SUBSTANCE USE AND SEXUALLY TRANSMITTED INFECTIONS, BARRIERS TO SEXUAL HEALTH CARE AND THE ROLE OF ENHANCED OUTREACH SERVICES ON STI TRENDS AMONG AN INNER-CITY POPULATION IN VANCOUVER, CANADA

by

MELANIE LENA ANNE RUSCH

B.Sc., The University of Victoria, 1999
M.Sc, Johns Hopkins University, Bloomberg School of Public Health, 2002

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

in

THE FACULTY OF GRADUATE STUDIES

(Health Care and Epidemiology)

THE UNIVERSITY OF BRITISH COLUMBIA

November 2006

ABSTRACT

In high risk communities such as Vancouver's Downtown Eastside (DTES), persistently high rates of sexually transmitted infections (STIs) warrants further research. This thesis examines prevalence of STIs from two perspectives: 1) factors associated with increased STIs, and 2) factors influencing access to treatment.

The Community Health And Safety Evaluation (CHASE) afforded a population sample in which to examine drug use patterns associated with STIs, STI trends and program influences. An extension of CHASE, the Women's Night (WN) survey, enabled further examination of program impact, assessing STI screening in this setting. Factors influencing access of sexual health care were assessed among the WN population, focusing on a novel STI-related stigma scale.

Examining drug use patterns and STIs revealed that, among HIV-negative women, crack cocaine use was independently associated with STIs (AOR: 2.6, 95% CI: 1.1-6.5), while among HIV-positive women, episodic drug use remained independently associated with STIs (AOR: 5.8, 95% CI: 1.4-23.5). Interaction between drugs was not seen, although estimated odds for dual-users of crack and crystal methamphetamine was additive, suggesting specific risks associated with drug type.

CHASE and regional STI trends were similar, although for gonorrhoea and syphilis CHASE prevalences were ten times higher. A recent syphilis outbreak was evident in both the CHASE and regional data. Shifted peaks in the CHASE cohort may reflect the influence of enhanced partner tracing and peer-based networking strategies.

The WN program had a low cross-sectional prevalence of chlamydia (2%) despite active sex work and high drug use. Nearly 75% of the WN population reported a pap smear, and approximately 50% reporting STI testing in the past year. Accessing pap smears was influenced positively by education (OR:4.5, 95% CI: 1.1-18.0) and negatively by injection drug use (OR: 0.25, 95%CI: 0.08-0.86). STI-stigma was not associated with accessing pap smears; however, internal stigma was associated with STI testing (OR: 0.43; 95% CI: 0.20-0.91).

Developing strategies for engaging hard-to-reach populations, developing less stigmatizing messages of prevention, and breaking down barriers that prevent regular sexual health care among women are important and necessary steps in reducing the impact of STIs.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

This work would not have been possible without the help and support of my thesis committee, Dr. Mark Tyndall, Dr. Jean Shoveller and Dr. David Patrick. In addition, I would like to acknowledge the collaboration and support from the Downtown Community Health Clinic – Dr. Susan Burgess, Dr. Karen Stancer, and the Women's Night team – as well as the CHASE project staff and peers, especially Tomiye, Michelle, Laurie and Sharie for their help conducting the survey. Special thanks also to the technical support provided by the BC CDC Laboratory, especially Dr. Gwen Stephens, Ms. Tazim Rahim and their team. Thanks to the Michael Smith Foundation for Health Research and the BC Medical Research Foundation for supporting this research. Thanks to my friends and colleagues at the BC Centre for Excellence in HIV/AIDS for all their time, encouragement and support over the years. Lastly, thanks to my family for constant encouragement, continual support, and endless patience, without which I would not have gotten this far.

DEDICATION

For their acceptance, encouragement, time and support, I would like to dedicate this work to all the participants of Women's Night.

CO-AUTHORSHIP STATEMENT

The following chapters were co-authored by the following individuals:

- **Chapter 2:** Kate Shannon, Calvin Lai, Thomas Kerr, David Patrick, Mark Tyndall
- **Chapter 3:** Kate Shannon, Calvin Lai, Thomas Kerr, David Patrick, Mark Tyndall
- **Chapter 4:** Kate Shannon, Calvin Lai, Thomas Kerr, David Patrick, Mark Tyndall
- **Chapter 5:** Jean Shoveller, Susan Burgess, Karen Stancer, David Patrick, Mark Tyndall
- **Chapter 6:** Jean Shoveller, Susan Burgess, Karen Stancer, David Patrick, Mark Tyndall

In all cases, primary writing responsibilites, research questions and statistical analysis were carried out by the candidate. The CHASE project was developed and lead by Dr. Mark Tyndall, while the Women's Night Survey was developed and lead by the candidate.

CHAPTER 1

EPIDEMIOLOGY OF SEXUALLY TRANSMITTED INFECTIONS: FROM TRANSMISSION TO TREATMENT

INTRODUCTION

Over the past decade, advances in diagnostics and therapies have allowed better detection and treatment of sexually transmitted infections; however, STIs continue to burden both individual and public health. Syphilis, thought to be under control, has shown up in outbreaks throughout the globe in MSM, IDU and heterosexual populations, and despite goals of elimination of gonorrhoea, rates in Canada have been increasing over the past several years [1-4]. High levels of asymptomatic infections [5-8], poor access to care among high-risk groups [9-11], lower levels of active surveillance among men [7,12] along with issues of stigma and discrimination [13,14] and the generally sensitive nature of sexual topics in society [12,15] are some examples of the problems faced in reducing STI rates.

The increased susceptibility of individuals with an STI to other co-infections, including HIV, has highlighted the importance of STI prevention and treatment [16]. It is important to address the continuing high prevalence of STIs and direct research efforts not only towards prevention of infection, but also towards prevention of transmission and accessibility of treatment. Education and risk reduction programs and practices have shown increased positive impact among different populations when peer-based, community-based and/or participatory approaches are used [17-19]. These models help address the specific cultural and contextual problems being faced in different environments [20]. The effect of high-risk, hard-to-reach core groups on the persistance of higher levels of STIs in a population can be seen in different networking, mathematical or phase-specific models of STI spread [21-23]. These examples highlight the importance of identifying high-risk groups in order to increase connections with health services and access to care, as well as to deliver health education and harm reduction strategies [24,25]. Efforts to increase access and encourage regular sexual health care among all women are also needed. Although targeting high-risk women for screening and treatment can be effective, care needs to be exercised in the

delivery of these programs so as not to increase STI-related stigma and reduce care-seeking behaviours in women who do not consider themselves 'high-risk' [26-29]. The following chapter gives an overview of STIs, including screening and treatment, reviews the literature examining relationships of substance use with STI transmission and explores the use of health behaviour models in assessing access of sexual health care.

SEXUALLY TRANSMITTED INFECTIONS

Chlamydia trachomatis and *Neisseria gonorrhoeae*, both of which are associated with abnormal urethral or cervical discharge but which also may be carried with few signs or symptoms, are the bacterial agents of chlamydia (CT) and gonorrhoea (GC), respectively [8]. Syphilis, usually associated in its early stages with ulcerative lesions followed by a generalized rash, is caused by a bacterial spirochete, *Treponema pallidum* [8]. Trichomonas, a common infection in sexually active females caused by the protozoa *Trichomonas vaginalis*, ranges from being asymptomatic to causing acute inflammatory disease [30]. The incubation periods range from 1 to 2 days for gonorrhoea, to 7-14 days for chlamydia, 2 to 6 weeks for syphilis and 3 to 28 days for trichomonas [8]. These differences become important in the epidemiology of disease transmission, with longer incubation times affording more opportunities to interrupt transmission through partner tracing and prophylactic treatment of exposed persons [31,32].

It has been suggested that there may be some level of immunity generated to CT infections when left untreated long enough for natural immunity to develop [33]. Models incorporating decreased population immunity due to early treatment into recent trends in B.C. offer this as a partial explanation for the rebound in rates following the steady decline seen until the late nineties [34]. This type of explanation has also been offered for the cyclical nature of syphilis epidemics [35].

This has implications both for the potential future use of vaccines for bacterial STIs [34] as well as for predicting future trends and impacts of planned interventions.

Besides managing the challenges of acute STI symptoms, there can be long term complications causing serious morbidity[7]. In the general public, the long-term complications that can be associated with STIs are often overshadowed by the more acute symptoms which are visible, but treatable, and therefore perceived to be less serious. Chlamydia and gonorrhoea infections can both lead to salpingitis and pelvic inflammatory disease [36]. PID can subsequently lead to tubal scarring, infertility and ectopic pregnancy, of which an estimated 40 to 80% is due to STIs [36]. In addition to PID, untreated gonococcal infections can lead to disseminated infection and complications including sepsis, arthritis, endocarditis and meningitis, while chlamydia in rare cases can cause Reiter's syndrome [37]. Although long-term complications of syphilis are rare since the introduction of antibiotics, untreated cases can lead to tertiary gummatous syphilis, cardiovascular complications and neurosyphilis [38]. All the aforementioned infections, including trichomonas, can cause complications during pregnancy and/or serious infections in newborns [7,39].

Co-infection with multiple STIs can occur, and is reported most frequently for CT and GC. Among youth entering juvenile detention in the U.S., 50% of infections were reported to be dual CT/GC, while among young women attending STI or family planning clinics, 50% of GC infections were co-infected with CT [40,41]. A U.S. sample of young adults aged 18-26 with average rates of approximately 5% for CT and 2% for GC, indicated an overall co-infection rate of 0.03% [42]. Co-infection rates for females with TV were reported to be approximatley 20% for either GC or CT infection [43].

As mentioned above, there are also implications for increased susceptibility to HIV. In the past, the presence of common STIs such as GC and CT have been used in HIV research as markers for condom use, with the idea that increased rates of STIs were indicative of decreased rates of condom use [44,45]. In the nineties, researchers found increasing evidence of biological interactions between STIs and transmission of HIV [16,46]. STIs causing ulcerative lesions (e.g., syphilis) act as cofactors (i.e. contributing to probability of spread) increasing an individual's susceptibility to HIV through a breakdown in the mucosal lining at the site of infection. Furthermore, increased presence of immune cells at the site of an STI infection may increase the number of susceptible target cells present for successful HIV infection [16]. STIs causing discharge (e.g., gonorrhoea) may act as cofactors increasing transmission of HIV from a co-infected individual through increased shedding of the virus [16,47,48]. There are many studies implicating HSV infection as an important factor causing increased susceptibility to HIV infection, while HIV co-infection with HPV has implications for the severity of the HPV infection and progression to cancer [49]. While not all of these pathways are entirely clear, it is apparent that management of STIs is an important aspect of HIV prevention efforts [50].

While there are three main determinants contributing to the spread of STIs – sexual behaviours, efficiency of transmission and duration of infection – the proximal and distal factors influencing these determinants are far ranging [51]. Social history, population demographics, cultural and behavioural changes over time, economics and social welfare, as well as technological advances in testing, treatment and protection methods, individual and social patterns of drug use and availability and access to care are all important factors influencing the spread and the persistance of STIs [51]. Individual sexual behaviours such as age at first intercourse, number of partners, use of condoms or other barrier methods, sex trade, and substance use during sex are all important factors; however, equally important are social and environmental factors such as location, sexual

networks and high-risk 'core' groups, neighbourhood socioeconomic status (SES), travel and migration patterns [51-53]. Whether social factors influence behaviours, exposure levels or ability to access treatment services, studies consistently show youth, ethnicity, low income (both individual and neighbourhood level) and various measures of SES to be associated with increased STIs [54-57].

Interestingly, studies examining specific correlates of CT versus GC infection have found that there are differences and that these can be geographically specific. For example, a study in Canada found that while GC and CT shared younger age and Aboriginal ethnicity as risk factors among female clinic attendees, while in addition to age and ethnicity, GC infection was also correlated with lower neighbourhood income levels [54]. In the US, those with CT infections were younger and more likely to report white ethnicity as compared to those with GC infections [58].

Although there are effective treatments for most bacterial STIs, the increased biological susceptibility of women, the high levels of unrecognized or asymptomatic infections, and the increased presence of antimicrobial resistant strains are some of the factors allowing STIs to persist [4,7,59]. Among women, 70% of chlamydial infections are asymptomatic, while for men, 50% are estimated to be asymptomatic [7]. In most developed countries where there is available medical care, it is recommended that sexually active women, especially young women, be screened for chlamydia during their annual examinations [60]. Studies examining the uptake of STI screening found that during regular visits among young women, approximately 75-80% agreed to testing when it was systematically offered, while in the general population, rates were lower, ranging from 32% to 55% [6,61-63]. While this does lower the number of untreated cases among women, there is no such testing done on men, leaving asymptomatic males capable of re-infecting their partners unless they too are treated under a partner notification program [12].

Although the asymptomatic rates for gonorrhoea are lower, a combination of non-specific and unrecognized symptoms can lead to similarly untreated proportions of cases in women[7].

There is a disproportionate burden of disease, with youth, women, minorities and marginalized populations amongst the most heavily impacted [57,64-67]. There are complex social, practical and behavioural barriers to reducing STIs, including openness of discussions about sexuality and sexual health, and STI-related stigma which may influence testing and treatment seeking behaviours [5,9,12,68]. Women again typically face the most social barriers, through social disadvantage, familial responsibilities (leaving little time for self-care), unbalanced power dynamics in relationships, and society's precarious categories of 'good' and 'bad' women [69-72]. Predictors of HIV in Vancouver consistently indicate females, youth, aboriginals and substance abusers as high-risk [11,67,73,74]. Other studies have similarly found female gender, low socioeconomic status, unemployment, ethnicity and younger age to be associated with STIs[6,56].

Epidemiology of STIs in Canada

Although STIs had been declining in Canada throughout the 1990's, gonorrhoea and syphilis rates have been on the rise since 1997. The most recent national surveillance data estimates continued increases in STIs to rates of 197.1, 28.9 and 3.5 per 100,000 for chlamydia, gonorrhoea and syphilis, respectively, in 2004, representing a 70% increase in CT, a near doubling of GC and nine times the rates of syphilis seen in 1997 [39,75]. While the chlamydia rates in BC are comparable to the national rates at 208 per 100,000 in 2004, data indicated a 45% increase from 2001 in the rate of infections in this province [75,76]. Gonorrhoea saw a 70% increase in the same time period, and syphilis rates continued to climb, with a provincial rise from 4.4 to 7.3 per 100,000, the highest in Canada[75,76]. Research has indicated an increase in unprotected intercourse among gay men since the introduction of HAART, as well as a decrease

in the age of first sexual experience among Canadian born adolescents, and high rates of inconsistent condom use among young adults [39].

HEALTH CARE: SURVEILLANCE, TESTING AND TREATMENT

The control of STIs from a public health perspective depends on several issues. Interestingly, CT, GC and syphilis, of their own accord, could be targets for eradication. They are only found in human hosts and there are effective treatments; however, the infections are in some cases insidious, making them difficult to detect. On the other hand, the available treatment consists of a simple antibiotic, making mass treatment a viable option, which has been tried in some populations. Mass treatment has previously been shown effective in reducing levels of STIs in high prevalence areas for a short term [77]. Recommendations could be made for the use of mass treatment among certain populations with high-risk/high prevalence core groups of transmission; however, most literature points to the additional requirement of other long term provisions for keeping rates low. These requirements include education and prevention campaigns as well as adequate services, especially among disadvantaged, high-risk populations [78]. As illustrated by the mass treatment campaign initiated to curb an ongoing outbreak in Vancouver, high-risk, hard-to-reach populations pose a problem, in that, if core transmission groups are missed, mass treatment serves to refresh the susceptible pool, allowing the epidemic to re-enter the population resulting in a second epidemic wave [79]. While mass treatment programs for syphilis have proven somewhat useful in some settings, certain similar programs for gonorrhoea have not had the same success, although the studies are few and situations are specific [78,80].

Surveillance for STIs remains an extremely important component of control. Surveillance data can help in defining population subgroups and behaviours for targeted interventions, informing clinical practice and diagnostics, and evaluating interventions, as well as setting priorities,

allocating resources and directing public health policies [81]. Surveillance data can also be used for assessing proportionate population burden, identifying 'phases' of epidemics, and modelling the spread of STIs as well as the impact of different types of interventions [23,34,82].

Diagnostics for chlamydia and gonorrhoea have seen major improvements in sensitivity and specificity as compared to culture techniques which require the presence of viable organisms, allowing for less invasive specimen collection such as first-void urine [83-85]. Different nucleic acid amplification techniques (NAATs) do, however, show different test characteristics for different sample sites [86]. Most research indicates similar sensitivity and specificity for detection of CT from swab or urine samples, although both for personal preference and increased case detection, self-collected vaginal swabs have been suggested to be the sample of choice for women [87-91]. On the other hand, a review of test comparisons reported a lower pooled sensitivity for detecting GC from female urine samples [89,92,93]. For men, some have reported lowered sensitivity in detecting GC in urine samples from asymptomatic males, although others, using different NAATs, have not seen this difference [84,93]. In either case, the ability to use self-collected, non-invasive samples has transformed traditional screening programs, incorportating more street outreach and more innovative methods such as mail-in samples [26,94-96].

Symptomatic, or syndromic, treatment has been tried as a method of overcoming some of these testing difficulties [97]. While syndromic treatment helps to avoid waiting times for laboratory testing and may save immediate costs, it is only adequately sensitive in treating men presenting with dysuria or urethral discharge [77]. For women, vaginal discharge is a commonly presented symptom; however, this is not sensitive for chlamydia or gonorrhoeal infections. Combinations of presenting symptoms and risk scores have been used in settings where diagnostics abilities are limited and have been shown to improve the efficacy of this approach; however, these

approaches need to be tailored for the context and community in which they are to be used [97]. In addition, syndromic treatment does not address the issue of asymptomatic cases.

Penicillin and penicillin derivatives have been effective in eradicating *N. gonorrhoeae* from infected individuals; however, there is continual concern of antibiotic resistance and emerging infections with resistant bacteria have become a problem [7]. Alternatives, such as cefixime or ciprofloxacin, have been proven efficacious as a single dose therapy and are the current recommended therapies [98]. Globally, quinolone resistant gonorrhoea is also becoming a concern, reducing the options for useful antibiotics even further [99]. Although doxycycline has been shown to be 99% efficacious at eliminating chlamydia, a problem with this regimen is that it must be followed for seven days, and some may not complete the treatment [100]. A single dose treatment with azithromycin is now the drug of first choice in most settings, with 95% to 100% cure rates in randomized trials [100]. The ability to treat with a single dose avoids the issues of adherence and reduces concern about emerging resistance [8]. Studies have also shown that azithromycin has activity against GC infection, though the clinical cure rate is sub-optimal at 93% [98]. For syphilis, a single dose, intramuscular shot of benzathine penicillin can be given [8]. *T. vaginalis* is effectively treated with metronidazole, an antiparasitic agent, and can be given as a low-dose, weekly regimen or in larger amounts as a single dose [8].

Despite the increasing capabilities of diagnostics, the continuing development and refinement of less invasive collection methods and the availability of effective treatment, chlamydia, gonorrhoea and syphilis remain a public health problem. With theoretically effective screening and treatment, and somewhat effective barriers to transmission, the persistence of treatable STIs in society is impacted by health behaviour, both in terms of sexual behaviour and sexual health care behaviour. This is not to say the answer is simple. In fact, far from it. There are many

levels of influence on individual behaviour, from individual life experience, culture and community, to social marginalization, access to appropriate health services, communication and non-stigmatizing education surrounding sex and sexual health care [9,10,13,52].

Education is a key component to prevention, both on the level of transmission and treatment; however, it does not negate the importance of research aimed at eliciting information surrounding the choices made and factors influencing high-risk behaviours. Widespread campaigns for safe sex and regular check-ups are useful, but can't be assumed to reach everyone and alter their behaviour appropriately.

Human behaviour is complex, especially with regards to human sexuality. The decisions people make are influenced by a variety of factors and are extremely specific to their personal context. Efforts to improve and maintain good sexual health behavior require interventions that target safer sexual behaviour and uncover the underlying barriers related to accessing care, especially among high-risk populations.

SUBSTANCE USE

Substance use and addiction impact heavily upon the lives of their victims. Aside from the physical dependence and direct medical problems associated with drugs, there are many indirect consequences, placing generally marginalized populations further and further into difficult, isolating and often harmful environments. Commercial sex work becomes an avenue for many to support themselves and their drug use [53,101]. Opiate withdrawal may place many in a desperate state while searching for the next opiate injection, increasing potential exposures to risky environments [102]. The illicit nature of drug use also pushes users into the shadows and alleys, avoiding police and society [103,104].

Aside from the social harms and high-risk environments that correspond with drug use, there is also the danger of infection – injection drug use carries the risk of blood-borne infections including HIV, HBV and HCV, as well as the risk of skin infections and abscesses [105-107]. In addition, the combination of risky environments, physical need, and impaired cognition increases the risk of STI transmission. Injection or non-injection drug users may be more likely to have other injectors in their network, increasing the possibility of HIV transmission through sex [67,73,108]. Studies of crack users have shown that, even in the absence of injection, environments such as crack houses create environments where unprotected exchanges of sex for drugs were common and HIV infection was high [109,110].

SUBSTANCE USE AND STIS

There are many potential pathways by which substance use may increase risk for STIs, including biological, behavioural, psychological, associative and combinations of the above. For example, biological pathways may increase susceptibility to infection through decreased immune functioning or may increase exposure through number of partners by increasing libido or sex drive [101,111,112]. Although individual differences are often noted, stimulants, such as cocaine and methamphetamines are generally associated with more sexual craving and potentially more risky behaviours [111]. In a study on non-injecting drug users, methamphetamines were found to be associated with the highest sexual arousal, while there were significant differences in the feelings produced by cocaine among men as compared to women, with men reporting consistently higher subjective sexual-drug use associations [112]. Another qualitative study found that methamphetamine users were more likely to cite sexual reasons for use, as opposed to cocaine users, who cited more social reasons [113].

The comorbidity of psychiatric and substance use disorders has been the subject of much research [114-116]. Even so, the relationships between psychiatric disorders, psychosocial problems and substance use are not well understood [117-119]. Recent evidence points to a possible causal role of anxiety disorders in substance use, and depression, while not as well-defined, has been shown to have increased prevalence among substance users or vice versa [120]. There are also links between depression, anxiety and other psychological disorders with increased sexual risk (depression, neuroses, anti-social personality) [120-122]. Sensation seekers are thought to be more likely to take risks in many areas of their lives, increasing their risk of abusing substances as well as increasing their risk of engaging in risky sex, although in this scenario these two components are not necessarily related to one another [101].

To some degree there is also a subjective nature of substance use dependent on the user. Alcohol offers a good example of this: chemically, alcohol causes a depressed state; nonetheless, many claim that it increases sexual functioning [123,124]. There have been studies, typically among adolescents, providing convincing data of the disinhibiting effect of alcohol on sexual risk behaviours, specifically through increased partners and decreased condom use [124,125]. Another study among women IDUs found alcohol use to increase sexual risk behaviours, while not increasing certain other risks such as sharing needles [126].

On the other hand, it has been pointed out that most studies do not measure event-specific data, for example evaluating condom and drug use at any one encounter, and are therefore identifying associations, but not necessarily direct relationships [127]. Indeed, studies using diaries have predominantly detected null associations between substance use and sexual risk [128]. In one study among adolescent females, there was a suggestion of increased unprotected sex with new partners when drugs or alcohol were present; however, most found previous condom use to be a

better predictor of current condom use practices [124]. Others have suggested that asking specifically about the number of drinks on a particular occasion is important, indicating that there is conceivably a threshold effect with excessive drinking and a loss of adequate control over events [129,130]. In a study among CSW, an association was found between an increased number of drinks and the use of condoms with a client [126].

Of course, this is not to say the ability to examine associations, even though indirect, is not important. Research into the impact of social context and environment on risk behaviours and risk of disease exposures has gained momentum in the past decade, taking into account the role of the situational environment in increasing the likelihood of risky sexual behaviour. Studies of the sexual encounters occuring at crack houses support this theory, with increased number of partners and decreased condom use among drug users and sex trade workers in this environment [109,110]. The literature examining drug and alcohol use and sexual risk among adolescents indicates a strong relationship between those who experiment early with substances and those who are sexually active earlier [124]. Homelessness, different sex work environments, and network structures have been identified as contributing to risk through multiple pathways [101,131-135]. Research that incorporates these multi-levels of risk are becoming more common in the literature [136].

A prime example of the important overlap of situational context and individual risk is commercial sex work. Commercial sex work (CSW) is associated with increased drug use, increased risk of STIs, and increased exposure to risky environments [101,131,137,138]. There are different levels of CSW, with street-based workers often facing the highest risks, although certain brothel-type locations, such as massage parlours, can be equally dangerous environments [28,132,134,139]. While many papers indicate the increased risk faced by CSWs, others have exhibited

the overlapping and independent risk of cocaine and crack use [140-142]. Gender and power roles also impact women's involvement in sex work and their ability to control sexual situations [126,143,144]. Again, CSW are an important population for prevention and treatment interventions, but factors impacting social context and risk environments must be considered.

The individual, the drug use and the environment, all play important roles in increasing any one individual's risk for STIs. While these may be difficult constructs to separate, it is useful to try and understand the multiple impacts when tailoring programs for prevention and treatment.

Previous studies of STI transmission and drug use

In studies from the U.S., Canada, and Australia, associations have been found between any STIs and drug use before sex, as well as between specific STIs and drug use, such as syphilis and non-injection drugs or gonorrhoea and alcohol [65,66,145]. Research has also shown associations between the number of drugs used, the type of drugs or the frequency of use and increased risky sexual behaviours [125,146-148]. In addition there are many studies examining the association between drug use and HIV seroconversion [67,105,149,150]. Notably, the majority of studies published examine either reports of sexual behaviour, self-reported STI occurrence or HIV as outcomes. There are fewer studies that measure STI outcomes, and these typically sample specific populations such as those attending drug treatment programs or STI clinics [138].

Associations of Drug Use with Self-reported Risky Behaviour

A number of studies have examined the association of drug use and self-reported sexual risk, especially among adolescent, MSM and IDU populations. A cross-sectional study of high school students in Brazil found that those reporting drug use had higher sexual risks (e.g. ever had sex, younger age at first intercourse, lower condom use) and that there was an increasing

association with the number of drugs used and the level of sexual risk [125]. Other studies in high school populations from the United States have similarly found associations with increased drug use and earlier sexual debut or increased number of recent partners [151,152]. A study in the United States employing prospective measures of sexual episodes among female adolescents through diaries found no direct link between the presence of alcohol and/or drugs and unprotected intercourse [124]. There was, however, a non-significant indication of increased likelihood to have unprotected sex with a new partner, among those reporting new partners, if alcohol or drugs were used.

There are numerous studies examining sexual risk and drug use among MSM. Studies have found relationships between unprotected intercourse and use of poppers, marijuana, amphetamines, cocaine, hallucinogens, methamphetamine, ecstasy, GHB, ketamine and viagra [153-155]. However, other studies have reported no associations with specific drugs when researching particular populations, supporting the theory that not only drug use but context of use is important [156-158]. For example, among regular ecstasy users in New York, only ecstasy retained an association with unprotected intercourse, while among a local population of regular club attendees in Florida, poppers and amphetamines showed associations with unprotected intercourse, while alcohol, cocaine and marijuana did not [157,158].

In studies among drug users, several researchers have found associations with crack use and increased sexual risk behaviours. A cross-sectional study in Massachusetts comparing crack smokers, injectors and those who both smoked and injected found that crack smokers, regardless of injection, were more likely to report increased numbers of partners and increased sex trade [159]. Higher risk behaviours have been associated with increased injection of cocaine, increased use of other non-injection drugs (mainly crack), while heroin has shown less of an association [67,141,160].

Another cross-sectional study involving three major U.S. centres found that inner city young adults who smoked crack had increased prevalence of HIV as compared to those who did not smoke crack, which was explained in multivariable models through reported high-risk sexual activities [161]. Among methamphetamine users, frequency of use was found to be associated with lower condom use [147]. Some studies have indirectly suggested a role of drugs in sexual risk practices through the association of interventions such as methadone maintenance programs with decreased sexual risk practices [162,163].

Associations of Drug Use with STIs

Studies examining the relationship of drug use with STIs are plentiful, although wide ranging in methodology and population. STI clinic populations have been shown to have higher substance use rates than the general population [164], while case control studies have found higher rates of substance use among those testing positive for syphilis [165]. Studies conducted among those attending drug treatment centers have found increased prevalence of chlamydia, gonorrhoea, syphilis, HBV, HCV and HIV as compared to population rates [166]. Also, a study among non-IDU drug treatment attendees found higher rates of syphilis among users compared to blood donors, but found no differences with any other STIs [167]. Among an aboriginal cohort in Australia, substance abuse (alcohol and petrol sniffing) was found to be a predictor of gonorrhoea but not of chlamydia [145]. In a study of adolescents recruited from STI clinics and community locations, HSV-2 was found to be increased among females with alcohol problems [168].

Community-sampled studies often focus on high-risk and drug using populations, finding high levels of syphilis, syphilis and HIV coinfection, HIV and HBV and HCV [169]. HIV, HBV and syphilis have also been correlated with increased years of injecting, bingeing and increased non-

injection drug use [170,171]. A comparison of crack users to other drug users found overall increased levels of STIs, as well as increased levels for syphilis, chlamydia and HSV-2 in particular [138]. One study comparing CSW to non-CSW found increased crack use and increased STIs among CSW; however, another study found that while increased drug use was associated with increased sexual risk and increased CSW, controlling for sex work did not completely negate the former association [140,141]. Other community samples of adolescents or young adults have shown increased gonorrhoea among those reporting drug use, increased rates of HCV and HIV among youth reporting injection of drugs, and increased prevalence of HSV-2, syphilis and HBV among females with increased levels of drug 'hardness' [172,173]. The 'hardness' scale used in the latter study increased from non-users to those using marijuana, other non-injection drugs to crack and injection drugs.

Interactions of Drug Use

Recently, there has been some attention paid to the concept of poly-drug use and drug use patterns and their impact on sexual risk behaviour. Dual-use of crack and injection cocaine has been identified as a behaviour that increases risk for HIV, while injection of speedballs generally increases risk with injection frequency [66,142,148]. A recent paper from Montreal identified patterns of injection among those using both cocaine and heroin, or speedballs, and found that while dual-users injected more frequently overall, their patterns of injecting specific drugs were similar to mono-users [174]. Given the complex interactions of drug-use, environment and networks, it is important to try and tease appart the competing risks.

Associations of Drug Use with HIV

Using HIV as the endpoint, numerous studies have outlined the increased risk posed to injection drug users (IDUs) [64,175-177]. Due to the nature of HIV transmission, it is less certain how much

risk is posed for IDUs from injection itself, and how much risk comes from sexual behaviours. Most research has pointed towards the increased reporting of sexual risk behaviours among IDU to indicate the presence of sexual risk, but few have tried to measure these components. Other studies have shown increased risk of HIV with increased frequency of injection, with one study in particular demonstrating a dose response with frequency of cocaine injection [67,178]. Again, there are competing hypotheses here. Increased injection means more needles and more potential for transmission through this route. At the same time, addiction may create a greater need for more drugs and therefore a need for more money to pay for these drugs. For many cocaine injectors, this means trading sex for money or drugs, which is likely to also increase their risk for sexual transmission.

Aside from the potential increased risk for HIV infection, it is also important to assess the differential impact of substance use on STI transmission among HIV-negative versus HIV-positive populations. Studies among HIV-positive high-risk groups indicate in some instances decreased sexual risk behaviours (i.e. decreased sexual contacts, increased condom use); however, other studies have shown similar rates of reported risk behaviours, or reported STIs in conjunction with crack use, for example [45,131,179-181]. Alcohol has also been shown to impact both HIV risk, as well as risky behaviours among HIV-positive individuals [126,129,182,183]. Networks with high-risk for HIV and for increased risky sexual behaviours are particularly vulnerable, and interventions able to reach out to these groups for treatment or harm reduction strategies could have substantial impact.

HEALTH CARE BEHAVIOURS

Behaviour plays an important role in sexual health, both from the perspective of the risk behaviours that may contribute to the acquisition of infection, as well as the behaviours such as

annual check-ups, recognition and treatment of symptoms, and perceptions of risk relating to decisions for screening. In this section, models of health behaviour will be reviewed, followed by discussion of a particular model for behaviour with regards to seeking regular and timely sexual health care.

There are many models of health behaviour that have emerged over the last thirty years, including the Health Belief Model, the Health Action Model, the Theory of Reasoned Action, the Theory of Planned Behaviour, Self-regulation theory, and the PRECEDE-PROCEED model, to name a few [184-186]. Each places emphasis on its own particular constructs that influence the processes involved in making decisions surrounding one's health, from partaking in risk to prevention. These models exhibit strength in their flexibility, allowing for integration into various topics of health, as well as for borrowing of pieces of theory to create patchwork models that address specific research situations [187-189]. Models have been used for planning and/or evaluating interventions involving anything from prevention health services uptake to care provider education programs or even Schistosomiasis control programs [188,190,191].

The PRECEDE model is a general model of behaviour that can be used to generate specific theoretical frameworks and is based on the categorization of elements into predisposing (knowledge, attitude,belief), enabling (accessibility, location/hours, mobility, health related skills, ability to avoid risk) and reinforcing factors (rewards/incentives, tangible or intangible, social support) [185]. While there is a tendency to see these components in a linear fashion (i.e. predisposing factors must be in place for enabling factors to have effect), each component may have direct or indirect influence on the others. The precede-proceed model, which implements the theoretical framework describe above (PRECEDE) along with a framework for evaluating the outcome of an intervention or program designed to improve or change health behaviours

(PROCEED), has been used in several settings to plan and evaluate interventions [187,190,192], as a framework for distinguished types of interventions [193], as well as to identify factors associated with health behaviour or behaviour changes [194-197]. Notably, this framework was shown to discriminate well between users and non-users of smokeless tobacco [194], and was found to explain greater variance when compared to other models for a range of general health behaviour changes [195]. It has been used in several studies relating to mammography screening [193,198,199], identifying useful individual and structural factors relating to follow-up time after an abnormal mammography screen [196]. In addition, the precede-proceed framework was implemented in a study to assess Papanicolauo rates among Chinese-Canadian, differentiating screening rates by knowledge, traditional health beliefs, practical concerns and practitioner-related factors such as cultural-sensitivity [197].

Barriers to Treatment

There are a number of possible individual-level and system-level barriers to seeking sexual health care. There might be practical issues, such as location, hours of operation, and availability or accessibility of transportation. More complex barriers include priority of health or presence of other overwhelming life problems (addiction, poverty), lack of control over actions, perhaps due to power and gender within a relationship, beliefs about the utility of modern medications or past unpleasant experiences with doctors, nurses or clinics [197,200-202]. Studies conducted on barriers to care among adolescents and among clinic populations have revealed that stigma, social support and concerns over how clinic staff communicate and deal with emotions are of higher concern than practical issues [13,202]. Among minority populations in the US there has been some indication that available transportation does play a role; however, among homeless women or women in shelters, this was not found to be the case [203].

Overall, studies reiterate that the social context and psychosocial variables are not trivial to health seeking behaviours. Both past and present environments will affect how each individual reacts, and how they respond to cues to action or non-action. The levels of stigma and shame, either through personal feelings about STIs or how an individual perceives that others feel about STIs, have been shown to have a bearing on how easy or difficult each individual finds taking positive action. Discrimination is also important, especially in an already marginalized population. A qualitative study among women in England already attending an STI clinic revealed the importance of comfort, appropriate staff communication, confidentiality and respect for the feelings of the women [202]. A similar study in the southern U.S. outlined four important concepts of stigma that surfaced from qualitative focus groups, including religious ideation of health care workers affecting their views of 'promiscuous' women, privacy fears among men, racial attitudes and stigma transference or fear of being labeled [204]. The ability to present safely and comfortably in a clinic setting can be greatly disturbed by perceptions of discrimination, either from the other clinic attendees, the doctors or nurses, or other clinic staff. Participatory, peer-based, and culturally sensitive programs have had success in reaching and supporting marginalized groups to attain better access to health care, and to increase education around health behaviours and health risks [17,19,20].

CONCLUSIONS

STIs continue to persist in society and, as evidenced by the recent upward trends in annual rates, current approaches to prevention, detection and treatment are not adequate. While there are many factors influencing the spread of STIs, substance use has received much focus, not only because it is associated through many pathways with increased STI risk, but also because of the overlap of HIV risk, especially among injection drug users. However, many studies have focused on HIV and IDU risk, assessed STIs among clinic populations or drug treatment

populations, or addressed specific types of drug use. Thus, an examination of multiple types and patterns of drug use on STI risk from a community-based sample is highly relevant.

Population of Study

Vancouver's Downtown Eastside (DTES) is a graphic example of a marginalized population, isolated despite its central location by high drug use, high levels of mental illness, inadequate low-income housing and high rates of sex trade [67,178,205-208]. Despite several community clinics, enhanced outreach and treatment efforts, many individual, social and structural barriers remain, and effective reductions in STI rates have not been sustained.

The BC CDC has implemented several programs to enhance care among the DTES population. The AIDS Prevention Street Nurse Program has been operated through the BC CDC since 1992, focusing on STD and HIV prevention among high risk populations such as sex workers, IDUs, immigrants and refugees [209]. In the past decade, the BC CDC has also initiated and supported women's health services tailored to immigrant and refugee women, STI/HIV prevention programs focusing on promotion and distribution of female condoms, peer outreach programs for youth, STI/HIV education and prevention programs run for and by the Aboriginal community, Papanicolauo Outreach programs (Pap 'blitz's'), as well as a number of other programs tailored to reach high risk communities[210-212]. Aside from the services run through the BC CDC, there are a number of community clinics and outreach programs, some providing harm reduction services such as needle exchange and referrals, others providing shelter, food and clothing, and some offering specific services for youth, sex workers, women, or illicit drug users[213].

Nonetheless, the recent syphilis outbreak[79,214], high rates of HIV[67,178,206,207] and continued risky sexual behaviours[66,67,74,215,216] indicate the need for continued outreach and novel approaches to connect hard-to-reach groups to health care. While there are many studies from this region examining HIV risk factors, including drug use and sexual risk behaviours, there are few published studies addressing how these risks influence STIs. While rates of injection drug use are high in the DTES, crack cocaine use is also prominent, and an assessment of how different types and patterns of substance use impact on STI levels is critically important. Identifying drug-related risk factors for STIs could highlight populations of high risk that may benefit from increased outreach, and could provide directions for novel outreach or social networking approaches to STI screening and treatment. However, given the high level of services already available in this community, a study of STI transmission would not be complete without an examination of barriers to access of current sexual health services. As noted above in the section on Health Care Behaviour, these barriers can range from individual factors (knowledge, perceived risk, competing interests) to social and structural factors (transportation, hours of operation, connection to services, culture, stigma). As STIs can often be asymptomatic, regular sexual health care becomes especially important in high risk populations, and an exploration of barriers to these services is as important as identification of risk factors with respect to overall prevalence of STIs.

AIMS

The overarching question being addressed in this dissertation is 'In a population at high risk for HIV/STIs and with existing efforts for providing far-reaching prevention education and treatment, what are the factors related to continued high prevalence of STIs, either from high risk behaviours leading to infections or from lower access to existing services leading to untreated

infections?". The Community Health And Safety Evaluation (CHASE) survey served as the base cohort for this work. The CHASE survey recruited over 3500 individuals from the DTES between 2003 and 2005 from Single-Room Occupancy (SRO) hotels, community organizations and local hang-outs. As an extension of the CHASE survey, the Women's Night (WN) survey was carried out during a weekly social program for women carried out at a community clinic in the DTES.

The first aim of this thesis was to assess the drug-related risk factors for STIs among the CHASE cohort, with an emphasis on specific patterns of use and polydrug use; although not excluded *a priori*, men were not included in this analysis as there was insufficient outcome data available. The second aim explored the impact of services on STIs through a description of existing services and STI trends among the CHASE cohort over the previous 15 years. The third aim assessed program impact through a description of the WN population and the usefulness of STI screening among the WN participants. The final aim was to assess the potential barriers to regular sexual health care among the WN participants, with particular focus on a novel tool developed for assessing STI-related stigma among women. The detailed statemtn of these aims along with specific hypotheses are as follows:

1) To estimate the association of STIs, including chlamydia, gonorrhoea, and syphilis, with patterns of drug use (frequency, mode of administration, type of drug) among HIV positive and HIV negative women from a marginalized population-based cohort.
   Hypotheses:
   - Stimulants, regardless of the mode of administration, will be associated with increased odds of STI
   - Alcohol will retain an independent odds of increased STI
   - Daily drug use, regardless of type, will have a stronger association with STIs than non-daily drug use

2) To describe STI trends among the CHASE cohort over the previous 15 years, comparing to regional trends, and to explore potential program influences on these trends.
Hypothesis:
   - Increased programming and outreach interventions will be reflected through fluctuations in the STI trends among the CHASE cohort

3) To assess the uptake of non-invasive STI screening and to estimate the cross-sectional prevalence of chlamydia and gonorrhoea among WN participants.
Hypotheses:
   - A higher proportion of women will undergo urine screening than will report having had a pap smear in the past year
   - The combined cross-sectional prevalence of STIs among the women will be greater than 5%

4) To describe predisposing (e.g. demographics), enabling (e.g. drug use, service contact) and reinforcing (e.g. sexual health communication, STI-related stigma) factors influencing STI treatment seeking behaviors among the WN participants.
Hypotheses:
   - Increased age, increased unprotected sex and increased STI-related stigma will have independent associations with decreased odds of accessing sexual health care in the previous year
   - Decreased contact with existing services and outreach personnel and decreased sexual communication will have independent associations with decreased odds of accessing sexual health care in the previous year

Thus, the following five chapters attempt to examine the factors influencing the prevalence of STIs in the DTES, from drug-related risk factors influencing risky behaviours to treatment barriers influencing infection duration, through the four aims listed above. Chapters two and three address the first aim, examining the associations of specific patterns of drug use, including frequency (daily versus episodic), mode of administration (injection versus non-injection) and type of drug (stimulant versus depressant). As crack cocaine is highly prevalent among the CHASE population, an exploration of potential interactions was undertaken to assess potential increased risks faced by polydrug users.

The potential impact of outreach and interventions is examined through aims two and three. Aim two is encompassed in Chapter four, which contains a descriptive analysis of STI

prevalence trends and STI programs that have had an impact on the DTES population. STI prevalence estimates for the previous 15 years were compared between the CHASE population, the Vancouver regional population and the provincial population. In Chapter five, program impact is examined on an individual level, with a description of the WN population – a subset of the CHASE cohort. The WN program attempts to attract high risk women for meals, clothing, activities and health care. Thus the survey set out to describe the demographics and risk behaviours of the women accessing the program, and to estimate the uptake of non-invasive STI screening and the cross-sectional prevalence of chlamydia and gonorrhoea in this group of women.

Finally, the fourth aim examines the potential barriers to regular sexual health care and STI testing and treatment among the WN population. As mentioned above, the asymptomatic nature of STIs is problematic, making regular sexual health care, especially among a high risk population, an important factor in population-level STI rates. There is a number of programs tailored specifically for women, offering support and referrals, and theoretically increasing access to clinics and programs such as the Street Nurse pap 'blitz'. The sixth chapter, then, examines the individual, social and structural barriers to receiving regular sexual health care, with an emphasis on STI-related stigma and sexual health communication. The chapter describes the development and piloting of a novel STI-related stigma scale, drawing on the gendered morality of sexuality and STIs, and then assesses the associations of demographics, including drug use, connection with services, sexual communication and STI-related stigma on self-reports of pap smears and STI-testing in the previous year.

The final chapter summarizes the findings from the above studies, providing comparisons to the literature and discussing strengths and limitations of the research. Implications and

recommendations for STI interventions and future research are made, emphasizing the need for both identification of high risk groups for tailored intervention and screening initiatives, and increased attention to the potential barriers to accessing available care, including perceptions of stigma.

Reference List

(1) Hopkins S, Lyons F, Coleman C, Courtney G, Bergin C, Mulcahy F. Resurgence in infectious syphilis in Ireland: an epidemiological study. *Sexually Transmitted Diseases.* 2004;31:317-321.

(2) Patrick DM, Rekart ML, Jolly A et al. Heterosexual outbreak of infectious syphilis: epidemiological and ethnographic analysis and implications for control. *Sexually Transmitted Infections 78 Suppl 1:i164-9, 2002 Apr.*

(3) Rosenman MB, Kraft SK, Harezlak J et al. Syphilis testing in association with gonorrhea/chlamydia testing during a syphilis outbreak. *American Journal of Public Health.* 2004;94:1124-1126.

(4) Hansen L, Wong T, Perrin M. Gonorrhoeae Resurgence in Canada. *International Journal of STD & AIDS.* 2003;14:727-731.

(5) Farley TA, Cohen DA, Elkins W. Asymptomatic sexually transmitted diseases: the case for screening. *Preventive Medicine.* 2003;36:502-509.

(6) Klausner J, McFarland W, Bolan G et al. Knock-Knock: A Population-Based Survey of Risk Behaviour, Health Care Access, and *Chlamydia trachomatis* Infection among Low-Income Women in the San Francisco Bay Area. *Journal of Infectious Diseases.* 2001;183:1087-1092.

(7) Zenilman J. Sexually Transmitted Diseases. In: Nelson KE, Williams C, Graham N, eds. *Infectious Disease Epidemiology.* Gaithersburg: Aspen Publishers, Inc.; 2001:615-20.

(8) Edwards A, Sherrard J, Zenilman J. *Fast Facts: Sexually Transmitted Infections.* Oxford: Health Press Limited; 2001.

(9) Crosby, Richard A. W. Family-Related Correlates of Sexually Transmitted Disease and Barriers to Care: A Pilot Study of Pregnant African American Adolescents. Family & Community Health 25[2], 16. 2002. Lippincott Williams & Wilkins -- Nursing. Ref Type: Generic

(10) Strathdee SA, Palepu A, Cornelisse PG et al. Barriers to use of free antiretroviral therapy in injection drug users. *Journal of the American Medical Association.* 1998;280:547-549.

(11) Wood E, Montaner JS, Chan K et al. Socioeconomic Status, Access to Triple Therapy, and survival From HIV-disease since 1996. *AIDS.* 2002;16:2065-2072.

(12) Institute of Medicine. *The Hidden Epidemic: Confronting Sexually Transmitted Diseases.* Washington, DC: National Academy Press; 1996.

(13) Cunningham SD, Tschann J, Gurvey JE, Fortenberry JD, Ellen JM. Attitudes about sexual disclosure and perceptions of stigma and shame. *Sexually Transmitted Infections.* 2002;78:334-338.

(14) Fortenberry JD, McFarlane M, Bleakley A et al. Relationships of stigma and shame to gonorrhea and HIV screening. *American Journal of Public Health.* 2002;92:378-381.

(15) Fortenberry JD. Unveiling the Hidden Epidemic of Sexually Transmitted Diseases. *JAMA.* 2002;287:768-769.

(16) Wasserheit JN. Epidemiological Synergy: Interrelationships between Human Immunodeficiency Virus Infection and Other Sexually Transmitted Diseases. *Sexually Transmitted Diseases.* 1992;19:61-73.

(17) Boyd MR, Moneyham L, Murdaugh C et al. A peer-based substance abuse intervention for HIV+ rural women: a pilot study. *Archives of Psychiatric Nursing.* 2005;19:10-17.

(18) Wingood GM, Diclemente RJ. HIV sexual risk reduction interventions for women: a review. *Am J Prev Med.* 1996;12:209-217.

(19) Thomas JC, Eng E, Earp JA, Ellis H. Trust and collaboration in the prevention of sexually transmitted diseases. *Public Health Reports.* 2001;116:540-547.

(20) Smith A, Christopher S, McCormick AK. Development and implementation of a culturally sensitive cervical health survey: a community-based participatory approach. *Women and Health.* 2004;40:67-86.

(21) Jolly AM, Moffatt ME, Fast MV, Brunham RC. Sexually transmitted disease thresholds in Manitoba, Canada. *Ann Epidemiol.* 2005;15:781-788.

(22) Garnett GP. The geographical and temporal evolution of sexually transmitted disease epidemics. *Sex Transm Infect.* 2002;78 Suppl 1:i14-9.:i14-i19.

(23) Mills S, Saidel T, Magnani R, Brown T. Surveillance and modelling of HIV, STI, and risk behaviours in concentrated HIV epidemics. *Sexually Tranmitted Infections.* 2004;80:ii57-ii62.

(24) Trotter, R. T., Bown, A. M., and Potter, J. M. Network models for HIV outreach and prevention programs for drug users. Needle, R. H., Genser, S. G., and Trotter, R. T. [NIH Pub No. 95-3889]. 1995. National Institute of Drug Abuse. Research Monograph 151.
Ref Type: Serial (Book,Monograph)

(25) Latkin, C. A. A Personal Network Approach to AIDS Prevention: An Experimental Peer Group Intervention for Street-Injecting Drug Users: The SAFE Study. Needle, R. H., Genser, S. G., and Trotter, R. T. [NIH Pub No. 95-3889]. 1995. National Institute of Drug Abuse. Research Monograph 151.
Ref Type: Serial (Book,Monograph)

(26) Bradshaw CS, Pierce LI, Tabrizi SN, Fairley CK, Garland SM. Screening injecting drug users for sexually transmitted infections and blood borne viruses using street outreach and self collected sampling. *Sex Transm Infect.* 2005;81:53-58.

(27) Auerswald CL, Sugano E, Ellen JM, Klausner JD. Street-based STD testing and treatment of homeless youth are feasible, acceptable and effective. *J Adolesc Health.* 2006;38:208-212.

(28) Grimley DM, Annang L, Lewis I et al. Sexually Transmitted Infections Among Urban Shelter Clients. *Sex Transm Dis.* 2006;.

(29) Fortenberry JD. Health Care Seeking Behaviours Related to Sexually Transmitted Diseases among Adolescents. *American Journal of Public Health.* 1997;87:417-420.

(30) Sobel JD. Vaginitis, Vulvitis, Cervicitis and Cutaneous Vulval Lesions. In: Cohen J, Powderly WG, eds. *Infectious Diseases.* 2nd ed. London: Mosby, Inc.; 2004:683-92.

(31) Rothenberg R. Commentary: the relevance of social network concepts to sexually transmitted disease control. *Sexually Transmitted Diseases.* 1996;23:24-29.

(32) Rompalo A. Can syphilis be eradicated from the world? *Current Opinion in Infectious Diseases.* 2001;14:41-44.

(33) Brunham RC, Pourbohloul B, Mak S, White R, Rekart ML. The unexpected impact of a Chlamydia trachomatis infection control program on susceptibility to reinfection. *J Infect Dis.* 2005;192:1836-1844.

(34) Brunham RC, Rey-Ladino J. Immunology of Chlamydia infection: implications for a Chlamydia trachomatis vaccine. *Nat Rev Immunol.* 2005;5:149-161.

(35) Grassly NC, Fraser C, Garnett GP. Host immunity and synchronized epidemics of syphilis across the United States. *Nature.* 2005;433:417-421.

(36) Dallabetta G, Kamenga MC, Field ML. Infections of the Female Pelvis Including Septic Abortion. In: Cohen J, Powderly WG, eds. *Infectious Diseases.* 2nd ed. London: Mosby, Inc.; 2004:693-5.

(37) Fox KK, Cohen MS. Gonococcal, Chlamydial and *Mycoplasma* Urethritis. In: Cohen J, Powderly WG, eds. *Infectious Diseases.* 2nd ed. London: Mosby, Inc.; 2004:795-806.

(38) Kinghorn GR. Syphilis. In: Cohen J, Powderly WG, eds. *Infectious Diseases.* 2nd ed. London: Mosby, Inc.; 2004:807-16.

(39) Canadian Institute for Health Information. Women's Health Surveillance Report. 2003. Ottawa, Ontario, Health Canada.
Ref Type: Report

(40) Dicker LW, Mosure DJ, Berman SM, Levine WC. Gonorrhea prevalence and coinfection with chlamydia in women in the United States, 2000. *Sex Transm Dis.* 2003;30:472-476.

(41) Kahn RH, Mosure DJ, Blank S et al. Chlamydia trachomatis and Neisseria gonorrhoeae prevalence and coinfection in adolescents entering selected US juvenile detention centers, 1997-2002. *Sex Transm Dis.* 2005;32:255-259.

(42) Miller WC, Ford CA, Morris M et al. Prevalence of chlamydial and gonococcal infections among young adults in the United States. *JAMA.* 2004;291:2229-2236.

(43) White MJ, Sadalla JK, Springer SR, Counselman FL. Is the presence of Trichomonas vaginalis a reliable predictor of coinfection with Chlamydia trachomatis and/or Neisseria gonorrhoeae in female ED patients? *Am J Emerg Med.* 2005;23:127-130.

(44) Erbelding EJ, Chung SE, Kamb ML, Irwin KL, Rompalo AM. New sexually transmitted diseases in HIV-infected patients: markers for ongoing HIV transmission behavior. *J Acquir Immune Defic Syndr.* 2003;33:247-252.

(45) Erbelding EJ, Stanton D, Quinn TC, Rompalo A. Behavioral and biologic evidence of persistent high-risk behavior in an HIV primary care population. *AIDS.* 2000;14:297-301.

(46) Fleming DT, Wasserheit JN. From epidemiological synergy to public health policy and practice: the contribution of other sexually transmitted diseases to sexual transmission of HIV infection. *Sexually Transmitted Infections.* 1999;75:3-17.

(47) Rompalo A, Lawlor J, Seaman P, Quinn TC, Zenilman JM, Hook EW. Modification of Syphilitic Genital Ulcer Manifestations by Coexistent HIV Infection. *Sexually Transmitted Diseases.* 2001;28:448-454.

(48) McClelland RS, Lavreys L, Katingima C et al. Contribution of HIV-1 Infection to Acquisition of Sexually Transmitted Disease: A 10-Year Prospective Study. *Journal of Infectious Disease.* 2005;191:333-338.

(49) Schuman P, Ohmit SE, Klein RS et al. Longitudinal study of cervical squamous intraepithelial lesions in HIV-seropositive and at-risk HIV-seronegative women. *Journal of Infectious Disease.* 2003;188:128-136.

(50) Cohn SE, Clark RA. Sexually transmitted diseases, HIV, and AIDS in women. *Med Clin North America.* 2003;87:971-995.

(51) Holmes KK. Human ecology and behavior and sexually transmitted bacterial infections. *Proc Natl Acad Sci U S A.* 1994;91:2448-2455.

(52) Adimora AA, Schoenbach VJ. Social context, sexual networks, and racial disparities in rates of sexually transmitted infections. *J Infect Dis.* 2005;191 Suppl 1:S115-22.:S115-S122.

(53) Aral SO. Determinants of STD epidemics: implications for phase appropriate intervention strategies. *Sex Transm Infect.* 2002;78 Suppl 1:i3-13.:i3-13.

(54) Jolly AM, Orr PH, Hammond G, Young TK. Risk factors for infection in women undergoing testing for Chlamydia trachomatis and Neisseria gonorrhoeae in Manitoba, Canada. *Sex Transm Dis.* 1995;22:289-295.

(55) Miller WC, Zenilman JM. Epidemiology of chlamydial infection, gonorrhea, and trichomoniasis in the United States--2005. *Infect Dis Clin North Am.* 2005;19:281-296.

(56) Vajdic CM, Middleton M, Bowden FJ, Fairley CK, Kaldor JM. The prevalence of genital Chlamydia trachomatis in Australia 1997-2004: a systematic review. *Sex Health.* 2005;2:169-183.

(57) Aral SO. Sexually transmitted diseases: magnitude, determinants and consequences. *Int J STD AIDS.* 2001;12:211-215.

(58) Zimmerman HL, Potterat J, Dukes RL et al. Epidemiologic differences between chlamydia and gonorrhea. *American Journal of Public Health.* 1990;80:1338-1342.

(59) Sarwal S, Wong T, Ng LK, Sevigny C. Increasing incidence of ciprofloxacin-resistant Neisseria gonorrhoeae infection in Canada. *CMAJ.* 2003;168:872-873.

(60) LCDC Expert Working Group on Canadian Guidelines for Sexually Transmitted Diseases. Canadian STD Guidelines. 1998 Edition. 1998. Ottawa, Ontario, Health Canada.
Ref Type: Report

(61) Mangione-Smith R, McGlynn EA, Hiatt L. Screening for chlamydia in adolescents and young women. *Arch Pediatr Adolesc Med.* 2000;154:1108-1113.

(62) Scholes D, Grothaus L, McClure J et al. A randomized trial of strategies to increase chlamydia screening in young women. *Prev Med.* 2006;.

(63) National Committee for Quality Assurance, 2005. The State of Health Care Quality 2005. National Committee for Quality Assurance. 2005. Washington, D.C.
Ref Type: Report

(64) Dematteo D, Major C, Block B et al. Toronto Street Youth and HIV/AIDS: Prevalence, Demographics, and Risks. *Journal of Adolescent Health.* 1999;25:358-366.

(65) Kral AH, Lorvick J, Edlin BR. Sex- and Drug-Related Risk Among Populations of Younger and Older Injection Drug Users in Adjacent Neighborhoods in San Francisco. *Journal of Acquired Immune Deficiency Syndrome.* 2000;24:162-167.

(66) Miller C, Spittal PM, Laliberte N et al. Females Experiencing Sexual and Drug Vulnerabilities Are at Elevated Risk for HIV Infection Among Youth Who Use Injection Drugs. *Journal of Acquired Immune Deficiency Syndrome.* 2002;30:335-341.

(67) Spittal PM, Craib KJP, Wood E et al. Risk factors for elevated HIV incidence rates among female injection drug users in Vancouver. *Canadian Medical Association Journal.* 2002;166:891-899.

(68) McLean CAM, Kohl KM, Baker MAM, Sinclair MFM, Ciesielski CAM, Markowitz LEM*. The Syphilis Reactor Grid:: Help or Hindrance for Syphilis Surveillance? [Article]. *Sexually Transmitted Diseases.* 2003;30:650-653.

(69) Nack A. Bad Girls and Fallen Women: Chronic STD Diagnoses as Gateways to Tribal Stigma. *Symbolic Interaction.* 2002;25:463-485.

(70) Katz SJ, Hofer TP. Socioeconomic disparities in preventive care persist despite universal coverage. Breast and cervical cancer screening in Ontario and the United States. *JAMA.* 1994;272:530-534.

(71) Meyer-Weitz A, Reddy P, Van den Borne HW, Kok G, Pietersen J. Health care seeking behaviour of patients with sexually transmitted diseases: determinants of delay behaviour. *Patient Education and Counseling.* 2000;41:263-274.

(72) Darroch J, Myers L, Cassell J. Sex differences in the experience of testing positive for genital chlamydia infection: a qualitative study with implications for public health and for a national screening programme. *Sexually Tranmitted Infections.* 2003;79:372-373.

(73) Miller CL, Spittal PM, Laliberte N et al. Females experiencing sexual and drug vulnerabilities are at elevated risk for HIV infection among youth who use injection drugs. *J Acquir Immune Defic Syndr.* 2002;30:335-341.

(74) Tyndall M, Patrick D, Spittal P, Li K, O'Shaughnessy MV, Schechter MT. Risky sexual behaviours among injection drug users with high HIV prevalence: implications for STD control. *Sexually Transmitted Infections.* 2002;78:i170-i175.

(75) Division of sexual health and sexually transmitted infections. 2004 Canadian Sexually Transmitted Infections Surveillance Report: Pre-Release. Public Health Agency of Canada. http://www.hc-sc.gc.ca/pphb-dgspsp/std-mts/stdcases-casmts/pdf-2002/std2002_q1.pdf , 1-4. 2006. Ottawa, Health Canada.
Ref Type: Report

(76) BC Centre for Disease Control. STD/AIDS Control: Annual Report. 2004. Vancouver, B.C., Provincial Health Services Authority.
Ref Type: Report

(77) Steen R, Dallabetta G. The Use of Epidemiologic Mass Treatment and Syndrome Management for Sexually Transmitted Disease Control. *Sexually Transmitted Diseases.* 1999;26:S12-S20.

(78) Holmes K, Johnson D, Kvale P, Halverson C, Keys T, Martin D. Impact of Gonorrhea Control Program, Including Selective Mass Treatment, in Female Sex Workers. *Journal of Infectious Diseases.* 1996;174:S230-S239.

(79) Pourbohloul B, Rekart ML, Brunham RC. Impact of mass treatment on syphilis transmission: a mathematical modeling approach. *Sex Transm Dis.* 2003;30:297-305.

(80) Jaffe H, Rice D, Voigt R, Fowler J, John R. Selective Mass Treatment in a Venereal Disease Control Program. *American Journal of Public Health.* 1979;69:1181-1182.

(81) Catchpole MA. The role of epidemiology and surveillance systems in the control of sexually transmitted diseases. *Genitourinary Medicine.* 1996;72:321-329.

(82) Fenton KA, Mercer CH, Johnson AM et al. Reported sexually transmitted disease clinic attendance and sexually transmitted infections in britain: prevalence, risk factors, and proportionate population burden. *J Infect Dis.* 2005;191 Suppl 1:S127-38.:S127-S138.

(83) Carroll KC, Aldeen WE, Morrison M, Anderson R, Lee D, Mottice S. Evaluation of the Abbott LCx ligase chain reaction assay for detection of Chlamydia trachomatis and Neisseria gonorrhoeae in urine and genital swab specimens from a sexually transmitted disease clinic population. *J Clin Microbiol.* 1998;36:1630-1633.

(84) Chernesky MA, Martin DH, Hook EW et al. Ability of new APTIMA CT and APTIMA GC assays to detect Chlamydia trachomatis and Neisseria gonorrhoeae in male urine and urethral swabs. *J Clin Microbiol.* 2005;43:127-131.

(85) Peralta L, Durako SJ, Ma Y. Correlation between urine and cervical specimens for the detection of cervical Chlamydia trachomatis and Neisseria gonorrhoeae using ligase chain reaction in a cohort of HIV infected and uninfected adolescents. *J Adolesc Health.* 2001;29:87-92.

(86) Schachter J, Hook EW, Martin DH et al. Confirming positive results of nucleic acid amplification tests (NAATs) for Chlamydia trachomatis: all NAATs are not created equal. *J Clin Microbiol.* 2005;43:1372-1373.

(87) Chernesky MA, Hook EW, III, Martin DH et al. Women find it easy and prefer to collect their own vaginal swabs to diagnose Chlamydia trachomatis or Neisseria gonorrhoeae infections. *Sex Transm Dis.* 2005;32:729-733.

(88) Chernesky MA, Jang DE. APTIMA transcription-mediated amplification assays for Chlamydia trachomatis and Neisseria gonorrhoeae. *Expert Rev Mol Diagn.* 2006;6:519-525.

(89) Cook RL, Hutchison SL, Ostergaard L, Braithwaite RS, Ness RB. Systematic review: noninvasive testing for Chlamydia trachomatis and Neisseria gonorrhoeae. *Ann Intern Med.* 2005;142:914-925.

(90) Gaydos CA, Howell MR, Quinn TC, Gaydos JC, McKee KT, Jr. Use of ligase chain reaction with urine versus cervical culture for detection of Chlamydia trachomatis in an asymptomatic military population of pregnant and nonpregnant females attending Papanicolaou smear clinics. *J Clin Microbiol.* 1998;36:1300-1304.

(91) Schachter J, Chernesky MA, Willis DE et al. Vaginal swabs are the specimens of choice when screening for Chlamydia trachomatis and Neisseria gonorrhoeae: results from a multicenter evaluation of the APTIMA assays for both infections. *Sex Transm Dis.* 2005;32:725-728.

(92) Buimer M, van Doornum GJ, Ching S et al. Detection of Chlamydia trachomatis and Neisseria gonorrhoeae by ligase chain reaction-based assays with clinical specimens from various sites: implications for diagnostic testing and screening. *J Clin Microbiol.* 1996;34:2395-2400.

(93) Martin DH, Cammarata C, Van Der Pol B et al. Multicenter evaluation of AMPLICOR and automated COBAS AMPLICOR CT/NG tests for Neisseria gonorrhoeae. *Journal of Clinical Microbiology.* 2000;38:3544-3549.

(94) Eggleston E, Turner CF, Rogers SM et al. Monitoring STI prevalence using telephone surveys and mailed urine specimens: a pilot test. *Sex Transm Infect.* 2005;81:236-238.

(95) Spigarelli MG, Biro FM. Sexually transmitted disease testing: evaluation of diagnostic tests and methods. *Adolesc Med Clin.* 2004;15:287-299.

(96) Garland SM, Tabrizi SN. Diagnosis of sexually transmitted infections (STI) using self-collected non-invasive specimens. *Sex Health.* 2004;1:121-126.

(97) Pettifor A, Walsh J, Wilkins V, Raghunathan P. How effective is syndromic management of STDs?: A review of current studies. *Sex Transm Dis.* 2000;27:371-385.

(98) Burstein G, Berman SM, Blumer JL, Moran JS. Ciprofloxacin for the Treatment of Uncomplicated Gonorrhea Infection in Adolescents: Does the Benefit Outweigh the Risk? *Clinical Infectious Diseases.* 2002;35:s191-s199.

(99) Goold PC, Bignell CJ. No way back for quinolones in the treatment of gonorrhoea. *Sex Transm Infect.* 2006;82:225-226.

(100) Adimora A. Treatment of Uncomplicated Genital *Chlamydia trachomatis* Infections in Adults. *Clinical Infectious Diseases.* 2002;35:s183-s186.

(101) Ross MW, Williams ML. Sexual behavior and illicit drug use. *Annu Rev Sex Res.* 2001;12:290-310.:290-310.

(102) Weeks MR, Grier M, Romero-Daza N, Puglisi-Vasquez MJ, Singer M. Streets, drugs, and the economy of sex in the age of AIDS. *Women and Health.* 1998;27:205-229.

(103) Cooper H, Moore L, Gruskin S, Krieger N. The impact of a police drug crackdown on drug injectors' ability to practice harm reduction: a qualitative study. *Soc Sci Med.* 2005;61:673-684.

(104) Wood E, Spittal PM, Small W et al. Displacement of Canada's largest public illicit drug market in response to a police crackdown. *CMAJ.* 2004;170:1551-1556.

(105) Des Jarlais DC, Friedman SR. HIV infection among intravenous drug users: epidemiology and risk reduction. *AIDS.* 1987;1:67-76.

(106) Thomas DL, Vlahov D, Solomon L et al. Correlates of hepatitis C virus infections among injection drug users. *Medicine (Baltimore).* 1995;74:212-220.

(107) Lloyd-Smith E, Kerr T, Hogg RS, Li K, Montaner JS, Wood E. Prevalence and correlates of abscesses among a cohort of injection drug users. *Harm Reduct J.* 2005;2:24.:24.

(108) Strathdee S, Sherman SG. The role of sexual transmission of HIV infection among injection and non-injection drug users. *Journal of Urban Health.* 2003;80:iii7-iii14.

(109) Inciardi JA. Crack, crack house sex, and HIV risk. *Archives of Sexual Behavior.* 1995;24:249-269.

(110) Ross MW, Hwang LY, Leonard L, Teng M, Duncan L. Sexual behaviour, STDs and drug use in a crack house population. *International Journal of STD & AIDS.* 1999;10:224-230.

(111) House RV, Thomas PT, Bhargava HN. Immunotoxicology of opiods, inhalants and other drugs of abuse. *NIDA Research Monographs.* 1997;173:175-200.

(112) Rawson RA, Washton A, Domier CP, Reiber C. Drugs and sexual effects: role of drug type and gender. *Journal of Substance Abuse Treatment.* 2002;22:103-108.

(113) Diaz RM, Heckert AL, Sanchez J. Reasons for stimulant use among Latino gay men in San Francisco: a comparison between methamphetamine and cocaine users. *J Urban Health.* 2005;82:i71-i78.

(114) Compton MT, Weiss PS, West JC, Kaslow NJ. The associations between substance use disorders, schizophrenia-spectrum disorders, and Axis IV psychosocial problems. *Soc Psychiatry Psychiatr Epidemiol.* 2005;40:939-946.

(115) Brown TA, Barlow DH. Comorbidity among anxiety disorders: implications for treatment and DSM-IV. *J Consult Clin Psychol.* 1992;60:835-844.

(116) Bukstein OG, Brent DA, Kaminer Y. Comorbidity of substance abuse and other psychiatric disorders in adolescents. *Am J Psychiatry.* 1989;146:1131-1141.

(117) Davis JR, Tunks E. Environments and addiction: a proposed taxonomy. *Int J Addict.* 1990;25:805-826.

(118) Zweben JE, Clark HW, Smith DE. Traumatic experiences and substance abuse: mapping the territory. *J Psychoactive Drugs.* 1994;26:327-344.

(119) Mueser KT, Drake RE, Wallach MA. Dual diagnosis: a review of etiological theories. *Addict Behav.* 1998;23:717-734.

(120) Gerdner A, Nordlander T, Pedersen T. Personality factors and drug of choice in female addicts with psychiatric comorbidity. *Substance Use and Misuse.* 2002;37:1-18.

(121) Lopes, C. S. and Sichieri, R. A case-control study on alcohol and psychiatric disorders as risk factors for drug abuse pattern. Cad Saude Publica 18[6], 1571-1575. 2002. Ref Type: Abstract

(122) Shoptaw S, Peck J, Reback CJ, Rotheram-Fuller E. Psychiatric and substance dependence comorbidities, sexually transmitted diseases, and risk behaviors among methamphetamine-dependent gay and bisexual men seeking outpatient drug abuse treatment. *Journal of Psychoactive Drugs.* 2003;35:161-168.

(123) Cook RL, Clark DB. Is there an association between alcohol consumption and sexually transmitted diseases? A systematic review. *Sex Transm Dis.* 2005;32:156-164.

(124) Fortenberry JD. Alcohol, drugs, and STD/HIV risk among adolescents. *AIDS Patient Care STDS.* 1998;12:783-786.

(125) Scivoletto S, Tsuji RK, Abdo CHN, de QS, de Andrade AG, Gattaz WF. Use of Psychoactive Substances and Sexual Risk Behavior in Adolescents. *Substance Use and Misuse.* 2002;37:381-398.

(126) Rees V, Saitz R, Horton NJ, Samet J. Association of alcohol consumption with HIV sex- and drug-risk behaviours among drug users. *Journal of Substance Abuse Treatment.* 2001;21:129-134.

(127) Gillmore MR, orrison DM, eigh BC. Does "High = High Risk"? An Event-Based Analysis of the Relationship Between Substance Use and Unprotected Anal Sex Among Gay and Bisexual Men. *AIDS & Behaviour.* 2002;6:361-370.

(128) Leigh BC, Stall R. Substance use and risky sexual behavior for exposure to HIV: Issues in methodology, interpretation and prevention. *Am Psych.* 1993;48:1035-1045.

(129) Lauchli S, Heusser R, Tschopp A, Gutzwiller F, Research Group of the Swiss HIV Prevention Study. Safer sex behavior and alcohol consumption. *Annual Epidemiology.* 1996;6:364-375.

(130) Nadeau L, Truchon M, Biron C. High-risk sexual behaviors in a context of substance abuse: A focus group approach. *Journal of Substance Abuse Treatment.* 2000;19:319-328.

(131) Inciardi JA, Surratt HL, Kurtz SP, Weaver JC. The effect of serostatus on HIV risk behaviour change among women sex workers in Miami, Florida. *AIDS Care.* 2005;17 Suppl 1:S88-101.:S88-101.

(132) Surratt HL, Inciardi JA. HIV risk, seropositivity and predictors of infection among homeless and non-homeless women sex workers in Miami, Florida, USA. *AIDS Care.* 2004;16:594-604.

(133) Latkin CA, Mandell W, Vlahov D. The relationship between risk networks' patterns of crack cocaine and alcohol consumption and HIV-related sexual behaviors among adult injection drug users: a prospective study. *Drug Alcohol Depend.* 1996;42:175-181.

(134) Latkin CA, Hua W, Forman VL. The relationship between social network characteristics and exchanging sex for drugs or money among drug users in Baltimore, MD, USA. *Int J STD AIDS.* 2003;14:770-775.

(135) Wechsberg WM, Lam WK, Zule W, Hall G, Middlesteadt R, Edwards J. Violence, homelessness, and HIV risk among crack-using African-American women. *Subst Use Misuse.* 2003;38:669-700.

(136) Diez Roux AV, Aiello AE. Multilevel analysis of infectious diseases. *Journal of Infectious Disease.* 2005;191:S25-S33.

(137) Jones D, Irwin KL, Inciardi JA et al. The high-risk sexual practices of crack-smoking sex workers recruited from the streets of three American cities. *Sexually Transmitted Diseases.* 1998;25:187-193.

(138) Ross MW, Hwang LY, Zack C, Bull L, Williams ML. Sexual risk behaviours and STIs in drug abuse treatment populations whose drug of choice is crack cocaine. *Int J STD AIDS.* 2002;13:769-774.

(139) Nemoto T, Iwamoto M, Wong S, Le MN, Operario D. Social factors related to risk for violence and sexually transmitted infections/HIV among Asian massage parlor workers in San Francisco. *AIDS & Behavior.* 2004;8:475-483.

(140) Logan TK, Leukefeld C. Sexual and drug use behaviors among female crack users: a multi-site sample. *Drug Alcohol Depend.* 2000;58:237-245.

(141) Maranda MJ, Han C, Rainone GA. Crack cocaine and sex. *J Psychoactive Drugs.* 2004;36:315-322.

(142) McCoy CB, Lai S, Metsch LR, Messiah SE, Zhao W. Injection drug use and crack cocaine smoking: independent and dual risk behaviors for HIV infection. *Annals of Epidemiology.* 2004;14:535-542.

(143) Surratt HL, Inciardi JA, Weaver JC, Falu VM. Emerging linkages between substance abuse and HIV infection in St. Croix, US Virgin Islands. *AIDS Care.* 2005;17 Suppl 1:S26-35.:S26-S35.

(144) McCoy HV, Miles C. A gender comparison of health status among users of crack cocaine. *J Psychoactive Drugs.* 1992;24:389-397.

(145) Miller PJ, Law M, Torzillo PJ, Kaldor J. Incident sexually transmitted infections and their risk factors in an Aboriginal community in Australia: a population based cohort study. *Sexually Transmitted Infections.* 2001;77:21-35.

(146) Dowe G, Smikle MF, Thesiger C, Williams EM. Bloodborne Sexually Transmitted Infections in Patients Presenting for Substance Abuse Treatment in Jamaica. *Sexually Transmitted Diseases.* 2001;28:266-269.

(147) Nemoto T, Operario D, Soma T. Risk Behaviors of Filipino Methamphetamine Users in San Francisco: Implications for Prevention and Treatment of Drug Use and HIV. *Public Health Reports.* 2002;117:S30-S38.

(148) Booth RE, Kwiatkowski CF, Chitwood DD. Sex related HIV risk behaviors: differential risks among injection drug users, crack smokers, and injection drug users who smoke crack. *Drug Alcohol Depend.* 2000;58:219-226.

(149) Chaisson M, Stoneburner R, Hildebrandt D, Ewing W, Telzak E, Jaffe H. Heterosexual transmission of HIV-1 associated with the use of smokeable freebase cocaine (crack). *AIDS.* 1991;5:1121-1126.

(150) Chaisson RE, Bacchetti P, Osmond D, Brodie B, Sande MA, Moss AR. Cocaine use and HIV infection in intravenous drug users in San Francisco. *Journal of the American Medical Association.* 1989;261:581-585.

(151) Shrier LA, Emans SJ, Woods ER, DuRant RH. The association of sexual risk behaviors and problem drug behaviors in high school students. *J Adolesc Health.* 1997;20:377-383.

(152) Staton M, Leukefeld C, Logan TK et al. Risky sex behavior and substance use among young adults. *Health Soc Work.* 1999;24:147-154.

(153) Strathdee SA, Hogg RS, Martindale S et al. Determinants of Sexual Risk-Taking Among Young HIV-Negative Gay and Bisexual Men. *Journal of Acquired Immune Deficiency Syndrome.* 1998;19:61-66.

(154) Mattison AM, Ross M, Wolfson T, Franklin D, San Diego HIV Neurobehavioral Research Center Group. Circuit party attendance, club drug use, and unsafe sex in gay men. *Journal of Substance Abuse.* 2001;13:119-126.

(155) Koblin B, Chesney MA, Husnik MJ et al. High-risk behaviors among men who have sex with men in 6 US cities: baseline data from the EXPLORE Study. *American Journal of Public Health.* 2006;93:926-932.

(156) Craib KJ, Weber AE, Cornelisse PG et al. Comparison of sexual behaviors, unprotected sex, and substance use between two independent cohorts of gay and bisexual men. *AIDS.* 2000;14:303-311.

(157) Klitzman RL, Pope HGJ, Hudson JI. MDMA ("Ecstasy") abuse and high-risk sexual behaviors among 169 gay and bisexual men. *American Journal of Psychiatry.* 2000;157:1162-1164.

(158) Darrow WW, Webster RD, Kurtz SP, Buckley AK, Patel KI, Stempel RR. Impact of HIV Counseling and Testing on HIV-INfected Men Who Have Sex with Men: The South Beach Health Survey. *AIDS & Behavior.* 1998;2:115-126.

(159) Hudgins R, McCusker J, Stoddard A. Cocaine use and risky injection and sexual behaviors. *Drug and Alcohol Dependence.* 1994;37:7-14.

(160) Somlai AM, Kelly JA, McAuliffe TL, Ksobiech K, Hackl KL. Predictors of HIV sexual risk behaviors in a community sample of injection drug-using men and women. *AIDS Behav.* 2003;7:383-393.

(161) Edlin BR, Irwin KL, Faruque S et al. Intersecting Epidemics -- Crack Cocaine Use and HIV Infection among Inner-City Young Adults. *New England Journal of Medicine.* 1994;331:1422-1427.

(162) Langendam MW, van Brussel GH, Coutinho R, Van Ameijden EJC. Trends in HIV Risk Behaviour and Methadone Dosage Among HIV-Negative Drug Users: an Ecological Study. *AIDS.* 2000;14:1870-1872.

(163) Wong KH, Lee SS, Lim WL, Low HK. Adherence to methadone is associated with a lower level of HIV-related risk behaviors in drug users. *Journal of Substance Abuse Treatment.* 2003;24:233-239.

(164) Aktan GB, Calkins RF, Johnson DR. Substance use, need and demand for substance user treatment services in patients treated for sexually transmitted diseases in Michigan. *Substance Use and Misuse.* 2001;36:1651-1676.

(165) Cox, J. M., D'Angelo, L. J., and Silber, T. J. Substance abuse and syphilis in urban adolescents: a new risk factor for an old disease. Journal of Adolescent Health 13[6], 483-486. 1992.
Ref Type: Abstract

(166) Hwang LY, Ross MW, Zack C, Bull L, Rickman K, Holleman M. Prevalence of sexually transmitted infections and associated risk factors among populations of drug abusers. *Clin Infect Dis.* 2000;31:920-926.

(167) de Carvalho HB, Mesquita F, Massad E et al. HIV and infections of similar transmission patterns in a drug injectors community of Santos, Brazil. *Journal of Acquired Immune Deficiency Syndrome and Human Retrovirology.* 1996;12:84-92.

(168) Cook RL, Pollock NK, Rao AK, Clark DB. Increased prevalence of herpes simplex virus type 2 among adolescent women with alcohol use disorders. *Journal of Adolescent Health.* 2002;30:169-174.

(169) Williams ML, Elwood WN, Weatherby NL et al. An assessment of the risks of syphilis and HIV infection among a sample of not-in-treatment drug users in Houston, Texas. *AIDS Care.* 1996;8:671-682.

(170) Nuttbrock L, Rosenblum A, Magura S, McQuistion HL, Joseph H. The association between cocaine use and HIV/STDs among soup kitchen attendees in New York City. *J Acquir Immune Defic Syndr.* 2000;25:86-91.

(171) Millson P, Myers T, Calzavara L, Wallace E, Major C, Degani N. Regional variation in HIV prevalence and risk behaviours in Ontario injection drug users (IDU). *Can J Public Health.* 2003;94:431-435.

(172) Schwarcz SK, Bolan GA, Fullilove M et al. Crack Cocaine and Exchange of Sex for Money or Drugs. *Sexually Transmitted Diseases.* 1992;19:7-13.

(173) Friedman SR, Flom PL, Kottiri BJ et al. Drug use patterns and infection with sexually transmissible agents among young adults in a high-risk neighbourhood in New York City. *Addiction.* 2003;98:159-169.

(174) Leri F, Stewart J, Tremblay A, Bruneau J. Heroin and cocaine co-use in a group of injection drug users in Montreal. *Journal of Psychiatry and Neurocience.* 2004;29:40-47.

(175) Chaisson RE, Moss AR, Onishi R. Human Immunodeficiency Virus Infections in Heterosexual Intravenous Drug Users in San Francisco. *American Journal of Public Health.* 1987;77:169-172.

(176) Nelson K, Vlahov D, Solomon L, Cohn S, Munoz A. Temporal Trends of Incident Human Immunodeficiency Virus Infection in a Cohort of Injecting Drug Users in Baltimore, MD. *Archives of Internal Medicine.* 1995;155:1305-1311.

(177) Rhodes T, Stimson GV, Crofts N, Ball A, Dehne K, Khodakevich L. Drug injecting, rapid HIV spread, and the 'risk environment': implications for assessment and response. *AIDS.* 1999;13:S259-S269.

(178) Tyndall M, Currie S, Spittal PM et al. Intensive injection cocaine use as the primary risk factor in the Vancouver HIV-1 epidemic. *AIDS.* 2003;17:887-893.

(179) Campsmith ML, Nakashima AK, Jones JL. Association between crack cocaine use and high-risk sexual behaviors after HIV diagnosis. *J Acquir Immune Defic Syndr.* 2000;25:192-198.

(180) Kalichman SC, Rompa D, Cage M. Sexually transmitted infections among HIV seropositive men and women. *Sex Transm Infect.* 2000;76:350-354.

(181) Wilson TE, Minkoff H, DeHovitz J, Feldman J, Landesman S. The relationship of cocaine use and human immunodeficiency virus serostatus to incident sexually transmitted diseases among women. *Sex Transm Dis.* 1998;25:70-75.

(182) Stein M, Herman DS, Trisvan E, Pirraglia P, Engler P, Anderson BJ. Alcohol use and sexual risk behavior among human immunodeficiency virus-positive persons. *Alcohol Clin Exp Res.* 2005;29:837-843.

(183) Zenilman JM, Hook EW, III, Shepherd M, Smith P, Rompalo AM, Celentano DD. Alcohol and other substance use in STD clinic patients: relationships with STDs and prevalent HIV infection. *Sex Transm Dis.* 1994;21:220-225.

(184) Walsh J, McPhee S. A Systems Model of Clinical Preventive Care: An Analysis of Factors Influencing Patient and Physician. *Health Education Quarterly.* 1992;19:157-175.

(185) Green LW, Kreuter MW. *Health Promotion Planning: An Educational and Environmental Approach.* 2 ed. Mountain View, CA: Mayfield Publishing Company; 1991.

(186) Ajzen I, Fishbein M. *Understanding Attitudes and Predicting Social Behavior.* Englewood Cliffs, New Jersey: Prentice-Hall, Inc; 1980.

(187) MacDonald MA, Green LW. Reconciling concept and context: the dilemma of implementation in school-based health promotion. *Health Educ Behav.* 2001;28:749-768.

(188) Goodson P, Gottlieb NH, Smith MM. Put prevention into practice. Evaluation of program initiation in nine Texas clinical sites. *Am J Prev Med.* 1999;17:73-78.

(189) Paradis G, O'Loughlin J, Elliott M et al. Coeur en sante St-Henri--a heart health promotion programme in a low income, low education neighbourhood in Montreal, Canada: theoretical model and early field experience. *J Epidemiol Community Health.* 1995;49:503-512.

(190) Meador MG, Linnan LA. Using the PRECEDE model to plan men's health programs in a managed care setting. *Health Promot Pract.* 2006;7:186-196.

(191) Kloos H. Human behavior, health education and schistosomiasis control: a review. *Soc Sci Med.* 1995;40:1497-1511.

(192) Chiang LC, Huang JL, Yeh KW, Lu CM. Effects of a self-management asthma educational program in Taiwan based on PRECEDE-PROCEED model for parents with asthmatic children. *J Asthma.* 2004;41:205-215.

(193) Ratner PA, Bottorff JL, Johnson JL, Cook R, Lovato CY. A meta-analysis of mammography screening promotion. *Cancer Detect Prev.* 2001;25:147-160.

(194) Polcyn MM, Price JH, Jurs SG, Roberts SM. Utility of the PRECEDE model in differentiating users and nonusers of smokeless tobacco. *J Sch Health.* 1991;61:166-171.

(195) Mullen PD, Hersey JC, Iverson DC. Health behavior models compared. *Soc Sci Med.* 1987;24:973-981.

(196) Arnsberger P, Fox P, Ryder P, Nussey B, Zhang X, Otero-Sabogal R. Timely follow-up among multicultural women with abnormal mammograms. *Am J Health Behav.* 2006;30:51-61.

(197) Hislop TG, Deschamps M, Teh C et al. Facilitators and barriers to cervical cancer screening among Chinese Canadian women. *Can J Public Health.* 2003;94:68-73.

(198) Miilunpalo S. Evidence and theory based promotion of health-enhancing physical activity. *Public Health Nutr.* 2001;4:725-728.

(199) Mahloch J, Taylor V, Taplin S, Urban N. A breast cancer screening educational intervention targeting medical office staff. *Health Educ Res.* 1993;8:567-579.

(200) Lichtenstein B, Bachmann LH. Staff affirmations and client criticisms: staff and client perceptions of quality of care at sexually transmitted disease clinics. *Sex Transm Dis.* 2005;32:281-285.

(201) Weeks MR, Schensul JJ, Williams SS, Singer M, Grier M. AIDS prevention for African-American and Latina women: building culturally and gender-appropriate intervention. *AIDS Educ Prev.* 1995;7:251-264.

(202) Dixon-Woods M, Stokes T, Young B, Phelps K, Windridge K, Shukla R. Choosing and using services for sexual health: a qualitative study of women's views. *Sexually Transmitted Infections.* 2001;77:335-339.

(203) Tucker JS, Wenzel SL, Elliott M, Hambarsoomian K, Golinelli D. Patterns and correlates of HIV testing among sheltered and low-income housed women in Los Angeles County. *Journal of Acquired Immune Deficiency Syndrome.* 2003;34:415-422.

(204) Lichtenstein B. Stigma as a barrier to treatment of sexually transmitted infection in the American deep south: issues of race, gender and poverty. *Social Science & Medicine.* 2003;57:2435-2445.

(205) Corneil T, Kuyper LM, Shoveller J et al. Unstable housing, associated risk behaviour, and increased risk for HIV infection among injection drug users. *Health and Place.* 2006;12:79-85.

(206) Craib KJ, Spittal PM, Wood E et al. Risk factors for elevated HIV incidence among Aboriginal injection drug users in Vancouver. *CMAJ.* 2003;168:19-24.

(207) Shannon K, Bright V, Duddy J, Tyndall MW. Access and utilization of HIV treatment and services among women sex workers in Vancouver's Downtown Eastside. *Journal of Urban Health.* 2005;82:488-497.

(208) Strathdee SA, Patrick DM, Archibald CP et al. Social determinants predict needle-sharing behaviour among injection drug users in Vancouver, Canada. *Addiction.* 1997;92:1339-1347.

(209) BC Centre for Disease Control. STD/AIDS Control: Annual Report. 1997. Vancouver, B.C., Provincial Health Services Authority.
Ref Type: Report

(210) BC Centre for Disease Control. STD/AIDS Control: Annual Report. 1999. Vancouver, B.C., Provincial Health Services Authority.
Ref Type: Report

(211) BC Centre for Disease Control. STD/AIDS Control: Annual Report. 2002. Vancouver, B.C., Provincial Health Services Authority.
Ref Type: Report

(212) BC Centre for Disease Control. STD/AIDS Control: Annual Report. 2005. Vancouver, B.C., Provincial Health Services Authority.
Ref Type: Report

(213) Carnegie Community Centre. Resources in and around the Downtown Eastside. 2002.
Ref Type: Pamphlet

(214) Patrick D, Rekart ML, Jolly A et al. Heterosexual outbreak of infectious syphilis: epidemiological and ethnographic analysis and implications for control. *Sexually Transmitted Infections.* 2002;78:i164-i169.

(215) Miller CL, Tyndall M, Spittal P, Li K, Laliberte N, Schechter MT. HIV incidence and associated risk factors among young injection drug users. *AIDS.* 2002;16:491-493.

(216) Spittal PM, Bruneau J, Craib KJ et al. Surviving the sex trade: a comparison of HIV risk behaviours among street-involved women in two Canadian cities who inject drugs. *AIDS Care.* 2003;15:187-195.

CHAPTER 2

PATTERNS AND TYPES OF SUBSTANCE USE AND STI TRANSMISSION*

* A version of this chapter has been submitted for publication to AIDS & Behaviour: Rusch M, Shannon K, Lai C, Kerr T, Patrick D, Tyndall M. Impact of injection drugs, non-injection drugs and alcohol use on Sexually tranmsitted infections among HIV-positive and HIV-negative women. September 2006.

INTRODUCTION

Sexually transmitted infections (STIs) are among the most serious adverse public health consequences of substance use. There are multiple ways in which substance use may compound transmission of STIs including behavioural influence, impaired cognitive functioning, time and place, social networks, personality disorders and possibly even directly through immune system functioning[1-5].

There are many studies associating the use of alcohol and illicit drugs to high-risk sexual behaviours[6-8]. Alcohol use has been associated with syphilis and HIV, as well as with increased use of other drugs[9]. Crack cocaine use has been linked to increased sex trade for drugs and increased numbers of sex partners[10-12]. The frequency of injection cocaine use or use of crack cocaine has also been shown to correlate with sex trade and HIV risk, although the former association is in part related to increased risk of HIV infection due to needle use[13,14]. Use of heroin and barbituates has been linked to risky sexual practices and injection of heroin and speedballs has been associated with increased involvement in sex trade[15,16]. Associations have been reported between crystal methamphetamine (CM) use and STIs in homosexual male populations, although there are few studies examining its use among women[17].

There may be other distal pathways whereby drug use influences decisions that lead to unsafe situations, rather than specific unsafe sexual behaviour[2], or where the situation or environment in which the drug is habitually taken increases the likelihood of unsafe sexual practices and thereby the likelihood of acquiring an STI[18]. For example, studies of the sexual encounters occurring at crack houses support this hypothesis, with increased number of partners and decreased condom use among illicit drug users and sex trade workers in this environment[19].

Relating to both behavioural and contextual pathways, the patterns of drug use (i.e. daily use, binge use) are important to consider. Daily injection behaviours have been associated with increased needle sharing, HIV and HCV infection[15,20-23], while daily non-injection crack use has been associated with more needle risk among IDUs, higher alcohol consumption, sexual risk behaviours and involvement in the sex trade[16,24-27]. Binge drug use, typically defined as drug use sessions in which higher than normal amounts of drugs are consumed, and which last more than 24 hours, has also been associated with increased risk behaviours including needle sharing, sex work and unsafe sex, as well as with increased risk for HIV and HCV[22,28-30].

Many papers have examined the impact of injection drugs on HIV, crack cocaine on sexual behaviors and sex work, CM use and STIs among high-risk men, and sexual behaviors and STIs among substance users involved in treatment. Few have been able to assess the independent risks of different drugs and patterns of use among a poly-substance using population. Given the numerous possible pathways through which substances may influence behaviour and STI risk, an assessment of the differential risks may provide insight into these pathways.

In this paper the independent associations of alcohol, injection and non-injection drug use are examined with respect to STI diagnosis among HIV positive and HIV negative women. It was hypothesized that injection of stimulants would have the strongest association with STI, that alcohol would retain an independent association with STI regardless of other substances used, and that those who had patterns of poly-drug use combining daily use and episodic high-intensity use would have the strongest associations with STI.

METHODS

The Community Health and Safety Evaluation (CHASE) survey recruited a representative sample of residents from a high-risk urban neighbourhood. Participants were recruited at multiple locations, including community-based organizations, store-front locations, Single Room Occupancy (SRO) hotels and subsidized housing developments. Participation involved an interviewer-administered survey, performed by trained peer-interviewers, covering demographics, health care utilization, medication and illicit drug use. All community residents were eligible and participants were reimbursed $10 CDN for their time.

Consent was also sought to use participant's personal health numbers or other identifying information to link questionnaire data with the British Columbia Centre for Disease Control (BC CDC) laboratory database. The study was approved by the UBC-Providence Health Care Research Ethics Board. The BC CDC provided STI data from January 1991 to December 2004.

Positive STIs were determined by provincial laboratory standards. The BC CDC database captures all syphilis testing carried out in the province. In addition to the BC CDC, STI tests are also carried out by community laboratories and therefore the rates of these infections are underestimated. The BC CDC database does contain all STI testing performed by street nurses who are very active in this community. Demographic and behavioural factors associated with having had a syphilis test were examined and compared to those associated with having other STI testing in order to examine possible bias in outcome ascertainment due to missing data from other laboratories.

Drug use variables were classified by type of drug (stimulant, depressant, other) and mode of use (injection, non-injection). Alcohol and marijuana were kept as separate categories. Only those

who used a substance on a regular basis (at least 2-3 times per month) were included. Daily use was defined as any drug use on a daily basis, excluding alcohol and marijuana. Epidsodic high-intensity use was defined as any non-daily use of a substance, with amounts exceeding the median amount reported by daily users of that substance. These amounts were >5 papers for injection cocaine, >4 papers for injection heroin, >2 points/gram for injection or non-injection crystal methamphetamine, >10 rocks for non-injection crack, >3 pills for benzodiazapenes or dilaudids, and >3 papers for non-injection heroin in a 24-hour period. Daily alcohol use and episodic high-intensity use (>10 drinks) were kept as seperate categories. Episodic, high-intensity use was used instead of 'binge' use, as data was only collected on regular patterns of drug use, not on 'runs' or 'binges' of use among regular users.

Demographic variables were compared between participants with any or no STI diagnosis using chi-square test for categorical variables and Kruskal-Wallis test for continuous variables. Logistic regression was used to assess the associations of substance use with STI diagnosis within one year (+/-) of the survey. Univariate associations were estimated for alcohol, marijuana, injection stimulants (cocaine, CM), injection depressants (heroin), non-injection stimulants (crack, CM), and non-injection depressants (heroin, benzodiazapenes, dilaudids) as well as previous STI diagnosis. Interactions were assessed in separate models for combination daily and episodic high-intensity users (i.e. those that used one or more drugs on a daily basis and also used another drug or drugs in a weekly or monthly, high-intensity use pattern). All analyses were stratified by HIV status (positive versus negative/unknown). HIV-negative and unknown serostatus were grouped, as many of the pathways of influence are behavioural, and therefore influenced by serostatus only if known. However, since there is also an impact of HIV infection on susceptibility to STIs, the analysis was also performed excluding women of uknown serostatus.

Stepwise regression procedures were used to estimate the full models, using the likelihood ratio test and adjusting for age and ethnicity. A p-value of 0.20 was used as the cut-off for exclusion in order to assess the direction of associations even though power was limited. Exploratory analyses were also done using specific STI outcomes.

RESULTS

Of the 1107 women who completed the CHASE survey, 703 (64%) tested HIV negative in the last year, 174 (16%) were HIV positive, and 230 (20%) self-reported they were HIV negative, but did not have a recent HIV test recorded in the BC CDC database (for a comparison by HIV-status, see Table AII.3).

Table 2.1 compares the characteristics of the women by presence of recent STI. Fifty-six women (5.1%) had a positive STI diagnosis within one year of the survey. Women testing positive were younger, more likely to be of Aboriginal ethnicity, to use injection or non-injection stimulants, injection depressants, and to have had a previous STI or HIV diagnosis.

Approximately 24% of the population had no recorded STI test. Having an STI test was associated with younger age, non-injection stimulant use and having a previous STI. These associations were similar whether restricting to syphilis tests or non-syphilis STI tests. Injection of stimulants and injection of depressants (marginally) were associated with syphilis testing but not other STI testing.

Among the HIV-positive women, the most prevalent STIs were gonorrhoea (4.0%, n=7) and trichomonas (7.5%, n=13). There was only one case each of syphilis and chlamydia. Among HIV-negative women, syphilis had the highest prevalence (2.3%, n=16), followed by

trichomonas (2.0%, n=14) and chlamydia (1.6%, n=11). There were only two cases of gonorrhoea.

Figure 2.1 illustrates the prevalence of drug use and poly-drug use (>1 substance reported, excluding marijuana) among the population. Among those who used non-injected stimulants, nearly two-thirds (61%) also used another substance; for all other substance categories, poly-substance use was nearly universal. While the use of injection and non-injection drugs was higher among HIV-positive women, the patterns of use were similar to HIV-negative women with the exception of increased stimulant use.

Of those who used any drugs other than alcohol and marijuana (N=780), 57% used daily, with the majority being crack users (38% smokers, 4% injectors and 11% both). Approximately 7% of users used in an episodic high-intensity fashion, and 56% of these also used one or more substances daily. The majority reported episodic injecting behaviour (71%), although 42% reported non-injecting episodic behaviour. Any alcohol use was reported by 43% of the population, with approximately one-third of these reporting daily use and 7% reporting episodic high-intensity use.

Table 2.2 shows unadjusted and adjusted odds ratios for the association of drug use and previous STI diagnosis with current STI diagnosis among women with HIV-negative / unknown serostatus. Use of non-injection stimulants, non-injection depressants, any daily drug use and having a previous STI were associated with having an STI. In the stepwise regression procedures, controlling for age and ethnicity, non-injection stimulants and previous STI remained in the model although the latter was only marginally significant (AOR: 1.76, 95% CI 0.90-3.47, p=0.10). Although only a small proportion of non-injection stimulants was attributed

to CM use (4%), both CM and crack remained at elevated odds when examined separately (AOR for crack: 2.02, 95% CI: 0.89 – 4.60; AOR for crystal: 2.50, 95% CI: 0.85 – 7.37).

Table 2.3 shows unadjusted and adjusted odds ratios for the association of drug use and previous STI diagnosis with current STI diagnosis among HIV-positive women. In the univariate analysis only injection stimulant use was significantly associated with having an STI diagnosis, although the odds ratios for alcohol and previous STI were elevated. In the stepwise regression model, controlling for age and ethnicity, alcohol use (AOR: 2.64; p=0.08), injection stimulant use (AOR: 2.89; p=0.11) and episodic use (AOR: 5.75; p=0.02) retained elevated odds. Daily use was marginally associated with decreased odds of having an STI (AOR:0.27, p=0.07); however, as indicated by the elevated odds of injection stimulants, examination of daily injection cocaine revealed an elevated odds, while daily crack use and daily injection heroin use (accounting for >90% of other drugs used daily) had non-significant, decreased odds of STI.

Restricting the final models to those women who had ever received STI testing, or excluding women with unknown HIV serostatus did not alter the conclusions.

Although the number of STI outcomes does not allow a well-powered examination of interaction, the exploration of poly-drug users using daily and in episodic high-intensity patterns, as well as those combining alcohol use with episodic high-intensity use of other drugs is shown in Table 2.4. As can be seen in the third row, episodic high-intensity use appears to have a stronger association with STI among those who don't report other daily drug use. For example, among HIV-negative women, 15% (3 of 19) who reported episodic use and no daily use had an STI, compared to only 2% of women reporting no drug use and 7% of women reporting only daily use. Among HIV-positive women, episodic use remains important among daily drug users,

although the association is not as strong. Among HIV-negative women, there was a suggested interaction between alcohol use and episodic high-intensity drug use, with more than triple the proportion of infections compared to all other groups. Among HIV-positive women, alcohol use alone (marginally) and episodic drug use alone were both associated with STI, and although the unadjusted proportions indicated the possibility of interaction, this did not remain significant after adjusting for age and ethnicity.

Examining specific STI outcomes, chlamydia and trichomonas remained marginally significantly associated with non-injection stimulant use (AOR: 9.14, p=0.072; AOR: 4.62, p=0.051; respectively) among HIV-negative women (see Table AII.4 and AII.5 for more detail). Interestingly, crack and CM use remained at similarly increased but non-significant odds for chlamydia diagnosis (AOR: 2.2 and 2.1, respectively), while CM use had a significantly elevated odds for trichomonas diagnosis (AOR: 6.36; p=0.009). Crack use retained an elevated odds (AOR: 2.91; p=0.189) for syphilis infection. Only injection of stimulants remained elevated for gonorrhoea infection (AOR: 11.7; p=0.119).

Among HIV-positive women, gonorrhoea diagnosis was marginally associated with alcohol use (AOR: 5.19; p=0.072), while injection stimulant use was elevated (AOR: 4.58; p=0.195). Trichomonas infection showed an elevated odds with alcohol use (AOR: 2.40; p=0.168).

DISCUSSION

Overall, this population of women had high prevalence of poly-drug use and STIs, including HIV. Alcohol use and injection of stimulants retained marginal associations, and episodic high-intensity drug use was strongly correlated with STI infection among HIV-positive women, while smoking crack or CM was strongly correlated with STI among HIV-negative women. Although

there was no apparent interaction of daily drug use combined with episodic high-intensity use, episodic use among non-daily users held strong associations with STI among both HIV-negative and HIV-positive women. While binge use among regular drug users has been shown to be associated with increased risk behaviours and infections[22,29], this sub-population of users who don't report any daily drug use, but use at high-intensities in an episodic pattern may represent an important population for outreach interventions and STI testing and treatment.

Among both HIV-positive and HIV-negative women, examination of specific STI outcomes indicated distinct associations. Ethnographic and epidemiologic studies examining networks have indicated that substance-specific networks form, and that there can be an overlapping of intimate partners in substance using networks[31,32]. Coupled with other sexual network studies that have shown distinct drug use reported by members of networks with specific circulating STIs, the results here may also indicate an overlap of sexual and drug use networks[33].

The risk factors for a current STI diagnosis among HIV-positive and HIV-negative women were variable, even though the patterns of substance use were not substantially different. There was, however, variation in the prevalence of specific STIs between these two populations. Of note, trichomonas was much more prevalent among the HIV-positive women (7.5% vs. 2.0%, $p<0.001$), which has been reported in previous studies[12,34]. This may indicate an increased susceptibility for infection, or it may highlight an HIV-positive sexual network in which this pathogen is circulating. The reduced number of syphilis cases among HIV-positive compared to HIV-negative women (0.5% vs 2.3%, $p=0.149$) was not significant, but could be indicative of the increased targeted testing and treatment of HIV-positive women since the onset of the syphilis epidemic in the area[35].

Among HIV-negative women, non-injection stimulant use had the strongest association with STIs. Many studies have seen similar associations, especially with crack use and increased STIs. Studies comparing populations of injectors and crack users have generally found higher risk among crack users as compared to injectors[36,37]. While one might have expected to see an association with injection stimulant use, the overwhelmingly high number of crack users in the population and the high proportion of injectors who also used crack may limit the ability to detect this association. Although daily drug use did not remain in the model, considering that 80% of daily users used non-injection crack cocaine, it is not surprising that non-injection stimulant use overshadowed the association of daily use of any drugs.

It is interesting that CM use, as opposed to crack use, was specifically associated with trichomonas infection. One could postulate that this is related to the transmission dynamics of trichomonas, possibly reflecting an increased number of sexual partners in CM users trading sex for drugs more frequently than other drug users. The younger age of CM users could also indicate increased risks, (median age 30, IQR: 23, 37 versus median age 42, IQR: 35, 52; p-value<0.001); however, there did not appear to be any interaction between age and CM use in this population. The context of CM use may also play a role, similar to that seen for syphilis and crack users in the 'crack house' environment[38].

The association of syphilis and crack seen in this population was weaker than would be expected from the literature[11,19,39]. This is potentially due to an incidence-prevalence effect resulting from the use of first syphilis cases only, particularly as the concerted tracking and treatment of syphilis cases several years prior to this survey would have increased case finding among potentially higher risk groups such as crack users.

It is difficult to draw much from the analysis of HIV-positive women due to the small number of STIs observed; however, there was some indication that alcohol and injection stimulant use were associated with increased STIs. In fact, alcohol use did show a marginally significant association with gonorrhoea infection. This is not surprising given the evidence of increased transmission of gonorrhoea among HIV-positive individuals, as well as the evidence of increased sexual risk behaviours associated with alcohol consumption among HIV-positive populations[40,41]. The different associations among HIV-positive versus HIV-negative women may be driven in part from the different risk behaviours leading to HIV-status. For example, women with increased injection and sexual risk behaviours may be more likely to have become HIV-positive, and if the behaviours and environments are not changed, these women will also be more likely to have an STI.

It is important to note that, among the HIV-positive women, drug use other than alcohol and marijuana was nearly ubiquitous (95%). Thus, the apparent decreased odds of daily drug use, mainly representing non-injection crack cocaine, is simply indicative of the level of risk among those that only smoke crack, as compared to those with other poly-substance use patterns. Episodic high-intensity use of drugs retained a strong association with STIs among HIV-positive women, with nearly two-thirds being daily crack smokers periodically using injection cocaine, and nearly one-third being daily injection cocaine users who periodically smoke crack cocaine or crystal methamphetamine. As these patterns of dual-use remained strongly associated even after controlling for any injection stimulant use and any daily drug use, this association may be accounting more for the contextual drug use scene represented by episodic high-intensity use. For example, the episodic drug use could be representative of situations when the drug of choice is not available, when the drug use is occuring with a different network of users, or when the user is already in a situation with minimal control.

The use of alcohol, while not significantly associated with STI among HIV-negative, did show a possible interaction with episodic, high-intensity drug use. This again may be indicative of contextual situations were there is less control and less ability to negotiate safe sex. Among HIV-positive women, alcohol remained marginally significantly associated with STI, which has been found in other populations[40]. There have been studies among adolescents, IDUs and commercial sex workers providing convincing data of the disinhibiting effect of alcohol use on sexual risk behaviours, specifically through increased partners and decreased condom use[6,42]. Alternatively, alcohol use may lead to increased partner aggression or fear of violence and thereby decrease the ability to negotiate condom use[43-45].

The importance of sexual and social networks in understanding STI risk has become more pronounced in recent literature[46]. Studies of the sexual encounters occurring within crack houses report increased number of partners, increased sex trade directly for drugs, increased violence towards and exploitation of women, and decreased ability to negotiate condom use[34].

The importance of distinguishing networks can be seen in the possible connection with CM use and trichomonas among HIV-negative women. While the data do not provide any solid conclusions, it is concerning that CM use among HIV-negative women was highly associated with trichomonas, an infection with high prevalence among HIV-positive women, and that non-injection CM use was associated with injection of stimulants (data not shown). There is a possibility that HIV-negative CM users who are also injecting stimulants are involved in overlapping networks with HIV-positive women, highlighting a group of women at high-risk for seroconversion.

The main strength of the CHASE survey is its size and broad representation of a high-risk region, as well as the ability to link to other data sources. It provides a specific window on a community that has a high STI burden. However, there are some limitations to this study. First, the sample is not generalizable to the larger population, although it is representative of the high-risk community of the DTES. Second, STI prevalence reported here is an underestimate of the true prevalence. Asymptomatic cases and patients treated symptomatically, as well as cases tested through community laboratories are not captured. While there is the potential for ascertainment bias, the comparison of characteristics of syphilis testers, for whom there is complete testing data, and other STI-testers did not show any significant variations. Thirdly, the drug use variables are based on self-report and there may be a trend toward underreporting.

In this population of poly-substance users, crack and non-injection CM use had independent associations with STIs among HIV-negative women. Among HIV-positive women, injection stimulants and alcohol were marginally associated with STI, while episodic high-intensity drug use was strongly associated. Treatment and behavioural interventions may benefit from taking into account the number of drugs used and the patterns of use. The relatively high prevalence of STI among the HIV-positive women indicates a need for programs to address continued protection among seroconcordant couples, as well as the multiple barriers that prevent high-risk women from negotiating condom use.

Table 2.1: Demographic and drug use behaviours among 1107 female participants of CHASE survey, stratified by presence of positive STI diagnosis within one year of survey

	No STI diagnosis (N=1051)	**Positive STI diagnosis** (N=56)	**p-value**
Median Age (IQR)	42 (35, 50)	33 (26, 39)	<.001 *
Aboriginal Ethnicity	422 (40.2)	32 (57.1)	0.012 *
High School	361 (38.6)	21 (37.5)	0.873
Unemployment	986 (93.9)	51 (91.1)	0.393
Alcohol	343 (33.1)	26 (43.3)	0.102
Daily use	132 (12.7)	4 (6.7)	0.166
Binge use	78(3.2)	4 (1.7)	0.795
Non-injection drugs			
Marijuana	316 (30.4)	21 (37.5)	0.259
Stimulants	549 (52.7)	48 (85.7)	<.001 *
Depressants	167 (16.0)	13 (23.2)	0.158
Injection drugs			
Stimulants	237 (22.8)	22 (39.3)	0.005 *
Depressants	206 (19.8)	18 (32.1)	0.025 *
Frequency of use	408 (39.0)	36 (60.0)	0.001 *
Daily use	46 (4.4)	9 (15.0)	<.001 *
Binge use			
Previous STI diagnosis	290 (27.6)	31 (55.4)	<.001 *
HIV-positive	156 (14.8)	18 (32.1)	<.001 *

*** p<0.05**

Figure 2.1: Proportions of any substance use (speckled bars) and poly-substance use (black bars: proportion of speckled bars reporting more than one substance) among 1097 women participating in the CHASE Survey, 2003-2005

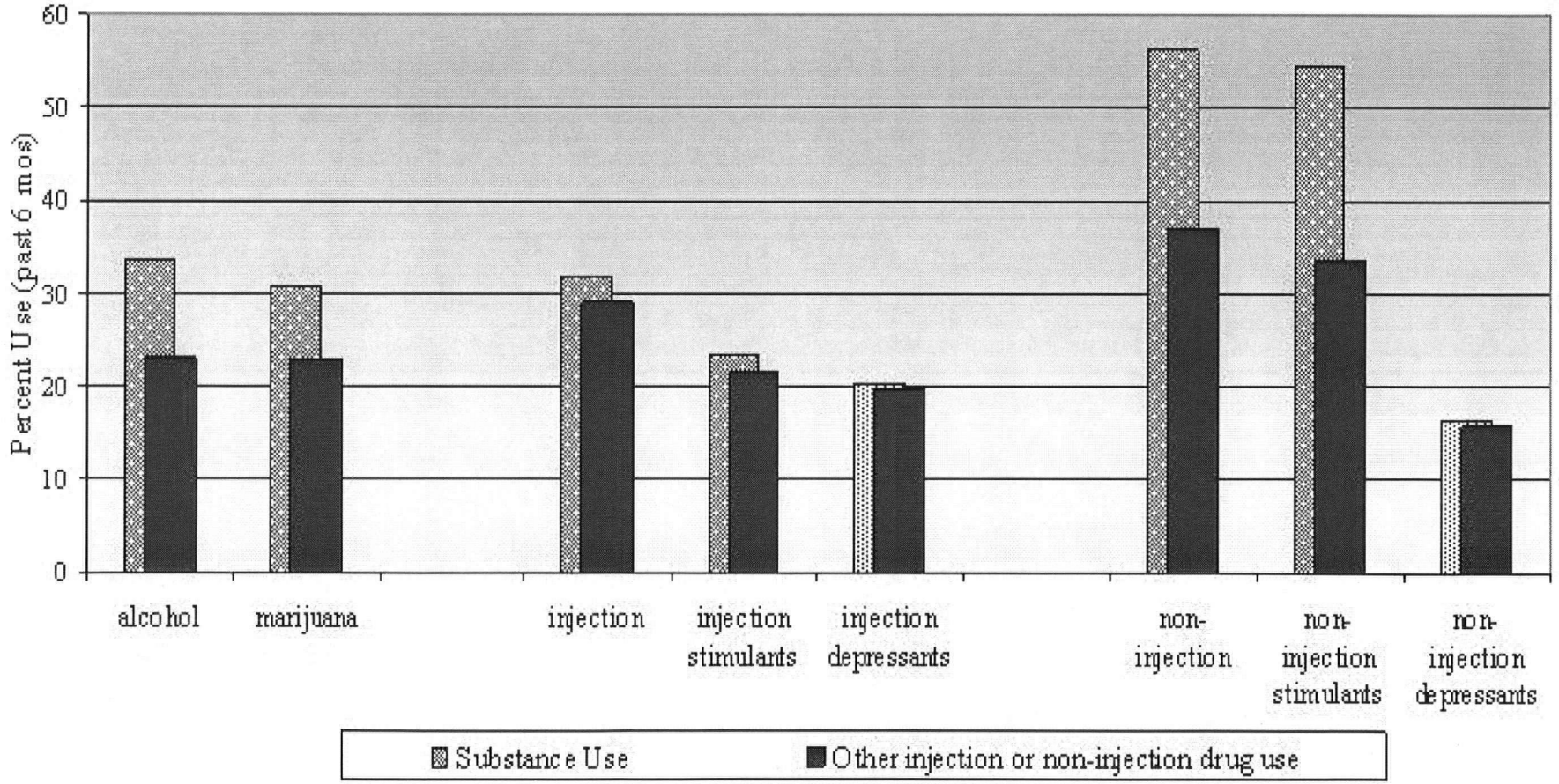


Table 2.2: Odds ratios and Adjusted odds ratios for the association of drug use and previous STI with STI diagnosis in past year among HIV-negative women (N=918)

	Unadjusted Odds Ratio	95% Confidence Interval	Adjusted ‡ Odds Ratios	95% Confidence Interval
Alcohol	1.19	0.61 – 2.34		
Daily use	0.18	0.03 – 1.33	--	--
Binge use	0.99	0.30 – 3.33		
Non-injection drugs				
Marijuana	1.21	0.61 – 2.41	--	--
Stimulants	5.79 *	2.40 – 13.97	2.63 *	1.05 – 6.54
Depressants	1.80	0.84 – 3.90	--	--
Injection drugs				
Stimulants	1.34	0.62 – 2.88	--	--
Depressants	2.09 *	1.03 – 4.24	--	--
Frequency of use				
Daily use	2.52 *	1.33 – 4.79	--	--
Binge use	2.05	0.60 – 6.98	--	--
Previous STI	2.94 *	1.52 – 5.65	1.80 †	0.93 – 3.48

* $p<0.05$; † $p<0.10$; ‡Model adjusted for age and ethnicity

Table 2.3: Odds ratios and Adjusted odds ratios for the association of drug use and previous STI with current STI diagnosis among HIV-positive women (N=173)

	Unadjusted Odds Ratio	95% Confidence Interval	Adjusted ‡ Odds Ratios	95% Confidence Interval
Alcohol	1.82	0.68 – 4.85	2.64	0.89 – 7.80
Daily use	1.05	0.28 – 3.89	--	--
Binge use	1.30	0.15 – 11.37	--	--
Non-injection drugs				
Marijuana	1.68	0.62 – 4.52	--	--
Stimulants	2.00	0.44 – 9.16		
Depressants	0.91	0.28 – 2.94		
Injection drugs				
Stimulants	**3.16 ***	**1.07 – 9.29**	2.89	0.77 – 10.80
Depressants	1.18	0.42 – 3.35	--	--
Frequency of use				
Daily use	1.12	0.42 – 2.97	0.27	0.07 – 1.08
Binge use	**5.07 ***	**1.65 – 15.59**	**5.75 ***	**1.41 – 23.54**
Previous STI	2.47	0.84 – 7.26	2.35	0.72 – 7.65

* $p<0.05$; ‡ Model adjusted for age and ethnicity

Table 2.4: Interactions between daily use and episodic high-intensity use, and alcohol use and episodic high-intensity use of other drugs and the resulting impact on the odds of having a positive STI test among HIV-positive and HIV-negative female participants of the CHASE cohort, controlling for age, ethnicity and previous STI diagnosis

	HIV Negative		**HIV Positive**	
	No STI (%) ***STI (%)***	**AOR ‡** **95% CI**	***No STI (%)*** ***STI (%)***	**AOR ‡** **95% CI**
No daily use, **No episodic use**	565 (97.6) 14 (2.4)	1.00	55 (91.7) 5 (8.3)	1.00
Daily use, **No episodic use**	294 (92.7) 23 (7.3)	1.47 0.72 – 3.01	87 (90.6) 9 (9.4)	0.48 0.13 – 1.79
No daily use, **Episodic use**	16 (84.2) 3 (15.8)	**5.14 *** **1.27 – 20.64**	3 (60.0) 2 (40.0)	**12.38 *** **1.44 – 106.4**
Episodic use among **daily users**	18 (100.0) 0 (0.0)	--	9 (69.2) 4 (30.8)	5.25 0.17 – 160.5
No alcohol, **No episodic use**	571 (96.0) 24 (4.0)	1.00	91 (93.8) 6 (6.2)	1.00
Alcohol, **No episodic use**	279 (95.6) 13 (4.4)	0.94 0.45 – 1.97	50 (86.2) 8 (13.8)	2.99 0.91 – 9.85
No alcohol, **Episodic use**	23 (95.8) 1 (4.2)	0.64 0.08 – 5.10	9 (75.0) 3 (25.0)	**6.89 *** **1.20 – 39.52**
Episodic use among **those using alcohol**	11 (84.6) 2 (15.4)	3.69 0.13 – 108.0	3 (50.0) 3 (50.0)	6.55 0.28 – 154.2

* $p<0.05$; ‡adjusted for age, ethnicity and previous STI

Reference List

(1) House RV, Thomas PT, Bhargava HN. Immunotoxicology of opiods, inhalants and other drugs of abuse. *NIDA Research Monographs.* 1997;173:175-200.

(2) Ross MW, Williams ML. Sexual behavior and illicit drug use. *Annu Rev Sex Res.* 2001;12:290-310.:290-310.

(3) Rawson RA, Washton A, Domier CP, Reiber C. Drugs and sexual effects: role of drug type and gender. *Journal of Substance Abuse Treatment.* 2002;22:103-108.

(4) Gerdner A, Nordlander T, Pedersen T. Personality factors and drug of choice in female addicts with psychiatric comorbidity. *Substance Use and Misuse.* 2002;37:1-18.

(5) Wylie J, Cabral T, Jolly A. Identification of networks of sexually transmitted infection: a molecular, geographic and social network analysis. *Journal of Infectious Disease.* 2005;191:899-906.

(6) Fortenberry JD. Alcohol, drugs, and STD/HIV risk among adolescents. *AIDS Patient Care STDS.* 1998;12:783-786.

(7) Cook RL, Clark DB. Is there an association between alcohol consumption and sexually transmitted diseases? A systematic review. *Sex Transm Dis.* 2005;32:156-164.

(8) Stein MD, Anderson B, Charuvastra A, Friedmann PD. Alcohol use and sexual risk taking among hazardously drinking drug injectors who attend needle exchange. *Alcohol Clin Exp Res.* 2001;25:1487-1493.

(9) Zenilman JM, Hook EW, III, Shepherd M, Smith P, Rompalo AM, Celentano DD. Alcohol and other substance use in STD clinic patients: relationships with STDs and prevalent HIV infection. *Sex Transm Dis.* 1994;21:220-225.

(10) Wilson TE, Minkoff H, DeHovitz J, Feldman J, Landesman S. The relationship of cocaine use and human immunodeficiency virus serostatus to incident sexually transmitted diseases among women. *Sex Transm Dis.* 1998;25:70-75.

(11) Ross MW, Hwang LY, Zack C, Bull L, Williams ML. Sexual risk behaviours and STIs in drug abuse treatment populations whose drug of choice is crack cocaine. *Int J STD AIDS.* 2002;13:769-774.

(12) Kalichman SC, Rompa D, Cage M. Sexually transmitted infections among HIV seropositive men and women. *Sex Transm Infect.* 2000;76:350-354.

(13) Myers T, Millson M, Rigby J et al. A comparison of the determinants of safe injecting and condom use among injecting drug users. *Addiction.* 1995;90:217-226.

(14) Spittal PM, Craib KJP, Wood E et al. Risk factors for elevated HIV incidence rates among female injection drug users in Vancouver. *Canadian Medical Association Journal.* 2002;166:891-899.

(15) Tyndall M, Currie S, Spittal PM et al. Intensive injection cocaine use as the primary risk factor in the Vancouver HIV-1 epidemic. *AIDS.* 2003;17:887-893.

(16) Hoffman J, Klein H, Eber M, Crosby H. Frequency and intensity of crack use as predictors of women's involvement in HIV-related sexual risk behaviors. *Drug and Alcohol Dependence.* 2000;58:227-236.

(17) Hirshfield S, Remien RH, Walavalkar I, Chiasson MA. Crystal methamphetamine use predicts incident STD infection among men who have sex with men recruited online: a nested case-control study. *J Med Internet Res.* 2004;6:e41.

(18) Rhodes T, Stimson GV, Crofts N, Ball A, Dehne K, Khodakevich L. Drug injecting, rapid HIV spread, and the 'risk environment': implications for assessment and response. *AIDS.* 1999;13:S259-S269.

(19) Schwarcz SK, Bolan GA, Fullilove M et al. Crack Cocaine and Exchange of Sex for Money or Drugs. *Sexually Transmitted Diseases.* 1992;19:7-13.

(20) Miller CL, Johnston C, Spittal PM et al. Opportunities for prevention: hepatitis C prevalence and incidence in a cohort of young injection drug users. *Hepatology.* 2002;36:737-742.

(21) Miller C, Spittal PM, Laliberte N et al. Females Experiencing Sexual and Drug Vulnerabilities Are at Elevated Risk for HIV Infection Among Youth Who Use Injection Drugs. *Journal of Acquired Immune Deficiency Syndrome.* 2002;30:335-341.

(22) Craib KJ, Spittal PM, Wood E et al. Risk factors for elevated HIV incidence among Aboriginal injection drug users in Vancouver. *CMAJ.* 2003;168:19-24.

(23) Santibanez SS, Garfein RS, Swartzendruber A et al. Prevalence and correlates of crack-cocaine injection among young injection drug users in the United States, 1997-1999. *Drug Alcohol Depend.* 2005;77:227-233.

(24) Carlson RG, Falck RS, Wang J, Siegal HA, Rahman A. HIV needle risk behaviors and drug use: a comparison of crack-smoking and nonsmoking injection drug users in Ohio. *J Psychoactive Drugs.* 1999;31:291-297.

(25) Kuyper LM, Lampinen TM, Li K et al. Factors associated with sex trade involvement among male participants in a prospective study of injection drug users. *Sex Transm Infect.* 2004;80:531-535.

(26) Surratt HL, Inciardi JA. HIV risk, seropositivity and predictors of infection among homeless and non-homeless women sex workers in Miami, Florida, USA. *AIDS Care.* 2004;16:594-604.

(27) Latkin CA, Mandell W, Vlahov D. The relationship between risk networks' patterns of crack cocaine and alcohol consumption and HIV-related sexual behaviors among adult injection drug users: a prospective study. *Drug Alcohol Depend.* 1996;42:175-181.

(28) Miller CL, Strathdee SA, Kerr T, Li K, Wood E. Factors associated with early adolescent initiation into injection drug use: implications for intervention programs. *J Adolesc Health.* 2006;38:462-464.

(29) Miller CL, Kerr T, Frankish JC et al. Binge drug use independently predicts HIV seroconversion among injection drug users: implications for public health strategies. *Subst Use Misuse.* 2006;41:199-210.

(30) Semple SJ, Patterson TL, Grant I. Binge use of methamphetamine among HIV-positive men who have sex with men: pilot data and HIV prevention implications. *AIDS Educ Prev.* 2003;15:133-147.

(31) Latkin CA, Hua W, Forman VL. The relationship between social network characteristics and exchanging sex for drugs or money among drug users in Baltimore, MD, USA. *Int J STD AIDS.* 2003;14:770-775.

(32) Trotter, R. T., Bown, A. M., and Potter, J. M. Network models for HIV outreach and prevention programs for drug users. Needle, R. H., Genser, S. G., and Trotter, R. T. [NIH Pub No. 95-3889]. 1995. National Institute of Drug Abuse. Research Monograph 151. Ref Type: Serial (Book,Monograph)

(33) Stoner BP, Whittington WL, Hughes JP, Aral SO, Holmes KK. Comparative epidemiology of heterosexual gonococcal and chlamydial networks: implications for transmission patterns. *Sexually Transmitted Diseases.* 2000;27:215-223.

(34) Magnus M, Clark R, Myers L, Farley T, Kissinger PJ. Trichomonas vaginalis among HIV-Infected women: are immune status or protease inhibitor use associated with subsequent T. vaginalis positivity? *Sex Transm Dis.* 2003;30:839-843.

(35) Rekart ML, Patrick DM, Chakraborty B et al. Targeted mass treatment for syphilis with oral azithromycin. *Lancet.* 2003;361:313-314.

(36) Booth RE, Kwiatkowski CF, Chitwood DD. Sex related HIV risk behaviors: differential risks among injection drug users, crack smokers, and injection drug users who smoke crack. *Drug Alcohol Depend.* 2000;58:219-226.

(37) Booth RE, Watters JK, Chitwood DD. HIV risk-related sex behaviors among injection drug users, crack smokers and injection drug users who smoke crack. *American Journal of Public Health.* 1993;83:1144-1147.

(38) Ross MW, Hwang LY, Leonard L, Teng M, Duncan L. Sexual behaviour, STDs and drug use in a crack house population. *International Journal of STD & AIDS.* 1999;10:224-230.

(39) DeHovitz JA, Kelly P, Feldman J et al. Sexually transmitted diseases, sexual behavior, and cocaine use in inner-city women. *Am J Epidemiol.* 1994;140:1125-1134.

(40) Stein M, Herman DS, Trisvan E, Pirraglia P, Engler P, Anderson BJ. Alcohol use and sexual risk behavior among human immunodeficiency virus-positive persons. *Alcohol Clin Exp Res.* 2005;29:837-843.

(41) McClelland RS, Lavreys L, Katingima C et al. Contribution of HIV-1 Infection to Acquisition of Sexually Transmitted Disease: A 10-Year Prospective Study. *Journal of Infectious Disease.* 2005;191:333-338.

(42) Rees V, Saitz R, Horton NJ, Samet J. Association of alcohol consumption with HIV sex- and drug-risk behaviours among drug users. *Journal of Substance Abuse Treatment.* 2001;21:129-134.

(43) Braitstein P, Li K, Tyndall M et al. Sexual violence among a cohort of injection drug users. *Social Science and Medicine.* 2003;57:561-569.

(44) Chuang CH, Liebschutz MJ, Horton NJ, Samet JH. Association of violence victimization with inconsistent condom use in HIV-infected persons. *AIDS & Behavior.* 2006;10:201-207.

(45) Kalichman SC, Williams EA, Cherry C, Belcher L, Nachimson D. Sexual coercion,domestic violence, and negotiating condom use among low-income African American women. *Journal of Women's Health.* 1998;7:371-378.

(46) Doherty MC, Garfein RS, Monterroso E, Latkin CA, Vlahov D. Gender differences in the initiation of injection drug use among young adults. *Journal of Urban Health.* 2000;77:396-414.

CHAPTER 3

POLY-SUBSTANCE USE – INTERACTIONS OF CRACK AND OTHER SUBSTANCES ON STI TRANSMISSION*

* A version of this chapter is in preparation for submission to Sexually Transmitted Diseases.

INTRODUCTION

Injection drug users (IDUs) continue to be at the forefront of the HIV/AIDS epidemic in North America and abroad[1]. In countries with established epidemics, IDU transmission has leveled off and concern is turning towards increased heterosexual transmission[2]; however, sexual transmission does not discount instances linked to substance use or drug using networks[3,4]. In Canada, although the proportion of HIV cases related to injection drug use has leveled off at approximately a third of annual cases, increasing numbers of women, youth and Aboriginals are making up this population[5]. Many sub-groups have been shown to have vulnerabilities that put them at risk for both injection and sexual transmission[6-8]. Injection risks are an important factor in transmission; however, the increased sexual risks taken by substance using populations have been illustrated and related to amount and frequency of substance use, the need to trade sex for drugs, and the context of the substance use situation[9-11]. This complex combination makes it difficult to design prevention and support programs that address all of the risks faced by substance using populations.

The relationship between injection drugs and risk of infection through injection is not difficult to understand. Aside from the risk posed by injecting with used needles, injection-related risks include using other contaminated equipment, requiring help injecting, and injection of highly addictive substances that increase the frequency of use[12,13]. Less easily explained is the influence of substance use on sexual behaviours[14,15]. There are many routes that could contribute, such as the influence of substances on neurochemical reactions and subsequent behaviour, pre-existing behaviour patterns, addiction levels and involvement in the drug/sex economy, as well as the social environments and networks related to substance use[16]. The frequency of injection cocaine has been correlated with HIV risk[12], likely through dual injection and sexual risk pathways. Risk of sexual transmission is also illustrated through reports of

higher-risk sexual networks, especially for female IDU, and higher self-reported sexual risk among users of crack and high frequency cocaine injectors[7,10]. Other evidence suggests that among IDUs, there are few differences in self-reported sexual risk when comparing sex workers to non-sex workers[17].

IDUs are not the only substance users at high-risk of HIV infection. Crack cocaine users have been shown to have very high rates of STIs, including HIV, through pathways of sex trade, risky drug using environments, more intense use and increased number of partners[14,18]. In the early ninties, several studies uncovered links between rising epidemics of syphilis and the crack cocaine culture[3,19,20]. Environments such as crack houses were found to perpetuate increased high-risk sex, especially when trading oral sex for drugs. Studies of sex trade workers have found high rates of crack use, heroin use and syringe borrowing, and among males, crack users had more sex partners, had more IDU partners, more STI history and reported higher rates of purchasing or trading drugs for sex[21,22].

Given the impact of both crack and injection cocaine on the transmission of HIV and other STIs, and the complicated pathways through which they may act, it becomes important to assess the interplay of the use of multiple substances. The few studies that have examined dual use of crack and injection cocaine have found that those who inject cocaine had the highest risk for HIV, but that dual users reported the highest sexual risk behaviours[23,24]. In addition, among women, dual users reported more involvement in sex trade[23]. Some hypothesize that drug use patterns and networks may vary among crack users who also inject cocaine as compared to non-crack using injectors, although others have reported many shared networks and behaviours between the populations[24,25]. Dual users may also have risks stemming from increased

frequency of use or increased use of drugs during sex, increased alcohol consumption, more IDU partners, and higher history of STIs, possibly indicating less propensity for using protection[26]. In addition, studies among HIV positive individuals have highlighted the ongoing nature of these risk behaviours[27-29]. However, few studies have compared the influence of drug use patterns between HIV-positive and negative populations. This comparison is important, as the social and sexual networks, the increased susceptibility to infection and therefore the pathways of influence and size of impact may be very different.

The purpose of the present paper was to assess the impact of dual drug use on STI acquisition among a population of women with high prevalence of substance use. The analysis was focused on dual use of crack and one of the following: injection cocaine, crystal methamphetamine or heroin use. As other papers have shown increased risk for HIV among injecting-only populations, but increased sexual risk reporting among dual users, the hypothesis here was that dual use be reflected by increased STIs, either because of an increased need for drugs and/or an increased frequency of use. In addition, the differential influence of dual use comparing HIV-negative and HIV-positive women is explored.

METHODS

The Community Health and Safety Evaluation (CHASE) Project surveyed a sample of residents in Vancouver's DTES from various locations including Single-room Occupancy Hotels and community groups enrolling 3541 individuals of whom 1107 (31%) were female. Participation involved an interviewer-administered survey that covered demographics, health care utilization, medication and illicit drug use. Participants were reimbursed $10 CDN for their time.

Consent was also sought to use participant's personal health numbers or other identifying information to link with the BC Centre for Disease Control (BC CDC) laboratory database. Consent forms were provided and read to the participants by trained interviewers. Participants were not excluded from the survey if they did not consent to linkage. The study was approved by the UBC-Providence Health Care Research Ethics Board. The survey was linked to data from the BC CDC from January 1991 to December 2004 in order to assess diagnosed STIs in this population.

Chlamydia, gonorrhoea and syphilis testing information were extracted from the BC CDC database. Chlamydia positivity was defined as a positive test result by culture, enzyme immunoassay or polymerase chain reaction (PCR). Gonorrhoea positivity was determined by culture only. For syphilis, only the first positive serologic test was considered. Although this may exclude people who were treated and become re-infected, it avoids misclassification of those who remain reactive at follow-up. Syphilis was deemed positive only for those with a positive RPR plus at least one treponemal specific test - Fluorescent Treponemal Antibody or Micro-hemagglutination Assay - recorded for that individual within a one-month period. The clinical diagnoses (i.e. primary, secondary or tertiary syphilis) were not available and therefore the reported rates are of cumulative exposure to syphilis and may not capture the incident infection.

The BC CDC laboratory database captures all syphilis testing carried out in the province of British Columbia. Some chlamydia and gonorrhoea testing is also carried out by community laboratory facilities and therefore the rates of these infections are underestimated. Of note, the BC CDC database does contain all STI testing performed by street nurses who are very active in this community and perform the majority of STI testing.

Having any positive diagnosis for syphilis, chlamydia, gonorrhoea or trichomonas within one year of the survey (retrospective or prospective) was considered a positive outcome. Substance use was defined by type of drug used and route of administration. Any use < 2-3 a month was considered casual use and was combined with non-use in this anaylsis. In order to assess interaction, categorical variables were created for each of the three combinations: crack and injection cocaine, crack and CM, and crack and injection heroin. The comparison group in all cases were those reporting no use of crack cocaine, injection cocaine, CM or injection heroin. The control group did however contain individuals using other substances (alcohol, marijuana, non-prescribed methadone, benzodiazepines, dilaudid).

Logistic regression was used to assess the association of the drug use variables with any STI diagnosis. Each of the three interactions were tested first on their own, and second in multivariate models adjusting for age, ethnicity, frequency of alcohol consumption and previous STI. All models were stratified by HIV status.

RESULTS

Table 3.1 contains the demographics of the female CHASE population by STI diagnosis. Younger age, Aboriginal ethnicity, previous STI diagnosis, HIV-positive status and substance use were all associated with having an STI (all p-values <0.05), while level of education and employment status were not. Although many of these variables may be indicative of an increased likelihood of having been tested, restricting to only those who had ever had an STI test did not change the direction or significance of any associations.

Figure 3.1 illustrates the prevalence of drug use among the whole population, as well as the prevalence of other drug use among crack smokers. As is illustrated in the graph, the main drug used by this population was crack cocaine, with 48% and 80% of HIV-negative / unknown and HIV-positive populations reporting use, respectively. Injection cocaine was the second-most prevalent drug used (18% of HIV-negative/unknown and 46% of HIV-positive), followed by heroin (21% of HIV-negative/unknown and 33% of HIV-positive) and finally CM (3% of HIV-negative/unknown and 6% of HIV-positive). Other drugs used by the population included non-prescription methadone (7.5%), benzodiazapenes (4.5%), dilaudids (3.5%), morphine (2%) as well as opium, powder cocaine, and Talwin/Ritalin (all <1%).

Table 3.2 contains the unadjusted and adjusted odds ratios for the impact of injection cocaine and crack use, CM and crack use, and injection heroin and crack use on STIs in three respective models for HIV-negative or unknown participants. Due to multiple stratifications, the numbers in any particular category are small, limiting the power to detect meaningful differences. For this population, there are too few injection cocaine users who did not use crack to assess the impact of injection alone. However, while crack retained its association independently of injection cocaine use (OR: 2.6, 95% CI: 1.0 – 6.6), dual use of crack and injection cocaine had a lower odds ratio (OR: 1.4, 95% CI: 0.5 – 4.5) than crack alone.

CM users, on the other hand, had an elevated association as compared to crack users, although the adjusted odds were not significant (OR for CM use: 2.9, 95% CI: 0.5 – 18.6; OR for crack use: 2.1, 95% CI: 0.8 – 5.3). Dual crack cocaine and CM users had a significantly elevated odds ratio, although it was not higher than what would be expected from combining the independent odds (OR: 4.9, 95% CI: 1.0 – 23.0). The non-significance of the interaction is confirmed by statistical testing of the interaction term in a similar model (p=0.8).

Examining heroin users, there is again insufficient numbers to assess odds of an STI as there are no STI cases among the 158 non-crack using heroin injectors. There is the suggestion of an interaction between crack and heroin use in the unadjusted models; however the adjusted ORs are similar (OR for crack use: 2.0, 95% CI: 0.8 – 5.4; OR for crack and heroin use: 2.5, 95% CI: 0.9 – 6.9).

Table 3.3 contains the unadjusted and adjusted odds ratios of the interaction models for cocaine, CM and heroin with crack among HIV-positive participants. Although there is insufficient power to detect interactions, there is one pattern that stands out. The increased odds ratio estimate for dual users of crack and injection cocaine highlights a possible difference as compared to the HIV-negative/ unknown population. The crude estimates for STI prevalence show 4% among the non-users, 5.8% among crack users, 10% among cocaine users, and 17% prevalence among dual users. In this case, injection cocaine appears to have a stronger impact on STIs. Dual use of crack and CM again showed an increased estimated odds ratio as compared to crack use similar to the HIV-negative population, although the numbers here are too small to draw conclusions.

DISCUSSION

Crack cocaine, followed by injection cocaine and heroin, was the most prevalent drug used by this population of urban women, with just over half of the participants reporting regular use. Among crack users, another 50% reported using at least one other illicit drug, not including marijuana or prescription medications. Among those with HIV unknown or negative status, crack cocaine was associated with approximately a 2-fold increased odds of having a positive STI test. While there was no significant interaction between crack use and use of either injection cocaine, CM or heroin, the odds of having a positive STI test for dual users of crack and CM was

raised in comparison with either crack or CM use alone. Among HIV-positive participants, prevalence of drug use was higher boarding all categories. There did not appear to be any interactions with dual drug use in this population either, although numbers were not sufficient to make any strong conclusions.

There are many studies correlating the use of crack with increased sexual risk behaviour, increased risk of HIV and other STIs[19,22,30-34]. Social and sexual networks as well as environments such as crack houses where sex is traded for crack at high rates have all been indicated as possible reasons for the observed associations[15,18]. Thus, the two-fold increase in odds for having a positive STI test among crack users seen here was not surprising. However, among HIV-positive participants, the increased risk was less certain. This could be due to insufficient power, but may also be indicative of the increased risk for STIs that the population in general experiences.

Although injection cocaine has previously shown strong associations with high-risk behaviour and HIV seroprevalence or seroconversion, there were few positive STI outcomes among the sub-group who injected cocaine but did not use crack. A similar analysis done by McCoy et al. (2004) examining the association of cocaine and crack dual use on HIV seroprevalence found that injection cocaine had the strongest association, while those who were dual users had a diluted association[23]. This is likely partially related to the difference in transmission routes, with shared needles contributing to the association seen with HIV and injection cocaine. In our population, injection cocaine was similarly associated with higher HIV prevalence, both for crack and non-crack users. However, crack use on its own had a stronger association with STIs than dual use with injection cocaine. Other studies of crack use have often exhibited stronger relationships with high-risk behaviours and sex trade as compared to other drug users[16,28,35].

Despite small numbers, the results for CM users are interesting. Among dual users, the association was about what would be expected from the combined risk of individual use of each drug, suggesting no interaction in the epidemiological sense. However, what this does indicate is that the risks associated with crack use and CM use in this population are not originating from general or overlapping drug use pathways. There are drug-specific risks associated with STIs in this population. This could point towards sexual networks or environments that are high-risk but unique for crack and CM. Alternatively it could indicate that the association has more to do with networks in one case and more to do with individual behaviour or risk patterns in the other.

In the case of heroin, there were again few outcomes among those who only used heroin; however, there did not appear to be much difference between the association of crack use and STIs among those who did or did not use heroin. Some previous studies have shown a link between heroin and sex trade, which may lead one to think there should have been some association or increased odds[7]. The link between heroin and the sex trade however may be changing over time and the increased use of crack may be overshadowing this. For example, the increased use of crack cocaine among those involved in the sex trade may mean that almost all heroin users involved in the sex trade also use crack. In this case, because the pathway is the same, there would be no combined risk expected for use of both drugs.

Although the HIV-positive population was too small to make any strong conclusions, it is interesting to explore the different patterns in the odds ratios as compared to the HIV-negative/unknown population. For example, crack on its own had the strongest impact in HIV-negative women when comparing dual use with injection cocaine; however, for HIV-positive women, crack and injection cocaine on their own had no association, while dual use had an

increased odds ratio. This may indicate different sexual or overlapping sexual-IDU networks among HIV-positive women, or it may indicate a differential impact of pathways.

The CHASE cohort represents a large and broad sample of a high-risk population concentrated in a marginalized urban area. The ability to sample such a large proportion of the population and link survey results to other health databases provides a major strength. However, the population is not generalizable to the whole community – the majority of participants are more established residents of the area and there is little representation of a younger population or of new initiates into drug use. In terms of outcome ascertainment, there is a potential for bias as asymptomatic cases and patients treated symptomatically, as well as cases tested through community laboratories are not captured; however, a comparison of those testing for syphilis (which is completely captured) to those testing for other STIs did not show any significant variations. In addition, restricting the models to only those who had ever received an STI test did not alter the observed associations.

While there was no statistical evidence for an interaction between crack and injection cocaine or CM, there appeared to be separate sexual risk pathways for crack use and CM use. This finding highlights the importance of multiple risk pathways and suggests that poly-drug users should be targeted for risk reduction and STI treatment. The possibility that these users are also linked into unique risk networks also indicates their importance in network analysis and partner tracing efforts. Poly-substance users may be key in quickly identifying multiple networks involved in outbreaks, and may provide access to the hard-to-reach core networks that drive these epidemics.

Table 3.1: Characteristics of 1107 female participants of the CHASE survey by presence or absence of positive STI test within one year of the survey (2001-2004)

	No STI diagnosis (N=1051)	**Positive STI diagnosis** (N=56)	**p-value**
Median Age (IQR)	42 (35, 51)	35 (28, 40)	<.001 *
Aboriginal Ethnicity	422 (40.2)	32 (57.21	0.012 *
High School	361 (38.6)	21 (37.5)	0.865
Unemployment	986 (93.9)	51 (91.1)	0.393
Previous STI diagnosis	290 (27.6)	31 (55.4)	<.001 *
HIV-positive	156 (14.8)	18 (32.1)	0.001 *
Drug use			
Crack cocaine	540 (51.9)	46 (82.1)	<.001 *
Injection cocaine	222 (21.3)	20 (35.7)	0.011 *
Crystal methamphetamine	36 (3.5)	7 (12.5)	0.001 *
Heroin	226 (21.7)	22 (39.3)	0.002 *

*** p<0.05**

Figure 3.1: Proportion of crack cocaine, injection cocaine, heroin and crystal methamphetamine users among female participants of CHASE, and the proportion of other substance use among crack cocaine users

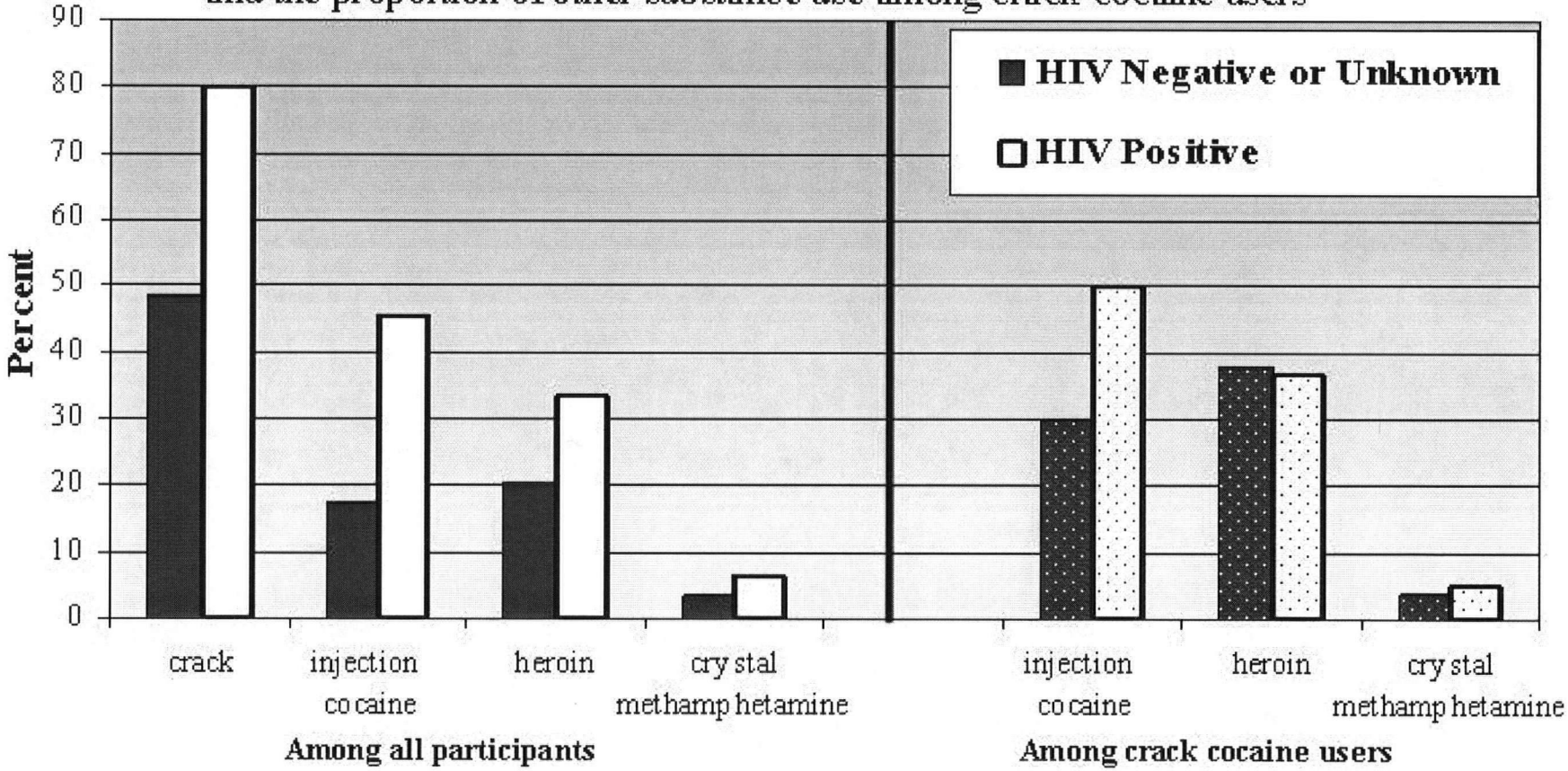


Table 3.2: Unadjusted and adjusted odds ratios for the association of single and dual-drug use with positive STI test among HIV-negative and HIV-unknown female participants of the CHASE cohort

		N (%)	Odds Ratio (95% CI)	Adjusted Odds Ratio † (95% CI)
HIV-negative or unknown	Neither	429 (47.4)	1.00	1.00
	Crack only	313 (34.6)	5.59 * (2.25 – 13.90)	2.56 * (1.00 – 6.56)
	Cocaine only	28 (3.1)	--	--
	Crack and cocaine	135 (14.9)	3.86 * (1.27 – 11.68)	1.42 (0.45 – 4.49)
	Neither	429 (47.8)	1.00	1.00
	Crack only	431 (48.3)	4.71 * (1.93 – 11.53)	2.08 (0.82 – 5.25)
	Crystal only	15 (1.7)	10.85 * (2.00 – 58.94)	2.89 (0.45 – 18.55)
	Crack and crystal	17 (1.9)	15.11 * (3.42 – 66.67)	4.86 * (1.02 – 23.02)
	Neither	429 (47.8)	1.00	1.00
	Crack only	278 (31.0)	4.02 * (1.54 – 10.49)	2.02 (0.76 – 5.39)
	Heroin only	20 (2.2)	--	--
	Crack and heroin	170 (19.0)	6.82 * (2.60 – 17.90)	2.45 (0.88 – 6.85)

* $p<0.05$; † adjusted for age, ethnicity, alcohol and previous STI

Table 3.3: Unadjusted and adjusted odds ratios for the association of single and dual-drug use with positive STI test among HIV-positive female participants of the CHASE cohort

		N (%)	Odds Ratio (95% CI)	Adjusted Odds Ratio* (95% CI)
HIV-positive	Neither	20 (11.9)	1.00	1.00
	Crack only	69 (41.1)	1.34 0.12 – 11.09	0.78 0. 08 – 7.83
	Cocaine only	10 (6.0)	2.11 0.12 – 37.72	0.83 0.04 – 17.44
	Crack and cocaine	69 (41.1)	4.00 0.49 – 32.83	2.02 0.22 – 18.23
	Niether	20 (12.4)	1.00	1.00
	Crack only	131 (80.9)	2.27 0.28 – 18.31	1.32 0.15 – 11.50
	Crystal only	4 (2.5)	--	--
	Crack and crystal	7 (4.3)	7.60 0.57 – 101.79	3.11 0.20 – 49.28
	Neither	20 (12.1)	1.00	1.00
	Crack only	87 (52.7)	2.19 0.26 – 18.37	1.35 0.15 – 12.09
	Heroin only	7 (4.2)	--	--
	Crack and heroin	51 (30.9)	3.02 0.34 – 26.30	1.46 0.15 – 14.26

*Adjusted for age, ethnicity, alcohol and previous STI

Reference List

(1) Aceijas C, Stimson GV, Hickman M, Rhodes T. Global overview of injecting drug use and HIV infection among injecting drug users. *AIDS.* 2004;18:2295-2303.

(2) UNAIDS. UNAIDS/WHO AIDS Epidemic Update: December 2005. 2005. Joint United Nations Programme on HIV/AIDS and World Health Organization.
Ref Type: Report

(3) Chaisson M, Stoneburner R, Hildebrandt D, Ewing W, Telzak E, Jaffe H. Heterosexual transmission of HIV-1 associated with the use of smokeable freebase cocaine (crack). *AIDS.* 1991;5:1121-1126.

(4) Nicolosi A, Leite ML, Musicco M, Molinari S, Lazzarin A. Parenteral and sexual transmission of human immunodeficiency virus in intravenous drug users: a study of seroconversion. The Northern Italian Seronegative Drug Addicts (NISDA) Study. *American Journal Of Epidemiology.* 1992;135:225-233.

(5) Canada, Public Health Agency. HIV/AIDS Epi Updates, May 2005. 2005. Surveillance and Risk Assessment Division, Centre for Infectious Disease Prevention and Control, Public Health Agency of Canada.
Ref Type: Report

(6) Miller C, Spittal PM, Laliberte N et al. Females Experiencing Sexual and Drug Vulnerabilities Are at Elevated Risk for HIV Infection Among Youth Who Use Injection Drugs. *Journal of Acquired Immune Deficiency Syndrome.* 2002;30:335-341.

(7) Spittal PM, Bruneau J, Craib KJ et al. Surviving the sex trade: a comparison of HIV risk behaviours among street-involved women in two Canadian cities who inject drugs. *AIDS Care.* 2003;15:187-195.

(8) Surratt HL, Inciardi JA, Weaver JC, Falu VM. Emerging linkages between substance abuse and HIV infection in St. Croix, US Virgin Islands. *AIDS Care.* 2005;17 Suppl 1:S26-35.:S26-S35.

(9) Booth RE, Watters JK, Chitwood DD. HIV risk-related sex behaviors among injection drug users, crack smokers and injection drug users who smoke crack. *American Journal of Public Health.* 1993;83:1144-1147.

(10) Somlai AM, Kelly JA, McAuliffe TL, Ksobiech K, Hackl KL. Predictors of HIV sexual risk behaviors in a community sample of injection drug-using men and women. *AIDS Behav.* 2003;7:383-393.

(11) Tyndall M, Patrick D, Spittal P, Li K, O'Shaughnessy MV, Schechter MT. Risky sexual behaviours among injection drug users with high HIV prevalence: implications for STD control. *Sexually Transmitted Infections.* 2002;78:i170-i175.

(12) Tyndall M, Currie S, Spittal PM et al. Intensive injection cocaine use as the primary risk factor in the Vancouver HIV-1 epidemic. *AIDS.* 2003;17:887-893.

(13) Riehman KS, Kral AH, Anderson R, Flynn N, Bluthenthal RN. Sexual relationships, secondary syringe exchange, and gender differences in HIV risk among drug injectors. *J Urban Health.* 2004;81:249-259.

(14) Baseman J, Ross M, Williams M. Sale of sex for drugs and drugs for sex: An economic context of sexual risk behavior for STDs. *Sexually Transmitted Diseases.* 1999;26:444-449.

(15) Ross MW, Hwang LY, Leonard L, Teng M, Duncan L. Sexual behaviour, STDs and drug use in a crack house population. *International Journal of STD & AIDS.* 1999;10:224-230.

(16) Ross MW, Hwang LY, Zack C, Bull L, Williams ML. Sexual risk behaviours and STIs in drug abuse treatment populations whose drug of choice is crack cocaine. *Int J STD AIDS.* 2002;13:769-774.

(17) Roxburgh A, Degenhardt L, Breen C. Drug use and risk behaviours among injecting drug users: a comparison between sex workers and non-sex workers in Sydney, Australia. *Harm Reduct J.* 2005;2:7.

(18) Inciardi JA. Crack, crack house sex, and HIV risk. *Archives of Sexual Behavior.* 1995;24:249-269.

(19) Rolfs RT, Goldberg M, Sharrar R. Risk factors for syphilis: Cocaine use and prostitution. *American Journal of Public Health.* 1990;80:853-857.

(20) Edlin BR, Irwin KL, Faruque S et al. Intersecting Epidemics -- Crack Cocaine Use and HIV Infection among Inner-City Young Adults. *New England Journal of Medicine.* 1994;331:1422-1427.

(21) Word CO, Bowser B. Background to crack cocaine addiction and HIV high-risk behavior: The next epidemic. *American Journal of Drug and Alcohol Abuse.* 1997;23:67-77.

(22) Jones D, Irwin KL, Inciardi JA et al. The high-risk sexual practices of crack-smoking sex workers recruited from the streets of three American cities. *Sexually Transmitted Diseases.* 1998;25:187-193.

(23) McCoy CB, Lai S, Metsch LR, Messiah SE, Zhao W. Injection drug use and crack cocaine smoking: independent and dual risk behaviors for HIV infection. *Annals of Epidemiology.* 2004;14:535-542.

(24) Iguchi ME, Bux DA. Reduced probability of HIV infection among crack cocaine-using injection drag users. *American Journal of Public Health.* 1997;87:1008-1012.

(25) Sterk CE, Theall KP, Elifson KW. Who's getting the message? Intervention response rates among women who inject drugs and/or smoke crack cocaine. *Prevention Medicine.* 2003;37:119-128.

(26) Booth RE, Kwiatkowski CF, Chitwood DD. Sex related HIV risk behaviors: differential risks among injection drug users, crack smokers, and injection drug users who smoke crack. *Drug Alcohol Depend.* 2000;58:219-226.

(27) Inciardi JA, Surratt HL, Kurtz SP, Weaver JC. The effect of serostatus on HIV risk behaviour change among women sex workers in Miami, Florida. *AIDS Care.* 2005;17 Suppl 1:S88-101.:S88-101.

(28) Kalichman SC, Rompa D, Cage M. Sexually transmitted infections among HIV seropositive men and women. *Sex Transm Infect.* 2000;76:350-354.

(29) Metsch LR, McCoy CB, Lai S, Miles C. Continuing risk behaviors among HIV-seropositive chronic drug users in Miami, Florida. *AIDS and Behavior.* 1998;2:161-169.

(30) Edlin B, Irwin KL, Ludwig D et al. High-risk sex behavior among young street-recruited crack cocaine smokers in three American cities: An interim report. *Journal of Psychoactive Drugs.* 1992;24:363-371.

(31) Fullilove R, Fullilove M, Bowser B, Gross S. Risk of sexually transmitted disease among black adolescent crack users in Oakland and San Francisco, California. *Journal of the American Medical Association.* 1990;263:851-855.

(32) Hoffman J, Klein H, Eber M, Crosby H. Frequency and intensity of crack use as predictors of women's involvement in HIV-related sexual risk behaviors. *Drug and Alcohol Dependence.* 2000;58:227-236.

(33) Paone D, Cooper H, Alperren J, Shi Q, Des Jarlais DC. HIV risk behaviors of current sex workers attending syringe exchanges: The experiences of women in five US cities. *AIDS Care.* 1999;11:269-280.

(34) Wingood G, DiClemente R. The influence of psychosocial factors, alcohol, and drug use on African-American women's high-risk sexual behavior. *American Journal of Preventative Medicine.* 1998;15:54-59.

(35) Cu-Uvin S, Ko H, Jamieson DJ et al. Prevalence, incidence, and persistence or recurrence of trichomoniasis among human immunodeficiency virus (HIV)-positive women and among HIV-negative women at high risk for HIV infection. *Clin Infect Dis.* 2002;34:1406-1411.

CHAPTER 4

STI TRENDS AND ECOLOGICAL IMPACT OF OUTREACH INTERVENTIONS AMONG A COMMUNITY AT HIGH-RISK FOR STI TRANSMISSION*

* A version of this chapter is in preparation for submission to the Canadian Medical Association Journal

INTRODUCTION

Despite progress in recent years, STIs continue to spread, often simmering undetected in high-risk 'core' groups until the right combination of susceptible groups and social networks allows endemic levels to burgeon into epidemic proportions[1]. In Canada, decreases in bacterial STIs starting in the late 1980's led to Health Canada setting goals for near elimination by 2010[2]. In 1997 increases were seen in both STIs and reported high-risk sexual behaviours[3]. Examining population trends in STIs over time can help us understand transmission in society, identify epidemic phases, inform programs and policies, and illustrate effects of environmental changes and societal shifts[4, 5].

Estimates of STI rates can be derived from surveillance data, cohort studies, or cross-sectional screening, each of which has limitations. Surveillance data underestimates true rates of infection, missing people with asymptomatic infections and those who have not sought treatment for minor symptoms. Reportability policies may also affect the completeness of surveillance data. Cohort studies often sample from locations where participants are more likely to be sexually active (STI clinics or substance abuse programs) or from particular high-risk populations (injection drug users (IDUs), street youth, or commercial sex workers)[6, 7, 8]. There may also be methodological limitations such as low volunteerism from the general population, aging effects, survival bias, loss to follow-up and migration effects. Screening campaigns allow more complete detection; however, the cost-effectiveness may not be sufficient to recommend this for estimating general population rates over time.

While wider regional estimates are useful, there is a gap between studies reporting on rates among high-risk populations and studies reporting overall rates for larger regions. Vancouver's Downtown Eastside (DTES) is a neighbourhood which is known to be highly affected by many

issues including substance misuse, mental illness, homelessness, poverty and STIs. Many of the studies focusing on specific high-risk groups (e.g. IDUs, CSWs) are based in this area; however, there are no studies encompassing a broader at-risk group[8, 9]. Examining the historical rates of STIs from this 'middle-ground' could provide additional insight on how various factors have influenced STI transmission.

This paper examines STI trends among a cohort from Vancouver's DTES over the 14-year period from 1991 to 2004. Programmatic and policy changes, such as increased resources, targeted programs and testing methods were descriptively assessed for timing and impact on STI trends.

METHODS

The Community Health and Safety Evaluation (CHASE) survey sampled residents of Vancouver's DTES from multiple locations including Single-room Occupancy Hotels (SRO's), needle exchange sites and community health clinics between 2003 and 2004. Participation involved an interviewer-administered survey that took approximately 10 to 15 minutes. The interviews were performed by trained peer-interviewers and covered demographics, health care utilization, medication and illicit drug use. Participants were reimbursed $10 CDN for their time.

Consent was also sought to use participant's personal health numbers or other identifying information to link to the BC Centre for Disease Control (CDC) laboratory database. Consent forms were provided and read to the participants by trained interviewers. Participants were not excluded from the survey if they did not consent to linkage. The study was approved by the UBC-Providence Health Care Research Ethics Board. The survey was linked to data from the

BC CDC laboratory database from January 1991 to December 2004 in order to assess STIs in this population.

Annual reports published by the STI division of the BC CDC were used to extract pertinent information regarding programming initiatives, guideline changes, and reportable STI rates for the province[10-16]. In Canada, syphilis, chlamydia and gonorrhoea are reportable infections, with data gathered provincially[17]. While the rates will still be underestimates, this data allows a reasonably accurate image of the trends occurring in STI transmission. Events listed in Table 2.1 are designated by letters and appear in Figure 2.1 where relevant.

Chlamydia, gonorrhea and syphilis testing information were extracted from the BC CDC database. Positive chlamydia was defined as a positive test result by culture, enzyme immunoassay or polymerase chain reaction (PCR). Gonorrhea positivity was determined by culture. For syphilis, only the first positive case (positive RPR plus one confirmatory test) was used. Although this may exclude people who were treated and became re-infected, it avoids misclassification of those who remain reactive at follow-up. Syphilis was deemed positive only for those with a positive RPR plus at least one treponemal specific test - Fluorescent Treponemal Antibody or Micro-hemagglutination Assay - recorded for that individual within a one-month period. It is important to note that the clinical diagnoses (i.e. primary, secondary or tertiary syphilis) were not available; therefore the reported rates are of cumulative exposure to syphilis rather than incident infection.

The BC CDC laboratory database captures all syphilis testing carried out in the province. Chlamydia and gonorrhoea testing may be carried out by private facilities as well; therefore the rates are underestimates of the total number of cases. The BC CDC database does contain all

STI testing performed by street nurses, whose efforts are concentrated in this community and would capture the majority of testing within the CHASE sample.

Demographic variables were compared using chi-square test for categorical variables and Kruskal-Wallis test for continuous variables. Yearly period-prevalence was calculated by assuming participants were living in BC since 1991, with back-censoring at age 14. A second calculation was done correcting for an in-migration of approximately 5 percent per year (equal to the rates observed in the 2001 census data for the six census tracts encompassing the DTES), from 1991 onward resulting in the final population total of 3541 surveyed in 2003-04.

Patterns of subsequent STIs were examined among those with any first positive chlamydia, gonorrhoea and, for women, trichomonas infection (N=188). Syphilis was excluded, as second syphilis events could not be determined. Those who did not have a first STI diagnosed until after December 31, 2003 were also excluded in order to ensure adequate potential follow-up time (the median time to re-infection was 17.6 months). Demographic and calendar-time trends associated with the time from first to second infection were assessed. Kaplan-Meier survival curves were calculated and multivariate Cox Proportional Hazard models were used to assess the independent impact of calendar-time trends. Calendar-year was categorized into three time periods: 1991 to 1995, 1996 to 2000 and 2001 to 2005. Individuals who never had a second positive STI test were right-censored at year end, 2005.

RESULTS

CHASE participants were mostly male (68%), White (56%) or Aborignial (28%) ethnicity, had high rates of unemployment (91%) and low education levels (40% completed high school).

Out of 3541 participants, 58.1 percent (2058) were linked to the BCCDC STD database at some point during the 14-year period from 1991 to 2004. Of these, 63% were male, 1% percent were trans-gendered, 37% were White, 33% were Aboriginal, 3% percent were Black, 3% percent were Asian and 5% were of other ethnicity. Women were more likely to have been tested for an STI (68% versus 54%, $p<0.01$). Among males, there was no difference in median age (43, IQR: 37-49) comparing testers to non-testers. For women, non-testers were significantly older than testers (median age: 48 [IQR: 39-73] versus 37 [IQR: 32-43]; $p<0.01$). Among all male participants, 3% tested positive for an STI; among females, 13% tested positive.

Table 4.1 highlights the major CDC program initiatives and changes that occurred over the period. The syphilis outbreak began in the summer of 1997, followed by a number of initiatives, including new approaches to partner tracing and testing of a mass treatment program[10-12]. Increases in gonorrhoea were noted after the initial rise in syphilis, prompting increased screening and treatment efforts here, also. Recent efforts include population-specific programs and partnerships with existing community-based organizations[13-16].

Figure 4.1 illustrates the similarities and differences comparing STI prevalence among the CHASE population to annual STI reporting rates for the province and for Vancouver. The dotted line represents the rates calculated correcting for in-migration. This correction increases estimates for previous years; however, in all cases there remains an inflection around 1996-97 with a subsequent rise in infections.

Although chlamydia rates are higher in the CHASE cohort, the prevalence mirrors that seen for Vancouver. Gonorrhoea rates estimated for the CHASE cohort were unstable due to the small numbers, but were on average 20-40 times higher that the rates found for Vancouver. The

Vancouver syphilis trends were loosely mirrored in the CHASE cohort, although there was more fluctuation in the latter. While there was an overall significant increase in syphilis within both populations, the decrease from 1998 to 2000 in the Vancouver region was shifted forward two years in the CHASE cohort.

Increases in positive tests from 1997 to 2001 were paralleled by increases in having received any test (Figure AII.1). In recent years, testing leveled off, while positive STI diagnoses continued to decrease. When stratifying STI testing rates by type of test, it is apparent that syphilis testing (>5-fold increase) contributed largely to the observed increase in tests performed. Chlamydia and gonorrhoea testing also showed increases of approximately 2.2-fold and 1.7-fold, respectively.

Among males, gonorrhoea was the most prevalent first STI (47%), followed by chlamydia (42%), while 10% had dual infections. Among females, trichomonas was the most prevalent first infection (46%), followed by chlamydia (30%) and gonorrhea (14%). Again, approximately 10% had more than one infection, with 20% of these being dual chlamydia and gonorrhea, 73% being trichomonas and either chlamydia or gonorrhea, and 7% being all three. Overall, 43% of female participants (63/146) had a subsequent STI infection, while 24% (10/42) of male participants had a subsequent STI over the entire study period. Restricting the follow-up time to 18 months reduced the proportion with re-infections to 25% among females and 10% among males. Re-infection with the same versus a different STI was not significantly different, nor was the proportion re-infected different depending on first STI diagnosis. STI-specific reinfection rates for females were as follows: chlamydia, 1.1 per 1000 person months (0.4-2.9); gonorrhoea, 1.9 per 1000 person months (0.6-5.9); and trichomonas, 4.5 per 1000 person months (3.0-6.8).

For men, re-infection rates for chlamydia and gonorrhoea were 1.6 (0.4-6.5) and 2.7 per 1000 person months (1.1-6.5), respectively.

Survival curves by gender and calendar year of first infection and adjusted for age at first infection are shown in Figure 4.2. As expected, females had a two-fold higher hazard for a subsequent STI test result at a later date compared to males (HR:2.01, 95%CI: 1.03-3.91). Among females, having a first infection in the latest time period (2001-2005) appeared to decrease the time to second infection, at least in the first 20 months. This difference in survival functions by year of first infection was not significant, with a p-value of 0.36 after 2 years of follow-up and a p-value of 0.57 after 5 yrs of follow-up. Among those with a second infection, there was no significant difference between time to re-infection with the same STI (i.e. time from first chlamydia to second chlamydia, or first gonorrhoea to second gonorrhoea) and time to a different infection (p=0.54). As chlamydia re-infection rates have been noted to be increasing provincially, the overall rates were calculated for chlamydia re-infection pre- and post 1998. In this population, there was no significant difference (p=0.36), with rates of 2.95 per 1,000 person-months from 1991 to 1998 (95% CI: 1.11 to 7.85) and 1.55 per 1,000 person-months from 1999 to 2005 (95% CI: 0.65 – 3.72).

Univariate and multivariate hazard ratios for subsequent STI are shown in Table 4.2. Only age at first infection was inversely associated with an increased hazard of second STI for both males and females, with those under 25 years of age at the highest risk. Although the hazard ratios for age categories did not reach statistical significance among females, the trend across all three categories was marginally significant (p=0.095) Calendar period did not have a significant association with the hazard of a subsequent positive STI test in the adjusted models.

DISCUSSION

STIs remain an important burden in this disenfranchised community. Nonetheless, there is some suggestion that outreach efforts, which have been bolstered in the years since the beginning of the syphilis outbreak, have had an impact.

Syphilis and gonorrhoea, which were highest between 1998 and 2001, both showed recent decline. Although syphilis increased again in 2005, it remained lower than the previous two peaks. This is encouraging especially when observing the continued increase in positive syphilis tests in the larger community. Chlamydia continued to fluctuate at higher levels than were observed prior to 1997, likely due in part to improved testing techniques[18]. Other research in Canada, England and Australia have also indicated the impact of changes in testing on surveillance trends[19-21]. The absence of cases in 2005 may indicate a decline, although it should be noted that the number of recorded tests in this year dropped by 50%. Thus, the decline may be an artifact due to increased use of private laboratories by clinics servicing this community.

Although directly implicating the environmental changes and interventional efforts on STI rates is difficult, it is still interesting to note how particular events map onto yearly trends. The increased tracking, testing and treatment for syphilis initiated in 1998, along with the piloting of a mass treatment initiative in 1999, were reflected by decreases in observed rates in the Vancouver region[22]. In early 2000, mass treatment was carried out targeting the DTES, resulting in the lowest number of cases since the beginning of the outbreak; however, a rebound in 2001 was followed by a sustained increase. One explanation was the increase in susceptible individuals following the mass treatment. In contrast, decreasing numbers of syphilis cases were seen until 2002 among the smaller CHASE cohort.

There are two possibilities that might explain the differences observed. First, the syphilis cases seen in the CHASE cohort may represent lower-risk networks into which the syphilis outbreak was introduced from high-risk core or bridging groups. After the mass treatment campaign, which did not target this lower-risk group, cases emerged and were treated, and following this it took longer before bridging networks re-introduced syphilis into the population. Alternatively, and perhaps more likely, the cases seen in 2000 may have been high-risk individuals not reached during the mass treatment, but later discovered through intensified case finding, while mass treatment was successful at limiting the subsequent spread until 2003. This 2-3 year time lapse before an increase in cases fits with that estimated from mathematical models of mass treatment in other areas[23]. The large increase seen in 2003 may also have resulted from increased social networking involving peers, thereby increasing the number of cases *found* in this year. This peak in 2003, then, is potentially shifted to the right. In the case of the latter scenario, the importance of peer-driven strategies to find cases in a population such as that represented by the CHASE group is highlighted.

It is notable that the CHASE population was consistently over-represented among regional syphilis cases, accounting for 0.6% of the population, but 2.7%, 25% and 10% in 1997, 2000 and 2003, respectively. The latter drop occurred even though the number of CHASE cases was at its highest that year. While the exact reasons remain difficult to discern, there does appear to be a shift in the DTES epidemic, influenced partially by the numerous control and prevention efforts. It remains to be seen if regional cases will decline, or whether the epidemic has shifted into other high-risk networks.

The proportion of participants with a subsequent positive STI visit – 43% of women and 24% of men – was similar to those reported by other studies[24-27]. Of note, however, was the longer

median time to subsequent infection. Studies with active surveillance have reported 23% re-infection with trichomonas in adolescents within 3 months[24], 13% re-infection with chlamydia among young women within 4 months[28] and as high as 73% of women re-infected with chlamydia or gonorrhea within 7 months[25]. In contrast, the median time to subsequent infection in this cohort was 18 months. However, aside from active follow-up, the younger age groups of these former studies may contribute to the differences in rates. A study among STI clinic attendees using passive surveillance found 14% returning with a positive diagnosis within one year[29], and a retrospective study among army recruits found a chlamydia re-infection rate of 4.3 per 1000 person months[30]. Nevertheless, given the high rate of re-infection in women, especially with regards to trichomonas, a follow-up program for re-testing among women tesing positive for trichomonas infection should be considered. While a similar program was piloted for gonorrhea infection in Baltimore and was not found to be effective[31], the established outreach programs already in place and the higher proportions of trichomonas re-infection may make this type of intervention useful in this setting.

Subsequent STI infection was found to be associated only with younger age (<25 years) in this cohort. This is also similar to what has been found by other research[29]; however, in many settings ethnicity has also been found to be a predictor, which was not the case in this study[29, 31]. While calendar year of first infection did not show any trend with increased hazard of subsequent infection, as has been noted for chlamydia in the provincial data, this may be partially due to the skewed age distribution of this cohort. The hypothesis has been put forward that population level immunity to chlamydia may be decreasing due to the efficient treatment, leading to the continued rise in infections since the late 1990's[32].

The main strength of the CHASE survey is its size and broad representation of a high-risk region, as well as the ability to link to other data sources. It provides a specific window on a community that contributes a disproportionate number of STI cases to provincial estimates.

There are some notable limitations. First, the sample is not generalizable to the larger population, although it is representative of the high-risk community of the DTES. While this community is unique, the results generated by the CHASE project may be generalizable to other geographically concentrated high-risk communities. Second, the yearly period-prevalence ratios reported here are underestimates of the true prevalence. Asymptomatic cases and patients treated symptomatically, as well as cases tested through private laboratories are not captured.

Overall, the CHASE cohort mirrored the rise in STIs after declining or steady rates of STIs seen prior to 1996, both provincially and nationally. Targeted testing and treatment, as well as increased opportunities to access care may have contributed to some decline in STIs among the CHASE cohort in recent years. While declines in later years could be due to an aging or cohort effect, especially in the case of syphilis as only first positive event was considered; however, as only the last year showed a 'steady' decline, and as the overall prevalence of first syphilis event was 3%, it is not likely that this is due to a cohort effect. It is possible that aging of the population led to decreases in risky behaviours over time; again, however, one would expect to see a decline sooner than in the final year. For Chlamydia and gonorrhea, although these infections can be acquired repeatedly thereby lessening the effect of the closed cohort, there may be some immunity conferred after multiple infections, which could lead to spurious declines in the data. Again, however, the overall prevalence of GC and CT was only, 2.2% and 2.9%, respectively, much lower than has been seen in other similar high-risk neighbourhood studies, suggesting that a threshold or saturation was not reached.

The comparison of syphilis rates between the CHASE cohort and the larger Vancouver area provides some interesting observations. Chlamydia rates in this cohort did not appear to differ substantially from regional rates; syphilis and gonorrhea, on the other hand, exhibit much higher rates in the CHASE cohort. Using regional data, the syphilis epidemic originally peaked in 1998, dropping off following intensive intervention efforts in the area. However, restricting to the CHASE cohort, there was fluctuation with the highest peaks seen in 2000 and 2003. This may represent hard-to-reach cases found later in the epidemic through partner-tracing efforts. Another intersting point is the shift in case representation. Although the highest number of cases in the CHASE cohort were seen in 2003, the proportion of CHASE cases represented in the regional data were much lower than in previous years. This may indicate potential changes in the sexual networks or shifts in the populations in which the ongoing epidemic is circulating.

The description and comparison of STI trends, while not offering definitive evidence of the impact of any particular program, can generate theories about what might be working and why. For example, increases in testing rates, especially among men, were seen after the introduction of new laboratory techniques allowing non-invasive speciman collection. Even after syphilis testing rates rose dramatically and mass treatment was used to try and curb the epidemic, a number of cases were found, potentially pointing out the positive impact of enhanced partner tracing and peer-based social networking strategies. These observations offer important discussion points for future intervention strategies.

Table 4.1: Policy, programmatic and testing changes in British Columbia, 1997-2003

Year		Event
1997	**a.**	4 new Street Nurses funded
	b.	Immigrant / Refugee Women's health care program initiated
	c.	Syphilis outbreak begins: summer of 1997
1998	**d.**	Chlamydia partner tracing initiated
	e.	Female condom: promotion & distribution begun
	f.	Increase in syphilis testing, tracking and tracing
1999	**g.**	More sensitive nucleic acid amplification technique used for chlamydia, allowing more sensitive urine testing
	h.	Control efforts for syphilis and gonorrhoea outbreaks enhanced
	i.	Pilot for syphilis mass treatment / prophylaxis completed
	j.	Concerted effort/ support given to peer education outreach among youth and hard-to-reach immigrant populations
2000	**k.**	Mass Treatment campaign carried out (~6,000 people treated)
2001	**l.**	Education efforts and application of more intensive partner tracing (social networking)
2002	**m.**	Social networking strategy fully implemented to curb ongoing syphilis epidemic; Vancouver Area Network of Drug Users (VANDU) project: employing peers to aid with social networking
	n.	Health fairs (4 for at-risk youth, 2 for DTES residents) organized
	o.	Asian Society for Intervention AIDS (ASIA) Project: culturally appropriate prevention strategies for sex workers in massage parlours
2003	**p.**	WISH / YAC (women's and youth centres) added to Street Nurse outreach locations
	q.	Papalooza (Pap screening blitz) carried out by street nurses

Figure 4.1 a: Yearly period-prevalence of chlamydia in BC, Vancouver and the CHASE cohort, 1991-2004

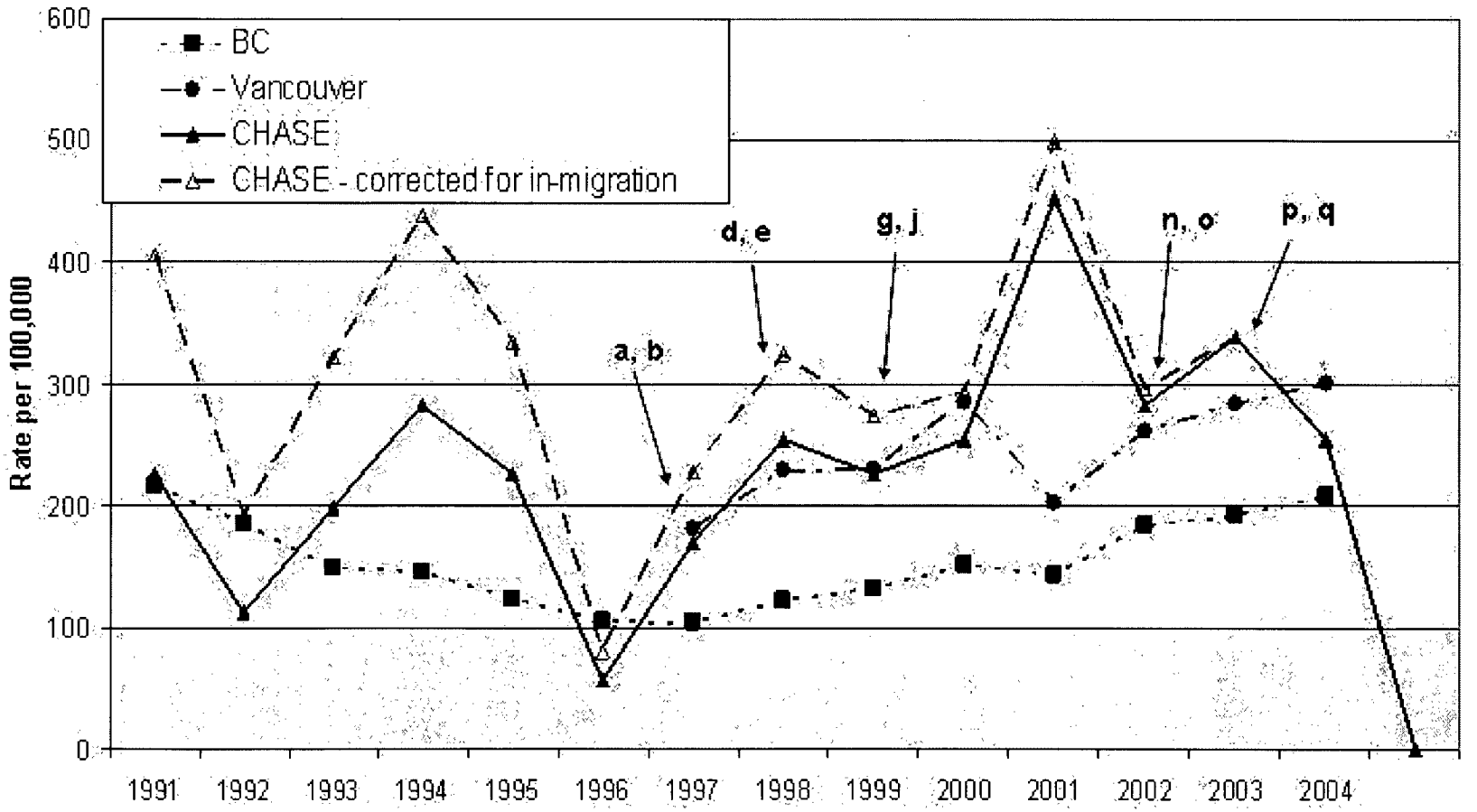


Figure 4.1 b: Yearly period-prevalence of syphilis in BC, Vancouver and the CHASE cohort, 1991-2004

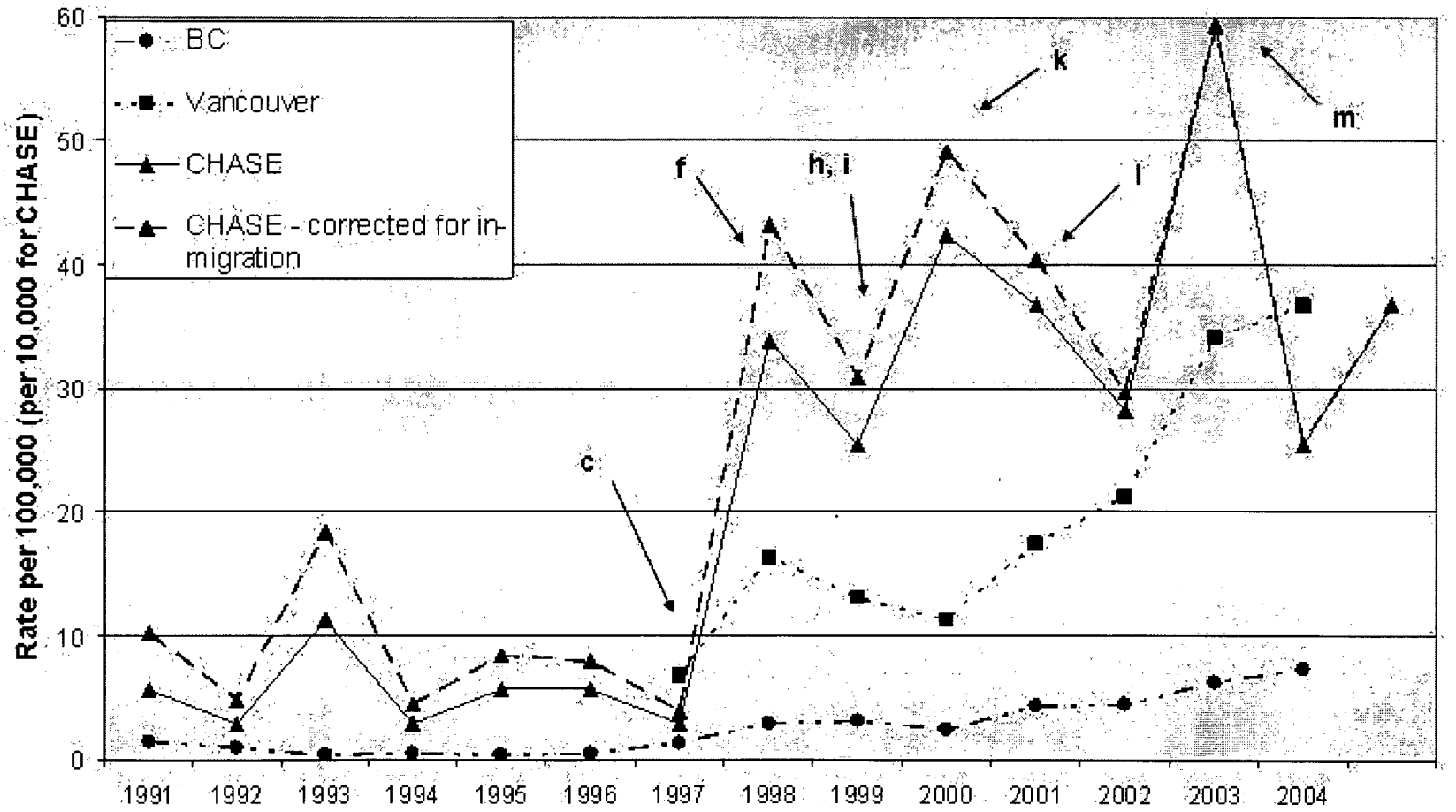


Figure 4.1 c: Yearly period-prevalence of gonorrhoea in BC, Vancouver and the CHASE cohort, 1991-2004

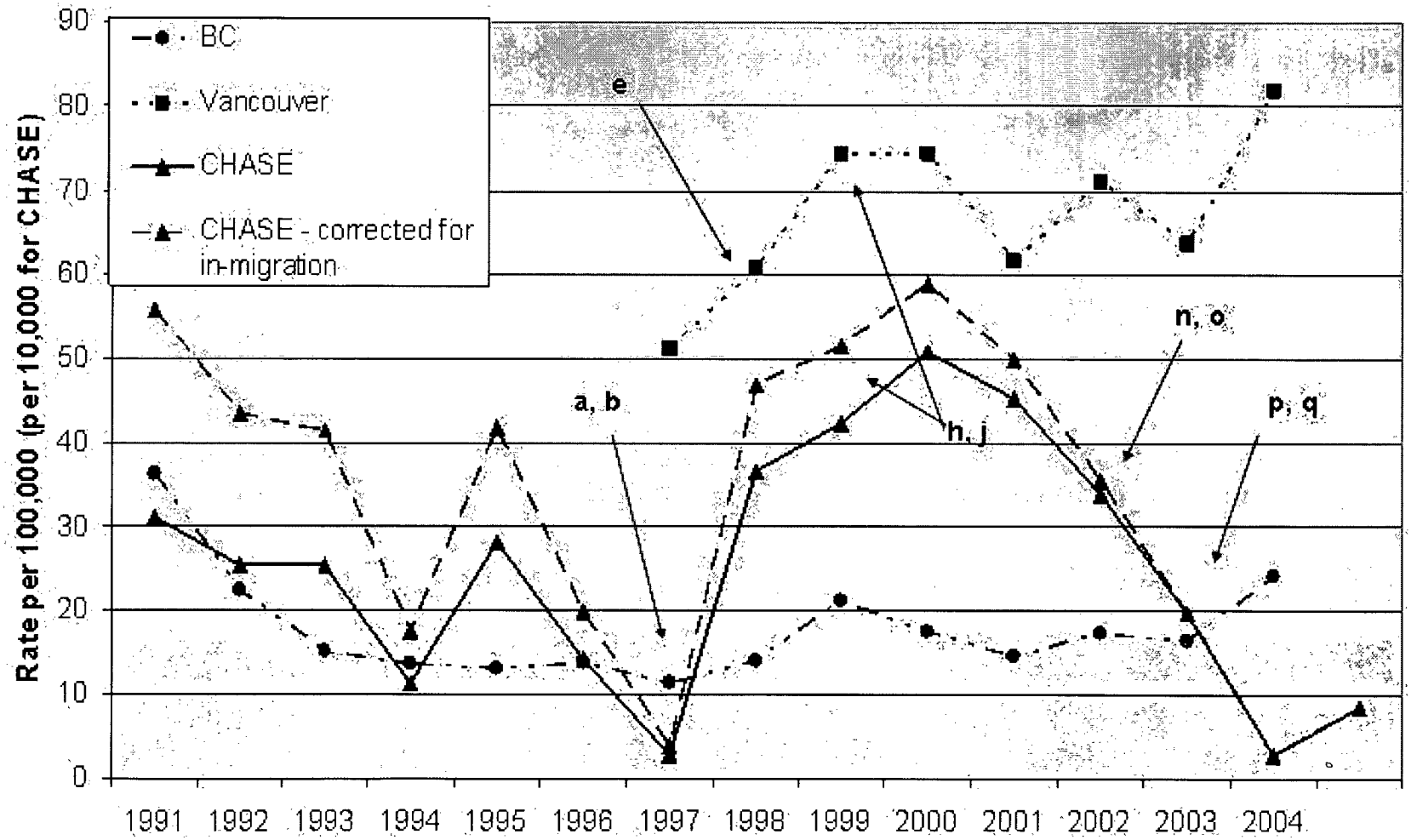
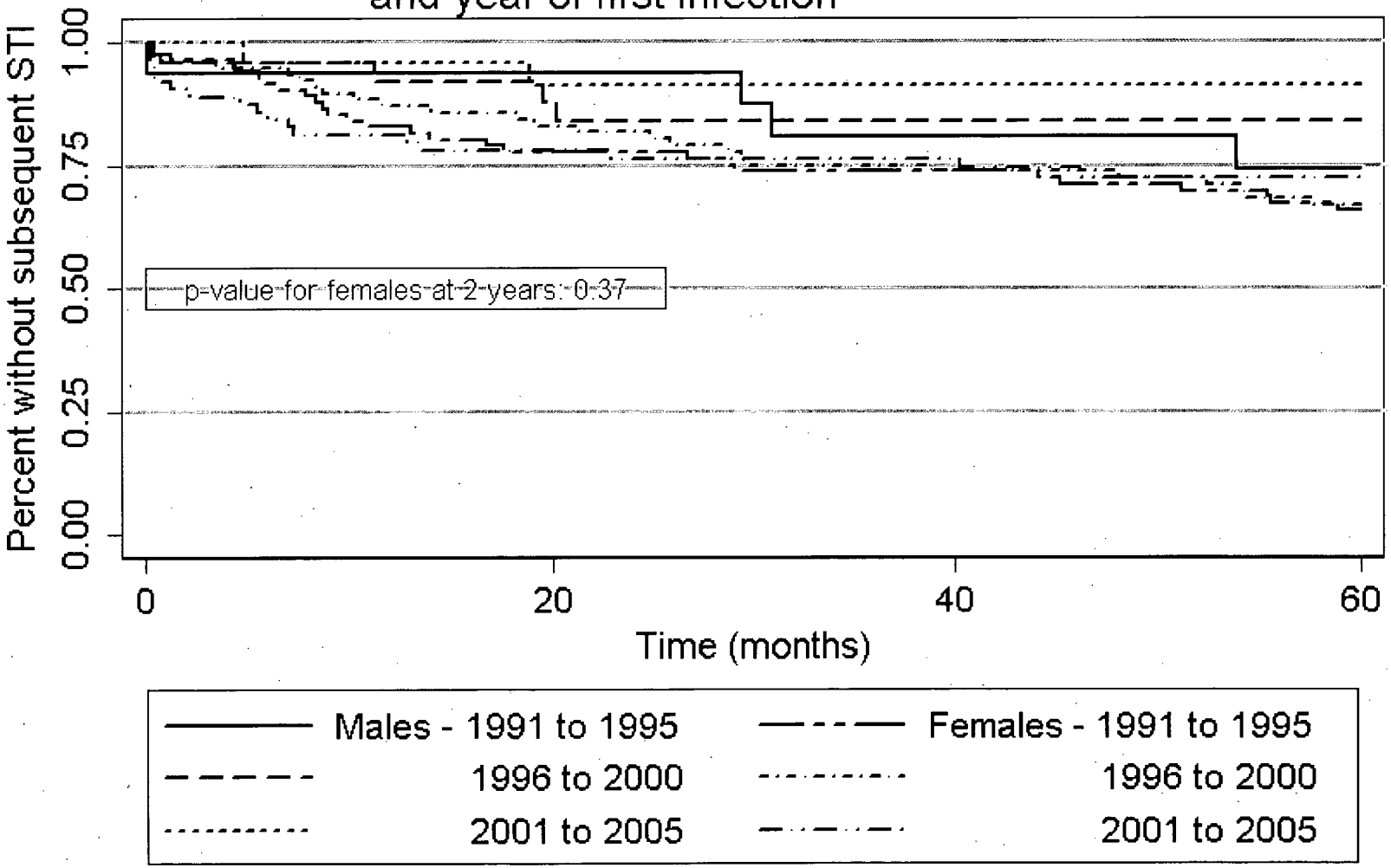


Figure 4.2: Time to subsequent STI, by gender and year of first infection



*adjusted for age at first infection

Table 4.2: Unadjusted and Adjusted Hazards of Second Chlamydia, Gonorrhea or Trichomonas (for females) Infection among CHASE participants, 1991 to 2005.

	Females		**Males**	
	HR (95% CI)	***AdjHR* (95% CI)**	**HR (95% CI)**	**AdjHR (95% CI)**
Year of first infection				
1991-1995	1.00	1.00	1.00	1.00
1996-2000	**0.53 (0.29-0.99)**	0.59 (0.32-1.12)	0.62 (0.15-2.48)	0.85 (0.19-3.85)
2001-2005	0.77 (0.41-1.44)	0.90 (0.47-1.75)	0.44 (0.08-2.43)	0.37 (0.07-2.08)
Age				
<25	1.00	1.00	**1.00**	**1.00**
26-34	0.86 (0.48-1.53)	0.80 (0.44-1.46)	**0.11 (0.01-0.92)**	**0.09 (0.01-0.79)**
35+	0.60 (0.32-1.11)	0.59 (0.31-1.14)	**0.22 (0.05-0.89)**	**0.21 (0.05-0.91)**
Aboriginal, Inuit or Metis	1.08 (0.66-1.78)	--	1.85 (0.52-6.58)	
High School Education	1.32 (0.79-2.20)	1.42 (0.84-2.40)	0.82 (0.20-3.32)	
First STI		---		
Chlamydia	1.00		1.00	
Gonorrhoea	0.95 (0.43-2.10)		0.85 (0.24-2.93)	
Trichomonas	0.99 (0.55-1.77)		--	
Multiple	1.55 (0.62-3.90)		--	
Multiple STIs at first event	1.58 (0.68-3.66)	1.63 (0.70-3.82)	--	
HIV infection	0.86 (0.31-2.37)	0.96 (0.34-2.66)	1.19 (0.15-9.46)	1.54 (0.16-15.0)

References

1. Jolly AM, Wylie JL. Gonorrhoea and chlamydia core groups and sexual networks in Manitoba. *Sex Transm Infect* 2002; 78(suppl1): i145-51.

2. Health Canada. Proceedings of the National STD Consensus Meeting and National Goals for the Prevention and Control of Sexually Transmitted Diseases in Canada. *Can Commun Dis Rep* 1997; 23: S6.

3. Wong T, Singh A, Mann J et al. Gender Differences in Bacterial STIs in Canada. *BMC Womens Health* 2004; 4(Suppl 1): S26.

4. Aral S, Blanchard J. Phase specific approaches to the epidemiology and prevention of sexually transmitted diseases. *Sex Transm Dis* 2002; 78(Suppl 1): i1-2.

5. Fenton K, Mercer C, Johnson A et al. Reported Sexually Transmitted Disease Clinic Attendance and Sexually Transmitted Infections in Britain: Prevalence, Risk Factors, and Proportionate Population Burden. *J Infect Dis* 2005; 191(Suppl 1): S127-38.

6. Haley N, Roy E, Leclerc P, et al. Risk behaviours and prevalence of Chlamydia trachomatis and Neisseria gonorrhoeae genital infections among Montreal street youth. *Int J STD AIDS* 2002; 13(4): 238-45.

7. Poulin C, Alary M, Berneir F, et al. Prevalence of Chlamydia trachomatis and Neisseria gonorrhoeae among at-risk women, young sex workers and street youth attending community organizations in Quebec City, Canada. *Sex Transm Dis* 2001; 28(8): 437-43.

8. Spittal PM, Craib KJP, Wood E, et al. Risk Factors for Elevated HIV Incidence Rates Among Female Injection Drug Users in Vancouver. *Can Med Assoc J* 2002; 166(7): 891-9.

9. Tyndall M, Patrick D, Spittal P, et al. Risky sexual behaviours among injection drug users with high HIV prevalences: implications for STD control. *Sex Transm Infect* 2002; 78(Suppl 1): i170-5.

10. BC Centre for Disease Control. *STD/AIDS Control: Annual Report 1997.* Vancouver, BC: Provincial Health Services Authority, 1997.

11. BC Centre for Disease Control. *STD/AIDS Control: Annual Report 1998.* Vancouver, BC: Provincial Health Services Authority, 1998.

12. BC Centre for Disease Control. *STD/AIDS Control: Annual Report 1999.* Vancouver, BC: Provincial Health Services Authority, 1999.

13. BC Centre for Disease Control. *STD/AIDS Control: Annual Report 2001.* Vancouver, BC: Provincial Health Services Authority, 2000.

14. BC Centre for Disease Control. *STD/AIDS Control: Annual Report 2002.* Vancouver, BC: Provincial Health Services Authority, 2001.

15. BC Centre for Disease Control. *STD/AIDS Control: Annual Report 2003.* Vancouver, BC: Provincial Health Services Authority, 2002.

16. BC Centre for Disease Control. *STD/AIDS Control: Annual Report 2004.* Vancouver, BC: Provincial Health Services Authority, 2003.

17. Health Canada. *National STD Guidelines, 1998.* Ottawa, ONT: Government of Canada.

18. Division of STD Prevention and Control. 1998/1999 Canadian Sexually Transmitted Diseases (STD) Surveillance Report. 26S6. 2000. Ottawa, Ontario, Health Canada.

19. Burckhardt F, Warner P, Young H. What is the impact of change in diagnostic test method on surveillance data trends in Chlamydia trachomatis infection? *Sex Transm Infect.* 2006;82:24-30.

20. Vajdic CM, Middleton M, Bowden FJ, Fairley CK, Kaldor JM. The prevalence of genital Chlamydia trachomatis in Australia 1997-2004: a systematic review. *Sex Health.* 2005;2:169-183.

21. Forward KR. The impact of switching to polymerase chain reaction for the diagnosis of Chlamydia trachomatis infections in women. *Can J Public Health.* 2003;94:229-232.

22. Pourbohloul B, Rekart ML, Brunham RC. Impact of mass treatment on syphilis transmission : a mathematical modeling approach. *Sex Transm Dis* 2003; 30(4): 297-305.

23. Korenromp EL, Vliet CV, Grosskurth H et al. Model-based evaluation of single-round mass treatment of sexually transmitted diseases for HIV control in a rural African population. *AIDS* 2000; 14: 573–93.

24. Van Der Pol B, Williams JA, Orr DP, Batteiger BE, Fortenberry JD. Prevalence, incidence, natural history and response to treatment of Trichomonas vaginalis infection among adolescent women. *J Infect Dis* 2005; 192(12):2036-2038.

25. Orr DP, Johnston K, Brizendine E, Katz B, Fortenberry JD. Subsequent sexually transmitted infection in urban adolescents and young adults. *Arch Pediatr Adolesc Med* 2001; 15598):947-953.

26. Niccolai LM, Kopicko JJ, Kassie A, Petros H, Clark RA, Kissinger P. Incidence and predictors of reinfection with Trichomonas vaginalis in HIV-infected women. *Sex Transm Dis* 2000;27(5):284-288.

27. Fortenberry JD, Brizendine EJ, Katz BP, Wools KK, Blythe MJ, Orr DP. Subsequent sexually transmitted infections among adolescent women with genital infection due to Chlamydia trachomatis, Neisseria gonorrhoeae, or Trichomonas vaginalis. *Sex Transm Dis* 1999;26(1):26-32.

28. Whittington WL, Kent C, Kissinger P, et al. Determinants of persistent and recurrent Chlamydia trachomatis infection in young women: results from a multicenter cohort study. *Sex Transm Dis* 2001; 28(2):117-123.

29. Hughes G, Brady AR, Catchpole MA, et al. Characteristics of those who repeatedly acquire sexually transmitted infections: a retrospective cohort study of attendees at three urban sexually transmitted disease clinics in England. *Sex Transm Dis* 2001; 28(7):379-386.

30. Barnett SD, Brundage JF. Incidence of recurrent diagnoses of Chlamydia trachomatis genital infections among male and female soldiers of the US Army. *Sex Transm Infect* 2001; 77(1):33-36.

31. Bernstein KT, Zenilman J, Olthoff G, Marsiglia VC, Erbelding EJ. Gonorrhea reinfection among sexually transmitted disease clinic attendees in Baltimore, Maryland. *Sex Transm Dis* 2006;33(2):80-86.

32. Brunham RC, Pourbohloul B, Mak S, White R, Rekart ML. The unexpected impact of a Chlamydia trachomatis infection control program on susceptibility to reinfection. *J Infect Dis* 2005;192(10):1836-1844.

CHAPTER 5

USEFULNESS OF CLINIC-BASED PROGRAMS FOR STI SCREENING AND TREATMENT INTERVENTIONS*

* A version of this chapter is in preparation for submission to Sexually Transmitted Infections

INTRODUCTION

Sexually transmitted infections (STIs) remain a significant health problem in terms of direct costs, long-term complications and increased risk of more serious infections such as HIV[1-3]. While the rates of STIs had declined during the 1980's and 1990's, a shift occurred at the end of 1990's, when STIs began a resurgence, again raising concerns about inadequate prevention efforts, increasing risk behaviours, and the impact of STIs on HIV transmission[4,5]. Syphilis outbreaks have been reported in populations in the US, Canada and several European countries, while gonorrhoea and chlamydia have increased from rates that had previously given rise to national eradication goals[4-11].

Prevalence studies among high-risk populations, such as street youth and illicit drug users, have found rates of chlamydia and gonorrhoea ranging from 3% to 8%, ten to fifteen times higher than those reported through general population surveillance[12-14]. Screening studies among commercial sex workers (CSW) have found rates five to thirty times higher than the general population[15-17]. Targeting identifiable risk groups is logical; however, several studies in the US have also reported high rates of STIs when sampling more generally from low-income neighbourhoods[18-20]. In communities where there are multiple risk factors, sexual health initiatives that focus on CSW or illicit drug using populations specifically may miss women who are linked into high-risk sexual networks through their partners[21,22].

In addition to being at higher risk for infection biologically, women are also more prone to long-term morbidities due to STIs[1,3,23]. The high rates of asymptomatic infections can also make it difficult to detect and treat STIs among women who are not regularly accessing sexual health care[23]. These problems can be magnified in populations of vulnerable women living in low

socioeconomic communities, where poverty, drug addiction, homelessness, mental illness and the inherent dangers of commercial sex work overshadow sexual health concerns[24-26]. Providing services that are meaningful, accessible and non-threatening is essential to improve the uptake of sexual health services. In any program, it is important that collaboration with the community is sought in order to most effectively reach marginalized women and provide them with the appropriate services[25]. Collaboration with community partners and service users provides voice to the practical barriers, needs and expectations of community members, thus maximizing utilization and reach of initiatives. Localized services are important, but may not be enough in the face of competing priorities, difficulties understanding the health care system, cost barriers, as well as fear and distrust of government organizations. Outreach services and initiatives that are culturally appropriate for the community (and for sub-groups within the community) are especially important for issues surrounding sexual health care. Outreach and peer methodologies have been shown to have the greatest reach and impact in these communities[27-29].

With new technologies, innovative ways of accessing high-risk communities for sexual health care are being initiated[30]. For example, nucleic acid testing provides accurate diagnosis through urine samples, and self-sample collection has been shown to be both feasible and acceptable to women[31,32]. While regular access to full sexual health services (i.e. cervical exam) should be encouraged, limited clinic hours and long wait times present barriers to care for many women, while others simply do not want to undergo a full exam[26]. Regular screening of identified high-risk women (e.g. active CSW) has been shown to be effective in many low and middle-income countries, where there is high prevalence of STIs[33]. In industrialized cities, there are often pockets of high-risk individuals living in concentrated areas among whom other methods of STI control have been tried, including presumptive treatment, mass treatment or targeted screening

through outreach methods[13,29,34,35]. There are social, cultural and disease-specific variables that can affect both the course of STI transmission and the acceptability and effectiveness of different public health approaches. It is therefore important to understand the dynamics of the population in order to implement effective programs.

In this study, we partnered with a local community clinic offering a weekly program for women in order to examine the feasibility and acceptability of STI screening in this venue. Potential impact of a screening initiative was assessed through a description of the population including sexual behaviours, sexual health care and previous STI prevalence.

METHODS

A survey and urine screen was carried out among 126 women attending a weekly program exclusive to women (including transgendered individuals) held at a local community health clinic. The program is attended regularly by a generally older, more stable cohort of women, while younger and higher risk women drop-in for meals or health care infrequently. The weekly, three-hour evening program offers women a safe place to access food and health care, as well as to socialize with other women, and take part in various activities including free haircuts, foot baths, art projects, and movie nights. There is also access to doctors and nurses, counselling services and massage therapy. While the program is not overtly advertised, there are fliers up at the clinic and at certain other community organizations frequented by women. Women were invited to take part in the study at the start of each evening. Although there was no overt advertising for the study, snowball sampling through word-of-mouth (i.e., CSWs telling other CSWs about the study) was used to recruit women into our study, especially those women who may not have been accessing the evening program on a regular basis.

The 27-item survey was used to gather data to describe the socio-demographic characteristics of the study participants, their use of and contact with services available in their community (including their contact with outreach programs, outreach workers and street nurses), as well as their self-reported patterns of sexual behaviour and drug use. We also asked questions about their use of sexual health care services such as annual Pap smears and testing or treatment for STIs.

For sexual behaviour questions, partner type was defined as follows. A regular partner was someone that the participant had been having sex with more than once a month for at least three months. A casual partner was someone that the participant had been having sex with once a month or less, or someone they had been having sex with for less than three months, including one-night stands. A client was someone that the participant had traded sex with for money, drugs, food or shelter. For each partner type, frequency of condom use (never, less than ½ the time, ½ the time, more than ½ the time, always) was asked.

Participants were given a copy of the consent form, and study coordinators read through the details of participation before asking for their consent. Participants were able to take part in the interview regardless of whether they provided a urine sample for STI testing. Treatment for positive STI results was provided through the clinic doctors as per established STI testing and treatment protocols. Participants received $10 remuneration for completing the survey.

Urine samples were tested by the BC CDC provincial laboratory using nucleic acid amplification techniques (NAAT) as per standard protocols[36]. In addition, consent was sought from participants to link survey data to the BC CDC laboratory database. As with the urine testing, this consent was not required to take part in the interview.

Chlamydia, gonorrhoea and syphilis testing information were extracted from the CDC database. Positive chlamydia was defined as a positive test result by culture, enzyme immunoassay or polymerase chain reaction (PCR). Gonorrhoea positivity was determined by culture. For syphilis, only the first positive case was used. Although this may exclude people who were treated and become re-infected, it avoids misclassification of those who remain reactive at follow-up. Syphilis was deemed positive only for those with a positive RPR plus at least one treponemal specific test - Fluorescent Treponemal Antibody or Micro-hemagglutination Assay - recorded for that individual within a one-month period. It is important to note that the clinical diagnoses (i.e. primary, secondary or tertiary syphilis) were not available; therefore the reported rates are of cumulative exposure to syphilis rather than incident infection.

Demographics and drug use behaviors were described for the participants of the women's program and comparison was done between those providing and those not providing a urine sample for STI screening. Sexual behaviors, including number and types of partners, condom use, and frequency of sexual health care were compared by sex work status (non-, former and current CSW). Dichotomous variables were compared using the chi-square test for significance, while continuous variables were compared using the Kruskal-Wallis test. The gender-specific Vancouver incidence ratios for chlamydia, gonorrhoea and syphilis were estimated from the BC CDC annual report for 2004, applying the provincial disease-specific gender ratios to the total Vancouver cases. The binomial probability test was used to compare STI levels in the two populations.

RESULTS

Table 5.1 includes a description of the gender, age and ethnicity of the participants. A small number of trans-gendered participants (n=4) were enrolled in the study. The median age of the

population was 42 years; women who were currently involved in the sex trade had a median age of 40 years (p=0.03). More than half of the participants self-identified as White (52%), while 40% identified as Aboriginal or Metis. Approximately 40% of the participants were active CSWs and 30% were former CSWs. Women who were still active in CSW had been involved for a median of 10 years. Overall, Aboriginal women were more likely to have ever been involved in the sex trade (76% versus 59%, p=0.02). There were no significant differences between those who provided urine for STI screening and those who did not.

Table 5.2 describes the number of partners reported by participants by type of partner. Most women, regardless of sex work status, reported only one regular partner. For casual partners, the median number reported for the previous six months was also one (regardless of sex work), although former and current sex workers were more likely to report having a casual partner.

Participants were also asked about their use of condoms with specific partner types. Among CSW, consistent condom use with clients was reported by nearly 80% of participants; however, with regular or casual partners this dropped to one-third. Consistent condom use with casual partners was also around 30% for non- and former CSWs, while consistent use with regular partners was less than 20%. Among current CSWs, the frequency of engagement in oral sex did not significantly influence condom use. Specifically, the exclusion of CSW who practiced only oral sex with clients did not alter the estimate of consistent condom use (74% versus 76%); nor did the exclusion of CSW who practiced only vaginal sex with clients (79% versus 76%). However, the highest proportion of consistent condom use was found among CSW practicing oral sex exclusively (5 of 6; 83%), and the lowest proportion of consistent condom use was found among CSW practicing vaginal sex exclusively (4 of 7; 57%).

Ninety-two (73%) of the 126 participants submitted a urine sample for STI testing. There were no positive gonorrhoea screening tests, but there were two positive chlamydia tests (2.2%). Amongst those who reported sexual activity in the past six months (N=72), the chlamydia prevalence increases to 2.8%. Using the retrospective STI data, yearly prevalence ratios were similarly low with one to two cases per year among the 105 participants who consented and were successfully linked, as is illustrated in Table 5.3. Although numbers were small, half of the cases in 2004 (2 of 4) were uncovered through urine screening undertaken as part of this study.

Although the numbers were exceedingly small in the WN sample leaving little power to make the comparison with provincial data, the 2004 chlamydia prevalence ratio, excluding the cases discovered through screening, was marginally higher than the estimated incidence for the females in the Vancouver health region (1.9% versus 0.41%; p=0.067). Similarly, the gonorrhoea ratio was marginally higher (0.95% versus 0.065%; p=0.066) and the syphilis ratio was significantly higher (0.95% versus 0.019%; p=0.020).

DISCUSSION

The weekly clinic program is conducted in a community considered to be at high-risk for sexually transmitted infections and aims to attract marginalized women who may not attend regular clinics. As shown, the participants in this study included a high proportion of both current and former CSW. However, the rates of STIs amongst this study population were relatively low, as was demonstrated during both the screening activity and through the retrospective data linkages. While rates of 2-5% are higher than surveillance rates of the general population, they are typical of screening studies carried out among at-risk populations[12-14,37]. The relatively low rates found in our study (compared with other high-risk or CSW populations), may be attributed to timely access to care in this population through local clinics and intensive

public health and treatment outreach efforts. In addition to the community clinics and Street Nurse outreach teams, recent years have seen an increase in programs tailored for high risk women, such as the WISH drop-in centre, which may be connected women to more regular care. In addition, a twice-yearly pap 'blitz' program was recently initiated by the Street Nurse team, bringing sexual health care to women in a variety of locations.

The level of acceptability of providing a urine sample was similar to that seen in other studies, which have reported levels ranging from 72 to 84% among different populations of women and young adults[38-40]. It has been suggested that, due to the lowered positive predictive value, NAAT screening for STIs is not suitable in populations with prevalence of 2% or less[30]. Thus, given the low numbers seen in our study, urine screening is not a recommended means of detecting STIs in this type of venue. Outreach screening (e.g. Street Nurse programs) may better reach high-risk populations with higher prevalence, not already accessing services or attending health programs.

The demographics of the women's program attendees indicated a diverse group of women partake of the services offered through this venue; however, ethnic minorities other than First Nations were not well represented (e.g., Asian and South Asian women), and young women (under age 25) did not figure prominently in the sample. Of the subset of attendees that were active CSWs, there was a trend towards reaching a more established group who had been involved in the sex trade for an extended time ($\geq$ 10 years), were not highly active in the sex trade (Median 10 partners in past 6 months, IQR: 4 to 50) and who may have already been well connected with outreach workers in the area (and therefore potentially been more aware of the variety of programs and services offered).

Condom use was highest among sex worker-client partnerships. However, there remains some concern over the lack of condom use with non-paying regular and casual partners. Partner-specific condom use patterns have also been noted in other CSW populations[41,42]. This is especially concerning in a community with high levels of drug use, as even monogamous couples may be risking infection with HIV and other STIs. Condom use with regular or casual partners was also low among non- and former CSWs. It is interesting to note that approximately 33% of active CSW reported consistent condom use with their regular and casual partners, while non- and former CSW were less likely to use condoms with regular partners as opposed to casual partners (~10-15% versus 33%). This may reflect to some extent a more specific facet of the type of casual relationship. For example, as the frequency of contact with casual partners was higher among CSW, it may be that these were friends or acquaintances as opposed to unknown one-night stands.

The frequency of sexual health care check-ups does not differ substantially as compared to studies in the US and Canada, which range from 55% in the past year to 85% in the past three years[38-40]. Nonetheless, there remains a portion of the population that has not received any sexual health care in the past year (N=24/123 overall; N=16/98 among those reporting sexual activity). The lack of sexual health care among these women has important implications both for their own health - as unknown or unacknowledged infections may lead to more painful conditions, or may leave them more susceptible to other infections such as HIV – as well as for public health, as every untreated infection represents additional cases that may have been found through partner tracing, as well as cases that may have been prevented. While some of the women who did not report any sexual health care were not regular attendees, approximately half had been attending the women's program, indicating a possible missed opportunity among women who are present but not accessing the available sexual health care services. While

previous studies have in B.C. have found lower rates of cervical screening among Aboriginal women, this was not the case among the women's program participants[43].

Examining the demographics and behaviors of the participants of the women's program allows a better understanding of the effectiveness (or lack thereof) of an STI screening program in this venue. While the population accessing the program consisted of women with a variety of risk factors (e.g. active sex work, drug use, and inconsistent condom use), there were not high rates of STIs. Although the effectiveness of urine screening in this venue is not apparent, the women's program could be used to improve the knowledge and awareness of sexual health and STI issues in this population, and it remains a good access point for care and treatment among the population. This reaffirms other research that pointed out the need for programs targeting high-risk women to be specific to the location, as conditions and barriers vary widely[44].

There are limitations to the study. As noted above, the generalizability of the results are restricted to an older, service-connected population of women from the community. There is a potential for under-reporting on sensitive topics such as drug use and sexual behaviors, although the high proportions reporting these behaviors indicates that most women were comfortable disclosing this information. There is also a potential for misreporting of sexual health check-ups either due to forgotten events or over-reporting of the desirable behavior; however, the proportions receiving care were similar to those reported in other studies. Lastly, the prevalence estimates from the retrospective data linkage are underestimates of the true prevalence, since asymptomatic cases, presumptively treated cases, and cases tested through non-provincial laboratories were not captured.

The provision of adequate health care services, especially sexual health services for marginalized women in urban settings, remains challenging. Competing priorities, including poor housing, low income, child-care, substance misuse, and commercial sex work, can put sexual health on the "back-burner" for many women. In addition, health clinic settings may be avoided by women, or certain sub-groups of women, due to fear of judgment and stigmatization[26]. The stigma associated with STIs creates difficulties in seeking care and talking openly with health care providers or with other women. Programs, like the one described in this paper, may hold good promise for reaching highly stigmatized women and providing sexual health care (and other forms of support) in a safe, caring and accessible environment.

While screening high-risk populations may be beneficial for improving the sexual health of individuals and of the community it is apparent that this type of intervention needs to be more carefully evaluated according to the setting through which it is offered. In resource-poor settings where access to care is difficult, high-risk populations tend to have very high rates of STIs and screening and treatment may be warranted. In high-risk populations where care is widely available and more easily accessible, the utility of screening programs needs to be evaluated and potentially tailored in order to better serve the needs of particular populations that remain unable or unwilling to seek sexual health care in its current formats or offerings.

Table 5.1: Demographics of 126 participants and comparison of 92 providing urine samples for STI screening to 34 not providing samples for screening.

	Total (N=126)	Urine test (N=92)	No Urine Test (N=34)	p-value
Gender				
Female	96.8 (122)	97.8 (90)	94.1 (32)	0.292
Transgender	3.2 (4)	2.2 (2)	5.9 (2)	
Median age (IQR)	42 (36, 49)	43 (36, 49)	42 (38, 48)	0.897
Ethnicity				
White	52.4 (66)	51.1 (47)	55.9 (19)	0.826
Aboriginal	39.7 (51)	41.3 (38)	35.3 (12)	
Other	7.9 (9)	7.6 (7)	8.8 (3)	
Education				
<High school	59.5 (75)	58.7 (54)	61.8 (21)	0.755
High school	40.5 (51)	41.3 (38)	38.2 (13)	
Employment				
Any	5.6 (7)	94.6 (87)	94.1 (32)	0.922
None	94.4 (119)	5.4 (5)	5.9 (2)	
Drug Use				
None	14.3 (18)	15.2 (14)	11.8 (4)	
Any	81.7 (103)	83.7 (77)	76.5 (26)	0.523
Type:				
Injection	39.7 (48)	40.7 (37)	36.7 (11)	0.698
Non-injection	81.8 (99)	80.2 (73)	86.7 (26)	0.427
Alcohol	41.6 (52)	39.1 (36)	47.1 (16)	0.422
Women's Night Attendance				
Regular	23.5 (28)	26.1 (24)	20.6 (7)	0.794
Occasional	51.3 (61)	51.1 (47)	52.9 (18)	
Never	25.2 (30)	22.8 (21)	26.5 (9)	
Commercial Sex Work status				
Non-	30.2 (38)	30.7 (27)	35.5 (11)	0.562
Former	26.2 (33)	26.1 (23)	32.3 (10)	
Current	38.1 (48)	43.2 (38)	32.3 (10)	

Table 5.2: Number of partners and sexual behaviors in the previous 6 months among non-, former and current CSW, stratified by partner type

Sexual Behavior (past 6 mos)		**Non-CSW (N=38)** % (N)	**Former CSW (N=33)** % (N)	**Current CSW (N=48)** % (N)
Regular Partner	**Any partner(s),**	47.4 (18)	57.6 (19)	66.7 (32)†
	Median Partners (IQR)	1 (1, 1)	1 (1, 1)	1 (1, 1)
	Consistent Condom Use	11.8 (2)	16.7 (3)	34.4 (11)†
Casual Partner	**Any partner(s) (%)**	15.8 (6)	12.1 (4)	31.3 (15)†
	Median Partners (IQR)	1 (1, 1)	1 (1, 2)	1 (1, 3)
	Consistent Condom Use	33.3 (2)	25.0 (1)	33.3 (5)
Clients	**Median Partners (IQR)**	--	--	10 (4, 50)
	Median Years working (IQR)	--	--	10 (3, 18)
	Consistent Condom Use	--	--	77.1 (37)
Sexual Health (past year)				
	Pap smear	62.2 (23)	66.7 (22)	78.3 (36)
	STI testing or treatment	50.0 (11)	45.5 (10)	61.5 (29)*
	Neither Pap or STI testing	28.9 (11)	18.2 (6)	14.6 (7)

*** p <0.05; † p < 0.10**

Table 5.3: Cross-sectional prevalence of chlamydia and gonorrhoea, as determined by PCR of urine samples, and prevalence of chlamydia, gonorrhoea and syphilis from 2000-2004 determined by database linkage

	Cross-sectional prevalence, % (N)	Yearly prevalence, % (N)				
		2000	2001	2002	2003	2004
Chlamydia	2.8 (2)	0	1.90 (2)	0.95 (1)	0	1.90 (2)
Gonorrhoea	0.0	0.95 (1)	0.95 (1)	0	0	0.95 (1)
Syphilis	--	0.95 (1)	0	0.95 (1)	0	0

Reference List

(1) Dallabetta G, Kamenga MC, Field ML. Infections of the Female Pelvis Including Septic Abortion. In: Cohen J, Powderly WG, eds. *Infectious Diseases*. 2nd ed. London: Mosby, Inc.; 2004:693-5.

(2) Fleming DT, Wasserheit JN. From epidemiological synergy to public health policy and practice: the contribution of other sexually transmitted diseases to sexual transmission of HIV infection. *Sexually Transmitted Infections*. 1999;75:3-17.

(3) Sobel JD. Vaginitis, Vulvitis, Cervicitis and Cutaneous Vulval Lesions. In: Cohen J, Powderly WG, eds. *Infectious Diseases*. 2nd ed. London: Mosby, Inc.; 2004:683-92.

(4) Health Canada. Proceedings of the National STD Consensus Meeting and National Goals for the Prevention and Control of Sexually Transmitted Diseases in Canada. 23, S6. 1997. Canadian Communicable Disease Reports.
Ref Type: Report

(5) Hansen L, Wong T, Perrin M. Gonorrhoea Resurgence in Canada. *International Journal of STD & AIDS*. 2003;14:727-731.

(6) Patrick D, Rekart ML, Jolly A et al. Heterosexual outbreak of infectious syphilis: epidemiological and ethnographic analysis and implications for control. *Sexually Transmitted Infections*. 2002;78:i164-i169.

(7) Ashton M, Sopwith W, Clark P, McKelvey D, Lighton L, Mandal D. An outbreak no longer: factors contributing to the return of syphilis in Greater Manchester. *Sexually Transmitted Infections*. 2003;79:291-293.

(8) Hopkins S, Lyons F, Coleman C, Courtney G, Bergin C, Mulcahy F. Resurgence in infectious syphilis in Ireland: an epidemiological study. *Sexually Transmitted Diseases*. 2004;31:317-321.

(9) Michaud JMM, Ellen JM, Johnson SM, Rompalo AM. Responding to a Community Outbreak of Syphilis by Targeting Sex Partner Meeting Location:: An Example of a Risk-Space Intervention. [Article]. *Sexually Transmitted Diseases*. 2003;30:533-538.

(10) Chen JL, Kodagoda D, Lawrence AM, Kerndt PR. Rapid public health interventions in response to an outbreak of syphilis in Los Angeles. *Sexually Transmitted Diseases*. 2002;29:277-284.

(11) Cusini M, Ghislanzoni M, Bernardi C et al. Syphilis outbreak in Milan, Italy. *Sexually Transmitted Infections*. 2004;80:154.

(12) Plitt SS, Garfein RS, Gaydos CA, Strathdee SA, Sherman SG, Taha TE. Prevalence and correlates of chlamydia trachomatis, neisseria gonorrhoeae, trichomonas vaginalis infections, and bacterial vaginosis among a cohort of young injection drug users in Baltimore, Maryland. *Sex Transm Dis*. 2005;32:446-453.

(13) Bradshaw CS, Pierce LI, Tabrizi SN, Fairley CK, Garland SM. Screening injecting drug users for sexually transmitted infections and blood borne viruses using street outreach and self collected sampling. *Sex Transm Infect.* 2005;81:53-58.

(14) Poulin C, Graham L. The association between substance use, unplanned sexual intercourse and other sexual behaviours among adolescent students. *Addiction.* 2001;96:607-621.

(15) Esquivel CA, Briones Ezcarzaga ML, Castruita Limones DE et al. Prevalence of Chlamydia trachomatis infection in registered female sex workers in northern Mexico. *Sexually Transmitted Diseases.* 2003;30:195-198.

(16) Matteelli A, Beltrame A, Carvalho AC et al. Chlamydia trachomatis genital infection in migrant female sex workers in Italy. *International Journal of STD & AIDS.* 2003;14:591-595.

(17) Tsunoe H, Tanaka M, Nakayama H et al. High prevalence of Chlamydia trachomatis, Neisseria gonorrhoeae and Mycoplasma genitalium in female commercial sex workers in Japan. *International Journal of STD & AIDS.* 2000;11:790-794.

(18) Turner CF, Rogers SM, Miller HG et al. Untreated Gonococcal and Chlamydial Infection in a Probability Sample of Adults. *JAMA.* 2002;287:726-733.

(19) Friedman SR, Flom PL, Kottiri BJ et al. Drug use patterns and infection with sexually transmissible agents among young adults in a high-risk neighbourhood in New York City. *Addiction.* 2003;98:159-169.

(20) Ruiz JD, Molitor F, McFarland W et al. Prevalence of HIV infection, sexually transmitted diseases, and hepatitis and related risk behavior in young women living in low-income neighborhoods of northern California. *West J Med.* 2000;172:368-373.

(21) Strathdee S, Sherman SG. The role of sexual transmission of HIV infection among injection and non-injection drug users. *Journal of Urban Health.* 2003;80:iii7-iii14.

(22) Rosengard C, Anderson B, Stein MD. Intravenous drug users' HIV-risk behaviors with primary/other partners. *American Journal of Drug and Alcohol Abuse.* 2004;30:225-236.

(23) Institute of Medicine. *The Hidden Epidemic: Confronting Sexually Transmitted Diseases.* Washington, DC: National Academy Press; 1996.

(24) Gupta GR, Weiss E. Women's lives and sex: implications for AIDS prevention. *Cult Med Psychiatry.* 1993;17:399-12.

(25) Ghys PD, Jenkins C, Pisani E. HIV surveillance among female sex workers. *AIDS.* 2001;15:S33-S40.

(26) Jeal N, Salisbury C. Self-reported experiences of health services among female street-based prostitutes: a cross-sectional survey. *British Journal of General Practice.* 2004;54:515-519.

(27) Mardh PA, Shoubnikova M, Genc M, Chaplinkas S, Unzeitig V. Health care of female commercial sex workers. *European Journal of Contraception and Reproductive Health Care.* 1999;4:165-180.

(28) Morton AN, Wakefield T, Tabrizi SN, Garland SM, Fairley CK. An outreach programme for sexually transmitted infection screening in street sex workers using self-administered samples. *International Journal of STD & AIDS.* 1999;10:741-743.

(29) Wilson J. Outreach programmes for female commercial sex workers. *International Journal of STD & AIDS.* 1999;10:697-698.

(30) Kohl KS, Markowitz LE, Koumans EH. Developments in the screening for *Chlamydia trachomatis*: a review. *Obstet Gynecol Clin N Am.* 2003;30:637-658.

(31) Auerswald CL, Sugano E, Ellen JM, Klausner JD. Street-based STD testing and treatment of homeless youth are feasible, acceptable and effective. *J Adolesc Health.* 2006;38:208-212.

(32) Pimenta JM, Catchpole M, Rogers PA et al. Opportunistic screening for genital chlamydial infection. I: acceptability of urine testing in primary and secondary healthcare settings. *Sex Transm Infect.* 2003;79:16-21.

(33) Steen R, Dallabetta G. Sexually transmitted infection control with sex workers: regular screening and presumptive treatment augment efforts to reduce risk and vulnerability. *Reproductive Health Matters.* 2003;11:74-90.

(34) Rekart ML, Patrick DM, Chakraborty B et al. Targeted mass treatment for syphilis with oral azithromycin. *Lancet.* 2003;361:313-314.

(35) Steen R, Dallabetta G. The Use of Epidemiologic Mass Treatment and Syndrome Management for Sexually Transmitted Disease Control. *Sexually Transmitted Diseases.* 1999;26:S12-S20.

(36) BC Centre for Disease Control, Laboratory Services. Laboratory Services Annual Report 2002. 2002. Vancouver, BC, BCCDC.
Ref Type: Report

(37) BC Centre for Disease Control. STD/AIDS Control: Annual Report. 2004. Vancouver, B.C., Provincial Health Services Authority.
Ref Type: Report

(38) Sirovich BE, Welch HG. The frequency of Pap smear screening in the United States. *J Gen Intern Med.* 2004;19:243-250.

(39) Yu CK, Rymer J. Women's attitudes to and awareness of smear testing and cervical cancer. *Br J Fam Plann.* 1998;23:127-133.

(40) Margolis KL, Lurie N, McGovern PG, Tyrrell M, Slater JS. Increasing breast and cervical cancer screening in low-income women. *J Gen Intern Med.* 1998;13:515-521.

(41) Sherman SG, Latkin CA. Intimate relationship characteristics associated with condom use among drug users and their sex partners: a multilevel analysis. *Drug and Alcohol Dependence.* 2001;64:97-104.

(42) Williams M, Ross MW, Bowen AM et al. An investigation of condom use by frequency of sex. *Sexually Transmitted Infections.* 2001;77:433-435.

(43) Hislop TG, Clarke HF, Deschamps M et al. Cervical cytology screening. How can we improve rates among First Nations women in urban British Columbia? *Can Fam Physician.* 1996;42:1701-8.:1701-1708.

(44) Day S, Ward H. Sex workers and the control of sexually transmitted disease. *Genitourinary Medicine.* 1997;73:161-168.

CHAPTER 6

DEVELOPMENT AND TESTING OF AN STI-RELATED STIGMA SCALE AND ITS ASSOCIATIONS WITH SEXUAL HEALTH CARE SEEKING BEHAVIOURS

INTRODUCTION

Despite the increasing capabilities of diagnostic testing, the continuing development and refinement of less invasive collection methods and the availability of effective treatment, chlamydia, gonorrhoea and syphilis control continue to frustrate public health measures. Throughout the 1980's and early 1990's, these infections were steadily decreasing to the point where Health Canada set goals for gonorrhoea and syphilis eradication and a goal to reduce national rates of chlamydia to 50 cases per 100,000 persons by the year 2010[1]. Increases in infection rates since the late 1990's, however, indicate that current strategies are not enough[2]. Efforts aimed at preventing infection and reducing risk behaviors are only one part of the fight against STIs. Another aspect is the ability and willingness of individuals to maintain their sexual health through regular check-ups and timely screening for perceived symptoms. Sexual health care seeking behaviours are impacted by a number of social factors including stigma and shame, power and gender, support and communication – all of which can be present at the individual, system and policy level[3-5].

Stigma has long been a part of our social existence, with the original greek translation referring to a physical sign exposing a moral imperfection[6]. While in today's society the physical mark need not be present, the moral associations have certainly remained intact. The topic of STIs presents a good example of the dynamic and socially fluid nature of stigma, as opposed to the often stationary, objectified definition it is sometimes given[7]. In relation to the categories of stigma outlined in Goffman's seminal work, STIs could be argued to cross all three – stigma of the body, of moral character and of tribe – and, for any one individual, STIs could also blur the boundaries of the *discredited* and the *discreditable*, depending on the nature of social interaction at any particular time[6,8].

There is a particularly gendered aspect of sexuality and STIs that lends itself to STI-related stigma. In many societies and cultures, male promiscuity is viewed favourably (e.g., as a measure of virility or status); on the other hand, female promiscuity is usually associated with immorality[9]. Within the last century, the social and medical standpoints on the spread and prevention of STIs have been influenced by these gender steroetypes. In the late nineteenth century the 'Purists' attempted to remove the double-standard that allowed men to stray without consequence, promoting equally high moral standards for all[10]. As the purist movement lost momentum into the twentieth century, STIs were creating problems among troops, leading to war time flyers warning soldiers away from the 'dirty' or 'bad' women who would infect them with STIs which they might pass on to their 'good' wives upon return home[10]. The problem of unhealthy soldiers was so great, some states enacted laws against 'promiscuity', and many single women were arrested or detained for such things as being out at a bar or club on their own[10].

While today's public health messages may be more progressive, there remains a stigma associated with messages intended to help prevent STIs, especially those that rely on scare tactics or create categories of behaviours, characteristics and, by extension, people, that should be avoided. Research into the experiences and the views of people living with STIs indicates that there needs to be careful consideration and balance in using these approaches[3]. While successfully encouraging safer behavior, these messages may also serve to increase stigma for those infected with STIs, thereby increasing isolation and delaying treatment seeking or adequate sexual health management[5,9,11].

Aside from stigma, there are many other barriers to seeking sexual health care that present themselves in a variety of forms. There may be practical issues, such as location, hours of operation, and availability or accessibility of transportation. The severity of symptoms, the

perceived seriousness, the knowledge of interventions, belief of effectiveness of health care system or specific interventions, social support factors, feelings of embarrassment, stigma and shame all play a role[12,13]. Furthermore, people who are marginalized in society, such as commercial sex workers or drug users, may be apprehensive in searching out health care due to inherent distrust of authority or fear of persecution for their illicit behaviour[14]. Previous studies examining health seeking behaviour have uncovered gender differences, wherein women are found to more often delay treatment and be more affected by embarrassment and stigma[12,15]. These delays can be important for the health of the individual as well as their sexual contacts.

Studies conducted on barriers to care among adolescents and among clinic populations have revealed that stigma, social support and concerns over how clinic staff communicate and deal with emotions are of more concern than the mundane issues of diagnosis and treatment[16,17]. Among minority populations in the US there has been some indication that available transportation does play a role; however, among homeless women or women in shelters, this was not found to be of significance[18]. Overall, studies reiterate that social context and psychosocial variables are highly relevant to health seeking behaviours. The levels of stigma and shame have been shown to have a bearing on how easy or difficult it is for an individual to take positive action, either through personal perceptions of STIs, or perceptions of society's views of STIs and social norms of sexual behaviour[3,9,17].

Discrimination, which is tied to stigma, is also important, especially in an already marginalized population[7]. While stigma is sometimes objectified as something in or attached to a person, discrimination is related more to the dislike and unfair treatment of a person or group of people, often due to a stereotype or stigma. The objectification of stigma may make it an easier concept to grasp; however, both stigma and discrimination should be thought of more as fluid, social

processes related to power and domination, with discrimination linked to the societal attitudes and actions towards the stigmatized[7]. A qualitative study among women already attending a clinic in England revealed the importance of comfort, appropriate staff communication, confidentiality and respect for the feelings of the women[17]. A similar study in the southern U.S. outlined four important concepts of stigma that surfaced from qualitative focus groups, including religious ideation of health care workers affecting their views of 'promiscuous' women, privacy fears among men, racial attitudes and stigma transference or fear of being labeled[5]. Thus, the ability to present safely and comfortably in a clinic setting can be disturbed by actual or perceived discriminating attitudes of the other clinic attendees, the doctors and nurses, or other clinic staff.

Stigma scales exist for general disabilities, mental health, and more recently for HIV/AIDS[19-22]. There are, however, few scales that examine STI-specific stigma, and none that incorporate both the gendered aspect of 'good' and 'bad' tribes of women[α], as well as the perceptions of both community in general and health care professionals specifically. Including perceptions on the views of health care workers incorporates the duality of STI-stigma with regards to the concept of the discredited and the discreditable. Health care workers represent a population to whom those seeking treatment for STI-symptoms are necessarily discredited. Patients must discuss the issue with their caregiver, thereby directly becoming discredited; however, there may also be perceptions of being discredited to other clinic staff who may have access to patient charts. This is in contrast with the ability to remain discreditable to society in general, especially in the case of a treatable STI. In addition, fears and concerns surrounding disclosure and confidentiality

[α] In qualitative work by Nack (2000), discorse around sexual behaviour norms and behaviour that was deemed appropriate for women evolved around the moral division of respectable or 'good girls' and disreputable or 'bad girls'. Membership in the 'good girl tribe' or morally-correct category, whether through actual behaviour, avoidance of STI or concealment of behaviours or diagnoses, was precarious, while membership in the 'bad girl tribe', was easy to gain and often thought of as irreversible.

were incorporated into the scale. Qualitative studies in many settings have identified all of these as important issues among women seeking treatment for STI symptoms as well as among those living with viral STIs such as HPV or herpes[3,5,8,17].

This paper first outlines the preliminary development of an STI-stigma scale tailored for women, encompassing physical stigma, moral (internal and social) stigma, including perceptions specifically relating to health care workers, and finally, stigma associated with the division of 'tribes' of good versus bad women. The impact of stigma among a group of low-income women from a marginalized community on sexual health care behaviors, including annual Papanicolaou (pap) smears and STI testing, was then assessed. It was hypothesized that stigma scores would be negatively correlated with health seeking behaviors in this population.

METHODS

A survey and urine screen was carried out among 126 women attending a weekly "Women's Night" program exclusive to women (including transgendered individuals) held at a local community health clinic. The weekly, evening-long program offers women a safe place to access food and health care, as well as to socialize with other women, and take part in various activities including free haircuts, footbaths, art projects, and movie nights. Women were invited to take part in the study at the start of each evening. Although there was no overt advertising for the study, snowball sampling through word-of-mouth was used to recruit women, including those women who may not have been accessing the evening program on a regular basis.

The 27-item survey was used to gather data to describe the socio-demographic characteristics of the study participants, their use of and contact with services available in their community (including their contact with outreach programs, outreach workers and street nurses), as well as

their self-reported patterns of sexual behaviour and drug use. We also asked questions about their use of sexual health care services such as annual pap smears and testing or treatment for STIs.

Participants were given a copy of the consent form, and study coordinators read through the details of participation before asking for their consent. Participants were able to take part in the interview regardless of whether they provided a urine sample for STI testing. Treatment for positive STI results was provided through the clinic doctors as per established STI testing and treatment protocols. Participants received $10 remuneration for completing the survey.

Part I: Stigma scale development

An 18-item pool was created building on Goffman's basic three categories, drawing on previous constructs from a general STI stigma and shame scale by Fortenberry, and incorporating the idea of the tribes of womanhood introduced by Nack[6,9,11]. In addition, based on other discourse around stigma and sexual health care seeking behaviors, the category of 'moral' stigma was split into internal stigma relating to feelings of guilt or shame, as well as the perceived views of others in the community, including health care workers and intimate partners[17,23]. A fourth category was created to encompass concerns over discretion, confidentiality and gossip.

Items were assessed for endorsement using a discrimination index, and for internal consistency within subgroups using Pearson's correlations. Problematic items were highlighted and taken into account during exploratory factor analysis.

Exploratory principal component factor analysis was done using promax (oblique) rotation to explore the categories present in the responses. An iterative process was used, discarding one

item at a time based on factor loadings as well as on discretion and internal consistency results, where applicable. For the three resulting scales (tribal stigma, social stigma and internal stigma), item-total correlation and alpha scores were calculated. Due to the small number of items in each, the Spearman-Brown Prophesy was used to correct the alpha co-efficients. Means and standard deviations are also presented. The final scales were standardized and associations with demographic, behavioural and health care seeking variables were assessed.

From the original 18 items, four were discarded due to poor understanding or poor factor loading. For each of the remaining 14 items, non-responders were compared to responders in order to assess variability.

Part II: Sexual health care and stigma

Associations of demographics and behaviors with two health care seeking behaviors were assessed – having had a pap smear in the last year, and having been screened or treated for an STI in the past year. For this analysis, the three stigma scales were inverted, with higher scores equating to higher stigma, for easier interpretation. The latter associations were limited to those women who reported sexual activity with a male partner in the past 6 months. Categorical variables were assessed using Pearson's chi-square and continuous variables were assessed using the Mann-Whitney test.

The impact of STI-stigma on health seeking behavior was assessed using logistic regression. Unadjusted and adjusted odds ratios were computed. The final adjusted models incorporated demographic variables, sexual behaviors, and general health care contact levels, including variables that were significantly associated with sexual health care behaviors at the p=0.20 level,

and used forward stepwise regression to select relevant characteristics. Again, this analysis was restricted to women reporting sexual activity in the previous six months.

RESULTS

Part I

Table 6.1 and Figure 6.1 outine the STI-related stigma items and the conceptual categories used in developing the items. Again, the categories followed Goffman's 3-levels of stigma, incorporating both self and social judgement in the moral stigma category, and including a fourth category dealing with discretion and disclosure. It was felt that the separation of this fourth category from social judgement may allow a subtle distinction between women who perceived others to be judgemental and women who were concerned about being judged, or becoming, even in a hypothetical setting, discredited. Physical stigma included five items: feeling dirty, feeling violated, knowing (and conversely, not knowing) that an STI was present and being able to hide an STI from others. Moral stigma included five items: internal feelings of guilt and embarrassment, and social judgement regarding intelligence, bad character and specifically, bad character as judged by clinic staff. Tribal stigma incorporated concepts introduced by Nack et al., elucidating what women perceived to be the "type of woman" who gets an STI[8,9]. This included four items: 1) being 'damaged goods', 2) being promiscuous, 3) being at fault as "women should 'know better'" and 4) being at fault for not being "careful enough". Discretion included four items encompassing discretion of clinic setting and clinic staff, community gossip, and fear of repercussions from partner disclosure.

Using the discrimination index, four items were flagged, including items 4 and 6 from the physical stigma, item 10 from disclosure and item 16 from moral stigma. Using $p<0.20$ as the cut-point for internal consistency, another two items were initially flagged, including item 3

from physical stigma and item 17 from discretion. Internal consistency was also re-evaluated within the sub-groups emerging during exploratory analysis.

The results from the exploratory factor analysis are shown in Figure 6.2 and Table 6.2. Principal component factor analysis using all items was first assesssed, and the resulting eigenvalues are plotted in Figure 6.2. From this, it was decided to restrict the number of categories to three, as there did not appear to be four distinct factors.

Iterative factor analysis was done, omitting items one at a time. Item 4 and 17 were the first two deleted, as their factor loadings were low and both had been flagged as having low discrimination or internal consistency. Item 6 was then deleted, due to multiple factor loading, low discrimination and consistency. Finally, item 3 was dropped, as it continued to load poorly and had low internal consistency. Correlation between the final three factors was not high enough to warrant combining the three sub-scales into one larger scale.

The remaining 14-items made up three final scales – internal stigma, social stigma and tribal stigma. The items making up the hypothesized 'tribal stigma' scale remained intact. The moral social items loaded together with the disclosure and discretion items, and were therefore grouped into a factor termed "social stigma", while the internal stigma factors loaded together with items 1 and 2 from the physical stigma catogery. These latter two items (1 – "feeling dirty" and 2 – "feeling violated") may be representing feelings of self-blame or self-disgust, rather than their intentioned physical meaning, which would explain why they fit in with items 7 and 8 (guilt and embarrasment). Item-total item correlations and alpha co-efficients if deleted for the three emergent factors are shown in Table 6.3, along with scale statistics and cronbach's alpha. Item-total correlations ranged from 0.398 to 0.598. The alpha co-efficients for each scale were 0.737,

0.705 and 0.729 for tribal stigma, social stigma and internal stigma, respectively. Using the Spearman-Brown Prophesy formula, all three alpha co-efficients were above 0.80.

Assessing each item for response and non-response characteristics, there was no large variation found; however, overall injection drug users and current sex workers were less likely to complete the stigma section of the questionnaire. As this was the last section of the survey, a few women did not complete all of the questions and nine women were excluded due to incomplete answers in this section of the survey.

In Table 6.4, the associations of demographic and behavioral characteristics with the three stigma scales are shown. Higher tribal stigma scores were marginally associated with being over 30 years of age, identifying as Aboriginal, Inuit or Metis and not reporting any use of injection drugs in the past six months. Among active CSW, higher social stigma scores were associated with having been working in the sex trade for less than 10 years, while among all the women, there was a marginal association of higher social stigma among women who did not report use of any non-injection drugs in the past six months. Higher internal stigma scores were associated with not having completed high school and identifying as Aboriginal, Inuit or Metis ethnicity.

Part II

The second part of this paper was concerned with barriers, including STI-related stigma as measured by the three factors elucidated above, to seeking sexual health care among women in a high-risk, marginalized neighbourhood.

The association of demographics, sexual and drug use behaviors and stigma levels with having had a pap smear in the past year and with having had any testing or treatment for an STI in the

past year were evaluated and the results are shown in Table 6.5. Having a pap smear in the past year was positively associated with having a high school diploma and was negatively associated with being an injection drug user and using condoms consistently with regular (non-client) partner(s). The latter association was restricted to those women reporting a regular partner. Having an STI test or treatment in the previous year was negatively associated with using condoms consistently with casual partners (among women reporting casual partner(s)). None of the stigma scales were associated with either of the sexual health seeking outcomes.

Table 6.6 exhibits the results from logistic models assessing the odds of reporting pap smears or STI testing in the past year. In the model for STI testing or treatment, adjusting for ethnicity, current sex work and perceived STI symptoms in the past year, higher scores on the internal stigma scale were associated in a negative direction with reporting of STI testing and/or treatment in the past year (AOR: 0.43; 95% CI: 0.20- 0.91).

In stratified models based on sex work status, current sex workers were more likely to have had a pap smear if they also reported consistent condom use with clients (AOR: 9.39; 95% CI: 0.86 – 102.8). Conversely, they were less likely to have had a pap smear if they reported consistent condom use with regular partners (AOR: 0.06; 95% CI: 0.01 – 0.72). This latter observation appeared to be driven by a small number of women who reported consistent condom use with both clients and other partners, but did not report a pap smear. In terms of condom use behaviour, current sex workers were most likely to report consistent condom use with clients, but not with other partners (52%). Approximately one-quarter were inconsistent with both clients and other partners and 23% were consistent condom users with all partners. Consistent condom use among non-sex workers was not associated with accessing pap smears.

DISCUSSION

While qualitative studies of stigma are better suited to understanding personal experiences with stigma, expressions of stigma and the manner in which it affects an individual's behavior, the ability to quantitatively assess stigma within a population is useful for uncovering differential effects of stigma on sub-groups of the population and ascertaining relationships with specific health actions. In this population of women from a high-risk neighbourhood, higher levels of internal stigma were associated with not having been tested or treated for an STI in the past year.

The perception of any stigma will invariably be effected by both the previous experiences of an individual as well as their current situation. For example, as Goffman indicated, there may be those who society stigmatizes, but who view themselves as 'normal' and everyone else as 'abnormal'[6]. In Nack's work surrounding women's STI experiences, it was found that those who had higher perceptions of stigma prior to their own experiences, or those who felt they were 'good' girls were more affected by the possibility of being placed in the 'bad girl' category[9]. Others who had had a less stigmatizing social education of STIs, or those who for various reasons felt they already belonged in the 'bad' girl category were less concerned with the perceived judgments that may be placed on them. While tribal and social stigma did not show any significant differences by demographic or behavioral characteristics, those with higher tribal stigma scores were less likely to be active injection drug users, while those with higher social stigma were less likely to be active non-injection drug users, and, among active sex workers, were more likely to have been working for less than 10 years. This could be reflecting a similar phenomenon where women who already place themselves in the 'bad' category (i.e. active drug users, highly active sex workers) are less concerned with societal views and stigma.

As the clinic program from where this population was recruited represents a mix of women, including both drug users and non-drug users, sex workers and non-sex workers, it is not surprising to see the dichotomy of 'good' and 'bad' girls emerge. This presence of stigma within a community has also seen in research on stigma towards drug users. Stigmatizing views towards drug users were found to be prominent among both non-users and users who were 'in control' and able to hide their drug use from the larger community[24]. Among non-users, the perception of being "able to tell" who used drugs and who didn't use drugs created characteristic stereotypes of how users looked or behaved. The undisclosed users, or discreditable users, were then left with the task of remaining hidden. Quite often this undisclosed group had stronger stereotypic descriptions or stigmatizing views of heavier users, drawing clear lines between themselves and 'other' drug users[24]. In the present study, this same phenomenon may be responsible for the association of stronger perceptions of stigma among women who are not disclosed members of the 'bad girls' tribe as opposed to women who are open about their sex work or drug use and less concerned about being labeled by the community. This could explain the higher social stigma scores among the lower activity sex workers.

Although the question item addressing partner disclosure was not included in the final stigma scales, the responses given do merit some attention. A large proportion of women (54% to 60%) indicated having fear of partner anger upon disclosure, highlighting the potential importance of providing support or referrals for women who are faced with an STI diagnosis. This also points to larger issues of general education around STIs. While prevention is key, the manner in which certain messages are delivered can create a stigmatized view of individuals, and if it is not balanced with messages that attenuate this stigma, it can lead to the blame, the anger and the fear that surrounds STI testing, diagnosis and treatment.

Unfortunately, it is difficult to tease out the historically gendered and socially moral underpinnings of sexual and STI education. We may be more aware today of the double-standards that exist in society's view of how men and women *should* behave sexually; however, there remains an ingrained social double-standard which can, consciously or subconsciously, alter one's perceptions even among those who don't prescribe to these views. An example of this was reported by Nack, where women diagnosed with an STI described their diagnosis as either 'deserved' or 'undeserved' based on their perceptions of what society viewed as acceptable behavior and how this fit in with their own past histories[8]. For example, 'good' women would report feeling their STI was undeserved due to their limited sexual experience, whereas among 'bad' women, an STI diagnosis was described more as an inevitability, a confirmation of their status. In the present study, the items making up the tribal stigma scale included statements with a gendered, moral tone placing the responsibility, or insinuating the fault, of STIs on women. Although the responses were skewed towards low stigma levels, a quarter of the women had moderate to high overall agreement. This included 14% agreement that having an STI would make them "damaged goods", 16% agreement that only women who "sleep around" get STIs, 34% agreement (25% *strong* agreement) that "women should know better", and 26% agreement that only women who "aren't careful" get STIs.

STI-related stigma and the resulting stereotypes may also serve to prevent men and women from seeking out regular sexual health care. For example, if someone perceives themself as belonging to the 'good' category and therefore not the type of person who would get an STI, he or she may not seek out sexual health care, despite any actual sexual risk behaviors. Another possibility is that someone who has an accurate or even over-estimate of his or her own risk behaviour, but is socially seen as the 'non-STI' type, may fear being diagnosed, even in the face of symptoms, and purposefully avoid testing. Similar to recent research on AIDS-related stigma, AIDS knowledge

and general education levels appear to diminish the associated stigma[20]. Increasing and improving education around STIs should be seen as a positive aspect that can help begin to break down the age-old stereotypes that go along with STIs. Prevention messages can still be useful without imposing categories based on moral sexual standards and ostracizing 'dirty' and 'promiscuous' women.

One concerning finding was the increased levels of both tribal stigma and internal stigma found among Aboriginal women. This may be due to compounding of cultural stigma felt by these women, in addition to the targeted testing and treatment of Aboriginal women in the community as a result of the many study findings that place them at higher risk for HIV and STIs. While increasing testing and treatment is for the benefit of women who have higher rates of infection, it may be viewed by the women as being culturally targeted, increasing their perceptions of stigma and STI-stigma in particular. The increased internal stigma among Aboriginal women remained in a regression model controlling for age, education, injection drug use and sex work status ($p=0.001$) indicating that a culturally-specific influence was present.

There are several places for women in this neighborhood to receive sexual health care. In addition to drop-in clinics, outreach nurses have a consistent presence throughout the community. This fact is reflected in the comparatively high numbers of women who had received at least one pap smear in the past year (75%), which is equal to or higher than proportions that have been reported by other studies on sexual health care[25-27]. Nonetheless, there remains a few interesting points to consider from the results of this analysis. First, there appears to be an independent association between injection drug use and not having had a pap smear. Injection drug users often have difficulty maintaining regular appointments and are less likely to wait to see a physician at a drop-in clinic. Given the existing outreach structure and the

annual 'pap blitz' programs, it may be useful to examine ways to increase the uptake of screening among the IDU population, either through targeted advertising, expansion of locations or through discussions within the IDU community of women to assess what other issues may be preventing them from accessing these services. Second, women who indicated consistent condom use were less likely to have presented for a pap smear in the past year. This could reflect a misinformed view that condom use is sufficient for remaining sexually healthy, and nullifies the need to have any check-ups or STI testing. It could also reflect a sub-group of women who are concerned enough about STIs to use condoms consistently, but who are afraid of receiving a positive STI diagnosis and therefore avoid regular sexual health care.

The difference in factors associated with having had a pap smear and having had STI testing or treatment is also not surprising. Pap smears are not directly linked to 'bad' sexual behavior, because they are recommended for all women. In promoting regular check-ups, some health care workers may purposefully disassociate pap smears from any STI-related language in order to reduce any STI-related stigma that may cause some women to avoid presenting for a pap smear. Once women have presented for an appointment, health care workers can discuss STI testing and other issues. Although in the short term this strategy may be successful at increasing the numbers of women having a pap smear, removing the sexual association of pap smears inherently supports the stigmatizing categories of 'good' girls who need only come in for regular cancer screeing, and 'bad' girls who need STI testing. While there was no relationship with tribal stigma or social stigma and having either a pap smear or STI testing, higher levels of internal stigma were related to lower levels of STI testing specifically.

Other qualitative studies among women presented with a positive STI diagnosis have indicated that most would like more information, but that the manner in which this information is given is

important[28]. Those expressing negative experiences felt that their health care contacts were a little too matter of fact, focusing on the personal risks that *must* have contributed to their infection[8,23,29]. Others in similar situations but with more positive experiences indicated that stress was placed on the commonality of the infection, rather than on the things they *should* have done to prevent getting infected[8]. Sexual health educators, health care trainers and public health practitioners could help to reduce STI-related stigma levels by ensuring that prevention and care combine methods to help break down barriers of stigma and double standards of sexual morality. Messages of prevention need to be crafted to combine education around risk factors and the responsibility of all sexually active persons, with the reality of STIs as an unwanted, but possible outcome among sexual active persons. In addition, the delivery of positive STI diagnoses should not be paired with a reiteration of the risks that could have been avoided, but should instead work first to support the individual with their diagnosis and possible treatments. As was seen in this population, there could also be a place for specific support or referals for help dealing with partner disclosure or potential partner violence associated with disclosure.

The associations of potential STI symptoms in the past year, current sex work and Aboriginal ethnicity with having been tested or treated for an STI in the past year were expected. As there is a disproportionately high number of Aboriginal women living in the neighbourhood, there are also a number of health services run by and for Aboriginal people. The fact that, after controlling for symptoms, and possibly for increased targeted screening, higher internal stigma remained associated with less STI-testing or treatment illustrates how feelings and social beliefs can impact an individuals behavior. Not only is there a possible concern with becoming discredited, either to health care workers or to the community, but there may also be a need to hide or avoid the issue. Many studies on chronic STI infections such as herpes have indicated deep psychological impacts and damage to self-esteem among those diagnosed[3,30,31]. Again, the

higher the perceived stigma prior to diagnosis, the higher the impact; thus, women who fear a positive diagnosis may avoid testing altogether. However, if delaying or avoiding testing means that symptoms or other concurrent infections go untreated, this can lead to increased susceptibility to more serious infections or long-term complications that could have been averted.

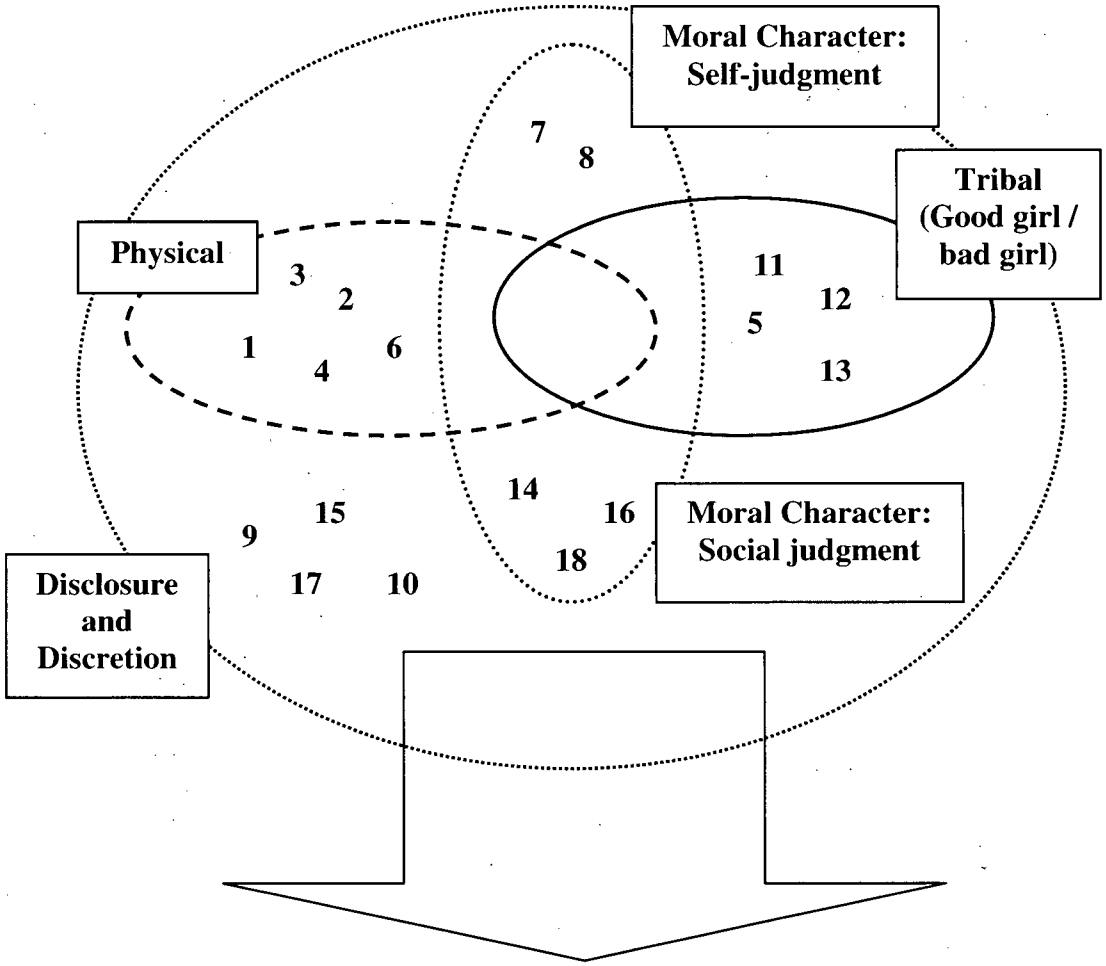
There are several limitations to this study. First, as the stigma scales were developed as a preliminary analysis of perceptions in this population of women, there was no inclusion of an external tool for validation. In this particular setting, it was felt that including several scales for this purpose would unduly increase the time needed to undertake the survey and would reduce the number of women willing to take the time to participate. Thus, the scale, while providing valuable insight, should undergo further development and testing to assess its usefulness on a larger scale. Second, self-report of sexual health care behaviors or opinions about STIs may have been biased through socially desirable responses. However, the questions about sexual health care and STI testing were asked after a series of questions about sexual behaviors, use of condoms and other risk behaviors, which may have helped lessen any embarrassment around reporting of STI testing. On the other hand, women may have felt they *should* report having had a pap smear, as this is recommended; however, given the large amount of outreach specifically for pap smears in the past few years in this community, the large number of women who reported having had a pap smear is not unexpected. Also of concern is the possibility of recall bias, especially with STI testing. This could be a problem among women who may consent to STI testing in the context of a pap smear, but because of the dissociation of pap smears and STIs may not recall if no additional follow-up to the STI test was needed.

This study was able to sample a diverse group of women from a high-risk neighbourhood. In addition, while the sample was recruited from a clinic site, the evening program serves as a drop in for many services, including dinner, clothing and other aspects not directly related to seeing a health care professional. Despite the neutral setting of the evening, it *is* a clinic and, even within the context of a safe evening for women, perceptions of STI-related stigma and moral categories of 'bad' versus 'good' girls were present. While screening and treatment programs have been useful in the past, stigma and fear of positive diagnosis will continue to prevent widespread regular sexual health care. Screening programs that are tailored for certain high-risk groups may be effective, but extra care is needed to ensure that these programs are not adding to existing perceptions of discrimination or stigma. At present, it is important for those involved in the diagnostic process to pay attention to language and manner of information delivery to patients. There should be an active attempt among all professionals involved in sexual health to diminish the socially stigmatizing categories that are attributed to persons, and particularly to women, with STIs.

Table 6.1: Items developed for STI-related stigma scale, measured on a 10-point scale (1=strongly agree, 10=strongly disagree)

If you had an STI, you would feel:	**Mean (std)**	**Median (IQR)**
1. Dirty	3.89 (3.42)	2 (1, 6)
2. Violated	3.42 (3.24)	1 (1, 5.5)
Someone with an STI:		
3. Would know it	5.28 (3.71)	5.5 (1, 10)
4. Could hide it	3.87 (3.31)	2 (1, 5.5)
5. Is damaged goods	7.75 (3.10)	10 (5.5, 10)
6. May not know	2.96 (2.99)	1 (1, 5)
If you had an STI, you would feel:		
7. Guilty	5.54 (3.88)	5.5 (1, 10)
8. Embarrassed	4.75 (3.86)	3 (1, 10)
At the clinic:		
9. Everyone would know if you were being tested for an STI	8.57 (2.82)	10 (9, 10)
10. Staff are discreet	1.57 (1.62)	1 (1, 1)
(Only) women ..... get STIs:		
11. Who have slept around	8.06 (3.09)	10 (5.5, 10)
12. Should know better than	6.31 (3.73)	8 (2, 10)
13. Who aren't careful	6.81 (3.58)	8 (4, 10)
If someone has an STI:		
14. People will think she is a bad person	6.73 (3.28)	7.5 (5, 10)
15. People will gossip	5.69 (3.41)	5.5 (3, 10)
16. Health workers will think poorly of her	8.14 (2.74)	10 (5.5, 10)
If you had an STI: 17. Your partner would be angry with you	3.72 (3.47)	1 (1, 6)
If someone has an STI: 18. People will think she is stupid	7.42 (3.04)	9.25 (5.5, 10)

Figure 6.1: Concepts of Stigma and Theoretical Development of Eighteen Items (numbers corresponding to questions in Table 6.1) using four categories (represented by circles)



Items with Low Discrimination: 4, 6, 10, 16
Items with Low Internal Consistency (within above groups): 3, 4, 6, 17

Figure 6.2: Scree plot of eigenvalues from principle component factor analysis including all test items

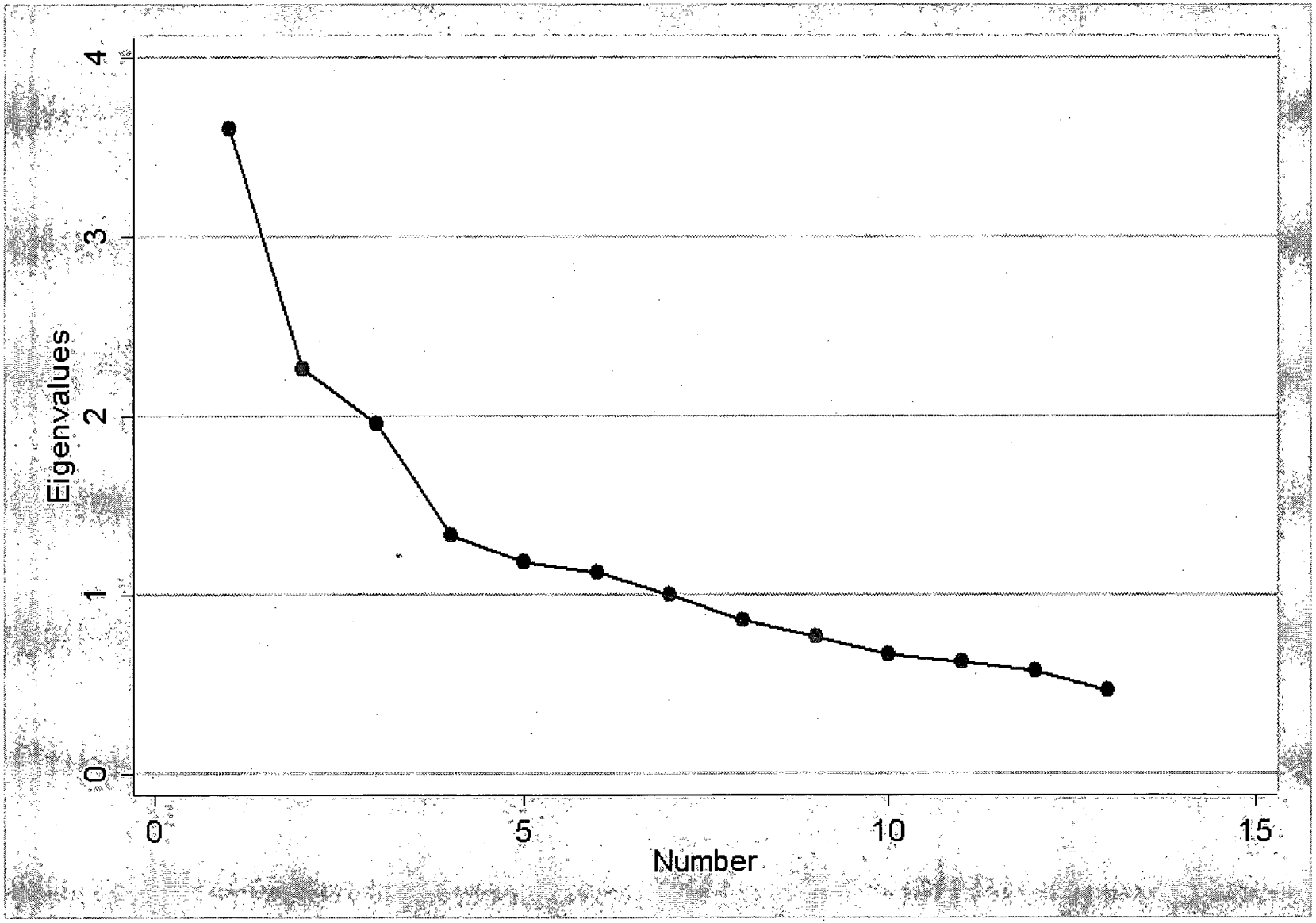


Table 6.2: Explorartory factor analysis – principle component factor loadings incorporating all items, using three factors and oblique rotation

Factor	**Items**	**Factor Loadings – all items**		**Factor Loadings – final**	**Factor correlations**	
					1	**2**
1	**3.** Would know*	0.412		---		
	5. Damaged Goods	0.558		0.497		
	6. Wouldn't know*	-0.645		--		
	11. Sleeps around	0.781		0.816	1.00	--
	12. Should know better	0.742		0.803		
	13. Isn't careful	0.600		0.691		
2	**4.** Could hide*	0.272		--		
	9. Clinic discretion	0.548		0.567		
	10. Staff discreet	-0.652		-0.660		
	14. Bad person	0.489		0.582	-0.18	1.00
	15. Community gossip	0.567		0.596		
	16. Staff morals	0.729		0.717		
	18. Stupid	0.644		0.666		
3	**1.** Dirty	0.746		0.777		
	2. Violated	0.607		0.663		
	7. Guilty	0.729		0.703	0.23	-0.21
	8. Embarrassed	0.782		0.787		
	17. Partner disclosure*	0.352		--		

Multiple Iterations

Items discarded one at a time for poor loading or multiple loading, also taking into account low endorsment or low internal consistency

*Not included in final factor

Table 6.3: Item-total item correlation and alpha-coefficients if deleted and scale statistics for three factors identified in factor analysis

Item	**Factor 1: Tribal Stigma**		**Factor 2: Social Stigma**		**Factor 3: Internal stigma**	
	$r_{(i-t)}$	α (d)	$r_{(i-t)}$	α (d)	$r_{(i-t)}$	α (d)
1.					0.547	0.652
2.					0.457	0.703
5.	0.459	0.719				
7.					0.473	0.692
8.					0.591	0.623
9.			0.432	0.667		
10.			0.413	0.673		
11.	0.598	0.632				
12.	0.563	0.658				
13.	0.478	0.697				
14.			0.398	0.676		
15.			0.443	0.664		
16.			0.519	0.639		
18.			0.404	0.675		
N	120		116		122	
Alpha Co-efficient	0.737		0.705		0.729	
Corrected Alpha Co-efficient (Spearman-brown prophesy)	0.849		0.827		0.843	
Mean	7.23		5.84		4.41	
SD	2.52		1.81		2.68	

Table 6.4: Characteristics associated with standardized scales for tribal stigma, social stigma and internal stigma, with lower scores indicating higher stigma

	Tribal Stigma		Social stigma		Self-judgement	
	Median	**p-value**	**Median**	**p-value**	**Median**	**p-value**
Age > 30	0.180	0.085†	0.082	0.536	-0.024	0.813
≤ 30	0.477		0.227		0.288	
High School (HS)	0.205	0.928	0.079	0.464	0.287	0.008*
No HS	0.152		0.158		-0.281	
Aboriginial, Inuit, Metis	-0.130	0.072 †	0.170	0.340	-0.354	0.001*
Other	0.205		0.079		0.229	
Injection Drug use	0.239	0.076 †	0.227	0.584	0.093	0.960
No IDU	0.079		0.082		-0.073	
Non-Injection Drug use	0.205	0.216	0.170	0.061 †	-0.137	0.346
No NIDU	-0.317		-0.044		0.224	
High Alcohol	0.092		-0.028		-0.644	
(> 6 drinks, >1 a week)		0.916		0.743		0.150
Low Alcohol	-0.062		0.085		-0.139	
Any partner	0.196	0.435	0.085	0.628	-0.058	0.643
No partner	0.180		0.106		0.220	
Regular partner	0.183	0.570	0.079	0.164	-0.199	0.292
No regular partner	0.192		0.243		0.229	
Casual partner	0.180	0.418	0.037	0.773	0.100	0.880
No casual partner	0.189		0.106		-0.014	
> 1 partner (non-client)	0.205	0.185	0.039	0.614	-0.135	0.702
≤ 1 partner	0.180		0.104		0.105	
CSW - Never	0.152		-0.014		0.224	
Former	0.212	0.816	0.243	0.178	-0.256	0.841
Current	0.205		0.210		-0.049	

*** p<0.05; † p<0.10**

Table 6.4 (con't): Characteristics associated with standardized scales for tribal stigma, social stigma and internal stigma, with lower scores indicating higher stigma

	Tribal Stigma		Social stigma		Self-judgement	
	Median	**p-value**	**Median**	**p-value**	**Median**	**p-value**
CSW						
Years working:						
≥10 years	0.440	0.864	**0.307**	**0.007***	0.100	0.891
<10 years	0.031		**-0.155**		-0.135	
Clients (past 6 mos):						
≥ 50 clients	0.443	0.592	0.317	0.427	0.183	0.611
< 50 clients	0.183		0.079		-0.193	
STI Communication						
Partner - Yes	0.205	0.275	0.079	0.467	0.093	0.485
No	-0.159		0.170		-0.005	
Friend - Yes	0.196	0.926	0.125	0.594	0.139	0.497
No	0.152		0.050		-0.116	
HC worker - Yes	0.189	0.640	0.079	0.705	0.044	0.966
No	0.386		0.326		0.063	

*** p<0.05; † p<0.10**

Table 6.5: Demographic and behavioral characteristics associated with access of pap screening and STI screening services

	Pap Smear (in past year) N (%)		STI test (in past year) N (%)	
	No N=24	**Yes** N=71	**No** N=46	**Yes** N=53
Age ≥ 30	22 (91.7)	66 (94.3)	44 (95.7)	48 (92.3)
High school Education	5 (20.8)	28 (39.4) †	14 (30.4)	21 (39.6)
Unemployed	24 (100.0)	68 (95.8)	43 (93.5)	51 (96.2)
Aboriginial, Inuit, Metis	9 (37.5)	31 (43.7)	16 (34.8)	25 (47.2)
Injection Drug use	17 (70.8)	26 (37.7) *	24 (52.2)	20 (39.2)
Non-Injection Drug use	22 (91.7)	61 (88.4)	42 (91.3)	43 (84.3)
Alcohol (> 6 drinks, > 1 a week)	3 (27.3)	7 (21.2)	4 (22.2)	6 (22.2)
Consistent condom use (non-clients)	7 (29.2)	9 (12.7) †	9 (19.6)	9 (17.0)
More than one partner (non-clients)	6 (27.3)	18 (25.4)	9 (20.5)	16 (30.8)
CSW				
Former	6 (26.1)	16 (24.2)	12 (28.6)	10 (20.0)
Current	10 (43.5)	36 (54.5)	19 (45.2)	29 (58.0)
Consistent condom use with clients	6 (60.0)	28 (77.8)	14 (73.7)	22 (75.9)
Median months since initiating CSW (IQR)	66 (12, 128)	135 (36, 228)	126 (36, 180)	120 (36, 228)
Median Stigma (IQR)				
Tribal	0.82 (0.55, 1.40)	0.79 (0.19, 1.51)	0.79 (0.50, 1.48)	0.97 (0.19, 1.41)
Social	1.00 (0.47, 1.30)	0.85 (0.57, 1.31)	0.83 (0.63, 1.36)	0.92 (0.48, 1.31)
Internal	1.09 (0.42, 1.93)	1.08 (0.33, 1.68)	1.35 (0.67, 1.93)	0.79 † (0.30, 1.59)

*** $p \leq 0.05$; † $p \leq 0.10$**

Table 6.6: Odds ratios for accessing any sexual health care (pap smears or STI tests/ treatment) over the past year among sexually active participants of the Women's Night Survey

Stigma	**Pap Smear**		**STI test**	
	OR	*AOR*	*OR*	*AOR*
Tribal	0.99 (0.51 – 1.94)	1.10 (0.46 – 2.61)	1.04 (0.59 – 1.85)	1.43 (0.67 – 3.09)
Social	0.96 (0.42 – 2.20)	0.81 (0.28 – 2.35)	0.85 (0.42 – 1.70)	1.11 (0.45 – 2.77)
Internal	0.90 (0.48 – 1.68)	1.06 (0.50 – 2.28)	0.64 (0.37 – 1.11)	0.43 * (0.20 – 0.91)
Demographics				
Age <30	0.67 (0.11 – 3.93)	--	1.83 (0.32 – 10.6)	--
High School	2.47 (0.82 – 7.43)	4.47 * (1.10 – 18.21)	1.5 (0.65 – 3.47)	--
Aboriginal	1.29 (0.50 – 3.36)	--	1.67 (0.74 – 3.79)	4.38 * (1.42 – 13.50)
Drug Use				
Injection	0.25 (0.09 – 0.68)	0.25 * (0.08 – 0.82)	0.59 (0.26 – 1.33)	--
Non-injection	0.69 (0.14 – 3.55)	--	0.51 (0.14 – 1.84)	--
Sexual Behavior				
Sex work	1.56 (0.60 – 4.08)	2.24 (0.72 – 6.94)	1.67 (0.72 – 3.84)	2.49 † (0.90 – 6.92)
Condom use (non-clients)	0.35 † (0.11 – 1.09)	0.38 (0.10 – 1.42)	0.84 (0.31 – 2.35)	--
2+ partners (non-clients)	0.91 (0.31 – 2.68)	--	1.73 (0.67 – 4.45)	--

*** p<0.05; † p<0.10**

Table 6.6 (con't): Odds ratios for accessing any sexual health care (pap smears or STI tests/ treatment) over the past year among sexually active participants of the Women's Night Survey

	Pap Smear		STI test	
	OR	*AOR*	*OR*	*AOR*
Sexual Behavior				
Condom use (clients) ‡	2.42 (0.54 – 10.8)	--	1.17 (0.31 – 4.48)	--
Number of months since sex work initiation ‡	1.03 (0.95 – 1.12)		1.00 (0.95 – 1.06)	
STI symptoms (past year)	1.66 (0.64 – 4.27)	--	**4.44 * (1.86 – 10.6)**	**4.73 * (1.67 – 13.40)**
General HC access				
Outreach contacts	1.03 (0.88 – 1.20)	--	0.92 (0.81 – 1.05)	--
Number of visit for general health care (past year)	1.11 (0.92 – 1.33)	--	0.98 (0.89 – 1.10)	--

*** $p \leq 0.05$; † $p \leq 0.10$; ‡ among active sex workers**

Reference List

(1) Patrick DM. Control of sexually transmitted diseases in Canada: A cautiously optimistic overview. *The Canadian Journal of Human Sexuality.* 1997;6:79-87.

(2) Patrick DM, Wong T, Jordan RA. Sexually transmitted infections in Canada: Recent resurgence threatens national goals. *The Canadian Journal of Human Sexuality.* 2000;9:149-165.

(3) Fortenberry JD. The Effects of Stigma on Genital Herpes Care-seeking Behaviours. *Herpes.* 2004;11:8-11.

(4) Hannigan S, Jones-Devitt S. Removing the stigma of sexually transmitted infections among women. *Nurs Times.* 2004;100:48-50.

(5) Lichtenstein B. Stigma as a barrier to treatment of sexually transmitted infection in the American deep south: issues of race, gender and poverty. *Social Science & Medicine.* 2003;57:2435-2445.

(6) Goffman E. *Stigma: Notes on the Management of Spoiled Identity.* New York: Simon & Schuster Inc.; 1963.

(7) Parker R, Aggleton P. HIV and AIDS-related stigma and discrimination: a conceptual framework and implications for action. *Social Science and Medicine.* 2003;57:13-24.

(8) Nack A. Damaged goods: women managing the stigma of STDs. *Deviant Behavior.* 2000;21:95-121.

(9) Nack A. Bad Girls and Fallen Women: Chronic STD Diagnoses as Gateways to Tribal Stigma. *Symbolic Interaction.* 2002;25:463-485.

(10) Brandt A. *No magic bullet: a social history of venereal disease in the United States since 1880.* New York: Oxford University Press; 1985.

(11) Fortenberry JD, McFarlane M, Bleakley A et al. Relationships of stigma and shame to gonorrhea and HIV screening. *American Journal of Public Health.* 2002;92:378-381.

(12) Meyer-Weitz A, Reddy P, Van den Borne HW, Kok G, Pietersen J. Health care seeking behaviour of patients with sexually transmitted diseases: determinants of delay behaviour. *Patient Education and Counseling.* 2000;41:263-274.

(13) Ajzen I, Fishbein M. *Understanding Attitudes and Predicting Social Behavior.* Englewood Cliffs, New Jersey: Prentice-Hall, Inc; 1980.

(14) Day S, Ward H. Sex workers and the control of sexually transmitted disease. *Genitourinary Medicine.* 1997;73:161-168.

(15) Darroch J, Myers L, Cassell J. Sex differences in the experience of testing positive for genital chlamydia infection: a qualitative study with implications for public health and for a national screening programme. *Sexually Tranmitted Infections.* 2003;79:372-373.

(16) Cunningham SD, Tschann J, Gurvey JE, Fortenberry JD, Ellen JM. Attitudes about sexual disclosure and perceptions of stigma and shame. *Sexually Transmitted Infections.* 2002;78:334-338.

(17) Dixon-Woods M, Stokes T, Young B, Phelps K, Windridge K, Shukla R. Choosing and using services for sexual health: a qualitative study of women's views. *Sexually Transmitted Infections.* 2001;77:335-339.

(18) Tucker JS, Wenzel SL, Elliott M, Hambarsoomian K, Golinelli D. Patterns and correlates of HIV testing among sheltered and low-income housed women in Los Angeles County. *Journal of Acquired Immune Deficiency Syndrome.* 2003;34:415-422.

(19) Bambauer KZ, Prigerson HG. The Stigma Receptivity Scale and its association with mental health service use among bereaved older adults. *J Nerv Ment Dis.* 2006;194:139-141.

(20) Kalichman SC, Simbayi LC, Jooste S et al. Development of a brief scale to measure AIDS-related stigma in South Africa. *AIDS Behav.* 2005;9:135-143.

(21) Yen CF, Chen CC, Lee Y, Tang TC, Yen JY, Ko CH. Self-stigma and its correlates among outpatients with depressive disorders. *Psychiatr Serv.* 2005;56:599-601.

(22) van Brakel WH, Anderson AM, Mutatkar RK et al. The Participation Scale: measuring a key concept in public health. *Disabil Rehabil.* 2006;28:193-203.

(23) Lichtenstein B, Bachmann LH. Staff affirmations and client criticisms: staff and client perceptions of quality of care at sexually transmitted disease clinics. *Sex Transm Dis.* 2005;32:281-285.

(24) Mateau-Gelabert P, Maslow C, Flom PL, Sandoval M, Bolyard M, Friedman SR. Keeping it together: stigma, response, and perception of risk in relationships between drug injectors and crack smokers, and other community residents. *AIDS Care.* 2005;17:802-813.

(25) Breast and cervical cancer screening among underserved women. Baseline survey results from six states. The National Cancer Institute Cancer Screening Consortium for Underserved Women. *Arch Fam Med.* 1995;4:617-624.

(26) Margolis KL, Lurie N, McGovern PG, Tyrrell M, Slater JS. Increasing breast and cervical cancer screening in low-income women. *J Gen Intern Med.* 1998;13:515-521.

(27) Sirovich BE, Welch HG. The frequency of Pap smear screening in the United States. *J Gen Intern Med.* 2004;19:243-250.

(28) McCaffery K, Irwig L. Australian women's needs and preferences for information about human papillomavirus in cervical screening. *J Med Screen.* 2005;12:134-141.

(29) Worthington C, Myers T. Factors underlying anxiety in HIV testing: risk perceptions, stigma, and the patient-provider power dynamic. *Qual Health Res.* 2003;13:636-655.

(30) Genuis SJ, Genuis SK. Managing the sexually transmitted disease pandemic: a time for reevaluation. *Am J Obstet Gynecol.* 2004;191:1103-1112.

(31) Newton DC, McCabe MP. A theoretical discussion of the impact of stigma on psychological adjustment to having a sexually transmissible infection. *Sex Health.* 2005;2:63-69.

CHAPTER 7

CONCLUSIONS

CONCLUSIONS

The primary purpose of this body of work is to identify potential factors influencing the continued presence of STIs among a community with a high prevalence of illicit drug use. This has been approached both from the perspective of individual risk behaviour patterns affecting transmission as well as broader issues influencing testing, treatment and regular sexual health care. Poverty, substance use, sex work, mental illness, homelessness and inadequate low-income housing, all contribute to the marginalization of Vancouver's Downtown Eastside[1-3]. Despite community clinics, specialized services and Street Nurse outreach, gaps remain in prevention, testing and treatment for HIV and other STIs, as evidenced by recent syphilis outbreaks, continuing high rates of HIV and STIs and poor access to antiretroviral treatment among HIV-positive women[4-7]. Consequently, an examination of STI transmission and treatment within this community is both timely and extremely relevant to public health policy and programming.

A large, cross-sectional cohort of community residents recruited for the Community Health And Safety Evaluation (CHASE) project served as the base population for this work. Aim 1 examined the trends in STI prevalence using retrospective linkages with the Provincial laboratory data, and assessed associations between specific types and patterns of drug use and recent STI among women from this cohort. Within the CHASE framework, a sub-sample of residents were recruited during a clinic-based health and well-being program for women who were asked to participate in an extended survey and STI screening protocol. Aim 2 determined the cross-sectional prevalence of chlamydia (CT) and gonorrhea (GC) within this sub-sample using NAAT testing of urine samples. Aim 3 assessed predisposing, enabling and reinforcing factors impacting the accession of sexual health services among these women.

SUMMARY OF RESULTS

The preceding chapters have highlighted the continued impact of STIs in the Downtown Eastside community despite interventions and outreach, the complex relationships between different drug use patterns and STIs, the apparent missing high-risk population of women from an existing program, and the potential importance of STI-related stigma on accessing STI testing and treatment.

In Chapter II, it was shown that STIs continue to burden this population, with much higher prevalence of gonorrhea and syphilis as compared to rates reported for the larger urban population, despite outreach efforts and targeted prevention programs. The comparison of yearly trends within the CHASE population to broader regional estimates allowed postulation of potential programming impacts and possible epidemic shifts. In the case of the well-described syphilis outbreak, the epidemic peaks were shifted among the CHASE population, possibly indicating 'late' cases found among hard-to-reach populations through more intensive tracing efforts. In addition, there was an indication of an epidemic shift, as CHASE cases continued to rise, but declined in terms of their contribution to regional cases.

In a secondary analysis, an assessment of the impact of time trends on incidence of subsequent STI infection did not reveal any significant differences, contrasting provincial data for chlamydia re-infection[5]. This finding doesn't necessarily negate the proposed theory of decreased population-level immunity to chlamydia resulting from widespread and timely treatment of infections[8]. However, given the skewed age distribution of the CHASE population, the lack of change over time in incidence of subsequent infections may indicate an age-specific impact of waning population-level immunity.

The descriptive analysis emphasized the importance of continuing innovative prevention and outreach on increased case finding, and potentially on contributing to some of the subsequent decline in STIs. The implementation of new laboratory techniques coupled with chlamydia partner tracing was followed by a rise in cases, especially among men. Peer-based social networking methods appeared to increase syphilis case finding even after the implementation of the mass treatment campaign, potentially indicating the ability to find hard-to-reach individuals through these methods. Chapter II also served to highlight the usefulness of surveillance data beyond monitoring of general trends and detecting emerging outbreaks. Aside from the descriptive analysis done here, evaluation of epidemic phases of an outbreak (i.e. shifting spread among specific sub-populations) can also be very valuable for informing predictive models or establishing where to concentrate future efforts[9,10].

Chapters III and IV assessed the associations of different patterns of drug use with the continued prevalence of STIs. In Chapter III, differential drug use patterns and associated STI risk were determined for HIV-positive and HIV-negative women. Stimulants were an important risk factor for having a positive STI among all women. The injection of stimulants held a stronger association among HIV-positive women whereas smoking of stimulants (namely crack cocaine) held the strongest association among HIV-negative women. Among HIV-positive women, alcohol use and high-intensity episodic drug use were also found to be associated with STIs. In examining factors associated with specific STI outcomes, there was a suggestion of particular risk pathways linked to different substances. This may reflect an important overlap of social contacts, drug using environments and sexual networks. Again in Chapter IV, the potential influence of separate risk environments linked to specific substances was suggested. Although there was no evidence of interaction between crack cocaine and other substances, there did appear to be independent risk from use of crystal methamphetamine and use of crack cocaine,

suggesting that the pathways of risk do not overlap. Drug use behaviours were particularly high among HIV-positive women (>90%), indicating an urgent need for more harm reduction and addiction services tailored towards this group of women.

In Chapter V, the cross-sectional prevalence of chlamydia and gonorrhea among a sub-sample of women from the area was assessed and found to be approximately 2.8% for chlamydia, while no cases of gonorrhea were found. Although the sample was small, this was lower than expected given the potentially high-risk behaviours of the population (38% current sex workers, 80% non-injection drug use, 40% injection drug use). This highlights the probable high-uptake of services in the area by women who are slightly older and have been living in the area and working in sex trade for longer (median time working in sex trade: 10 years, IQR: 3 to 18 years). The number of sex work clients reported by CSW also supports the hypothesis that this population is a low-risk faction of the CSW population, with a median of 10 partners (IQR: 4 to 50) over the past six months. This is a much smaller number as compared to more active CSW or survival sex workers in the area who have reported a median of 100 partners in other studies[2,11-13]. The WN clinic is therefore not an effective service for reaching higher risk women and there is a need for continued outreach and targeting of the younger, more vulnerable women who may not be accessing clinic-based services, especially given the continued high prevalence of STIs reported for the larger health region[5].

Accessing health services, particularly sexual health services, was again addressed in Chapter VI. Here, it was found that injection drug users had a lower uptake of annual pap smear testing, despite the presence of outreach 'pap blitz' programs. STI testing and treatment was associated with reporting Aboriginal ethnicity, being a current sex workers, and younger age. This is not surprising given the tailored services for Aboriginal women and CSW in the area, and the

general focus for STI screening among younger populations. However, there did appear to be a negative influence of STI-stigma, specifically internal stigma or self-judgement, on reporting receipt of STI testing or treatment in the past year. While increased testing and treatment among Aboriginal women is indicative of the increased culturally-tailored programs, the observed increase in STI-related stigma among Aboriginal women may reflect the unwarranted effect of increasing testing on the actual or perceived views of the community towards a specific population.

STRENGTHS AND LIMITATIONS

There are certain limitations of this study that need to be considered. Despite a large sample of community residents and a large repository of retrospective STI data, passive surveillance of STIs does not yield sufficient outcomes for male participants. Therefore, apart from Chapter II which examined overall prevalence trends, males were excluded from the study as there were insufficient outcomes to assess associations with drug use behaviours. As there are substantial gender differences in risk behaviours and risk pathways for STIs[14-16], as well as differences in biological susceptibility, a model that simply adjusted for gender was not deemed to be appropriate. In addition, the potential biases in outcome ascertainment, which will be discussed further below and in Appendix I, would not be the same for males, reflecting the different reasons that men and women access available services.

STI outcome data was obtained from the BC CDC Provincial Laboratory database. While the laboratory undertakes all syphilis testing for the province, chlamydia and gonorrhea testing may also be carried out at private facilities. There is an additional database containing all reportable STIs; however, attempts to link CHASE data to this database were unsuccessful (this is

discussed further in Appendix I). An assessment of the potential directions of the resulting misclassification of STI cases as non-cases revealed that estimates of the associations of specific drug use with STI would generally be underestimates of the true associations. Another potential form of bias could result from reliance on self-report of sensitive behaviours such as drug use and sexual behaviours. In addition to results from the literature that indicate generally reliable reporting of sensitive behaviours among drug using populations[17,18], the CHASE project employed trained, peer interviewers from within the community. While the extended survey among the sub-sample of women did not utilize peer interviewers, the researcher spent a considerable amount of time participating in the evening program prior to the survey.

There is also a potential for both desirable reporting as well as recall bias in response to questions about previous sexual health care visits. Although the number of women reporting having had a pap smear in the past year (75%) was higher when compared to reports in other populations, this was not surprising given the substantial outreach efforts for pap screening over the previous two years within this community[19,20]. On the contrary, reports of previous STI testing was lower (54% overall, 60% among those reporting a pap smear), which may be due to some recall bias among women who had STI testing done routinely during a pap smear, but did not report this as an STI testing event during the interview. It would not, however, be expected that pap smear testing and STI testing would be completely congruent, and so the decreased number of STI tests reported may reflect an actual difference in testing patterns.

Lastly, although there was an extensive amount of STI outcome data available, the cross-sectional nature of the CHASE survey limited the ability to associate time-dependent variables, such as drug use patterns, with STI outcomes.

Despite these limitations, there are also substantial strengths to the study. Unlike most studies of STIs and drug use which sample populations from clinic locations, drug treatment centres or which focus on cohorts of specific drug users, the CHASE project encompassed a large, community sample, representing a broader variety of drug users. This allowed for a more extensive examination of the association of types of drugs, patterns of use, and combinations of types of drugs and use patterns. Similarly, although the sub-sample of women recruited was small, it represented a range of women with different levels of sexual risk.

The ability to link health records with the CHASE survey resulted in access to an extensive database of STI information, despite the limitations associated with passive surveillance. As many STI studies rely on self-report of STIs or draw samples from clinic-based populations, the issue of missing asymptomatic cases associated with passive versus active surveillance remains. Thus, the combination of a large community sample and an extensive database of STI outcomes is a strength of this study.

As mentioned above, the CHASE survey was based in the community and employed several peers from within the community for the interviewing process. This not only supports the community, but strengthens trust and possibly decreases self-reporting biases.

COMPARISON OF RESULTS TO THE LITERATURE

Sexually Transmitted Infections

As illustrated in Chapter II, STI prevalence trends generally reflected the provincial and regional data, although with the exception of chlamydia, period-prevalence rates were much higher in the CHASE population. Considering the CHASE population as a high-risk group, rates of 0.3 to 0.5% per year for gonorrhoea are not comparatively high. When examining other neigh-

bourhood based samples, rates of gonorrhoea have been found to range from 1% to 5% [21-23]. Restricting to women, the percentage with any STI rose from around 1% to 3.5% between 1997 and 2002. While these proportions are higher, reports for similar high-risk population samples in other settings using active ascertainment of outcomes range from 3% prevalence to 20% [21,24-26]. The lower proportions seen in the CHASE population are expected due to the passive ascertainment of outcomes. Among the sub-sample of women who underwent urine screening, chlamydia prevalence was estimated at 2.8%, which was lower than expected, but not significantly different from similar studies[25].

In Chapter III, the types of STIs present among HIV-negative and positive women in 2003-04 were compared. The high prevalence of trichomonas (7.5%) found among HIV-positive women has been noted in other populations, and the high prevalence of gonorrhoea (4.0%) is not entirely surprising given the potential interactions between HIV and GC infection[27,28]. For HIV-negative women, syphilis was the most prevalent STI in recent years, reflecting the continued impact of the syphilis epidemic. Syphilis was negligible among HIV-positive women; however, this was driven by the fact that most of these women had already tested positive earlier in the epidemic and that the analysis was limited in its ability to distinguish re-infection from past infection.

Risk Behaviours

Reports of drug use behaviour were quite high in this population, with 60% using an illicit drug other than marijuana in the past six months. The most prevalent drug reported was non-injection crack cocaine, followed by injection cocaine. As in other studies of crack users, there was a proportion of the population that only reported smoking crack, another that only reported injecting cocaine, and another that reported both practices[29]. A smaller faction reported similar patterns with crystal methamphetamine smoking and injecting, although given the older age

distribution of the CHASE population and reports of much higher proportions of use in younger populations, the CM use reported in this population may not capture the majority of CM users[30]. Injection behaviours were also more often reported among the HIV-positive participants, which would be expected given their dual risk exposures[31].

In the sub-set of women recruited for the extended survey, sexual behaviours reported were similar to what would be expected based on the scientific literature, with the exception of client numbers among CSW. Among active sex workers, client numbers ranged from 1 to over 400 over the past 6 months, which is typical; however, the median was only 10 (IQR: 4 to 50). This contrasts other studies from the same community, indicating the over-representation of more stable, less active CSW as compared to those that rely on sex trade for living[2,11,13]. Reporting of condom use was high for clients, but declined for regular partners[11,32,33]. Sexual health care in the form of pap smears was reported by a comparable proportion of the women (75%), while STI testing and treatment was lower[19,22,23]. The associations of STI testing with groups previously identified as being at high risk for HIV and other STIs reinforces the validity of the self-reported behaviours.

Associations

Chapters III and IV uncovered specific STI risk profiles for HIV-positive and HIV-negative women, and demonstrated the role of types of drugs used as well as varying drug use patterns such as daily use, episodic use or combinations of these. These findings are supported in the literature, where higher drug risk profiles tend to go hand-in-hand with higher sexual risk behaviours and STIs[34]. The literature on environment and context of drug use supports these findings. Several studies have displayed the key role of environment and context in the associations of crack and STIs[35-37]. These arguments provide an explanation for the specific

associations between CM and trichomonas, or for the distinct, although not interacting, associations for crack use and CM use among dual users. If the setting and drug use networks are shifting when different drugs are being used or different use patterns are observed, the associated sexual risk networks and behaviours may also be shifting.

The likelihood of drug use environments and networks playing a key role in the complex patterns observed is reinforced through studies that have examined a detailed causal pathway. Although many studies report associations between unprotected sex and alcohol or drug use, studies using event-level analysis found that previous condom use behaviours, as opposed to concurrent drug use behaviours, were a stronger predictor of current condom use[38,39]. Nevertheless, some research has found increased willingness to engage in unprotected sex with clients among sex workers with higher and more frequent alcohol consumption levels[40], and among a general high-risk population, quantity of alcohol consumed per sitting rather than frequency of drinking was found to correlate with inconsistent condom use in a linear fashion[41]. In the present work, an independent association of alcohol and STIs was found among HIV-positive women; however, the association was restricted to general consumption of alcohol and was not seen with daily alcohol consumption or high-intensity episodic drinking patterns. While perhaps not expected, studies examining the levels of alcohol used have found that 'spreaders' or those that drink moderate amounts in throughout the week reported more problems than those defined as 'binge' drinkers, concentrating similar levels of consumption into one or two days[42].

Whether different substances are operating through different risk environments or at different levels of intensity (i.e. increased frequency of STI-risk exposures), Chapters III and IV highlight

the varying effects of specific and multiple substance use. The important public health message here relates to the potential use of specific patterns of drug use as an indicator of high-risk, not only for the individual, but potentially for associated drug using network. Accessing visible poly-user populations through outreach may help to extend connections into the more hidden but possibly inter-connected drug and sexual networks.

Chapter VI revealed factors associated with regular sexual health visits and STI testing among a sub-set of women. In a population where pap 'blitz' programs reach a large number of at-risk women, injection drug users were found to be less likely to report receiving these services. Among the three stigma scales developed, only internal stigma retained an association with receiving an STI test or treatment in the past year.

Notably, both tribal stigma and internal stigma were notably higher among Aboriginal women. As stigma and social perceptions of stigma are tied to cultural and structural frameworks of dominance and oppression, the STI-related stigma expressed here is likely compounded by other social inequalities and cultural histories of marginalization. The presence of STI-related stigma in this population, and the associaiton of internal stigma with STI screening should remind all health care professionals, from policy makers to front-line workers, of the potential impact of STI messages and of the influence of language used during patient interactions. It is imperative not to overlook the impact of STI-related stigma among marginalized populations, wherein numerous issues, including gender-related power issues, cultural stigma, pressures from social conditions and addictions, and limited contact with or access to sexual health services, may compound the problem[43-45]. There is a need to continue to think about how services and STI messages are delivered, and to push for innovation in education methods in order to decrease the

gendered view of STI 'offenders' versus 'victims' that may delay the timely and regular access of sexual health services among women.

CONTRIBUTION TO THE FIELD

This study contributes to previous research on associations of drug use and STIs, as it was able to draw on a large, diverse community-recruited sample. Typically, studies have focused on STI-clinic or drug treatment centre populations, or utilize larger cohorts of specific types of drug users. This study adds to a handful of other neighbourhood based studies examining prevalence and correlates among drug using populations. Unlike previous neighbourhood studies, this population has an older age distribution, and due to the concentrated nature of drug use in this location, has a high prevalence and variation of drug use behaviours. Paired with the ability to link participants to large public health datasets, this study was able to examine a wider range of substance use combinations and patterns of use. While some analytical limitations were present due to inadequate power, we were also able to explore several types of interaction, generating hypotheses for future research.

The advent of nucleic acid amplification techniques (NAAT) for STI screening has allowed for faster and less invasive sample collection. Although methods for screening urine for GC have only recently been approved and implemented by several Provinces, the feasibility of using these methods to test for CT and GC among a population of women from the community was examined. Accessing the existing women's program to implement rapid STI screening was not found to be particularly useful due to the low number of positive tests (2 positive CT tests, 0 positive GC screens), although the acceptability of the method was high (79% among sexually active women). This information can be useful in directing efforts towards more outreach

focusing on women not currently making use of the existing programs and services in the area. The results are also useful for the directors of current programs, highlighting the population of women that are making use of programs, and providing impetus for creating innovative events or advertising methods in order to broaden the reach of existing programs to younger, higher risk women.

The results of the sexual health survey provided evidence of the usefulness of existing pap blitz programs, but also highlighted the reduced use of these programs by injection drug users. Again, these results could be used to tailor future efforts towards these women.

The novel, albeit preliminary development of STI-related stigma scales specific for women was another important contribution. Incorporating both classical stigma theory and more recent research revealing the important impact of gendered STI-stereotypes on women, these scales could prove to be useful tools after further refinement. As seen in the present work, measures of the impact of STI-related stigma on sexual health service use could reveal populations in need of more tailored support services during STI screening programs. In addition, STI-related stigma scales could be used to assess STI education and prevention programs in terms of their ability to decrease these perceptions.

DIRECTIONS OF FUTURE RESEARCH

Stemming from Chapters III and IV, further examination of the overlap of distinct drug patterns and sexual networks would benefit from an addition of networking methods. These methods could be especially important in examining relationships among CM use and the possible overlap of HIV-negative and HIV-positive sexual networks, potentially putting young HIV-negative CM users at high risk for seroconversion. Further exploration of the usefulness of

accessing high-risk core groups through identification of specific networks based on drug use practices is warranted.

The high levels of trichomonas among HIV-positive women in addition to the high levels of drug use reported by this group indicate a need for increased services tailored to this vulnerable population. Other research done in the community also suggests that many HIV-positive women are not making use of HIV treatment services[4]. Programs that combine HIV-treatment, sexual health services and harm reduction could have an enormous impact for this population.

The inverse association of injection drug use and regular sexual health care could also benefit from further analysis, perhaps through qualitative studies assessing differences and identifying reasons for this association.

Lastly, revision and re-testing of items to further develop a validated STI-related stigma tool would be worthwhile. Along with testing and validation of the scales, exploration of its usefulness among different populations of women would be required.

FINAL CONCLUSIONS

Summary of Main Findings:

- **Chapter 2:** Polydrug use patterns and risk profiles are distinct among HIV-positive and HIV-negative women; patterns of use – daily, episodic, or combinations of this – are important factors to consider when assessing sexual risk and substance use. High prevalence of STIs, especially *T. Vaginalis* infection, among HIV-positive women indicates continued need for regular screening and enhanced prevention messages.

- **Chapter 3:** Among polydrug users, there was no apparent interaction for multiple substances, although substances may hold independent risks for STI among dual-users
- **Chapter 4:** Peer-based and outreach programs appeared to have a positive impact on syphilis case finding, and potentially played a role in subsequent decreasing STI trends. Examination and comparison of annual STI prevalence between high-risk populations and regional data can be useful in exploring epidemic shifts and suggesting ecological program impact.
- **Chapter 5:** Health and well-being programs tailored to women in a high-risk community may not be effective at drawing in the hard-to-reach population at most risk for HIV and STI; specific programs tailored to different groups of women (e.g., street youth, survival sex workers) may be of more use for STI screening and intervention initiatives.
- **Chapter 6:** Internal stigma was independently associated with decreased STI testing and treatment. Diminishing STI-related stigma should be a consideration of all STI prevention, intervention and sexual health care initiatives; gender and cultural aspects of stigma are important to consider when tailoring interventions for high-risk groups.

Throughout the chapters, the continued impact of STIs in this high-risk neighbourhood was shown, indicating the need for continued support of outreach programs, and development of innovative interventions that reach out to the hidden populations and support testing and treatment in the most vulnerable. The complexities of the relationships between drug using networks and environments and the associated risky sexual contacts and behaviours were also illustrated. The low rates of use of newer drugs, such as crystal methamphetamine, reported by this population and the comparatively strong associations seen with STIs again suggests the importance of the hidden, hard-to-reach populations that may not be accessing adequate sexual

health services. In strategizing for future outreach efforts, it may be useful to consider the drug networks of individuals with more complex patterns of use in order to access some of these sub-groups. It is clear that general screening of women attending this particular clinic-based program, regardless of the medical or non-medical nature of the event, was not effective in reaching the women who do not already access some form of services. Nonetheless, even within this population of service-connected women, STI-related stigma remained an important factor in seeking STI testing or treatment.

(1) Miller C, Spittal PM, Laliberte N et al. Females Experiencing Sexual and Drug Vulnerabilities Are at Elevated Risk for HIV Infection Among Youth Who Use Injection Drugs. *Journal of Acquired Immune Deficiency Syndrome.* 2002;30:335-341.

(2) Tyndall M, Patrick D, Spittal P, Li K, O'Shaughnessy MV, Schechter MT. Risky sexual behaviours among injection drug users with high HIV prevalence: implications for STD control. *Sexually Transmitted Infections.* 2002;78:i170-i175.

(3) Corneil T, Kuyper LM, Shoveller J et al. Unstable housing, associated risk behaviour, and increased risk for HIV infection among injection drug users. *Health and Place.* 2006;12:79-85.

(4) Shannon K, Bright V, Duddy J, Tyndall MW. Access and utilization of HIV treatment and services among women sex workers in Vancouver's Downtown Eastside. *Journal of Urban Health.* 2005;82:488-497.

(5) BC Centre for Disease Control. STD/AIDS Control: Annual Report. 2004. Vancouver, B.C., Provincial Health Services Authority.
Ref Type: Report

(6) Patrick D, Rekart ML, Jolly A et al. Heterosexual outbreak of infectious syphilis: epidemiological and ethnographic analysis and implications for control. *Sexually Transmitted Infections.* 2002;78:i164-i169.

(7) Spittal PM, Craib KJP, Wood E et al. Risk factors for elevated HIV incidence rates among female injection drug users in Vancouver. *Canadian Medical Association Journal.* 2002;166:891-899.

(8) Brunham RC, Pourbohloul B, Mak S, White R, Rekart ML. The unexpected impact of a Chlamydia trachomatis infection control program on susceptibility to reinfection. *J Infect Dis.* 2005;192:1836-1844.

(9) Mills S, Saidel T, Magnani R, Brown T. Surveillance and modelling of HIV, STI, and risk behaviours in concentrated HIV epidemics. *Sexually Tranmitted Infections.* 2004;80:ii57-ii62.

(10) Fenton KA, Mercer CH, Johnson AM et al. Reported sexually transmitted disease clinic attendance and sexually transmitted infections in britain: prevalence, risk factors, and proportionate population burden. *J Infect Dis.* 2005;191 Suppl 1:S127-38.:S127-S138.

(11) Alary M, Worm AM, Kvinesdal B. Risk behaviours for HIV infection and sexually transmitted diseases among female sex workers from Copenhagen. *International Journal of STD & AIDS.* 1994;5:365-367.

(12) Elmore-Meegan M, Conroy RM, Agala CB. Sex workers in Kenya, numbers of clients and associated risks: an exploratory survey. *Reproductive Health Matters.* 2004;12:50-57.

(13) Ward H, Day S, Mezzone J et al. Prostitution and risk of HIV: female prostitutes in London. *British Medical Journal.* 1993;307:356-358.

(14) Strathdee SA, Galai N, Safaiean M et al. Sex Differences in Risk Factors for HIV Seroconversion Among Injection Drug Users. *Archives of Internal Medicine.* 2001;161:1281-1288.

(15) Jones D, Irwin KL, Inciardi JA et al. The high-risk sexual practices of crack-smoking sex workers recruited from the streets of three American cities. *Sexually Transmitted Diseases.* 1998;25:187-193.

(16) Absalon J, Fuller CM, Ompad D et al. Gender differences in sexual behaviors, sexual partnerships, and HIV among drug users in New York City. *AIDS & Behavior.* 2006;E-pub ahead of print:1-9.

(17) Darke S. Self-report among injecting drug users: a review. *Drug and Alcohol Dependence.* 1998;51:253-263.

(18) Anthony JC, Vlahov D, Celentano DD et al. Self-report interview data for a study of HIV-1 infection among intravenous drug users: description of methods and preliminary evidence on validity. *Journal of Drug Issues.* 1991;21:739-758.

(19) Margolis KL, Lurie N, McGovern PG, Tyrrell M, Slater JS. Increasing breast and cervical cancer screening in low-income women. *J Gen Intern Med.* 1998;13:515-521.

(20) Sirovich BE, Welch HG. The frequency of Pap smear screening in the United States. *J Gen Intern Med.* 2004;19:243-250.

(21) Plitt SS, Garfein RS, Gaydos CA, Strathdee SA, Sherman SG, Taha TE. Prevalence and correlates of chlamydia trachomatis, neisseria gonorrhoeae, trichomonas vaginalis infections, and bacterial vaginosis among a cohort of young injection drug users in Baltimore, Maryland. *Sex Transm Dis.* 2005;32:446-453.

(22) Turner CF, Rogers SM, Miller HG et al. Untreated gonococcal and chlamydial infection in a probability sample of adults. *JAMA.* 2002;287:726-733.

(23) Poulin C, Alary M, Bernier F, Carbonneau D, Boily MC, Joly JR. Prevalence of Chlamydia trachomatis and Neisseria gonorrhoeae among at-risk women, young sex workers, and street youth attending community organizations in Quebec City, Canada. *Sexually Transmitted Diseases.* 2001;28:437-443.

(24) Bradshaw CS, Pierce LI, Tabrizi SN, Fairley CK, Garland SM. Screening injecting drug users for sexually transmitted infections and blood borne viruses using street outreach and self collected sampling. *Sex Transm Infect.* 2005;81:53-58.

(25) Klausner J, McFarland W, Bolan G et al. Knock-Knock: A Population-Based Survey of Risk Behaviour, Health Care Access, and *Chlamydia trachomatis* Infection among Low-Income Women in the San Francisco Bay Area. *Journal of Infectious Diseases.* 2001;183:1087-1092.

(26) Tsunoe H, Tanaka M, Nakayama H et al. High prevalence of Chlamydia trachomatis, Neisseria gonorrhoeae and Mycoplasma genitalium in female commercial sex workers in Japan. *International Journal of STD & AIDS.* 2000;11:790-794.

(27) Kalichman SC, Rompa D, Cage M. Sexually transmitted infections among HIV seropositive men and women. *Sex Transm Infect.* 2000;76:350-354.

(28) Cu-Uvin S, Ko H, Jamieson DJ et al. Prevalence, incidence, and persistence or recurrence of trichomoniasis among human immunodeficiency virus (HIV)-positive women and among HIV-negative women at high risk for HIV infection. *Clin Infect Dis.* 2002;34:1406-1411.

(29) McCoy CB, Lai S, Metsch LR, Messiah SE, Zhao W. Injection drug use and crack cocaine smoking: independent and dual risk behaviors for HIV infection. *Annals of Epidemiology.* 2004;14:535-542.

(30) Wood E, Stoltz JA, Montaner JS, Kerr T. Evaluating methamphetamine use and risks of injection initiation among street youth: the ARYS study. *Harm Reduction Journal.* 2006;3:18.

(31) Strathdee S, Sherman SG. The role of sexual transmission of HIV infection among injection and non-injection drug users. *Journal of Urban Health.* 2003;80:iii7-iii14.

(32) Spittal PM, Bruneau J, Craib KJ et al. Surviving the sex trade: a comparison of HIV risk behaviours among street-involved women in two Canadian cities who inject drugs. *AIDS Care.* 2003;15:187-195.

(33) Williams M, Ross MW, Bowen AM et al. An investigation of condom use by frequency of sex. *Sexually Transmitted Infections.* 2001;77:433-435.

(34) Patterson TL, Semple SJ, Zians JK, Strathdee SA. Methamphetane-using HIV-positive men who have sex with men: correlates of polydrug use. *Journal of Urban Health.* 2005;82:i120-i126.

(35) Logan TK, Leukefeld C. Sexual and drug use behaviors among female crack users: a multi-site sample. *Drug Alcohol Depend.* 2000;58:237-245.

(36) Inciardi JA. Crack, crack house sex, and HIV risk. *Archives of Sexual Behavior.* 1995;24:249-269.

(37) Costenbader EC, Astone NM, Latkin CA. The dynamics of injection drug users' personal networks and HIV risk behaviors. *Addiction.* 2006;101:1003-1013.

(38) Gillmore MR, orrison DM, eigh BC. Does "High = High Risk"? An Event-Based Analysis of the Relationship Between Substance Use and Unprotected Anal Sex Among Gay and Bisexual Men. *AIDS & Behaviour.* 2002;6:361-370.

(39) Leigh BC, Stall R. Substance use and risky sexual behavior for exposure to HIV: Issues in methodology, interpretation and prevention. *Am Psych.* 1993;48:1035-1045.

(40) Nadeau L, Truchon M, Biron C. High-risk sexual behaviors in a context of substance abuse: A focus group approach. *Journal of Substance Abuse Treatment.* 2000;19:319-328.

(41) Lauchli S, Heusser R, Tschopp A, Gutzwiller F, Research Group of the Swiss HIV Prevention Study. Safer sex behavior and alcohol consumption. *Annual Epidemiology.* 1996;6:364-375.

(42) Miller P, Plant M, Plant M. Spreading out or concentrating weekly consumption: alcohol problems and other consequences within a UK population sample. *Alcohol Alcohol.* 2005;40:461-468.

(43) Parker R, Aggleton P. HIV and AIDS-related stigma and discrimination: a conceptual framework and implications for action. *Social Science and Medicine.* 2003;57:13-24.

(44) Fortenberry JD, McFarlane M, Bleakley A et al. Relationships of stigma and shame to gonorrhea and HIV screening. *American Journal of Public Health.* 2002;92:378-381.

(45) Newton DC, McCabe MP. A theoretical discussion of the impact of stigma on psychological adjustment to having a sexually transmissible infection. *Sex Health.* 2005;2:63-69.

APPENDIX 1

ADDITIONAL METHODS AND METHODOLOGICAL ISSUES

CHASE PROJECT

The CHASE project was initiated as an evaluation of the impact of Vancouver Coastal Health Authority intitiatives on the health and health service utilization of the Downtown Eastside community as well as to identify shortfalls of current programs and priority areas for future efforts. The project established a large open cohort of residents between 2003 and 2005, recruiting participants through community-based organizations, storefront locations and door-to-door initiatives in single-room occupancy (SRO) hotels and subsidised housing buildings. The short baseline questionnaire was delivered by trained peer interviewers from the community and included questions on sociodemographics, health status, service utilization, barriers to healthcare and patterns of substance use.

ISSUES WITH DATA LINKAGE AND MISSING DATA

In order to assess STI outcomes among the CHASE participants, an agreement was made with the BC CDC Laboratory to access laboratory test data. For syphilis, this captured all tests carried out, as the Provincial Lab is the only location offering this test. For other STIs, testing can also be carried out by private laboratories, resulting in a potential bias in ascertainment of outcome among the CHASE population. Samples collected by Street Nurses, whose efforts are concentrated in the Downtown Eastside, are all sent to the Provincial Laboratory.

In order to try and complete the STI outcome dataset, an agreement was reached with the STI division at the BC CDC to assess the feasibility and usefulness of linking the CHASE data to the Provincial reportable STI database. A sample of 100 participants were selected using three groups: 32 current CSW (known high-risk participants, to assess potential bias among this group); 34 randomly selected participants (to assess potential bias in general CHASE group); 34 randomly selected participants *with* a recorded STI in the provincial laboratory database (to

assess the potential problems with matching, given these individuals *should* have a positive match in the reportable database). A data analyst at the BC CDC carried out the matching using the methodology shown in Table 1 (provided by BC CDC).

The results of the pilot match indicated that, while it would increase case finding, the process would be incomplete and non-efficient. Less than ¼ of the CHASE population with an identified STI in the Provincial Laboratory database were also identifiable in the reportable database. Of note, there was a higher proportion of matching among the high-risk group (25%) as compared to the general CHASE population (12%) in the two samples with no records in the laboratory database.

In order to assess the potential for bias in the population several comparisons were carried out. Since all syphilis tests were available, the *testing* population – regardless of outcome – was compared by type of test. While reasons behind receiving a particular STI test may be different, especially with targeted testing for syphilis during and after the epidemic, unexpected differences or large overall population differences may indicate a 'missing' population. These individuals may have accessed testing as observed by the presence of a syphilis test, but have no other recorded STI tests and may therefore have accessed testing services at a private laboratory. In addition, analyses were restricted to those who had any recorded STI test to evaluate any large variations in the resulting models. While it is still possible for those with recorded tests to have accessed multiple venues and have test results in both the Provincial laboratory database and in private databases, this restricts the sample to those *more likely* to access care through clinics and providers that use the Provincial Laboratory testing services. Table 2 outlines the potential impact of missing outcome data on drug use associations.

Using the smaller population of women who completed the Women's Night survey, a comparison of drug use proportions and higher risk sexual behaviours (namely injection cocaine, crack use and sex work in the last 6 months) was done, allowing estimates to be applied to the potential increases in STI diagnosis among the drug use and non-drug use categories. While the difference in misclassifying women as not having an STI would be differential (i.e. drug use was consistently reported at higher frequencies in the population of active sex workers), in all examples – overall association of STI with crack use or with injection cocaine – did not substantially change the odds ratio. This is resulting from the small sizes of the 'a' and 'c' cells (STI outcomes) compared to the total population, and the relatively small size of the 'b' cell when examining a particular drug or mode of direction. The 'd' cell is thus big enough to offset the increased proportion of women moving from 'b' to 'a', and the final estimate is not heavily impacted. Nonetheless, results need to be interpreted with caution, and thought placed into each analysis to understand the potential differences in the outcome.

SURVEY DEVELOPMENT

The development of the survey began with an examination of how best to address the final research question: what is the sexual health knowledge of women in the neighbourhood, and what are the barriers to accessing these services. Behaviour plays an important role in sexual health, both from the perspective of the risk behaviours that may contribute to the acquisition of infection, as well as the behaviours such as annual check-ups, recognition and treatment of symptoms and perceptions of risk relating to decisions for screening.

A literature review revealed several possible health behaviour models, including the PRECEDE/PROCEED model, the Health Belief Model, the Theory of Planned Behavior, the Theory of Reasoned Action, and the Self-regulation model, and the model of Social Cognitive

Theory, to name a few[1-3]. Each places emphasis on it's own particular constructs that influence the decision process involved in making decisions surrounding one's health, from partaking in risk to prevention. The strength of these models is their flexibility, allowing for integration into various topics of health as well as the borrowing of pieces of theory for patchwork models that address specific research situations.

The PRECEDE model is a general model of behaviour that can be used to generate specific theoretical frameworks and is based on the categorization of elements into predisposing (knowledge, attitude,belief), enabling (accessibility, location/hours, mobility, health related skills, ability to avoid risk) and reinforcing factors (rewards/incentives, tangible or intangible, social support)[4]. While there is a tendency to see these components in a linear fashion (i.e. predisposing factors must be in place for enabling factors to have effect), each component may have direct or indirect influence on the others.

The focus of the research question was on behaviours of health service utilization, not on reducing personal sexual risk behaviors. To this end, both seeking services for screening, either due to symptoms or known risky contacts, and seeking treatment for STDs are considered. Since the factors influencing these sexual health behaviours are multileveled and include social, personal and contextual elements, the PRECEDE model was chosen to attempt to describe and explain the influence of these elements on the action of seeking sexual health care. The first model, seen below, included predisposing constructs of knowledge with respect to STI symptoms and severity, as well as demographics and psychological aspects such as depression and anxiety. Enabling factors included program attendance in the Downtown Eastside and contact with Street Nurses. Reinforcing concepts thought to be important encompassed social support in terms of integration with community and sexual social support in terms of

opportunities to openly and safely discuss sexual health issues. In addition, concepts of self-regulation and attitude towards STIs, specifically in terms of the importance or weight given to sexual health, were initially incorporated in the model.

The survey elements were developed from this theoretical model, drawing on previously developed scales, survey instruments, and published literature on various topics dealing with health seeking behaviours. Demographics, drug use behaviours and general health system access were already included in the CHASE survey. Standard scales were chosen for affect and depression, sexual behaviours were modelled after other questionnaires, stratifying questions about condom use and frequency of sexual events by partner-type. A measure of self-perceived risk with each partner-type was also included.

Social support measures using categories of social contacts, types of support provided as well as ability to discuss health and sexual health with particular contacts were included. General clinic attendance and attendance (or outreach contact) for pap smears, STI testing or STI treatment was assessed. In particular, women were asked whether or not they had received a pap from their own doctor, another doctor or as part of the "papalooza" screening blitz carried out by Street Nurses in the previous fall. Finally, a stigma scale was developed, building on qualitative literature and previous scales in adolescent populations[5-7]. Visual aids were developed for the questions regarding frequency of sexual events, proportion of condom use with each partner and agreement/disagreement with stigma-scale items.

After the initial questionnaire was developed and piloted with colleagues, it was determined to be too long for the present study. The survey was to take place within the context of Women's Night, giving the researcher approximately 3 hours to enrol women and deliver both the CHASE

and the Women's Night survey. The CHASE survey was relatively short (10-15 minutes to complete) and was delivered by peer interviewers, allowing some overlap, but it was decided that in order to increase the number of recruits to enhance the cross-sectional STI screening, the additional survey should remain below 15 to 20 minutes. Also, in this setting many women attend to have dinner and socialize, therefore the researcher did not think it would be appropriate to ask the women to give up any more of their time, even with incentives. It was decided that a shorter survey could focus on symptom knowledge, transportation and outreach contact sexual bevaviours, sexual health care, sexual communication and stigma. The final survey is attached in Appendix II.

The final survey was piloted among three women not associated with the clinic or with public health research for clarity of the concepts. Subsequently, the survey was piloted with a small number of women who were regular attenders fo the Women's Night. The researcher had been attending the event for the previous year in order to support the clinic program, as well as to gain acceptance from the women and the staff.

Each Tuesday evening, the survey was announced to the women attending the evening program, although after the first week, word of the survey had sufficiently spread through the community. Women were signed up at the beginning of the night, with six to eight interviews scheduled for that night, and another six to eight spilling over to the next evening.

The CHASE consent was delivered by a research staff member and the questionnaire delivered by a peer interviewer. The Women's Night consent and survey was delivered by the researcher. Urine screening was offered to participants, with no consequence on their ability to participate in the survey if they refused. Urine samples were tested by the BC CDC Laboratory using the Roche COBAS AMPLICOR™ CT/NG PCR test. The testing was done under routine protocol

for *Chlamydia trachomatis,* and was done as a preliminary screen for *Neisseria gonorrhoeae,* as the current protocol calls for the use of cervical samples rather than urine[8,9].

A full, descriptive report of the survey was compiled in the form of a public report for the community clinic and is included in Appendix IV.

Table A1.1: Protocol for data linkage with STD Reportable database

Objective

Find all patients (clients) in STD data that have a matching record in foreign data.

Source Data

1. STD data

1) "STD clients" table: Client#, Client Name, Alias Name, Gender, Birthdate
2) "imrT" table: Client#, Date, Ethnicity
3) Clean Client Names: Client#, Client Name, LastName, GivenName, GivenName1, GivenName2, GIvenName3
4) Clean Alias Names: Client#, Alias Name, LastName, GivenName, GivenName1, GivenName2, GIvenName3, AltDOB

2. Foreign data

1) "UBC sample" table: ID, FirstName, MInitial, LastName, DOB, Gender, Ethnicity

Procedure

1. Update source data

1) Update "STD clients" and "imrT" tables with current data
2) Update "Clean Client Names" and "Clean Alias Names" tables by cleaning and parsing Client Name and Alias Name

2. Determine the matching records based on the following criteria using a set of Access queries and visual inspection

Criteria for matches

The two records have the same values in all of the following fields:
Gender, Birthdate*, LastName**, and one component of GivenName**

* Alternative Birthdate (AltDOB) can be used for Birthdate.
** LastName and GivenName can be derived from either Client Name or Alias Name.

Criteria for potential matches

The two records meet the above criteria with the following exceptions. Personal inspection of the corresponding records is usually required to determine the matches.

1. GivenName is missing in one record
2. GivenNames match by initials (LN-G)
3. One LastName is given as initial, which is the first letter of the other LastName (L-LN)
4. Birthdate is missing in one record
5. Birthdate is different between records
6. Gender is unspecified in one record
7. Gender is different between records

Table A1.2: Calculation of potential bias due to misclassification of participants through differential outcome ascertainment

	STI	**No STI**			
Drug use – crack	225 (26% increase)	163 (22% decrease)		**"Truth"** ←	
No Drug use	258 (38% increase)	452 (14% decrease)		**OR: 2.48**	
Assume:				**STI**	**No STI**
33% missing from high		**Data** →	**Drug use – crack**	178	210 HR: 55% LR: 45%
10% missing from low		**OR: 2.39**	**No Drug use**	155	523 HR: 16% LR: 84%

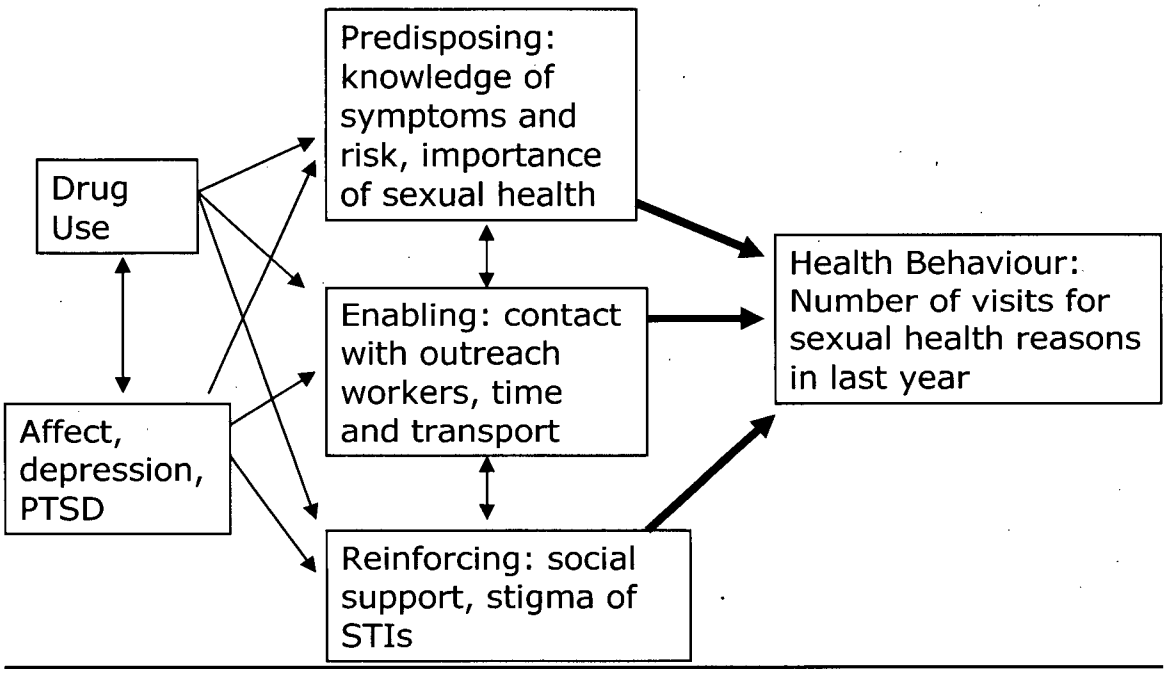
Data OR: ad / bc

"True" OR: (a+0.26a)(d-0.14d)/(b-0.22b)(c+0.38c)

= 1.26a*0.86d / 0.78b*1.38c

= 1.08ad/1.07bc = 1.01ad/bc

Figure A1.1: Theoretical Model for Development of "Women's Night" Survey



Reference List

(1) Committee on Health and Behavior: Research PaP, Board on Neuroscience and Behavioral Health. *Health and Behaviour: The Interplay of Biological, Behavioural and Societal Influences.* Washington DC: National Academy Press; 2001.

(2) Glanz K, Rimer BK, Lewis FM. *Health Behaviour and Health Education: Theory, Research and Practice.* 3 ed. San Francisco: John Wiley & Sons, Inc; 2002.

(3) Mullen PD, Hersey JC, Iverson DC. Health behavior models compared. *Soc Sci Med.* 1987;24:973-981.

(4) Green LW, Kreuter MW. *Health Promotion Planning: An Educational and Environmental Approach.* 2 ed. Mountain View, CA: Mayfield Publishing Company; 1991.

(5) Fortenberry JD, McFarlane M, Bleakley A et al. Relationships of Stigma and Shame to Gonorrhea and HIV Screening. *American Journal of Public Health.* 2002;92:378-381.

(6) Goffman E. *Stigma: Notes on the Management of Spoiled Identity.* New York: Simon & Schuster Inc.; 1963.

(7) Nack A. Bad Girls and Fallen Women: Chronic STD Diagnoses as Gateways to Tribal Stigma. *Symbolic Interaction.* 2002;25:463-485.

(8) Martin DH, Cammarata C, Van Der Pol B et al. Multicenter evaluation of AMPLICOR and automated COBAS AMPLICOR CT/NG tests for Neisseria gonorrhoeae. *Journal of Clinical Microbiology.* 2000;38:3544-3549.

(9) BC Centre for Disease Control, Laboratory Services. Laboratory Services Annual Report 2002. 2002. Vancouver, BC, BCCDC.
Ref Type: Report

APPENDIX II

ADDITIONAL TABLES AND FIGURES

Figure AII.1: STI specific testing rates among the CHASE cohort, 1991-2004

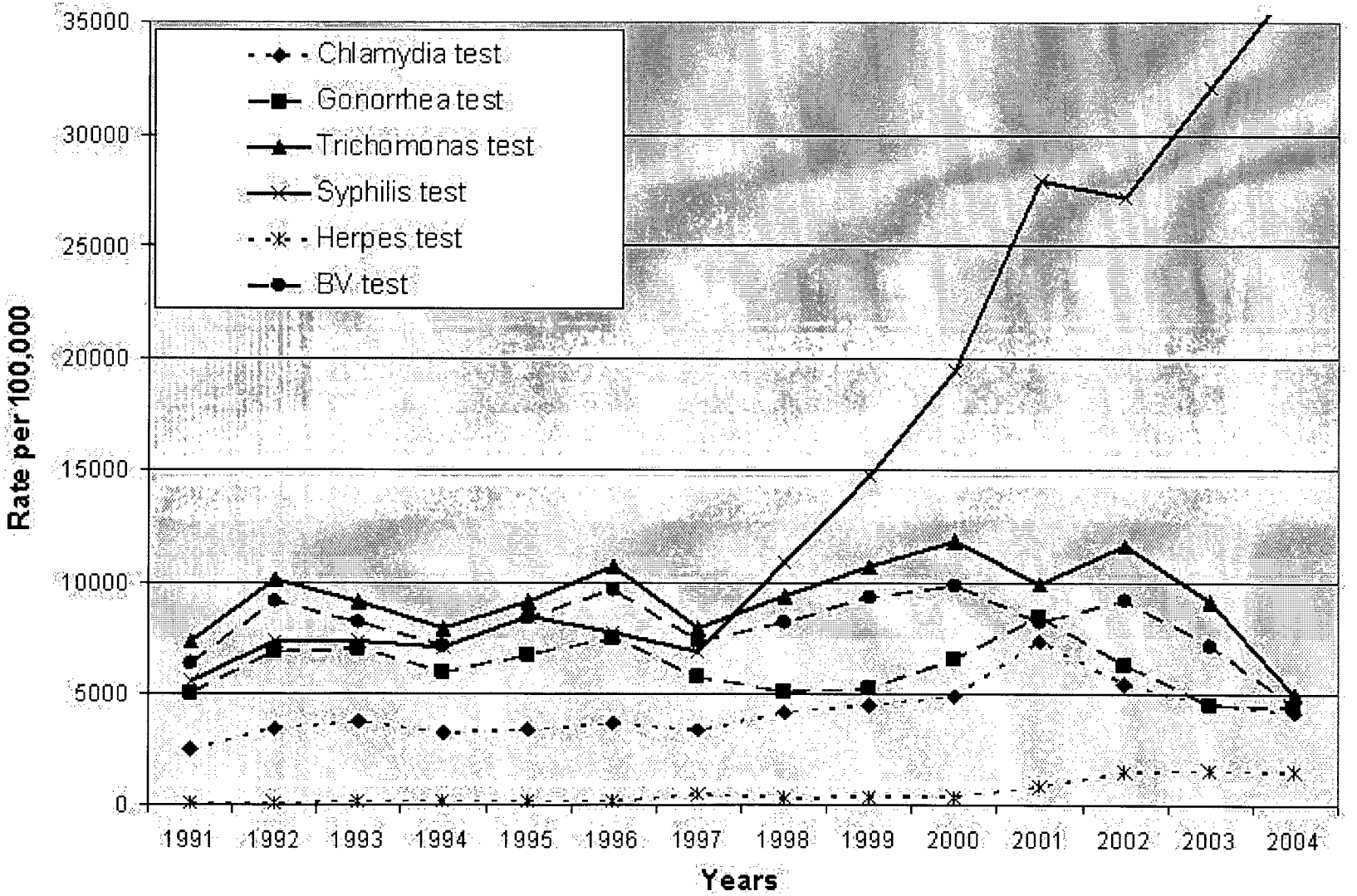


Table AII.1: Basic demographics and overall STI prevalence among the CHASE cohort

	Male	Female
Overall, N(%)	2407 (68)	1107 (31)
Median Age (current)	43 (37, 49)	41 (35, 50)
Ethnicity		
White	1516 (63)	454 (41)
Black	75 (3.2)	23 (2.1)
Aboriginal	582 (24.2)	432 (39)
Asian	106 (4.4)	166 (15)
Other	116 (4.8)	44 (4)
Education (completed high school)	1011 (42)	387 (35)
Employment	2190 (91)	1041 (94)
Any STI test	1305 (54)	698 (63)
Any positive STI	119 (4.9)	366 (33.1)
Any positive Syphilis, Gonorrhea or Chlamydia	76 (3.2)	141 (12.7)

Table AII2: Differences between those with testing data in CDC database and those without, stratified by gender

	Males		**Females**	
Any test	**31%**		**68%**	
	Any test	*No test*	*Any test*	*No test*
Aboriginal, Inuit or Metis	**34%**	**22%**	**48.5%**	**31%**
Unemployment	**94%**	**90%**	95%	94%
HS education	**42%**	**47%**	32%	36.5%
Age	43 (36, 48)	43 (36, 50)	**37 (32, 43)**	**48 (39, 73)**

* **$p \leq 0.01$**

Table AII.3: Demographic characteristics of female participants of the CHASE survey, by HIV-status

	HIV-negative *N (% of 703)*	**HIV-positive** *N (% of 174)*	**HIV-unknown** *N (% of 230)*
Median Age (IQR)	40 (33, 46)	39 (34, 44)	70 (48, 79)
Aboriginal Ethnicity	321 (45.7)	90 (51.7)	43 (18.7)
High School	277 (39.4)	57 (32.8)	48 (20.9)
Unemployment	652 (92.8)	167 (96.0)	218 (94.8)
Alcohol	341 (48.5)	77 (44.2)	56 (24.4)
Non-injection drugs	536 (76.2)	157 (90.2)	60 (26.1)
Injection drugs	255 (36.3)	111 (63.8)	22 (9.6)
Previous STI diagnosis	126 (17.9)	74 (42.5)	6 (2.6)

Figure AII.2: Proportions of STIs among HIV-negative (N=703) and HIV-positive (N=173) women, 2002-2004

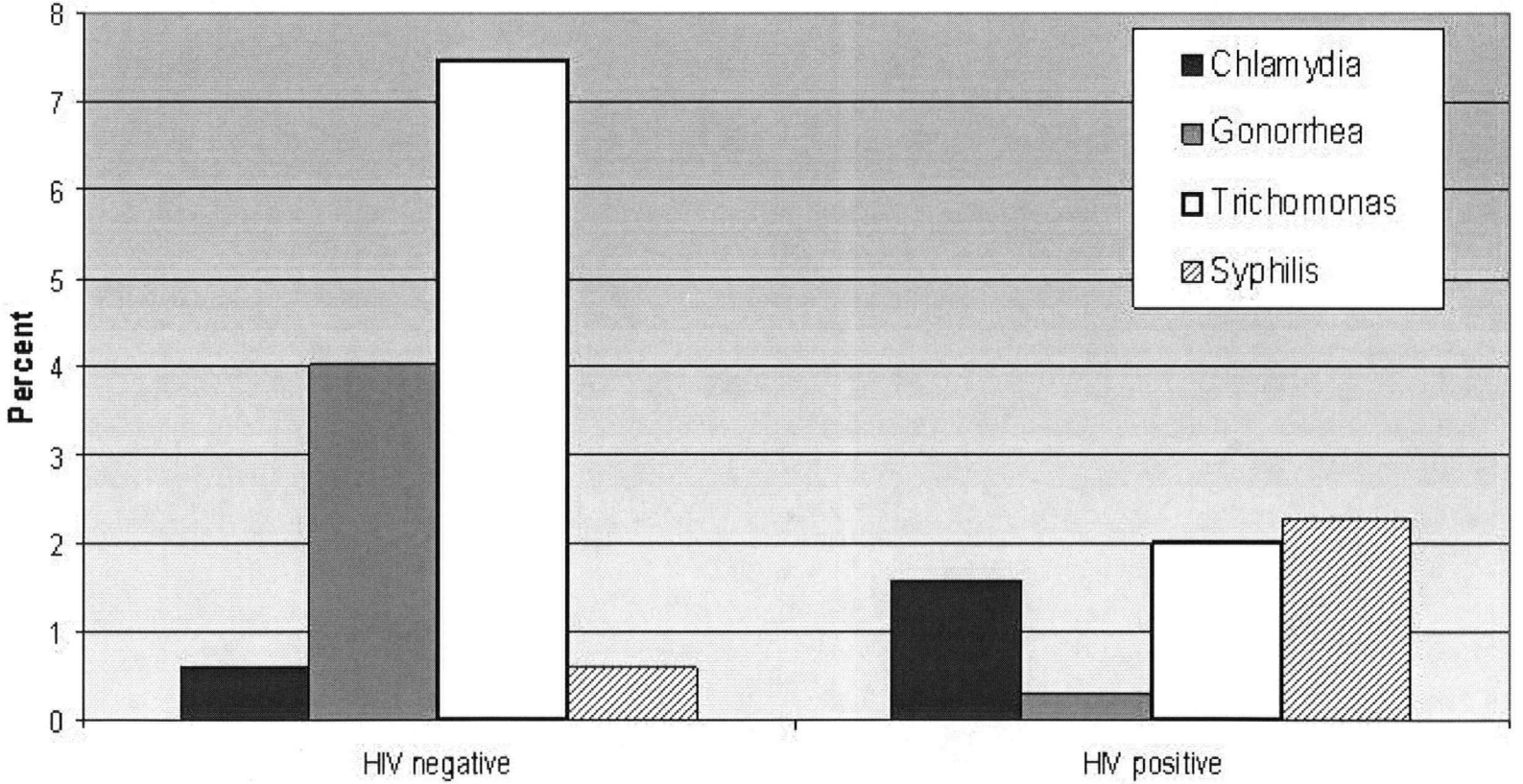


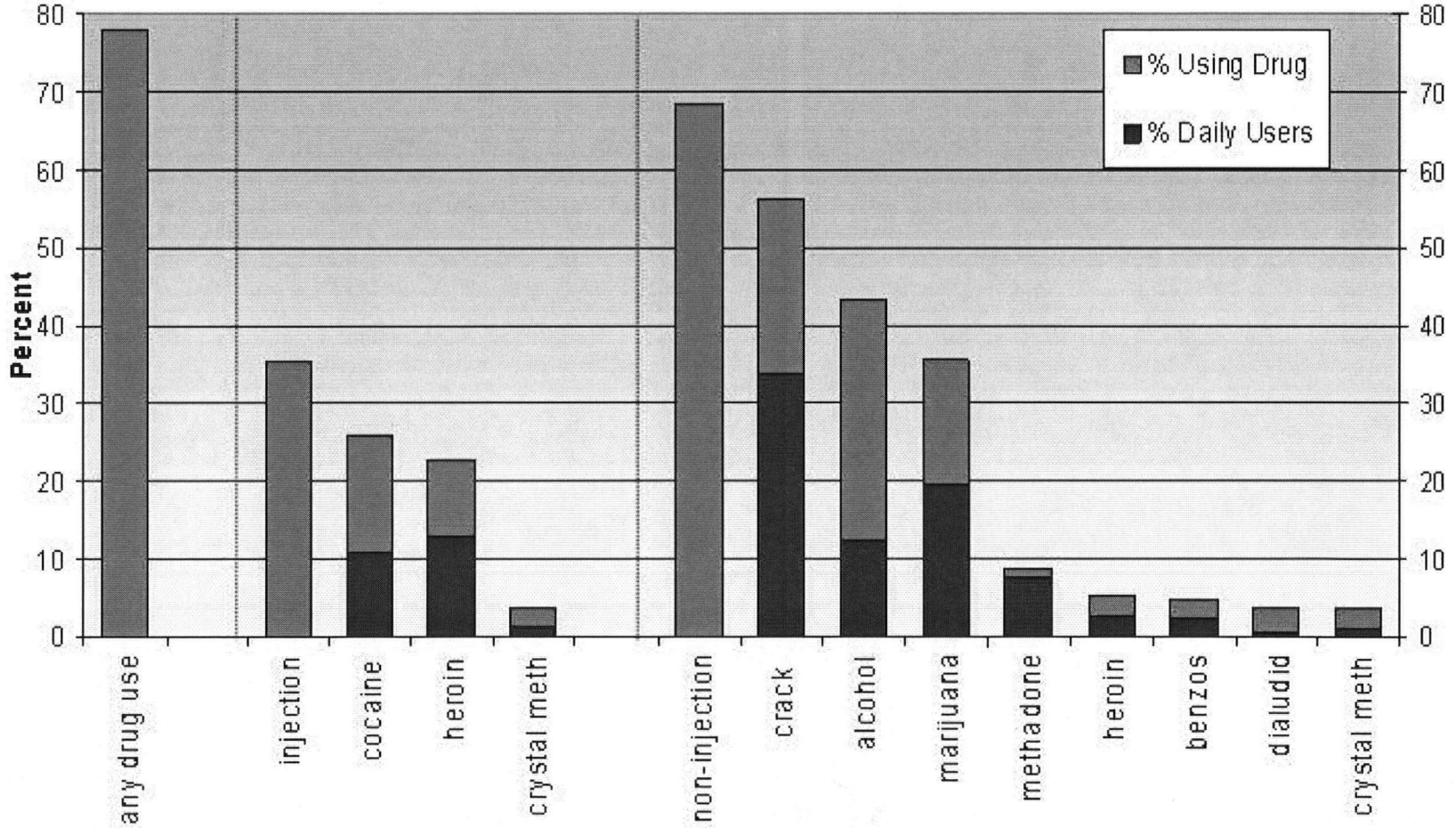
Table AII.4: Adjusted Odds Ratios for drug use variables associated with specific STIs among HIV-negative women

	HIV-negative	
	OR (95% CI)	**AOR (95% CI)**
Syphilis		
Injection st	2.09 (0.75 – 5.84)	--
Injection dep	**3.61 (1.33 – 9.78)**	**2.27 (0.81 – 6.37)**
Non-injection st	**4.89 (1.10 – 21.7)**	**--**
Non-injection dep	1.03 (0.29 – 3.66)	--
Alcohol	0.53 (0.17 – 1.66)	--
Chlamydia		
Injection st	0.32 (0.04 – 2.55)	0.12 (0.01 – 1.10)*
Injection dep	1.91 (0.55 – 6.61)	--
Non-injection st	**6.65 (0.85 – 52.2)***	**9.14 (0.90 – 92.4)**
Non-injection dep	1.63 (0.43 – 6.25)	--
Alcohol	0.93 (0.27 – 3.21)	--
Gonorrhea		
Injection st	3.29 (0.20 – 52.9)	10.8 (0.55 – 214)
Injection dep	--	--
Non-injection st	0.65 (0.04 – 10.4)	--
Non-injection dep	--	--
Alcohol	1.63 (0.10 – 26.2)	--
Trichomonas		
Injection st	0.54 (0.12 – 2.44)	--
Injection dep	0.25 (0.03 – 1.92)	0.15 (0.02 – 1.19)*
Non-injection st	**4.00 (0.89 – 17.99)***	**4.62 (1.00 – 21.3)**
Non-injection dep	1.75 (0.54 – 5.67)	--
Alcohol	1.23 (0.42 – 3.58)	--
Crystal		**6.0 (1.49 – 24.3)**

Table AII.5: Adjusted Odds Ratios for drug use variables associated with specific STIs among HIV-positive women

	HIV-positive	
	OR (95% CI)	**AOR (95% CI)**
Gonorrhea		
Injection st	6.94 (0.82 – 58.9)*	4.58 (0.51 – 41.6)
Injection dep	0.93 (0.17 – 4.94)	--
Non-injection st	1.43 (0.17 – 12.32)	--
Non-injection dep	0.53 (0.06 – 4.49)	--
Alcohol	4.53 (0.85 – 24.10)*	5.19 (0.91 – 29.5)*
Trichomonas		
Injection st	1.81 (0.57 – 5.78)	--
Injection dep	0.68 (0.18 – 2.58)	--
Non-injection st	1.32 (0.28 – 6.27)	--
Non-injection dep	0.96 (0.25 – 3.68)	--
Alcohol	2.11 (0.68 – 6.57)	2.40 (0.74 – 7.80)

Figure AII.3: Proportions of any drug use and of daily drug use for specific substances among female participants of the CHASE cohort, 2002-2004



APPENDIX III

WOMEN'S NIGHT SURVEY

In addition, you are invited to provide a urine sample to test for Chlamydia and gonorrhea, through the clinic. You may return to the clinic in one week to find out the results of your test and, if necessary, receive treatment for infection, if it is detected. Please note that the urine sample test does not replace the need for
a full check-up if you were planning on seeing a doctor for sexual health reasons, or if you are due for a regular check-up and pap smear. For research purposes, we will also be testing the urine for white blood cell counts. These results are not used diagnostically, but can be made available to you upon request. You will receive a $10 reimbursement for your time and participation.

Reporting to Public Health
Your urine test will be done at the provincial laboratory, and the same procedures required for regular STI testing are in place. Chlamydia and gonorrhea are reportable infections; therefore, any positive tests will be actively followed up through the clinic doctors. This means if you do not return to the clinic for the results of the urine test, and the results are positive, your name will be given to a public health authority and a health care worker will attempt to contact you for treatment purposes.

How Information is Stored:
The researcher will not report any information that identifies you. All information obtained during the course of study will be kept confidential. Information containing identifying information will be kept in a secure database in a locked and secured office at the B.C. Centre for Excellence in HIV/AIDS. All information contained in electronic databases will be password protected. Only the principal investigator and research staff will have access to the identifying information obtained during the course of the study.

Your Rights and Who You Can Contact about this Study:
You have the right to refuse to participate in this survey and refusing to participate will not in any way affect your access to health care. You may also refuse to answer any questions or withdraw from the study at any point without any consequences to continuing health care. You may choose to participate in the survey portion of the study while refusing to supply a urine sample for Chlamydia and gonorrhea testing. There will be no consequences if you refuse to supply a urine sample. There is a possibility that you may test positive for Chlamydia or gonorrhea – if this happens you can receive treatment for these infections. The researchers do not anticipate that participation in this study will result in distress for you. However, some of the questions are of a sensitive

Sexually Transmitted Infections and Health Care Use among Participants of a Women-centered Program in Vancouver's Downtown Eastside

Date (d/m/y): ____ / ____ / _____

How did you hear about this study?_____

1. Community Contact

A. In the past six months, which DTES community programs have you attended?

Regularly	Once in a while		Regularly	Once in a while	
☐	☐	Women's night	☐	☐	WISH
☐	☐	UGM beauty night	☐	☐	DAMS
☐	☐	Women's Centre	☐	☐	Positive Women's Network
☐	☐	Native Health			
☐	☐	Sheway			

B. How do you get there?_____

C. How many times in the last month have you spoken to a street nurse / outreach worker?_____

2. Sexually Transmitted Infections and Sexual Behaviours

A. Do you currently have or in the past year have you had any of the following symptoms:

past year	current		past year	current	
☐	☐	Vaginal discharge ☐ ☐ (___days)	☐	☐	Painless sore ☐ ☐ (___days)
☐	☐	(___days) Urination (pain, burning)	☐	☐	(___days) Vaginal itching
☐	☐	(___days) Pain with sex	☐	☐	(___days) Soreness
☐	☐	(___days) Stomach or abdominal pain	☐	☐	(___days) Other_____
☐	☐	(___days) Vaginal bleeding			

B. Do you have a regular partner? ☐ Yes ☐ No ***(if no, skip to C)***

i. Number of regular partners: _____

ii. How many sexual encounters with regular partners:
☐ None ☐ 2-3 times a week
☐ 2-3 times a month ☐ everyday
☐ once a week

iii. How often do you use a condom with regular partners:
☐ Never ☐ > ½ the time
☐ < ½ the time ☐ Always
☐ ½ the time

iv. How much of your regular partner sex is oral sex?
☐ None ☐ < ½ ☐ About ½ ☐ > ½ ☐ All

v. Do you have a regular partner who:
☐ you know is HIV positive ☐ you don't know if they are HIV positive or negative
☐ you are sure is HIV negative

vi. On a scale of 1 to 10, how risky do you think you are with your regular partners?
1 2 3 4 5 6 7 8 9 10

C. Do you have a casual partner? ☐ Yes ☐ No ***(if no, skip to D)***

i. Number of casual partners: _____

ii. How many sexual encounters with casual partners:
☐ None ☐ 2-3 times a week
☐ 2-3 times a month ☐ everyday
☐ once a week

iii. How often do you use a condom with casual partners:
☐ Never ☐ > ½ the time
☐ < ½ the time ☐ Always
☐ ½ the time

iv. How much of your casual partner sex is oral sex?
☐ None ☐ < ½ ☐ About ½ ☐ > ½ ☐ All

v. Do you have a casual partner who:
☐ you know is HIV positive ☐ you don't know if they are HIV positive or negative
☐ you are sure is HIV negative

vi. On a scale of 1 to 10, how risky do you think you are with your casual partners?
1 2 3 4 5 6 7 8 9 10

D. Have you ever traded sex for money, food or shelter? ☐ Y ☐ N ☐ Yes, in the last 6 months

Have you ever traded sex for drugs? ☐ Y ☐ N ☐ Yes, in the last 6 months

(if no, skip to question 5):

How long have you been working?_____

Do you usually work: ☐ on the street ☐ from a room/hotel ☐ from your home
☐ other_____

i. Number of clients:	**ii.** How many sexual encounters with clients:		**iii.** How often do you use a condom with clients:	
_____	☐ None	☐ 2-3 times a week	☐ Never	☐ > ½ the time
	☐ 2-3 times a month	☐ everyday	☐ < ½ the time	☐ Always
	☐ once a week		☐ ½ the time	

iv. How much of your client sex is oral sex?
☐ None ☐ < ½ ☐ About ½ ☐ > ½ ☐ All

v. Do you have a client who:
☐ you know is HIV positive ☐ you don't know if they are HIV positive or negative
☐ you are sure is HIV negative

vi. On a scale of 1 to 10, how risky do you think you are with your clients?
Not risky 1 2 3 4 5 6 7 8 9 10 Very risky

3. Sexual Healthcare:

A. In the past year, how many times have you been to see a doctor or gone to a clinic:
for a health care visit? _____ # of times
was this at Women's Night? _____ # of times
for a pap smear? _____ # of times
was this part of Papalooza? ☐ Yes ☐ No
was this at Women's Night? ☐ Yes ☐ No
was this by a street nurse on another occasion? ☐ Yes ☐ No
for birth control or pregnancy? _____ # of times
for HIV/AIDS test? _____ # of times
for STD test or treatment? _____ # of times
have you gotten treatment for an STD from another source? ☐ Yes ☐ No

B. Do you talk about sex with:
☐ your partner(s) ☐ your doctor ☐ family or friends
☐ other_____

Do you talk about STDs with:
☐ your partner(s) ☐ your doctor ☐ family or friends ☐ other_____

4. STD-related stigma

How much do you agree or disagree with the following statements:

	Agree									Disagree
1. If you had an STD, you would feel dirty	1	2	3	4	5	6	7	8	9	10
2. If you had an STD, you would feel violated	1	2	3	4	5	6	7	8	9	10
3. If someone had an STD, they would know it	1	2	3	4	5	6	7	8	9	10
4. If someone had an STD, they could hide it from others	1	2	3	4	5	6	7	8	9	10
5. If someone has an STD, they are damaged goods	1	2	3	4	5	6	7	8	9	10
6. If someone has an STD, they might not know it	1	2	3	4	5	6	7	8	9	10
7. If you had an STD, you would feel guilty	1	2	3	4	5	6	7	8	9	10
8. If you had an STD, you would be embarrassed	1	2	3	4	5	6	7	8	9	10
9. If you went to a clinic for STD testing or treatment, everyone would find out	1	2	3	4	5	6	7	8	9	10
10. The staff at the clinic are discreet and results are kept confidential when someone goes in for STD testing or treatment	1	2	3	4	5	6	7	8	9	10
11. Only women who sleep with lots and lots of different guys get STDs	1	2	3	4	5	6	7	8	9	10
12. Only women who aren't careful enough with protection get STDs	1	2	3	4	5	6	7	8	9	10
13. Women should know better than to get STDs	1	2	3	4	5	6	7	8	9	10
14. If someone got an STD, people would think she was a bad person	1	2	3	4	5	6	7	8	9	10
15. If someone has an STD, everyone else will talk about them and spread gossip	1	2	3	4	5	6	7	8	9	10
16. Health care workers think poorly of women who come in for STD treatment	1	2	3	4	5	6	7	8	9	10
17. If you got an STD, your partner would be upset with you	1	2	3	4	5	6	7	8	9	10
18. If someone has an STD, others think they are stupid	1	2	3	4	5	6	7	8	9	10

S	M	T	W	Th	F	S

S	M	T	W	Th	F	S
		X				

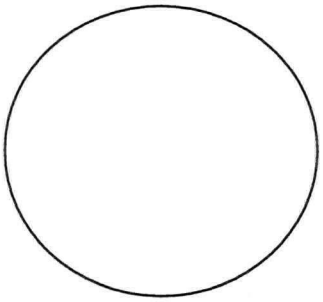
S	M	T	W	Th	F	S
	X					
				X		

S	M	T	W	Th	F	S
				X		
		X				
					X	
			X			

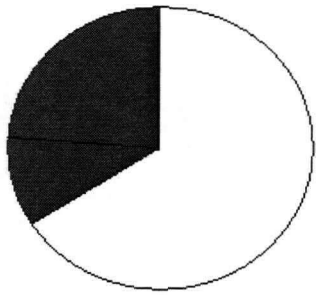
S	M	T	W	Th	F	S
	X			X		
		X	X		X	
	X			X		
			X			X

S	M	T	W	Th	F	S
	X		X	X		X
	X	X	X	X		
X	X	X		X	X	
	X		X		X	X

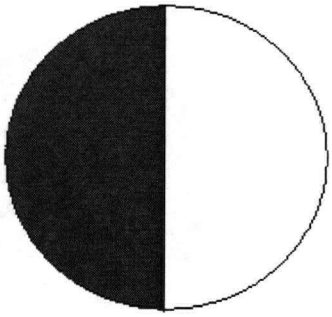
S	M	T	W	Th	F	S
X	X	X	X	X	X	X
X	X	X	X	X	X	X
X	X	X	X	X	X	X
X	X	X	X	X	X	X



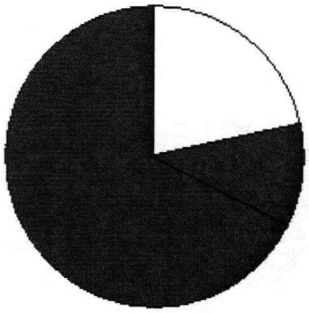
Never



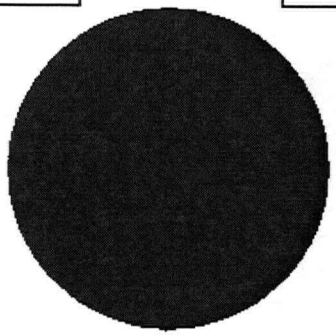
Less than half the time



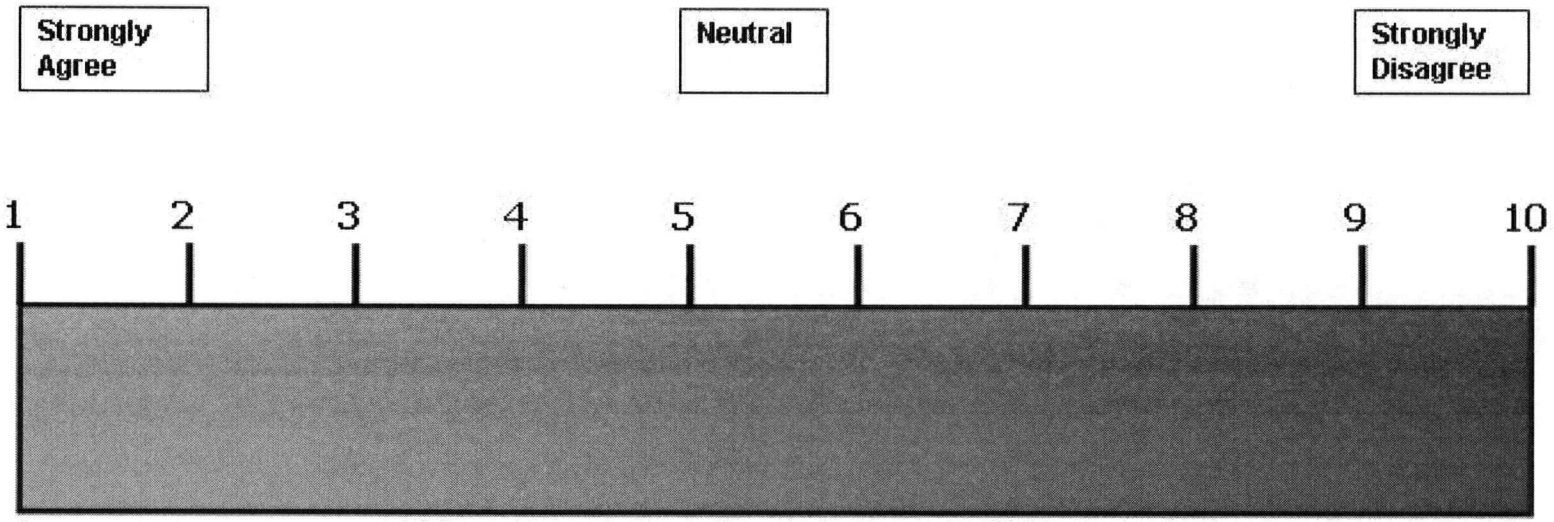
About half the time



More than half the time



Always


Strongly Agree
Neutral
Strongly Disagree
1
2
3
4
5
6
7
8
9
10

APPENDIX IV

REPORT TO THE DOWNTOWN COMMUNITY HEALTH CENTRE

Demographics, Sexual Behaviour and Sexual Health Care of Participants of the Downtown Community Health Centre's Women's Night

Report Prepared by Melanie Rusch,
Senior Graduate Trainee, Michael Smith Foundation for Health Research

October, 2005

Special thanks to all the DCHC staff, especially Drs. Karen Stancer and Susan Burgess, the Women's Night volunteers and to the participants of the study. Also thanks to Tomiye Ishida and the CHASE project staff and peer interviewers for their help with the survey, and to Dr Gwen Stephens, Ms Tazim Rahim and the rest of the Bacteriology Laboratory at the BC Centre for Disease Control for their technical support. This work was supported by the Michael Smith Foundation for Health Research in the form of a graduate award to Melanie Rusch. The work was carried out as part of Ms Rusch's doctoral thesis project for the Department of Health Care and Epidemiology, University of British Columbia. Additional thanks for support and input from Dr Mark Tyndall, thesis supervisor, and Dr Jean Shoveller and Dr David Patrick, thesis committee members.

Table of Contents

Demographics, Sexual Behaviour and Sexual Health Care of Participants of the Downtown Community Health Centre's Women's Night

Summary

Background: Sexually transmitted infections (STIs) remain a significant health problem in terms of direct costs, long-term complications and increased risk of more serious infections such as HIV. These problems can be magnified in populations of vulnerable women living in areas such as Vancouver's Downtown Eastside, where poverty, drug addictions, homelessness, mental health and the inherent dangers of commercial sex work overshadow sexual health concerns. While chronic and incurable STIs like HIV and herpes are damaging to both men and women, women are typically more likely to experience long-term complications of untreated, curable STIs such as chlamydia and gonorrhea. With high rates of asymptomatic infection, especially among women, STIs like chlamydia and gonorrhea are likely to continue to propagate through populations.

Methods: In the fall of 2004, a survey and urine screen was carried out among 126 participants attending a weekly "Women's Night" program at the Downtown Community Health Centre in order to assess the utility of urine screening among a high-risk group of women, to describe the patterns of sexual health care among the women and to uncover some of the barriers to sexual health check-ups. The survey included questions about participant's contact with programs, outreach workers and street nurses, as well as STI symptom awareness, sexual behaviours and perceived sexual risk, ability to communicate on sexual topics and STI-related stigma.

Main Results: The self-reported ethnicities were white (52.4%), Aboriginal or Metis (39.7%), black (4.8%), Asian (1.6%) and other (2.4%). The median age was 42, and the majority of participants were between 36 and 49 years of age. Sixty percent of participants had not completed schooling to grade 12; 13.5% had attended at least a year of college or university. Only 5.6% indicated having any employment, whether full- or part-time. When asked to rate their own health, 27.8% indicated poor, 39.7% indicated fair and 32.5% indicated good or excellent. Most respondents (84.9%) said they were on income assistance for a median of 11 years. In addition 72.2% were on disability, for a median of 5 years. Among 126 Women's Night (WN) attendees, 3.2% self-identified as transgendered or male.

Twenty-five percent were regular WN attendees, while 51.6% reported attending once in awhile. Only 1 woman did not have contact with any of the eight women's programs mentioned (WN, UGM Beauty Night, Women's Centre, Native Health Centre, Sheway/Crabtree, Women's Information and Safe House (WISH), Drug & Alcohol Meeting Support (DAMS) for Women and Positive Women's Network). Approximately 40% of the participants were active Commercial Sex Workers (CSW); 30% were former CSWs and 30% were not involved in sex work. Among those who reported sexual activity in the previous 6 months, 2.8% (N=2) tested positive for Chlamydia infection. Sixty-six percent of the respondents reported having had a Pap smear in the past year, with about 1/3 of these being done through outreach programs such as WN or the Street Nurses' "Papalooza" screening blitz. Only 46.4% reported also being tested or treated for STIs in the past year. At least one HIV test in the past year was reported by 63.7%.

Part I. Demographics: Who are we reaching?

Self-reported gender, age and ethnicity of the Women's Night participants are included in Table 1. A small proportion of transgendered participants were present in the study population (n=4). The median age of the population was 42 years. The participants who were currently involved in the sex trade were significantly younger, with a median age of 40 years (p=0.03).

Table 1: Demographics of 126 Survey Participants, by commercial sex work status

	Total	Non-CSW	Former CSW	Current CSW
% (N)	100 (126)	30.2 (38)	26.2 (33)	38.1 (48)
Gender				
Female	96.8 (122)	94.5 (36)	100 (33)	95.8 (46)
Transgender or Male	3.2 (4)	5.3 (2)	0	4.2 (2)
Median age (Interquartile Range)	42 (36-49)	43 (38-49)	44 (38-50)	40 (35-45)
Ethnicity				
White	52.4 (66)	63.2 (24)	45.4 (15)	50.0 (24)
Aboriginal	39.7 (51)	23.7 (9)	54.6 (18)	41.2 (20)
Other	7.9 (10)	13.2 (5)	0	8.3 (4)
Drug Use				
None	14.3 (18)	28.6 (10)	9.7 (3)	6.3 (3)
Type:				
Injection	39.7 (48)	22.9 (8)	45.2 (14)	50.0 (24)
Non-injection	81.8 (99)	65.7 (23)	83.9 (26)	91.7 (44)
Alcohol	41.6 (52)	39.5 (15)	33.3 (11)	47.9 (23)

The majority of participants self-identified as White (52%) or as Aboriginal or Metis (40%). Other ethnicities reported included Black (n=6), Asian (n=2) and West Indian (n=1). Given the large Asian community in the surrounding area (30% of the population in the surrounding 5 census tracts), this population appears to be underrepresented among WN participants. A large proportion (82%) of the participants reported some drug use, with current and former CSW being more likely to have used injection (p=0.037) and non-injection (p=0.010) drugs as compared to non-CSW. Injection drugs included cocaine, heroin and crystal methamphetamine. Major non-injection drugs reported were crack (90%) and marijuana (45%).

Asian women are under-represented in the Women's Night population

While a large proportion of participants were either currently (i.e. in the past six months) involved in the sex trade (38%) or had been involved in the sex trade previously (26%), nearly one-third reported never having been involved in the sex trade. Overall, Aboriginal participants were more likely to have ever been involved in the sex trade (76% versus 59%, p=0.02).

❖

In Table 2, education levels, employment status and income assistance for the participants are listed. Sixty percent of the participants had not completed high school. While there was no significant difference by sex work status, a larger proportion of former CSW had completed high school.

❖

The vast majority were unemployed, and although this was slightly lower among non-CSW, it still reached close to 90%. Census Canada data from 2001 reported the female unemployment rate in the Vancouver metropolitan area to be 7.2%. Even when examining specific census tracts in the Downtown Eastside, the highest female unemployment rate reported by Census Canada was 21%, in the census tract encompassing the location of the clinic. Participants receiving income assistance and disability were significantly more likely to be current or former CSW. Nevertheless, even among non-CSW, income assistance was received by 70% of the population and disability by 60%.

Table 2: Education, Employment and Income Assistance among Participants, by commercial sex work status

	Total	Non-CSW	Former CSW	Current CSW
Education				
<High school	59.5 (75)	60.5 (23)	48.5 (16)	64.6 (31)
High school	27.0 (34)	18.4 (7)	45.5 (15)	22.9 (11)
Some Post-secondary	13.5 (17)	21.1 (8)	6.1 (2)	12.5 (6)
Employment				
Any	5.6 (7)	10.5 (4)	3.0 (1)	4.2 (2)
None	94.4 (119)	89.5 (34)	97.0 (32)	95.8 (46)
Self-rated health				
Poor	27.8 (35)	31.6 (12)	33.3 (11)	22.9 (11)
Fair	39.7 (50)	47.4 (18)	36.4 (12)	35.4 (17)
Good/excellent	32.5 (41)	21.1 (8)	30.3 (10)	41.7 (20)
Income assistance				
Yes	84.9 (107)	71.1 (27)	93.9 (31)	87.5 (42)
No	15.1 (19)	28.9 (11)	6.1 (2)	12.5 (6)
Disability				
Yes	72.2 (91)	60.5 (23)	72.7 (24)	77.1 (37)
No	27.8 (35)	39.5 (15)	27.3 (9)	22.3 (11)

❖

About 40% of the participants rated their health as fair, while around 30% indicated poor health and another 30% indicated good or excellent health. There were no significant differences in self-rated health sex work status; however, current CSW had the highest proportion of participants rating their health as good or excellent (42%). This could reflect the perception of what encompasses 'health', or it could indicate the different reasons that CSW come to WN (food, clothing, condoms) as compared to the other participants (medical care).

Census Canada reports 21% unemployment among females in this area, while 95% reporting in this survey were unemployed

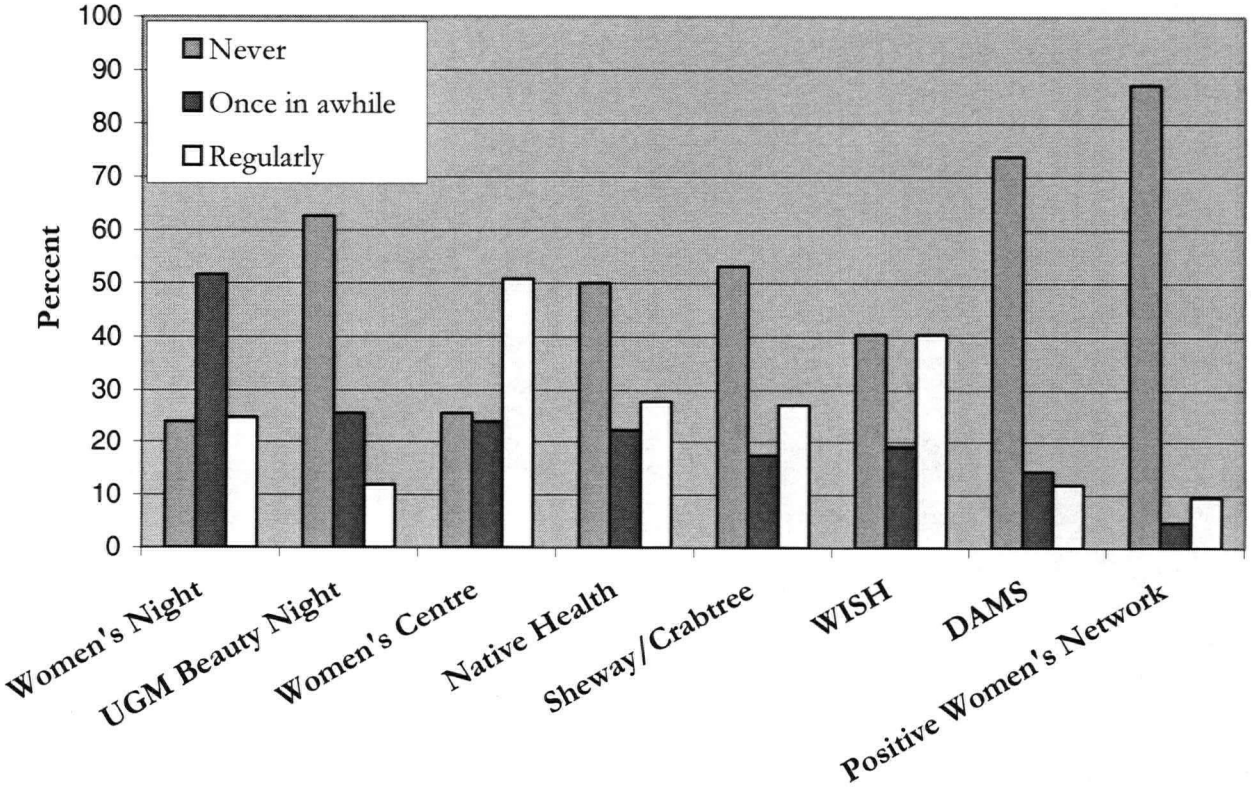
Comparing regular WN attendees to those who attended only occasionally or not at all, there was a higher proportion of CSW and a lower proportion of former CSW among the regular attendees. Regulars were also slightly older (median ages 43 vs 39), more likely to be employed (12% vs 4%) and more likely to be on disability (80% vs 68%).

❖

Part II. Patterns of Contact and Care

As can be seen in Figure 1, the Women's Centre had the highest number of regular attendees, followed by WISH, and subsequently Native Heath, Sheway and Women's Night. However, Women's Night did have a substantially larger number of occasional attendees, and the least number of participants (24%) who had never attended. The average number of programs attended by participants was 4 (IQR: 2, 5). The median age of those attending Women's Night, either on an occasional or regular basis, was 43 (IQR: 38, 49), while the median age of those never attending was 39 (IQR: 35, 45). Overall, approximately 25% of the participants (N=30) were regular WN attendees, and 51% (N=65) were occasional attendees. Of those that did not attend WN, the majority were clients of either the Women's Centre and/or WISH. Although only one woman did not report any program attendance, there were 24 participants (20%) who only reported occasional attendance, and 1/3 of these listed only one program (WN=4, WC=4 or PWN=1).

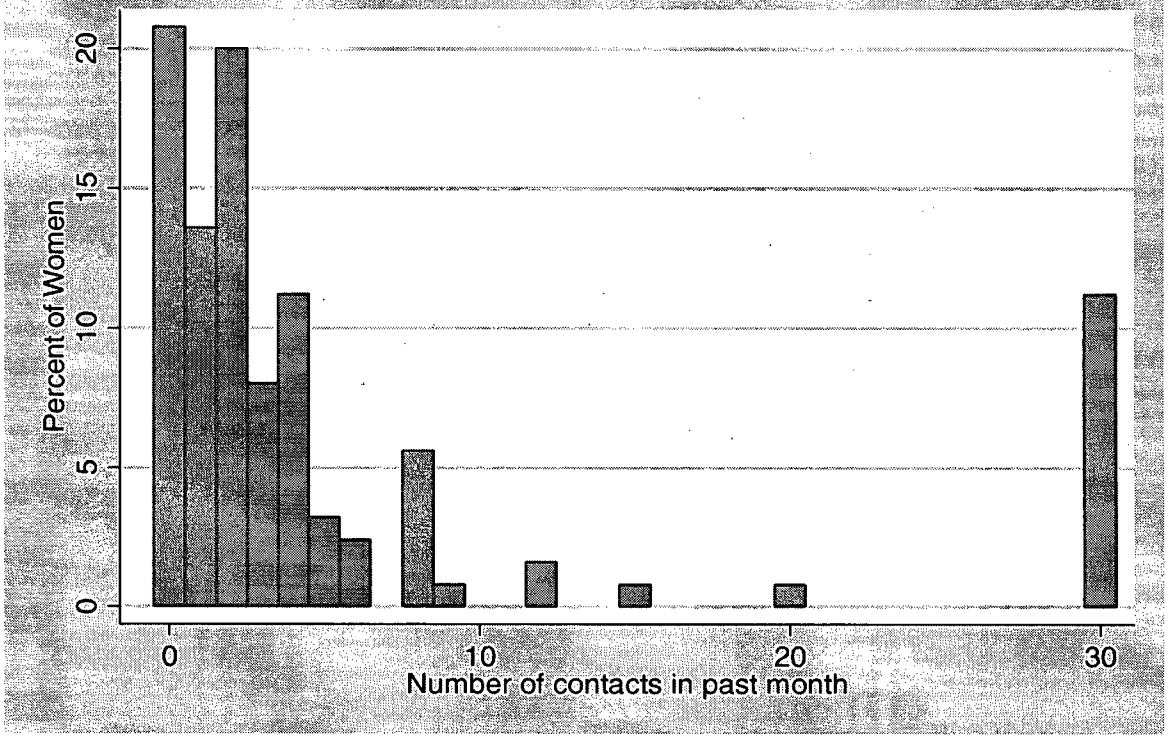
Figure 1: Self-reported attendance at eight women's programs in the DTES



❖

Figure 2 illustrates the amount of contact the participants reported with Street Nurses or other outreach workers. The question was phrased in order to encompass any direct contact, even if specific services were not provided by the Street Nurse or outreach worker. Approximately 20% (N=26) of the participants did not report any contact. Of those that did, the median number of contacts was 3 times in the past month. A small proportion of respondents (N=14) reported daily contact in the past month, with the majority indicating that this large amount of contact was through participation in various programs in the capacity of a worker or volunteer.

Figure 2: Contact with Street Nurses and/or Outreach Workers in the Past Month



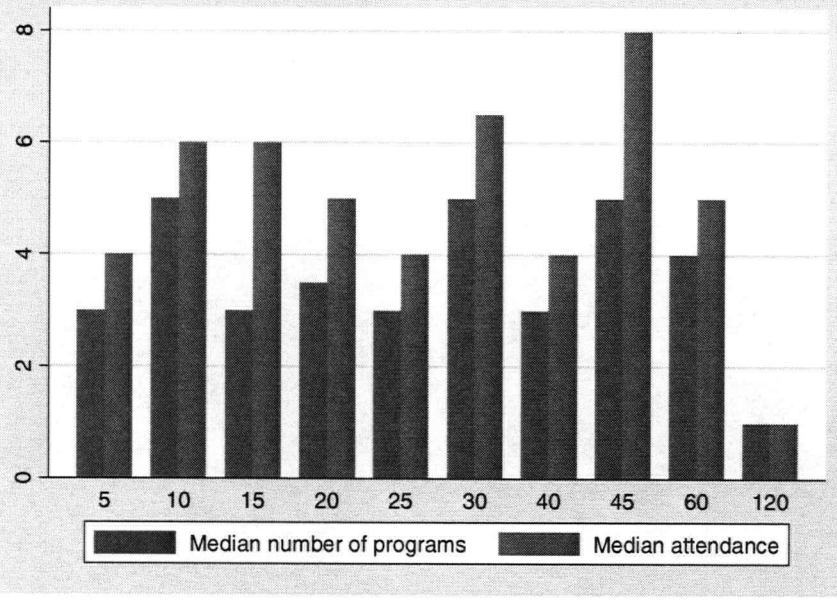
Among the respondents who did not attend any programs on a regular basis, contact with outreach workers was lower (average of one day of contact per month) as compared with those who attended at least one program on a regular basis (average of three days of contact per month).

16% of participants were not attending any programs regularly, and were accessing outreach workers

❖

Transportation time was assessed in order to determine its impact on program attendance and contact with outreach workers. While the programs service a relatively small geographic area, there is little affordable transportation and walking home at the end of the night is not always a favourable prospect. While SafeRide – a service providing transport to and from medical service locations – is a well-used option, it is often extremely busy and long wait-times are not uncommon. Nonetheless, as Figure 3 shows, transportation time was not a significant predictor of program attendance. Although not shown, transportation time was also not predictive of the amount of contact the participants reported with outreach workers.

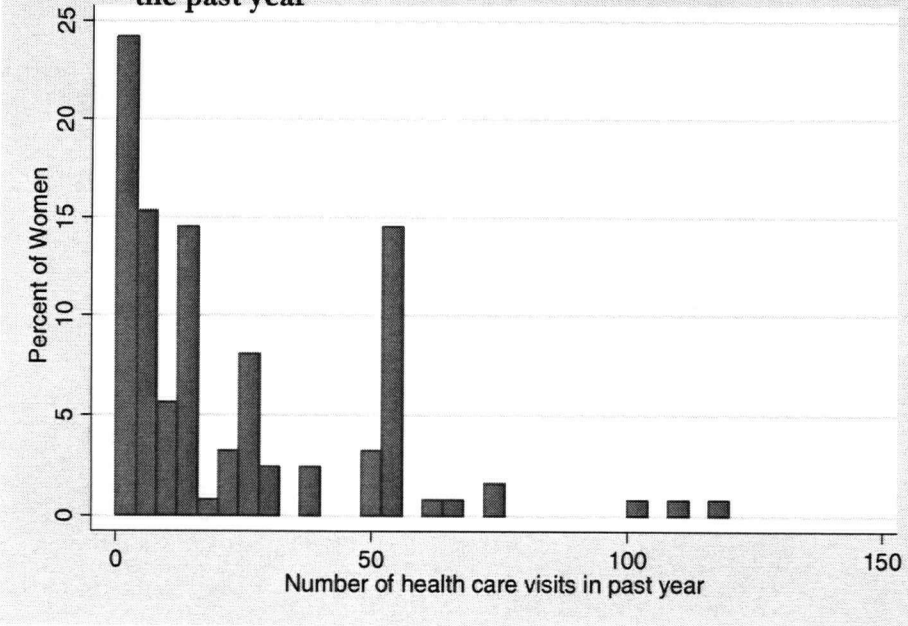
Figure 3: Variations in attendance by transportation time (in minutes)



❖

Only three participants reported that they had not been to a clinic for a general health check-up in the past year. Figure 4 exhibits the number of reported visits in the past year. Approximately one-quarter of the participants reported four or less visits. The median number of visits was 12 (Inter-quartile range: 4, 36) in the past year. Although information was not requested on reasons for general visits, a few participants indicated methadone treatment as a reason for high-frequency of visits. Over 50% (17 of 29) participants with weekly or more visits were on methadone treatment.

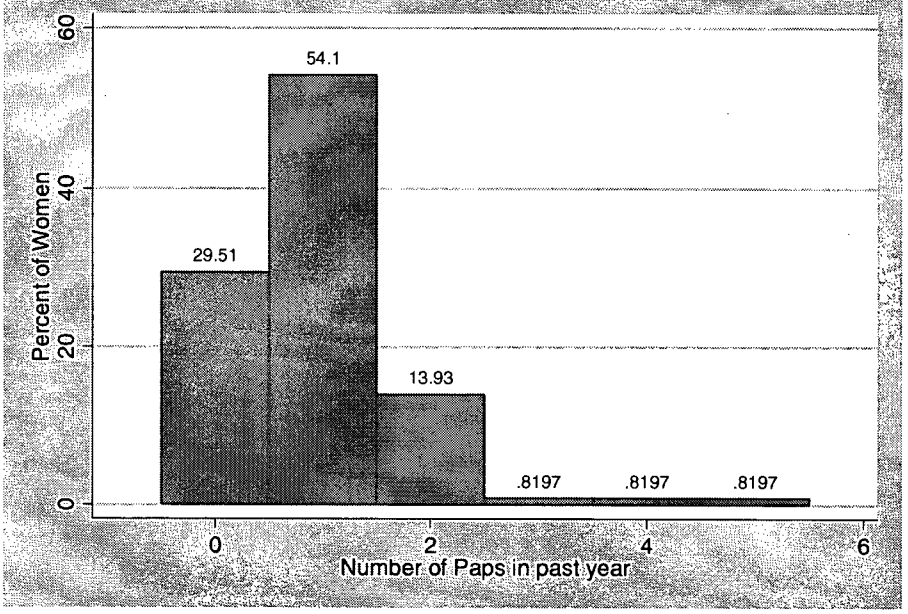
Figure 4: Self-reported number of general health care visits over the past year



❖

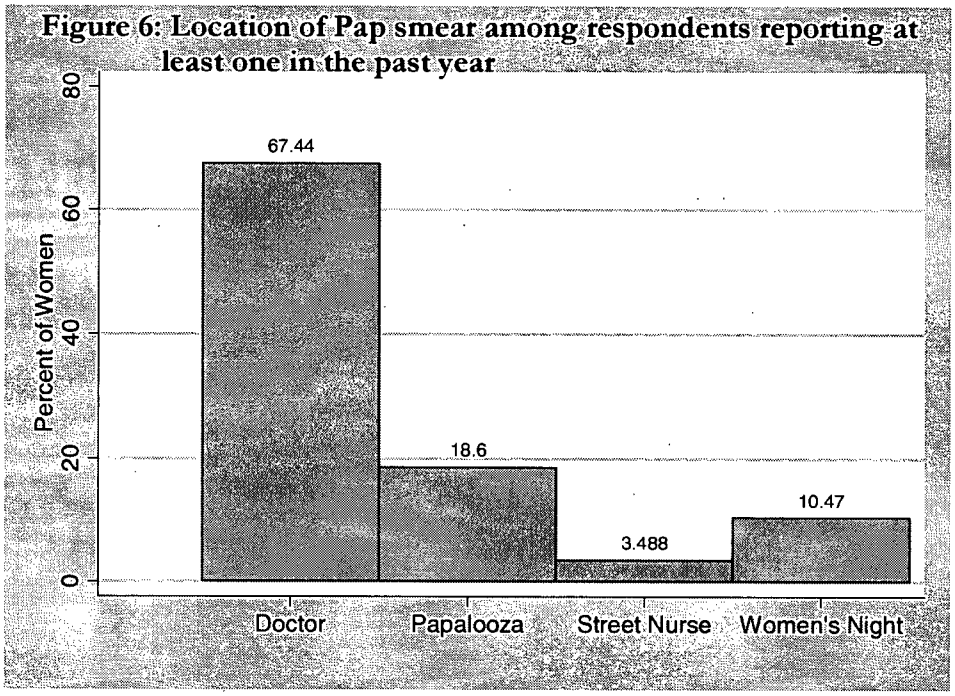
Figure 5 illustrates the number of pap smears the participants reported in the past year. While general health care check-ups were frequent, almost 1/3 of the women had not had a pap smear in the past year. Over fifty percent reported having had one smear and the remaining 20% had more than one. Women who reported having had a pap smear were more likely, although not significantly so, to also report having had STI testing or treatment in the past year (51% vs 36%, p=0.129). Nineteen percent (23 women) reported neither a pap smear nor any STI testing in the past year. It is possible that some women receiving a pap smear also received STI testing but were not aware or did not recall this during the survey. Thirty six percent of the women reported not having an HIV test in the past year. Among women who reported sexual activity in the past six months (N=99), 17% reported no STI or HIV testing in the past year.

Figure 5: Self-reported number of Pap smears over the past year



❖

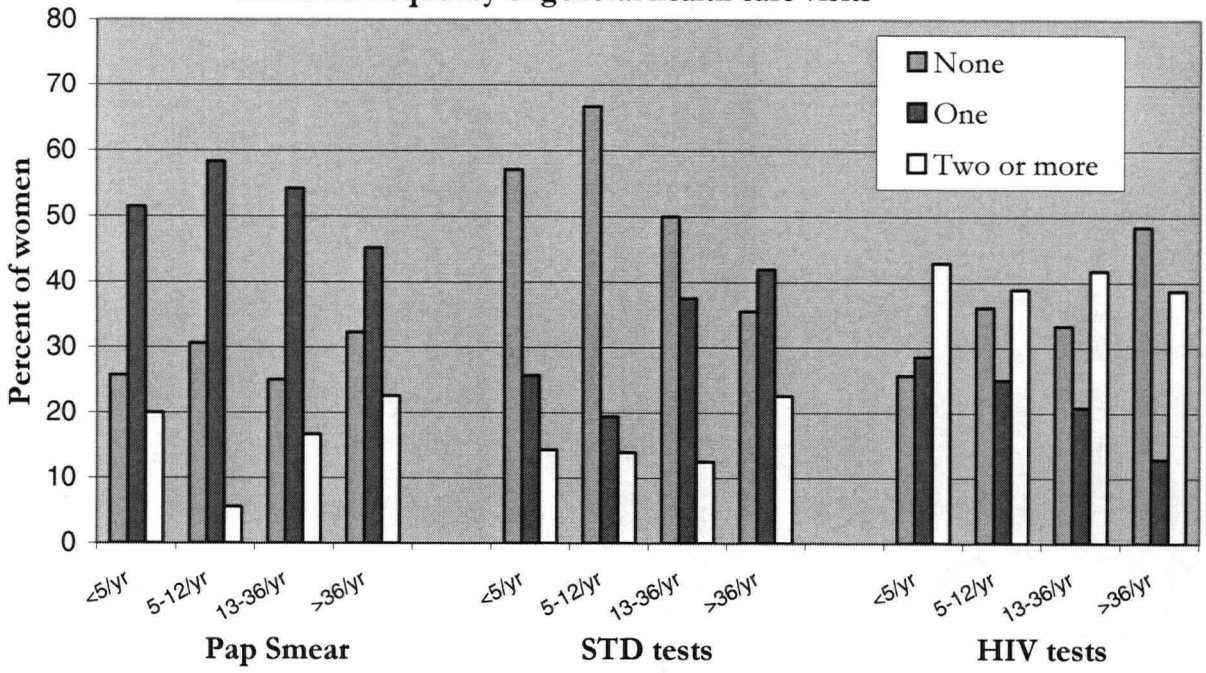
Figure 6: Location of Pap smear among respondents reporting at least one in the past year



Of the women that did report having at least one pap smear, approximately 32% had done so through outreach or targeted services including "Papalooza" (pap smear blitz organized by Street Nurses), Street Nurses on another occasion, or during Women's Night. The remaining 68% had gone to their regular doctor (77% of the women in total reported having a regular doctor), if they had one, or to a clinic for their check-up. Having a regular doctor did not increase the likelihood of having a pap smear, nor did not having a regular doctor increase the likelihood of having a pap smear through one of the specified targeted services.

❖

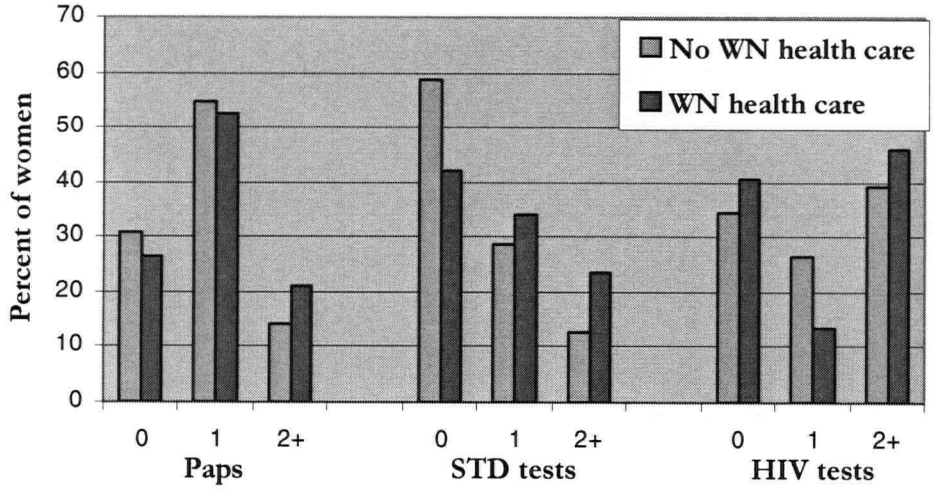
Figure 7: Proportion of women reporting Pap smear, STI test and HIV test based on frequency of general health care visits



In Figure 7, the number of pap smears, HIV tests and STI tests reported by the participants is examined by the amount of general clinic visits reported. There was an increased proportion of participants reporting STI tests among those who were more frequent clinic attendees ($p=0.11$). For HIV testing, a decrease was observed in the number of participants with an HIV test as the frequency of visits increased, although this was not significant. This decrease may be explained by an increased proportion of HIV positive participants among those with higher frequency of general visits.

❖

Figure 8: Proportion of participants reporting Pap smear, STI and HIV tests, comparing WN health care visitors to non-health care visitors



Participants were also asked about their use of Women's Night health care services. While there was no statistically significant difference in the amount of pap smears and HIV testing when comparing participants who used WN health care,

there was a significantly higher proportion of participants who reported STI testing among those who used WN health care services (p=0.06).

❖

Part III. Sexually Transmitted Infections and Risk Behaviour

Of the 92 participants who consented to having a urine test, there were no positive gonorrhea screening tests, and there were 2 (2.2%) positive chlamydia tests. Excluding those participants who did not report any sexual activity in the past six months (N=14), the prevalence of chlamydia rises to 2.6%.
Although the numbers are not large enough to draw significant conclusions, other studies done in similar high-risk populations have found prevalence of chlamydia to be as high as 5%, and a combined prevalence of chlamydia/gonorrhea to be as high as 8.7%.

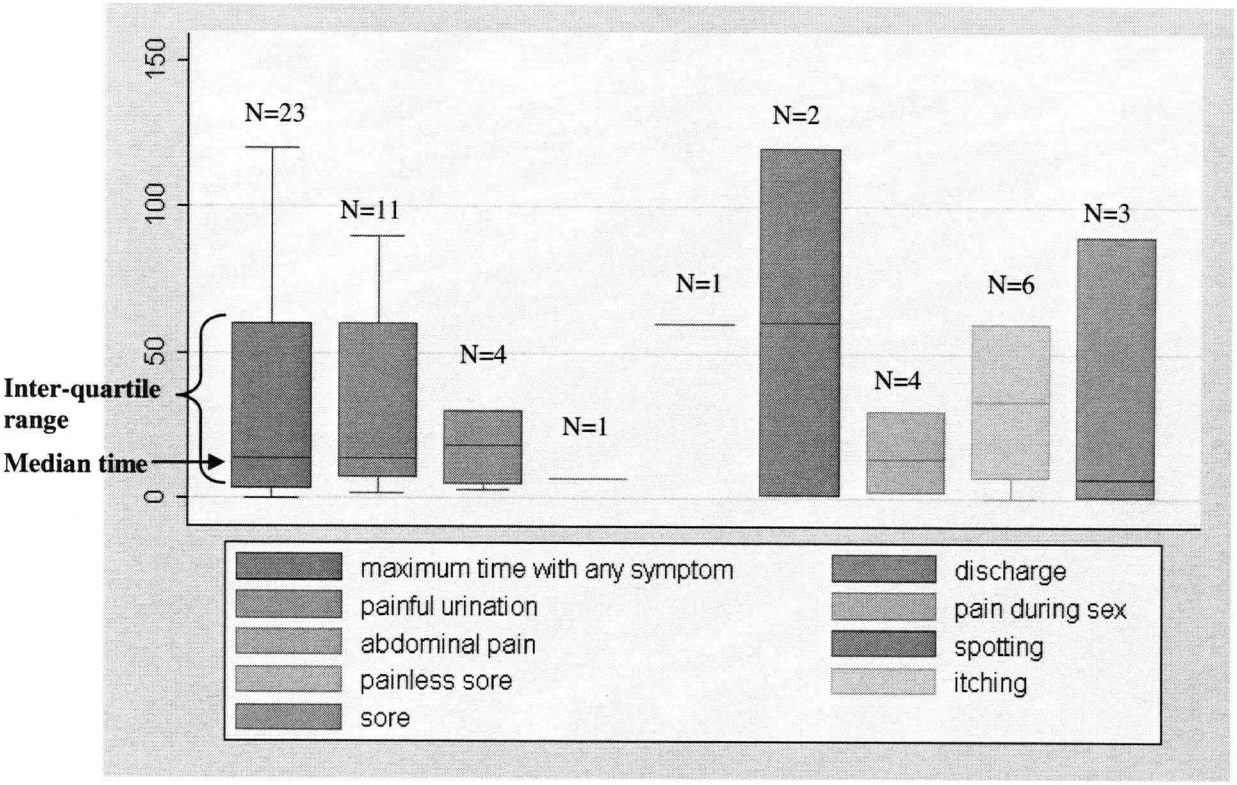
While only two participants tested positive for chlamydia or gonorrhea, 27 of the participants (21.4%) reported current symptoms consistent with STIs (e.g. vaginal discharge, pain on urination, painful or painless sore). Four of the twenty-seven participants reported chronic symptoms (>6 months, or on-and-off for past year or longer).

23 Women reported current symptoms, lasting anywhere from 2 to 120 days, with a median time of one month.

Of the remaining 23 participants, the reported number of symptomatic days ranged from 2 to 120, with a median of 30 days. The majority of the participants experienced vaginal discharge (11/23), with a median symptom time of 14 days; however 5 of the 11 reported more than one symptom. Three participants complained of two symptoms, one paired with painful urination, one with abdominal pain and one with vaginal itching. The two participants who complained of three symptoms both had vaginal discharge and itching, along with spotting in one case and soreness in the other.

Six of the participants complained of vaginal itching, which could be attributed to yeast infection; however, the participants reported the itching had been present for a median of 60 days. Painful urination was reported by only 4 of the 23 participants, with a median time for this symptom of 18.5 days. Three participants reported noticing a painless sore, present anywhere from 2 to 30 days, while two participants reported a painful sore, present in one woman for the past week, and in the other for 3 months. Two participants reported abnormal abdominal pains, both indicating it had been present for around two months. Two participants also reported spotting between menstrual cycles, one of whom had been experiencing this for four months, and the other who had just noticed it the previous day.
In Figure 9, the median times for each symptom are shown. In the case of specific symptoms, these times are based on a small number of participants, as noted above each bar. The first bar shows the maximum time with any symptom for all 23 participants with current symptoms. The median time for any symptom was 30 days, ranging from 2 to 120 days. Of the two cases of chlamydia discovered, one reported having any current symptoms, consisting of an abnormal discharge that had been present for two weeks.

Figure 9: Median time with current symptoms among 23 participants reporting any symptom

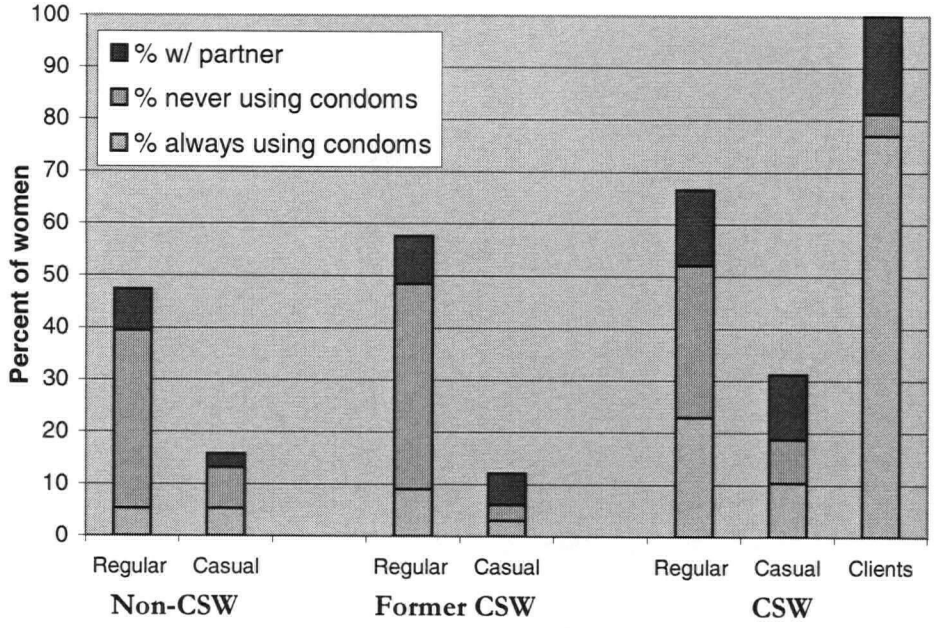


❖

As noted earlier, approximately 40% of the participants were current sex workers, 28% were former sex workers and 32% had never been involved in the sex trade. There was no significant difference in these proportions when restricting to participants who were attendees of the Women's Night program in particular. Sexual behaviours among non-sex workers, former sex workers and current sex workers are described below.

Participants were asked about their sexual partners and use of condoms with these partners. Fifty-eight percent of the participants indicated having a regular partner (someone they sleep with more than once a month for at least three months) and 21% reported having a casual partner (excluding clients). Figure 10 illustrates the proportion of participants with regular and casual partners, and the subsequent proportions always or never using condoms with these partners. For active sex workers, condom use with clients is also included. The total bar represents the percent of participants reporting each partner type, while the shaded sections represent the proportions always using condoms and never using condoms. Participants actively involved in the sex trade were more likely to have both regular and casual partners. The proportion of participants always using condoms increased from regular partners (10% and 16% among non-CSW and former CSW, respectively) to casual partners (~33% among both non- and former CSW). For current CSW, condom use was similar with regular and casual partners, but rose to nearly 80% consistent use with clients.

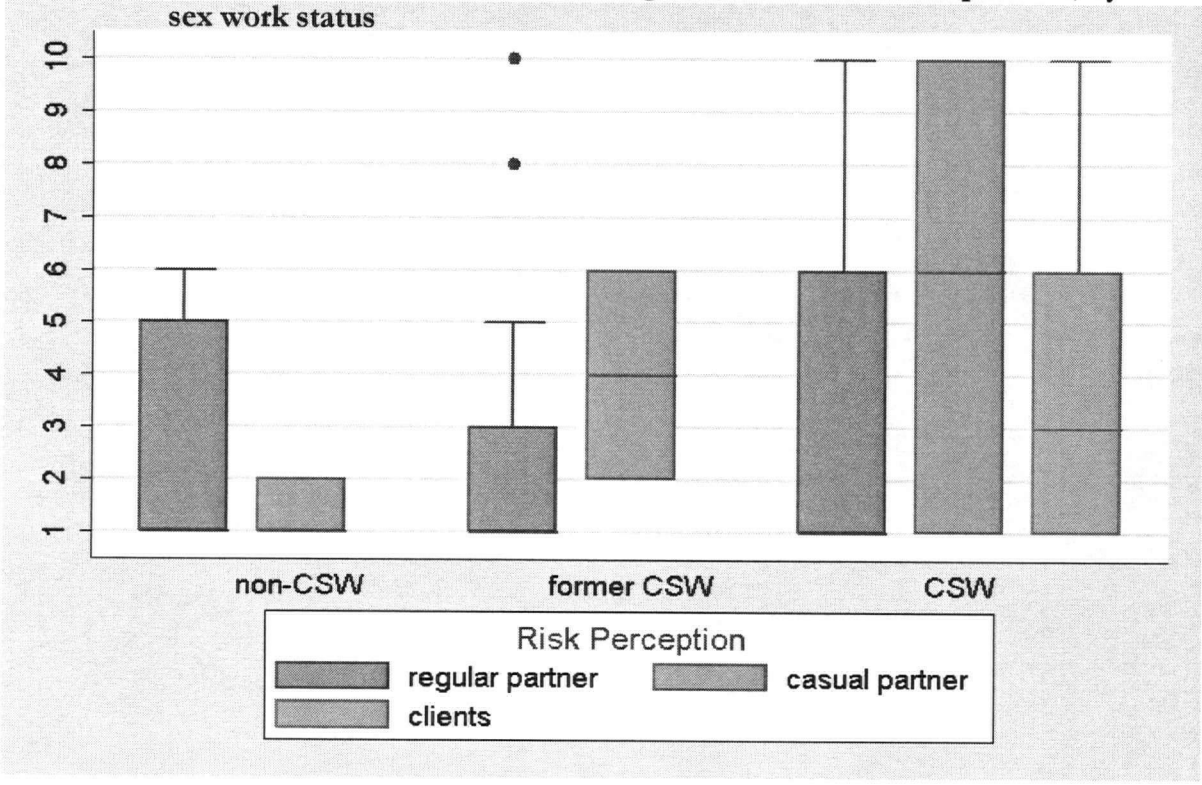
Figure 10: Sexual partners and condom use among non-CSW, former CSW and current CSW



In general, participants reported having one regular partner in the past six months, although a small proportion (~10%) reported two or three regular partners. Likewise, the majority of participants reported only one casual partner in the last six months, although approximately 15% of the participants reported 2 or 3, and about 10% reported 5 to 10 casual partners. Among current sex workers, the number of clients in the past six months ranged from one to one thousand. The majority of the participants reported somewhere between 4 and 50 paying partners.

To determine self-perceived sexual risk levels, participants were asked to rate what they thought

Figure 11: Perceived sexual risk scores with regular, casual and client partners, by sex work status



their risk was for getting an STI with each partner-type. These scores are presented in Figure 11. For regular partners, the median risk score was one for all participants, although among current sex workers one quarter scored themselves above six. For casual partners, the median risk score rose from one among non-CSW, to four among former CSW and six among CSW. For client relationships, CSW perceived themselves overall at a lower risk (median score of three) than they did with their casual partners. While this would seem to reflect awareness of risk among CSW not using condoms with their casual partners, an examination of casual partner risk scores among CSW showed higher scores for those who reported consistent condom use with casual partners (median score of eight; inter-quartile range from six to ten) than for those who did not (median score of three; inter-quartile range from one to ten).

❖

Part IV. Sexual Communication and STI-related Stigma

Sexual communication, i.e. the ability to talk to other people about topics of a sexual nature, was assessed by asking the participants who they had in their lives (family, friends, doctor, partner, other), if anyone, that they felt comfortable discussing sex in general, or STIs in particular. Only 7% of the participants reported that they did not feel comfortable talking to anyone in their lives about sex, while 9.6% did not feel comfortable talking to anyone about STIs, and 5.6% could not talk about either sex or STIs.

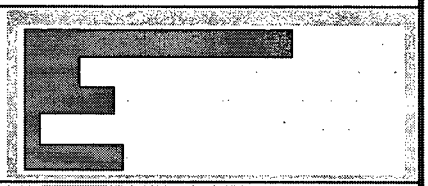
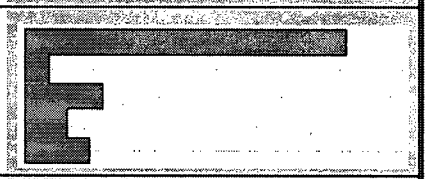
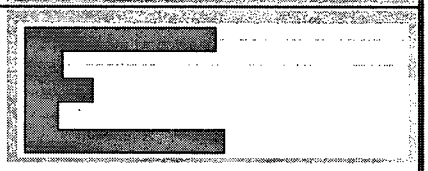
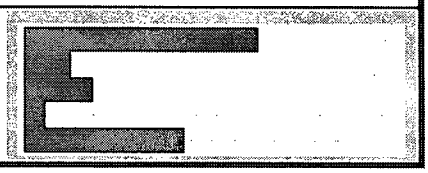
Among those that reported a sexual partner, 17% were not comfortable talking about sex with their partner. Likewise 17.6% of the participants were not comfortable talking to their doctor about sex. Over one-third (35%) were uncomfortable talking to any friends about sex and 62% were uncomfortable taking to any family members. A small number of participants (n=6) indicated that they were comfortable speaking to nurses about sexual topics.

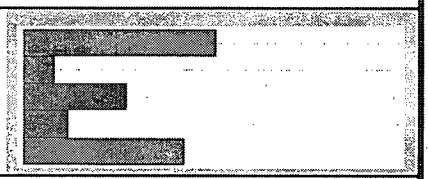
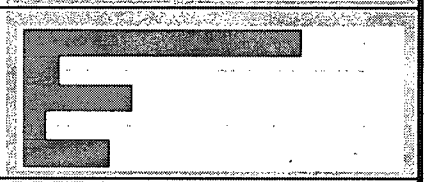
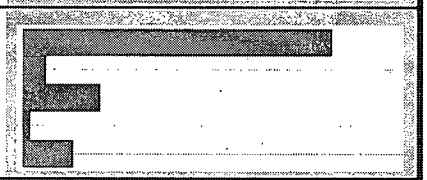
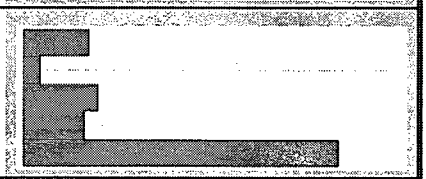
In general, there were higher levels of discomfort when talking about STIs to partners, family or friends. Twenty-six percent were not comfortable talking to their partner(s), 41% were unable to talk to friends and 62% were unable to talk to family members. On the other hand, only 12% reported not being comfortable talking with a doctor about STIs.

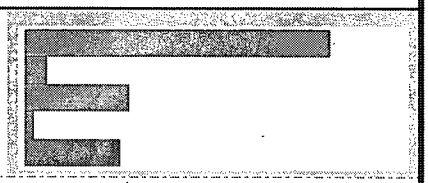
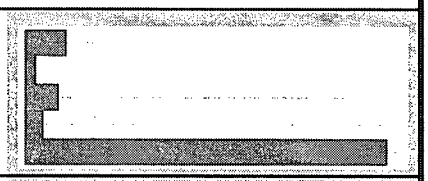
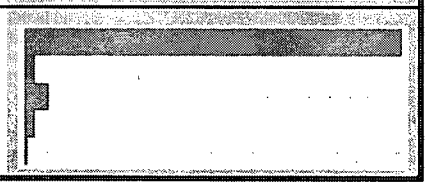
❖

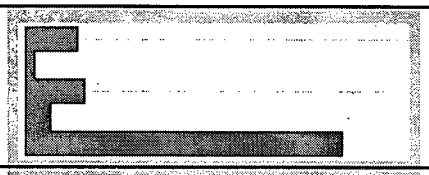
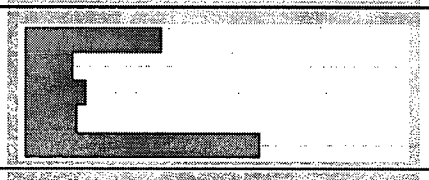
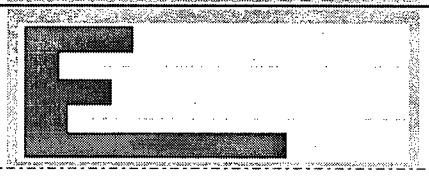
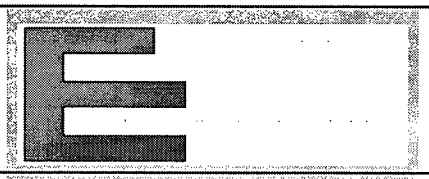
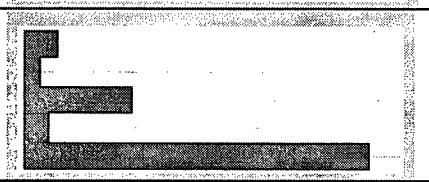
In order to assess levels of stigma attached to STIs in particular, the survey asked participants to indicate their level of agreement on a 10-point scale with 18 particular statements addressing perceptions of stigma, including how participants would feel if they had an STI, how easy or difficult it is to be discreet, what kind of participants get STIs, and how society would view them specifically or others in general if they had an STI.

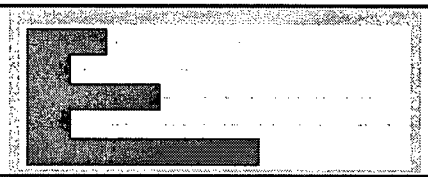
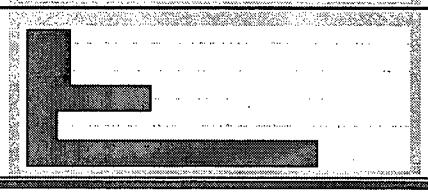
Table 4: STI-related stigma: perceptions of STIs, who gets STIs and how society views people with STIs

Self-stigma and shame			
If you had an STI, you would feel:			
Dirty	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	50.4% 10.6% 17.1% 3.3% 18.7%	
Violated	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	59.8% 4.9% 14.8% 8.2% 12.3%	
Guilty	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	35.8% 7.3% 13.0% 6.5% 37.4%	
Embarrassed	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	43.9% 8.9% 13.0% 4.1% 30.1%	

Physical and Psychological Perceptibility			
Someone with an STI:			
Would know it	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	36.1% 5.9% 19.3% 8.4% 30.3%	
Could hide it	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	52.1% 6.8% 20.5% 4.3% 16.2%	
May not know	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	66.1% 5.0% 16.5% 1.7% 10.7%	
Is damaged goods	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	12.4% 3.3% 14.1% 11.6% 58.7%	

Discretion and Disclosure			
If you had an STI:			
Your partner would be upset with you	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	56.8% 4.2% 19.5% 1.7% 17.8%	
At the clinic:			
Everyone would know if you were being tested for an STI	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	9.0% 2.5% 7.4% 4.1% 77.1%	
Staff are discreet	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	88.4% 2.5% 5.8% 2.5% 0.8%	

Social Stigma			
Women who get STIs:			
Have slept around	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	11.4% 2.4% 13.0% 5.7% 67.5%	
Weren't careful	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	25.6% 9.1% 11.6% 9.9% 43.8%	
Women should know better	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	20.3% 6.5% 16.3% 8.1% 48.8%	
If someone has an STI:			
People will gossip	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	24.4% 7.6% 30.3% 7.6% 30.3	
Health workers will think poorly of her	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	6.6% 3.3% 20.5% 4.9% 64.8%	

People will think she is a bad person	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	15.0% 8.3% 25.0% 8.3% 43.3%	
People will think she is stupid	**Strongly agree** **Agree** **Neutral** **Disagree** **Strongly disagree**	8.3% 8.3% 23.3% 5.8% 54.2%	

While more than 50% of the participants agreed with the statements that they would feel dirty or violated if they had an STI, fewer agreed and a higher proportion disagreed with statements that they would feel guilt or embarrassment.

In terms of physical impact, most participants agreed that one could hide an STI, or that one may not even know they had an STI. A large proportion (70%) disagreed that having an STI meant you were "damaged goods"; nonetheless, this leaves 30% that were neutral or agreed with the statement.
It is reassuring to note that clinic discretion (90% agreed) and health care worker disapproval (70% disagreed) were not found to be problematic by most participants. Even though the proportions are not alarmingly high, the nature of statements like "women should know better" (27% agreed), and "only women who aren't careful" (35%) or "only women who sleep around" (14%) get STIs raise some concerns around how participants perceive STIs and how blame for contracting an STI is laid. Also concerning, are the proportions agreeing with statements about how others react, such as thinking someone with an STI is stupid (17%) or a bad person (23%), or that they will gossip (32%).

❖

Discussion

The Women's Night program appeared to reach a population of unemployed, low-income women, with over 90% receiving income assistance and/or disability. The participants included those currently and formerly involved in sex trade. There was a high proportion of drug use, with 40% injecting drugs and 80% using non-injection drugs. Approximately 36% reported both types of drug use. The program was attended mostly by White or Aboriginal women, while other ethnic minorities were not highly present. The majority of the participants were over 40 years of age, and those that were involved in the sex trade indicated that they had been involved for a median of ten years. The Women's Night program is not specifically tailored to any one social or ethnic group of women; however, the demographics suggest that there are particular social clusters that attend. As many individuals in the DTES sustain a level of distrust for those that are not in their social circles, it is possible that the presence of certain social groups has limited the attendance of others.

This may explain why there were so few young adult and adolescent participants, why there was an under-representation of Asian and South Asian participants, and why there was a lack of

newcomers to the DTES at the Women's Night program. Of note, among the quarter of participants that had not previously attended WN, over 1/3 indicated that they were unaware of its existence, but were interested in finding out more. This indicates that for some, non-attendance has more to do with not being aware of available services, although social contacts would influence this.

In terms of attendance frequency, the WN program had a much larger proportion of occasional attendees. Thus, even though there may be some sub-groups missing, attendance is to some extent dynamic, leaving open opportunities to spread the word and attract a wider group. The observation that a small proportion of participants were not connecting with programs or outreach workers is notable. In this sample, the participants with low contact (e.g. no regular program attendance and low contact with outreach workers) were more likely to be non-CSW (53% vs. 28%, p=0.114), identify as an ethnic minority (17% vs. 6%, p=0.140) and were less likely to be receiving any income assistance (67% vs. 88%, p=0.019) as compared to those with higher contact. A more in depth look at who is not accessing these services and whether this is due to barriers or need would be a useful endeavor.

Most participants were regularly accessing health care (median number of visits in previous year was 12 times) and only three participants reported not having any health care visits in the past year. Seventy-seven percent indicated they had a regular doctor; however, participants did report experiencing barriers to accessing care, including limiting hours of operation (20%), long wait times (54%), not knowing where to go (15%), poor treatment by doctors or staff (29%) and difficulty in keeping appointments (41%). Sexual health care was also prevalent, with the majority accessing Pap smears through their regular doctor or a clinic. Outreach efforts to provide and promote Pap smears, including WN, Street Nurse services and the "Papalooza" program, were successful in reaching 44% of those who did not have a Pap smear through regular clinic services.

Fifty-three percent of those who were sexually active reported having had an STI test in the past year. This may be a result of underreporting, as it was observed that only 50% of those who received a Pap smear also reported any STI testing. Presumably this proportion would be higher, which would indicate that some participants are either unaware of STI testing being done at the time of their Pap smear, or that they failed to recall this testing at the time of the survey. There was a small proportion of participants (14%) who did not report having a Pap smear or any STI testing. Although there were no significant differences in the age, ethnicity or sex work status of the participants who were not receiving sexual health care, there was a slightly higher proportion of non-Aboriginal, non-CSW participants in this group. Of note, participants attending the WN program were more likely to report receiving STI testing in the past year. This may be a reflection of increased testing, or increased awareness of testing among these participants.

There was a low cross-sectional prevalence of chlamydia (2.8%) and gonorrhea (0%) among the participants agreeing to be tested (N=99). Although WN is carried out in a high-risk neighbourhood and is attended by a range of participants, including current and former CSW, there was not a high rate of STIs. This may be attributed to timely access to care in this population through clinics and outreach. Provincial STI statistics and the recent and ongoing syphilis outbreak in the DTES both indicate that STIs are not disappearing. Screening efforts that employ an outreach-based approach as opposed to a clinic-based approach may be more successful in reaching pockets of the population with higher prevalence of STIs than was seen at the WN program.

Only a small proportion of participants were not comfortable talking about sex and STIs with their doctor or another health care professional. Talking about STIs with partners was an issue for a number of participants, and a large number did not feel comfortable talking with family or friends. Not being able to talk with a doctor about STIs would be an immediate barrier to testing and treatment; however, not being able to talk to a partner or a close friend may impact decisions in other ways. For example, testing may be delayed if an individual is afraid of the results and the subsequent discussion with their sexual partner(s). Also, testing may be delayed because symptoms were unnoticed due to a lack of information that could have been provided by open discussions with and encouragement from friends. Stigma-related feelings were not alarmingly high, but were present in various forms in this population. As there remains an entrenched attitude of blame towards the 'bad girl' in our society, even today, it is important not to dismiss these issues, even if numbers are small.

Conclusions

1. Representation

- Women's Night attracts a diverse cross-section of participants, including sex workers and non-sex workers, injection drug users, crack users and non-drug users.
- There were few participants under 25 years of age, and few ethnic minorities other than Aboriginal or Metis.
- The Women's Night population is dynamic, with a smaller core group of regular attendees and a large number of occasional drop-ins.

The observation that sub-groups of the population (younger age, ethnic minorities) are not present at Women's Night is not an indicator that there is a need to reach out to these populations. It is possible that these individuals are accessing services through other venues and have no need for the Women's Night program. However, if there was a desire to expand the participation of Women's Night, there could be opportunities to do so through encouraging word-of-mouth spread with trinkets (buttons, stamps) that are visible and remind participants about Women's Night throughout the week, or through postings at a wider variety of venues that are frequented by the population of interest.

2. Sexual Health Care

- Almost all participants (98%) had accessed some form of health care in the past year, and most women (66%) had undergone a Pap smear.
- Half of the participants reporting sexual activity in the past six months reported STI testing and/or treatment.
- Cross-sectional prevalence of chlamydia and gonorrhea was 2.8% and 0.0%, respectively.

While most participants were accessing sexual health care on a regular basis, there was a small proportion reporting none. As with program attendance, it is unclear whether this reflects an access issue or whether it is more a reflection of reduced need, although the majority of the participants not accessing care did report sexual activity. With regards to screening initiatives, there does not appear to be sufficient prevalence among the Women's Night participants to merit a focused effort. Instead, outreach based screening initiatives, such as the Street Nurses Papalooza, may attract and connect with a broader population with higher STI prevalence.

3. STIs: Communication and Stigma

- Eighteen percent and 12% of participants were uncomfortable discussing sexual topics and STIs with a health care professional (doctor or nurse), respectively.
- Twenty-six percent were not comfortable talking to their partner(s), 41% were unable to talk to friends and 62% were unable to talk to family members about STIs.

- Clinic discretion and disapproval of health care workers were not indicated as problems by most participants (90% and 70%, respectively).
- Small but concerning proportions (ranging from 15-30%) of participants agreed with statements that were blaming (i.e. women should know better, only women who sleep around or aren't careful get STIs) and statements that indicated perceptions of societal stigma (i.e. others will gossip, will think someone with an STI is stupid).

Although these issues are tied to larger social perceptions and STI-related stigma, there are ways in which health care providers could offer support and encouragement. Information in the form of pamphlets is one method of improving knowledge; however, even straight-forward, easy-to-read pamphlets like "What you need to know about STI" provided by Health Canada have limited use in settings where literacy rates are low and cultural and/or language differences may be a barrier. Another approach is to provide more opportunities to talk about STIs. One of the most successful prevention strategies for behaviour change among high-risk women has been sessions that simultaneously provide information and teach self-efficacy for using condoms or other forms of protection through role-playing and examples of ways to approach the subject and negotiate use. This strategy could also be used to open communication about STIs, providing examples of how to broach the subject with partners and introducing discussion techniques, as well as providing opportunities to talk about STIs, and encouraging participants to share the information with other friends. Integrating traditional prevention messages with a broader range of topics, including STIs, testing and treatment and how to talk about these issues may improve sexual health seeking behaviour and decrease perceptions of stigma. While traditional prevention messages are important, focusing on protection without talking about what happens when it doesn't work or when we 'slip up' leaves an opening for increased feelings of anxiety and guilt, as well as fear of disappointing partners or health care providers.

In the Women's Night setting, the diversity of attendees would make this type of intervention difficult. Another approach could apply a more general "Women's Health" initiative, where an array of topics, including STIs, are introduced in a non-intrusive way. Options for presentation include skits, games, "talk-to-a-professional" nights, or "how-to nights" ranging from sexual topics (e.g. using the female condom), to nutrition (e.g. low-budget cooking"), to relaxation (e.g. yoga stretch, meditation). In fact, many of these types of evenings have been done with various levels of participation and success. However, while the current programs run mostly on dedicated volunteers, a co-ordinated Women's Health initiative would require proper funding in order to carry out a sustainable series of sessions with input from appropriate health care professionals experienced in providing care to the DTES population.

APPENDIX V

ETHICS APPROVAL FORMS