Factors Mediating the Relations between Street Youths'
Experiences of Trauma and their HIV Risk Behaviour

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by

Melissa Northcott

Department of Psychology
Carleton University

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Abstract

This study examined factors mediating the relations between the traumatic experiences and HIV-related risk behaviours of 430 street-involved youths (12 to 18 years) surveyed in British Columbia, Canada. High rates of trauma, mental health difficulties, alcohol and marijuana use, hard drug use and HIV-related risk behaviours were observed among these youths. Factor analyses identified 4 clusters of HIV risk behaviours: risky sex (e.g., number of sexual partners, using drugs or alcohol before intercourse), street survival behaviour (e.g., sex trade work, sharing injection equipment), drug- and alcohol-related service use (e.g., drug or alcohol counselling) and needle-related service use (e.g., use of a needle exchange). Path analyses, which accounted for 10.7 to 67.9% of the variance in the 4 types of HIV risk behaviours, revealed that trauma had 2 indirect effects on youths' HIV risk behaviours. Specifically, more trauma was associated with greater use of alcohol and marijuana that was, in turn, associated with more risky sex. More trauma was also associated with more mental health problems, which was then related to more street survival behaviour. Trauma also had direct effects on youths' street survival behaviour and their use of drug- and alcohol-related services, suggesting that unidentified factors also mediate the impact of trauma on these behaviours. Finally, more hard drug use was associated with both more use of alcohol- and drug-related services and less use of needle-related services. The implications of these and other findings (e.g., moderating role of gender and Aboriginal status) for future research and HIV-related interventions for street youths are discussed.

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Factors Mediating the Relations between Street Youths'

Experiences of Trauma and their HIV Risk Behaviour

Approximately 150,000 youths live on the streets of Canada every day (DeMatteo et al., 1999) and youths under the age of 24 constitute the fastest growing segment of the Canadian homeless population (Koeller, 2006). Because street youths are a largely hidden population often missed by national probability samples, these numbers may actually underestimate the number of street youths in Canada (Kral, Molnar, Booth & Watters, 1997).¹

Street youths have typically endured harsh social experiences and face equally harsh living conditions, including poverty, residential instability and lack of access to basic health care (Public Health Agency of Canada, 2006). Globally, these youths are also at a greater risk for HIV than housed youths (Milburn et al., 2007). In the United States, for example, approximately 2.3% of street-involved youths are HIV+, which is 60 times higher than the HIV seroprevalence of non-street involved youths (Milburn et al., 2007).

There are no known studies that directly compare the HIV seroprevalence among street-involved and non-street involved youths in Canada. However, several studies have examined the HIV seroprevalence of street-involved youths in Canada specifically. For example, the Enhanced Surveillance of Canadian Street Youth ([E-SYS] 1999, 2001, 2003; Public Health Agency of Canada, 2006), a national surveillance system of 4,728

¹For the purpose of this study, 'street youths' are defined as youths involved in a street lifestyle. This may involve "being homeless, panhandling, involvement in the sex trade, selling or using drugs, or engaging in criminal activities" (Smith et al., 2007, p. 12).

street youths 15 to 24 years of age, found that 0.96% and 0.66% of those tested in 2001 and 2003, respectively, were HIV+. In 2001, most of these HIV+ cases were among older youths (0.3% of youths 15 to 19 years old vs. 2.3% of youths 20 to 24 years old), while in 2003, all of the cases were among older youths. In addition, 4.5% of the 2003 sample was infected with the Hepatitis C virus (HCV). Other research reports comparable rates, with a study of 695 Toronto street youths finding an HIV seroprevalence rate of 2.2% (DeMatteo et al., 1999). Similarly, in a year-long seroepidemiological study of Montreal street youths 13 to 25 years of age, Roy et al. (2000) documented HIV prevalence rates of 1.9% for the total sample, 1.1% among females ($n = 262$) and 2.2% among males ($n = 640$). In comparison, the HIV+ seroprevalence rate among all Canadian youths, aged 15 to 19 years old, was 1.5% in 2006 and 2008 (Public Health Agency of Canada, 2006, 2008). These rates, however, are controversial, as these studies use different methods of testing seroprevalence (including serum, saliva, or both) and as such, it is difficult to make a comparison between the HIV seroprevalence among street-involved and non-street involved youths.

Regardless of the exact rates, it is clear that street youths are vulnerable to HIV. Consistent with this, and as outlined below, street youths are more likely than non street-involved youths to engage in a number of HIV risk behaviours. Because street youths are also more likely than non street-involved youths to have experienced trauma, and trauma is related to HIV status, the present study is designed to examine the extent to which the psychological aftereffects of trauma mediate the relations between street youths' experiences of trauma and their current HIV risk behaviour.

Street Youths' HIV Risk Behaviour

A number of studies have examined street youths' sex- and drug-related HIV risk behaviour. Unsafe sexual behaviours include having sexual intercourse without a condom, having many sexual partners and having sex with high risk individuals (e.g., injection drug users, people who have many sexual partners). They also include having a sexually transmitted infection (STI), which increases an individual's vulnerability to HIV infection because STIs can cause ulcerative lesions which facilitate access for viral infections (Medrano & Hatch, 2005). Involvement in the sex trade, which has been labelled 'survival sex' in the case of street youths, increases the risk of HIV infection through factors such as having unprotected sex, engaging in sexual activity while under the influence of substances, and engaging in sex with multiple individuals (Medrano, Hatch, Zule & Desmond, 2003). Sex trade workers are also at increased risk of violent and coercive sex by their clients, who are unlikely to use a condom during their perpetration of sexual assault (Farley, 2004; Lodico & DiClemente, 1994). Clients may also offer more money to avoid using a condom and the desperate economic circumstances of many sex trade workers increases the likelihood of them accepting such offers (Farley, 2004). In addition, male sex trade workers run the risk of contracting HIV by having unprotected sex with male clients (Haley, Roy, Leclerc, Boudreau, & Boivin, 2004).

A number of drug-related behaviours also place people at risk for HIV. Using substances during sex, for example, may detract from reasoned decision-making and contribute to the failure to use a condom (Kral et al., 1997). It may also lead to

disinhibition that results in a person having sex they would not otherwise engage in (Kral, et al., 1997). Homeless and street-involved injection drug users (IDUs) are particularly vulnerable to HIV. Their lack of stable housing, for example, makes it difficult to store clean injection equipment and thereby increases the likelihood that they will share used needles with other IDUs, a process referred to as “direct sharing” (Koester, 1996). Homeless IDUs’ lack of stable housing also increases the likelihood that they will engage in what has come to be known as “indirect sharing,” which refers to sharing other injection-related paraphernalia such as the water used to mix the drug or rinse syringes, spoons, or the cotton used to draw the drug solution up from the spoon into the needle (Koester & Hoffer, 1994). Homeless IDUs are also more likely to attend shooting galleries, which increases the likelihood of both direct and indirect sharing (Coady et al., 2007).

A number of studies have examined the extent to which street youths engage in these sex- and drug-related HIV risk behaviours. In the E-SYS studies (1999, 2001, 2003; Public Health Agency of Canada, 2006), where about 1% of the youths reported being HIV+ and 4.5% were infected with HCV, street youths were more likely than youths from the general population to engage in a number of sexual and drug-related behaviours that put them at risk for HIV. For example, street youths reported being younger than youths from the general population when they first had sexual intercourse (*Ms* = 14.0 and 14.8 years old, respectively). Male street youths also reported having between 18 and 45 lifetime sexual partners, while female street youths reported having between 4 and 21 sexual partners. A high proportion of street youths (26.6%) also

reported having had a STI. Relative to youths from the general population, street youths were about 11 times more likely to be infected with Chlamydia and 20 to 30 times more likely to be infected with gonorrhea. Further, 50% of these street youths reported not using a condom during their last sexual encounter. Approximately one quarter reported having traded sex for money or goods, with female street youths being more likely than male street youths to have ever traded sex in 2003 (29.3% vs. 14.5%, respectively). Further, 22.3% of the youths reported having injected drugs, most commonly cocaine, heroin, morphine and speedballs (a combination of cocaine and heroin), and one-third said they had borrowed another person's injection equipment (Public Health Agency of Canada, 2006).

Comparable findings were observed in Smith et al.'s (2007) study of 762 street youths recruited on the street, through drop-in centers and through shelters in nine different communities in British Columbia. These street youths, who were 12 to 18 years old (*M* age = 16.0 years; half female; 54% Aboriginal) reported engaging in a number of sexual- and drug-related HIV risk behaviours. These behaviours included an early age of sexual initiation, with the average age of first intercourse at 13.8 years. The rates of condom use were low, with 25% of 14-year-olds and 47% of 18-year-olds indicating that they had not used a condom the last time they had sexual intercourse. Given this, it is not surprising that 19% reporting having had a STI. Further, more than one-third reported having traded sex for money or goods and, although only 7% of these youths reported using injection drugs in the past month, one quarter reported using needles or other injection gear after someone else had used them.

Marshall, Kerr, Shoveller, Patterson, Buxton and Wood (2009) also observed high rates of HIV-related sexual behaviour in their study of 529 street-involved youths in Vancouver (age range = 14 to 26 years, median age = 21.9 years; 30% female; 24% Aboriginal). Despite being older than the youths in Smith et al.'s (2007) study, and presumably more aware of the HIV-related risks of sexual behaviours and better able to control their impulses, over two-thirds (69.4%) of these youths reported inconsistent condom use and a similar proportion (61%) reported multiple sexual partners in the last six months (range = 0 to 55 partners; inter-quartile range = 1 to 3 partners).

Other researchers have documented the effects of these HIV risk behaviours on the HIV rates of street youths. For example, Roy et al. (2000) found that being over 20 years of age (adjusted odds ratio [AOR] = 7.09), using injection drugs (AOR = 4.48), engaging in sex trade work (AOR = 3.32) and being born outside Canada (AOR = 4.41) independently predicted HIV infection. Having sex with HIV-infected partners, IDUs or sex trade workers, using crack, speedballs or tranquillizers, and having a tattoo were also associated with HIV infection. In a later study of 1013 street youths, 14 to 25 years old, in Montreal, Roy et al. (2003) found that injection drug use (Hazard ratio = 7.0) and involvement in survival sex (Hazard ratio = 4.0) were independently associated with being HIV+. In addition, in their study of 429 street youths in Northern California recruited from locations such as parks, food lines and street blocks marked with high rates of homelessness, Clements, Gleghorn, Garcia, Katz and Marx (1997) found that almost a third ($n = 137$; 32%) of the 1121 youths in their study had used injection drugs, while Gleghorn, Marx, Vittinghoff and Katz (1998) found that 39% ($n = 435$) of the

street youths in their study had ever used an injection drug.

HIV prevalence rates are especially high among both adult (Robertson et al., 2004) and adolescent IDUs (Coady et al., 2007) with precarious housing. Of the HIV+ youths in the 2003 E-SYS study, 37.5% were IDUs (Public Health Agency of Canada, 2006) and in a study of 479 injection drug users, 29 years and younger living in Vancouver, the prevalence of HIV/HCV co-infection was 26% (Miller et al., 2004). The findings of Miller et al.'s (2005) longitudinal study of 241 street-involved Vancouver IDUs aged 24 and younger also suggest that homeless and street-involved IDUs are especially vulnerable to both HIV and HCV. At baseline in 1996, 10% ($n = 25$) of these IDUs were HIV+ and 46% ($n = 110$) were HCV+. Of the 158 HIV- youths who came back for at least one follow-up during the three years of the study, 11% ($n = 18$) became HIV+. Of the HCV- youths who returned for at least one follow-up, 44% ($n = 36$) became HCV+. After 36 months, the cumulative incidence rates for HIV and HCV were 11.1% and 52.1%, respectively.

Although the diversity among the predictors of street youths' HIV status suggests that a number of factors may contribute to their HIV-risk behaviours, one particular set of inter-related factors may account for a good portion of the variance in street youths' sex-related and drug-related HIV risk behaviours, namely the aftereffects of trauma. As discussed below, numerous studies have documented links between various forms of trauma, HIV risk behaviours and HIV.

Trauma and HIV Risk Behaviour

The backgrounds of street youths frequently include trauma, an experience known to increase the likelihood of both sex- and drug-related HIV risk behaviour.

Street youths' experiences of trauma. Research by Kaufman and Widom (1999) suggests that childhood victimization increases youths' risks of running away and delinquency (i.e., being arrested as a juvenile). In a 20-year longitudinal study, these authors compared 676 children who had experienced neglect, sexual abuse or physical abuse with 520 children matched on age, sex, ethnicity, and socioeconomic status who had not been abused or neglected. The abused sample was selected from all of the substantiated cases of child abuse and neglect processed from 1967 to 1971 by the family and juvenile criminal courts in the Midwestern United States. The abused children were 11 years or younger at the time of the abuse. Two-hour follow-up interviews were conducted with the participants between 1989 and 1995. The authors found members of the abused/neglected group were more likely to run away than youths from the matched comparison group. Specifically, the abused/neglected youths were 2.5 times more likely to run away before the age of 18, 2.9 times more likely to run away overnight before the age of 15, 3.4 times more likely to have run away before the age of 15, and 3.0 times more likely to have been arrested for running away than the youths from the comparison group. Added to this, those who had been abused or neglected were 1.8 times more likely to have been arrested as a juvenile.

Given Kaufman and Widom's (1999) findings, it is not surprising that researchers observe high rates of child abuse in lives of street youths (Kral et al., 1997). Indeed,

youths often run away and become street-involved because of their experiences of physical abuse, sexual abuse and/or witnessing family violence (Kurtz, Lindsey, Jarvis, Williams, & Nackerud, 2000). For example, in Kral et al.'s (1997) study of 775 runaway and homeless adolescents in San Francisco, Denver and New York, over half (59%) of the youths indicated they had left home due to family conflict and almost a quarter (22%) reported leaving home due to physical and/or sexual abuse.

Similar findings have been observed in Canada. For example, a 2001 review of 22 studies of Canadian street youths (CS/RESORS Consulting Ltd., 2001) found that street youths experience higher levels of physical and sexual abuse than non-street involved youths. Similarly, more than half of the Canadian street youths in the E-SYS (1999, 2001, 2003; Public Health Agency of Canada, 2006) studies reported prior experiences of emotional abuse or neglect. In 2003, 13.4% of youths reported leaving home because of emotional abuse, 4.6% reported leaving because of physical abuse and 1.1% reported leaving because of sexual abuse. More females than males reported leaving home because of abuse (25.1% vs. 15.5%, respectively). Likewise, 17% of the females and 13% of the males in Smith et al.'s (2007) study of BC street youths reported leaving home due to violence or abuse at home. Again, more females than males reported being sexually abused (55% vs. 15%, respectively), while 61% of all youths had experienced physical abuse and 61% had witnessed family abuse. In addition, 40% of these youths said they had been physically attacked or assaulted. Taken together, the findings of these studies indicate that trauma is common in the lives of many, perhaps the majority, of street-involved youths.

Trauma and youths' HIV risk behaviour. The relations between trauma and youths' HIV risk behaviour have been examined in studies of both school-based and street youths. In a school-based study, Saewyc, Magee and Pettingall (2004) examined the relationship between sexual abuse and HIV risk behaviours among adolescent students in Minnesota in 1992 ($N = 29,187$) and 1998 ($N = 25,002$). The researchers found that in 1992, 27% of females and 6% of males reported experiencing sexual abuse, while in 1998, a similar percentage reported experiencing sexual abuse (22% of females and 9% of males). In both years, sexually abused females were more likely to report having been pregnant than nonabused females, while sexually abused boys were more likely than their nonabused peers to have impregnated a female. Abused males and females were also more likely to report having an STI, using drugs or alcohol before sex, having more sexual partners, as well as less frequent use of birth control and less condom use in comparison to their nonabused counterparts.

Voisin (2003) studied the effects of being a victim of community violence (i.e., of robbery, being threatened with a weapon and forced sexual contact prior to the age of 13) on the HIV risk behaviours of 120 African American adolescent males recruited through their homeroom classes in Manhattan and the Bronx. Forming a composite measure of HIV risk behaviour on the basis of students' responses to questions about having sex without a condom, substance use prior to having sex, having sexual intercourse with a partner who had concurrent partners, and having a history of STIs, Voisin (2003) found that adolescent males who had experienced community violence were more likely to engage in HIV risk behaviours than those who had not experienced community violence.

In a later study, Voisin (2005) examined the effects of childhood sexual abuse and witnessing family or community violence on the HIV risk behaviours of 409 adolescent boys and girls recruited from a Manhattan high school. The HIV risk behaviours considered included having sex without a condom, having sex with multiple partners and substance use prior to intercourse. Analyses of these data revealed that adolescents who had experienced CSA and/or witnessed family violence were almost 4 times more likely to engage in all three HIV risk behaviours than youths who had not experienced such trauma. Further, those who had been exposed to community violence were almost three times more likely to engage in the HIV risk behaviours than youths who had not. Finally, among those who had witnessed family violence, boys were 2.6 times more likely to report having sex after drug use and 2.7 times more likely to report having sex with multiple partners relative to girls. There were no gender differences in observing family violence and having sex without a condom.

In one of the largest studies to date, Saewyc et al. (2006) examined the influence of sexual abuse and sexual orientation on the HIV-risk behaviours of adolescents in grades 7 to 12. This study examined the seven common HIV risk behaviours assessed in the 1995 and 1999 Seattle Teen Health Surveys ($Ns = 7,477$ and $6,590$) and the 1992, 1998, and 2003 British Columbia Adolescent Health Surveys ($Ns = 239,975$, $281,576$ and $265,132$). These behaviours involved adolescents' age at first intercourse, the number of sexual partners they had during the past three months and during their lifetime, their use of a condom when they last had sexual intercourse, whether they were ever diagnosed with a STI, whether they ever used injection drugs and their use of substances when they

last had intercourse. Analyses of these data revealed that gay/lesbian and bisexual youths had higher HIV risk scores in comparison to heterosexual youths. Further, within each sexual orientation group, those with a history of sexual abuse had higher HIV risk scores than nonabused youths, and abused sexual minority youths had higher HIV risk scores than abused heterosexual youths.

Using the same sample as Kaufman and Widom (1999), Wilson and Widom (2008) conducted a 30-year follow-up comparison of the individuals who had experienced abuse or neglect and the members of the matched comparison group. Relative to the members of the nonabused comparison group, those who had experienced child abuse reported an earlier age at first intercourse and were more likely to have engaged in prostitution. Further, although not statistically significant, the assessment at age 41 indicated that the prevalence of HIV in the abused group was more than twice that of the comparison group (Odds ratio = 2.35). Among females, but not males, experiences of childhood physical abuse were strongly associated with an early age of first intercourse (Odds ratio = 4.80) and sex trade work (Odds ratio = 5.58). Although these are nonexperimental data, the longitudinal nature of this study and the inclusion of a matched comparison group provide strong support for the suggestion that experiencing abuse increases an individual's likelihood in engaging in sex-related HIV risk behaviours such as prostitution.

Taken together, these and other school-based studies (e.g., Bornolova, Gwadz, Kahler, Aklin, & Lejuez, 2007) indicate that trauma, be it in the form of direct experiences of physical or sexual abuse or indirect witnessing of family or community

violence, is associated with both sexual- and drug-related HIV risk taking. Other research indicates that trauma has comparable effects on street youths' HIV risk behaviour. Further, both trauma and family conflict have been found to contribute to drug use among homeless youths, youths who are known to use all types of drugs more frequently than their nonhomeless peers (Mallett, Rosenthal and Keys, 2005). Using qualitative interviews, Mallett et al. (2005) investigated the pathways that led to the homelessness of 302 youths recruited from homeless services in Melbourne, Australia. Analyses of these data revealed four broad pathways to homelessness, each of which involved family conflict in some way. More than a third (38%) of the youths said that their own drug or alcohol use led to family conflict, which in turn led to their homelessness, and just over a quarter (26%) indicated that a family member's drug or alcohol use led to family conflict, which then led to their homelessness but not their drug use. Almost a fifth of the youths (19%) indicated that family conflict (or a strong sense of disaffection with their parents/step-parents) led to their drug or alcohol use, which in turn led to their homelessness and another fifth (17%) indicated that family conflict led directly to their homelessness, at which point they began using drugs or alcohol. In addition, almost 10% of these youths indicated that sexual abuse was the direct reason they left home; however, this was not associated with their drug use. Overall, then, while there may be many paths to a young person's homelessness and drug use, family conflict and trauma appear to play an important role in each.

Although many studies have identified high rates of trauma among street youths (e.g., Public Health Agency of Canada, 2006; Smith et al., 2007), and other studies have

documented that street youths engage in high levels of HIV risk behaviour (e.g., Dematteo et al., 1999; Weber, Boivin, Blais, Haley & Roy, 2002), few studies have compared the HIV risk behaviours of street youths who have and have not experienced trauma. In a notable exception, Johnson, Aschkenasy, Herbers and Gillenwater (1996) studied the self-reported HIV risk behaviours of 196 homeless youths in Chicago (*M* age = 18.2 years, range = 13 to 21 years) recruited through shelters and various street locations. Sixteen percent (*n* = 32) of these youths indicated that they had been sexually abused. Relative to their nonabused counterparts, the abused youths also indicated being younger when they first had sexual intercourse (11.9 vs. 13.4 years, respectively), more irregular condom use (46.9% vs. 24.8%, respectively), engaging in sex trade work (28.1% vs. 9.9%, respectively) and having been diagnosed with a STI (50% vs. 22.2%, respectively). Furthermore, in their study of 542 male street youths recruited from street youth agencies in Montreal, Haley et al. (2004) found that those who had experienced CSA (*n* = 233; 42.9%), were three times more likely (AOR = 3.6) to engage in survival sex than their non-abused peers. Similar findings were observed in Marshall, Kerr, Shoveller, Patterson, et al.'s (2009) study of Vancouver street youths, where those who had been sexually abused had more sexual partners in the last six months than those who had not been sexually abused (Incident Rate Ratio = 1.67).

In sum, the existing literature indicates that street-involved and homeless youths are likely to have experienced some form of trauma and that traumatization is associated with behaviours that place youths at risk of contracting HIV.

Mediators of the Trauma-HIV Risk Behaviour Relation

Much research suggests that the aftereffects of trauma may be responsible for the observed relations between street youths' experiences of trauma and their HIV risk taking. Perhaps the most frequently studied aftereffect of trauma is posttraumatic stress disorder (PTSD; Breslau, Davis, Andreski & Peterson, 1991; Briere & Elliott, 1994; Castillo, 1997) and both PTSD and its associated features (i.e., depression and substance use) have been linked to HIV risk behaviour.

Aftereffects of trauma. PTSD is an Axis 1 anxiety disorder defined by four criteria: 1) the presence of a traumatic event in which the person experienced actual or threatened death, serious injury or a threat to the physical integrity of themselves or others that involved intense fear; 2) re-experiencing the trauma through flashbacks, nightmares or intrusive thoughts; 3) numbing of responsiveness or avoidance of thoughts or actions related to the traumatic event, which includes feeling detached from others and a sense of a foreshortened future (e.g., expecting to die at a young age); and 4) persistent symptoms of increased arousal, including anger, irritability, the inability to concentrate and sleep disturbances (American Psychiatric Association, 2000). The three symptom clusters must be present for at least one month and the disturbance must cause clinically significant distress or impairment in important areas of life. PTSD also has a number of associated features, of which depression and substance-related disorders are most relevant in the present context (American Psychiatric Association, 2000).

Based on their review of 45 studies, Kendall-Tackett, Williams and Finkelhor (1993) reported that, on average, 32% of sexually abused children and adolescents

suffered from PTSD. Paolucci, Genuis and Violato's (2001) meta-analysis of 37 studies also found that childhood sexual abuse was associated with increased risk for PTSD (weighted $d = .40$) on the part of children, adolescents and adults. Other researchers have studied the effects of community violence on adolescents' experiences of PTSD (e.g., Breslau et al., 1991). For example, in their study of 79 adolescent girls recruited at an outpatient medical clinic, Horowitz, Weine and Jekel (1995) found that experiences of community and domestic violence (including witnessing shootings, stabbings, experiencing beatings and forced unwanted sexual contact) were related to PTSD, which was present in 67% of the sample.

Researchers have also documented high rates of depression following childhood traumatization. For example, in their review, Kendall-Tackett et al. (1993) found that, on average, 31% of sexually abused children and 46% of sexually abused adolescents suffered from depression. Similarly, Paolucci et al.'s (2001) meta-analysis revealed that childhood sexual abuse was associated with depression (weighted $d = .44$), combined across children, adolescents and adults. Studies of homeless youths reveal comparable findings. In particular, in Ryan, Kilmer, Cauce, Watanabe and Hoyt's (2000) study of 329 homeless adolescents recruited from drop-in centres in Seattle, 35% of those who had been both sexually and physically abused as children met the diagnostic criteria for depression/dysthymia, compared to 14.8% of those who had not experienced such abuse.

Other studies have also documented the relation between homeless people's exposure to traumatic events and their increased risk for depression (e.g., Boivin, Roy, Haley & du Fort, 2005; Rayburn et al., 2005). Molnar, Shade, Kral, Booth and Watters

(1998) found in their study of 775 street-involved youths, that those who had experienced physical or sexual abuse were 1.9 to 4.3 times more likely to attempt suicide in comparison to those who had not experienced abuse. In addition, in a review of studies examining the prevalence of psychological difficulties among homeless Australian youths, Kamieniecki (2001) found that, in comparison to non-homeless youths, homeless youths scored higher on standardized measures of psychological distress and had higher rates of suicidal behaviour and psychiatric disorders.

Drug and alcohol abuse, which are more common among street youths than non-street involved youths (Mallett et al., 2005), also follow trauma (American Psychiatric Association, 2000; Chilcoat & Breslau, 1998a, 1998b) and often represent attempts to self-medicate the negative affect (e.g., anxiety, depression, feelings of low self-worth), hyperarousal and intrusive memories that follow trauma (e.g., Bailey & McCloskey, 2005; Finkelhor & Browne, 1986; Simmons, Sack & Miller, 1996). Perhaps the most compelling evidence of the relation between trauma and substance abuse comes from Kilpatrick et al. (2000), who used random telephone interviews to examine the substance use of a probability household sample of 4,023 adolescents from across the United States. Eight percent of these youths reported experiencing sexual assault, 22% reported physical assault, and 39% reported witnessing assault. Adolescents who had been sexually abused were 4.6 times more likely to report alcohol abuse, 3.8 times more likely to report marijuana use and 8.6 times more likely to report hard drug use in the past year than nonabused youths. Similarly, youths who had been physically assaulted were 3.9 times more likely to report alcohol abuse, 4.8 times more likely to report marijuana use and

12.4 times more likely to report hard drug abuse during the past year than non-abused youths. Finally, youths who had witnessed violence were 4.9 times more likely to report alcohol abuse, 8.4 times more likely to report marijuana use and 13.2 times more likely to report hard drug abuse in the past year than youths who had not been abused or witnessed violence. Thus, all types of childhood trauma were associated with substance use.

Consistent findings were observed in Kendall-Tackett et al.'s (1993) review, where 53% of the adolescents who had experienced childhood sexual abuse engaged in substance abuse, as well as in Bailey and McCloskey's (2005) study of 150 female adolescents recruited from shelters and the general community, where the 43 girls who reported childhood experiences of sexual abuse were more likely to report using marijuana, cocaine, uppers, crystal methamphetamine and other drugs than girls who did not report such abuse. Compared to their nonabused counterparts, these abused girls also reported using more types of drugs and higher levels of problem drinking.

Overall, then, trauma is associated with a number of aftereffects, including PTSD, depression and substance abuse, that may contribute to unsafe HIV risk behaviour.

Aftereffects of trauma and HIV risk behaviour. The aftereffects of trauma, such as PTSD, depression and substance abuse, may contribute to HIV risk behaviour in any of a number of ways. As a result of the negative feelings associated with PTSD and depression, an individual's ability to cope with difficult situations may be compromised and result in helpless or passive behaviour in situations that may lead to HIV risk taking (Brown, Kessel, Lourie, Ford & Lipsitt, 1997). Further, feelings of hopelessness, depression and the sense of a foreshortened future associated with PTSD may cause a

person to not think or even care about the repercussions of unsafe sexual or drug use behaviour. Moreover, child sexual abuse and other trauma cause changes to neurochemical systems and brain regions, such as the hippocampus and amygdala, which can lead to long term changes in brain circuits (Bremner, 2006). As a result of these changes in brain chemistry, an individual may become more inclined to addictions (Maté, 2008).

Substance abuse may also contribute to sex- and drug-related HIV risk behaviour in a host of ways (Allers, Benjack, White, & Rousey, 1993). As noted earlier, it may reduce inhibitions, reduce a person's perceptions of the risk of contracting HIV, and impede rational decision-making that might normally prevent a person from engaging in HIV risk behaviour (Kral et al., 1997). Substance abuse may also detract from a person's ability to negotiate safer sex- and drug-related behaviour. The latter may be especially problematic for adolescents who are unlikely to possess the skills necessary to negotiate safer sex- and drug-related behaviour and assertively set limits in their encounters (Brown et al., 1997). Inebriation may also make youths vulnerable to sexual assault (Abbey, Zawacki, Buck, Clinton, & McAuslan, 2001; Jones, Gruber, & Timbers, 1981), during which the use of condoms is unlikely.

Findings consistent with these possibilities have been reported by a number of researchers. For example, in Weber et al.'s (2002) study of 265 female street youths in Montreal, the 88 girls involved in sex trade work were more likely to report bingeing on alcohol (65% vs. 47%, respectively), using injection drugs (65% vs. 33%, respectively) and often or always being under the influence of drugs or alcohol during sex (67% vs.

37%, respectively) than those not involved in sex trade work. These sex trade workers were also at least twice as likely to report using all of the drugs assessed (e.g., crack, heroin, cocaine), except marijuana. Similarly, in a study of 327 homeless and runaway youths recruited from shelters, health clinics and the streets, Bailey, Camlin and Ennett (1998) found that those who used marijuana during their last sexual encounter were more likely to have had sexual intercourse without a condom than those who did not use marijuana. Furthermore, lifetime marijuana use increased the likelihood of having sex with high risk partners, having more sexual partners, having sex with less well known partners and exchanging sex for money or goods, while youths who had used each of the considered substances (i.e., alcohol, crack cocaine, hallucinogens and heroin) were more likely than those who had not used these substances to have had sex with casual partners.

Modelling the Relation between Trauma and HIV Risk Behaviour

To date, only one model has been proposed to account for the factors mediating the relations between experiences of trauma and people's HIV-related risk behaviour. Based on a comprehensive review of the literature, Miller (1999) developed a theoretical model in which the relations between women's experiences of childhood sexual abuse and their HIV risk behaviours were depicted as being mediated by three variables, namely sexual adjustment, drug use and psychopathology. In particular, Miller presented evidence linking childhood sexual abuse to sexual adjustment difficulties such as obsessions with sex, the inability to sustain intimate relationships, destructive sexual relationships and sex trade work, and then presented evidence linking these sexual adjustment difficulties to both sex- and drug-related HIV risk behaviour. Similarly, she

presented compelling evidence of both the impact of childhood sexual abuse on drug use (e.g., as a form of self-medication) and the impact of drug use on sex- and drug-related HIV risk behaviour. Finally, Miller documented research establishing the relations between childhood sexual abuse and various forms of psychopathology, specifically PTSD, depression, and dissociation, and evidence of the effects of these mental health challenges on women's HIV risk behaviour. Miller also noted that these paths to HIV risk behaviour may overlap and that sexual adjustment, drug use and psychopathology are likely to be highly correlated.

In a test of Miller's model, and to see if the model applied to both women who had experienced childhood sexual and those who had experienced childhood physical abuse, Plotzker, Metzger and Holmes (2007) measured 113 female IDUs' experiences of childhood physical and sexual abuse, their current PTSD and depression, and their sex- and drug-related HIV risk behaviours. The descriptive analyses indicated that more than half (56%) of these women had experienced childhood sexual abuse, 68% had experienced physical abuse, 53% had comorbid PTSD and depression, 2.8% had only PTSD and 23% had only depression. Other analyses revealed that women who had experienced childhood sexual abuse were 3.3 times more likely to engage in sex-related HIV risk behaviours, including having more sexual partners in the past six months, trading sex for drugs or money in the past six months, engaging in sexual intercourse with someone who was HIV+ or had AIDS, and reporting hustling as a current source of money. Women's experiences of childhood physical abuse were independent of their sex-related HIV risk behaviour. In addition, and relative to the women with neither

PTSD nor depression, women with depression only (Odds ratio = 12.2) and those with both PTSD and depression (Odds ratio = 17.6) reported more sexual risk taking. Because women's experiences of child sexual abuse were also associated with PTSD and depression, PTSD and depression were potential mediators of the relation between child sexual abuse and women's sex-related HIV risk behaviour. Consistent with Miller's model, the relation between child sexual abuse and sexual risk taking was rendered nonsignificant when depression (Odds ratio = 10.7) and PTSD and depression (Odds ratio = 13.5) were controlled.

Similar findings were observed for women's drug-related HIV risk behaviour. Specifically, women who had experienced childhood sexual abuse were 2.1 times more likely to engage in drug-related HIV risk behaviours, while women who had experienced childhood physical abuse were marginally more likely to engage in drug-related risk behaviours (Odds ratio = 1.99, $p < .09$). These behaviours included sharing needles, sharing needles with someone who was HIV+ or had AIDS, and failing to clean needles properly after they had been used by someone else. Relative to the women with neither PTSD nor depression, women with depression only (Odds ratio = 4.95) and those with both PTSD and depression (Odds ratio = 5.69) reported more sexual risk taking. Once again, because women's experiences of child sexual and physical abuse were also associated with PTSD and depression, PTSD and depression were potential mediators of the relation between child abuse and women's drug-related HIV risk behaviour. In line with Miller's model, the relations of child sexual and physical abuse with drug-related risk taking became nonsignificant when depression (Odds ratio = 4.41) and PTSD and

depression (Odds ratio = 4.70) were controlled statistically. Overall, Plotzker et al.'s (2007) findings are in line with those predicted by Miller's (1999) model in that they demonstrate that PTSD and depression mediate the relations between early traumatic experiences and sex- and drug-related HIV risk behaviours.

In another study, Holmes, Foa and Sammel (2005) assessed the ability of Miller's (1999) model to account for the lifetime number of sexual partners of 197 men recruited through random digit dialling. The analyses of these data indicated that the 43 (22%) men who had been sexually abused during childhood had more lifetime sexual partners than the men who had not experienced such abuse ($M_s = 26.7$ and 15.3 partners, respectively). Further, this relation between childhood sexual abuse and the number of sexual partners was mediated by the presence of PTSD and depression. These findings, together with those of Plotzker et al. (2007), suggest that Miller's (1999) model of the factors mediating the child abuse-HIV risk behaviour relation holds for childhood experiences of both physical and sexual abuse on the part of both women and men.

The Proposed Study

Research examining the relation between trauma and HIV risk behaviours has focused primarily on adults, and studies of youths have been largely limited to those in school or clinical settings. This is surprising given that marginalized and disadvantaged individuals are most at risk of contracting HIV (Public Health Agency of Canada, 2007) and that street youths constitute one of the most vulnerable of these populations, faced with the challenges of daily survival under the most precarious conditions. Moreover, although some researchers have examined the traumatic experiences and HIV risk

behaviours of homeless and street-involved youths (e.g., Johnson et al., 1996; Public Health Agency of Canada, 2006; Smith et al., 2007), none of them considered factors that may mediate the impact of trauma on street youths' HIV risk behaviour. Given this, the current study is designed to assess the extent to which mental health and substance use mediate the relations between street youths' experiences of trauma and their HIV risk taking.

Figure 1 illustrates the model assessed in this study. Because several authors have noted that witnessing abuse and experiencing community violence (e.g., Voisin, 2003, 2005), childhood physical abuse (e.g., Bornolova et al., 2007; Plotzker et al., 2007) and childhood sexual abuse (Miller, 1999) are all related to HIV risk behaviour, the current study will consider the effects of witnessing abuse and experiencing physical and sexual abuse on street youths' sex- and drug-related HIV risk behaviours. In addition, because Miller's model appears to apply to both women and men (Holmes et al., 2005), the proposed model will be applied to both street-involved girls and boys.

As indicated in Figure 1, it is anticipated that the mental health aftereffects of trauma, namely PTSD, a sense of foreshortened future, suicide, sleep difficulties, depression and emotional distress more generally, will have both a direct effect on street youths' sex-related HIV risk behaviour and an indirect effect that is mediated by drug and alcohol use. In addition, it is expected that the mental health aftereffects of trauma will have an indirect effect on street youths' drug-related HIV risk behaviour that is mediated by their use of drugs and alcohol. The current study will test the proposed model using the data from Smith et al.'s (2007) study of street youths in British Columbia.

Given the number of street youths in Canada and the propensity of street youths to engage in risky behaviours, it is important to identify the factors that influence these behaviours. If the findings show that the mental health aftereffects of trauma (i.e., PTSD, a sense of foreshortened future, suicide, sleep difficulties, depression and emotional distress) and alcohol and drug use mediate the relations between street youths' experiences of trauma and their HIV risk behaviours, they will suggest that HIV risk reduction programs for street youths will be more effective when they address both the mental health aftereffects of trauma and the use of drugs and alcohol.

Figure 1

Proposed Model of the Relations between Trauma, Mental Health, Substance Use and HIV Risk Behaviours

Method

This research involved a secondary analysis of data from the Youth Health Survey: Street Youth 2006, a 150 item paper and pencil survey assessing the physical and emotional health of street involved youths that was developed and implemented by the McCreary Centre Society.² The survey was designed based on the British Columbia (B.C.) Adolescent Health Survey, a survey derived from the 1986 Minnesota Health Survey (Blum, Harris, Resnick & Rosenwinkel, 1989) and a previous survey of marginalized and street-involved youths conducted by the McCreary Centre Society in 2000. Community researchers and advisory committee members, which included the directors and supervisors of youth-focused community service organizations, helped in the development of the sampling method and questionnaire. Further, former and current street youths participated in a pilot study of the questionnaire and offered their input regarding the wording and topics addressed in the survey (Smith et al., 2007).

The survey was conducted between October and December 2006 in nine communities across B.C.: Vancouver, Victoria, Abbotsford and Mission, Surrey, Prince Rupert, Nanaimo, Prince George, Kamloops and Kelowna. The survey was administered by community research teams, which included street-involved youths and staff members and volunteers from agencies across B.C., all of whom were trained by researchers from the McCreary Centre Society. In order to include youths that did not access community

²The McCreary Centre Society is a nonprofit community organization that focuses on research, education and community-based projects concerning the health of youths in British Columbia. It is funded by the B.C. Ministry of Children and Family Development, with additional funding provided by the Canadian Institutes for Health Research and the Michael Smith Foundation for Health Research (Smith et al., 2007).

services, the community researchers varied when and where they conducted the survey, with locations including on the street, drop-in centers and shelters (Smith et al., 2007).

In order to ensure the youths understood the questions and to avoid potential literacy problems, the survey administrators read the survey to all of the participants and answered participants' questions (A. Smith, Personal Communication, November 26, 2008). The youths were paid \$10 for completing the survey, which took 30 to 45 minutes. Refusal rates ranged from 0 to 3% across the nine communities (Smith et al., 2007). The youths provided verbal consent and those who wanted debriefing information were provided with oral and written debriefing. Ethical approval of the study was provided by the University of British Columbia Ethics Board.

Participants

In total, 762 youths 12 to 18 years old completed the survey. However, 43% of the sample failed to answer questions regarding their use of services relevant to their drug-related HIV risk behaviours (i.e., whether they accessed a youth detox, needle exchange, safe injection site, and/ or alcohol and drug treatment or counselling), questions that appeared near the end of the survey. Because these behaviours were central to the focus of the current research, these participants were excluded from the analyses, leaving a sample of 430 youths.³

The proportion of females and males in the sample was split almost evenly; 50.8% ($n = 218$) of the youths were female and 48.7% ($n = 209$) were male. There were

³ Although 435 youths answered these questions, five outliers were also removed from the data (see results section).

also two transgendered youths in the sample (0.5%).⁴ On average, these youths were 16.4 years old ($SD = 1.6$, range = 12 to 18 years) and most described themselves as Aboriginal ($n = 245$, 57.5%) or European ($n = 204$, 47.9%).⁵ Youths also described themselves as Asian ($n = 19$, 4.5%) African ($n = 6$, 1.4%) or 'other' ($n = 23$, 5.4%), while 6.1% ($n = 26$) indicated that they did not know their ethnic background. Sixty-one percent ($n = 261$) of the youths were currently attending school (including regular and alternative schools). The majority of the youths indicated they were currently enrolled in Grade 10 ($n = 110$, 26.1%) or 11 ($n = 80$, 19%). One-fifth of the youths were enrolled in Grades 7 to 9 ($n = 92$, 21.8%), while 11.6% ($n = 49$) were currently enrolled in Grade 12 and 7.6% ($n = 32$) had graduated from high school. More than a tenth of the youths ($n = 48$, 13.8%) indicated they had dropped out of school.

The youths were sampled evenly from the various survey locations, with slightly more youths sampled in Vancouver ($n = 104$, 24.2%). Almost a quarter of the youths were surveyed in Northern BC (i.e., Prince Rupert and Prince George) ($n = 94$, 21.9%), followed by 19.3% ($n = 83$) in the Interior of BC (i.e., Kamloops and Kelowna), 18.4% ($n = 79$) in the Fraser Valley (i.e., Abbotsford, Mission and Surrey) and 16.3% ($n = 70$) on Vancouver Island (i.e., Nanaimo and Victoria).

More than half of the youths reported having been kicked out of their home at some point ($n = 242$, 57.5%) and, on average, they were 13.6 years old ($SD = 2.2$, range = 8.5 - 17 years old) the first time this occurred. Even more youths indicated that they had run away at some point ($n = 299$, 71.9%), being an average of 12.8 years old the first time

⁴ Note that not all of the items in this section add up to 430 due to missing values.

⁵ Note *N*s do not add to 430 as youths could specify more than one ethnicity.

they did so ($SD = 2.5$, range = 8.5 – 17 years old).

More than a third of the youths ($n = 150$, 36.5%) were 13 to 14 years old when they first started hanging out on the street, while 22.1% ($n = 91$) were 11 to 12 years old, 23.3% ($n = 96$) were at least 15 years old and 18% ($n = 74$) were at most 10 years old when they first became street involved.

The participants reported several reasons for their street involvement. Common reasons included because their friends hung out on the street ($n = 168$, 42.7%), they did not get along with their parents ($n = 121$, 30.8%), they felt accepted on the street ($n = 118$, 30%), they ran away from home ($n = 91$, 23.2%), they were kicked out of their home ($n = 88$, 22.4%), and drug and alcohol addiction ($n = 85$, 21.6%). Less common reasons included violence and abuse at home ($n = 66$, 15.3%), difficulty finding a job ($n = 45$, 11.5%), not liking their foster or group home ($n = 39$, 9.9%) and difficulty finding affordable housing ($n = 37$, 9.4%).⁶

At the time of the survey, most of the youths reported currently living in a house ($n = 201$, 46.7%) or with a parent ($n = 161$, 37.4%), while others reported living with a sibling ($n = 22$, 5.1%), with a relative ($n = 21$, 4.9%), in a foster home ($n = 21$, 4.9%) or in a group home ($n = 13$, 3.0%).⁷ However, one in five youths ($n = 76$, 21.3%) reported currently living in some type of precarious housing (i.e., a hotel, squat, on the street, abandoned building, shelter, transition house, couch surfing, car or tent), and almost a third ($n = 169$, 30.3%) reported doing so in the past year.

⁶ Note N s do not add to 430 as youths could specify more than one reason for their street involvement.

⁷ Note N s do not add to 430 as youths could specify more than one place of current residence.

Survey Questions Used in the Current Study

Only the survey items assessing participants' experiences of trauma, mental health, alcohol and drug use, and their HIV risk behaviours were considered in the present study.

Experiences of trauma. Measures of respondents' experiences of trauma, the predictor variable, were derived from questions asking the youth if they ever witnessed abuse in their family (*No, Yes*), if they had ever experienced physical abuse (by *Mother, Father, Step-parent, Foster or group home parent, etc.*) and if they had ever experienced sexual abuse (by *Mother, Father, Step-parent, Foster or group home parent, etc.*). Further, the number of individuals who perpetrated against the youth (both physically and sexually) (with response options ranging from 0 to 8), whether the youth had been abused in the past three months (*No, Yes physical abuse, Yes sexual abuse, Yes both physical and sexual abuse*) and whether the youth had experienced forced sexual intercourse (*No, Yes by youth or adult, Yes by both youth and adult*) were also included.

Mediators of the trauma-HIV risk behaviour relation. Youths' responses to survey items assessing their mental health and substance use were analyzed to examine whether youths' mental health and substance use mediate the relation between their experiences of trauma and their HIV risk behaviours.

Participants' mental health was assessed from their responses to items asking if they had ever been told by a health professional that they had PTSD (*No, Yes*) and depression (*No, Yes*), whether or not they indicated that they expected to be dead in response to a survey item asking where they see themselves in the next five years

(measuring a foreshortened sense of future) (*No, Yes*) and whether they had experienced difficulties in getting to sleep in the past 30 days (*No, Yes*). Further, three items relating to emotional distress were assessed. The first item asked the youth if, during the past 30 days, they felt they were under any strain, stress or pressure (with a 5-point scale ranging from *Not at all* to *Yes, almost more than I could take*). The second item asked the youth if, during the past 30 days, they had been bothered by nervousness or nerves (with a 5-point scale ranging from *Not at all* to *Extremely so, to the point I couldn't work or deal with things*). The third item asked the youth if, during the past 30 days, they felt so sad, discouraged, hopeless or had so many problems they wondered if anything was worthwhile (with a five-point scale ranging from *Not at all* to *Extremely so, to the point I couldn't work or deal with things*).

Four items regarding suicide were also considered. These items asked the youth if they had seriously considered suicide in the past 12 months (*No, Yes*), if they had made a plan about how they would attempt suicide (*No, Yes*), the number of suicide attempts they made in the past 12 months (with responses made along a 5-point scale ranging from *0 times* to *Six or more times*) and if the youth had made a suicide attempt that resulted in an injury (*Did not attempt suicide during the past 12 months, No, Yes*).

Youths' responses to items assessing their use of alcohol, marijuana and other drugs were also considered. Youths' alcohol use was measured using four survey questions, including how many days in the past month the participant consumed at least one drink of alcohol (with responses on an 8-point scale ranging from *Never consumed alcohol* to *All 30 days*), the number of days in the past month the participant had

consumed five or more drinks of alcohol (with responses on an 8-point scale ranging from *Never consumed alcohol* to *20 or more days*), the number of drinks the participant consumed yesterday (with responses on a 5-point scale ranging from *None* to *5 or more drinks* and *Never consumed alcohol*) and the youth's age when s/he first drank alcohol (with response options on an 8-point scale ranging from *Less than 9 years old* to *17 or more years old* and *Never had a drink of alcohol*).

Participants' marijuana use was measured using three survey questions, including how many days in the past month the youth used marijuana (with responses on a 6-point scale ranging from *Never tried marijuana* to *40 or more times*), how many times the youth used marijuana yesterday (with responses made on a 4-point scale ranging from *Never tried marijuana* to *10 to 19 times*) and the youth's age when s/he first tried marijuana (with response options on an 8-point scale ranging from *Never tried marijuana* to *Less than 9 years old*).

Participants' use of other drugs was determined from their responses to items asking if they had ever injected an illegal drug (*No*, *Yes*; derived from a yes response to any of the options *Used yesterday*, *Used in past 30 days* and *Used ever*) and a count of which of 13 illegal drugs (e.g., *cocaine*, *inhalants*, *heroin*) they had ever used (*No*, *Yes*; derived from a yes response to any of the options *Used yesterday*, *Used in past 30 days* and *Used ever*).

HIV risk behaviours. The criterion variables consisted of two sets of HIV risk behaviours, namely those pertaining to sex-related HIV behaviours and drug-related HIV behaviours. Participants' sex-related HIV behaviour was assessed from their responses to

items asking about their age when they first had sexual intercourse (with response options on a 10-point scale range from *10 years old* to *18 years old* and *Never had sexual intercourse*), the total number of sexual partners (male and female) during their lifetime (as indicated on a 6-point scale ranging from *0* to *6 or more partners* and *Have never had sexual intercourse*), the number of sexual partners they had in the past three months (as indicated on a 6-point scale ranging from *0* to *6 or more partners* and *Have never had sexual intercourse*) and the number of times the youth has been, or has gotten another individual, pregnant (as indicated on a 3-point scale ranging from *0 times* to *2 or more times*).⁸ Measures of sex-related HIV behaviour also included participants' responses regarding their substance use at last sexual intercourse (*No, Yes*), their condom use at last sexual intercourse (*No, Yes* and *Have never had sexual intercourse*) and if they had ever been told by a nurse or doctor that they had a sexually transmitted disease, including HIV or AIDS (*No, Yes*).⁹

The participants' involvement in sex trade work was also considered in the measurement of sex-related HIV behaviour. Sex trade work was measured based on the youths' responses to their age when they first traded sex (with response options on a 10-point scale ranging from *Have never traded sex, 10 years old or younger* to *18 years old*) and how often the youth had traded sex for money or goods in the last 12 months (with response options including *Never, Once* and *Two or more times* for options such as food, clothing and shelter).

⁸ Note that pregnancy measure included a 'not sure' option which was set to missing and was thus not included in the analyses.

⁹ An individual's history of sexually transmitted diseases is a reliable marker of unprotected sex (Koenig & Clark, 2004), as is a history of pregnancy.

Questions assessing youths' drug-related HIV behaviours asked if the participant ever shared needles or injection gear (*No, Not sure, Yes*), along with questions regarding youths' access to various treatment-related sites and how helpful the youths found these items to be (response options for these sites included *Helpful, Not helpful, Did not access, Not available*).¹⁰ These sites included a safe injection site, a needle exchange, alcohol or drug treatment and a youth detox centre.

Results

The analyses were conducted in three stages. The preliminary analyses included data cleaning, scale development and examining the descriptive statistics of the predictor, mediating and criterion variables. The second stage consisted of the main analyses examining the relationships among the predictor, mediating and criterion variables and path analyses. The third stage involved examining potential moderators of the observed relations, identifying potential confounds and alternative explanations for the observed relations, and comparing the characteristics of the participants who were and were not included in the sample.

Preliminary Analyses

Preliminary analyses involved data cleaning, data reduction and scale development, and examining the descriptive statistics and the correlations between and among the predictor, mediating and criterion variables.

Data cleaning. Before conducting any analyses the data were inspected for outliers and analyses were conducted to assess whether the data complied with the

¹⁰ Note that the 'not available' option for these items was set to missing and were thus not included in the analyses.

various assumptions underlying the intended statistical analyses. Examining the univariate descriptive statistics and standardized scores revealed five univariate outliers for each of two variables, specifically the number of individuals who physically abused the youth and the number of individuals who sexually abused the youth. These cases were deleted from the sample, leaving 430 cases in the final sample.¹¹ Scatterplots, standardized scores and P-P plots revealed no multivariate outliers. The individual variables were tested for normality before being converted to Z scores, as necessary. Where a variable was not normally distributed, appropriate transformations were applied (Pallant, 2007).¹²

Scale development. Item analyses, principle components analyses and factor analyses were conducted to develop measures of the predicting, mediating and criterion variables. Before conducting these analyses, potential scale items were reverse coded if necessary and transformed to Z scores when they involved different response metrics (e.g., 3- and 4-point response scales) (see Caspi et al., 2002, for an example of Z score transformations for the purposes of factor analyses and subsequent regression analyses). As indicated by the values of the mean inter-item correlations and alpha, shown in Table 1, the seven items assessing youths' experiences of trauma were internally consistent. Given this, an overall trauma measure was formed by calculating the mean of the Z scores of these items, resulting in higher scores indicating more severe traumatization.

¹¹ The outliers were deleted from the sample as there were few outliers relative to the sample size.

¹² Note that the results of the Spearman correlation and path analyses were the same when transformed and untransformed scales were used in the analyses. Given this, and to stay closer to the original metric, the untransformed scores were used in all of the analyses.

Principal components and factor analyses were used to identify the structure of the relations among the items assessing youths' mental health, their use of drugs and alcohol, and their HIV-related risk behaviours. Appendix A provides the details of these analyses, including the correlations between the scale items, Scree plots, KMO and Bartlett's Tests and, where applicable, the results of principal components and factor analyses.

Prior to conducting the principal components and factor analyses of the mental health items, measures of total emotional distress and suicidal risk were formed. The measure of emotional distress was based on the mean of the Z scores of youths' answers to three items asking if, during the past 30 days, they felt strained, had been bothered by nervousness, and felt so sad they wondered if anything was worthwhile. The measure of suicide risk was derived from respondents' answers to four items asking if they had seriously considered suicide in the past 12 months, if they had planned how they would attempt suicide, the number of suicide attempts in the past 12 months, and if they had made a suicide attempt that resulted in injury.

Table 1

Results of Item Analyses of the Measures of the Predictor, Mediating and Criterion Variables

Measure	N of items	M inter-item r	α
Predictor variable:			
Trauma	7	.36	.64
Mediating variables:			
Mental health	5	.28	.68
Alcohol and marijuana use	7	.27	.72
Hard drug use	2	.80	.91
Criterion variables:			
Risky sexual behaviour	4	.35	.68
Street survival behaviour	7	.22	.66
Drug- and alcohol-related service use	2	.74	.85
Needle-related service use	2	.99	.99

Cattell's (1966) Scree Test indicated that one factor underlay the correlations among these measures of emotional distress and suicide risk and four other items assessing youths' mental health. Five of these items, excluding the measure of a foreshortened sense of future, had loadings of .40 or more on this factor, namely the measures of emotional distress and suicide risk and the items assessing youths' depression, sleep difficulties and PTSD. A reliability analysis subsequently revealed these five items provided an internally consistent measure of youths' mental health, as

shown in Table 1. Given this, an overall *mental health* score was calculated from the mean of the *Z* scores of participants' responses to these items, resulting in higher scores indicating more mental health difficulties.

Principal components and factor analyses were also used to identify the factors underlying youths' responses to the items assessing their use of drugs and alcohol. Based on a Scree Test, a two-factor solution was selected. After applying a varimax rotation, seven items had loadings of at least .40 on the first factor, which explained 30.3% of the variance in the inter-item correlation matrix. These items assessed marijuana use in the past month, marijuana use yesterday, the age when the youth first tried marijuana, alcohol use in the past month, frequency of having five or more drinks in the past month, number of drinks yesterday and the age when the youth first drank alcohol. As displayed in Table 1, these 7 items provided a homogenous measure of youths' *alcohol and marijuana use*. An overall measure of youths' alcohol and marijuana use was therefore calculated by taking the mean of the *Z* scores of their responses to these items, resulting higher scores indicating more alcohol and marijuana use.

Two items had loadings of at least .40 on the second factor, which explained 21.4% of the variance in the inter-item correlations. These items, which were strongly correlated ($r = .80$), assessed the number of drugs the youth had ever used and whether or not they had ever used injection drugs. A measure of youths' *hard drug use* was therefore calculated based on the mean of the *Z* scores of youths' responses to these items. Because it was not possible to normalize the distribution of the scores on this measure, a median split at -0.20 was used to classify scores as indicative of more or less

hard drug use.

The Scree Test associated with a principal components analysis indicated that a four-factor solution best captured the correlations among the items measuring youths' HIV-related risk behaviours.¹³ A factor analysis with a varimax rotation indicated that the first factor, which explained 14.0% of the variance in correlations among the items, was defined by four items: youths' age at first sexual intercourse, the number of sexual partners in the past three months, the number of female sexual partners in the past three months and the use of drugs or alcohol at last sexual intercourse. Because these items were homogeneous (see Table 1), a measure of youths' *risky sexual behaviour* was calculated by taking the mean of the *Z* scores of participants' responses to these items, resulting in higher scores indicating more risky sexual behaviour.

The 7 items loading .40 or more on the second factor, which explained 21.1% of the variance in inter-item correlations, consisted of items measuring the youth's age when they first traded sex, the number of things the youth had traded sex for, the number of male sexual partners in the past three months¹⁴, whether the youth had ever been/gotten someone pregnant, their use of a condom at last intercourse, whether the youth had ever been told they had an STI, and whether the youth had ever shared needles or other injection gear. Because these items were internally consistent (see Table 1), a measure of

¹³ Although some of the items assessing youths' HIV-related risk behaviours were dichotomous, the Pearson and Spearman correlations among these items were virtually identical (see Appendix A, Tables A8 and A9). Given this, the results of the factor analyses are likely to be robust to the noncontinuous nature of these items.

¹⁴ The relationship between the items relating to number of male sexual partners in the past three months may, to some extent, stem from the participants' involvement in sex trade work.

youths' *street survival behaviour* was formed by calculating the mean of the Z scores of their responses to these items. Again, higher scores indicated engaging in more street survival behaviour.

The third factor underlying the items assessing youths' HIV risk behaviours was defined by two items measuring youths' *needle-related service use*, specifically whether the youth had ever accessed a safe injection site and whether the youth had ever accessed a needle exchange site. These items, which explained 10.7% of the variance in the inter-item correlations, were strongly related ($r = .99$). A total measure was therefore derived from the mean of the Z scores of participants' responses to these items. Because it was not possible to normalize the distribution of scores for the measure, participants' scores were dichotomized into those reflecting more (less than 1.00) or less needle-related service use.

Two items had loadings of at least .40 on the fourth factor underlying the items assessing youths' HIV risk behaviours, a factor that explained 11.4% of the variance in the inter-item correlations. These items assessed whether the youth had ever accessed a youth detox center and whether the youth had ever received drug or alcohol counselling. Because participants' responses to these items were reasonably correlated ($r = .74$), the mean of the Z scores of youths' response to these items was calculated as a measure of youths' *drug- and alcohol-related service use*. Again, because it was not possible to normalize the distribution of scores for this measure, participants' scores were dichotomized into those indicative of more (scores greater than 0.10) or less frequent use of drug- and alcohol-related services.

Descriptive statistics. Detailed information regarding the descriptive statistics for the individual survey items is presented in Appendix B. Examining these statistics for the measures of trauma revealed that the vast majority of these youths had experienced some form of trauma. Almost two-thirds indicated that they had witnessed someone in their family being abused or mistreated. Two thirds also reported being physically abused. Specifically, more than a third reported being physically abused by a non-family member and almost a quarter reported being physically abused by a family member. This abuse was most commonly perpetrated by one person, although the number of individuals who physically abused these youths ranged from 1 to 8.

In addition, over a third of the youths reported being sexually abused. Of these youths, just over half reported sexual abuse by a family member and a quarter reported sexual abuse by a non-family member. Most commonly, this sexual abuse was perpetrated by one person, although the youths described as many as 7 sexual abusers. Added to these figures, almost a third of the youths reported having been forced to have sexual intercourse and 10.9% indicated experiencing physical abuse and 3.3% sexual abuse in the past 30 days. Table B1 in Appendix B provides additional descriptive information about the nature of these youths' traumatic experiences.

Many of these youths also struggled with serious mental health problems. Although only 6.1% had been diagnosed with PTSD, almost a quarter indicated that they had been diagnosed with depression. Further, almost half of the youths indicated that they suffered from sleep difficulties in the past 30 days, a third reported feeling extremely sad or sad "quite a bit" in the past 30 days, and a quarter reported feeling "almost more

[stress] than they could take.” In view of these findings, it is perhaps not surprising that in the past 12 months a third of the youths had seriously considered suicide, more than a quarter had made a suicide plan and a quarter had attempted suicide. Table B2 of Appendix B presents more information regarding the descriptive statistics for these mental health items.

As shown in Table B3 in Appendix B, which contains the descriptive statistics for the items assessing youths’ use of alcohol and marijuana, these youths were an average of 11.2 years old when they first consumed alcohol ($SD = 2.30$, range = 8.5 – 17.0 years). Among youths who had ever had alcohol, 17.4% indicated they had not consumed any alcohol in the past 30 days, 41.1% consumed alcohol on one to five days, 30.1% consumed alcohol on six to 19 days, and 11.2% drank alcohol on 20 to all 30 days. In addition, among youths who had ever consumed alcohol, 22.5% indicated not consuming more than five drinks of alcohol in the past 30 days, 49.4% did so on one to five days, 20.0% on six to 19 days and 8.1% had five or more drinks of alcohol on 20 or more days. Although just over two-thirds of those who had alcohol in the past reported not drinking any alcohol yesterday, 12.6% indicated having five or more drinks yesterday.

Almost all (92.9%) of the youths had tried marijuana, typically starting at 11.8 years of age. Well over a third (41.6%) of these youths indicated that they had used marijuana more than 40 times in the past 30 days. In addition, a quarter stated they used marijuana one or two times yesterday, another quarter said they used marijuana three to nine times yesterday, and a fifth of the youths reported using marijuana 10 or more times yesterday.

As shown in Table B4 in Appendix B, most youths (89.5%) reported using a number of drugs, on average 6.6 types of drugs ($SD = 4.2$, range = 1 – 13 types of drugs). Further, 40.6% of the youths reported having injected an illegal drug.

Table B5 in Appendix B lists the descriptive statistics for the items comprising the measure of risky sex behaviour. Most of these youths (86.5%) had engaged in sexual intercourse, beginning on average at 13.6 years of age ($SD = 2.0$, range = 10.0 – 18.0 years). Among those who engaged in sexual intercourse, half reported having had sexual intercourse with six or more females, while another third reported having had sexual intercourse with one to five females. In addition, of those who had intercourse, over a third indicated having sexual intercourse with one person in the past month, while almost a third had sexual intercourse with two to five people and a tenth had sexual intercourse with six or more people in the past month. Further, of those who had intercourse, 56.9% reported using alcohol or drugs the last time they had sexual intercourse.

Table B6 in Appendix B lists the descriptive statistics for youths' street survival behaviours. Youths who had traded sex had done so most frequently for money (10.5%) or drugs or alcohol (10.5%), followed by shelter (6.0%), food (5.0%), clothing (4.7%), and transportation (3.9%). On average, youths who traded sex (18.1% of the youths) had done so by the time they were 15.1 years of age ($SD = 2.4$, range = 10.0 -18.0 years). Among those who had engaged in the sex trade, almost half (47.3%) had traded sex by the time they reached 14 years of age. In addition, of those who had intercourse, almost a third (31.1%) had done so with 6 or more males, 40.5% did not use a condom the last time they had intercourse, almost a third (27%) had been pregnant or had gotten someone

pregnant, almost a fifth had been told that they had an STI, and a quarter had used needles or other injection-related gear after someone else had used it.

The details of the descriptive statistics for the items comprising the measures of needle-related and drug- and alcohol-related service use appear in Tables B7 and B8 in Appendix B. As shown there, almost a quarter of the youths had accessed a needle exchange program, while less than a fifth of the youths had accessed the safe injection site. Note that both a needle exchange program and the safe injection site were unavailable for 11.5% of the youth. Similarly, although a quarter of these youths had accessed a drug or alcohol counselling service and a quarter had accessed a youth detox facility, both of these services were unavailable for just over a tenth of the youths.

In sum, these descriptive analyses indicate that most of these youths had experienced some form of trauma and were struggling with some form of mental health difficulty, including suicidal feelings and suicide attempts. Further, although most of these youths reported using drugs and alcohol, including hard drugs and injection drugs, most of these youths also indicated that they had never accessed a needle exchange, the safe injection site, or drug- and alcohol-related services. Similarly, although most of the youths reported engaging in sexual intercourse, many of them engaged in high risk HIV-related behaviours, including consuming alcohol at the time of intercourse and engaging in sexual intercourse with several people. These youths also reported other high risk sexual behaviours, including inconsistent condom use and engagement in the sex trade. Several youths also indicated having been diagnosed with an STI and sharing needles or other injection-related gear.

Main Analyses

Correlations were calculated to examine the interrelations both between and among the predictor (i.e., trauma), mediating (i.e., mental health, alcohol and marijuana use, and hard drug use) and criterion variables (i.e., risky sex behaviour, street survival behaviour, drug- and alcohol-related service use, and needle-related service use). Path analyses were then conducted to assess the proposed mediated model of the relationships between trauma and HIV risk behaviours.

Relations among the predictor, mediating and criterion variables. Table 2 displays the correlations among the predictor, mediating and criterion variables. While youths' experiences of trauma were independent of their use of needle-related services, youths who experienced more trauma engaged in slightly more risky sexual behaviour, moderately more street survival behaviour, and were slightly more likely to attend drug- and alcohol-related services. As expected, higher trauma scores were also associated with moderately poorer mental health scores, slightly more alcohol and marijuana use, and slightly more hard drug use.

The correlations among the mediating variables revealed that, although youths with poorer mental health were slightly more likely to use alcohol and marijuana, they were not more likely to use hard drugs. Consistent with this, youths' hard drug use was independent of their use of alcohol and marijuana. Youths who used more alcohol and marijuana were, however, moderately more likely to engage in risky sexual behaviour and slightly more likely to use needle-related services. Youths who engaged in more hard drug use engaged in slightly more risky sexual behaviour and street survival

behaviour, and were moderately more likely to use alcohol- and drug-related services.

Finally, youths' risky sexual behaviour, street survival behaviour, needle-related service use and drug- and alcohol-related service use were weakly to moderately inter-correlated.

Table 2

Spearman Correlations among the Predictor, Mediating and Criterion Variables

Variable	2	3	4	5	6	7	8
1. Trauma	.45**	.16**	.09*	.14**	.53**	-.18**	.03
2. Mental health	-	.13**	.06	.10*	.35**	-.13**	-.08
3. Alcohol & marijuana use	-	-	-.07	.42**	.08	-.02	-.13**
4. Hard drug use	-	-	-	.09*	.14**	-.29**	.82**
5. Risky sexual behaviour	-	-	-	-	.28**	-.19**	.01
6. Street survival behaviour	-	-	-	-	-	-.23**	.08
7. Drug- and alcohol-related service use	-	-	-	-	-	-	-.19**
8. Needle-related service use	-	-	-	-	-	-	-

* $p < .05$. ** $p < .01$. (two-tailed).

Note: N s range from 383 to 430.

Path analyses. Path analyses were conducted to assess the proposed mediated model of the effects of trauma on HIV-related risk behaviour. Because these analyses involved a series of simultaneous regression analyses, the viability of the assumptions

associated with use of multiple regression was assessed (Tabachnick & Fidell, 2007).

Normality was assessed by examining the skew and variance of the scales, as well as frequency histograms and residual scatterplots. These tests indicated that the continuous scales were normally distributed. Linearity was evaluated through inspection of bivariate scattergrams that indicated that the relationships were close to linear. Multicollinearity was assessed by looking at the variance inflation factor, tolerance, condition indices and of the correlations among the independent variables, all of which indicated that multicollinearity was not present among these scales. Finally, examining the bivariate scatterplots indicated that the assumption of homoscedasticity was met.

Path analyses were conducted for each of the three criterion variables significantly correlated with trauma (i.e., risky sexual behaviour, street survival behaviour and drug- and alcohol-related service use). Because each of the three proposed mediating variables (i.e., mental health, alcohol and marijuana use and hard drug use) was related significantly to either trauma or at least one criterion variable, all of the hypothesized mediating variables were considered in these analyses. Finally, only alcohol and marijuana use and hard drug use were considered in the path analysis predicting needle-related service use because needle-related service use was independent of youths' trauma and mental health scores.¹⁵

¹⁵ Three of the measures used in the regression analyses associated with the path analyses were dichotomous (i.e., hard drug use, drug- and alcohol-related service use, and needle-related service use). Although some argue that multiple regression analyses should be limited to continuous measures, there is some debate regarding this (S. Brown, personal communication, December 17, 2009). Garson (2009), for example, stated that "with a binary dependent [variable], it is impossible to meet the normality assumptions of OLS [ordinary least squares] regression, but if the split is not extreme (not 90:10 or worse),

When youths' risky sexual behaviour scores were regressed simultaneously onto their alcohol and marijuana use, hard drug use, mental health and trauma scores, these variables collectively explained 19.5% of the variance, $F(4, 398) = 24.04, p = .000$. The tests of the standardized beta weights revealed that alcohol and marijuana use, $\beta = .412, t(398) = 9.01, p = .000$, made a significant contribution to this equation, while hard drug use, $\beta = .083, t(398) = 1.84, p = .07$, mental health, $\beta = .004, t(398) = 0.01, p = .95$, and trauma, $\beta = .076, t(398) = 1.43, p = .15$, did not.

When street survival behaviour scores were regressed simultaneously onto alcohol and marijuana use, hard drug use, mental health and trauma, these variables explained 34.5% of the variance, $F(4, 386) = 50.79, p = .000$. In this case trauma, $\beta = .481, t(386) = 9.88, p = .000$, and mental health, $\beta = .158, t(386) = 3.28, p = .001$, predicted street survival behaviour, while hard drug use, $\beta = .080, t(386) = 1.93, p = .06$, and alcohol and marijuana use, $\beta = -.037, t(386) = -0.89, p = .37$, did not.

When youths' drug- and alcohol-related service use scores were regressed simultaneously onto their alcohol and marijuana use, hard drug use, mental health and trauma scores, these variables explained 10.7% of the variance, $F(4, 358) = 10.73, p = .000$. In this case, hard drug use, $\beta = -.268, t(358) = -5.34, p = .000$, and trauma, $\beta = -.124, t(358) = -2.11, p = .04$, but not alcohol and marijuana use, $\beta = .003, t(358) = 0.06, p = .95$, or mental health, $\beta = -.056, t(358) = -0.95, p = .34$, made significant contributions.

OLS regression will not return dramatically different substantive results than logistic regression" (p. 29). Given this, and that the three binary variables had equal numbers in each group because they were determined by median splits, OLS regression analyses were conducted using these measures.

Finally, youths' alcohol and marijuana use and hard drug use scores explained 67.9% of the variance in their needle-related service use scores, $F(2, 370) = 746.58, p = .000$, with both alcohol and marijuana use, $\beta = -.113, t(370) = -3.82, p = .000$, and hard drug use, $\beta = .815, t(370) = 27.67, p = .000$, making significant contributions to the equation.

The next set of analyses examined the predictors of the hypothesized mediating variables. When youths' alcohol and marijuana use scores were regressed simultaneously onto their mental health and trauma scores, the two predictors explained 2.6% of the variance in alcohol and marijuana scores, $F(2, 400) = 6.37, p = .002$. However, trauma made a significant contribution to this equation, $\beta = .138, t(400) = 2.40, p = .02$, while mental health did not, $\beta = .059, t(400) = 1.03, p = .31$. When youths' hard drug use scores were regressed simultaneously onto their mental health and trauma scores, the two predictors explained a nonsignificant 1.2% of the variance, $F(2, 405) = 2.54, p = .08$. Consistent with this, neither trauma, $\beta = .101, t(405) = 1.76, p = .08$, nor mental health, $\beta = .018, t(405) = .308, p = .76$, predicted hard drug use. Finally, trauma explained a sizeable 26.6% of the variance in mental health scores, $F(1, 406) = 147.23, p = .000, \beta = .516, t(406) = 12.13, p = .000$.

In sum, only alcohol and marijuana use predicted youths' risky sex behaviour, while both trauma and mental health difficulties predicted youths' street survival behaviour. Further, only youths' experiences of trauma and use of hard drugs predicted their drug-and alcohol-related service use. Hard drug use and alcohol and marijuana use also predicted youths' needle-related service use. Of the hypothesized mediating

variables, youths' experiences of trauma predicted their mental health scores and their alcohol and marijuana use. However, neither trauma nor mental health difficulties predicted youths' hard drug use.

Figure 2

Results of Path Analysis Examining the Direct and Indirect Effects of Trauma on HIV Risk Behaviours

Note. Correlations among the criterion variables, which are not illustrated for clarity, ranged from -.23 to .82, $ps < .001$.

Figure 2 shows the standardized beta coefficients for the significant paths in the hypothesized mediated model of the effects of trauma on HIV-related risk behaviour. As displayed there, trauma had two direct and two indirect effects on youths' HIV-related behaviours. Trauma had direct effects on the extent to which youths engaged in street survival behaviours and their use of drug- and alcohol-related services. Among the indirect effects, youths who experienced more trauma engaged in more alcohol and marijuana use, which in turn was associated with more risky sexual behaviour. In addition, youths who experienced more trauma reported more mental health difficulties, which in turn were associated with more street survival behaviour. Finally, youths who used more alcohol and marijuana and youths who engaged in less hard drug use were more likely to have accessed needle-related services.

Additional Analyses

Additional analyses were conducted to examine variables that might moderate the relations observed in the path analyses and to identify potential confounds that may provide alternative explanations for the observed relations in the path analyses. The characteristics of the participants included in the sample were also compared with those of the participants excluded from sample.

Moderators of the observed relations. Youths' gender and Aboriginal status were examined to determine whether they qualified any of the findings of the path analyses. Specifically, all of the path analyses were re-run with the potential moderating variable (i.e., gender or Aboriginal status) entered with the predictor variables (e.g., trauma, mental health, alcohol and marijuana use, and hard drug use) on the first step of a

hierarchical regression analysis and the interaction terms of the potential moderator with each predictor variable (e.g., mental health x gender) were entered on the second step.

Note that continuous predictor variables were mean centered prior to creating the interaction terms. Significant interaction terms were followed-up using Preacher, Curran and Bauer's (2006) simple-slopes web tool.

Figure 3

Relationship between Trauma and Mental Health as a Function of Gender

These analyses revealed that gender moderated the relationship between trauma and mental health. Trauma, $\beta = .486$, $t(402) = 10.45$, $p = .000$, but not gender, $\beta = .076$, $t(402) = 1.64$, $p = .10$, made a significant contribution to the first step of the equation predicting mental health difficulties, $R^2 = .271$, $F(2,402) = 74.72$, $p = .000$. When entered on the second step, the gender x trauma interaction term accounted for an additional 0.80% of the variance in mental health difficulties, $F \text{ change}(1,401) = 4.71$, $p = .03$. A simple slopes analysis revealed that trauma was a significant predictor of the

mental health difficulties of both females, $\beta = .078$, $t(401) = 4.38$, $p = .000$, and males, $\beta = .048$, $t(401) = 4.36$, $p = .000$. However, as illustrated in Figure 3, trauma had a stronger adverse effect on the mental health of females relative to males. The remaining hierarchical regression analyses indicated that gender did not qualify any of the previous findings illustrated in Figure 2.

Comparable hierarchical regression analyses were conducted to determine whether youths' Aboriginal status moderated any of the findings of the previous path analyses. These analyses revealed that youths' Aboriginal status moderated the relations between trauma and risky sex behaviour, hard drug use and risky sex behaviour, and hard drug use and needle-related service use. Aboriginal status, $\beta = -.140$, $t(395) = -3.10$, $p = .002$, and alcohol and marijuana use, $\beta = .409$, $t(395) = 9.02$, $p = .000$, but not hard drug use, $\beta = .086$, $t(395) = 1.91$, $p = .06$, mental health, $\beta = -.020$, $t(395) = -.372$, $p = .71$, or trauma, $\beta = .091$, $t(395) = 1.72$, $p = .09$, made significant contributions to the first step of the equation predicting youths' risky sex behaviour, $R^2 = .214$, $F(5,395) = 21.47$, $p = .000$. When entered on the second step, both the Aboriginal status x trauma interaction term, $\beta = .178$, $t(391) = 2.212$, $p = .03$, and the Aboriginal status x hard drug use interaction term, $\beta = -.192$, $t(391) = -2.338$, $p = .02$, made significant contributions to the equation, explaining an additional .03% of the variance in mental health difficulties, F change(9, 391) = 3.47, $p = .01$.

A simple slopes analysis revealed that trauma was not a significant predictor of risky sexual behaviour for either Aboriginal youths, $\beta = .031$, $t(391) = 0.70$, $p = .49$, or non-Aboriginal youths, $\beta = -.006$, $t(391) = -0.41$, $p = .88$. However, as illustrated in

Figure 4, trauma had a greater effect on the risky sex behaviour of Aboriginal youths relative to non-Aboriginal youths.

Figure 4

Relationship between Trauma and Risky Sex Behaviour as a Function of Aboriginal Status

A simple slopes analysis, illustrated in Figure 5, also revealed that hard drug use was a significant predictor of the risky sexual behaviour of non-Aboriginal youths, $\beta = -.301$, $t(391) = 3.04$, $p = .003$, but not Aboriginal youths, $\beta = -.005$, $t(391) = -0.06$, $p = .95$.

Finally, youths' Aboriginal status qualified the path between hard drug use and needle-related service use. In this case, Aboriginal status, $\beta = .083$, $t(369) = 2.64$, $p = .01$, alcohol and marijuana use, $\beta = -.113$, $t(369) = -3.58$, $p = .000$, and hard drug use, $\beta = .781$, $t(369) = 24.79$, $p = .000$, all made significant contributions to the first step of the equation predicting needle-related service use, $R^2 = .634$, $F(3,369) = 213.79$, $p = .000$.

Figure 5

Relationship between Hard Drug Use and Risky Sex Behaviour as a Function of Aboriginal Status

When entered on the second step, the Aboriginal status x hard drug use interaction term, $\beta = .165$, $t(367) = 2.857$, $p = .01$, accounted for an additional 0.01% of the variance in needle-related service use, $F \text{ change}(2.367) = 3.12$, $p = .01$. Although the simple slopes analysis revealed that hard drug use was a significant predictor of the needle-related service use of both Aboriginal, $\beta = .221$, $t(366) = 11.05$, $p = .000$, and non-Aboriginal youths, $\beta = .174$, $t(366) = 14.50$, $p = .000$, hard drug use had a more profound adverse effect on the needle-related service use of Aboriginal relative to non-Aboriginal youths (see Figure 6).

Figure 6

Relationship between Hard Drug Use and Needle-Related Service Use as a Function of Aboriginal Status.

The remaining hierarchical regression analyses indicated that Aboriginal status did not moderate any other relations. In sum, then, gender moderated the relations between trauma and mental health difficulties, with traumatization having more unfavourable effects on the mental health of female relative to male youths. Youths' Aboriginal status qualified three relations. Specifically, hard drug use had a more profound effect on the risky sex behaviour of non-Aboriginal relative to Aboriginal youths, while the relations between trauma and risky sex behaviour and between hard drug use and needle-related service use were stronger for Aboriginal than non-Aboriginal youths.

Potential confounds and alternative explanations. To identify potential confounds, Spearman correlational analyses (two-tailed) and chi-square analyses were

conducted to determine whether any demographic characteristics or other measures were correlated with both of the variables involved in any of the significant relations observed in the path analyses. The demographic characteristics and measures considered included: youths' age, gender, Aboriginal status, school attendance, precarious housing currently and in the past year, age at first street involvement, age when the youth first left home, times the youth ran away in the past year, times kicked out of home in the past year, whether the youth had engaged in unwanted sex when under the influence of drugs or alcohol, and sexual orientation (heterosexual vs. lesbian/gay/bisexual).¹⁶ The significant relations analyzed for potential confounds were: trauma and mental health; trauma and alcohol and marijuana use; trauma and street survival behaviour; trauma and drug- and alcohol-related service use; mental health and street survival behaviour; alcohol and marijuana use and risky sexual behaviour; hard drug use and drug-and alcohol-related service use; alcohol and marijuana use and needle-related service use; and hard drug use and needle-related service use. When a potential confound was significantly correlated with both variables, hierarchical regression analyses were run where the potential confound was entered on the first block and the predictor variable was entered on the second block of the equation. These analyses revealed that none of the above stated demographic characteristics or measures provided alternative explanations for the significant paths observed in the path analyses.

Comparisons of youths included versus excluded from the sample. Analyses were conducted to determine whether the participants who were included in the sample

¹⁶ The 'not sure' option of the sexual orientation item was set to missing and thus not included in the measure of sexual orientation.

were systematically different from those excluded from the sample in terms of their gender, age, Aboriginal status, ethnicity, precarious housing in the past year, current precarious housing, location of participation, injection drug use, and the conceptual measures examined in the main analyses (i.e., trauma, mental health, alcohol and marijuana use, hard drug use, risky sexual behaviour and street survival behaviour).

These analyses revealed that, relative to the youths who were excluded from the sample, the participants included in the sample were marginally older (Included: $M = 16.43$, $SD = 1.56$ years; Excluded: $M = 16.21$, $SD = 1.61$ years; $t(740) = -1.84$, $p = .07$, $\eta^2 = .01$), and marginally more likely to report precarious housing in the past year (Included: 68.2%, $n = 174$; Excluded: 38.5%, $n = 106$; $\chi^2(1, N = 757) = 3.81$, $p = .05$, Odds ratio = 1.35). Youths included in the sample were also more likely to report using hard drugs (Included: 50.0%, $n = 215$; Excluded: 31.8%, $n = 104$; $\chi^2(1, N = 757) = 25.22$, $p = .000$, Odds ratio = 2.14), and using injection drugs (Included: 68.2%, $n = 174$; Excluded: 31.8%, $n = 81$; $\chi^2(1, N = 755) = 20.45$, $p = .000$, Odds ratio = 2.06). The latter differences, however, may simply be an artefact of the exclusion of youths who failed to respond to the items comprising the drug- and alcohol-related service use and the needle-related service use measures.

Discussion

Studies of street youths in both Canada and the United States have found high rates of trauma among this population (Kral et al., 1997), and both trauma (Kurtz et al., 2000) and the aftereffects of trauma (e.g., depression, drug and alcohol abuse; Weber et al., 2002) have been shown to increase the likelihood of HIV-related risk behaviour. In

view of these findings, the current study examined whether streets youths' experiences of trauma would increase their mental health difficulties and substance use and, thereby, their sex and drug-related HIV risk behaviour. Before considering the results relevant to the primary focus of this research, it is useful to consider other informative findings.

The findings regarding the frequency of these street youths' traumatization, mental health problems, substance use, and their HIV-related risk behaviour were congruent with those noted by other researchers. For example, most of the youths in this study had experienced trauma in some form, with almost two-thirds having witnessed abuse in their family and a similar proportion experiencing physical abuse. Further, almost a third reported experiencing sexual abuse and sexual assault. These findings are entirely consistent with those of a number of researchers (e.g., Bailey & McCloskey, 2005; CS/RESORS Consulting Ltd., 2001; Haley et al., 2004; Johnson et al., 1996; Kral et al., 1997), who typically report that between a half and three quarters of homeless youths have been physically and/or sexually abused (Ryan et al., 2000).

Consistent with both these high rates of traumatization, and other research findings (e.g., Boivin et al., 2005; Kamieniecki, 2001; Molnar et al., 1998; Ryan et al., 2000), many of these youths reported experiencing the aftereffects of trauma, including depression, PTSD and emotional distress more generally. Further, a quarter of the youths had made a suicide attempt in the 12 months prior to their participation in the study. As observed in other studies (e.g., Clements et al., 1997; Coady et al., 2007; Dematteo et al., 1999; Gleghorn et al., 1998; Haley et al., 2004; Roy et al., 2000), these youths also reported using a number of drugs, the vast majority reported using alcohol or marijuana,

and well over a third had injected an illegal drug. Further, that 25% of the youths reported sharing needles or injection-related equipment is disturbing given the associated high probability of transmitting blood borne viruses such as HIV and HCV (Koester, 1996). Conceivably, at least part of this high rate of sharing injection-related gear is attributable to youths' precarious housing, which reduces the availability of clean needles, spoons, clean water and/or other paraphernalia associated with injection drug use (Coady et al., 2007; Kristiansen & Cooper, 2009).

These youths also engaged in a number of sex-related behaviours that put them at risk for contracting HIV and other sexually transmitted infections. For example, 40% of the youths reported not using a condom the last time they had sexual intercourse, a rate comparable to that observed in other studies of street youths (e.g., Clements et al., 1997; Marshall, Kerr, Shoveller, Patterson, et al., 2009; Public Health Agency of Canada, 2006). Given this, it is perhaps not surprising that a quarter of the youths reported having been pregnant or getting someone pregnant and almost a fifth indicated that they had been informed by a doctor or nurse that they had an STI or HIV. However, the high rate of unprotected sex among this population is especially troubling because homeless youths are unlikely to receive routine health exams and tests for STIs and HIV. Because STIs, including HIV (Johnson, Stanford, Douglas, Botwinick & Marino, 2001), can be present without detectable symptoms, as many as 40% of these youths may be unknowingly passing STIs on to others.

In line with the findings of research that suggest that 12% to 32% of Canadian street youths engage in sex trade work (Haley et al., 2004; Johnson et al., 1996; Public

Health Agency of Canada, 2006; Roy et al., 2000; Weber et al., 2002), approximately 18% of this sample of street youths indicated that they had engaged in sex trade work, most commonly for money or drugs. Further, half of those who engaged in sex trade work did so by the time they were 14 years of age. Interestingly, in the factor analysis of the HIV-related risk behaviour items, sex trade work loaded on the same factor as a number of other high risk HIV behaviours, most notably inconsistent condom use and sharing used injection equipment. This suggests that youths who engaged in sex trade work also engaged in other sex- and drug-related HIV risk behaviours and that they may have been doing so as a way of surviving on the streets. For example, sex trade work can provide youths with the money they need for their basic survival. It can also provide them with drugs, drugs that may facilitate their psychic survival. In line with these possibilities, researchers have found that sex trade work is often related to injection drug use (Coady et al., 2007; van den Hoek, 1997). For example, Kerr et al. (2009) found that street youths who engaged in injection drug use were more than twice as likely to engage in sex trade work relative to street youths who did not use injection drugs. Unfortunately, the disinhibition associated with drug use may then increase the likelihood of additional risky behaviours, such as having unprotected sex (Medrano et al., 2003) and sharing injection equipment (Kristiansen & Cooper, 2009).

The current findings also speak to the services available to substance users. In particular, two-thirds of these youths indicated that they had never accessed a needle exchange program, a safe injection site, drug or alcohol counselling, or a detox centre, services that may be useful to those who want to address issues related to their substance

(ab)use (Simmons et al., 1996; World Health Organization, 2004a, 2004b). These youths may not have accessed these services for any of a number of reasons. For example, because the only safe injection site in BC is located in Vancouver, this service is unavailable to youths in other communities. The other services may also be unavailable to some youths and, even where they are available, street youths may be unaware of them. Regardless of the reasons, barriers to the use of harm reduction services are important because they prevent street youths from obtaining any help they may seek and increase the likelihood of street youths engaging in risky HIV behaviour. In regard to the latter, for example, Marshall, Kerr, Shoveller, Montaner and Wood (2009) found that barriers to health and harm reduction services, such as the inability to access services or law-related barriers such as warrants for arrest or area restrictions, were associated with street youths having more sexual partners and using condoms inconsistently.

Like the descriptive findings, the results of the correlation analyses were generally in line with the findings of other researchers. As observed in studies of adults and both street-involved and non-street involved youths (e.g., Breslau et al., 1991; Briere & Elliott, 1994; Horowitz, et al., 1995; Kendall-Tackett et al., 1993; Molnar et al., 1998; Paolucci et al., 2001; Ryan et al., 2000), the street youths in this study who reported more trauma also reported moderately more mental health problems, as indicated by the composite measure of depression, PTSD, emotional distress, suicide risk, and sleep difficulties. Similarly, and like earlier research with both adults and street-involved youths (e.g., Bailey & McCloskey, 2005; Felitti et al., 1998; Kendall-Tackett et al., 1993; Kilpatrick et al., 2000; Marshall, Kerr, Shoveller, Patterson, et al., 2009), street youths who

experienced more trauma engaged in slightly more use of alcohol and marijuana and slightly more hard drug use. Also consistent with past research (e.g., Johnson et al., 1996; Medrano et al., 2003; Saewyc et al., 2004; Voisin, 2005), youths who reported more traumatization reported engaging in slightly more risky sex, such as using drugs or alcohol the last time they had sexual intercourse and having more sexual partners in the past three months. As in previous research (Miller, 1999; Medrano et al., 2003; Wilson & Widom, 2008) these street youths also reported moderately more HIV-related street survival behaviour, which involved extremely risky behaviours such as engaging in sex trade work and sharing injection equipment. Finally, although more trauma was associated with slightly more use of drug- and alcohol-related services (i.e., drug or alcohol counselling services and youth detox facilities), it was entirely independent of youths' use of needle-related services (i.e., needle exchange programs and the safe injection site).

The correlates of youths' mental health were more mixed in terms of their consistency with previous findings. While youths with more mental health problems used slightly more alcohol and marijuana, youths' mental health problems were unrelated to their use of hard drugs and their use of needle-related services. These findings are inconsistent with past research with both youths and adults (e.g., Chilcoat & Breslau, 1998a, 1998b; Epstein, Saunders, Kilpatrick & Resnick, 1998; Kilpatrick et al., 2000; Miller, 1999), which has found that the mental health aftereffects of trauma increase the risk of substance use to alleviate the negative aftereffects of trauma (Simmons et al., 1996). As expected (Bailey et al., 1998; Gleghorn et al., 1998; Miller, 1999), however,

youths with poorer mental health engaged in slightly more risky sex and moderately more street survival behaviour.

The correlates of youths' substance use were also mixed in terms of their consistency with prior findings. For example, although these youths often used alcohol, marijuana, and hard drugs, their use of alcohol and marijuana was independent of their use of hard drugs. In contrast, past studies of street youths (e.g., Clements et al., 1997) have found that hard drug use is often combined with alcohol use. This may have occurred if the nature of youths' substance use was influenced by one of two distinct social environments or peer groups. In addition, youths who used more alcohol and marijuana reported engaging in moderately more risky sex, suggesting that alcohol and marijuana use may well inhibit decision making and lead youths to make unwise sexual decisions (e.g., Bailey et al., 1998; Kral et al., 1997; Weber et al., 2002). Youths who engaged in more alcohol and marijuana use also made slightly more use of needle-related services. In this regard one might speculate that youths who typically used alcohol and marijuana, as opposed to injection drugs, were more cautious whenever they did engage in injection drug use. In contrast, youths who engaged in more hard drug use reported slightly more risky sex, slightly more street survival behaviour, moderately more use of drug- and alcohol-related services and substantially less use of needle-related services. Hence, unlike alcohol and marijuana use, hard drug use was associated with a wider range of HIV-related risk behaviour, including high risk behaviours such as sex trade work, sharing injection equipment and not participating in needle exchange programs. The latter findings are not unlike those reported by other researchers (e.g., Gleghorn et

al., 1998; Haley et al., 2004; Kerr et al., 2009; Weber et al., 2002).

Given the unexpected nature of some of the correlational findings, it is not surprising that the findings of the path analyses were also mixed. As expected, the relations between youths' childhood experiences of trauma and their risky sexual behaviour and street survival behaviour were mediated by their mental health and/or substance use. Further, trauma, mental health, and/or substance use accounted for 20% and 34% of the variance in youths' risky sex and street survival behaviours. Specifically, youths who experienced more trauma used more alcohol and marijuana that, in turn, was associated with engaging in more risky sex. Similarly, youths who experienced more trauma, especially female youths,¹⁷ reported more mental health problems that, in turn, were associated with more street survival behaviour. On the whole, then, these findings are generally consistent with Miller's (1999) model of the relations between women's experiences of trauma and their HIV risk behaviour. They are also consistent with Holmes et al.'s (2005) application of Miller's model to adult men's HIV risk behaviour and Plotzker et al.'s (2007) finding that PTSD and depression mediated the relationship between female injection drug users' experiences of child sexual abuse and their sex-

¹⁷ Trauma had a stronger effect on the mental health of the female relative to the male youths in this sample. Although the size of this effect was small, accounting for less than 1% of the variance, it is consistent with literature reviews indicating that women are two times more likely to have a lifetime experience of PTSD than men (Norris, Foster, & Weisshaar, 2002; Seedat & Stein, 2000). The sole exception to this pattern is for rape, where the risk of PTSD is the same for both men and women (Norris et al., 2002). Women's greater vulnerability to PTSD following trauma cannot be fully explained by gender differences in the type of trauma or perceptions of threat and fear (Norris et al., 2002). Rather, women's increased physiological reaction to stress, their greater disposition to major depressive disorder, and their more frequent exposure to the stressors of poverty, discrimination and oppression (Norris et al., 2002) have all been linked to women's heightened risk for developing PTSD in response to trauma.

related HIV risk taking. Contrary to expectations, however, more hard drug use was associated with slightly more risky sex on the part of Aboriginal but not non-Aboriginal youths.

The most notable unexpected findings were associated with youths' use of services. In particular, youths who experienced more trauma and those who engaged in more hard drug use were somewhat more likely to use drug- and alcohol related services, with these variable explaining 11% of the variance. However, neither mental health nor alcohol and marijuana use were significant mediators. In regard to needle-related services, youths who used more alcohol and marijuana were slightly more likely to use needle-related services while those who used more hard drugs were extremely less likely to use needle-related services, with these variables accounting for 68% of the variance. In this case neither trauma nor mental health were significant predictors.

Taken together, these results point to three conclusions. One is that there appear to be three distinct routes to street youths' HIV risk behaviour. One path involves youths who, for whatever reason, are more resilient in that their mental health is unaffected by their traumatic experiences. For these youths more trauma is associated with slightly more use of alcohol and marijuana, which in turn is associated with moderately more risky sex and slightly more use of needle-related services. A second, more dangerous path involves street youths whose traumatic experiences are moderately associated with serious mental health problems, which are in turn moderately associated with more high risk street survival behaviour. The third path, which involves hard drug use, is independent of trauma and mental health and is associated only with the use of services.

For youths on this path, more hard drug use is associated with extremely less use of needle-related services and only slightly more use of drug- and alcohol-related services, such as counselling and detox. These distinct paths to different HIV-related behaviours are entirely consistent with results of the factor analysis that identified four independent factors underlying these youths' HIV-related behaviour. They also point to the usefulness of developing measures of HIV-related behaviours empirically, as opposed to grouping items conceptually on an a priori basis (e.g., forming a measure of all sex-related HIV behaviours and a different measure of all drug-related HIV behaviours).

The second conclusion comes from the direct, unmediated, effects of trauma on youths' street survival behaviour and their use of drug- and alcohol-related services. Because it is not possible for previous experiences of trauma to have direct effects on current behaviour, these findings suggest the need to identify other trauma-related variables that may mediate the relations between street youths' experiences of trauma and their HIV-related risk behaviour. And finally, although the path analyses explained a good deal of the variance in the behavioural outcomes, there was still a good deal of variance left unaccounted for. To the extent that this unexplained variance is not entirely a result of measurement error, it is clear that street youths' HIV-related risk behaviour is also guided by factors unrelated to trauma.

Like all research, this research has both a number of strengths and a number of drawbacks. One of its main strengths is its sample, which consisted of a large segment of the population of street youths in British Columbia. Street youths are a very difficult population to study, given the transient nature of their lives and the noted difficulties in

reaching them (Kral et al., 1997). Given this, the current sample of over 400 youths is quite large. In fact, it is one of the largest samples of street youths studied in Canada to date. Further, because these youths were sampled from nine different communities in BC, including more rural communities, these data probably provide a more accurate and comprehensive picture of street youths' experiences than studies that focus exclusively on street youths sampled from large urban centres such as Vancouver, Toronto or Montreal. This sample also included youths with a variety of ethnic backgrounds, including a sizeable proportion of self-identified Aboriginals. As such, the lives and experiences of youths of different backgrounds were captured. Further, the youths were recruited from several locations, such as drop-in centers and the street. Thus, the sample was not limited to youths who access community services, as is often true of studies of street youths (e.g., Mallett et al., 2005; Roy et al., 2000). Each of these elements increases the representativeness of this sample to street youths across British Columbia and makes it more likely that data were obtained from youths at all risk levels.

Another strength of this study comes from the fact that individuals familiar with the lives of street youths and former and current street youths participated in the development of the survey. It is, therefore, likely that the survey questions were in tune with street youths' lives and experiences and used language that the participants understood. This, in turn, should facilitate the validity and reliability of the youths' survey responses. Similarly, because the measures of youths' HIV-related risk behaviour were formed on the basis of a factor analysis as opposed to any a priori grouping of the items, it is likely that these measures of the criterion behaviours more accurately reflected

these youths' experiences.

In addition to the strengths, however, this study has a number of limitations, perhaps the most obvious being the large amount of missing data for the questions assessing youths' use of and access to various services, which occurred because these questions appeared at the end of the survey when a number of youths stopped participating, perhaps due to fatigue or boredom. Because the answers to these questions were central to the study at hand, cases without these data were excluded from the sample. Fortunately, there were no differences in the characteristics of the youths who were included and excluded from the sample. Nevertheless, this large number of missing values casts some suspicion regarding the quality of the data more generally. As such, future research involving street youths should consider randomizing the order of survey questions in order to decrease the number of missing values for certain measures.

Other limitations stem from possible measurement error and the post hoc nature of the measures used in these analyses. Because the survey was read to all of the participants, and despite assurances of confidentiality, it is conceivable that social desirability biases may have affected the accuracy of their reports (Kazdin, 2003). For example, some youths may have been hesitant to report experiences of abuse, particularly sexual abuse. Similarly, some youths may have been reluctant to report engaging in HIV-related risk behaviours, many of which are stigmatized in our society (e.g., having an STI or participating in sex trade work). As a result, the present findings may underestimate the rates of these behaviours (Johnson et al., 1996). The accuracy of these youths' responses may also have been constrained by their ability to answer correctly.

For example, youths were asked whether they had ever been told by a professional that they had PTSD or depression. Youths who had never been given this information but who nevertheless met the diagnostic criteria for these disorders would have scored inappropriately lower on both these individual items and the composite measure of mental health problems. Given these measurement issues, it is likely that the measures underestimate the frequency of street youths' experiences of trauma, their mental health problems, their HIV-related risk behaviour and perhaps their substance use as well.

Because this study consisted of an analysis of archival data, the various measures were limited to those that could be created from the existing data. As a result, the precision, reliability and/or validity of some of the measures may be less than ideal, particularly those formed using dichotomous measures. This, together with any measurement error stemming from social desirability and youths' inability to answer accurately, suggests that the relations between these variables may be stronger than they appear. Moreover, it was not possible to assess some more specific relations because the survey did not include multi-item measures of various constructs. For example, although Plotzker et al. (2007) found that childhood experiences of sexual abuse, but not physical abuse, were related to risky sexual behaviours, in the current study it was not possible to assess whether one form of trauma had a stronger impact on youths' HIV risk behaviour than another form. This is unfortunate because such more finely tuned analyses may have been informative.

Finally, both the internal and external validity of the findings are questionable. In regard to the former, this study's cross-sectional, correlational design means that the

temporal order and causal directions between trauma, the mediating factors, and the HIV risk behaviours remain uncertain (Bailey et al., 1998; Kazdin, 2003). And regarding the latter, the findings of this study are limited to the experiences of street-involved youths in BC and, as a result, may not be generalizable to street-involved youths in other locations across the country. For example, youths in various communities likely have different experiences with regard to the accessibility and availability of various services, which may differ based on federal, provincial or territorial funding. Given this limitation, it is important that studies such as the E-SYS study (Public Health Agency of Canada, 2006) continue to compile information on street-involved youths across the country so as to determine the unique characteristics and needs of each community.

The current findings suggest a number of avenues for further research. One consists of efforts to identify factors that determine which of the various routes to HIV behaviour youths take. To understand why some youths were resilient to adverse effects of trauma on mental health, for example, it would be useful to consider protective factors known to decrease both the likelihood of youths experiencing the mental health aftereffects of trauma and their HIV-related risk behaviours. One candidate in this regard is social support, which has been found to both mitigate the negative effects of child abuse and contribute to safer HIV-related behaviour. The presence of a supportive adult, for example, has been found to have a protective influence on the well-being of children who have been physically abused (Herrenkohl, Herrenkohl, Rupert, Egolf, & Lutz, 1995), children who have been sexually abused (Conte & Schuerman, 1987; Gomes-Schwartz, Horowitz, & Cardarelli, 1990) and adults who were sexually abused as children (Herman,

1992; Springs & Friedrich, 1992). The importance of social support for street youths' HIV-related risk behaviour is suggested by the findings of a number of studies. For example, a study of former street-involved youths by Kurtz et al. (2000) found that the presence of a trusted individual who provided guidance and protection helped youths take control of their difficult situations and eventually leave the street. Similarly, in a qualitative study, ten adults who had been street-involved youths cited the help of trusted people such as friends, family and professionals, their individual strengths and having hope as among the most important factors that helped them leave the street (Raleigh-DuRoff, 2004).

Another factor that may affect whether mental health or the use of alcohol and marijuana mediate the relation between street youths' experiences of trauma and their HIV-related risk behaviour is the mental health of youths' caregivers. In this regard the negative effects of abuse have been found to be greatest for children from families with high levels of stress and mental health problems such as schizophrenia and depression (Kurtz, Gaudin, Howing & Wodarski, 1993). Similarly, in their study of 715 street youths recruited in Los Angeles and San Diego, Darling, Palmer and Kipke (2005) found that youths' who perceived their caregivers as having more problems, such as alcohol and drug abuse, had more sexual partners and engaged in more high-risk substance abuse (e.g., injection drug use).

Longitudinal and cohort studies of street youths are also needed in order to evaluate the changes in youths' HIV-related risk behaviours over time. Such research might also consider including a comparison group of non-street involved youths in order

to determine whether trauma has comparable effects on the HIV-related risk behaviour of non-street involved youths. This research would also benefit from the use of measures known to be psychometrically sound.

To the extent that the findings of this research are reliable and valid, they also have a number of implications for efforts to meet the needs of street-involved youths. The most fundamental of these is the clear need for interventions designed to reduce the extent to which street youths engage in HIV-related risk behaviours. In this regard the current findings suggest that street youths' risky sex behaviour, such as using drugs and alcohol prior to sexual intercourse, may be best addressed by interventions that focus on street-involved youths' use of alcohol and marijuana and the implications of such substance use for HIV-related behaviour (e.g., in terms of decision-making). In contrast, reducing street youths' street survival behaviour, which includes sex trade work, might be best accomplished by interventions that focus on street youths' mental health needs, including those related to depression, PTSD, and emotional distress more generally.

The present findings also indicate the need for interventions that encourage street youths to use drug- and alcohol-related counselling services and needle-related harm reduction programs. At a basic level, this would include making such services available to all street youths in BC. Street outreach programs and campaigns designed to increase youths' awareness of the availability of such services may also be beneficial (Johnson et al., 1996).

The current findings also suggest the need for gender-specific interventions. Given that experiences of trauma were more closely tied to the mental health of female relative

to male street youths, female street youths may require more counselling to overcome the mental health aftereffects of trauma. This seems particularly likely in view of other research indicating that trauma has more adverse effects on females relative to males (Norris et al., 2002; Seedat & Stein, 2000).

There is also a need for culture-specific programming for Aboriginal youths. Although Aboriginals comprise only 2.2 % of the Canadian population (Gionet, 2009), more than half of the youths in this study identified themselves as Aboriginal. As is true of youths from all cultures, Aboriginal youths have unique needs based on experiences and circumstances specific to their backgrounds, such as historical trauma and the obliteration of their culture (Marshall et al., 2008). Further, Aboriginal individuals have culture-specific approaches to healing (CS/RESORS Consulting Ltd., 2001). A number of findings also suggest that interventions may be more effective if they are tailored to the different needs of Aboriginal and non-Aboriginal youths. For example, findings indicating that trauma was more strongly related to the risky sex behaviour of Aboriginals relative to non-Aboriginals, while hard drug use was more strongly related to the risky sex behaviour of non-Aboriginals relative to Aboriginals, suggests that interventions designed to reduce Aboriginal street youths' risky sex behaviour might devote additional attention to their experiences of trauma while interventions for non-Aboriginal youths focus additional attention on their hard drug use. The need for culture-specific interventions is also suggested from the relation between hard drug use and the lack of needle-related services, a relationship that was stronger among Aboriginal relative to non-Aboriginal youths.

While the current findings point to the need for interventions addressing street youths' mental health, substance use, and HIV-related risk behaviours, it is likely that more fundamental interventions will be required to truly facilitate street youths' well-being. Because addressing substance use, mental health issues and HIV-related risk behaviour is challenging in the absence of stable housing (Slesnick, Bartle-Haring, Dashora, Kang, & Aukward, 2008), these interventions should include the provision of adequate long-term housing rather than temporary shelters and any other programs (e.g., education, vocational counselling, employment training) that help street youths change their lifestyles.

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Appendix A

Results of Factor Analyses and Related Analyses

Analyses of Items Assessing Mental Health

Table A1

Correlations Among the Mental Health Items

Item	2	3	4	5	6
1. Depression	.30**	.30**	.32**	.36**	.18**
2. PTSD	-	.17**	.16**	.22**	.04
3. Sleep difficulties	-	-	.33**	.22**	.07
4. Emotional distress	-	-	-	.37**	.17**
5. Suicide	-	-	-	-	.19**
6. Foreshortened sense of future	-	-	-	-	-

* $p < .05$. ** $p < .01$. (two-tailed)

Figure A1

Scree Plot of Mental Health Items

Table A2

KMO and Bartlett's Test for Mental Health Items

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .759

Bartlett's Test of Sphericity: Approx. $\chi^2(df = 15) = 318.22^{***}$

$p < .001$.

Table A3

Results of Principal Components Analysis of Mental Health Items

Item	Component
Emotional distress	.751
Depression	.737
Suicide	.664
Sleep difficulties	.610
PTSD	.498
Foreshortened sense of future	.355

Analyses of Items Assessing Drug and Alcohol Use

Table A4

Correlations Among the Drug and Alcohol Items

Item	2	3	4	5	6	7	8	9
1. Marijuana use in past 30 days	.73**	.31**	-.01	.04	.23**	.21**	.08	.17
2. Times used marijuana yesterday	-	.27**	.06	.12**	.24**	.24**	.18**	.13**
3. Age first tried marijuana	-	-	-.01	.04	.18**	.19**	.08	.48**
4. Injection drug use	-	-	-	.83**	-.17**	-.20**	.05	-.07
5. Number of drugs used	-	-	-	-	-.03	-.06	.05	-.01
6. Number of days had at least one drink in the past month	-	-	-	-	-	.82**	.35**	.24**
7. Number of days had 5 or more drinks in the past month	-	-	-	-	-	-	.37**	.23**
8. Number of drinks yesterday	-	-	-	-	-	-	-	.09*
9. Age first had alcohol	-	-	-	-	-	-	-	-

* $p < .05$. ** $p < .01$. (two-tailed)

Figure A2

Scree Plot of the Drug and Alcohol Use Items

Table A5

KMO and Bartlett's Test for Drug and Alcohol Use Items

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .590

Bartlett's Test of Sphericity: Approx. $\chi^2(df = 36) = 1567.96^{***}$

Table A6

Results of Principal Components Analysis of Drug and Alcohol Use Items

Item	Component			
	1	2	3	4
Marijuana use in the past 30 days	.627	.265	-.505	-.388
Times used marijuana yesterday	.634	.345	-.383	-.443
Age first tried marijuana	.532	.147	-.381	.532
Injection drug use	-.174	.909	.235	.088
Number of drugs used	-.041	.900	.235	.088
Number of days had at least one drink in past month	.762	-.174	.449	-.029
Number of days had 5 or more drinks in past months	.767	-.208	.449	-.036
Number of drinks yesterday	.456	.053	.502	-.075
Age first drank alcohol	.492	.001	-.205	.700

Table A7

Results of Factor Analysis of Drug and Alcohol Use Items with Two Factors and a Varimax Rotation

Item	Factor	
	1	2
Number of days had 5 or more drinks in the past month	.736	-.300
Number of days had at least one drink in the past month	.735	-.266
Times used marijuana yesterday	.671	.266
Marijuana use in the past 30 days	.655	.187
Age first tried marijuana	.546	.081
Age of first drink of alcohol	.488	-.060
Number of drinks yesterday	.459	-.003
Injection drug use	-.062	.923
Number of drugs used	.069	.899

Analyses of Items Assessing HIV Risk Behaviours

Table A8

Pearson Correlations Among the HIV Risk Behaviour Items

Item	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Shared needles or related gear	.28**	.30**	.20**	.17**	.22**	.29**	.09	.17**	.19**	.13**	.02	.02	-.18**	-.21**
2. # items traded sex for	-	.54**	.15**	.12**	.22**	.20**	.10*	.17**	.24**	.12*	.09	.07	-.19**	-.23**
3. Age when first traded sex	-	-	.09	.06	.22**	.21**	.21**	.11**	.27**	.13**	.09	.09	-.18**	-.23**
4. Ever pregnant	-	-	-	.28**	.31**	.17**	.20**	.03	.19**	.03	.09	.08	-.11*	-.10
5. Condom use at last intercourse	-	-	-	-	.24**	.12**	.12*	.10*	.21**	.09	.01	-.01	.02	.05
6. # lifetime male sexual partners	-	-	-	-	-	.27**	.27**	.16**	.25**	-.34**	-.08	-.07	-.03	.04

Table A8 cont'd

Pearson Correlations Among the HIV Risk Behaviour Items

Item	2	3	4	5	6	7	8	9	10	11	12	13	14	15
7. Ever told they had an STI	-	-	-	-	-	-	.06	.12*	.14	-.05	-.04	-.05	-.17*	-.15**
8. Age at first intercourse	-	-	-	-	-	-	-	.33**	.43**	.39**	-.01	-.01	.19**	-.10**
9. Alcohol/drug use at last intercourse	-	-	-	-	-	-	-	-	.30**	.24**	-.07	-.08	-.07	-.05
10. # sexual partners last 3 months	-	-	-	-	-	-	-	-	-	.42**	-.07	-.05	-.06	-.08
11. # lifetime female sexual partners	-	-	-	-	-	-	-	-	-	-	.05	.06	.16**	-.21**
12. Access safe injection site	-	-	-	-	-	-	-	-	-	-	-	.99**	-.02	-.06

Table A8 cont'd

Pearson Correlations Among the HIV Risk Behaviour Items

Item	2	3	4	5	6	7	8	9	10	11	12	13	14	15
13. Access needle exchange	-	-	-	-	-	-	-	-	-	-	-	-	-.02	-.06
14. Access drug or alcohol counselling	-	-	-	-	-	-	-	-	-	-	-	-	-	.74**
15. Access youth detox	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* $p < .05$. ** $p < .01$. (two-tailed)

Table A9

Spearman Correlations Among the HIV Risk Behaviour Items

Item	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Shared needles or related gear	.24**	.31**	.20**	.17**	.23**	.29**	.08	.17**	.19**	.13**	.03	.02	-.19**	-.21**
2. # items traded sex for	-	.59**	.12**	.11*	.19**	.14**	.08*	.09	.20**	.11*	.08	.09	-.17**	-.13**
3. Age when first traded sex	-	-	.09	.06	.26**	.24**	.17**	.14**	.29**	.15**	.09	.10	-.18**	-.22**
4. Ever pregnant	-	-	-	.27**	.30**	.16**	.19**	.04	.18**	.05	.09	.09	-.10	-.09
5. Condom use at last intercourse	-	-	-	-	.25**	.12**	.08	.10*	.20**	.09	.01	-.01	.02	.05
6. # lifetime male sexual partners	-	-	-	-	-	.27**	.23**	.16**	.29**	-.32**	-.07	-.06	-.03	.03

Table A9 cont'd

Spearman Correlations Among the HIV Risk Behaviour Items

Item	2	3	4	5	6	7	8	9	10	11	12	13	14	15
7. Ever told they had an STI	-	-	-	-	-	-	.04	.12*	.05	-.05	-.04	-.04	-.18*	-.16**
8. Age at first intercourse	-	-	-	-	-	-	-	.29**	.39**	.38**	.00	.01	-.18**	-.17**
9. Alcohol/drug use at last intercourse	-	-	-	-	-	-	-	-	.31**	.24**	-.07	-.08	-.07	-.05
10. # sexual partners last 3 months	-	-	-	-	-	-	-	-	-	.43**	-.06	-.04	-.06	-.09
11. # lifetime female sexual partners	-	-	-	-	-	-	-	-	-	-	.05	.06	-.17**	-.22**
12. Access safe injection site	-	-	-	-	-	-	-	-	-	-	-	.99**	-.06	-.10

Table A9 cont'd

Spearman Correlations Among the HIV Risk Behaviour Items

Item	2	3	4	5	6	7	8	9	10	11	12	13	14	15
13. Access needle exchange	-	-	-	-	-	-	-	-	-	-	-	-	-.05	-.10
14. Access drug or alcohol counselling	-	-	-	-	-	-	-	-	-	-	-	-	-	.74**
15. Access youth detox	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* $p < .05$. ** $p < .01$. (two-tailed)

Figure A3

Scree Plot of HIV Risk Behaviour Items

Table A10

KMO and Bartlett's Test for HIV Risk Behaviour Items

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .603

Bartlett's Test of Sphericity: Approx. $\chi^2(df = 105) = 2456.49^{***}$

$p < .001$.

Table A11

Results of Factor Analysis HIV Risk Behaviour Items with Four Factors and a Varimax Rotation

Item	Factor			
	1	2	3	4
# lifetime male sexual partners	.793	.020	.124	-.132
Ever pregnant	.546	.146	-.001	.130
Ever told they had an STI	.514	-.096	-.282	-.125
Shared needles/gear	.474	.147	-.315	.003
Condom use last intercourse	.467	.244	.193	.029
Items traded sex for	.451	.081	-.377	.119
Age when first traded sex	.448	.199	-.385	.130
# lifetime female sexual partners	-.294	.765	-.240	.126
# sexual partners past 3 months	.257	.747	-.001	-.034
Age at first intercourse	.173	.714	-.077	-.001
Alcohol/drug use at last intercourse	.148	.558	-.011	-.121
Access youth detox centre	.014	-.083	.877	-.033
Access drug or alcohol counselling	-.043	-.053	.855	.026
Access safe injection site	.028	-.051	-.029	.984
Access needle exchange	.021	-.044	-.024	.984

Appendix B

Descriptive Statistics for Items Measuring the Predictor, Mediating and Outcome Variables

Table B1

Descriptive Statistics for Items Measuring Trauma

Trauma measure		<i>n</i>	%
Witnessing abuse:	Yes	258	60.8%
	No	166	39.2%
Physical abuse:	No	147	35.1%
	Non-family member	172	41.1%
	Family member	100	23.9%
Sexual abuse:	No	253	60.8%
	Non-family member	107	25.6%
	Family member	57	13.6%
Forced sexual intercourse:	No	297	69.1%
	Yes, by youth or adult	115	26.7%
	Yes, by both a youth or adult	18	4.2%
Abused in past 30 days:	No	367	87.2%
	Physical abuse	46	10.9%
	Sexual abuse	14	3.3%

Note: *Ns* range from 417 to 430; Number of missing values range from 0% to 3.1%.

Table B2

Descriptive Statistics for Items Measuring Mental Health

Mental health measure	<i>n</i>	%
Told they suffered depression		
Yes	102	24.8%
No	309	75.2%
Told they suffered PTSD		
Yes	25	6.1%
No	386	93.9%
Sleep difficulties in past 30 days		
Yes	205	47.4%
No	219	50.9%
Felt under strain, stress or pressure in past 30 days		
Yes, almost more than I could take	110	26.1%
Yes, quite a bit of pressure	71	16.8%
Yes, some/more than usual	67	15.9%
Yes, a little/about usual	87	20.6%
Not at all	110	26.1%

Table B2 cont'd

Descriptive Statistics for Items Measuring Mental Health

Mental health measure	<i>n</i>	%
Bothered by nervousness or nerves in past 30 days		
Extremely so, to the point I couldn't work or deal with things	52	12.5%
Quite a bit	79	19.0%
Some, enough to bother me	60	14.5%
A little	80	19.3%
Not at all	144	34.7%
Felt sad, discouraged or hopeless in the past 30 days		
Extremely so, to the point I couldn't work or deal with things	70	16.6%
Quite a bit	70	16.6%
Some, enough to bother me	63	15.0%
A little	73	17.3%
Not at all	145	34.4%

Table B2 cont'd

Descriptive Statistics for Items Measuring Mental Health

Mental health measure	<i>n</i>	%
Ever seriously consider attempting suicide during past 12 months		
Yes	139	32.9%
No	284	67.1%
Make a suicide plan		
Yes	111	26.2%
No	312	73.8%
How many times in past 12 months attempt suicide		
0 times	324	77.2%
1 time	38	9.0%
2 or 3 times	38	9.0%
4 or 5 times	8	1.9%
6 or more times	12	2.9%
Suicide attempt during past 12 months that resulted in injury		
Yes	137	32.5%
No	48	11.4%
Did not attempt	236	56.1%

Note: *Ns* range from 411 to 430; Number of missing values range from 0% to 4.5%.

Table B3

Descriptive Statistics for Items Measuring Alcohol and Marijuana Use

Alcohol and marijuana use measure	<i>n</i>	%
Number of days had at least one drink in the past month		
Never had alcohol	48	11.6%
0 days	65	15.4%
1 or 2 days	85	20.2%
3 to 5 days	68	16.2%
6 to 9 days	60	14.3%
10 to 19 days	52	12.4%
20 to 29 days	22	5.2%
All 30 days	20	4.8%
Number of days had five or more drinks in the past month		
Never had alcohol	61	14.5%
0 days	81	19.2%
1 day	56	13.3%
2 days	54	12.8%
3 to 5 days	68	16.2%
6 to 9 days	38	9.0%
10 to 19 days	34	8.1%
20 or more days	29	6.9%
Number of drinks yesterday		
Never had alcohol	55	13.1%
None	254	60.5%
1 to 2 drinks	42	10.0%
3 to 4 drinks	23	5.5%
5 or more drinks	46	11.0%

Table B3 cont'd

Descriptive Statistics for Items Measuring Alcohol and Marijuana Use

Alcohol and marijuana use measure	<i>n</i>	%
Age first drank alcohol		
Never had alcohol	32	7.6%
Less than 9 years old	70	16.7%
9 or 10 years old	55	13.1%
11 or 12 years old	106	25.3%
13 or 14 years old	115	27.4%
15 years old	19	4.5%
16 years old	15	3.6%
17 or more years old	7	1.7%
Times used marijuana in the past 30 days		
Never tried marijuana	30	7.1%
0 times	61	14.4%
1 or 2 times	58	13.7%
3 to 9 times	52	12.3%
10 to 19 times	31	7.3%
20 to 39 times	28	6.6%
40 or more times	164	38.7%
Times used marijuana yesterday		
Never tried marijuana	31	7.3%
0 times	122	28.8%
1 or 2 times	103	24.3%
3 to 9 times	92	21.7%
10 or more times	75	17.7%

Table B3 cont'd

Descriptive Statistics for Items Measuring Alcohol and Marijuana Use

Alcohol and marijuana use measure	<i>n</i>	%
Age first tried marijuana		
Never tried marijuana	28	6.6%
Less than 9 years old	53	12.5%
9 or 10 years old	70	16.5%
11 or 12 years old	120	28.2%
13 or 14 years old	109	25.6%
15 years old	20	4.7%
16 years old	12	2.8%
17 or more years old	13	3.1%

Note: *Ns* range from 420 to 430; Number of missing values range from 0% to 2.4%.

Table B4

Descriptive Statistics for Items Measuring Hard Drug Use

Hard drug use measure		<i>n</i>	%
Injection drug use:	Yes	174	40.6%
	No	255	59.4%
Cocaine:	Yes	309	28.0%
	No	120	72.0%
Hallucinogens:	Yes	272	63.4%
	No	157	36.6%
Ecstasy:	Yes	333	77.6%
	No	96	22.4%
Mushrooms:	Yes	314	73.2%
	No	115	26.8%
Inhalants:	Yes	210	49.0%
	No	219	51.0%
Crystal			
methamphetamine:	Yes	258	60.1%
	No	11	39.9%
Other			
amphetamines:	Yes	24	5.6%
	No	405	94.4%

Table B4 cont'd

Descriptive Statistics for Items Measuring Hard Drug Use

Hard drug use measure		<i>n</i>	%
GHB:	Yes	190	44.3%
	No	239	55.7%
Ketamine:	Yes	205	47.8%
	No	224	52.2%
Heroin:	Yes	190	44.3%
	No	239	55.7%
Steroids:	Yes	149	34.7%
	No	280	65.3%
Prescription pills:	Yes	233	54.3%
	No	196	45.6%
Other:	Yes	131	30.5%
	No	298	69.5%

Note: All *N*s = 429; Number of missing values equal .03%.

Table B5

Descriptive Statistics for Items Measuring Risky Sex-Related HIV Behaviour

Risky sexual behaviour measure	<i>n</i>	%
Age first sexual intercourse		
Never had intercourse	58	13.5%
10 years old	32	7.5%
11 years old	24	5.6%
12 years old	38	8.9%
13 years old	81	18.9%
14 years old	78	18.2%
15 years old	48	11.2%
16 years old	35	8.2%
17 years old	23	5.4%
18 years old	12	2.8%
Number of lifetime female sexual partners		
Never had intercourse	76	18.2%
0 females	95	22.8%
1 female	34	8.2%
2 females	40	9.6%
3 to 5 females	50	12.0%
6 or more females	122	29.3%

Table B5 cont'd

Descriptive Statistics for Items Measuring Risky Sex-Related HIV Behaviour

Risky sexual behaviour measure	<i>n</i>	%
Sexual partners in past 3 months		
Never had intercourse	68	16.1%
None	65	15.4%
1 person	140	33.1%
2 people	59	13.9%
3 to 5 people	57	13.9%
6 or more people	34	8.0%
Drug or alcohol use at last intercourse		
Never had intercourse	56	13.2%
Yes	209	49.4%
No	158	34.7%

Note: *Ns* range from 417 to 429; Number of missing values range from .03% to 3.1%

Table B6

Descriptive Statistics for Items Measuring HIV-Related Street Survival Behaviour

Street survival behaviour measure		<i>n</i>	%
Items traded sex for			
Food:	Never	365	95.1%
	Once	13	3.4%
	2+ times	6	1.6%
Clothing:	Never	363	95.3%
	Once	11	2.9%
	2+ times	7	1.8%
Shelter:	Never	361	94.0%
	Once	13	3.4%
	2+ times	10	2.6%
Transportation:	Never	368	96.1%
	Once	9	2.3%
	2+ times	6	1.6%
Money:	Never	349	89.5%
	Once	19	4.9%
	2+ times	22	5.6%
Drugs or alcohol:	Never	349	89.5%
	Once	19	4.9%
	2+ times	22	5.6%
Other:	Never	298	97.7%
	Once	2	0.7%
	2+ times	5	1.2%

Table B6 cont'd

Descriptive Statistics for Items Measuring HIV-Related Street Survival Behaviour

Street survival behaviour measure	<i>n</i>	%
Age first traded sex: Never	336	81.9%
10 or younger	8	2.0%
11 years old	1	0.2%
12 years old	4	1.0%
13 years old	11	2.7%
14 years old	11	2.7%
15 years old	9	2.2%
16 years old	7	1.7%
17 years old	12	2.9%
18 years old	11	2.7%
Number of lifetime male sexual partners		
Never had intercourse	92	22.8%
0 males	121	30.0%
1 male	19	4.7%
2 males	15	3.7%
3 or 5 males	60	14.9%
6 or more males	97	24.0%

Table B6 cont'd

Descriptive Statistics for Items Measuring HIV-Related Street Survival Behaviour

Street survival behaviour measure	<i>n</i>	%
Condom use at last intercourse		
Never had intercourse	55	13.0%
Yes	219	51.8%
No	149	35.2%
Number of pregnancies		
None	289	69.9%
One	68	16.4%
2 or more	44	10.6%
Not sure	13	3.1%
Told by doctor or nurse had STI		
Yes	79	18.9%
No	339	81.1%
Shared needles/gear		
Yes	104	24.7%
No	293	69.6%
Not sure	24	5.7%

Note: *Ns* range from 380 to 423; Number of missing values range from 1.7% to 11.7%.

Table B7

Descriptive Statistics for Items Measuring Drug- and Alcohol-Related Service Use

Drug- and alcohol-related service use measure	<i>n</i>	%
Access drug or alcohol counselling		
Yes	102	25.5%
No	270	63.7%
Unavailable	46	10.8%
Access youth detox centre		
Yes	95	22.4%
No	279	66.0%
Unavailable	49	11.6%

Note: *Ns* range from 423 to 424; Number of missing values range from 1.4% to 1.7%.

Table B8

Descriptive Statistics for Items Measuring Needle-Related Service Use

Needle-related service use measure	<i>n</i>	%
Access needle exchange		
Yes	85	20.0%
No	292	68.5%
Unavailable	49	11.5%
Access safe injection site		
Yes	108	18.1%
No	295	68.6%
Unavailable	57	13.3%

Note: *Ns* range from 426 to 430; Number of missing values range 0% to 1%.