female sex workers (FSWs) in Tijuana and Ciudad Juarez (Patterson et al. 2006). Among 155 FSWs in Tijuana and 140 in Cd. Juarez, HIV seroprevalence was 4.8% and 4.9%, respectively. FSWs in Cd. Juarez were more likely to test positive for active syphilis (31.3%) compared with Tijuana (11.8%) but did not differ in terms of the prevalence of gonorrhoea and chlamydia. FSWs in both sites reported high levels of unprotected sex and use of drugs; however, FSWs in Cd. Juarez were more likely than those in Tijuana to ever have injected drugs (75% vs. 25%, $p < .001$). Heroin and cocaine use and injection drug use were significantly more common in Cd. Juarez, whereas methamphetamine use was more common in Tijuana. Injection of vitamins was common in both cities. Logistic regression analyses suggested that being younger, working in Cd. Juarez, and using heroin or cocaine were independently associated with active syphilis infection. In Tijuana, methamphetamine use was strongly associated with active syphilis infection.

6. Summary of the Findings

The present review identified several studies assessing the association between HIV and cocaine and crack-cocaine use. The evidence gathered was mostly from North and South America. The majority of the studies had a cross-sectional design, which is less able to explain the relationship between exposure and outcome than longitudinal cohort studies. There is a dearth of evidence on minority groups, such as sex workers and prison-based populations.

HIV Prevalence

HIV prevalence among cocaine and crack-cocaine users should be analysed into two distinct groups due: those who use drugs via non-injecting routes (smoke or snort) and those who inject. This is due to their different levels of exposure to HIV risk.

The total pooled HIV prevalence rate of 23 studies involving non-injectors was around 10%, but this figure varied greatly (table 1). A low prevalence rate of 0.4% was reported among Spanish intranasal cocaine users (Brugal et al. 2009). Nunes et al. (2007) also found a low prevalence of 1.6% among female crack cocaine users in Salvador, Brazil. High prevalence rates ranging from 14% up to 37% were reported in several studies in North America, in one study in Trinidad and Tobago and in one study in southern Brazil.

HIV prevalence rates among crack/cocaine non-injectors appear to be lower in South America (11 studies, pooled prevalence of 6.13%) than in North America (8 studies, pooled prevalence 15.56%). When studies reporting extreme prevalence rates are excluded, the gap is even greater: in South America (9 studies, pooled prevalence of 6.63%) compared to North America (6 studies, pooled prevalence 18%). This might be due to injecting drug use being lower in South America than North America. Participants in North American studies might also inject other drugs or have a history of injecting drugs. It might be also the case that non-injectors in North America have more HIV-positive individuals in their social network.

Among PWID, HIV seroprevalence were markedly higher in most countries. The combined average prevalence from 11 studies among PWID was 29% (table 2), ranging from 2.6% among male injectors in Colombia (Berbesi 2014) up to 52% in the first phase of the AJUDE project in Brazil (Caiaffa et al. 2006). The gap between prevalence rates in South America (pooled average of 30.31%) and North America (pooled average of 25%) is narrower among injector populations.

HIV incidence rates reported in the longitudinal cohort studies are presented in Figure 5. All studies were conducted in North America. The pooled incidence per 100 person-years was 2.56 (95% CI 1.83, 3.29), varying from 0.88 (95% CI 0.31, 1.45) in New York and up to 3.37 (95% CI 2.02, 4.72) in Puerto Rico (Deren et al. 2004). McCoy et al. (2005) reported a HIV incidence rate of 4.1 per 100 person years in Miami, USA. This result was not included in the figure below as the confidence interval was not reported. Tavitian-Exley et al. (2015) in their systematic review and meta-analysis estimated that the risk of acquiring HIV was 3.6 (95% CI=2.8–4.7) times higher for cocaine injectors compared to non-injectors. Cocaine and ATS injectors had a consistently high risk of HIV acquisition.

Table 1: HIV prevalence among non-injecting cocaine and crack-cocaine users

Studies	Country	HIV prevalence
South America		
Bastos 2014	Brazil	4.97%
Bertoni, 2014	Brazil	6.92%
Santos Cruz 2013	Brazil	7.50%
Von Diemen 2010	Brazil	37%
De Carvalho 2009	Brazil	6.6%
Nunes 2007	Brazil	1.60%
De Azevedo 2007	Brazil	7%
Caiaffa 2011	Uruguay and Argentina	7.9%
Zocratto 2010	Uruguay and Argentina	6.19%
Health Ministry of Uruguay 2013	Uruguay	6.3%
Rossi 2008	Argentina	6.30%
Central America		
Day 2007	Saint Lucia	7.50%
Reid 2006	Trinidad and Tobago	19.80%
North America and Europe		
Des Jarlais 2014	USA	16%
Brewer 2007	USA	34.27%
Weiser 2006	USA	14%
Rees 2006	USA	23.90%
Surratt 2005	USA	5.12%
Tortu 2004	USA	14.60%
McCoy 2004	USA	20.10%
Shannon 2008	Canada	19%
Brugal 2009	Spain	0.40%

Table 2: HIV prevalence among people who injecting crack/cocaine users

Studies	Country	HIV prevalence
South America		
Berbesi 2014	Colombia	2.6% (men) -3.1% (women)
Malta 2010	Brazil	pooled 23.1
De Azevedo 2007	Brazil	33%
Zocratto 2006	Brazil	51.80%
Pechansky 2006	Brazil	20.60%
Caiaffa 2006	Brazil	52%[1]
Caiaffa 2006	Brazil	36.5%[2]

Pechansky 2004	Brazil	22.60%
North America		
De 2009	Canada	19%
Shannon 2008	Canada	31%
De 2007	Canada	23%[3]
Wylie 2006	Canada	7.20%
Buchanan 2006	USA	25%
McCoy 2004	USA	45.10%

[1] Ajude I, 1998
[2] Ajude II, 2000/2001
[3] Self-reported

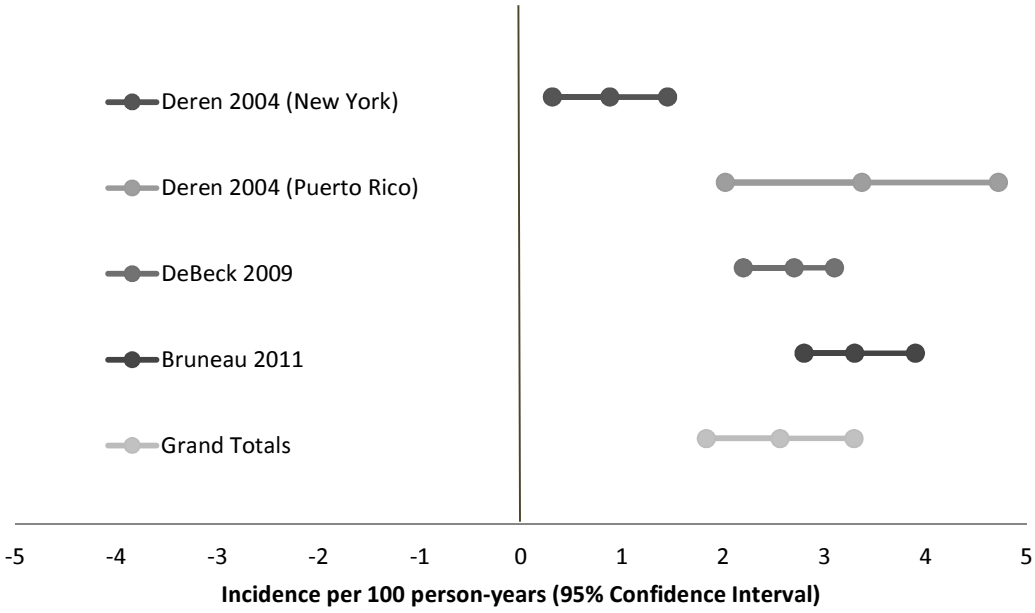

Figure 5: HIV Incidence

HCV Prevalence

Thirteen studies reported HCV prevalence rates among crack/cocaine non-injectors. There was a great variability in the rates reported by studies in North and South America and Europe (Table 3). The lowest rate (0.60%) was reported by Santos Cruz et al. (2013) in Brazil and the highest (46%) was reported by Shannon et al. (2008). Eleven studies reported HCV rates among crack/cocaine injectors (Table 4). HCV seroprevalences were constantly high in this group with an average pool prevalence of 48.6%. HCV prevalences in South America (6 studies, pooled average 36.72%) were lower than those reported in North America (5 studies, pooled average 63%).

Table 3: HCV prevalence among non-injecting cocaine and crack-cocaine users

Studies	Country	HCV Prevalence
South America		
Bastos 2014	Brazil	2.63%
Bertoni, 2014	Brazil	0.63%
Oliveira-Filho, 2013	Brazil	31.30%
Santos Cruz, 2013	Brazil	0.60%
Von Diemen, 2010	Brazil	27.70%
De Sa, 2013	Brazil	1%
Nunes, 2007	Brazil	2.40%
Caiaffa, 2011	Uruguay and Argentina	8.8%
Rossi 2008	Argentina	7.50%
North America and Europe		
Shannon 2008	Canada	46%
Tortu 2004	USA	19.50%
Brugal 2009	Spain	0.90%
Macias 2008	Spain	12.60%

Table 4: HCV prevalence among people who injecting cocaine and crack-cocaine users

Studies	Country	HCV Prevalence
South America		
Silva 2010	Brazil	29.40%
Oliveira 2009a	Brazil	23.40%
Oliveira 2009b	Brazil	20.60%
Marchesini 2007	Brazil	83%
Zocratto 2006	Brazil	52.90%
Olivera 2006	Brazil	11%
North America		
De 2009	Canada	62%
Shannon 2008	Canada	85%
De 2007	Canada	71.1%
Wylie 2006	Canada	54.20%
Buchanan 2006	USA	42%

HBV Prevalence

Six studies reported HBV prevalence among non-injecting crack/cocaine users (average pooled prevalence 6.93%). The great majority of studies were from South America. Prevalence rates ranged from 0.80% (Nunes et al. 2007) up to 16% (Bertoni, 2014). Among PWID, HBV rates were comparable and consistently high (4 studies, average pool 30.40%). Two studies from North America reported HBV

rates of 25% and 30.50% (Buchanan et al. 2006, Wylie et al. 2006) and two studies from Brazil reported HBV rates of 27.10% and 55% (Oliveira et al. 2005, Marchesini et al. 2007)

Table 5: HBV prevalence among non-injecting cocaine and crack-cocaine users

Studies	Country	HBV Prevalence
Bertoni, 2014	Brazil	16.35%
Santos Cruz, 2013	Brazil	3.12%
Nunes, 2007	Brazil	0.80%
Zocratto, 2010	Uruguay and Argentina	10.80%
Rossi 2008	Argentina	9%
Brugal 2009	Spain	1.50%

Table 6: HBV prevalence among injecting cocaine and crack-cocaine users

Studies	Country	HBV Prevalence
Marchesini 2007	Brazil	55%
Oliveira 2005	Brazil	27.10%
Wylie 2006	Canada	30.50%
Buchanan 2006	USA	25%

Sexual Risk Behaviour

Inconsistent condom use was reported by several studies (Bastos and Bertoni, 2014; Bertoni et al. 2014; Day 2007; Koblin et al. 2010; Timpson et al. 2010; Pallonen et al. 2008; Schonnesson et al 2008; Brocato et al. 2014; Diehl et al. 2014; Zocratto et al. 2006). Some studies reported inconsistent condom use in over half of the sample (Bastos and Bertoni, 2014; de Carvalho and Seibel 2009; Santos Cruz et al. 2013; Nunes et al. 2007; Chavoshi et al. 2010). One study reported that over half of the sample used condoms correctly; however, this factor was not associated with frequency of condom use (Ross et al. 2004).

Chavoshi et al. (2010) found that inconsistent condom use among women was significantly associated with ever being enrolled in a treatment programme and ever being sexually abused. Among men, inconsistent condom use was significantly associated with having more than 20 lifetime sex partners.

Another study identified the sense of personal and partners' responsibility for condom use as predictors of intention to use condoms in the future (Bowen et al. 2006). Having used condoms in the past was also a positive predictor. Personal responsibility interacted with intimacy such that only men who indicated the highest levels of intimacy were more likely to intend to use condoms.

However, DePesa et al. (2015) found that older women and those in a stable relationship were least likely to report condom use. Koblin et al. (2010) also found that factors associated with unprotected anal intercourse (UAI) varied by partner type. Cocaine use was related to UAI with a casual or an exchange partner. The study also found that younger women were more likely to report unprotected anal intercourse if they did not use birth control.

Zocratto et al. (2010) found a dose-response relationship between the use of condoms and the risk of HBV. Subjects who reported safe sexual practices in both anal and vaginal intercourse showed a lower risk of being HBV seropositive in comparison with those using condoms in either sexual practice.

Brewer et al. (2007) found that HIV-positive women were less likely to engage in unprotected sex compared with HIV-negative women.

Huo and Ouellet (2009) examined the impact of a needle exchange program (NEP) on sexual risk behaviours and found that NEP users had a similar number of sex partners over time, but had greater odds of using condoms with their main partners. At baseline, there was no difference between NEP users and non-users in episodes of vaginal intercourse, but over time the odds of having a higher number of unprotected instances of vaginal intercourse were reduced for NEP users.

Deren et al. (2008) examined baseline predictors of changes in sex risk at 6- and 36-month follow–up interviews among high-risk IDUs from New York and Puerto Rico (Deren et al. 2008). In New York, predictors of higher sex risk were being younger, having primary partners, having more other sex partners, never exchanging sex, having lower self–efficacy for reducing sex risk behaviours and being HIV–negative. In Puerto Rico, short–term predictors included being male, having primary partners, never exchanging sex, lower sex risk norms and lower self–efficacy. Only having primary partners was significant in longer–term behaviours.

Harzke et al. (2009) looked at binge use of crack cocaine and sexual risk behaviours among HIV-positive African-American (Harzke et al. 2009). Crack binge was common and over two-thirds of bingers had sex during the last binge. Crack bingers also reported more sex risk behaviour.

Exchange Sex for Money/drugs

Exchanging sex for drugs or money was reported in several studies included in this review (Atkinson et al. 2010; Risser et al. 2006). The percentage of the sample that practised this risk behaviour varied in different studies: a third of the sample reported exchanging sex for drugs/money in Nunes et al. (2007) and Day (2007) studies, 12.5% in Santos Cruz et al (2013), 14% in de Carvalho and Seibel (2009), and nearly half of the sample in Cavazos-Rehg et al. (2009), Duff et al. (2013) and Bastos and Bertoni (2014) studies.

Crack/cocaine use seems to be correlated to exchanging sex for money/drugs predominantly among women (Inciardi et al. 2005). However, a minority of men also report exchanging sex for money/drugs (Weiser et al. 2006). In Australia, Degenhardt et al. (2006) identified an increase and then a reduction in prostitution offences around the same time that there was an increase and then a reduction in cocaine use happened among IDUs.

Exchanging sex for crack/money has been associated with several HIV risk behaviours, such as having greater number of clients/week (Duff et al. 2013), high levels of unprotected sex (Patterson et al. 2006), sharing crack cocaine with clients (Shannon et al. 2008a), heavier crack use, homelessness, and unemployment (Edwards et al. 2006). Bastos and Bertoni (2014) reported a higher HIV prevalence among those who exchange sex for drugs/money than among those who did not.

Table 7: HIV prevalence among Sex workers

Studies	Country	HIV prevalence
Inciardi 2005	USA	21.90%
Patterson 2006	Mexico (Tijuana)	4.80%
Patterson 2006	Mexico (Cd. Juarez)	4.90%

Injecting Risk Behaviour

Injecting drugs is a critical risk behaviour for HIV, HCV and HBV infection. Injecting risk behaviours include sharing/lending syringes, using someone else's used syringe, injecting someone else, etc. Crack/cocaine injectors seem to frequently engage in this type of risk behaviour (De Boni et al. 2005; Zocratto et al. 2006; Santibanez et al. 2005). Several studies included in the present review found associations between injecting risk behaviours and positive serostatus, particularly HCV infection (Wylie et al. 2006; Malta et al. 2010; Zocratto et al. 2006; Oliveira et al. 2006; Santibanez et al. 2005).

Oliveira et al. (2006) found that sharing of needles/syringes was more prevalent at the first injection and these individuals were more likely to currently engage in sharing practices. The same authors also reported in a separate study that short-term injectors were more likely to engage in needle-sharing while long-term injectors were more likely to attend Needle Exchange Programmes. Attendance to Needle Exchange Programmes was inversely associated with viral infection among long-term injectors (Oliveira et al. 2009a).

De et al. 2009 found that sharing of syringes and drug preparation equipment did not differ between concordant or discordant partners for HCV infection; however, HIV-positive individuals did not share with HIV-negative injectors.

People who reported sharing syringes might also engage in other risk behaviours (Berbesi et al. 2014), which increasing the likelihood of infection. Psychological distress was also found to increased needle sharing among cocaine users (Levesque et al. 2013).

Two longitudinal cohort studies with PWID identified injecting risk behaviour decreasing over the years (McCoy et al. 2005; Corsi et al. 2006).

Sharing Smoking Equipment

Crack-cocaine smokers often report sharing smoking equipment, such as straws and crack pipes (Santos Cruz et al. 2013; Fischer et al. 2006; Shannon et al. 2008a). Five cross-sectional surveys identified an association between sharing smoking equipment and HCV infections (Bastos and Bertoni 2014; de Sa et al. 2013; Oliveira-Filho et al. 2013; Tortu et al. 2004; Macias et al. 2008).

Length of Exposure

Some of the studies included in the present review found greater rates of infection among older participants: HIV infection (Bastos and Bertoni, 2014) and HCV (Galperim et al. 2004). Diehl et al (2014) found that those with more severe drug use had 3.64 times greater of high risk of reporting sexual

behaviours. Other studies also reported higher prevalence of infection among those with longer drug use careers (Caiaffa et al. 2006; Oliveira-Filho et al. 2013; Zocratto et al. 2010). DeBeck et al. (2009) also found that the risk of HIV seroconversion among participants who were daily crack smokers increased over time.

Gender

Some studies reported greater HIV rates or risk among women (Bastos and Bertoni 2014; Bertoni et al. 2014; Rees et al. 2006; Wright et al. 2014). Surratt et al. (2005) found that that women engaged in more sexual risk behaviour than men. However, Bruneau et al. (2011) followed 2,137 PWID and found that HIV seroconversion was associated with male gender.

Non-injectors vs Injectors

Some studies compared outcomes between crack/cocaine non-injectors and crack/cocaine injectors. Some studies found higher infection rates among injectors, but non-injectors presented greater risky sexual activity (De Azevedo et al. 2007, McCoy et al. 2004, Pechansky et al. 2006). Khan et al. (2013) found that Injection drug use was strong association with STI, however this correlation appeared to be mediated by sex with STI infected partners rather than by sexual risk behaviours.

McCoy et al. (2004) found that those who smoked and also injected (dual users) were more likely to engage in high risk sexual practices, exchanging sex for money/drugs, and have a history of STDs. Crack injectors reported higher rates of abscesses, mental illness and Hepatitis C infection, but not Hepatitis B or HIV infection. (Buchanan et al. 2006).

Cocaine vs Heroin

Some studies compared outcomes across cocaine/crack and heroin users. In study in Spain, cocaine users had more unprotected sex and shared tubes for sniffing while heroin users injected more, reported more injecting risk behaviour and exchange sex for money. Heroin users more often knew their HIV status, and more often were HIV, HCV and HBV positive. Lejuez et al. (2005) found that sexual risk behaviour was higher in primary crack/cocaine users than in primary heroin users, with those using both drugs showing intermediate levels of sexual risk behaviour. Kopetz et al. (2010) findings indicated that compared to heroin, cocaine had negative effects on participants' perceived sexual desire and performance, nevertheless cocaine was more frequently used with an intimate partner than heroin.

Shearer et al. (2007) interviewed cocaine users in Sydney and Melbourne (Shearer et al. 2007). One group was made of young, employed, well-educated people who generally snorted cocaine on a recreational basis, typically in conjunction with other drugs. A second group of socially and economically marginalised users, residing mainly in Sydney, injected cocaine often in conjunction with heroin. This group reported significantly higher levels of cocaine use, cocaine dependence, criminal behaviour and HIV risk-taking behaviour. Heroin use was found to predict independently higher levels of cocaine use, criminal behaviour, and needle sharing and physical problems in this sample.

De et al. (2007) compare the drug-injecting network characteristics of cocaine and heroin injectors associated with a risk of HIV and hepatitis C virus (De et al. 2007). Cocaine injectors were more likely to live in unstable housing, self-report HCV infection, and have a greater number of IDUs in their social network and were less likely to be polydrug users and to have social support. The authors argue that the difference on HIV and HCV infection risk can be attributed to the characteristics of an IDU's social

and drug-injecting networks. The injecting networks of cocaine users were more likely to have members who were older, had a history of shooting gallery use, and had shorter relationships with the subject.

Network

Another risk factor contributing to infection is to have social network with greater HIV prevalence or including individuals who engage in HIV risk behaviour. Rossi et al (2008) also found that risk of being infected with HIV, HBV, and HCV was significantly associated with having had a sex partner who was either a drug injector or who was known to be HIV positive. Bruneau et al. (2011) found that HIV seroconversion was associated with having sex with an HIV-positive partner.

One study found that individuals whose sexual partners were MSM and HIV seropositive had a higher risk of HBV infection. Also individuals whose sexual partners were HIV seropositive and NIDUs showed an even higher risk (Zocratto et al. 2010). Tobin et al. (2011) compared social and sexual networks of crack-using and non-crack using African American men who have sex with men. The sexual networks of crack-using African American MSM were composed of a greater number of HIV-positive sex partners, exchange partners, and partners who were both sex and drug partners and had fewer partners with whom they always use condoms as compared to non-crack using African American MSM.

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1. Non-Injecting Drug Users

Author, Year	Country	Design	Population, Sample size	Age (SD), Gender	Drug, Route	HIV Prevalence/ Incidence	Relevant findings
Bastos, 2014	Brazil	Report	Crack cocaine users	Mean age was 30.28 years old, 78.68% were male.	Crack cocaine	HIV prevalence: 4.97% (IC95% 3.75-6.56). HIV prevalence was higher among females (8.17%, IC95% 5.55-11.88) than among males (4.01%, IC95% 2.72-5.88) p=0.009. HIV prevalence was higher among those who exchange sex for drugs/money (6.55%, IC95% 4.62-9.19) than among those who did not 2.89% (IC95% 1.95-4.25) p<0.0001.	Brazilian National Study on Crack-cocaine use Findings of a national study on the use of crack published in a report lead by Bastos and Bertoni (2014): The study included 7,381 crack users recruited at open drug scenes using Time-Location-Sampling. The sample was representative of open drug scenes of the Country. Sample: Eligible participants reported at least 25 days of crack use in the past 6 months. Participants were interviewed and tested for HIV, HCV and TB. Nearly 80% of the sample was non-white, with low level of education, about 40% lived on the streets in the past 30 days and about a half (48.80%) had been in prison at some point in their lives. Stimulant use in the past 30 days: 95.90% crack, 36.61% cocaine, 6.75% oxi , 7.09% cocaine paste, 5.50% merla, 1.16% ATS. Participants had used crack on average for 80.76 months and around 13 stones per day. About two-thirds (68.72%) of the sample used crack every day and 7.82% reported acute intoxication in the past 30 days. Risk behaviour: about half (42.17%) reported exchanging sex for drugs/money in the past 30 days, among those who had sex in the past 30 days, inconsistent condom use was reported in 64.15% of vaginal sex, 79.05% of oral sex and 62% of anal sex. 5.50% reported having sex with someone they knew

							to be HIV-positive. Nearly 10% of the sample ever injected drugs; of theses about a third reported sharing injecting equipment. **HIV prevalence was 4.97% (IC95% 3.75-6.56)** HIV prevalence was higher among females (8.17%, IC95% 5.55-11.88) than among males (4.01%, IC95% 2.72-5.88) p=0.009. HIV prevalence was higher among those who exchange sex for drugs/money (6.55%, IC95% 4.62-9.19) than among those who did not 2.89% (IC95% 1.95-4.25) p<0.0001. **HCV prevalence: 2.63% (IC95% 1.69-4.07).** HCV prevalence was higher among those who were 31 years or older (4.67%, IC95% 2.83-7.62) than in those who were between 18 and 30 years old (1.08%, IC95% 0.49-2.35) p=0.001. HCV was slightly higher among those who reported sharing smoking equipment in the past 30 days (3.02%, IC95% 1.81-5.00) than among those who did not (1.83% IC95% 1.00-3.32). TB prevalence was 1.67% (IC95% 0.70-3.90) and reported life time TB was 6.26% (IC95% 4.99-7.83).
Nunes, 2007	Brazil	CS	125 female crack cocaine users from Salvador, Bahia	mean age 22.5 years ; female only	Crack	1.6%	**ASSESSING RISK BEHAVIOURS AND PREVALENCE OF SEXUALLY TRANSMITTED AND BLOOD-BORNE INFECTIONS AMONG FEMALE CRACK COCAINE USERS IN SALVADOR - BAHIA, BRAZIL: Results**: One-third (37%) reported having traded sex for money or drugs, and 58% reported that they had not used condoms during intercourse in the last 30 days. The prevalence of infections was low: HIV-1.6%; HCV-2.4%; HBV- 0.8%; HTLV I/II- 4.0%; and syphilis-4.0%.
Von Diemen, 2010	Brazil	CS	73 female crack users from Porto Alegre	Female only; mean age 28.1±7.6 year	Crack	37.0%;	**RISK BEHAVIOURS FOR HCV- AND HIV-SEROPREVALENCE AMONG FEMALE CRACK USERS IN PORTO ALEGRE, BRAZIL**: **Results:** The overall prevalence of HIV was

							37.0%; HCV sero prevalence was 27.7%; of 15.1% the sample was co-infected with HIV and HCV. Four years of schooling or fewer (OR 4.72–CI 95%; 1.49–14.99) and having three or more HIV tests in one's lifetime (OR 4.26–CI 95% (1.29–14.04)) were associated with HIV infection (after multivariate logistic regression). The single greatest risk factor for HCV infection was having 4 years of schooling or fewer (OR 4.51–CI 95%; 1.18–17.27).
De Carvalho, 2009	Brazil	CS	350 drug users attending treatment clinics in São Paulo	mean age 25.9 years; 86% males	Crack (15% of the sample injected)	6.6% (4.0 to 10.2)	**CRACK COCAINE USE AND ITS RELATIONSHIP WITH VIOLENCE AND HIV: Results:** A high HIV prevalence and associated risky sexual behaviours were observed among crack cocaine users. HIV prevalence was 6.6% (4.0 to 10.2). 22% reported having contracted sexually transmissible diseases 40% reported never using a condom and the rest of the sample reported inconsistent condom use. A decrease in frequency of sexual intercourse was observed among users of injected drugs, though prostitution was reported by 14% of the sample.
De Sa, 2013	Brazil	CS	353 crack user from Teresina, Piauí	mean age 29.4 years ; 84.1% males	Crack (13% ever injected)	HCV test only	**SEROPREVALENCE OF HEPATITIS C AND FACTORS ASSOCIATED WITH THIS IN CRACK USERS: Results:** the prevalence of Anti-HCV was 05 (1.4%) and 04 (1.1%) for the RNA-HCV. There was a statistically significant association between hepatitis C (serological marker RNA-HCV) and age, being resident at home, length of use of crack, interruption of the use of crack, and the habit of sharing the crack pipes.
Oliveira-Filho, 2013	Brazil	CS	384 cocaine users from Para	mean age 35 years; 67.5 % male	Cocaine (20% were injectors)	HCV test only	**HCV INFECTION AMONG COCAINE USERS IN THE STATE OF PARA, BRAZILIAN AMAZON:** 32.3 % cocaine users had anti-HCV antibodies and 120 31.3% had HCV-RNA. Genotyping results indicated the pre-dominance of genotypes 1 (73.3 %) and 3 (26.7 %).

Santos Cruz, 2013	Brazil	CS	160 crack users from the cities of Rio de Janeiro, RJ and Salvador, Bahia	mean age 21 years ; 67 % males	Crack	0.6%	**KEY DRUG USE, HEALTH AND SOCIO-ECONOMIC CHARACTERISTICS OF YOUNG CRACK USERS IN TWO BRAZILIAN CITIES:** Over 60% Shared crack smoking implements (past 30 days). About 40% of participants in Rio, and 25% in Salvador had been tested for HIV prior to the study. Serological testing confirmed that a total of 12 participants (3 or 5% in Rio, 9 or 15% in Salvador) were HIV+. In addition, 5 participants in Rio were HBsAg+, and 1 in Salvador was anti-HCV+. 12.5% reported sex work. Over 60% of the sample reported Unprotected sex (past 30 days). The majority of participants did not use existing social or health services, but desired access to crack user specific services.
Galperim, 2004	Brazil	CS	60 cocaine users from Porto Alegre, Southern Brazil.	mean age 31. 7 years ; 83% males	Cocaine	HCV test only	**INTRANASAL COCAINE USE DOES NOT APPEAR TO BE AN INDEPENDENT RISK FACTOR FOR HCV INFECTION: Results:** Fifteen (25%) patients of 60 tested intranasal cocaine users were anti-HCV positive. Ten (75%) of them had detectable HCV-RNA. Comparison between 15 anti-HCV positive and 45 anti-HCV negative patients showed significant differences in mean age (35 versus 27 years), estimated time of drug use (10 versus 4 years), rate of elevated ALT and/or AST (60% versus 16%) and presence of parenteral risk factors (100% versus 7%). While there was a high prevalence of anti-HCV antibodies in this sample of intranasal cocaine users, the infection was highly correlated with the presence of intravenous (i.v.) drug use and duration of drug use. In this sample, therefore, intranasal cocaine use

							alone was not an important risk factor for HCV infection.
Diehl, 2014	Brazil	CS	299 subjects non-injecting substance-dependent Sao Paulo	87.0% male;	Most of them crack and cocaine users	n/a	**SEXUAL RISK BEHAVIOURS IN NON-INJECTING SUBSTANCE-DEPENDENT BRAZILIAN PATIENTS** The findings showed that approximately 39% the subjects of the high risk sexual behaviour group exhibited a higher prevalence of others sexual risk behaviours, including having sex with sex workers (RP=1.96), homosexual experiences, and homosexual experiences in exchange for drugs, history of STIs (RP=1.39), HIV testing, use of the morning–after pill (RP=1.78) and induced abortion. The probability of alcohol and cocaine snorted user having high risk sexual behaviours is 2.47 and 1.66 times respectively higher than crack users. In addition, users with substantial or severe levels of problems with drugs had a probability of 3.64 times greater of high risk sexual behaviours.
De Azevedo, 2007	Brazil	CS	132 crack users and 109 injectable cocaine users	Crack users: 27.5 years (7.1) Injectable cocaine users: 24 years (6.1)	Crack	Crack users: 11% and 7% (excluding those with a history of IV drug use) Injectable cocaine users: 33%	**CRACK USERS, SEXUAL BEHAVIOUR AND RISK OF HIV INFECTION** Crack users showed less time of drug consumption when compared to the injecting cocaine users. Despite this fact, they had higher rates of risky sexual activity, differences in poly-consumption of drugs, and higher rates of involvement in illegal issues. Crack users had higher rates of risky sexual activity. HIV seroprevalence among crack users was lower than for injecting cocaine users (11% vs. 33%). Some crack cocaine users included in this sample had a past history of injecting drugs. If these participants were excluded from the sample than the seroprevalence among crack users dropped to 7%. Injectable cocaine users had a seroprevalence

							relative risk of 3.11 that of crack users (95% CI 1.77-5.47).
Dias, 2011	Brazil	Long	131 crack-cocaine users from São Paulo, Brazil	Mean age 35 years, 96.3% males	Crack		**EVOLUTION OF DRUG USE IN A COHORT OF TREATED CRACK COCAINE USERS: RESULTS:** Among the patients evaluated, 43 were crack-free (12 months or longer), 22 were users, 13 were imprisoned, two were missing, and 27 were deceased. Three groups with distinct post-discharge drug use patterns were identified. Safe sexual behaviour (condom use) was correlated with stable abstinence (p=0.001). Positive HIV test upon admission (p=0.046), use of snorted cocaine in the last year (p=0.001), and lifetime use of snorted cocaine (132 months or longer) (p=0.000) were associated with long term use of crack cocaine. History of intravenous cocaine use increased the probability of death at 12 years by 2.5 fold (p=0.031) (95%CI: 1.08; 5.79).
Bertoni, 2014	Brazil	CS	159 (35 women and 124 men) from Rio de Janeiro and Salvador	Mean age of the samples was 21 years.	Crack	18.9% women; 4.1% men Total sample= 6.92%	**EXPLORING SEX DIFFERENCES IN DRUG USE, HEALTH AND SERVICE USE CHARACTERISTICS AMONG YOUNG URBAN CRACK USERS IN BRAZIL** Both groups indicated long histories of frequent daily crack use, but virtually no drug injection histories. More women than men exchange sex-for-drug (28.6% women; 4% men) and were HIV+ (18.9% women; 4.1% men). HCV prevalence: 3% women and 0% men. HBV prevalence: 28.1% women and 13.9% men. About two thirds of the total sample reported having sex without a condom in the past 30 days. The CHAID analysis identified sex work; paid work; begging/panhandling; as well as physical and mental health status (all at $p < 0.05$) as primary differentiating factors by sex.

Zocratto, 2010	Uruguay and Argentina	CS	824 NICUs from Buenos Aires (Argentina) and Montevideo (Uruguay)	mean age 28.3 years; 68.3% males	Cocaine	6.19% HIV+ (HCV and HBV negative) = 28 HIV+ (also HBV+) = 23 Total HIV+= 51	**SEXUAL BEHAVIOUR AND HBV INFECTION AMONG NON-INJECTING COCAINE USERS (NICUS):** HBV infection and sexual behaviour were assessed among 824 non-injecting cocaine users (NICUS): in from Buenos Aires and Montevideo. HBV prevalence was 10.8% and it was similarly distributed across cities. NICUs living in Uruguay showed a higher risk of being previous infected by HBV than Buenos Aires residents. So did male subjects, those older than 26, employed individuals and those who have been arrested at some point. Age at the time when subjects first used cocaine was the only variable which showed strong association with HBV previous infection ($p < .01$). Subjects whose sexual partners were MSM and HIV seropositive revealed a higher risk of infection. Subjects whose sexual partners were HIV seropositive and NIDUs showed an even higher risk of HBV seropositivity. For NICUs infected by HIV, the risk of being infected by HBV was almost nine times higher (OR = 8.80; 95% CI [4.80–16.14]) than for HIV seronegatives ($p < .01$). A dose-response gradient between the use of condoms and the risk of HBV was observed. Subjects who report safe sexual practices in both anal and vaginal intercourses showed a smaller risk of being HBV seropositive in comparison with those wearing condoms in one but not another.
Caiaffa, 2011	Uruguay and Argentina	CS	871 NICUs : 504 from Buenos Aires and 367 from Montevideo	mean age 28.2 years and 70% males	Vast majority: Intranasal Cocaine	7.9 (95% CI: 6.1–9.7) 4.0% HIV only	**HEPATITIS C VIRUS AMONG NON-INJECTING COCAINE USERS (NICUS) IN SOUTH AMERICA: CAN INJECTORS BE A BRIDGE?:** Some 871 non-injecting cocaine users from Buenos Aires and Montevideo metropolitan areas were included in a cross-sectional survey. Prevalence

			metropolitan areas				rates were 7.9 (95% CI: 6.1–9.7) and for HIV and 8.8 (95%CI, 6.9–10.8) for HCV. 4.9% were HCV only and 4.0% were HIV only HCV-infected. HCV mono-infected were more like to have been in prison, arrested, shared straws, had intercourse with someone who was HIV-positive and to have current or past HBV infection. HIV mono-infected were more likely to have had intercourse with PWID and someone who was HIV-positive, to have current or past HBV infection and to have syphilis. HCV-infected NICUs were twice as likely as HCV–HIV seronegatives to have shared straws for cocaine snorting or sniffing.
Ministerio de Salud Pública Uruguay 2013	Uruguay	Government Funded Report	318 drug users From Montevideo and its metropolitan area (Ciudad de la Costa, Las Piedras, La Paz, Progreso, Ciudad del Plata)	41.5% 18 to 25 years; 37.8% 26 to 35 years; 89.3% males	Crack cocaine	6.3% (CI 95% 2.6–11.3)	**SEROPREVALENCE STUDIES OF HIV / AIDS AND KNOWLEDGE, ATTITUDES AND PRACTICES BETWEEN USERS OF COCAINE PASTE, CRACK AND OTHER DENOMINATIONS OF THE SMOKABLE COCAINE IN MONTEVIDEO AND ITS METROPOLITAN AREA:** The report estimated 6.3% of HIV prevalence (CI 95% 2.6–11.3;). User access to diagnostic services for HIV and other STIs is low. Results practices show signs of greater vulnerability among women compared to men participants.
Rossi, 2008	Argentina	CS	504 NIDUs from Buenos Aires its surroundings	mean age 28.2 years; 69.8% male	Cocaine	6.3%	**MULTIPLE INFECTIONS AND ASSOCIATED RISK FACTORS AMONG NON-INJECTING COCAINE USERS IN ARGENTINA:** Rossi et al (2008) further report on Argentinian subsample included in the study above. Seroprevalence rates were: HIV (6.3%), HBV (9%), HCV (7.5%), and VDRL (4.2%). The risk of being infected with HIV, HBV, and HCV was significantly

							associated with having had a sex partner who was either a drug injector or who was known to be HIV positive. HIV and HCV infections were associated with former imprisonment, and HCV was associated with having been tattooed.
Day, 2007	Caribbean, Saint Lucia	Report	Crack cocaine abusers	42.63 (S.D. 10.89) 78.7% male	Crack cocaine	7.5%	**COCAINE AND THE RISK OF HIV INFECTION IN SAINT LUCIA** A report led by Day from the Caribbean Drug Abuse Research Institute was published in 2007. Of the 106 crack cocaine users from Saint Lucia tested, eight (7.5%) were HIV-infected compared to none in a control group of 45 non-crack users (marginally significant difference p =0.047). There were no differences in the test results for Hepatitis B and HTLV1 between drug users and non-drug users. Women who were drug users were significantly more likely to test positive for VDRL than women who were not drug users (94.4% vs. 66.7%, p=0.046); the same trend emerged among men but less strong (50.0% vs. 30.3%). There were no group differences by gender differences in the test results for HIV, Hepatitis B, and HTLV1. Drug users were more likely to report always having unprotected sex than were non-drug users (30.8% vs. 12.0%, p=0.045). Female drug users compared to non-drug users were more likely to report exchanging sex for money or crack (76.5% vs. 25%, p=0.049). A larger percentage of female drug users reported exchanging crack for money or sex than did female non-drug users (35.3% vs. 0.0%; ns). Males were more likely to report always having unprotected sex when compared to male non-drug users (31.5% vs. 5.3%, p=0.008).

Reid, 2006	Trinidade and Tobago	CS	121 female in-patient substance abusers	mean age 34.7 years. Only females	Crack	19.8%	**POOR EDUCATIONAL ATTAINMENT AND SEXUALLY TRANSMITTED INFECTIONS ASSOCIATED WITH POSITIVE HIV SEROSTATUS AMONG FEMALE IN-PATIENT SUBSTABCE ABUSERS IN TRINIDAD AND TOBAGO:** Reid et al. (2006) assessed 121 female in-patient substance abusers in Trinidad and Tobago. HIV seroprevalence was 19.8%. The following factors were associated with HIV infection: poor educational attainment, history of a sexually transmitted infection (STI), and use of crack cocaine. In the multivariate analysis, only poor educational attainment and history of an STI were independently associated with HIV seroprevalence.
Kopetz, 2010	USA	CS/CC	46 individuals who use both heroin and cocaine from Washington D.C. metropolitan area	mean age 47.93 years 80.4% males	Cocaine	Risk Behaviour	**SOCIAL CONTEXT AND PERCEIVED EFFECTS OF DRUGS ON SEXUAL BEHAVIOUR AMONG INDIVIDUALS WHO USE BOTH HEROIN AND COCAINE:** Results indicated that compared to heroin, cocaine had deleterious effects on participants' perceived sexual desire and performance. Despite such deleterious effects on sexual behaviour, cocaine was more frequently used with an intimate partner than heroin. Furthermore, participants did not differ in the extent to which they used the two drugs in other social contexts (e.g. with friends, family or neighbours). These preliminary results suggest that the relationship between cocaine and sexual behaviour, especially among long-term cocaine users, may be facilitated by opportunities for sex that exist in the context of cocaine use, rather than by the pharmacological effects of the drug.

Lejuez, 2005	USA	CS/CC	123 inner-city drug users in residential treatment	Mean age = 42.52; 62% male	Crack	Risk Behaviour	**DIFFERENCES IN IMPULSIVITY AND SEXUAL RISK BEHAVIOUR AMONG INNER-CITY CRACK/COCAINE USERS AND HEROIN USERS**: Results indicated that SRB was higher in primary crack/cocaine users than in primary heroin users, with those using both drugs evidencing intermediate levels of SRB. Beyond differences in SRB, a similar pattern across drugs was found for impulsivity. Finally, impulsivity mediated the relationship between drug choice and SRB. Although further research is necessary to establish causal relationships, these results support a relationship between SBR and crack/cocaine, and suggest that disinhibition processes including impulsivity may underlie this relationship.
Cavazos-Rehg, 2009	USA	CS/CC	459 cocaine dependent individuals from St. Louis area	mean age 36 years 47% were male	Cocaine	Risk Behaviour	**RISKY SEXUAL BEHAVIOURS AND SEXUALLY TRANSMITTED DISEASES: A COMPARISON STUDY OF COCAINE-DEPENDENT INDIVIDUALS N TREATMENT VERSUS A COMMUNITY-MATCHED SAMPLE:** Nearly half of cocaine-dependent participants in treatment had traded sex for drugs and=or money and over one-third had more than 10 sexual partners in 1 year with a risk concentrated among African Americans even after controlling for income and educational attainment. Participants recruited from the community with some exposure to cocaine reported similar rates of high risk sexual behaviours as the cocaine dependent subjects from treatment settings.
Weiser, 2006	USA	CS	1,148 homeless and marginally housed individuals in San Francisco	The median age was 44.6 for women and 46.3 for men	Crack	14%	**GENDER-SPECIFIC CORRELATES OF SEX TRADE AMONG HOMELESS AND MARGINALLY HOUSED INDIVIDUALS IN SAN FRANCISCO** In total, 39% of women and 30% of men reported a lifetime history of sex exchange. Methamphetamine use and greater length of homelessness were

							positively associated with a history of sex trade among women while heroin use, recent mental health treatment, and homosexual or bisexual orientation were significantly associated with sex trade for men. Crack use was correlated with sex trade for both genders. Correlates of sex trade differ significantly according to biologic sex, and these differences should be considered in the design of effective HIV prevention programs.
Rees, 2006	USA	CS	637 (Users/546; Sellers/91){	55.9% male	Cocaine and crack	23.9%	**RISKS FOR HIV INFECTION AMONG USERS AND SELLERS OF CRACK, POWDER COCAINE AND HEROIN IN CENTRAL HARLEM: IMPLICATIONS FOR INTERVENTIONS** Nearly a quarter (23.9%) of all respondents was HIV positive. Drug injectors were more than 2.5 times more likely to have HIV infections than other respondents (OR/2.66; 95% CI 1.66/4.26). Those involved in frauds/cons were almost as likely to be HIV positive (OR/2.58; 95% CI 1.64/4.06). Those with a marital status of being separated, divorced or widowed were twice as likely to be HIV infected (OR 2.16; 95% CI 1.43/3.25). Respondents currently having multiple partner sex (OR/1.66; 95% CI 1.1/2.51) or who were female (OR/1.66; 95% CI 1.12/2.45) were more than 1.5 times more likely to be HIV positive. Thus, controlling for lifetime drug injection and current multiple partner sex, other factors, such as participating in frauds/cons, as well as relationship status and being female, were also associated with HIV infection
Ross, 2004	USA	CS	163 persons in treatment for	35.08 years; 53.9% male	crack cocaine	n/a	**CONDOM USE ASSESSMENT OF PERSONS IN DRUG ABUSE TREATMENT**

			cocaine addiction				An overall score of 40% correct condom use indicated the need for training in this sample. Assessment showed training needs especially related to steps involving reduction of ejaculate leakage and steps related to potential hazards of nonoxynol-9 use. Frequency of condom use was also assessed; there was no correlation between frequency of condom use and condom use skill. Drug addiction treatment programs are encouraged to incorporate HIV risk reduction programs that teach condom use skills and use the CUDOS as an empirical measure of condom skill acquisition.
Surratt, 2005	USA	CS	254 chronically drug- or alcohol-involved men and women	Males in the sample were slightly older than females, with a mean age of 39.7 versus 37.3 years. 48.4% male	Crack was recently used by 78.6% of women and by 34.1% of men. Cocaine was recently used 8.4% of women and 7.3% men.	Self-reported 5.12% Women 8.8% Men 1.4%	**EMERGING LINKAGES BETWEEN SUBSTANCE ABUSE AND HIV INFECTION IN ST. CROIX, US VIRGIN ISLANDS** Crack use was overwhelmingly reported by females when compared to males (84.7% vs. 48.8%). Women also reported a significantly higher number of sexual partners in the past month (5.6 vs. 2.3) and significantly more occasions of unprotected vaginal sexual contact (11.2 vs. 6.5). Rates of self-reported HIV infection were elevated among women as well (8.8% vs. 1.4%). Women's precarious economic position and lack of access to legitimate income-generating activities tended to drive them into 'survival sex' to support their subsistence and drug needs. As such, it would appear that substance abuse has an emerging role in the spread of the epidemic in St. Croix, particularly among women.
Kang, 2005	USA	CS	N= 383 in New York; N= 165 in Puerto Rico crack users	39 (6.0) years old NY; 33 (8.3) years Puerto Rico; 38% male	crack	n/a	**EGOCENTRIC HIV RISK NETWORKS AMONG PUERTO RICAN CRACK USERS IN NEW YORK AND IN PUERTO RICO: IMPACT ON SEX RISK BEHAVIOURS OVER TIME**

							The majority of crack users (88% New York; 92%, Puerto Rico) in the sample named one or more personal risk network members. As compared with New York participants, crack users in Puerto Rico reported larger risk networks and were more likely to engage in sex risk behaviours with strangers or acquaintances. In multivariate analyses, a significant variable in predicting sex risk behaviours at follow–up in both sites was the baseline measure of the dependent variable. Significant network variables were: having any known crack use member less than 6 months and having acquaintance/stranger in network in New York; communicating with network members about using condoms in Puerto Rico.
Bowen, 2006	USA	CS	259 male African–American crack smokers with multiple partners	The majority of the sample was between 31 and 40 years of age (74%), all male	crack	n/a	**MALE HETEROSEXUAL CRACK SMOKERS WITH MULTIPLE SEX PARTNERS: BETWEEN- AND WITHIN-PERSON PREDICTORS OF CONDOM USE INTENTION** Stepwise logistic regressions showed that for both partners one and two, condom use at last sex and personal responsibility for condom use were predictors of intention to use condoms at next sex. Perceived partner responsibility was an additional positive predictor with Partner 2. Hierarchical generalized linear model analyses showed that positive intention was associated negatively with perceived partner responsibility and intimacy, while positively related to situational self-efficacy. Personal responsibility interacted with intimacy such that only men who indicated the highest levels of intimacy were more likely to intend to use condoms. Overall, the findings in this study support the need for examining additional social cognitive constructs that capture the inter-personal aspects of sexual

							relationships such as personal and perceived responsibility, intimacy and how beliefs may change between multiple partners and across time. Finally, the differences in the valence of perceived partner responsibility across analyses and the interaction of personal responsibility with intimacy suggest the need for studies that include measure of power within the relationship.
Schonnesson, 2008	USA	CS	258 HIV-positive crack cocaine smokers	47% male; 43 years (SD = 7.6);	crack	n/a	**A CLUSTER ANALYSIS OF DRUG USE AND SEXUAL HIV RISKS AND THEIR CORRELATES IN A SAMPLE OF AFRICAN-AMERICAN CRACK COCAINE SMOKERS WITH HIV INFECTION** Comparisons of the three HIV risk groups revealed that the highest risk group had a higher proportion of illegal sources of income, higher proportion of binged crack use, frequent, daily, alcohol use, same gender sex partners, and scored higher on depressive symptoms. Members of the consistent condom use group were more likely to have been HIV diagnosed for a shorter time, to have HIV serodiscordant casual sex partners, higher psychological motivation for condom use, and a lower frequency of vaginal sex. Members of the inconsistent condom use group were more likely to have a main sex partner, to be married, to be on public assistance, to know the HIV serostatus of their casual partner, and less likely to conceal their HIV serostatus. An alarming finding was that a large number of participants inconsistently used condoms with HIV serodiscordant sex partners.
Pallonen, 2008	USA	CS	449 urban sexually active,	63% male; mean age was	crack	n/a	**PERSONAL AND PARTNER MEASURES IN STAGES OF CONSISTENT CONDOM USE AMONG AFRICAN–**

			heterosexual, African American crack smokers two inner-city neighbour hoods in Houston, Texas.	33 years (sd□5.8)			**AMERICAN HETEROSEXUAL CRACK COCAINE SMOKERS** Over 90% of participants did not use condoms, consistently. Two-thirds of the inconsistent users were in the pre-contemplation stage. The rest were equally divided between the contemplation and preparation stages. Personal responsibility outperformed other measures in initial intention to become a regular condom user; partner's perceived responsibility dominated continued intention and actual consistent condom use. Negative attitudes and self-efficacies had strong relationships to the stages of consistent condom use in univariate analyses but these relationships became substantially weaker when the responsibility, attitude, and self-efficacy concepts were entered simultaneously into multivariate analyses.
Harzke, 2009	USA	CS	303 African-American, HIV-positive users in Houston, TX		crack	n/a	**BINGE USE OF CRACK COCAINE AND SEXUAL RISK BEHAVIOURS AMONG AFRICAN-AMERICAN, HIV-POSITIVE USERS** Fifty-one percent reported a recent crack binge. The typical crack binge lasted 3.7 days and involved smoking 40 rocks on average. Nearly two-thirds reported their last binge was in their own or another's home. Seventy-two percent had sex during the last binge, with an average of 3.1 partners. In multivariable logistic regression analyses, recent bingers were more likely than non-bingers to consider themselves homeless, to have any income source, to have used crack longer, and to score higher on risk-taking and need for help with their drug problem. In multivariable ordinal and logistic regression analyses, recent bingers had more sex

							partners in the last six months and 30 days and were more likely to have never used a condom in the last 30 days. Among male users, recent bingers were more likely to report lifetime and recent exchange of money for sex and drugs for sex. Among both male and female users, recent bingers were more likely to report lifetime trading of sex for drugs. African-American, HIV-positive binge users of crack cocaine appear to be at increased risk for HIV transmission.
Timpson, 2010	USA	CS	137 African American HIV positive crack smokers in Houston, TX	73% male; mean age 40 years	crack	n/a	**SEXUAL ACTIVITY IN HIV-POSITIVE AFRICAN AMERICAN CRACK COCAINE SMOKERS** Participants reported having 1,266 different partners in the 30 days prior to the interview and had traded sex for money or drugs with 68%. A total of 79 participants had multiple partners and accounted for 1,247 partnerships. Rates of consistent condom use across partnerships were low, indicating that more interventions in this at-risk population are needed.
Koblin, 2010	USA	CS	404 HIV-negative non-injection drug using women at sexual risk	42.2 years, women only	crack and cocaine	n/a	**CORRELATES OF ANAL INTERCOURSE VARY BY PARTNER TYPE AMONG SUBSTANCE-USING WOMEN: BASELINE DATA FROM THE UNITY STUDY** At baseline, 41.7% reported anal intercourse in the prior 3 months; of these, 88.2% reported unprotected anal intercourse (UAI). Factors associated with UAI varied by partner type: UAI with a steady partner was associated with younger age, depressive symptoms, and experience of battering; UAI with casual partners was associated with younger age, cocaine use and negative outcome expectancies for condom use; UAI with exchange partners was associated with cocaine use, negative outcome expectancies for condom use and depressive symptoms. Younger women were more

							likely to report unprotected anal intercourse if they did not use birth control.
Atkinson, 2010	USA	CS	692 sexually active African-American crack cocaine users living in Houston, TX	72% males;	crack	n/a	**MULTIPLE SEXUAL PARTNERSHIPS IN A SAMPLE OF AFRICAN-AMERICAN CRACK SMOKERS** Results indicate that while many partnerships were based on trading sex for money or drugs, many participants reported partners they considered a spouse or friend. Risk behaviours and affective measures were found to differ by partner type.
Wright, 2014	USA	CS	251 rural African American cocaine users	51.39%; 38 years	cocaine	n/a	**CORRELATES OF HIV TESTING AMONG RURAL AFRICAN AMERICAN COCAINE USERS** In ordered logistic regression analyses, HIV testing was strongly associated with being female, of younger age (predisposing factors); having been tested for sexually transmitted diseases or hepatitis, ever having been incarcerated in jail or prison (enabling factors); and having had one sex partner the past 30 days (health behaviour factor). Other sexual risk behaviours, drug use, health status, and perception of risk were not associated with HIV testing.
DePesa, 2015	USA	CS	women receiving court-mandated drug and alcohol treatment	32.15 (7.63), women only	cocaine	n/a	**PREDICTORS OF CONDOM USE IN WOMEN RECEIVING COURT- MANDATED DRUG AND ALCOHOL TREATMENT: IMPLICATIONS FOR INTERVENTION** Multilevel logistic modelling revealed that perception of relationship commitment, condom outcome expectancies, and age significantly affected condom use for women in the sample. Specifically, condom use was least likely when women reported that the relationship was committed (odds ratio [OR] = 0.31, 95% confidence interval [CI]: 0.23, 0.43) or when the participant was older (OR = 0.96, 95% CI:

							0.94, 0.99), and more likely when women reported more positive condom outcome expectancies (OR = 1.02, 95% CI: 1.00, 1.03). The findings suggest that perceptions of relationship commitment, regardless of perceptions of partner risk, strongly affect condom use among women court-mandated into drug and alcohol treatment. In addition, positive outcome expectancies (e.g., positive self-evaluations and perceived positive partner reactions) are associated with a greater likelihood of condom use.
Tortu, 2004	USA	CS	123 women drug users from East Harlem, New York City	mean age 37.8 years ; women only	Cocaine and crack	14.6%	**SHARING OF NONINJECTION DRUG-USE IMPLEMENTS AS A RISK FACTOR FOR HEPATITIS C:** Prevalence of HCV and HIV infections was 19.5% and 14.6%, respectively. Multiple logistic regression determined significant associations between sharing non-injection drug-use implements and HCV infection. ‘‘Ever shared both oral and intranasal non-injection drug implements’’ was independently associated with HCV infection [Odds ratio (OR) 2.83; Confidence interval (CI) 1.04, 7.72; p ¼ 0.04]; ‘‘ever shared non-injected heroin implements with an injector’’ was a trend (OR 3.06; CI .85, 10.79; p ¼ 0.08). The strongest association between sharing non-injection drug-use implements and HCV infection was found among HIV positive individuals (2 ¼ 8.8, 1 d.f., p < 0.01).
Brewer, 2007	USA	CS	178 Afro American women from Miami, Florida	mean age 39.8 years; 100% females	Crack	34.27%	**HIGH-RISK BEHAVIOURS IN WOMEN WHO USE CRACK: KNOWLEDGE OF HIVSEROSTATUS AND RISK BEHAVIOUR: Results:** Sixty-one HIVþ and 117 HIV women were enrolled. HIVþ women were significantly more likely to be African-American. There were no significant differences in drug use, types of sexual partners, number of paying partners,

							attitudes regarding condoms, or STI diagnoses. HIVþ women were less likely to engage in unprotected sex compared with HIV women (56% vs. 75%, adjusted odds ratio [AOR], 0.36; 95% confidence interval [CI], 0.13–0.99). Among HIVþ women, unprotected sex was negatively associated with stronger beliefs regarding the protective value of condoms (AOR, 0.07; 95% CI, 0.01–0.67) and concurrent injection-drug use (AOR, 0.19; 95% CI, 0.04–0.99).
Des Jarlais, 2014	USA	CS	7,182 NIDUs in New York City	mean age 35 years; 80,4% males	Crack	16%	**A PERFECT STORM: CRACK COCAINE, HSV-2, AND HIV AMONG NON-INJECTING DRUG USERS IN NEW YORK CITY:** we identified factors that contributed to this high prevalence: a pre-existing HIV epidemic among injectors, a crack cocaine epidemic, mixing between injectors and crack users, policy responses not centred on public health, and herpes-simplex virus 2 facilitating HIV transmission. Implications for avoiding high prevalence among NIDU in other areas are discussed.
Deren, 2004	USA	Long	723 participants from Harlem , New York and Bayamon, Puerto Rico	Mean age 37.9 years , Harlem, vs. 32.5 years Bayamon, 75% male	Crack	0.88/100 person-years at risk (pyr; 95% CI, 0.31–1.45) in NY and 3.37/100 pyr (95% CI,2.02–4.72) in PR ($P <$ 0.001	**'HIV INCIDENCE AMONG HIGH-RISK PUERTO RICAN DRUG USERS' A COMPARISON OF EAST HARLEM, NEW YORK, AND BAYAMON, PUERTO RICO:** There were a total of 32 seroconverters, 9 in NY and 23 in PR, for seroconversion rates of 0.88/100 person-years at risk (pyr; 95% CI, 0.31–1.45) in NY and 3.37/100 pyr (95% CI,2.02–4.72) in PR ($P <$ 0.001). In PR, variables significantly related to seroconversion were younger age and using shooting galleries. Being in methadone treatment was protective against seroconversion. In NY, crack use was significantly related to seroconversion.
Hagan 2011	USA	CS	102 injection and	half were male, and the median	Most NIDUs	n/a	**Sexual Risk and HIV Infection Among Drug Users in New York City: A Pilot Study**

			noninjection users of heroin, cocaine, or crack	age was 45.	were current crack smokers (78%)		There was considerable overlap and transitioning between crack smoking and injecting. Crack users were also significantly more likely to be gay, lesbian, or bi-sexual than other drug users. In multivariate analysis, HIV infection was independently associated with crack use and with being gay or bisexual. In New York City, HIV prevention for drug users has focused on syringe access, safe injection, and drug user treatment
Chavoshi, 2010	Canada	CS	305 young Aboriginal people who live in British Columbia and use drugs	23 years old; 51.7% male	crack	n/a	**THE CEDAR PROJECT: SEXUAL VULNERABILITIES AMONG ABORIGINAL YOUNG PEOPLE INVOLVED IN ILLEGAL DRUG USE IN TWO CANADIAN CITIES** Of the 292 women and 313 men at baseline, prevalence of inconsistent condom use during insertive sex was 59% and 46%, respectively. In multivariable logistic regression, after adjusting for age and location, inconsistent condom use among women was significantly associated with ever being enrolled in a drug/alcohol treatment program (AOR: 1.95, 95% CI: 1.06-3.60), and ever being sexually abused (AOR: 1.80, 95% CI: 1.01-3.20). Among men, inconsistent condom use was significantly associated with having more than 20 lifetime sex partners (AOR: 2.06, 95% CI: 1.24-3.44).
Fischer, 2006	Canada	CS	148 primary crack users	63.5% male	crack	n/a	**SOCIAL, HEALTH AND DRUG USE CHARACTERISTICS OF PRIMARY CRACK USERS IN THREE MID-SIZED COMMUNITIES IN BRITISH COLUMBIA, CANADA** The majority of the samples: reported unstable housing/homelessness; relied on social benefit payments for income generation; were under current criminal justice supervision; were poly-drug users, using other drugs like alcohol, cannabis or opioids; reported physical and mental health

							problems; were hepatitis C virus positive; had numerous crack-use episodes per day; frequently shared crack-use paraphernalia; and obtained crack pipe paraphernalia from makeshift items**.**
Brugal, 2009	Spain	CS	1720 IDUs young cocaine and heroin users from Barcelona Madrid and Seville	mean age 22.7 years ; 50% males	Cocaine Heroin	0.4%	**INJECTING, SEXUAL RISK BEHAVIOURS AND HIV INFECTION IN YOUNG COCAINE AND HEROIN USERS IN SPAIN: Results*:*** CUs were less marginalized socially than HUs. Only 0.9% had ever injected versus 64.3%; none had ever injected with borrowed syringes versus 25%; 2.2% had an injecting steady partner in the last 12 months versus 24.9%; 4.8% had ever traded sex versus 16.0%. However, 31.0 versus 12.7% had unprotected sex with more than two occasional partners in the last 12 months; 45.0 versus 21.9% had sniffed through tubes used by more than 10 persons. Only 32.3% knew their HIV status versus 80.3%; 0.4 versus 18.1% were HIV positive; 0.9 versus 51.9% were HCV positive, and 1.5 versus 17.0% were HBV positive.
Macias, 2008	Spain	CS	182 NIDUs from Seville, Southern Spain	mean age 34 years ; 91.2% males	Crack	HCV test	**HIGH PREVALENCE OF HEPATITIS C VIRUS INFECTION AMONG NONINJECTING DRUG USERS: ASSOCIATION WITH SHARING THE INHALATION IMPLEMENTS OF CRACK: Results:** HCV infection was detected in 23 (12.6%) participants. Sharing the inhalation tube of crack cocaine[adjusted odds ratio (AOR) 3.6, 95% confidence interval (CI) 1.3–9.8, P = 0.01], presence of tattoos (AOR 3.5, 95% CI 1.3–9.1, P = 0.02) and age Z34 years (AOR 3.9, 95% CI 1.3–11.6, P = 0.01) 3.9 were independently associated with HCV infection.
Shearer, 2007	Australia	CS	cocaine users interviewed in the two	30.6 (6.8) years; 55% male	cocaine	n/a	**CONTEMPORARY COCAINE USE PATTERNS AND ASSOCIATED HARMS IN MELBOURNE AND SYDNEY, AUSTRALIA**

			largest Australian cities of Sydney (n=88) and Melbourne (n=77)				The majority of cocaine users interviewed were classified as socially and economically integrated. They were young, employed, well-educated people who generally snorted cocaine on a recreational basis, typically in conjunction with other illicit and licit drugs. A second group of socially and economically marginalised users, residing mainly in Sydney, injected cocaine often in conjunction with heroin. This group reported significantly higher levels of cocaine use, cocaine dependence, criminal behaviour and human immunodeficiency virus (HIV) risk-taking behaviour. Heroin use was found to predict independently higher levels of cocaine use, criminal behaviour, needle sharing and physical problems in this sample, suggesting that increased resources and coverage for combined heroin/cocaine users may have scope for reducing cocaine-related problems in the Australian community.

2. Injecting Drug Users Only

Author, Year	Country	Design	Population, Sample size	Age (SD), Gender	Drug, Route	HIV Prevalence/ Incidence	Relevant findings
DeBeck, 2009	Canada	Long	1,048 IDUs from Greater Vancouver	median age 34 years; 373 (35.6%) were female, 64.4% males.	Crack cocaine	2.7 per 100 person-years (95% CI 2.2–3.1)	**SMOKING OF CRACK COCAINE AS A RISK FACTOR FOR HIV INFECTION AMONG PEOPLE WHO USE INJECTION DRUGS: Results:** Overall, 1048 eligible injection drug users were included in our study. Of these, 137 acquired HIV infection during follow-up. The mean proportion of participants who reported daily smoking of crack cocaine increased from 11.6% in period 1 to 39.7% in period 3. After adjusting for potential confounders, we found that the risk of HIV sero conversion among participants who were daily smokers of crack cocaine increased over time (period 1: hazard ratio [HR] 1.03, 95% confidence interval [CI] 0.57–1.85; period 2: HR 1.68, 95% CI 1.01–2.80; and period 3: HR 2.74, 95% CI 1.06–7.11).
Bruneau, 2011	Canada	Long	2,137 HIV-seronegative IDUs from Montreal	mean age 33.6 years (SD 8.7) 80.5% Male	Cocaine	incidence: 3.3 cases/100 person-years; 95% confidence interval: 2.8, 3.9	**Trends in Human Immunodeficiency Virus Incidence and Risk Behaviour Among Injection Drug Users In Montreal, Canada: A 16-Year Longitudinal Study** "An annual HIV incidence decline of 0.06 cases/100 person-years prior to 2000 was followed by a more rapid annual decline of 0.24 cases/100 person-years during and after 2000. Behavioural trends included increasing cocaine and heroin use and decreasing proportions of IDUs reporting any syringe-sharing or sharing a syringe with an HIV-positive person. In multivariate analyses, HIV seroconversion was associated with male gender, unstable housing, intravenous cocaine use, and sharing syringes or having sex with an HIV-positive partner. Always acquiring syringes from safe sources conferred a

							reduced risk of HIV acquisition among participants recruited after 2004, but this association was not statistically significant for participants recruited earlier.
De, 2007	Canada	CS/CC	282 IDUs from Montreal	mean age 33 years; male (73%)	Cocaine and Heroin	Risk Behaviour	**RETHINKING APPROACHES TO RISK REDUCTION FOR INJECTION DRUG USERS DIFFERENCES IN DRUG TYPE AFFECT RISK FOR HIV AND HEPATITIS C VIRUS INFECTION THROUGH DRUG-INJECTING NETWORKS:** Results: Of 282 IDUs, 228 (81%) used cocaine and 54 (19%) used heroin as their primary injected drug. In analyses adjusted for age and gender, cocaine injectors compared with heroin injectors were more likely to live in unstable housing (odds ratio [OR] = 3.55, 95% confidence interval [CI]: 1.49 to 8.40), self-report HCV infection (OR = 4.69, 95% CI: 2.14 to 10.31), and have a greater number of IDUs in their social network (OR = 1.61, 95% CI: 1.14 to 2.28) and were less likely to be polydrug users (OR = 0.06, 95% CI: 0.02 to 0.16) and to have social support (OR = 0.97, 95% CI: 0.95 to 0.99). The injecting networks of cocaine users were more likely to have members who were older (OR = 1.08, 95% CI: 1.04 to 1.12), had a history of shooting gallery use (OR = 2.27, 95% CI: 1.08 to 4.76), and had shorter relationships with the subject (OR = 0.91, 95% CI: 0.85 to 0.97).
Wylie, 2006	Canada	CS	435 Injection drug users in Winnipeg		Cocaine	7.20%	**Demographic, risk behaviour and personal network variables associated with prevalent hepatitis C, hepatitis B, and HIV infection in injection drug users in Winnipeg, Canada** At the multivariate level, pathogen prevalence was correlated with both respondent and IDU risk network variables. Pathogen transmission was associated with several distinct types of high-risk

							networks formed around specific venues (shooting galleries, hotels) or within users who are linked by their drug use preferences. Smaller, isolated pockets of IDUs also appear to exist within the larger population where behavioural patterns pose a lesser risk, unless or until, a given pathogen enters those networks.
De, 2009	Canada	CS	IDUs were recruited from syringe exchange and methadone treatment programmes in Montreal, Canada.	32 years, 70% were male	cocaine	n/a	**HIV and HCV discordant injecting partners and their association to drug equipment sharing** Among 159 participants and 245 injecting partners, sharing of syringes and drug preparation equipment did not differ between concordant or discordant partners, although HIV-positive subjects did not share with HIV-negative injectors. Sharing of syringes was positively associated with discordant HIV status (OR = 1.85) and negatively with discordant HCV status (OR = 0.65), but both results were not statistically significant. Sharing of drug preparation equipment was positively associated with both discordant HIV (OR = 1.61) and HCV (OR = 1.18) status, but both results were non-significant. Factors such as large injecting networks, frequent mutual injections, younger age, and male gender were stronger predictors of equipment sharing. In conclusion, IDUs do not appear to discriminate drug equipment sharing partners based at least on their HCV infection status.
Levesque, 2013	Canada	CS	589 cocaine smokers or injectors were recruited in community-based and	76.6% were ≥ 30-year-old 86.2% were male	cocaine	n/a	**Psychological Distress Increases Needle Sharing among Cocaine users: Results from the COSMO Study** Severe psychological distress was reported by 202 (34.3%) out of 589 participants (86.2% male; 76.6% ≥ 30y.o.). The prevalence of sharing was: 14.8% for

			addiction treatment programs located in downtown Montreal				needles, 24.9% for other injection equipment (378 injectors) and 68.3% for smoking material (508 smokers). Multivariate analysis showed that injectors with severe psychological distress were more likely to report needle sharing (Adjusted Odds Ratio (AOR): 2.1, 95% CI: 1.1-3.8). No significant association was found between K10 score and sharing of other paraphernalia. Severe psychological distress increases the risk of needle sharing, a major risk factor for HIV and HCV infection, but not sharing of other paraphernalia.
Shannon, 2008b	Canada	CS	437 crack smokers from British Columbia	mean age 41 years; 66% males	Crack	HIV and HCV	**HIV AND HCV PREVALENCE AND GENDER-SPECIFIC RISK PROFILES OF CRACK COCAINE SMOKERS AND DUAL USERS OF INJECTION DRUGS: Results:** Of 437 crack smokers, 246 (56%) were dual users while 191 (44%) were never injectors. In a fitted logistic regression model, dual use among female crack smokers was associated with HCV infection (adjusted OR= 4.65, 95% CI: 1.92–9.70), exchanging sex for money, drugs, or shelter while using crack (aOR = 4.47, 95% CI: 1.56–12.80), having a casual partner who injects (aOR = 4.13, 95% CI: 1.05–16.26), having equipment broken or confiscated by police without being arrested (aOR = 3.66, 95% CI: 1.43–9.34), and HIV infection (aOR = 2.07, 95% CI: 1.18–5.96). Among male crack smokers, dual use was associated with HCV infection (aOR = 5.34, 95% CI: 2.10–13.18), exchanging sex for money, drugs, or shelter (aOR = 3.25, 95% CI: 1.59–6.65), crack use history ≥ 5 years (aOR = 2.16, 95% CI: 1.29–3.63), and smoking in a group of unknown people (such as crack houses, alleys; aOR = 1.70, 95% CI: 1.10–2.81).

Huo, 2009	USA	Long	889 IDUs injection drug users in Chicago, Illinois	71.3% males (511)	Crack and cocaine		**NEEDLE EXCHANGE AND SEXUAL RISK BEHAVIOURS AMONG A COHORT OF INJECTION DRUG USERS IN CHICAGO, ILLINOIS: Results—**Compared to NEP non-users, NEP users had a similar number of sex partners over time, but had 49% higher odds of using condoms with their main partners (p=0.047). At baseline, there was no difference between NEP users and non-users in episodes of vaginal intercourse, but over time the odds of having a higher number of unprotected instances of vaginal intercourse were reduced by 26% per year for NEP users but only 10% per year for non-users (p=0.02).
McCoy, 2005	USA	Long	111 IDUs injection drug users in Miami, Florida	mean age 34 in 1988 and 44 in 1998 years, 54% male	Crack	n/a	**TRENDS OF HIV RISK BEHAVIOURS IN A COHORT OF INJECTING DRUGUSERS AND THEIR SEX PARTNERS IN MIAMI, FLORIDA, 1988–1998:** Incidence was twice as high for sex partners (37.5%) as for IDUs (18.0%). Drug and needle use risk behaviours, except crack use, showed decreases; sexual risk behaviours were less amenable to change. Knowledge significantly increased among the long-term HIV negatives and seroconverters but not among those HIV positive in 1988.
Corsi, 2006	USA	Long	561 participants	59.4% male 43 years old at follow up	IDU and a significant proportion used crack at baseline	n/a	**LONG-TERM PREDICTORS OF HIV RISK BEHAVIOURS AMONG IDUS** A total of 773 subjects were located (82% relocation rate), 578 of whom were interviewed at follow-up. Statistical analysis revealed significant improvement in most high-risk injection and sex behaviours. However, over half the sample reported having sex without a condom at follow-up. Further analysis revealed that having sex without a condom at baseline, not having previously participated in drug

							treatment, being of an ethnicity other than African American, smoking crack, and having sex with a drug injector were all significantly related to having sex without a condom at follow-up.
Khan, 2013	USA	CS/CC	14,322 individuals young adults	mean age 21,4 years 51 % males	Crack	Risk Behaviour	**NON-INJECTION AND INJECTION DRUG USE AND STI/HIV RISK IN THE UNITED STATES: THE DEGREE TO WHICH SEXUAL RISK BEHAVIOURS VERSUS SEX WITH AN STI-INFECTED PARTNER ACCOUNT FOR INFECTION** **TRANSMISSION AMONG DRUG USERS**: 1.64, 95 % confidence interval (CI): 1.16–2.31) and sexual risk behaviours including multiple partnerships and inconsistent condom use. Injection drug use was strongly associated with STI (APR: 2.62, 95 % CI: 1.29–5.33); this association appeared to be mediated by sex with STI infected partners rather than by sexual risk behaviours.
McCoy, 2004	USA	CS/CC	3555 IDUs from urban Miami, FL and rural Belle Glade and Immokalee, FL	mean age: 34 years , males: 2235, 62.9 %	Crack	PWID 45.1% PWID/NIDU 30.5% NIDU 20.1%	**INJECTION DRUG USE AND CRACK COCAINE SMOKING: INDEPENDENT AND DUAL RISK BEHAVIOURS FOR HIV INFECTION: RESULTS:** HIV seroprevalence rates were 45.1% for IDUs, 30.5% for dual users, 20.1% for crack smokers and 7.3% for controls. Multivariate logistic regression analysis found that when compared with controls odds ratios for HIV seropositivity were 9.81 for IDUs, 5.27 for dual users, and 2.24 for crack smokers. **CONCLUSIONS:** These findings provide evidence of: 1) behavioural and structural co-factors that influence HIV exposure patterns among drug users; and 2) the substantially higher risk of HIV infection among IDUs compared with other drug users.

Deren, 2008	USA	Long	837 IDUS high-risk Puerto Rican drug users	Mean age 37,7 years New York; 32,5 years Puerto Rico 71,4 % male	Crack		**SEX RISK BEHAVIOURS OF DRUG USERS: A DUAL SITE STUDY OF PREDICTORS OVER TIME:** In New York, predictors of higher sex risk were being younger, having primary partners, having more other sex partners, never exchanging sex, having lower self–efficacy for reducing sex risk behaviours and being HIV–negative, and these predictors were significant at both post baseline periods. In PuertoRico, short–term predictors included being male, having primary partners, never exchanging sex, lower sex risk norms and lower self–efficacy. However, only having primary partners was significant in longer–term behaviours.
Buchanan, 2006	USA	CS	989 IDUs	38 years; between 70.2% and 80.98% male	crack	n/a	**Demographic, HIV risk behaviour, and health status characteristics of "crack" cocaine injectors compared to other injection drug users in three New England cities** Nine percent (n=89) of participants reported "ever" injecting crack cocaine and 4.2% (n=42) reported injecting crack in the past 30 days. Lifetime and current crack injectors did not differ significantly on any demographic characteristics. Lifetime and current crack injectors did not differ on gender, age or marital status from IDUs who have never injected crack. Significant differences were found on race, education, employment and residence, with crack injectors more likely to be white, employed, better educated and living in New Haven than IDUs who have never injected crack. After adjusting for current (past 30 day) speedball and powder cocaine injection, crack injectors reported higher rates of risky drug use behaviours and female crack injectors reported higher rates of risky sexual behaviours.

							Crack injectors reported higher rates of abscesses, mental illness and Hepatitis C infection, but not Hepatitis B or HIV infection.
Santibaneza 2005	USA	CS	329 crack cocaine IDUs		crack	n/a	**Prevalence and correlates of crack-cocaine injection among young injection drug users in the United States, 1997–1999** Crack-cocaine injection was reported by 329 (15%) of 2198 participants. Prevalence varied considerably by site (range, 1.5–28.0%). No participants injected only crack-cocaine. At four sites where crack-cocaine injection prevalence was greater than 10%, recent (past 6 months) crack-cocaine injection was correlated with recent daily injection and sharing of syringes, equipment, and drug solution. Lifetime crack-cocaine injection was correlated with using shooting galleries, initiating others into drug injection, and having serologic evidence of hepatitis B virus and hepatitis C virus infection.
Malta 2010	Brazil	SR	n/a	n/a		Pooled prevalence 23.1 (95% CI: 16.7-30.2).	**HIV prevalence among female sex workers, drug users and men who have sex with men in Brazil: A Systematic Review and Meta-analysis** Twenty-nine studies targeting DU were identified (13,063 participants). Those studies consistently identified injection drug use and syringe/needle sharing as key predictors of HIV-infection, as well as engagement in sex work and male-to-male sex. The combined HIV prevalence across studies targeting DU was 23.1 (95% CI: 16.7-30.2).
Zocratto, 2006	Brazil	CS	272 IDUs enrolled in the AjUDE-Brasil I Project, conducted in	82.7% men; mean age of 29.25 ± 8.04 years	Cocaine	9.2% HIV mono-infected, and 42.6% co-infected (HIV and HCV)	**HCV AND HIV INFECTION AND CO-INFECTION: INJECTING DRUG USE AND SEXUAL BEHAVIOUR, AJUDE-BRASIL I PROJECT:** IDUs were clustered in four distinct groups: seronegative (37.9%), HCV mono-infected (10.3%), HIV mono-infected (9.2%), and co-

			five Brazilian cities in 1998.				infected (42.6%). The majority of the IDUs who reported ever having received/borrowed (78.8%) or given/lent syringes (77.4%) to other IDUs belonged to one of the infected groups. Active sharing of injecting equipment was associated with HCV infection (p = 0.001). Sexual behaviour variables, especially male same-sex sexual relations, were consistently associated with HIV infection. Some 60% reported not having used condoms in their sexual relations with partners of the opposite sex. HCV/HIV co-infection was associated with both sexual and drug use variables.
De Boni, 2005	Brazil	CS	250 respondents (Rio 146; POA 104) who reported using cocaine by injection in the six months prior to interview. Data collected between 1994 and 1997	31 years in Rio de Janeiro e 28 years in Porto Alegre 90% male	Cocaine	HIV test	**RISKS DIFFERENCES OF HIV INFECTION BETWEEN INJECTION DRUG USERS IN RIO DE JANEIRO AND PORTO ALEGRE** There were no statistically significant differences between the two samples in terms of demographic characteristics, with the exception of mean age (31 years in Rio de Janeiro and 28 years in Porto Alegre). The Porto Alegre sample reported more frequent cocaine injection and more injecting risk behaviours. The Rio de Janeiro sample displayed more sexual risk behaviours and more frequent use of both alcohol and snorted cocaine. Cocaine injectors in the two regions studied displayed different levels of HIV risk behaviours, and these behaviours appear to be related to the type, method and frequency of drug use. These data were collected between 1994 and 1997 when the use of crack was less common in these cities, which may have changed the current level of risk behaviours for HIV among cocaine users.

Marchesini, 2007	Brazil	CS	205 IDUs from public health clinics in the city of Sao Paulo	mean age 39 years ; 81% males	Cocaine	Hepatitis B and C only	**HEPATITIS B AND C AMONG INJECTING DRUG USERS LIVING WITH HIV IN SÃO PAULO, BRAZIL: Results:** Hepatitis B and C prevalence were 55% (95% CI: 49;63) and 83%(95% CI: 78;88), respectively. Eighty percent of respondents had not heard of Hepatitis B and C prior to the first time they used injecting drugs.
Oliveira, 2005	Brazil	CS	609 IDUs from Rio de Janeiro	mean age 32.2 years; 91.5 % males	Cocaine	HBC test only	**A WINDOW OF OPPORTUNITY: DECLINING RATES OF HEPATITIS B VIRUS INFECTION AMONG INJECTION DRUG USERS IN RIO DE JANEIRO, AND PROSPECTS FOR TARGETED HEPATITIS B VACCINATION: Results.** The prevalence of HBV infection was 27.1% , with 3.4% of the sample positive for HbsAg (active infection) and 0.8% positive for anti-HBs (indicating previous HBV vaccination). Most interviewees (81.3%) were aware of at least one form of viral hepatitis and received information from many different sources. In agreement with laboratory findings, 96.7% of the interviewees stated they had never been vaccinated against hepatitis B, but almost all unvaccinated interviewees (97.8%) said they would volunteer to be vaccinated if HBV vaccination were available.
Oliveira, 2006	Brazil	CS	606 IDUs from Rio de Janeiro	mean age 30.1 years; 91.4 % males	Cocaine	HCV test only	**"THE FIRST SHOT": THE CONTEXT OF FIRST INJECTION OF ILLICIT DRUGS, ONGOING INJECTING PRACTICES, AND HEPATITIS C INFECTION IN RIO DE JANEIRO, BRAZIL:** Seroprevalence rates were: HIV (6.3%), HBV (9%), HCV (7.5%), and VDRL (4.2%). The risk of being infected with HIV, HBV, and HCV was significantly associated with having had a sex partner who was either a drug injector or who was known to be HIV positive. HIV and HCV infections were associated with former imprisonment, and HCV was associated with having been tattooed. Because of the

							rising number of NICU and the multiple infections detected, it is essential to implement prevention strategies focused on this population.
Oliveira, 2009b	Brazil	CS	770 IDUs from Rio de Janeiro	mean age 32.3 years ; 88% males	Cocaine	HCV test only	**TRENDS IN HCV PREVALENCE, RISK FACTORS AND DISTRIBUTION OF VIRAL GENOTYPES IN INJECTING DRUG USERS: FINDINGS FROM TWO CROSS-SECTIONAL STUDIES: Results:** A substantial decline in the prevalence of HCV infection was found over the years (75% in 1994 vs. 20.6% in 2001, P<0.001) that may be a consequence of the significant reduction in the overall frequencies of drug injection and needle-sharing, as well as the participation of IDUs in initiatives aimed at reducing drug-related harm. No trend was found in terms of viral genotype distribution.
Oliveira, 2009a	Brazil	CS	606 IDUs short- and long-term injecting drug users from Rio de Janeiro	mean age 30 years ; 91.4 % males	Cocaine	HCV test only	**EPIDEMIOLOGICAL AND GENETIC ANALYSES OF HEPATITIS C VIRUS TRANSMISSION AMONG YOUNG/SHORT- AND LONG-TERM INJECTING DRUG USERS FROM RIO DE JANEIRO, BRAZIL: Results:** ST were more likely to engage into needle-sharing (p = .021) and LT to attend Needle Exchange Programs (p = .006). HCV prevalence was 10.1% vs. 23.4% among initiates and LT, respectively (p < .001). Older age vs. imprisonment and longer duration of IDU career were independent predictors for HCV infection among ST and LT, respectively. Among the latter, NEP attendance was inversely associated with viral infection. HCV3a infections were the most prevalent. A moderate extent of phylogenetic segregation between sequences was found, suggestive of transmission between IDU subgroups.

Silva, 2010	Brazil	CS/CC	194 individuals from Salvador-BA, Brazil	mean age IDUs 26.6 / ex-IDUs 27.8,male 93.8%	Cocaine	HCV test only	**PREVALENCE AND GENOTYPES OF HEPATITIS C VIRUS AMONG INJECTING DRUG USERS FROM SALVADOR-BA, BRAZIL:** Anti-HCV screening revealed that 35.6%, 29.8% and 5.3% of samples from IDUs, ex-IDUs and non-IDUs, respectively, were seropositive. HCV-RNA detection confirmed that the prevalence of infection was 29.4%, 21.3% and 5.3% for IDUs, ex-IDUs and non-IDUs, respectively. Genotyping analysis among IDUs/ex-IDUs determined that 76.9% were infected with genotype 1, 18.5% with genotype 3 and 4.6% with a mixed genotype; this result differed significantly from non-IDUs, where genotype 3 was the most frequent (60%), followed by genotype 1 (20%) and a mixed genotype (20%). We report a significantly higher prevalence of HCV infection in IDUs/ex-IDUs compared to the control group ($p < 0.001$).
Pechansky, 2006	Brazil	Long	1449 IUDs from Porto Alegre, Brazil	Mean age 29 years, 63% males	Cocaine and crack	20.6%,	**HIV sero prevalence among drug users: an analysis of selected variables based on 10 years of data collection in Porto Alegre, Brazil:** The study included 1449 subjects who were divided into categories based on their pattern of drug use: (1) injection drug users (IDUs), (2) crack smokers, (3) frequent drug users, and (4) infrequent drug users. Half of the subjects reported frequent condom use, and exchanges involving drugs, sex, and money were infrequent but more common in groups 1 and 2. The overall seroprevalence was 20.6%, and the prevalence was different across the four groups, showing a linear decrease from group 1 (57.1%) to group 4 (11.7%). The IDU and crack-smoking groups showed similarities in their risk levels when compared

							with the other two groups. After controlling for all other risk factors, IDU, males having sex with males, and crack use were highly associated with HIV.
Caiaffa, 2006	Brazil	CS	1,144 IDUs from São Paulo, Sorocaba, and São José do Rio Preto (São Paulo); Itajaí (Santa Catarina); and Porto Alegre(Rio Grande do Sul) in 1998 in 2000-2001 Salvador (Bahia); São José do Rio Preto(São Paulo); Florianópolis and Itajaí (Santa Catarina); Porto Alegre and Gravataí(Rio Grande do Sul).	median age 29 years ; 65% males	Cocaine and crack	Ajude I, 1998= 52% Ajude II, 2000/2001= 36.5%	**THE CONTRIBUTION OF TWO BRAZILIAN MULTI-CENTER STUDIES TO THE ASSESSMENT OF HIV AND HCV INFECTION AND PREVENTION STRATEGIES AMONG INJECTING DRUG USERS: THE AJUDE-BRASIL I AND II PROJECTS: Results:** fifty-two percent of IDUs were HIV-infected in AjUDE I versus 36.5% in AjUDE II. In both studies, HIV infection was independently associated with: mean background HIV prevalence for each site (OR = 2.17; 10.66), HCV seropositive status (OR = 19.79; 15.48), and men who reported ever having sex with other men (OR = 2.10; 2.09). Incarceration (OR = 1.41) and 8 or more years of injecting drug (OR = 2.13) were also associated with HIV in AjUDE II. The high HIV infection rates and high prevalence of both parenteral and sexual risk behaviours in the context of syringe-exchange programs are of great concern and demand thorough surveillance and renewed prevention strategies.

Pechansky, 2004	Brazil	CS	420 IDUs from Porto Alegre, Rio Grande do Sul State	mean age 37,5 years ; 69.5% males	Cocaine	22.6%	**RISK FACTORS FOR HIV TRANSMISSION IN DRUG USERS FROM PORTO ALEGRE, RIO GRANDE DO SUL STATE, BRAZIL: Results:** Overall HIV seropositivity was 22.6%; 39.3% of the subjects infected were at least 30 years old, and 69.5% were males. **Conclusions:** Seroprevalence in this sample is considered high, particularly since 70.0% of the sample reported no prior drug injection. Variables associated with HIV infection are similar to the national and international literature and agree with the theoretical model of risk behaviour proposed by the first author.
Berbesi, 2014	Colombia	CS	796 IDUs from three main cities	mean age 26.6 years ; 92% males	Cocaine	2.6% (men) -3.1% (women)	**CROSS-SECTIONAL STUDY OF HIV PREVALENCE AND THE CHARACTERISTICS OF INJECTING DRUG USERS IN COLOMBIA: Results:** There are extensive networks of injection drug users (IDUs). The population of IDUs was characterized as mostly men between 18 and 34. The data suggest a recent introduction of HIV into networks and a high degree of risk behaviour for HIV spread in networks and used syringes. People who reported sharing syringes, were at greater risk of not using a condom when having sex with casual partners, this factor is increased when controlling for other variables consulted (OR ¼ 4.10, 95% CI 1.23 to 16.05; p50.00).

3. Men who have Sex with Men (MSM) Only

Author, Year	Country	Design	Population, Sample size	Age (SD), Gender	Drug, Route	HIV Prevalence/ Incidence	Relevant findings
Brocato, 2014	USA	CS	106 adult African American women	31 years (SD= 6.4), women only	crack	n/a	**Sexual Practices and HIV Risk Behaviours Among African American Female Partners of Sex-Trading Men Who Have Sex with Men and Women: A Descriptive Analysis** Nearly 90% of participants reported unprotected vaginal sex and using crack cocaine in the previous 3 months. The recent use of heroin was significantly associated with diminished condom use. A clear majority of the participants did not know their HIV status. This study is the first to examine and document shared structural and behavioural risk profiles of this population.
Tobin, 2011	USA	CS/CC	230 participants from Baltimore; Crack-using vs non-crack using African American men who have sex with men	mean age : 37.8 years 100% male	Crack	n/a	**A COMPARISON OF THE SOCIAL AND SEXUAL NETWORKS OF CRACK-USING AND NON-CRACK USING AFRICAN AMERICAN MEN WHO HAVE SEX WITH MEN:** Of 230 enrolled AAMSM, 37% (n=84) reported crack use. The sexual networks of crack-using AA MSM were composed of a greater number of HIV-positive sex partners, exchange partners, and partners who were both sex and drug partners and fewer networks with whom they always use condoms as compared to non-crack using AA MSM. Crack use was independently associated with increased odds of bisexual identity and networks with a greater number of exchange partners, overlap of drug and sex partners, and lesser condom use.

4. Sex Workers

Author, Year	Country	Design	Population, Sample size	Age (SD), Gender	Drug, Route	HIV Prevalence/ Incidence	Relevant findings
Degenhardt, 2006	Australia	CS	key informants and IDU		cocaine	n/a	**Examining Links Between Cocaine Use and Street-Based Sex Work in New South Wales, Australia** Qualitative data suggested a greater number of primary heroin users were engaging in street-based sex work, which was driven in part by the increases in cocaine use among this group. Subsequent reductions in cocaine availability led to decreased cocaine use and possession offenses, along with reductions in prostitution offenses.
Duff, 2013	Canada	Long	206 IDUs from Vancouver	median age 35 years, female (inclusive of transgender male-to-female)	Crack	n/a	**SEX-FOR-CRACK EXCHANGES: ASSOCIATIONS WITH RISKY SEXUAL AND DRUG USE NICHES IN AN URBAN CANADIAN CITY: Results:** Of 206 SWs, 101 (49%) reported sex-for-crack exchanges over 18 months of follow-up. In multivariable GEE analyses, sharing a crack pipe with a client (aOR = 1.98; 95%CI: 1.27-3.08) and smoking crack in a group of strangers (e.g., in an alley or crackhouse) (aOR = 1.70; 95% CI: 1.13-2.58) were independently correlated with sex-for-crack exchanges. In our confounding model, exchanging sex for crack (aIRR = 1.34; 95% CI: 1.07-1.69) remained significantly associated with servicing a greater number (>10) of clients/week.
Shannon, 2008a	Canada	CS	198 survival sex workers	39 years (IQR 34-44)	crack	26%	**DRUG SHARING WITH CLIENTS AS A RISK MARKER FOR INCREASED VIOLENCE AND SEXUAL AND DRUG-RELATED HARMS AMONG SURVIVAL SEX WORKERS** Based on diagnostic testing, the overall HIV prevalence was 26%. Self-reported HCV prevalence was 59% and 11% reported a recent STI diagnosis (gonorrhoea, chlamydia, syphilis). Of the total, 117

							(59%) reported sharing drugs with clients in the last six months and crack cocaine was the primary drug shared (n=108). Sharing drugs with clients was associated with borrowing a used crack pipe, intensive/daily crack cocaine smoking, inconsistent condom use by a client and having a recent bad date.
Risser, 2006	USA	CS	193 African American female crack cocaine users who currently, previously, or never traded sex for money.	32 years , women	cocaine	n/a	**PSYCHOLOGICAL CORRELATES OF TRADING SEX FOR MONEY AMONG AFRICAN AMERICAN CRACK COCAINE SMOKERS** Current traders were less likely to have a main sexual partner, more likely to have a casual sexual partner, and more likely to smoke larger quantities of crack. There was a significant trend towards current traders reporting lower self-esteem, greater depression and anxiety, poorer decision-making confidence, more hostility, less social conformity, greater risk taking behaviours, and more problems growing up, compared to previous and never traders. These differences suggest that interventions should address self-esteem, risk- taking practices, depression and anxiety as well as other psychosocial factors.
Inciardi, 2005	USA	CS	407 drug-involved women sex workers in Miami, Florida,	mean age 38 years; women only	Crack	21.90%	**THE EFFECT OF SEROSTATUS ON HIV RISK BEHAVIOUR CHANGE AMONG WOMEN SEX WORKERS IN MIAMI, FLORIDA: Results:** Overall, at follow-up, the HIV-positive women were 2.4 times more likely than the HIV-negative women to have entered residential treatment for drug abuse, 2.2 times more likely to have decreased the number of their sex partners, 1.9 times more likely to have decreased the frequency of unprotected sex, 1.9 times more likely to have reduced their levels of alcohol use, and 2.3 times more likely to have

							decreased their crack use. These data support the importance of HIV testing and risk-reduction programmes for drug-involved women sex workers.
Edwards, 2006	USA	CS	669 African American women who use crack cocaine	36.4 (6.8) years	crack	n/a	**Correlates of Exchanging Sex for Drugs or Money among Women Who Use Crack Cocaine** The results indicate that heavier crack use, homelessness, and unemployment are associated with trading sex. In addition, childhood abuse is associated with trading sex and this relationship is, in part, mediated by psychological distress. This suggests that distal factors may underlie the relationship between current variables and sex trading. These findings underscore the importance for public health interventions to address both distal and proximal factors that contribute to and/or co–occur with women's drug use which, in turn, may affect their HIV risk and overall well–being.
Patterson, 2006	Mexico	CS	295 female sex workers from Tijuana and Ciudad Juarez Mexican- U.S. border	mean age 32.4 years; 100% females	Cocaine	4.80% Tijuana 4.90% Cd. Juarez	**COMPARISON OF SEXUAL AND DRUG USE BEHAVIOURS BETWEEN FEMALE SEX WORKERS IN TIJUANA AND CIUDAD JUAREZ, MEXICO: Results:** Among 155 FSWs in Tijuana and 140 in Cd. Juarez, HIV seroprevalence was 4.8% and 4.9%, respectively. FSWs in Cd. Juarez were more likely to test positivefor active syphilis (31.3%) compared with Tijuana (11.8%) but did not differ in terms of the prevalence of gonorrhoea and chlamydia. FSWs in both sites reported high levels of unprotected sex and use of drugs; however, FSWs in Cd. Juarez were more likely than those in Tijuana to ever have injected drugs (75% vs. 25%, p <.001). Heroin and cocaine use and injection drug use were significantly more common in Cd. Juarez, whereas methamphetamine use was more common in Tijuana. Injection of vitamins was

							common in both cities. Logistic regression analyses suggested that being younger, working in Cd. Juarez, and using heroin or cocaine were independently associated with active syphilis infection. In Tijuana, methamphetamine use was strongly associated with active syphilis infection.