

# **Characteristics of young adult crack-cocaine users in Brazil: A sex- and gender-based analysis**

**by**

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B.A. (Hons.), Dalhousie University, 2011

Thesis Submitted in Partial Fulfillment of the  
Requirements for the Degree of  
Master of Science

in the

Master of Science Program

Faculty of Health Sciences

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**SIMON FRASER UNIVERSITY**

**Spring 2014**

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## **Abstract**

Crack-cocaine use represents a major social and public health challenge in Brazil. Important sex and gender differences have been found among crack users in other countries, but little comparative data exists regarding male and female crack users in Brazil. This secondary, sex-and-gender-based analysis explores potential sex differences in key characteristics of a community-based sample of young crack users (n=159) in two Brazilian cities. Participants completed an anonymous questionnaire on social, health and behavioural characteristics, and serological testing for HIV and HCV. Data was analyzed using univariate and stepwise discriminant analyses. Discriminant modeling found that: (1) Paid work, HIV testing, sex work, and begging differentiated male and female crack users; (2) Female sex independently predicted HIV testing history; and (3) Alcohol use, poor self-rated mental health and an absence of paid work predicted unprotected sex among participants. These findings suggest the need for gender-specific prevention strategies targeting sex-related risk among young Brazilian crack users.

**Keywords:** Crack-cocaine use; Epidemiology; Sex- and gender-based analysis; Risk environment; Brazil

*For M., who knows why.*

## **Acknowledgements**

Thank you to my senior supervisor, Benedikt Fischer for his guidance and expertise, and for the opportunity to take on this work, and to my supervisory committee members, Elliot Goldner and Marina Morrow for their support and encouragement. I would also like to acknowledge Cecilia Benoit, Wayne Jones and Rodney Hunt for their valuable contributions to my project.

A very special thank you to Marcelo Santos Cruz, Francisco Bastos, Neilane Bertoni, and the research staff at the University of Rio de Janeiro and the Oswaldo Cruz Foundation. Additionally, I would like to recognize the Faculty of Health Science and the IMPART research training program for their generous financial support for this project.

Finally, I would like to express my deep gratitude to my friends and family for their fierce support, patience and tenderness over the last two years. This accomplishment would not have been possible without you.

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# **Chapter 1.**

## **Introduction**

### **1.1. Background**

Currently, Brazil is believed to be the largest crack-cocaine market in the world (United States Department of State, 2012), and national estimates indicate that there may be as many as one million active crack users in the country (Laranjeira et al., 2012). The scale, severity and increasing visibility of crack abuse in Brazil has generated significant public concern (Confederacao Nacional de Municipios, 2011; Forero, 2012): Large, open-air markets for crack use have emerged in several of Brazil's major cities, and the proliferation of crack addiction among vulnerable segments of Brazilian society, including impoverished children and youth, has been described by researchers as a public health emergency (Bastos, 2012). In response to growing public health and safety concerns, the Brazilian government initiated a two-year CAN\$2.2 billion National Crack Strategy in 2012, intended to eradicate crack trafficking, consumption and drug-related violence in the country (Brasil, 2012) – although the impact of this action is currently unclear.

Crack use is associated with a number of significant health and social harms, which pose challenges to effective public health and policy responses. Crack users present with a number of negative health consequences, including respiratory and neurological conditions (Devlin & Henry, 2008; Glauser & Queen, 2007), high rates of infectious disease, including HIV/AIDS, viral hepatitis, sexually-transmitted infections, and tuberculosis (Howard, Klein, Schoenbaum, & Gourevitch, 2002; Khan et al., 2013; Ross, Hwang, Zack, Bull, & Williams, 2002; Scheinmann et al., 2007), and inflated mortality rates in comparison with the general population (Degenhardt et al., 2011). In addition to physical health problems, elevated levels of co-morbid psychiatric disorders,

including mood, personality and concurrent substance use disorders have also been documented among people who use crack (Falck, Wang, Siegal, & Carlson, 2004; Ford et al., 2009; Gossop, Manning, & Ridge, 2006). Crack use is also linked to substantial social vulnerabilities, including homelessness, participation in illegal income generating activities (e.g., theft/robbery, sex work, drug dealing), and involvement with the criminal justice system (Cross, Johnson, Davis, & Surratt, 2001; Falck, Wang, Siegal, & Carlson, 2003; Fischer et al., 2006); and in North America, the social harms related to crack use, including drug-related violence and incarceration, have disproportionately impacted impoverished communities (Edlin et al., 1994; Fischer & Coghlan, 2007; Werb et al., 2010). Despite the severe health and social consequences of crack use, and the high abuse potential of the drug (Chen & Anthony, 2004; Dackis & O'Brien, 2001), few preventive or treatment interventions specific to crack use are currently available, and existing interventions (e.g., psychosocial/behavioural treatment) have not demonstrated sustainable, long-term effects (Fischer, Tiesmaki, Rudzinski, Lusted, & Rehm, 2012).

While crack use is a relatively new phenomenon by Brazilian standards, other global regions with a longer history of crack consumption (i.e., North America) have noted important socioeconomic and cultural dimensions of this form of drug use. In particular, previous research in this context has found gender-based differences in the substance use, socioeconomic, criminal, and sexual risk characteristics between men and women who use crack (Evans, Forsyth, & Gauthier, 2002; Logan, Cole, & Leukefeld, 2003; Shannon, Rusch et al., 2008; Tortu et al., 1998), which have important implications for preventive and treatment interventions targeting crack users (e.g., gender-tailored services). However, few studies to date in Brazil have examined potential sex or gender-based differences among people who use crack, where the majority of epidemiological studies have focused solely on male participants, or feature women in small proportions (i.e., <15% of total sample; see: Azevedo et al., 2007; Dunn & Laranjeira, 1999; Filho, Turchi, Laranjeira, & Castelo, 2003; Guindalini et al., 2006; Turchi et al., 2003; Dias et al., 2011). As such, very little comparative evidence regarding the characteristics of Brazilian men and women who use crack is currently available.

Given the multiple health and social problems associated with crack use, and the paucity of sex- and gender-based analysis in Brazilian literature, the present study will explore potential sex differences across a range of key social, health and behavioural characteristics, in a multi-site community-based sample of young, Brazilian crack users. In doing so, this research will contribute important new knowledge regarding the social, health, and behavioural profiles of young women and men who use crack in Brazil, and inform potential gender-specific intervention needs among this group of young drug users.

## **1.2. Literature Review**

### **1.2.1. Crack-cocaine use in Latin America**

Global cocaine production is concentrated in Latin America's Andean region (Bolivia, Peru, & Colombia), where the coca leaf – a medicinal ingredient used to produce cocaine – is cultivated (United States Department of State, 2012). Historically, the demand for cocaine has been largely driven by European and North American drug markets, where the highest rates of global cocaine consumption have traditionally been observed (Gootenberg, 2008; United Nations Office on Drugs and Crime, 2011). However, in the past decade key shifts in global cocaine consumption trends have been observed: cocaine use appears to be declining in major North American and European consumer markets, and Latin America is poised to become one of the largest cocaine consumer regions in the world, with an estimated 3.5 million current cocaine users (United Nations Office on Drugs and Crime, 2013). A comparative analysis of six Latin American countries (Inter-American Drug Abuse Control Commission, 2011; United Nations Office on Drugs and Crime, 2008) found that past-year cocaine consumption rates for the subregion significantly exceeded the global average (1.4% vs. 0.3%), and documented high levels of cocaine dependence – ranging from 18% to 46% of cocaine users, depending on the country.

The availability and quality of surveillance data regarding cocaine consumption and patterns of use (i.e., inhaled vs. smoked cocaine) in Latin America is currently limited (Aguilar-Gaxiola et al., 2006). However, existing epidemiological evidence

indicates that the use of smokable cocaine derivatives, including cocaine base paste (CBP) and crack-cocaine, may represent an important form of drug use in select Latin American countries (i.e., Brazil, Argentina; Inter-American Drug Abuse Control Commission, 2011; United Nations Office on Drugs and Crime, 2011). Lifetime prevalence estimates for smokable cocaine use in 11 Latin American countries were found to range from 0.14% to 3.10% among the population aged 15 to 65 (Inter-American Drug Abuse Control Commission, 2011), and significantly higher lifetime prevalence rates of crack cocaine use have been documented among incarcerated and street-involved youth in Brazil, El Salvador, and Argentina (Dualibi, Ribeiro, & Laranjeira, 2008; Fialho et al., 2008; Inter-American Drug Abuse Control Commission, 2011; Secretaria de Programacion para la Prevencion de la Drogadiccion y la Lucha contra el Narcotrafico, 2007).

### **1.2.2. Characterizing crack-cocaine use in Brazil**

Brazil is the largest and most populous country in Latin America, comprised of 27 individual states and over 190 million inhabitants (Instituto Brasileiro de Geografia e Estatistica, 2011). The country's proximity to major cocaine-producing countries, and its expansive, porous border system (Forero, 2013; United States Department of State, 2012) has made it a key drug trafficking route for cocaine destined for European and African markets, and the second largest cocaine consumer country in the world (United Nations Office on Drugs and Crime, 2011). Accounts of crack use first emerged in Southeastern Brazil (i.e., São Paulo) in the early 1990s, where it was observed among street-involved cocaine users and people seeking drug treatment (Andrade, Lurie, Medina, Anderson, & Dourado, 2001; Dunn, Laranjeira, Da Silveira, Formigoni, & Ferri, 1996; Inciardi, Surratt, & Telles, 2000). The advent of crack in Brazil signaled a dramatic reduction in the prevalence of cocaine injection in many areas, and a corresponding increase in the prevalence of crack use among people involved in illicit drug use – often in the span of only a few years (Bastos, de Pina, & Szwarcwald, 2002; Ferri & Gossop, 1999; Formiga, Santos, Dumcke, & Araujo, 2009; Mesquita et al., 2001).

Important regional differences in crack production and consumption trends have been documented in Brazil, including the presence of multiple crack and smokable

cocaine variants (e.g., oxi, merla, basuco), which circulate simultaneously with crack in local drug markets (Bastos, Mendes, Arruda Vieira Duarte, & Bertoni, 2011; Blickman, 2006; Nappo, Sanchez, Rameh, Almedia, & Uchoa, 2012). Smoking appears to be the dominant form of crack consumption in Brazil, which often involves the use of makeshift smoking equipment, including aluminum cans and plastic or glass containers (Inciardi et al., 2006; Pechansky et al., 2007). The simultaneous use of crack with other substances, including alcohol, tobacco, cocaine and marijuana appears to be common among Brazilians who use crack (Dualibi et al., 2008; Laranjeira et al., 2012; Leukefeld et al., 2005). In particular, crack and marijuana co-use – often in the form of a mixed crack/marijuana cigarette – has been identified by users as an important method for regulating or modifying the effects of crack (Andrade, Santiago, Amari, & Fischer, 2011; Labigalini, Rodrigues, & Da Silveira, 1999).

### **1.2.3. Brazilian crack users: prevalence and characteristics**

Presently, no comprehensive municipal or state-level estimates of the size of the Brazilian crack user population are available (Bastos, 2012), although national estimates suggest that there may be as many as one million active crack users in Brazil (Laranjeira et al., 2012; United States Department of State, 2012). National survey data on substance use among Brazilians aged 15–49 suggests that crack use is relatively rare in the general population (<1% lifetime prevalence; Centro Brasileiro de Informação sobre Drogas Psicotrópicas, 2006), but significantly higher levels of crack use have been documented among incarcerated persons (Burattini et al., 2005; Priuli & Moraes, 2007), commercial sex workers (Nunes, Andrade, Galvão-Castro, Bastos, & Reingold, 2007) and children and adolescents living in the street (Moura, Sanchez, & Noto, 2010; Noto et al., 2003). A 2004 survey of street children and adolescents (aged 10–18) in 27 Brazilian state capitals found that respondents reported frequent crack use, with past-month consumption rates ranging from 15% to 26% (Noto et al., 2003). In this context, the majority of Brazilian crack users have been characterized as young (<30 years), single males who report low education, high unemployment, unstable housing or homelessness, and involvement in property, drug and violent crime (Carvalho & Seibel, 2009; Dualibi et al., 2008; Dunn & Laranjeira, 1999; Ribeiro, Sanchez, & Nappo, 2010).

Important morbidity and mortality characteristics have been found among people who use crack in Brazil. Crack users report a range of physical health problems, including tuberculosis, pneumonia, malnutrition, and neurophysiological and drug overdose symptoms (Balbinot, Alves, Junior, & Araujo, 2011; Batista et al., 2013; Ferri, Dunn, Gossop, & Laranjeira, 2004; Oliveira et al., 2012; Oliveira & Nappo, 2008); and comorbid mental health problems, including other substance abuse disorders, also appear to be prevalent (Kessler et al., 2008; Kessler et al., 2012; Zubaran, Foresti, Thorell, Franceschini, & Homero, 2010). A multi-site study of drug treatment patients in four Brazilian capital cities (Kessler et al., 2012) found that crack users (n=115) presented with significantly higher rates of comorbid psychiatric disorders than other substance users, including major depression (47.8%), suicidal ideation (47.4%), alcohol dependence (42.1%), attention deficit and hyperactivity disorder (36.8%) and antisocial personality disorder (24.8%). Suicide attempts, family violence and histories of childhood maltreatment have also been documented in high proportions in Brazilian crack user samples (Narvaez et al., 2012; Noto, Nappo, Galduróz, Mattei, & Carlini, 1997; Selegim, Marangoni, Marcon, & Oliveira, 2011).

Consistent with evidence from North America, crack users in Brazil also demonstrate involvement in sexual risk behaviours that increase their susceptibility to blood-borne viruses (BBVs) and sexually-transmitted infections (STIs), including infrequent condom use, multiple sex partners, and trading sex for money or drugs (Azevedo, Botega, & Guimaraes, 2007; Carvalho & Seibel, 2009; von Diemen, De Boni, Kessler, Benzano, & Pechansky, 2010). Among 120 active crack/cocaine users in Porto Alegre, 66% reported inconsistent condom use, 25% paid for sex in the past month, and 27% reported sex with an HIV-positive partner (Leukefeld et al., 2005). Recent estimates of HIV prevalence in Brazil indicate that illicit drug users have an HIV prevalence rate 10 times greater than the general population (5.9% vs. 0.6%; Brazilian Ministry of Health, 2012a), but no systematic data on HIV prevalence among crack users currently exists (Malta et al., 2010). Additionally, epidemiological information regarding drug consumption behaviours that may contribute to BBV risk among people who use crack (e.g., crack pipe sharing; Fischer et al., 2007; Scheinmann et al., 2008) is missing from existing Brazilian research literature.

Mortality rates for Brazilian crack users have also been found to exceed those observed in the general population. According to national forensic data, the proportion of overdose fatalities related to crack and cocaine consumption increased significantly in Brazil, from 14.2% of cases in 2006 to 26.7% in 2008, and traumatic death accounted for the majority (52%) of cases in which cocaine was detected (Campelo & Caldas, 2010). Violence appears to be a common occurrence in crack users' daily lives, and Carvalho and Siebel (2009) found that 80% of crack users in São Paulo (n=204) reported either directly witnessing or knowing someone who was murdered for drug-related reasons. Similarly, findings from a longitudinal study of 131 crack users in São Paulo (Dias et al., 2011) highlighted crack users' apparent vulnerability to death by external causes: 27 participants died during the 12-year study period – reflecting a mortality rate 12 times higher than that of the general population – and the main cause of death was homicide (n=16), followed by HIV/AIDS-related complications (n=6) and drug overdose (n=3).

#### **1.2.4. Integrating sex/gender in substance use research**

In parallel with epidemiological research on drug use, there has been a significant interest in exploring the socio-cultural, structural and environmental aspects of individual and group-level substance use (Rhodes, 2009). Within this work, the impact of sex and gender on the course, characteristics, outcomes and experiences of women and men's drug use has become an important area of inquiry (Greaves & Poole, 2007). Broadly speaking, 'sex' describes the biological and secondary sex characteristics that distinguish female, male, intersex and transsexual persons (Health Canada, 2003; Johnson, Greaves, & Repta, 2007); while 'gender' refers to the socially-constructed roles, attributes and social status differentially ascribed to women and men. More recent definitions have sought to recognize the inseparability of these biological and cultural factors in shaping health, and have proposed an integrated 'sex/gender' terminology (Krieger, 2003; Springer, Stellman, & Jordan-Young, 2012). For the purposes of this paper, I will use this integrated 'sex/gender' term.

Sex and gender have been recognized as fundamental determinants of human health, which differentially – and in some cases, unequally – affect men and women's health risks and outcomes, health-related behaviours, and access to healthcare services

(Benoit & Shumka, 2009; World Health Organization, 2009; Health Canada, 2003). Consequently, the inclusion and appropriate consideration of sex and gender is considered critical to ensuring the quality and relevance of research on human health, and the development of evidence-based health responses (Greaves, 2000). To this end, there is a growing recognition of the importance of sex- and gender-based analysis (SGBA) in generating comprehensive health knowledge, which enables researchers to systematically investigate the biological (sex) and social (gender) differences that may exist between men and women, in relation to a particular health problem (Olliffe & Greaves, 2012).

Over time, a considerable body of epidemiological and clinical evidence has evolved to address sex and gender within studies of substance use. Comparative research has documented important sex and gender differences in substance use epidemiology, substance use trajectories, susceptibility to abuse/dependence, social characteristics, biological processes, physical and mental health consequences, and access, retention and outcomes of substance use treatment (Greenfield et al., 2010; Tuchman, 2010; Anderson, 2005). In general, women appear to demonstrate a more rapid progression to problematic substance use (Hernandez-Avila, Rounsaville, & Kranzler, 2004) Brady & Randall, 1999; Greenfield, Back, Lawson, & Brady, 2010); exhibit higher levels of co-morbid mood, anxiety and traumatic disorders (Zilberman, Tavares, Blume, & el-Guebaly, 2003); and experience distinct social and economic barriers to substance use treatment, including male-oriented treatment models, childcare and financial issues, and social stigma (Greenfield et al., 2007).

In parallel with clinical and epidemiological data, ethnographic work in this area has documented the impact of social constructions of femininity and masculinity on the practice and meaning of men and women's substance use (Measham, 2002; Collison, 1996; Henderson, 1996; Ettore, 2004), and the expression of gender dynamics within illicit drug cultures (Rosenbaum, 1981; Bourgois, 2002; Maher, 1997; Miller, 1995). Collectively, this body of knowledge demonstrates that men and women experience substance use and related harms in distinct ways, and establishes the importance of addressing sex and gender in improving knowledge of the nature, etiology and socio-

cultural context of substance use, and developing appropriate intervention and policy responses (Greaves & Poole, 2007).

### **1.2.5. Sex/gender and crack-cocaine**

An important body of literature has emerged regarding the gendered experiences of men and women involved in crack cocaine use in North America. The following section will review major epidemiological and clinical findings concerning the characteristics of women and men who use crack cocaine, and key qualitative literature on gender and crack use.

#### ***Epidemiological data: sex differences between male and female crack users***

North American research has highlighted important differences in the substance use, sociodemographic and health profiles of women and men who use crack. Epidemiological data indicates that women use crack at similar, and in some cases, higher levels than male crack users (Cross et al., 2001; Cross et al., 2001; Falck, Wang, & Carlson, 2008; Tortu et al., 1998), but appear to evidence more severe crack dependence – as measured by standard diagnostic criteria for substance abuse/dependence (Lejuez, Bernalova, Reynolds, Daughters, & Curtin, 2007; Pope, Falck, Carlson, Leukefeld, & Booth, 2011). Polysubstance use – the concurrent or sequential use of multiple substances – appears to be common among crack users (Khan et al., 2013), although there is currently no conclusive evidence of gender-specific patterns of polysubstance among women and men who use crack (Maranda, Han, & Rainone, 2004; Royse et al., 2000; Tortu et al., 1998).

Research on income generation among crack users indicates that men and women enact different strategies to acquire material resources. Male crack users have been found to report greater involvement in drug market and informal (e.g., 'odd job') labour than women, who identify social assistance payments, money from family/friends, and sex work among their primary sources of income (Cross et al., 2001; DeBeck et al., 2007). Women who use crack consistently demonstrate greater involvement in sex work than men (Booth, 1995; Edlin et al., 1994; Logan et al., 2003), and report a greater

number of sexual partners, more IDU partners, and higher levels of recent sexual activity (Atkinson, Williams, Timpson, & Schonnesson, 2010; Booth, Kwiatkowski, & Chitwood, 2000; Ross et al., 2002).

Involvement in sex work has been identified as an independent predictor of STI, HIV and HCV infection among women who use crack (Cavazos-Rehg et al., 2009; Edlin et al., 1994; Logan & Leukefeld, 2000; Shannon et al., 2008). A multi-site sample of female crack users in the United States (n=4,667) found that women who reported sex work (n=2,658) had significantly higher rates of STIs than women who did not exchange sex, including gonorrhea (40% vs. 20%), syphilis (22% vs. 6%), chlamydia (12% vs. 7%) and HIV (14% vs. 7%; Logan & Leukefeld, 2000); and comparative studies of crack users have documented significantly higher rates of these infections among women than men (Hwang et al., 2000; Jones et al., 1998). Importantly, a small proportion of male crack users have also been found to participate in sex work to varying degrees (Baseman, Ross, & Williams, 1999; Cavazos-Rehg et al., 2009; Logan et al., 2003). Sexual contact with other men appears to play an important role in this behaviour (Hagan, Perlman, & Des Jarlais, 2011), and men's involvement in sex work has been identified as a potential pathway for HIV "bridging" between male crack users and their sexual partners (Tobin, German, Spikes, Patterson, & Latkin, 2010). Further, both men and women who use crack report similarly low levels of condom use, which appears to persist regardless of sex partner characteristics (e.g., spouse vs. casual sex partner; Brewer, Zhao, Metsch, Coltes, & Zenilman, 2007; Siegal, Falck, Wang, & Carlson, 1996).

Sex/gender differences in mental health problems have also been documented among crack users (Johnson, Striley, & Cottler, 2006; Lejuez et al., 2007). Kopetz et al.'s (2013) survey of 211 in-treatment crack users found that a significantly greater proportion of women (n=67) met diagnostic criteria for major depression (36% vs. 22%), anxiety (14% vs. 7%) and borderline personality disorder (40% vs. 22%) than men. Histories of childhood maltreatment and trauma appear to be common among people who use crack (Medrano, Hatch, Zule, & Desmond, 2002), but important differences have been found regarding the nature of these events: women who use crack appear to experience more instances of sexual violence, including childhood sexual abuse, than

men (Hyman, Garcia, Kemp, Mazure, & Sinha, 2005; Logan et al., 2003), who report greater exposure to physical violence (Johnson et al., 2006). Homelessness and unstable housing is reported by a greater proportion of male crack users than women (Atkinson et al., 2010; Tortu et al., 1998), and Royse and colleagues' (2000) multisite study of crack users in the United States found that men were twice as likely to be homeless compared to women – although there is evidence that homeless female crack users face unique challenges, including involvement in street-based sex work, and susceptibility to violence and victimization (Edwards, Halpern, & Wechsberg, 2006; Wechsberg et al., 2003).

### ***The gender dynamics of crack-cocaine use: ethnographic and qualitative literature***

In general, much of the gender-oriented research on crack-cocaine use has explored women crack users' experiences and positions within the illicit drug economy, and the gender dynamics of this context – with a special interest in sex work and the so-called 'sex-for-crack' phenomenon (see: Ratner, 1993; Inciardi, Lockwood, & Pottigier, 1993). It is important to note that gender-oriented crack research has focused extensively on women's experiences, and studies of masculinity within crack use culture have not been afforded the same level of attention – with the exception of Phillipe Bourgois' (2002) pioneering ethnography of male crack dealers in New York City's El Barrio neighborhood. As such, this review primarily addresses the gendered experiences of women who use crack.

Key ethnographic works have explored the nature of women's roles within the crack cocaine economy (Dunlap, Johnson, & Maher, 1992; Maher, 1997; Bourgois & Dunlap, 1993; Sterk, 1999), and have emphasized how gender stratification and hierarchy within illicit drug markets limit women crack users' opportunities for participation in profitable forms of drug-related work. In particular, research in this area has highlighted how the structure of crack-cocaine trafficking and dealing networks favours male participation, due to male domination of high level positions within the crack economy; the presence of male 'sponsors' to facilitate and manage individuals' participation in the illegal drug market; and women's perceived unsuitability for illegal work (Maher & Hudson, 2007; Bourgois, 2002). Consequently, women who use crack

are largely excluded from drug-related work, or otherwise relegated to low-level, peripheral (e.g., police 'lookouts', drug runners) or traditionally gendered positions (i.e., crack "cooking"/manufacturing, provision of housing) that confer little remuneration or social status (Sterk, 1999; Anderson, 2005). Women who succeed in securing higher-level positions often do so on the basis of their relationships with men, who function as gatekeepers to the illicit drug economy (Maher & Hudson, 2007).

Gendered patterns have also been identified in the types of criminal activity reported by crack users. Men who use crack tend to be involved in crimes that are associated with a greater risk of arrest (e.g., armed robbery, property crimes, drug dealing), while women primarily report involvement in petty crimes, like shoplifting and fraud (Evans et al., 2002; Maher & Curtis, 1992). These patterns have been attributed to the male-dominated nature of street-level criminal networks, which support and reward specific expressions of violent masculinity (Anderson, 1999; Mullins, 2008), and enforce a powerful, institutionalized sexism against women involved in crime or drug use (Bourgois, 2000; Maher, 1997). Mullins (2008) argues that women's involvement in crime is restricted both by the social marginalization and misogyny they face within street-level criminal networks, and the demands of normative, feminine gender roles that dictate woman-appropriate criminal activity. Collectively, work in this area highlights the gendered nature of criminal and drug-related activity within crack-cocaine markets, and women's limited capacity to generate resources through these illegal avenues.

Conversely, women who use crack appear to have a predominant role within local sex trade markets, and female crack users' involvement in sex work and 'sex-for-crack' exchanges has been a driving focus for ethnographic research on women and crack use (Inciardi et al., 1994; Ratner et al., 1992). Women crack users' involvement in sex work has been linked to a number of factors, including the relative profitability of sex work compared to other forms of available employment (e.g., low-wage labour), the comparatively low level of skill required for participation, and the ready access to money and resources afforded by this type of work (Maher, 1997; Inciardi et al., 1993; Sterk, 1999). Within this literature, female crack users' involvement in sex work has been framed as economically instrumental both to the financial wellbeing of individual women, and to the illicit drug economy itself (Anderson, 2008; May et al., 1999).

The nature of sex work in the crack use milieu has been found to pose important challenges to women's health and safety. Sex work in the context of crack use has been characterized as being significantly more violent, degrading and dangerous than other forms of commercial sex work (Erickson, Butters, McGillicuddy, & Hallgren, 2000; Inciardi, Lockwood, & Pottigier, 1993; Maher & Curtis, 1992); and research in this area has highlighted women crack users' subordinate, sexualized and stigmatized positions both within crack user and mainstream cultures (Fulilove et al., 1992; Elwood et al., 1997). Specific features of this type of sex work have been identified as barriers to safer sex (i.e., condom use) among women who use crack, including: crack intoxication or withdrawal, economic incentives to engage in unprotected sex, client-perpetrated violence, and insecure/unstable working conditions – particularly in the context of street-based sex work (Inciardi et al., 1993; Maher, 1997; Shannon, et al., 2008; Williams et al., 2000). Researchers have also suggested that the economic interrelationship between crack and sex work markets has worked to create unsafe conditions for sex workers, as the low price of crack has resulted in the systematic devaluation of street-based sex work (Baseman et al., 1999; Maher, 1997). Consequently, riskier forms of sex work (e.g., multiple sex partners, unprotected sex) and a greater number of daily clients are required in order to generate sufficient income (Baseman et al., 1999; Nappo, Sanchez, & Oliveira, 2007). Women's ability to enact safer sex practices with sex work clients, or exert control over their earnings may also be compromised by the involvement of a male partner in the direction or monitoring of their sex work and related income (Shannon et al., 2008).

Relationships with intimate male partners also represent a potential source of BBV risk, due to negative perceptions of condom use with sex partners (i.e., condoms as a barrier to trust, pleasure, intimacy; Williams et al., 2000), potential inequalities in women's status and power within romantic relationships (Amaro, 1995), and pressure for women to subsidize their male partner's expenses through sex work (Sterk, 1999). Women's relationships with drug using male partners are also influential to the course and trajectory of their crack use, as research has found that women tend to be introduced to crack by an intimate male partner (Evans, 2002; Henderson & Boyd, 1994), and that crack use often constitutes an important focal point within these relationships (Maher, 1997). In particular, these relationships with male, drug-using

partners may act as a barrier to women crack users' entry into drug treatment (Falkin & Strauss, 2003).

### **1.2.6. Current state of knowledge: sex/gender and crack use in Brazil**

Brazilian literature on crack use has tended to focus on either male or female-exclusive samples, and as such, little comparative information regarding men and women who use crack exists in this context. However, available evidence on female crack users in Brazil appears to confirm the pattern of social disadvantage observed among Brazilian crack users (Malta et al., 2008; Nunes et al., 2007). An ethnographic study of 75 female crack users in São Paulo (Nappo, Sanchez, & De Oliveira, 2011) found that women reported early initiation to sex (10-14 years of age) and crack use (<20 years old), and 91% were unemployed, 77% had incomplete elementary schooling, and 62% had at least one child. Additionally, research with 85 pregnant women in an inpatient detoxification unit in Porto Alegre (Costa et al., 2009) documented heavy crack use and concurrent use of tobacco (89.4%), alcohol (63.5%) and marijuana (51.8%) among patients, and high levels of incarceration and criminal involvement, including robbery (41.2%), sex work (44.7%) and home desertion (38.8%). Women in the sample also demonstrated poor retention in outpatient drug treatment following discharge from detoxification (25% retention rate; *ibid.*).

A high prevalence of BBVs have been documented among Brazilian women involved in sex work (Malta et al., 2010), with substantial variation in HIV and viral Hepatitis rates across crack user samples. For instance, a survey of 73 female crack users in Porto Alegre (von Diemen et al., 2010) documented infrequent condom use (49.3%) and recent involvement in sex work in exchange for crack (17.8%) among participants, and found high rates of HIV (37.0%) and HCV (27.7%), with a 15% co-infection rate. Conversely, Nuñez et al's (2007) survey of 125 crack-using women in Salvador documented similar levels of sexual risk behaviour, but found substantially lower rates of HIV (1.6%) and HCV (2.4%) infection. Crack use has been identified as an independent predictor of HIV status among Brazilian women involved in sex work, and Szwarcwald et al.'s (1998) study of 697 female sex workers in Santos, Brazil found

that crack use was associated with a five-fold increased odds of contracting HIV (adjusted OR = 5.30,  $p < .0001$ ), and that women who used crack reported significantly higher levels of unprotected sex with clients, greater marijuana and injection drug use, and lower earnings than non-crack using women. Additionally, women of Afro-Brazilian descent (i.e., Black or Mixed Race Brazilians) have been represented in high proportions in studies of female crack users (greater than 60%; see: Nunes et al., 2007; von Diemen et al., 2010), but the potential role of race in relation to crack use, gender and BBV risk in Brazil has not been addressed by research in this area.

While epidemiological research on female crack users in Brazil is currently limited, existing qualitative evidence provides important insight into the lives of women involved in this type of drug use. Malta et al's (2008) interviews with women who use crack and were involved in commercial sex work ( $n=27$ ) in the Southern city of Foz de Iguaçu, highlight the degree of instability, danger and violence that characterizes the daily lives of many of these women. Women described pervasive violence in their communities, work environments and personal lives; and many reported experiencing harassment and violence perpetrated by police, intimate partners or sex work clients. Women also reported a range of health problems, including STIs, tuberculosis and respiratory problems, which were generally untreated due to a virtual absence of public health services, including reproductive health and prenatal/maternal care, in their communities. In relation to sex work, participants reported that condom use was rare, and that their ability to negotiate safer sex was often impacted by their crack use (e.g., being intoxicated or experiencing withdrawal symptoms), and the dangerous/potentially violent environments in which they worked.

Attitudes and norms about condom use also appear to be influential in Brazilian crack users' decisions to use condoms. Women who use crack have identified a range of reasons for not using condoms, including the increased payment associated with unprotected sex (Shannon, 2008); fears of violence/victimization from clients or sex partners (Malta, 2008); perceptions that condoms reduce sensation/pleasure, and feelings of trust and intimacy with regular or romantic sex partners (Malta, 2008; Ribeiro et al., 2011); and beliefs that condoms are only required to in instances where there is a risk of pregnancy (i.e., not required for oral or anal sex)(Nappo et al., 2007). Gender

norms about condom use also appear to influence unprotected sex among Brazilian crack users, as Nappo et al (2007) described a tendency for female crack users involved in sex work to perceive male clients as being responsible for the decision to use condoms

Being under the influence of crack, or experiencing acute withdrawal/craving has also been shown to impede condom use among Brazilian crack users, and increase individuals' willingness to engage in riskier sexual activities. Interviews with 40 current and former crack users (50% female) in São Paulo found that respondents reported that crack withdrawal/craving strongly influenced their decision to trade sex for crack, and that condom use was deprioritized when experiencing withdrawal symptoms (Chaves et al., 2011). Further, studies with male crack users in Brazil suggest that a subset of men participate in sex trading with other men in order to obtain money or crack, and that these exchanges often involved unprotected anal or oral sex (Oliveira & Nappo, 2008; De Souza et al., 2002).

### **1.3. Summary**

Extant sex/gender-oriented literature on crack use in North America strongly suggests that distinct aspects of the experience, risks, and outcomes associated with crack cocaine use exist for women and men. In particular, ethnographic evidence highlights the existence of social, economic and gender dynamics within street networks, which collectively undermine the health, safety and status of women who use crack. Brazilian literature on female crack users – while presently limited – indicates that Brazilian women who use crack experience significant health and social problems, including high levels of BBVs, poverty and involvement in sex work; and also points to underlying environmental factors that may generate specific types of sexual risk for men and women who use crack in this context. Given the important public health challenge currently posed by crack use in Brazil, there remains a need to consider potential sex/gender-based differences in the social profiles, health and service needs of Brazilian crack users in this context, and the implications for health-oriented preventive and treatment interventions targeting men and women involved in this form of drug use.

## **1.4. Current Study**

### **1.4.1. Theoretical framework**

The Risk Environment Framework (Rhodes, 2002) is a valuable conceptual tool for understanding how aspects of the physical and social environment shape drug-related risk, and has previously been used in gender-oriented research to explore how micro- and macro-level environmental factors, including exposure to violence, policing practices, gender inequities, and poverty influence drug users' vulnerability to HIV (Krishnan et al., 2008; Maher et al., 2011; Shannon et al., 2008). This perspective views drug use and drug-related harms as the product of a dynamic system of interactions between (and within) individuals and their environments, and calls attention to the role of social, economic and political institutions in both the generation and potential reduction of drug harms (Rhodes, 2002). Central to this approach is the notion that environments that create conditions for drug-related harm ('risk environments') may be transformed through concerted action into "enabling environments" (p. 193, Rhodes, 2009) conducive to harm reduction; and this perspective provides a generative basis for the development of interventions seeking to reduce drug-related harms within a particular context.

This study presents the findings of a secondary, sex- and gender-based analysis of a community sample of young crack users in the cities of Rio de Janeiro and Salvador, Brazil (Santos Cruz et al., 2013). The results of this study are interpreted using Rhodes' (2002) Risk Environment Framework, in order to provide a contextual basis to identify and explore how aspects of the micro- and macro-level environment may interact with sex/gender to produce distinct experiences of crack use and related risk in a sample of young Brazilian men and women who use crack. It is important to note that this exploratory analysis is intended to act as a starting point for considering how a risk environment perspective might be applied to enrich our understanding of sex/gender, crack use and related risk in Brazil; and is by no means an exhaustive account of the socioeconomic, political or material conditions involved in conferring risk in the lives of people who use crack in this context. Rather, the purpose of this analysis is to begin to consider how epidemiological work on crack use (and substance use in

general) can utilize a risk environment perspective to move towards a socially-situated understanding of drug use and drug-related harm.

#### **1.4.2. Study objectives**

The primary objectives of this study are to characterize and explore potential sex differences in the key characteristics of young Brazilian crack users, and to examine whether sex is a predictor of crack users' involvement in relevant health-related behaviours, including unprotected sex and HIV testing.

Findings from this study will be interpreted in relation to existing sex/gender-oriented crack use literature, and the main results will be contextualized using Rhodes' (2002) risk environment framework. The results from this study are intended to address a knowledge gap regarding the respective health and social needs of men and women who use crack in Brazil, and to inform existing or emergent intervention and policy work targeting crack users in this context.

This investigation aims to explore three major objectives:

1. To document the prevalence of key socioeconomic, drug use, health and service utilization characteristics, by sex, in a multi-site sample of young Brazilian crack users; and identify relevant factors that differentiate male and female crack users from one another.
2. To identify relevant factors that predict involvement in HIV testing among young Brazilian crack users; and
3. To identify relevant factors that predict involvement in unprotected sex among young Brazilian crack users.

## **Chapter 2. Methods**

### **2.1. Design and study population**

This secondary analysis drew on data collected from a cross-sectional survey of 160 young crack users in the cities of Salvador and Rio de Janeiro, Brazil, between November, 2010 and June, 2011. This study was conducted with a team of English and Portuguese investigators, and relied on an original English language study protocol (see: Fischer et al., 2010). All modifications to the original study protocol were back-translated from Portuguese to English.

Participants were recruited using community-based outreach methods in neighborhoods with known crack user populations, including one site in Rio de Janeiro and five sites in Salvador, and were eligible to participate in the study if they were between 18 to 24 years of age, reported regular crack use (defined as crack use on three or more days per week in the past three months), and consented to participate in the full study protocol. Individuals exhibiting severe intoxication or acute mental health problems during screening were excluded from the study.

In total, sixteen participants were excluded from the original study due to failure to meet age (n=15) or crack use (n=1) criteria, and one participant was excluded from the present analyses on the basis of their self-identified sex.

### **2.2. Data Collection**

Data was collected using an anonymous, 31-item questionnaire administered by a trained interviewer, which assessed socio-demographic, drug use, sexual behaviour, health status and service utilization characteristics. Socio-demographic questions included self-identified race, marital status, education, housing status, employment

status, sources of income, and arrest history. Drug use questions focused on crack use characteristics, including frequency and duration of crack use, modes of crack consumption, and sharing of crack paraphernalia; and current (past 30 days) and lifetime use of other substances, including injection drug use. Sexual behaviour questions addressed condom use, number of recent sex partners, trading sex for drugs, and whether sex partners had a known HIV or HCV infection. Health status questions assessed physical and mental health problems, self-rated physical and mental health, drug overdose, and HIV and HCV testing, self-reported status and treatment access. Service utilization questions focused on the utilization of social, health and drug treatment services, and participant willingness to use a specialized service for drug users. On average, the assessments took 45 minutes to complete.

Basic physiological data (e.g., height, weight) and blood specimens were also collected by a trained nurse for infectious disease testing (HIV, Hepatitis B and C). Nurses provided participants with pre-test counseling for BBVs, including basic information on prevention, treatment and social and health services, in accordance with Brazilian standards (Filgueiras, Fernandes, & Goncalves, 1998). However, due to anonymous study procedures, BBV test results were not disclosed to participants. Upon completion of the assessment, participants were provided with a transportation pass (approximate value: US\$10) in recognition of their time and effort. All participant data and blood serum samples were processed and analyzed by research staff at the Oswaldo Cruz Foundation in Rio de Janeiro, Brazil.

### **2.3. Variables of interest**

The primary purpose of this secondary analysis was to investigate potential sex differences in the sociodemographic, behavioural and health characteristics in a sample of young crack users in Brazil. Sex was defined on the basis of participants' self-identification as male, female or transsexual. Due to the low representation of transsexual persons in this sample (n=1), the analysis sample was limited to respondents who self-identified as male or female (n=159).

Other variables of interest included: city of residence (Rio de Janeiro or Salvador), self-identified race (Black, Mixed Race/Other or White), educational attainment (none or some elementary schooling vs. completed elementary school or higher), housing status (stable vs. unstable housing), employment status (employed vs. unemployed), sources of income generation (financial assistance, paid work, sex work, illegal work and begging), arrest history, daily crack use, lifetime and current use of other substances, unprotected sex, participation in sex-for-drug exchange, self-rated physical and mental health (“Poor or satisfactory” vs. “Excellent, good, or very good”), HIV and HCV testing history, HIV and HCV serology, and service utilization. Sociodemographic variables (sex, race, education) were treated as fixed, and behavioural variables were in reference to the 30 days that preceded the interview – with the exception of HIV and HCV testing and arrest history, which assessed lifetime and past year timeframes, respectively.

Stable housing was defined as owning or renting a dwelling, or living with family, and unstable housing included staying with friends, hotel or motel room rental, institutionalization (e.g., prison, hospital, drug treatment) and homelessness. Paid work referred to non-drug or non-sex-related work, sex work was defined as having received money in exchange for sexual services, illegal work included drug-related work and other illegal activities (excluding sex work), and begging involved soliciting money from strangers. Daily crack use was defined as having consumed crack each day in the preceding 30 days. Unprotected sex referred to any instance of oral, vaginal or anal sex without a condom. Sex-for-drug exchange was defined as having exchanged sex for drugs. Service utilization referred to the use of at least one social (social assistance, food bank, shelter), health (community health centre, hospital, emergency room, needle exchange program) or drug treatment service, including inpatient (psychiatric hospital, drug treatment facility, therapeutic community) and outpatient programs.

For the purposes of this investigation, multi-level categorical variables were dichotomized when possible (e.g., education, employment, housing status, self-rated mental and physical health, service utilization), or otherwise further refined/collapsed (e.g., self-identified race).

## 2.4. Statistical Analysis

The secondary analysis focused on data from 159 participants. Descriptive and univariate analyses were used to assess potential differences between women and men in the sample, using independent t-tests for continuous variables and Pearson's  $\chi^2$  test for categorical variables. Explanatory variables found to be statistically significant at the univariate level ( $p < .05$ , two-tailed) were tested for correlations using Spearman's  $\rho$ , prior to their inclusion in the multivariate models.

Stepwise discriminant analysis using the Wilks' Lambda method was conducted in order to evaluate the relative importance of the explanatory variables in classifying participants according to self-identified sex, HIV testing history, and unprotected sex. The discriminant equation is expressed in the form:  $D = a_1b_1 + a_2b_2 + \dots + a_ib_i + c$ , where 'a' is the discriminant coefficient, 'b' is the discriminating variable, and 'c' is the constant.

Separate, exploratory analyses were undertaken to identify predictors of group membership for: (1) male vs. female crack users; (2) HIV test history vs. no HIV test history; and (3) unprotected sex in past 30 days vs. no unprotected sex in past 30 days (as measured by reported condom use). Explanatory variables found to be statistically significant at the univariate level were included in each model, alongside variables of theoretical relevance. Selected explanatory variables were tested for intercorrelation prior to their inclusion in the stepwise discriminant analysis (see Appendix A.). The criteria for inclusion/exclusion was  $F = 3.84$ . The classification accuracy of each discriminant model was assessed at 25% above the proportional chance criteria (see: Burns & Burns, 2009).

All analyses were performed using IBM SPSS® Statistics 21 software (IBM, 2012).

## 2.5. Ethics

Ethics approval for the original study protocol was granted by the Ethical Review Committee in the Department of Psychiatry at the Federal University of Rio de Janeiro,

and the Brazilian National Ethics Committee (CONEP, Protocol No. 519/2010). The present investigation received an exemption from the requirements of research ethics review from the Office of Research Ethics at Simon Fraser University (February 28th, 2013), which was granted on the basis of the study's secondary use of anonymous information.

## **Chapter 3. Results**

### **3.1. Descriptive analysis**

#### **3.1.1. Sociodemographic, economic and legal characteristics**

Table 1 summarizes that, on average participants were just over 20 years old; although women were slightly older than men (21.6 years vs. 20.7). Men accounted for over three-quarters of the total sample. The majority of participants were single, Black or Mixed race, and had some elementary school education. Almost equal proportions of men were from Rio de Janeiro (43.5%) and Salvador (56.5%), but disproportionately more women in the sample were from Rio de Janeiro (74.3%). Just over half of men (52.4%) reported unstable housing or homelessness in the preceding 30 days, compared to 80% of women ( $p < .05$ ).

As indicated by Table 2, there were significant differences in employment status and income generation between women and men. Over half (63.7%) of men reported being employed in the past 30 days, compared to only a quarter of women (25.7%,  $p < .001$ ), and men indicated significantly more paid work (66.1% vs. 17.1%,  $p < .001$ ). By contrast, significantly more women than men reported income via sex work (45.7% vs. 2.4%,  $p < .001$ ) and begging/panhandling (40.0% vs. 15.3%,  $p < .001$ ). Additionally, nearly 30% of the total sample reported income from formal/informal transfers (i.e., social assistance payments, money from friends/family).

Similar levels of arrest were observed in the sample, and just under half of men (45.2%) and a third of women (31.4%) reported being detained by police in the past year. Drug offenses were the most common reason for arrest, followed by property crime (i.e., theft), and a minority of participants reported being arrested for violent crime (7.3% men; 2.9% women).

### **3.1.2. Crack use characteristics and other drug use**

Table 3 illustrates that there were few differences in crack use characteristics across men and women. Participants had used crack for an average of four (men) and five years (women), and over half reported daily crack consumption, with an average daily use of 10 'rocks' for men, and 8 'rocks' for women. Crack was used in a variety of ways, but significantly more men reported smoking mixed crack and marijuana than women (47.6% vs. 28.6%,  $p < .05$ ), while more women reported smoking crack using aluminum cans (45.7% vs. 26.6%,  $p < .05$ ) and plastic cups (74.3% vs. 51.6%,  $p < .05$ ). Less than half of participants (40%) reported using a pipe to smoke crack in the past month. Sharing crack smoking implements was reported by almost 60% of participants, but women reported significantly more frequent sharing of crack equipment (i.e., 11 times or more) in the past month than men (71.4% vs. 44.4%,  $p < .05$ ).

According to Table 4, participants indicated similar lifetime rates of alcohol, tobacco, and marijuana use, and low rates of amphetamine, benzodiazepine and LSD consumption. However, men reported significantly higher lifetime use of cocaine (79.8% vs. 62.9%,  $p < .05$ ), while women indicated significantly higher lifetime use of inhalants/solvents (77.1% vs. 45.2%,  $p < .001$ ). The lifetime prevalence of injection drug use was low (<2% total sample), and no participants reported lifetime use of opioids.

Regarding substance use in the past 30 days, tobacco, marijuana, and alcohol were the most commonly used substances; although men reported significantly higher rates of recent marijuana, alcohol, and cocaine use than women. Overall, very few participants reported current use of benzodiazepines and inhalants/solvents (<6% of total sample), and no participants reported current use of amphetamines, opioids, or LSD.

### **3.1.3. Sexual risk behaviour**

Table 5 presents the prevalence of sexual risk behaviour among men and women in the sample. Overall, the majority of participants reported having unprotected sex in the past 30 days, and had at least one regular sex partner in the past month. Most participants reported no more than two additional sex partners in the past month,

although a third of the sample reported sex with three or more additional partners. Notably, a significantly greater proportion of women than men reported frequent unprotected sex (i.e., 6 times or more; 68.2% vs. 44.7%,  $p < .05$ ), and exchanging sex for drugs (28.6% vs. 4.0%,  $p < .001$ ) in the past month. A minority of participants reported having sex with a partner with a known HIV or HCV infection.

### **3.1.4. Health characteristics and service utilization**

Table 6 indicates that participants generally characterized their physical health as “satisfactory or poor”, and just under half of the sample reported experiencing a physical health problem in the past month. Few participants reported receiving medical attention for their physical health problem, but a high proportion of participants (75%) indicated a desire to receive medical care. Low levels of drug overdose were observed in the sample (6.5% men, 2.9% women), and roughly 1 in 7 participants indicated an oral injury in the past month. On the basis of serological testing, a total of 11 participants were HIV-positive (6.9% total prevalence), and the prevalence rate for HIV was significantly higher among women than men (17.1% vs. 4.0%;  $p < .01$ ). One (female) participant tested anti-HCV-positive, resulting in an overall HCV prevalence of 0.6%. Further, significantly more women reported previously receiving testing for HIV (74.3% vs. 21.8%,  $p < .001$ ) and HCV than men (54.3% vs. 7.3%,  $p < .001$ ).

Half of men rated their mental health as “excellent, very good, or good” compared to 31.4% of women ( $p < .05$ ) – the majority of whom described their mental health as “satisfactory or poor”. Despite differences in self-rated mental health, men and women reported similar levels of mental health problems in the past 30 days (46.8% and 42.9%, respectively). Of those, two-thirds of participants indicated a desire to receive medical attention for their mental health problem, but only one participant reported receiving medical care.

Regarding service utilization (see Table 7), over half of women (57.1%) reported accessing at least one health or social service in the past month, compared to 30% of men ( $p < .01$ ). A significantly higher proportion of women accessed social services (45.7% women vs. 19.4% men,  $p < .01$ ), and health services were the second most

commonly accessed service (10.4% of men, 22.9% of women). Less than 3% of participants reported utilizing any type of drug treatment service in the past month. Additionally, over three-quarters of participants stated that they would use basic health or social services for drug users, if such services were available.

## **3.2. Multivariate analysis**

### **3.2.1. Male crack users versus female crack users**

Table 8 presents the summary statistics for the stepwise discriminant analysis of male vs. female crack users. A total of 15 variables were entered into the analysis, and of these, four were found to be statistically significant predictors of crack user sex, including: sex work, HIV testing history, paid work, and begging/panhandling. Based on structure coefficient scores, the strongest predictor of participant sex was sex work (0.663), followed by HIV testing history (0.519), paid work (-.446), and begging/panhandling (0.260). The canonical correlation score for the model was .708, meaning that these four predictor variables collectively accounted for 50.1% of the total variance observed between male and female participants.

The prior probabilities for group membership were calculated at 78.0% for males, and 22.0% for females. Cross-validation of the model (see Table 9) indicated that 3.2% of male participants were misclassified as female, and that 37.1% of female participants were misclassified as male. This resulted in an overall accuracy rate of 89.3% for the discriminant analysis model, which is considered good.

### **3.2.2. HIV testing versus no HIV testing**

Table 10 summarizes the results of the discriminant analysis for HIV testing vs. no HIV testing. Due to missing data, a total of 149 participants were included in the analysis. Of the 18 variables selected for inclusion in the analysis, sex was the only variable found to significantly predict group membership for HIV testing vs. no HIV testing (structure coefficient score = 1.00). The canonical correlation value for the discriminant model (0.441) indicates that the model accounted for 19.5% of the total

observed variance between participants with HIV testing history vs. participants without HIV testing history, which indicates poor overall model fit.

The prior probabilities calculated for HIV testing history and no HIV testing history were 34.9% and 65.1%, respectively. Cross-validation of the discriminant model (Table 11) illustrates that 51.9% of participants who reported HIV testing were misclassified as having no HIV testing, and 9.3% of participants who reported no HIV testing history were misclassified as having an HIV testing history. The overall accuracy of the discriminant model was 75.8%, considered good.

### **3.2.3. Unprotected sex versus no unprotected sex**

Table 12 presents the summary statistics for the discriminant analysis of condom use vs. no condom use. Due to missing participant data, a total of 149 participants were included in the model. According to the structure coefficient scores, the strongest predictor of condom use status was alcohol use in the past 30 days (-.655), followed by self-rated mental health (.565) and paid work in the past 30 days (-.297). Sex was not identified as a significant predictor of group membership. Based on the canonical correlation score (0.369), this model accounted for 13.6% of the total variance observed between participants who reported condom use, compared to those who did not. This suggests a poor overall model fit with study observations regarding condom use.

The prior probabilities calculated for group membership were 59.7% for unprotected sex, and 40.3% for no unprotected sex. Cross-validation of the discriminant model (Table 13) shows that 25.8% of participants who reported no unprotected sex were misclassified as reporting unprotected sex, and 43.3% of participants who reported unprotected sex were misclassified as reporting no unprotected sex; resulting in an overall accuracy rate of 67.1% for the discriminant model, which is considered acceptable.

**Table 1. Sociodemographic characteristics in a sample of young Brazilian crack users, by sex**

	Men	Women	t or $\chi^2$
	n (%) or Mean (SD)	n (%) or Mean (SD)	
<b>Total</b>	124 (78)	35 (22)	
<b>Age</b>	20.7 (2.08)	21.6 (2.18)	2.174*
<b>City</b>			
Rio de Janeiro	54 (43.5)	26 (74.3)	10.316***
Salvador	70 (56.5)	9 (25.7)	
<b>Race</b>			
Black	52 (41.9)	11 (31.4)	1.260
Mixed Race or Other	61 (49.2)	22 (62.9)	2.042
White	11 (8.9)	2 (2.9)	0.362
<b>Marital Status</b>			
Single	89 (71.8)	23 (65.7)	0.481
Married, cohabitating, or formerly partnered	35 (28.3)	12 (34.3)	
<b>Education<sup>a</sup></b>			
None or some elementary school	102 (82.2)	29 (85.1)	3.736
Completed elementary school or higher	22 (17.8)	5 (14.3)	
<b>Housing status<sup>a</sup></b>			
Owns or rents apartment/house	58 (46.8)	7 (20.0)	8.619*
Unstable housing or homelessness	65 (52.4)	28 (80.0)	

Note: \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

<sup>a</sup> denotes missing data

**Table 2. Employment status, income generation and arrest history in a sample of young Brazilian crack users, by sex**

	Men (n=124)	Women (n=35)	
	n (%)	n (%)	$\chi^2$
<b>Employment status</b>			
Employed	79 (63.7)	9 (25.7)	15.944***
Unemployed	45 (36.3)	26 (74.3)	
<b>Income generation</b>			
Financial assistance	35 (28.2)	10 (28.6)	0.002
Paid work	82 (66.1)	6 (17.1)	26.503***
Illegal activities	25 (20.2)	4 (11.4)	1.396
Sex work	3 (2.4)	16 (45.7)	48.627***
Begging/panhandling	19 (15.3)	14 (40.0)	10.107***
<b>Arrest history</b>			
Detained by police	56 (45.2)	11 (31.4)	2.111
<b>Reason for arrest<sup>a</sup></b>			
Drug offense	30 (24.2)	6 (17.1)	0.775
Property crime	16 (12.9)	2 (5.7)	1.405
Violent crime	9 (7.3)	1 (2.9)	0.897

Note: \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

<sup>a</sup> denotes missing data

**Table 3. Crack use characteristics in a sample of young Brazilian crack users, by sex**

	Men (n=124)	Women (n=35)	
	Mean (SD)	Mean (SD)	<i>t</i>
<b>Number of years of crack use</b>	3.40 (2.99)	4.90 (3.45)	1.547
<b>Number of crack rocks used per typical day</b>	10.09 (10.47)	8.31 (5.91)	0.925
	<b>n (%)</b>	<b>n (%)</b>	<b><math>\chi^2</math></b>
<b>Daily crack use</b>			
Yes	66 (53.2)	24 (69.6)	2.617
<b>Modes of crack use<sup>a</sup></b>			
Mixed crack and tobacco	26 (21.0)	12 (34.3)	2.662
Mixed crack and marijuana	59 (47.6)	10 (28.6)	4.015*
Aluminum can	33 (26.6)	16 (45.7)	4.671*
Plastic cup	64 (51.6)	26 (74.3)	5.712*
Pipe	50 (40.3)	13 (37.1)	0.115
<b>Shared crack smoking equipment in the past 30 days</b>			
Yes	72 (58.1)	21 (60.0)	0.042
<b>Number of times shared<sup>b</sup></b>			
Shared 10 times or more	37 (51.3)	6 (28.5)	2.230
Shared 11 times or more	32 (44.4)	15 (71.4)	3.811*

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

<sup>a</sup> denotes multiple responses.

<sup>b</sup> denotes percentage of those reporting on item.

**Table 4. Lifetime and past month substance use in a sample of young Brazilian crack users, by sex**

	Men (n=124)	Women (n=35)	$\chi^2$
	n (%)	n (%)	
<b>Lifetime use</b>			
Alcohol	105 (84.7)	27 (77.1)	1.099
Tobacco	106 (85.5)	31 (88.6)	0.218
Marijuana	108 (87.1)	27 (77.1)	2.110
Cocaine	99 (79.8)	22 (62.9)	4.328*
Amphetamines	5 (4.0)	2 (5.7)	0.183
Benzodiazepines	12 (9.7)	4 (11.4)	0.092
Opioids	0 (-)	0 (-)	-
Inhalants/solvents	56 (45.2)	27 (77.1)	11.189***
LSD	2 (1.6)	1 (2.9)	0.228
Injection Drug Use (IDU)	2 (1.6)	0 (-)	0.572
<b>Past 30 days</b>			
Alcohol	68 (54.8)	9 (25.7)	9.270**
Tobacco	97 (78.2)	31 (88.6)	1.861
Marijuana	88 (71.0)	18 (51.4)	4.689*
Cocaine	55 (44.4)	4 (11.4)	12.680***
Amphetamines	0 (-)	0 (-)	-
Benzodiazepines	3 (2.4)	0 (-)	0.863
Opioids	0 (-)	0 (-)	-
Inhalants/solvents	5 (4.0)	2 (5.7)	0.183
LSD	0 (-)	0 (-)	-

Note: \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

**Table 5. Sexual behaviour in a sample of young Brazilian crack users, by sex**

	<b>Men (n=124)</b>	<b>Women (n=35)</b>	
	<b>n (%)</b>	<b>n (%)</b>	<b><math>\chi^2</math></b>
<b>Unprotected sex in past 30 days</b>			
Yes	75 (60.5)	22 (62.9)	1.079
<b>Frequency of unprotected sex with regular partner</b>			
No regular sex partner	28 (37.3)	4 (18.1)	2.112
Never to 5 times	13 (17.3)	3 (13.6)	0.110
6 times or more	34 (44.7)	15 (68.2)	3.751*
<b>Number of sex partners, in addition to regular sex partner</b>			
None to 2	55 (75.3)	15 (68.1)	0.373
3 or more	24 (30.1)	7 (31.8)	0.017
<b>Had sex partner with known HIV or HCV infection</b>			
Yes	3 (2.5)	2 (5.7)	3.082
<b>Had sex in exchange for drugs</b>			
Yes	5 (4.0)	10 (28.6)	19.238***

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

<sup>a</sup> denotes percentage of those reporting on item

**Table 6. Health characteristics in a sample of young Brazilian crack users, by sex**

	Men (n=124)	Women (n=35)	$\chi^2$
	n (%)	n (%)	
<b>Self-rated physical health<sup>a</sup></b>			
Excellent, very good, or good	49 (39.5)	12 (34.3)	0.316
Satisfactory or poor	69 (55.6)	23 (45.7)	1.135
<b>Physical health problem(s), past 30 days<sup>a,b</sup></b>			
Yes	54 (43.5)	16 (45.7)	1.030
<b>Received medical attention</b>	7 (12.9)	5 (31.25)	3.028
<b>Would like to receive medical attention</b>	40 (70.4)	12 (75.0)	3.408
<b>Drug overdose in past 30 days</b>			
Yes	8 (6.5)	1 (2.9)	0.660
<b>Oral injuries/sores in past 30 days</b>			
Yes	18 (14.5)	5 (14.3)	0.005
HIV+ (serology)	5 (4.0)	6 (17.1)	7.240**
HCV+ (HCVAB)	0 (-)	1 (2.9)	3.565
<b>Self-rated mental health<sup>a</sup></b>			
Excellent, very good, or good	63 (50.8)	11 (31.4)	4.120*
Satisfactory or poor	56 (45.2)	23 (65.7)	4.612*
<b>Mental health problem(s), past 30 days<sup>a,b</sup></b>			
Yes	58 (46.8)	15 (42.9)	0.240
<b>Received medical attention</b>	1 (1.8)	0 (-)	4.093
<b>Would like to receive medical attention</b>	38 (65.5)	10 (66.6)	3.965

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

<sup>a</sup> denotes missing data

<sup>b</sup> denotes percentage of those reporting on item

**Table 7. Service utilization characteristics in a sample of young Brazilian crack users, by sex**

	Men (n=124)	Women (n=35)	
	n (%)	n (%)	$\chi^2$
<b>Accessed social, health or drug treatment service in past 30 days</b>	37 (29.8)	20 (57.1)	8.848**
<b>Type of service<sup>b,c</sup></b>			
Social service	24 (19.4)	16 (45.7)	10.073**
Health service	13 (10.4)	8 (22.9)	3.646
Drug treatment service	3 (2.4)	1 (2.9)	0.021
<b>Would use service for drug users, if available</b>			
Yes	98 (79.0)	27 (77.1)	0.258
<b>BBV testing history, lifetime prevalence</b>			
HIV testing	27 (21.8)	26 (74.3)	34.540***
HCV testing	9 (7.3)	19 (54.3)	46.476***

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

<sup>a</sup> denotes percentage of those reporting on item

<sup>b</sup> denotes multiple responses

**Table 8. Stepwise discriminant analysis of male crack users vs. female crack users (n=159)**

Variable	Structure coefficient	Wilks' Lambda	p-value
Sex work*	.663	.694	<.001
HIV test*	.519	.603	<.001
Paid work*	-.446	.528	<.001
Begging*	.260	.499	<.001
Housing status <sup>a</sup>	-.287	-	-
Sex-for-drugs <sup>a</sup>	.295	-	-
Marijuana use, past 30 days <sup>a</sup>	-.208	-	-
Service utilization (any) <sup>a</sup>	.170	-	-
Unprotected sex, past 30 days <sup>a</sup>	.151	-	-
City <sup>a</sup>	.132	-	-
Illegal activity, past 30 days <sup>a</sup>	.105	-	-
Cocaine use, past 30 days <sup>a</sup>	-.075	-	-
Alcohol use, past 30 days <sup>a</sup>	-.062	-	-
Detained by police, past year <sup>a</sup>	.037	-	-
Daily crack use <sup>a</sup>	.027	-	-

Note: Male = 1, female = 2

\* denotes significance at univariate level (p <.05)

<sup>a</sup> denotes that variable did not meet inclusion criteria (F > 3.84)

**Table 9. Cross-validation of classification accuracy: discriminant analysis of male crack users vs. female crack users**

Discriminant function result	Crack user sex	
	Male	Female
Percent classified correctly	96.8%	62.9%
Percent misclassified	3.2%	37.1%

A. 89.3% of cross-validated grouped cases classified correctly

**Table 10. Stepwise discriminant analysis of participants with HIV testing vs. participants with no HIV testing (n=149)**

Variable	Structure coefficient	Wilks' Lambda	p-value
Sex*	1.000	.806	<.001
Sex work* <sup>a</sup>	-.494	-	-
Paid work* <sup>a</sup>	.404	-	-
Exchanged sex for drugs* <sup>a</sup>	-.319	-	-
Cocaine use, past 30 days* <sup>a</sup>	.219	-	-
Alcohol use, past 30 days* <sup>a</sup>	.202	-	-
City* <sup>a</sup>	-.189	-	-
Service utilization, any <sup>a</sup> *	-.181	-	-
Housing status* <sup>a</sup>	.175	-	-
Self-rated mental health* <sup>a</sup>	.164	-	-
HIV+ serology* <sup>a</sup>	-.131	-	-
Health service utilization	-.127	-	-
Marijuana use, past 30 days* <sup>a</sup>	.109	-	-
Daily crack use <sup>a</sup>	-.103	-	-
Detained by police, past year <sup>a</sup>	.102	-	-
Education <sup>a</sup>	-.095	-	-
Self-rated physical health <sup>a</sup>	.057	-	-
Illegal activities <sup>a</sup>	.046	-	-
Unprotected sex <sup>a</sup>	.008	-	-

Note: HIV test = 1, no HIV test = 2

\* denotes significance at univariate level

<sup>a</sup> denotes that variable did not meet inclusion criteria ( $F > 3.84$ )

**Table 11. Cross-validation of classification accuracy: Discriminant analysis of participants with HIV testing vs. participants with no HIV testing**

Discriminant function results	HIV test	
	Yes	No
Percent correctly classified	48.1%	90.7%
Percent misclassified	51.9%	9.3%

A. 75.8% of cross-validated grouped cases classified correctly.

**Table 12. Stepwise discriminant analysis of unprotected sex vs. no unprotected sex (n=149)**

Variable	Structure coefficient	Wilks' Lambda	p-value
Alcohol use, past 30 days*	-.655	.937	.002
Self-rated mental health*	.565	.894	<.001
Paid work*	-.297	.863	<.001
Cocaine use, past 30 days <sup>a</sup>	.292	-	-
Self-rated physical health <sup>a</sup>	.284	-	-
Marijuana use, past 30 days <sup>a</sup>	-.256	-	-
City <sup>a</sup>	.255	-	-
Service utilization (any) <sup>a</sup>	-.174	-	-
Sex work <sup>a</sup>	-.129	-	-
HIV+ (serology) <sup>a</sup>	-.127	-	-
Sex <sup>a</sup>	.118	-	-
Education <sup>a</sup>	.106	-	-
Health service utilization <sup>a</sup>	-.092	-	-
Daily crack use <sup>a</sup>	.084	-	-
Detained by police, past year <sup>a</sup>	-.076	-	-
Illegal activities <sup>a</sup>	-.060	-	-
Exchanged sex for drugs <sup>a</sup>	-.034	-	-
HIV test <sup>a</sup>	.022	-	-
Housing status <sup>a</sup>	-.014	-	-

Note: Unprotected sex = 1, no unprotected sex = 2

\* denotes significance at univariate level

<sup>a</sup> denotes that variable did not meet inclusion criteria (F >3.84)

**Table 13. Cross-validation of classification accuracy: discriminant analysis of unprotected sex vs. no unprotected sex**

Discriminant function results	Unprotected sex	
	Yes	No
Percent classified correctly	74.2%	56.7%
Percent misclassified	25.8%	43.3%

A. 67.1% of cross-validated grouped cases classified correctly

## **Chapter 4. Discussion**

This exploratory study confirms the existence of key sex/gender differences in the social, health and behavioural characteristics of young Brazilian crack users, and identifies gender-specific sexual risk profiles that have important implications for interventions targeting crack use. Of particular concern, female crack users experienced significant disengagement from paid employment and greater participation in sex work as compared to males; and male crack users had low involvement in HIV testing services. The results also suggest a high prevalence of unprotected sex among young Brazilian crack users experiencing more severe health and social problems.

This section will present a brief overview of the descriptive results, before turning to a discussion of the main study findings. Overall, study participants were single, Black or Mixed Race, and indicated low educational attainment and recent arrest – primarily for drug offenses. This social profile is consistent with previous research in Brazil, which has documented the disproportionate concentration of crack cocaine use among young, socioeconomically marginalized users (Dualibi et al., 2008). Unstable housing situations were common, but particularly among women. In the past month, 80% of women and 52% of men reported some form of housing instability, including on-street homelessness. Women were also largely unemployed in the past month, and featured significantly lower involvement in paid labour compared to men. In addition, 46% of women identified sex work as a source of income in the past month, in contrast to 2% of men. This is similar to previous research identifying sex work as a major income source for women who use crack (Inciardi et al., 1994; Maher, 1997; Weeks, Grier, Romero-Daza, Puglisi-Vasquez, & Singer, 1998), often in the absence of legal job opportunities. Taken together, these findings suggest that crack users face important challenges in securing basic resources, but emphasize the heightened physical and material insecurity among women who use crack.

The mean duration of crack use was four years, and most participants indicated a heavy, daily pattern of crack consumption; reflecting the intensive style of use often associated with the drug. Multiple methods for smoking crack were reported, including the use of makeshift smoking equipment described in other Brazilian literature (Inciardi et al., 2006). Sex differences in crack use modalities were noted, with men endorsing more marijuana/crack co-use compared to women, who reported greater use of makeshift equipment. Additionally, approximately 60% of crack users reported pipe sharing in the past month, with women sharing more frequently. These findings may be indicative of gender differences in crack use 'style', but may also reflect local-level dynamics, including drug use trends, social norms, and the availability of smoking materials.

Lifetime use of other substances was generally high, with few observed sex differences. However, men evidenced more current alcohol, marijuana and cocaine use in comparison to women, which suggests heavier overall substance use among male crack users. Concurrent drug use appears to be common among Brazilian crack users (Friere, dos Santos, Bortolini, Duarte, & Oliveira, 2012; Oliveira & Nappo, 2008), and has been identified as an important method for modulating or attenuating negative crack effects (i.e., anxiety, craving; Andrade et al., 2011; Chaves, Sanchez, Ribeiro, & Nappo, 2011). Injection drug use (IDU) was rare among participants, and only 1.2% of the total sample indicated a history of IDU, with no reported cases of current IDU. This confirms a general pattern of declining IDU observed in many regions of Brazil (Andrade et al., 2001; Bastos, Bongertz, Texeira, Morgado, & Hacker, 2005; Inciardi et al., 2006), and the reduced prevalence of IDU and IDU-related risk behaviour (i.e., syringe sharing) among Brazilian drug users may contribute to the lower BBV rates observed in this group (Malta et al., 2010).

Most respondents were sexually active in the past month, and indicated some form of unprotected sex. Frequent unprotected sex appeared to be the norm, particularly for women. Of those who reported having a regular sex partner, 60% reported sex with at least one additional person in the past month, with no observed sex differences. A small proportion of crack users also reported recent sex with an HIV or HCV-positive partner, which is a key risk factor for BBV infection. These findings are

consistent with other Brazilian literature that has documented high levels of sexual risk behaviour among crack users (Azevedo et al., 2007; Leukefeld et al., 2005), underscoring the need for tailored interventions targeting sexual risk among young people who use crack in this context. In addition, 29% of women and 4% of men reported trading sex for drugs in the past 30 days, which is consistent with a broader literature documenting the prevalence of this phenomenon among female crack users (Cavazos-Rehg et al., 2009; Logan et al., 2003; Sterk, Elifson, & German, 2000). Crack users' participation in sex-for-drug exchange has previously been associated with poorer socioeconomic status, including homelessness (de Souza, Diaz, Sutmoller, & Bastos, 2002; Edwards et al., 2006; Wechsberg et al., 2003), and sex exchange appears to represent an important marker of disadvantage among the young people in this study.

Just under half of participants had experienced a recent physical or mental health problem, and the majority reported needing medical care for these problems, but not receiving it. Crack users also indicated minimal engagement with drug treatment services. Collectively, these findings suggest a high, unmet healthcare need among crack users, which may be related to a number of factors – e.g., lack of services, low help-seeking, barriers to accessing mainstream healthcare services (transportation, hours of operation, stigma/discrimination) – that deserve further investigation. However, 78% of respondents reported that they would use a service specific to drug users, if one were available; highlighting the potential for tailored interventions to facilitate greater service engagement with crack users in these two cities.

Sex differences in self-perceived mental health were noted, and a greater share of men (51%) rated their mental health as good or better. Female crack users reported greater overall service utilization than men, primarily in the form of social services (e.g., shelters, food bank). This may be related to women's poorer socioeconomic status needs (re. unstable housing, high unemployment), but may also reflect gender differences in crack users' help-seeking behaviours (see: McCoy, Metsch, Chitwood, & Miles, 2001). Related to this, women also reported higher overall access to BBV testing services, including HIV (74%) and HCV testing (54%) than men, and this discrepancy suggests that important gendered pathways to BBV screening may exist in this context.

The sample was found to have an overall seroprevalence of 6.9% for HIV and 0.6% for HCV. This HIV rate exceeds estimates for the general population (0.6%)(Brazilian Ministry of Health, 2012a), and reflects the elevated risk for HIV infection among this group of non-injection drug users – particularly among female crack users, who had significantly higher HIV (17.0%) and HCV seroprevalence (1.2%) as compared to men. However, it is important to note that the BBV rates observed in this study are considered low in comparison with the rates documented among IDUs in the same cities (Silva et al., 2010; Texeira et al., 2004), and crack users in other global regions (i.e., North America; McCoy, Lai, Metsch, Messiah, & Zhao, 2004; Shannon et al., 2008). Consequently, this presents an important opportunity for preventative interventions for HIV/AIDS and HCV, targeting youth involved in crack use in urban Brazil.

## **4.1. Envisioning the risk environment for young Brazilian crack users**

### **4.1.1. Paid work**

The results from the discriminant analysis of crack user sex demonstrate the greater degree of engagement with paid work among male crack users; and female crack users' dependence on self-generated, marginal forms of income generation – as expressed by sex work and begging/panhandling. This finding is consistent with other research that has identified significant disparities in employment and income generation among men and women who use crack (Cross, Johnson, Davis, & Liberty, 2001), and suggests that underlying gender inequalities exist in both the pathways to, and opportunities for paid work among Brazilian crack users.

Previous research has identified housing instability, low education, and regular crack use as important barriers to securing and maintaining forms of legal employment among women who use crack (Miller & Neaigus, 2001; Maher, 1997), and these micro-level social factors may partially account for the low engagement in paid work observed among women in this study. However, the finding that a significantly greater proportion of male crack users were involved in some form of paid work compared to females –

despite having similarly low levels of education (i.e., incomplete elementary school) – suggest the existence of underlying gender dynamics that may differentially favour male crack users’ participation in the wage labour market. This discrepancy in male and female crack users’ employment may be related in part to differences in early work experience. Brazilian literature on school dropout has found important gender differences in reasons for dropout among low-income boys and girls: Boys typically leave school to contribute to participate in paid labour, while girls primarily exit school to assist with unpaid domestic work (e.g., caregiving, household maintenance; Gustafsson-Wright & Pyne, 2002), or due to early pregnancy and parenthood (Almeida, Aquino, & Barros, 2006; Cardoso & Verner, 2006). As a result, low-income male children and youth demonstrate a much stronger attachment to the labour market, and consistently higher levels of employment than their female peers (Duryea, Hoek, Lam, & Levison, 2005).

School dropout and early (childhood) labour experiences have not been substantively investigated in Brazilian literature on crack use (see: Nappo, Sanchez, & Oliveira, 2007). Given the observed sex difference between male and female crack users’ involvement in paid work, there remains a need for Brazilian research to consider how these early education and labour experiences may differentially affect male and female crack users’ employment prospects in early adulthood.

These observed sex differences in paid work may also be a reflection (or magnification) of existing gender inequalities in the employment sector in Brazil. Income inequality and poverty appear to inordinately impact Brazilian women, who have diminished opportunities for education, labor force participation and financial independence compared to their male counterparts (van Klaveren, 2009; World Economic Forum, 2012), and represent over half of all Brazilians living in extreme poverty (Brasil, 2012). Research on formal sector labour in Brazil has identified a number of important barriers to women’s employment, including discriminatory hiring and payment practices; inequities associated with women’s (unpaid) domestic and reproductive work; and social norms that reinforce the acceptability of gender segregated labour within the public and private (domestic) sphere (Agenor & Canuto, 2013; Gustafsson-Wright & Pyne, 2002; van Klaveren, Tijdens, Hughie-Williams, &

Martin, 2009). Gender segregation has also been documented within the informal economy, where women have been found to participate to a greater extent than men in unstable, low-wage labour (Chant & Pedwell, 2008; Heintz, 2006). To this end, research on the informal economy in urban Brazil has found that men had significantly more options for informal sector work, in contrast to women, who were largely confined to “feminized” informal jobs (e.g., sewing, housework; Telles, 1992).

Women’s exclusion from paid employment is also apparent within the illicit drug economy. Ethnographic research with crack users has described how the structural characteristics of the illicit drug market differentially affect men and women’s drug-related employment and earnings (Maher et al., 1997; Anderson, 2005; Evans et al., 2002). In particular, the male-dominated nature of drug trade networks facilitates greater male participation and mobility in drug production, trafficking, and selling positions; while simultaneously restricting women’s opportunities for participation in drug-related work (Maher & Hudson, 2007). Consequently, women are often restricted to peripheral or subordinate roles within the drug economy, which offer little in the way of remuneration, job security, or advancement – thus necessitating their involvement in alternate forms of income generation, including sex work (Sterk, 1999; Edlin, 1994).

### **Sex work**

The finding that sex work was strongly associated with being female indicates that gender-specific sexual risk profiles exist between the young men and women in this sample. In particular, female crack users had significantly greater involvement in recent sex work and sex-for-drug exchange, as compared to men, which is consistent with other literature documenting the high prevalence of sex trading among female crack users in Brazil and elsewhere (Costa, Soibelman, Zanchet, Costa, & Salgado, 2012; Malta et al., 2008; Nappo et al., 2011; Logan, Cole, & Leukefeld, 2003; Shannon et al., 2008). Extensive research has described the increased sexual risks associated with sex work among female crack users, including multiple sexual partners, sex while intoxicated or high, unprotected sex, and elevated rates of HIV and STIs (Edlin et al., 1994; Hoffman et al., 2000; Inciardi et al., 1993; Ross et al., 2002). Specific characteristics of sex trading among Brazilian women who use crack have also been found to increase women’s susceptibility to sexual risks and violence, including: a lack of fixed prices or

designated locations for sex work (Oliveira & Nappo, 2008); crack use before or during sex work (Malta et al., 2008); and the existence of social norms and attitudes that normalize unprotected sex (Nappo, Sanchez, & Oliveira, 2007; Ribeiro, Sanchez, & Nappo, 2010). Overall, these results suggest that Brazilian women who use crack experience gender-specific sexual risks directly related to their involvement in sex work.

Previous research has established the role of poverty and unemployment in influencing female crack users' involvement in sex trade work (Maher, 1997; Elwood, 1997; Edlin et al., 1994). Women in this study exhibited significant social disadvantage, including high unemployment, housing instability and disconnection from paid labour, which strongly suggests that their participation in sex work may be directly related to their experiences of poverty (i.e., survival sex work). This study did not assess the income derived from sex work, but other Brazilian research has found that sex work may be more lucrative than other forms of illegal or informal sector work available to women who use crack (Nappo, Sanchez, & Oliveira, 2007). As such, there is a need for further research to examine the role of poverty, socioeconomic marginalization, and economic factors that may influence female crack users' elevated participation in sex work in this context.

The high proportion of women involved in sex work also indicates that there is a relatively high demand for sex work in Rio de Janeiro and Salvador, which may make this a more sustainable source of income for Brazilian women who use crack. Previous studies have found that male crack users play an important role as sex work clients (Logan, Cole, & Leukefeld, 2003; Tortu et al., 1998; Baseman et al., 1999), and future research in Brazil should investigate how male crack users may contribute to the local demand for sex work. There is also a need to explore how other micro-level physical and economic factors (e.g., low security/policing, presence of brothels, low cost of services) may be involved in sustaining the demand for sex work market among female crack users in Brazil.

It is also important to note that a small (non-significant) share of men were involved in sex work and sex-for-drug exchange, which has been described in Brazilian research on crack use (Oliveira & Nappo, 2008; Ribeiro, Sanchez, & Oliveira, 2010). Sex trading among male drug users is associated with important sexual risks, including

unprotected oral and anal sex, multiple (male) sex partners, and unprotected sex with non-sex trade partners (Elwood et al., 1997); and poor social indicators, including homelessness, and histories of childhood maltreatment and abuse (Newman, Rhodes, & Weiss, 2002). As such, this finding points to the need for further exploration of the correlates and characteristics of sex trading among young Brazilian men who use crack, in order to inform appropriate interventions to reduce sexual risk.

#### **4.1.2. HIV testing**

The multivariate results for HIV testing indicate that important gender-specific pathways to HIV testing exist among young crack users in this study. Specifically, female sex was identified as the sole discriminating factor in determining whether participants had previously been tested for HIV, and women in the sample also reported significantly higher levels of previous HIV testing (75%) compared to men (22%).

A very limited number of Brazilian studies have assessed prior HIV testing among people who use crack, and no comparative evidence is currently available. However, these observed sex differences in HIV testing appear to be consistent with available data: A survey of 73 female crack users in Porto Alegre found that nearly all women had been tested for HIV at least once, and approximately 50% reported being tested for HIV multiple times (i.e., two times or more; von Diemen et al., 2010). Conversely, a study of 199 crack users (90% male) in Sao Paulo find that only 24% of the sample had been previously tested for HIV. Collectively, available literature and the findings from this study indicate that female crack users have higher levels of exposure to HIV testing services than men. It is possible that these findings may compliment broader trends in HIV testing access among Brazilian men and women in the general population, but population-level data regarding HIV testing access among Brazilians is currently unavailable (Brazilian Ministry of Health, 2012a)

Female crack users' greater observed exposure to HIV testing services may be facilitated by a number of factors. For instance, women's greater reported involvement in known sexual risk behaviours, including sex work and sex-for-drug exchange may motivate them to seek out HIV testing services. These findings may also reflect local-

level differences in service infrastructure and availability between the two study sites, as a significant majority (75%) of women in the sample were recruited from Rio de Janeiro. Further, the socioeconomic profile of women in this study – i.e., homelessness, begging and sex work – suggests that they experience greater street entrenchment than men, which may enhance their visibility and access to street-based, outreach interventions targeting vulnerable urban populations in Brazil (see: Brazilian Ministry of Health, 2012b). At the macro-level, Brazil's national policy of universal prenatal HIV screening and counselling for pregnant women has been found to contribute to greater overall HIV testing exposure among Brazilian women in the general population (França-Junior, Calazans, Zucchi, & Grupo de Estudos em População, Sexualidade e Aids, 2008), and the discrepancy in HIV testing rates observed between men and women in this study may be related to female crack users' access to BBV screening during prenatal care. Given that the present investigation did not assess pregnancy, childcare, or maternal or reproductive healthcare service utilization, further investigation of the social factors facilitating female crack users' improved access to HIV screening is required.

While the high level of HIV testing reported by women in this study illustrates that there has been some success in the provision of BBV testing to Brazilian women who use crack, the low rate of HIV testing among male crack users indicates that men do not appear to be benefiting equally from these prevention efforts. Men were found to have an elevated HIV seroprevalence (4.0%), and involvement in HIV-related sexual risk behaviours, including unprotected sex and sex with multiple partners, which indicate a clear need for HIV prevention services targeting young men who use crack in Brazil.

Men's lower levels of HIV testing access may reflect a lower self-perceived risk for BBV infection, as high-risk HIV exposure activities like sex work and injection drug use were virtually nonexistent among men this study. Research on HIV testing among men has found that a low self-perceived risk of HIV, a denial of existing HIV risk factors, and fear about testing HIV-positive are important barriers to men's access to HIV testing services (Kellerman et al., 2002). Male crack users' lower HIV testing may also be related to masculine gender norms regarding health and help-seeking, which feminize health-promoting activities, while simultaneously characterizing behaviours that may undermine health (e.g., risky behaviours, low healthcare service utilization) as identifiers

of masculinity (Courtenay, 2000). There is also a need to consider how HIV prevention and service delivery characteristics (e.g., focus on women, gay/bisexual men; Higgins, Hoffman, & Dworkin, 2010), and homophobia may impact Brazilian men's lower observed engagement with HIV testing services.

#### **4.1.3. Unprotected sex**

Results from the discriminant analysis of unprotected sex found that current alcohol use, poor self-rated mental health, and the absence of paid work were strongly associated with unprotected sex among young Brazilian crack users. Collectively, these results suggest heavier substance use, and a more disadvantaged health and social profile among crack users involved in unprotected sex. However, these findings must be interpreted with caution, as this model demonstrated a poor overall fit with study data, and was found to have limited predictive accuracy – which indicates the need for consideration of additional factors. It is also important to note that participant sex was not identified as an important predictor of unprotected sex, although significant sex differences between the identified discriminating factors were observed at the univariate level – i.e., alcohol use, poor self-rated mental health, lack of paid work.

The association between alcohol use and unprotected sex may be indicative of a heavier overall pattern of substance use, but may also reflect sexual risks directly related to alcohol consumption (i.e., sex while intoxicated). A significantly greater proportion of male crack users reported current alcohol use, which suggests that the relationship between alcohol use and unprotected sex may be particularly relevant for Brazilian men who use crack. This is consistent with existing research that has identified both alcohol use and intoxication during sex as independent predictors of unprotected sex among people who use crack (Booth et al., 2000; Rasch et al., 2000; Timpson, Williams, Bowen, & Keel, 2003). Overall, this literature points to the need for further consideration of the physical and social dynamics of alcohol consumption and unprotected sex among Brazilian crack users (e.g., physical setting, sequencing; see: Dickson-Gomez et al., 2012), with a particular focus on alcohol use among male crack users.

Similarly, the relationship between poor self-rated mental health and unprotected sex deserves further consideration. Just under half of crack users in this study reported experiencing a mental health problem in the past month, and a greater proportion of women described their mental health as “satisfactory or poor”. Overall, these results suggest that young Brazilian crack users may experience mental health problems that may negatively affect their sexual health, particularly among women. Brazilian crack users have described significant stress in their daily lives (Ribeiro, Sanchez, & Nappo, 2010; Malta et al., 2008), and exhibit high rates of co-morbid mental health disorders (Kessler et al., 2012). Concurrent mental health and substance use problems have been found to impair individuals’ capacity to implement self-protection strategies, including consistent condom use (Jones & Roberts, 2009; Meade & Sikkema, 2005). While this study did not include diagnostic criteria for mental health disorders, these results demonstrate the need for further, in-depth research to examine the relationship between poor mental health states and condom use behaviours among Brazilians who use crack.

Concretely, the association between paid work and unprotected sex may be explained by micro-level economic factors, including a diminished capacity to afford condoms. These financial barriers may be particularly relevant to female crack users, who reported significantly lower participation in paid work than their male counterparts. However, it is interesting to note that sex work was not identified as a discriminating variable for unprotected sex, which suggests that specific features of unemployment itself (e.g., low income, poverty) may influence crack users’ involvement in unprotected sex. As such, there remains a need to explore how micro-level economic factors, including condom use affordability and access, may inform unprotected sex among crack users in this context.

## **4.2. Interpretation and implications for intervention**

The findings from this study support the existence of gendered ‘risk environments’ that produce distinct forms of drug-related risk for male and female crack users in Brazil. Women who use crack experienced more severe forms of socioeconomic disadvantage, including disconnection from paid work, housing

instability, and participation in marginal forms of income generation. Sex work was a dominant source of income for women in this study, and a high proportion of women also reported trading sex for drugs. Given the known sexual risks associated with sex work, and the high seroprevalence of HIV (17.0%) and HCV (1.2%) among women in this study, tailored interventions should be introduced to address sexual-related risk among female crack users involved in sex work in Brazil. In particular, these findings suggest that sex work in this population of women is a direct response to conditions of poverty and material insecurity, which indicates the need for environmental-structural interventions for women who use crack, such as access to safe, affordable housing. Services should also be introduced to support harm reduction among female crack users involved in sex trading, such as peer-based education and outreach programs, which have demonstrated success in improving condom use, safer sex practices and HIV and STI knowledge among female sex workers elsewhere (Vanwesenbeeck, 2001; Rekart, 2005).

This study also observed important gender differences in male and female crack users' access to HIV testing services, which indicates a need for gender-specific HIV prevention programs. In particular, male crack users' low rates of HIV testing suggests the presence of important social and structural factors that may be influencing their lower exposure to HIV screening; and asserts the need for a tailored approach to increase HIV prevention among male crack users in these municipalities. For instance, a recent pilot study of a mobile HIV testing program targeting gay and bisexual men and transvestites in three major Brazilian cities (*Quero Fazer*), demonstrated success in engaging street-involved men in HIV screening and diagnosis services (Pact Brasil, 2010). The potential uptake and feasibility of a similar, mobile HIV testing program targeting men who use crack in Rio de Janeiro and Salvador should be explored. In contrast to men, the high HIV testing coverage observed among women in this study suggests that an 'enabling environment' exists to facilitate female crack users' access to HIV screening services. More information on the characteristics of these HIV testing services is required, in order to determine the extent to which these screening services are successful in connecting women who use crack to appropriate follow-up care, including HIV diagnosis, post-test counselling, and treatment.

The prevalence of unprotected sex in this sample highlights the need for targeted condom promotion interventions for young crack users in these two cities, including a general condom promotion and distribution program to improve access to condoms in neighborhoods with known crack user populations. Previous research has demonstrated the feasibility of a tailored behavioural intervention to promote male and female condom use among Brazilian men who use crack (Leukefeld et al., 2005). Given the finding that alcohol use was strongly associated with unprotected sex, there may also be a need for targeted condom distribution and outreach services in public settings where crack and other substances are being consumed. In addition, gender-specific condom use promotion programs should be tailored to address the heightened vulnerabilities associated with sex work among female crack users, including empowerment-based initiatives like condom negotiation training (Rekart, 2005). Street-based outreach and condom distribution programs targeting sex workers in urban Brazil have also demonstrated success (Brazilian Ministry of Health, 2012), and the results of this study suggest that similar outreach services for street-entrenched, female crack users in Rio de Janeiro and Salvador are warranted.

Further, the finding that poor self-rated mental health was associated with unprotected sex reflects a potential need for safer sex programs, including condom promotion and education, to incorporate a mental health care component (i.e., service referral, counselling) within services targeting crack users (see: Cournos, McKinnon, & Wainberg, 2005). Finally, the majority of participants in this study indicated that they would use a service specifically tailored to drug users, if one were available. Research on peer-based harm reduction services targeting crack users in Brazil has described the success of these programs in facilitating improved access to health, social, and psychological supports for local crack user populations (Domanico & Malta, 2012). As such, this represents an important opportunity for harm reduction and health promotion initiatives among young people involved in crack use; and highlights the potential uptake of a community-based service that could provide integrated harm reduction programming to crack users (e.g., HIV screening and diagnosis, safer sex education, condom distribution, referrals) in these two municipalities.

### 4.3. Study limitations

The present study features some important limitations that must be considered when interpreting the results. This secondary analysis was based on a convenience sample of young crack users that featured a small proportion of women (30%). Consequently, these findings may not generalize well to other young people who use crack in Brazil. Related to this, the unequal representation of men and women in the sample limited the statistical power of the univariate and multivariate analyses. The cross-sectional nature of the original dataset also restricted this study's ability to infer temporal or causal relationships between the variables assessed. As a result, findings from these comparative analyses must be considered exploratory in nature, and many of the behaviours and characteristics described here require further, in-depth investigation.

Aspects of the secondary data analysis approach itself pose specific challenges to the strength and validity of the study findings. Cases of missing data (while generally infrequent) reduced the sample size and overall statistical power of the presented analyses; and may speak to an underlying selection bias within the sample. The study's reliance on self-report measures may limit the completeness and accuracy of reported information, due to social desirability or response bias, inaccurate recall, or aspects of the original data collection process. Therefore, sensitive behaviours related to drug use, illegal activities, or sexuality may have been underreported – although self-report measures with drug users have previously demonstrated acceptable validity across a range of topics (i.e., drug use, sexual risk, criminal behaviour; Darke, 1998).

Importantly, the use of an existing dataset also limited the depth of the current investigation's sex-and gender-based analysis, as variables that are relevant to a sex-and gender-based approach were either not featured in the original assessment, or appeared in insufficient numbers (i.e., low representation of women, transsexual participants). In particular, the analyses of unprotected sex and HIV testing would have benefitted from the inclusion of additional measures, such as information on sexuality (e.g., lesbian, gay, bisexual, heterosexual), same-sex contact, interpersonal violence, and sex partner characteristics. The evidence and interpretation of sexual-related risk among participants would have also been further enriched by the inclusion of self-report

and/or clinical data on sexually-transmitted infections among participants, as well as a measure for unprotected sex with non-regular (i.e., casual or one-time) sex partners.

The low representation of women in the sample limited the power and external validity of the comparative data on male and female crack users. Additionally, the exclusion of the transsexual participant from this sample is concerning, given the known health and safety challenges experienced by transsexuals in Brazil (Inciardi & Surratt, 1997; Grandi et al., 2000). As such, there is a need for future sex- and gender-based analysis in this area to employ targeted sampling techniques in order to ensure adequate representation of female and transsexual participants in Brazilian studies of crack use. Additionally, the integration of gender-sensitive measures, including information about reproductive health (e.g., pregnancy, abortion), parenting and/or caregiving, and interpersonal violence (e.g. physical or sexual assault, domestic abuse) will facilitate a more detailed delineation of the 'risk environment', and potential interventions for men and women who use crack in this context.

Finally, it is important to note the limitations of the predictive discriminant function models that addressed HIV testing and unprotected sex behaviours. Both of these models featured a number of missing cases (i.e., 10% of total sample), and demonstrated a poor overall fit with the study observations regarding these respective behaviours. Findings from these models must therefore be interpreted cautiously, as these results suggest their limited contribution to the overall 'picture' of HIV testing and unprotected sex among our sample participants – emphasizing the need for further consideration of additional factors that may be associated with condom use and HIV testing among crack users in Brazil. By comparison, results of the predictive model of crack user sex indicated a better overall fit with observations regarding men and women in our sample.

Despite these limitations, this research makes important contributions to the growing knowledge base regarding crack cocaine use in Brazil. This study is among the first to examine sex differences across major social, health and behavioural domains among Brazilian youth who use crack, which is important given the relative absence of sex-and gender-based analyses in existent Brazilian literature on this subject. Findings

from this study demonstrate that male and female crack users differ in key areas, including: housing status, employment and income generation strategies, participation in sex work and sex-for-drug exchange, HIV and HCV seroprevalence, and health and social service utilization. These results confirm gendered patterns observed in crack user populations elsewhere (Maher & Curtis, 1992; Edlin et al., 1994; Sterk et al., 2000; Tortu et al., 1998; Shannon et al., 2008), and contribute important new evidence of sex differences in the social, health and behavioural profiles – and subsequent needs – specific to male and female crack users in Brazil.

This investigation also identified factors that differentially affect the pathways to sexual-related risk among men and women who use crack, which have important implications for the social and public health responses targeting crack use in these two Brazilian cities. Adopting a risk environment framework enabled this study to identify micro- and macro-level physical, economic and social factors that may interact with sex/gender to produce observed sex/gender differences in crack-related risk among the young people in this study. In particular, aspects of the micro-level and macro-level economic and social environment appear to disadvantage Brazilian women who use crack in distinct ways, which may directly contribute to their greater observed participation in sex work. These findings point to the need for gender-specific interventions to address the enhanced social vulnerabilities experienced by female crack users, including structural interventions to support access to safe, affordable housing, as well as tailored, empowerment-oriented interventions to directly address the health and safety risks associated with sex trading in Rio de Janeiro and Salvador (e.g., condom negotiation, peer-based education and support services, outreach services).

Further, male crack users' low engagement in HIV screening services suggests the existence of micro- and macro-level social factors that may undermine men's access to HIV prevention services. As such, there is a need to develop gender-sensitive HIV screening interventions that are appropriately tailored to meet the service needs of men who use crack (e.g., mobile HIV testing). Finally, the majority of crack users in this study participated in unprotected sex, which suggests an important opportunity for local condom promotion and distribution interventions targeting this group of young drug users. Specifically, the results of this study highlight the importance of micro-level

economic and social factors in influencing unprotected sex among crack users, and support the need for outreach-based condom promotion interventions for marginalized crack users. These findings also suggest the importance of integrating a mental health care component (e.g., counselling, service referral) within sexual prevention services targeting young Brazilian crack users.

This study highlights the intersecting effects of sex/gender and micro-level physical, economic, and social factors on the health and wellbeing of young Brazilian crack users; and the existence of gender-specific 'risk environments' that differentially impact the experiences of crack-related harm among men and women. This research contributes important new knowledge of the respective social and health-related needs of male and female crack users in Brazil, which may be used to inform the development of appropriate structural and behavioural interventions to improve health outcomes for crack users in this context. Further, this study establishes the importance of a risk environment approach in contributing important contextual information about men and women's distinct experiences of crack use and crack-related harm, and establishing a generative framework for potential public health and social responses to reduce crack-related harm among young people in urban Brazil.

#### **4.4. Future research**

Findings from this study point to several areas for further research. Studies with larger, representative sample sizes would provide an opportunity to build on the present study's findings. Similarly, targeted sampling of groups underrepresented in the present investigation (i.e., women, transsexual participants) may serve future research interested in assessing the gendered dynamics of crack use in greater detail. Additionally, incorporating a longitudinal or life history component (see: Evans, 2002) would help to clarify the temporal nature of several relationships examined in this research, including information on education, employment/income generation, housing status, drug and other substance use, BBV status, and health and social service utilization. This information could help to identify opportunities for preventive or treatment interventions targeting drug-related harms among young crack users.

This study showed that female crack users were significantly less engaged with paid work than men. Future research should identify and further examine barriers to employment among Brazilian women who use crack; while also clarifying the nature of paid work among male crack users. Research in this area should also explore the contextual factors of sexual behaviours examined in the present analysis (e.g., partner characteristics, physical setting, substance use/intoxication, condom use), including sex trading, unprotected sex, and sex with multiple or BBV-positive partners, to better understand the dynamics of these behaviours. Additional investigations should include information about non-regular (i.e., casual) sex partners, to clarify how these behaviours may vary by partner type. This study assessed BBV-related drug use and sexual behaviours, but future investigations should include additional exposure categories (e.g., vertical transmission) to identify other potential sources of BBV-related risk among crack users in Brazil.

This study found that male crack users had significantly lower exposure to BBV testing services, and additional research is needed to identify potential barriers to HIV testing among men. Related to this, future research should also identify the context(s) in which women are receiving HIV and HCV testing, and potential factors that may facilitate their greater access to BBV screening. Additionally, there remains a need to determine whether these services are connecting female crack users with appropriate follow-up care, including HIV diagnosis, counselling, and treatment services. These findings also highlighted the high level of untreated physical and mental health problems among young crack users, and future research regarding the characteristics (i.e., type, severity) of these health problems would help to identify the health service needs of Brazilian crack users. Further investigations should also identify and examine barriers to health and social service access among young crack users, including service characteristics and availability.

In addition to investigating the behaviours and characteristics of regular crack users, future research in this area should incorporate factors specific to the Brazilian context. A significant proportion of participants from this study were recruited from low-income neighborhoods in Rio de Janeiro and Salvador, including *favela* ('shantytown') areas, which constitute distinct physical, socioeconomic and political spaces in Brazilian

society (Perlman, 2010). The significant socioeconomic disadvantage and patterns of drug use observed among participants in the present study is indicative of a need to consider how environmental conditions, including neighborhood characteristics and drug use spaces, may shape the crack use experience and related health and social consequences in Brazil – particularly in relation to housing and service infrastructure, neighborhood safety/security, and drug trafficking activity.

## **4.5. Conclusions**

This study contributes important new information regarding the comparative health, social and behavioural profiles of young women and men who use crack in Brazil; and also highlights common characteristics that are relevant to the health and wellbeing of crack users in this context. The results demonstrated key sex differences between male and female participants, suggesting underlying social, economic and gender dynamics that particularly disadvantage Brazilian women who use crack. These observed differences have important implications for the health and safety of crack users, as well as the development of appropriate health and social responses targeting crack-related harms among Brazilian youth. In particular, these findings suggest that gender-specific prevention programs targeting sexual-related risk may be required to address the respective needs of male and female crack users, yet also underscore the need for structural and environmental interventions to create ‘enabling environments’ for harm reduction among Brazilians who use crack.

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# Appendix A.

## Table A. Correlation matrix of key study variables

	City	Sex	Education	Housing	Paid work	Illegal Activity	Sex work	Begging	Alcohol use	Marijuana use	Daily crack use	Sex for drugs	Unprotected sex	HIV test	HIV+ status	Physical health	Mental health	Service utilization	Detained by police
City	.25**																		
Sex	.25**	.25**																	
Education	.13	-.07	.13																
Housing	-.40**	.23**	.11	.40**															
Paid work	-.29**	.40**	-.11	.28**	.29**														
Illegal activity	.01	.09	.16*	.09	.23**	.01													
Sex work	.13	-.55**	.10	.18*	.21**	.02	.05												
Begging	.10	-.25**	.01	.26**	.19*	.05	.12	.10											
Alcohol use	-.44**	.24**	-.04	.23**	.19*	-.12	.08	.12	.33**										
Marijuana use	-.30**	.24**	.02	.23**	.17*	-.09	.08	.14	.33**	.02									
Daily crack use	.22**	.35**	.05	.28**	.21**	.11	.05	.14	.33**	.06	.06								
Sex-for-drugs	-.07	.35**	.05	.28**	.21**	.11	.05	.14	.33**	.06	.06	.12							
Unprotected sex	-.12	-.02	.06	.20**	.14	.05	.05	.12	.28**	.13	.12	.12	.12						
HIV test	.17*	-.46**	-.04	.20**	.14	.05	.05	.12	.28**	.13	.12	.12	.12	.10					
HIV+ status	-.18*	-.21**	.05	.17*	.04	.02	.05	.12	.28**	.13	.12	.12	.12	.10	.25**				
Physical health	.21**	.08	-.06	.01	.02	.07	.11	.09	.13	.09	.07	.05	.05	.07	.25**	.08			
Mental health	.11	.17*	.10	.09	.00	.04	.13	.09	.13	.09	.07	.05	.05	.07	.25**	.31**	.31		
Service utilization	.03	-.23**	.08	.19*	.14	.01	.21**	.13	.06	.11	.01	.06	.07	.19*	.15	.00	.00	.00	
Detained by police	-.27**	.11	.09	-.01	.05	.09	-.07	-.06	.21**	.09	-.02	.05	.16*	-.03	-.03	-.00	.08	.08	-.02

Note: \* p < 0.05, \*\* p < 0.01