

**PROFILE OF
HEPATITIS C & INJECTION DRUG USE IN
CANADA**

A DISCUSSION PAPER

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The views expressed herein, are solely those of the authors and do not necessarily reflect the official policies of Health Canada.

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Executive Summary

Recently, there has been growing international concern about the spread and prevalence of the hepatitis C virus among those who inject drugs. Worldwide prevalence estimates range from 50% to 100% infection rates among drug injecting populations (Finch, 1998). In Canada, injection drug use and the sharing of needles is the main cause of hepatitis C transmission, accounting for approximately 70% of all prevalent infections (LCDC, 1999). For this reason, people who inject drugs are a key group, and central to the persistence of the hepatitis C virus in Canada. This report examines injection drug use in Canada, characteristics of those who inject drugs, and the identification of high-risk behaviours. This information is intended to provide direction for future initiatives and programming in efforts to reduce the spread of the hepatitis C virus in this country.

In Canada, much of hepatitis C programming has consisted of an extension of existing HIV or STD programs. As a result of significant differences in the nature of transmission, these efforts have not been successful (Crofts et al., 1997; 1999; Van Beek et al., 1998). The hepatitis C virus is transmitted more easily through blood than HIV, is more potent than HIV, and is acquired earlier after the sharing of needles. Compared to HIV, the hepatitis C virus is 10 to 15 times more infectious by the spread of blood (Heintges and Wands, 1997). This situation is further exacerbated by high prevalence rates of hepatitis C infection among populations that inject drugs, such that even occasional sharing of needles and other drug paraphernalia carries an extreme risk of infection. As such, those who are contemplating injection drug use or are new initiates of this behaviour are critical populations in efforts to prevent HCV infection.

Due to the illegal nature of injection drug use, as well as the negative societal view, it is difficult to obtain reliable information on the extent of injection drug use in Canada, and the characteristics of people who inject drugs. Most of the available information is based on responses from needle exchange participants or addictions treatment clients. It is estimated that there are between 75,000 to 125,000 people in Canada who inject drugs (Single, 2000). Presently, a young, single person at the low end of the economic scale is characteristic of those at greater risk of sharing needles and other drug paraphernalia (Single, 2000). Within the larger population of those who inject drugs, sub-populations have been identified that have unique

characteristics that place them at greater risk. These include prison populations, street-involved youth, women and Aboriginal people in Canada who are engaging in injection drug use.

Canadians incarcerated in prison have relatively high rates of hepatitis C and other blood-borne infections and injection drug use is the predominant risk factor underlying their higher risk (Jürgens, 1996). The presence of injection drug use and the sharing of needles in prisons increase the spread of the hepatitis C virus among inmates as well as the community at large upon their release. There is a pressing need for an examination of possible harm reduction initiatives that can be provided within the prison system.

The use and misuse of drugs in general, and injection drug use in particular, is particularly high among street-involved youth (Anderson, 1993; Roy et al., 1998). For many, drug use is symptomatic of family dysfunction and a hazardous street environment (Adlaf, Zdanowicz and Smart, 1996). Unless youth are able to remove themselves from street culture, success of intervention is low. These realities necessitate the provision of comprehensive prevention interventions that are sensitive to the environment in which unsafe behaviour occurs, as well as the provision of basic needs.

Increasingly, women who inject drugs are becoming more visible. There is evidence to suggest that females are becoming involved in injection drug use at a younger age than males (Rothon et al., 1997; Roy et al., 1998). For women who inject drugs, sexual or physical abuse may be a critical underlying factor. Research has found that women are less likely than men to inject illicit drugs alone and more likely to be influenced by others to inject drugs (Whynot, 1998). Women are often less able to resist pressure by their males partners to share needles or engage in unsafe sexual practices.

Aboriginal people in Canada have many social disadvantages that are frequently associated with the use and misuse of drugs, including poverty, low education, unstable family structure, physical abuse and poor social support networks (Scott, 1997). The number of Aboriginal people who inject drugs is not known. However, the evidence suggests that a disproportionately high number of Aboriginal people are users of injection drugs. It is imperative that prevention strategies incorporate ethnocultural differences that may impact upon risk-taking behaviour and

hepatitis C infection.

The control of the hepatitis C virus epidemic will require more intense concentration on prevention and reducing needle-sharing than was required to reduce the incidence of HIV. In meeting these demands, it is critical that the factors underlying the use of injection drugs are appreciated and considered in the development of targeted approaches.

Introduction

During the mid-1980s the sharing of needles and syringes became recognized as a major route of human immunodeficiency virus (HIV) transmission among persons who inject drugs. More recently, there has been growing international concern about the spread and prevalence of other blood-borne viruses among those who inject drugs, in particular the hepatitis C virus (HCV). Worldwide prevalence estimates range from 50% to 100% infection rate among drug injecting populations (Finch, 1998). Currently, injection drug use (IDU) is the most important mode of transmission of HCV in Canada, accounting for approximately 70% of all prevalent infections (LCDC, 1999). Statistics generally show that between 75% and 85% of individuals infected with HCV will become chronically infected (LCDC, 1999; MRC, 1999). Of these, approximately one-third will develop cirrhosis followed by end stage liver disease, and a small proportion (1% to 5%) will subsequently develop liver cancer (MRC, 1999).

The high rates of HCV infection among populations that inject drugs, the highly efficient transmission associated with the sharing of syringes and other drug equipment, and a steady addition of initiates into IDU have resulted in continued high rates of HCV infection (Crofts et al., 1997). For these reasons people who inject drugs are a key group, and centrally important to the persistence of this virus in Canada. For the most part, interventions designed to prevent HCV infections have been add-ons to existing HIV or sexually transmitted disease (STD) initiatives, and have not had a measurable impact on HCV rates in Canada (LCDC, 1999). To effectively address this issue, it is necessary to understand the unique relationship between HCV and IDU, as differentiated from other blood-borne viruses.

This document summarizes available information regarding the prevalence of HCV and IDU in Canada, demographic characteristics of those who inject drugs in Canada, and the identification of high-risk behaviors. The information contained in this profile will raise awareness and understanding of the nature of HCV infection among IDU populations in Canada, thereby providing direction for future initiatives and programming in this area.

Methodology

This report represents a synopsis of the draft report "A Socio-Demographic Profile of Drug Users in Canada", that was prepared for the HIV/AIDS Division by Dr. Eric Single, as well as a summary of research pertinent to the relationship between IDU and HCV. Although the focus is the Canadian context, research from other jurisdictions is included to further validate observations made by Canadian researchers.

Epidemiology of HCV

The hepatitis C virus was identified in 1989 (Choo et al., 1989), with a specific test to detect the presence of the virus available in 1990 (Remis, 1998). Serologic tests for HCV are relatively recent, as such there are many areas relating to disease and transmission that are only now being realized (Mather and Crofts, 1999).

Prevalence and Incidence

Although a restricted form of national reporting of HCV infection in Canada started in 1992, it was not until January 01, 1999 that all Canadian provinces and territories were reporting HCV cases (LCDC, 1999). In 1997, a total of 19,571 cases were reported. The prevalence of HCV infection in Canada is estimated at 0.8% (240,000 persons) (Remis, 1998). Worldwide, it is estimated that 3%, or approximately 170 million people are chronic carriers (LCDC, 1999). Most newly or chronically infected persons have no symptoms (approximately 70%), and as such are unaware of their infection (LCDC, 1999; MRC, 1999). They remain a source of transmission and are at risk for chronic liver disease, cirrhosis and liver cancer (LCDC, 1999).

The lack of symptoms, as well as the absence of a test to distinguish new cases from chronic cases, make it very difficult to estimate the incidence of the disease. An enhanced surveillance system to identify cases of acute HCV was established in four Canadian cities in October 1998. The extrapolated results suggest that 911 cases of clinically recognized acute hepatitis C could be identified in Canada. If infections without symptoms (70%) are included in this estimate, the total number of new HCV infections is estimated at 4,500 per year for Canada (Zou, Zhang, Tepper, et al., 2000).

Because of the potentially long lag time between infection and symptoms, a substantial increase in disease sequelae of HCV infection is anticipated in Canada over the next decade (LCDC, 1999). It has been predicted that by the year 2008, the incidence of cirrhosis and end-stage liver disease will have doubled, the incidence of liver cancer will have increased by 70% and liver deaths by 140% (MRC, 1999).

Modes of Transmission

The primary mode of transmission for HCV is through exposure to blood and blood products. The major group infected and at risk of infection is persons who share needles and other drug paraphernalia. In numerous studies of this population, HCV antibody positivity rates have been reported to be higher than 50%, and in some populations, reaching close to 100% (Heintges and Wands, 1997). In Canada, IDU accounts for approximately 70% of all HCV prevalent infections (LCDC, 1999).

Before HCV antibody screening of donated blood became standard practice, 10-15% of individuals who had received multiple blood transfusions or plasma products contracted the virus (LCDC, 1999). The introduction of HCV antibody screening of blood products has led to a dramatic decrease in HCV transmission through this method (Heintges and Wands, 1997). In Canada, the current risk is very low at about 1 in 103,000 units (LCDC, 1999). The Canadian Blood Services and HEMA Québec are currently investigating a new blood screening method (Nucleic Acid Amplification Testing or NAT) that is anticipated to further decrease the risk of transmission to 1 in 500,000 units (Canadian Blood Services, 1999).

Although sexual transmission of HCV infection has been demonstrated, it is not a common mode of transmission. Research in the United States and Europe has found low rates of infection, in the range of 0% to 6%, in partners of individuals with chronic HCV infection. The risk of infection through sexual intercourse with a carrier has been estimated at 2.5% over 20 years (LCDC, 1999). There is evidence to suggest that individuals who engage in frequent multi-partner sexual activity, independent of other factors such as IDU and tattooing, are at increased risk of contracting HCV (Dienstag, 1997).

Scully and colleagues (1993) examined the clinical and epidemiological features of HCV virus infection in a gastroenterology/hepatology practice in Ottawa, Canada. In this study, a retrospective chart review was conducted on 63 consecutive patients identified as anti-HCV positive. The results indicated that 48 (76%) had been exposed to HCV through exposure to blood: 27 used intravenous drugs, and 21 had received blood or blood products. In addition, the long-term sexual partners of 29 of these patients agreed to HCV antibody testing. None of the sexual partners who were tested were anti-HCV positive. The authors concluded that the majority of HCV cases, at least in Ottawa, are acquired through exposure to blood (either through medical treatment or sharing of needles) and that sexual transmission is rare.

Mother to child transmission of HCV is fairly uncommon, occurring in less than 5% of cases. Transmission rates are approximately three times greater if the mother is co-infected with HCV and HIV (Zanetti et al., 1999; Zanetti et al., 1995). There is no definite association between transmission and type of delivery or breast-feeding (Patrick et al., 2000). However, the Canadian Liver Foundation recommends the suspension of breast-feeding if the mother's nipples are bleeding or cracked (Canadian Liver Foundation, 1999).

In other countries, associations have been observed between the use of unsterilized devices in activities that break the skin, such as tattooing, ear or body piercing, or acupuncture, and HCV infection (CDC, 1998). However, research in the US has failed to find a relationship between these practices and HCV infection (CDC, 1998; Silverman et al., 2000). Finally, approximately 10% of people with HCV infection have no known risk factor (LCDC, 1999).

IDU in Canada

Information regarding rates and patterns of IDU is extremely difficult to obtain. As Millar (1998) explains, persons who inject drugs are often heavy, dependent users with a lifestyle that revolves around their drug use and marginalizes them from mainstream society. These are the visible, marginalized street population. There are also the hidden populations of injection drug users who may not fit the typical profile. Due to the illegal nature of the behaviour, as well as the negative societal view, it is difficult to obtain accurate information on the characteristics of people who inject drugs and injecting behaviors. Much of the available information is based on

best estimates, obtained from relatively accessible treatment populations such as clients in needle exchange programs, methadone maintenance or other addictions treatment programs.

This section examines the extent of IDU in Canada, characteristics of those who inject drugs and a discussion of high-risk groups. Much of the information contained in this section is from the Health Canada report "A Socio-Demographic Profile of Drug Users in Canada" (Single, 2000).

Prevalence of IDU

The extent of IDU in Canada is not known, but it is estimated that there are between 75,000 and 125,000 people who inject drugs in Canada (Single, 2000), approximately one-third of whom are women. Most reside in Toronto, Vancouver and Montreal. It is estimated that 30,000 people who inject drugs reside in Toronto (Remis et al., 1997), and 15,000 in Vancouver (Millar, 1998). In Montreal, the number of people who inject cocaine is estimated between 6,000 and 25,000 and for heroin between 5,000 and 15,000 (Roy and Cloutier, 1994). Although there are no estimates for Quebec City or Ottawa, it is believed that a significant amount of IDU occurs in these cities as well. In addition, 29.4% of young steroid users, or approximately 25,000 Canadians, report injection use (CCDFS, 1993).

Types of Drugs

The most commonly injected drugs are cocaine and heroin. This is a cause for concern in itself, as cocaine use involves particular risk. Persons who inject cocaine inject as often as twenty times a day, increasing the problems associated with obtaining clean needles and sharing contaminated needles (McAmmond and Associates, 1997). Information obtained through detailed interviews with 610 individuals who inject drugs in Winnipeg, Manitoba (Elliot and Blanchard, 1998) found cocaine to be the predominant drug injected, and was associated with binge use and frequent injection. Talwin, Ritalin, amphetamines and steroids have also been used intravenously in some areas of Canada at various times (Single, 2000).

Needle-Sharing

The proportion of people who report sharing needles varies considerably, but is exceedingly high in many communities: 76% in Montreal (Bruneau et al., 1997), 69% in Vancouver (Strathdee et al., 1997), 64% in a semi-rural Nova Scotia community (Stratton et al., 1997), 54% in Quebec City (Belanger et al., 1996) and Calgary (Elnitsky and Abernathy, 1993), 46% in Toronto (Myers et al., 1995) and 37% in Hamilton-Wentworth (Devillaer and Smye, 1994).

Strathdee and colleagues (1997) conducted a study with 281 people involved in IDU from Vancouver, British Columbia that examined the social determinants predictive of needle-sharing behaviour. Factors that were independently associated with needle-sharing included injecting four or more times/day, polydrug use, and a history of sexual abuse. With regard to sexual abuse, the authors hypothesized that a history of sexual abuse may be related to low self-esteem and depression, which in turn could make individuals less concerned about safe needle practices. Access or barriers to clean needle use was not associated with needle-sharing.

Belanger et al. (1996) examined the indicators of risk that discriminate those sub-groups that are at high risk of sharing needles and other drug paraphernalia. The sample included clients participating in the needle exchange program in Quebec City. More than half of the participants (54.1%) reported having shared at least one used needle during the six months before the interview. Factors related to needle-sharing included multi-drug use, frequenting a shooting gallery, and injecting in the presence of people not well known. Females and young people (under the age of 20 years) were more inclined than males and older clients, respectively, to adopt unsafe injecting practices. A discussion of potential reasons that place women and youth at greater risk of unsafe practices is provided in the section "HCV and At-Risk Populations."

Demographic Characteristics

In an attempt to delineate the characteristics associated with IDU in Canada, Single (2000) synthesized information from some 20 different Canadian studies. A description of these studies is contained in Table 1 (see Appendix). It is important to note that the information in this section is based on the characteristics of clients in needle exchange programs and/or treatment programs and as such, may not reflect the overall population of people who inject drugs in Canada.

The ratio of male to female injection drug use in these studies vary from 1.6:1 (SADAC, 1993) to 6.1:1, reflecting differences in outreach and client requirements (Millson et al., 1995). The overall average is 3 to 1, indicating that approximately one fourth of those who inject drugs are women. While there is a great variation in age, the mean age of those involved in injection drug use is the early 30s for men and the late 20s for women. The reasons for these gender differences are not clear. However, research with young users of injection drugs suggests that females are initiating injection drug use at an earlier age than males. This research will be discussed further in the section "HCV and At-Risk Populations."

The average age of IDU in these studies ranged from 28 to 35, but substantial numbers are under the age of 20 years. For instance, more than one in five individuals who injected drugs in a recent study conducted in Quebec City were teenagers (Belanger et al., 1996). Although it is difficult to recognize a trend with only sixteen studies, there are indications that the average age of participants in needle exchange programs has increased somewhat over the past few years. The (unweighted) mean age of the five most recent studies is 32 years of age, which is higher than reported for any of the prior studies.

Only five of the 20 studies reported marital status. While the proportion that is single ranges widely from 38% (Millson et al., 1990) to 76% (Hewitt and Vinge, 1991), the majority of study participants from the five studies were single.

Compared to clients who do not inject drugs, those who inject drugs have lower educational attainment. Although there is a wide range, the majority of IDU occurs among high school dropouts. Rates of incomplete high school in various locations are as follows: 81% in Vancouver (Strathdee et al., 1997), 63% in a semi-rural community in Nova Scotia (Stratton et al., 1997), 61% in Quebec City (Poulin et al., 1995), 57% in Calgary (Elnitsky and Abernathy, 1993), 52% in Edmonton (Wolfe and Sykes, 1992). Toronto observed higher rates of completed high school, with 37% having less than a high school education (Millson et al., 1990).

Most people involved in IDU are unemployed. Rates of unemployment range from 43% in Cape Breton (Poulin et al., 1992) to 88% in Montreal (Bruneau, 1994), 87% in Edmonton

(Wolfe and Sykes, 1992) and 77% in Toronto (Millson et al., 1995). In Vancouver, 88% of participants were on social assistance (Archibald et al., 1996). As such, it is not surprising that IDU is generally associated with low incomes. Although few studies report income, it is noteworthy that 40% of individuals involved with IDU in Montreal earn less than \$10,000 per year and 71% earn less than \$25,000 (Brunea et al., 1997).

HCV in IDU Populations

Consistently, studies of intravenous drug using populations reveal high rates of HCV. This section profiles some of the research conducted in Canada, as well as internationally, by highlighting the perspective that the prevalence of HCV appears to be contingent on the harms associated with IDU, and unlike the HIV population, less related to sexual practices. A summary of the research in this area is provided in Table 2 (see Appendix).

Canada

Strathdee and colleagues (1997) examined the prevalence of HCV, HIV and risk behaviors in a prospective study of individuals who inject drugs from Vancouver, British Columbia. Beginning in May 1996, the Vancouver IDU study recruited persons who had injected drugs at least once in the previous month. Prevalence rates of HCV and HIV were 88% and 23%, respectively. The results also revealed high levels of needle-sharing, with 40% of participants having lent used needles, and 40% having borrowed used needles. As the authors note, the normative nature of needle-sharing is particularly disturbing given that Vancouver has the highest number of needle exchange programs in North America.

Building on the previous study, Patrick et al. (1998) examined incidence and independent predictors of HCV seropositivity in the sample from Vancouver, British Columbia. Among a sample of 1,080 individuals, only 172 were HCV negative at baseline. After a median follow-up of 9.8 months, 23 of these became HCV positive. Factors associated with a positive HCV status included duration of IDU, female gender, history of incarceration, and ever attending a needle exchange program. The authors emphasized the need for primary prevention of IDU, harm reduction in prison and programming for women.

Romanowski et al. (1997) examined risk factors for HCV infection in a sample of 6,668 males and females attending two STD clinics in Alberta. In this group, HCV prevalence was 3.4% and HIV prevalence was 1.5%. The majority (75%) of those who were infected with HCV indicated that they were users of injection drugs. Analyses revealed a significant relationship between hepatitis C infection and IDU, prostitution, exchanging money or drugs for sex and Aboriginal ethnicity.

Stratton and colleagues (1997) employed an interesting approach in their examination of IDU and HCV in a semi-rural region of Nova Scotia. These authors examined seroprevalence of HCV, HBV and HIV among those who inject drugs and their sexual partners (SIDU). IDU among the sexual partner group was not recorded. A total of 172 adults (92 IDU, 80 SIDU) were recruited from the community and local correctional facility. In the IDU group, seroprevalence of HCV was 47%, HBV was 23% and 5% for HIV. Among sexual partners, HCV, HBV and HIV was 1%, 5% and 1%, respectively. Of IDU participants, 71% of males (n=77) and 79% of females (n=15) reported borrowing needles. Based on these findings, the authors concluded that the sharing of needles and HCV infection among persons who inject drugs is not a problem that is restricted to large urban centres.

International

Australia has been prolific in conducting research on the role of IDU in the spread of HCV. In 1997, Crofts and colleagues conducted a review of the available epidemiological data in Australia. The results revealed high rates of HCV, in the magnitude of 60-70%, in populations of Australians who inject drugs. Over a number of studies, with different populations and recruiting methods, a consistent pattern of high HCV infection rates was observed. Infection started with the first injection and continued through the career of the drug injector.

Much of the research examining HCV transmission has been conducted with persons who inject drugs or blood transfusion recipients. Sladden et al. (1997) examined the routes of HCV transmission by conducting a survey of all HCV cases notified to the local public health unit in an Australian community. Of the 467 responses, all but one reported blood exposure: IDU (85%), pre-1990 blood transfusion (6%), other blood exposures (8%). The large majority of respondents were persons who were involved in IDU.

A notable study in the United States is the ALIVE study, a longitudinal investigation of the natural history of HIV in the Baltimore, Maryland area (Garfein et al., 1996; Thomas et al., 1995; Villano et al., 1997). Between 1988 and 1989, 2,921 persons who injected drugs were enrolled in the study. The median duration of drug use was 12 years, and 85% of participants were HCV positive at baseline. Garfein et al. (1996) examined seroprevalence rates among the 716 participants who reported initiation into drug use within the six years before enrollment into the study. Of the 716 participants, 76.9% were HCV positive. Among those who had injected for one year or less, 64.7% were HCV positive. The authors emphasized how the high rate of HCV among short-term injectors highlights the need for early interventions with individuals starting to inject drugs.

Garfein et al. (1998) examined the prevalence and risk factors for HCV in a prospective study of young injection drug users in Baltimore. Recruitment efforts targeted individuals between the ages of 18 and 25 years. Of the 229 participants enrolled, 86 (37.6%) were HCV seropositive at baseline. A positive HCV status was significantly associated with injecting for less than two years. The high HCV prevalence and the strong association with short-term IDU suggest that young adults are at high risk for HCV infection soon after their initiation into IDU. As such, the need for interventions targeted early in IDU or at those at risk for starting IDU is essential.

Chang and colleagues (1999) specifically examined the relationship between the prevalence of HCV infection and duration of drug use in a sample of 899 drug users from Taiwan. The prevalence of HCV was 67.2% among those who injected drugs, and 14.7% among those that did not inject drugs. HCV infection was positively associated with duration of injection use within the first seven years of drug use. The steepest trajectory in HCV infection occurred within the first four months of IDU. Consistent with the findings of other studies discussed, these results highlight the importance of early risk reduction and prevention interventions in reducing HCV infection rates.

The research findings from Canada regarding the role of IDU in the transmission of HCV are consistent with those obtained internationally. Populations with a higher occurrence of IDU activity have a correspondingly higher rate of HCV; for example, 88% in Vancouver, Canada

(Strathdee et al., 1997), 85% in Baltimore, United States, 85% in Australia (Sladden, 1997). Studies that examined HCV infection among individuals with health issues other than IDU had a much lower rate of HCV prevalence: 3.4% in a sexually transmitted disease clinic in Alberta, Canada (i.e. Romanowski et al., 1997), 14.7% among a sample of people who use drugs (non-injection drug use) in Taiwan (Chang et al., 1999).

HCV and At-Risk Populations

Street-involved youth, women, Aboriginal populations, and prison populations are important target groups for interventions designed to control HCV. This section discusses some of the unique characteristics that place these groups at greater risk.

Street-Involved Youth

The use and misuse of drugs is particularly high among street-involved youth (Anderson, 1993; Radford et al., 1989; Smart and Adlaf, 1991). The term 'street-involved youth' refers to children and adolescents who become socially dislocated from their mainstream counterparts and who experience marginal or chronic homelessness (Hagan and McCarthey, 1997). It is generally believed that a major pathway to this marginal lifestyle is the experience of physical, emotional and/or sexual abuse at home (Radford et al., 1989). There are no scientifically valid estimates of the street-involved youth population in Canada, but estimates have ranged as high as 150,000 (Covenant House, 1988).

Unfortunately there is very little Canadian information on the extent and nature of IDU among youth in general, and street-involved youth in particular. There is even less information on the factors underlying the transition from non-injection drug use to injection drug use. An understanding of these factors is critical to the development of prevention initiatives designed to prevent the spread of HCV infection in this population.

In 1995, a prospective cohort study of Montreal street-involved youth (15-22 years of age) was initiated. The results revealed that a high proportion of street-involved youth (36%) has used injection drugs and 23% had injected in the previous six months. The proportion of Montreal street-involved youth infected with HCV was found to be 18% and 4% for HIV (Roy

et al., 1996; 1998). On average, girls tended to start injecting at a younger age than boys (16 vs. 17.3 years). Over half of those who had injected had borrowed needles and 67% had shared injecting equipment.

Four other Canadian studies provide further information on the extent and nature of drug use among street-involved youth. The first is a national multi-site study, conducted in 10 Canadian cities, based on interviews with 712 street-involved youth aged 15-20 years (Radford et al., 1989). Two separate studies were conducted in Toronto, one in 1990 with 145 street-involved youth (Smart et al., 1990) and the other conducted in 1992 with 217 youth (Smart et al., 1992). In Halifax, interviews were conducted in 1991 with 200 youth less than 24 years of age (Anderson, 1993). Finally, interviews were conducted in 1993 in Vancouver with 100 street-involved youth aged 19 and younger (McCreary Centre Society, 1994).

In the 1988 Canadian multi-site study, 12% of street-involved youth reported injecting drugs in their lifetime (Radford et al., 1989). In Toronto, 28% injected drugs in their lifetime and 4% have shared needles during the past year (Smart et al., 1992). In Halifax, about one in nine street-involved youth had injected drugs (Anderson, 1993). IDU rates were higher in Vancouver, with 48% of males and 32% of females reporting lifetime drug injection (McCreary Centre Society, 1994).

Information obtained in the Winnipeg Injection Drug Epidemiology Study (Elliot and Blanchard, 1998) found that 22% of individuals had injected with a used needle the first time they ever injected. At the time of first injection, 49% were under 20 years old. These results speak to the young age at which people are initiating IDU and engaging in highly risky injection practices.

Similar results were obtained in a study conducted by Belanger et al. (1996) that examined the predictors of needle-sharing among participants in a needle exchange program in Quebec City. The results showed that younger participants, under the age of 20 years, were more likely than older participants to report sharing needles in the six months prior to the study. Needle-sharing was also related to multiple drug use, which in turn was more common among young users. Although these results are not directly related to 'street' youth, they underscore the need for efforts targeted at younger injectors.

The authors provided several hypotheses to explain the observed relationship between a young age and risky injection practices. First, young users of injection drugs may be more open to exploring different types of drugs and engaging in poly-drug use, whereas older users may have settled with a particular drug. Second, preventive messages may have had less impact because younger users have had less exposure to such messages. Finally, IDU may be more of a social behavior for young users, bringing with it increased opportunity for needle-sharing. In contrast, injecting among older adults may represent more of a solitary lifestyle activity (Belanger et al., 1996).

An important study conducted in Australia specifically examined the level of information regarding HCV transmission among young injectors (Carruthers and Loxley, 1995). The sample included 234 12 to 20 year old users of injection drugs. Although the majority (80%) had heard of HCV, only 50% considered the infection to be a serious problem. Unfortunately, there is no information available related to knowledge levels of HCV among young Canadians.

Women

Very few studies have addressed the issues specific to women who inject drugs.

Notwithstanding the lack of information, women who inject drugs are increasingly visible. For instance, women comprised 35% of the approximately 6000 registrants of a Vancouver needle exchange. A similar proportion of women were represented in the Vancouver Injection Drug Use Study (VIDUS) (Whynot, 1998).

A few studies have observed that girls start to inject at a younger age than boys. For instance, among street-involved youth in Montreal, the average age that girls started injecting was 16 years, compared to 17.3 years for boys (Roy et al., 1996; 1998). In a study of youth in British Columbia correctional facilities, more young females (10.2%) than males (3.4%) reported IDU (Rothon et al., 1997). Analyses revealed that females 16 to 19 years of age were 5.3 times more likely than males aged 16 to 19 to have engaged in IDU. Females were also more likely than males to have had sex with a user of injection drugs. Similar results were found in a study conducted in New South Wales with youth in custody (Copeland et al., 1998). Girls were more likely than boys to have injected drugs and shared injecting equipment. In addition, lack of

knowledge regarding the transmission of HIV, HCV and HBV was more pronounced among females, despite their higher rates of potential exposure to these viruses.

For women, sexual or physical abuse is often a predisposing factor in IDU and a barrier to reduction of risky behaviors (Gilbert et al., 1997). To understand IDU among women, it is important to consider their social networks (Barnard, 1993; Whynot, 1998). Research has found that women are less likely than men to inject illicit drugs alone and more likely to be influenced by others to inject drugs (Whynot, 1998). Women are often less able to resist pressure by their male partners to share needles or engage in unsafe sexual practices. As Barnard (1993) notes, the dominant male culture surrounding IDU inhibits a woman's ability to negotiate safe practices, particularly if the women are young and without social support.

Aboriginal People in Canada

Indigenous peoples have many social disadvantages that are frequently associated with the use and misuse of drugs, including poverty, low education, unstable family structure, physical abuse and poor social support networks (Scott, 1997). The number of Aboriginal people in Canada who inject drugs is not known. It is reasonable to assume, however, that Aboriginal people are at particular risk of HCV infection, in part because they are over-represented in groups practicing high risk behaviors, such as prisoners, the chronically unemployed and the homeless.

Shields (2000) examined high-risk behaviours and hepatitis C status among 519 youth 15-24 years of age who identified their ethnic origin as Aboriginal. Participants were recruited through drop-in centers in seven major Canadian cities. Just under one-quarter (21%) reported injecting drugs at least once in their lives. In the WIDE study (Elliot and Blanchard, 1998), 1068 participants from Winnipeg who had ever injected drugs were identified through community clinics, needle exchange programs, treatment programs, street contacts and public health nurses. A disproportionately high number of those surveyed self-identified as Aboriginal (compared to the proportion of Aboriginal people living in Winnipeg). Specifically, 64% of those who had ever injected drugs were Aboriginal.

Information from British Columbia on HIV/AIDS in Aboriginal communities also underscores the issue of IDU in this population. A major difference in Aboriginal AIDS cases versus non-

Aboriginal cases is the frequency with which IDU is cited as a risk factor. This is particularly evident among Aboriginal women. Nationally, 50% of Aboriginal women and 19% of Aboriginal men have IDU as their primary risk factor for HIV infection. For non-Aboriginal women and men, the rates of IDU are 7.4% and 3.2%, respectively. As noted by the authors, IDU has not traditionally been a topic of discussion in most Aboriginal communities. To begin to address this new and emerging issue in these communities, "it will take willingness, persistence and honesty to look at underlying causes for the use of injection drugs" (B.C. Aboriginal HIV/AIDS Task Force, 1999, p. 10).

Prison Populations

Canadians incarcerated in prison have relatively high rates of HCV and other blood-borne infections and IDU is the predominant risk factor underlying their higher risk (Jürgens, 1996). A significant portion of the prison population consists of people who currently inject drugs or did so in the past. The presence of IDU and the sharing of needles in prisons increases the spread of HCV among inmates as well as the community at large upon their release

Studies conducted in Canadian prisons have found HCV prevalence rates between 28% and 40% (Canadian HIV/Legal Network, 1999). The most recent study of federal prison inmates (Lior et al., 1998) found 48% of inmates in the federal prison at Springhill, Nova Scotia to be users of injection drugs, of which 52% were HCV positive. Furthermore, 39% of users continued to inject drugs in prison and the majority (82%) reported sharing needles when injecting drugs.

In another study, 39 long-term inmates (20 males and 19 females) were randomly selected from two federal institutions and invited to participate in a survey examining risk-taking behaviors (Calzavara et al., 1997). The participation rate was 82%. Inside prison, 56% used any drugs during the past 12 months, 28% injected drugs inside prison in the past 10 years, and 5% injected drugs during the past 12 months of their current incarceration. Needle-sharing was more prevalent inside prison than it was outside. Just under one-quarter (21%) reported infection with hepatitis C.

Research in this area reinforces the need for appropriate services to prevent HCV transmission

within the prison walls as well as the community at large. Drugs are readily available in most prisons and those who inject drugs are at high-risk for infection because of the lack of access to harm reduction resources (Marte and Gatell, 1999).

Considerations for Intervention

In 1994, the Canadian Laboratory Centre for Disease Control (LCDC) held a national meeting on the prevention and control of HCV. This was followed by a conference in 1998 (Hepatitis C: Prevention and Control. A Public Health Consensus) intended to review the present state of knowledge and action with regard to the public health aspects of HCV. With respect to reaching IDU populations, the following conclusion was made:

Despite some efforts targeted at injection drug users (IDUs), the involvement of public health in Canada has not yet had a measurable impact on the hepatitis C epidemic in this group. There has been piggy-backing onto existing HIV/STD programs, which themselves are not adequate, but these cannot be expected to take into account the special characteristics of the HCV epidemic (LCDC, 1999, pg. 15).

This conclusion is consistent with the research findings reviewed in this report.

As expressed by researchers in Australia (Crofts et al., 1997; 1999; Van Beek et al., 1998), if the sharing of needles and syringes were the major mode of transmission of HCV, there would have been a decline in rates resulting from the provision of needle exchange programs since the late 1980s. Analyses reveal a decline in HIV, but not HCV. For instance, the prevalence of HCV among people who inject drugs is about 65% whereas that of HIV is less than 3%; incidence is about 15% per year for HCV and less than 1% per year for HIV.

A number of factors have been identified that help explain the high rates of HCV infection among people who inject drugs, and the relative ineffectiveness of existing HIV harm reduction strategies in reducing rates of HCV infection. First, compared to HIV, HCV is more easily transmitted through blood-to-blood contact, and infection is acquired earlier after initiation of injection drug use (Crofts and Aiken, 1997; Crofts et al., 1999; Tranchina, 1998; Wodak,

1997). Minute amounts of blood may be sufficient to transmit HCV, so the risk associated with the sharing of drug equipment may be higher than that for HIV. As an indication of the potency of the virus, on average, HCV is 10 to 15 times more infectious by blood-to-blood contact than is HIV (Heintges and Wands, 1997; Liddle, 1996; Mather and Crofts, 1999). This is not to suggest that HIV prevention strategies such as needle exchange programs are unwarranted, but using current practices, they are not enough.

Videotapes of groups of individuals injecting drugs reveal many opportunities for exposure through blood contaminating equipment other than needles and syringes. This includes swabs, spoons, water vials and tourniquets, as well as surfaces in the immediate environment such as countertops. There are also various injection practices that increase the risk of transmission (Riehman, 1996). One practice, called 'booting', draws blood from the user's arm, mixes the drawn blood with the drug already contained in the syringe, and then re-administers the blood/drug mixture into the vein. Traces of blood will remain in the needle and syringe, thereby placing other users of the equipment at risk. In another practice, called 'frontloading' or 'backloading' the drug is mixed in one syringe, and then the mixture is divided by squirting some of the solution into one or more additional syringes. Although the needle is not shared, HCV can be transmitted if the syringe used for mixing has been previously contaminated. Therefore, encouraging drug users to adopt non-injecting routes of administration (sniffing, smoking, snorting or swallowing) may be another way for achieving HCV control among persons who inject drugs (Wodak, 1997).

The second important factor affecting rates of HCV infection is drug of choice. Cocaine is the drug of choice among many Canadians who inject drugs. Because cocaine is metabolized very quickly in the body, it requires far more frequent injections to maintain its effects. People who inject cocaine inject as often as twenty times a day, increasing the problems associated with obtaining clean needles and sharing contaminated needles (McAmmond and Associates, 1997).

Background viral prevalence is the third critical factor in the spread of HCV (Crofts et al., 1999). HCV prevalence is now so high among populations that inject drugs that even very occasional sharing of needles and syringes carries an extreme risk of infection. With a low prevalence virus such as HIV, high-risk behavior must be far more frequent and prevalent to

sustain continued spread of infection. The implication is that control of the HCV epidemic will require more intense concentration on reducing needle-sharing and other risky behavior than was required to reduce the incidence of HIV.

Some of the research reviewed clearly shows the need for prevention efforts targeted at people who are just beginning to inject drugs, and those who are contemplating injection. For instance, van Beek et al. (1998) noted the extremely high incidence of HCV among participants less than 20 years of age in Australia. In the study conducted by Chang et al. (1999) in Taiwan, the steepest trajectory in HCV infection occurred within the first four months of IDU. These findings highlight the importance of early risk reduction and prevention interventions in reducing HCV infection rates. A major barrier, of course, is the difficulty in reaching this population. There is a clear need for research that can lend understanding to the nature of this group in terms of methods to identify new users and those contemplating IDU, and the types of messages and strategies that can effectively curb risky drug using behaviors.

Another important target group is the prison population. Prison populations are unique in that they represent a focused concentration of individuals at risk for contracting or spreading HCV. For instance, more than four-fifths (81%) of users of injection drugs in Toronto have been incarcerated since they began using intravenously (Millson et al., 1995). In the United States, it is estimated that 30-40% of the 1.8 million inmates in the US are infected with HCV (Reindollar, 1999). Not only is the risk of HCV exposure great within the confines of the prison, but this population also represents a serious risk to the community at large following their release. Future efforts directed at implementing education, policies, and procedures for the prevention and treatment of HCV in correctional populations in Canada are imperative.

Other at-risk populations that were identified include street-involved youth, women and Aboriginal people in Canada. The unique circumstances and needs of each of these groups will have to be incorporated in future prevention and intervention strategies if they are to be effective.

In an examination of IDU among street-involved youth in Toronto, Adlaf, Zdanowicz and Smart (1996) found that for many youth, drug use was symptomatic of family dysfunction and a

hazardous street environment. Unless youth are able to remove themselves from street culture, success of intervention is low. The authors state that success may be improved with a combination of services including substance abuse treatment and other counseling, aftercare programs and social supports such as welfare, improved housing, literacy and job training.

Although inconclusive, there is evidence to suggest that females are becoming involved in IDU at a younger age than males. For women who inject drugs, sexual or physical abuse may be a critical underlying factor. Another important consideration is their social networks, and the finding that women are less able to resist pressure by their male partners to share needles. An area in need of further investigation is the factors underlying initiation into IDU, and an examination of gender differences.

Aboriginal people in Canada have many social disadvantages that place them at greater risk of harmful involvement with drugs. These unique realities need to be understood and addressed in future efforts designed to prevent the spread of HCV in this population. Specifically, prevention strategies will need to take into account ethnocultural differences which may impact upon risk-taking behaviour and HCV infection.

Summary

In Canada, there has been a great deal of debate between federal/provincial/territorial policy makers, and the agencies responsible for providing addiction services with regards to the potential societal and financial impact of HBV, HCV and HIV infection rates. This paper examined the current literature pertaining to the prevalence of HCV in this country and examined some of the characteristics specific to this population.

The epidemiology of HCV appears to be unique and results in a pattern of infection different from HBV and HIV infected individuals. The literature is clear that HCV is transmitted primarily through blood-to-blood contact; with the sharing of needles among people who inject drugs the most common mode of transmission. There are vulnerable populations in our society who are at greater risk, but as has been experienced with other blood-borne viruses, these viruses can be transmitted to other segments of the population. Presently a young, single person at the low end of the economic scale is characteristic of those at greater risk.

As national and provincial/territorial policy makers develop strategies to curb the infection rate of HCV, it is not only the epidemiology of the virus and the existing infection rates that will need to be addressed, it is also the long-term costs to the Canadian health care system that will play an integral part in this national debate. The cumulative costs to society and the medical treatment needed to care for infected individuals are and will continue to be significant.

In a recent report to the Minister of Health, the Medical Research Council (1999) strongly emphasized the "looming crisis" that is being created by HCV on the health care system and the necessity for swift action in terms of resource allocation, policy development and a research agenda. In meeting this challenge, the report stressed that "it is imperative to keep people affected by HCV at centre stage and empower them to make informed decisions on issues pertaining to public awareness, screening, diagnosis, treatment options, access to care, prevention programs and research strategies in order to decrease the burden of HCV" (p. 10).

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Appendix

Table 1: Characteristics of Canadian injection drug users in studies of persons in needle exchange programs and/or treatment

Reference	Site	Clinical setting	Ratio M : F	Age	% single	% < H.S. education	% not employed	% Native	Injection drugs of choice	% sharing needles	Other traits or comments
Millson et al., 1990	Toronto	treatment centres	2.1: 1	44% < 30	38%	37%	54%	--	heroin, cocaine	37% in past month	
Bardlesy et al., 1990	Vancouver	needle exchange	1.7: 1	58% < 30	--	--	--	34%	--	--	
Hewitt & Vinge, 1991	Alberta	treatment centres	2.8: 1	22% < 25 91% < 40	76%	--	69%	--	cocaine	--	
TDPH, 1991	Toronto	needle exchange	1.9: 1	64% < 31	--	--	--	--	--	--	
James & Huebert, 1991 ¹ ; Huebert and James, 1992	Alberta	treatment centres	2.3: 1	mean=30.5 42% < 30	--	60%	--	--	84% cocaine 47% Talwin & Ritalin; 32% amphetamines	60%	
Coates et al., 1992	Toronto and Montreal	treatment centres	Tor: 1.8: 1 Mon: 2.7: 1	Mean= Tor: 30.3 Mon: 30.6	Tor: 50% Mon: 67%	Mean yrs= Tor: 10.5 Mon: 10.7	Tor: 68% Mon: 81%	--	Tor: heroin (46%); Mon: cocaine (66%)	approx 3/4 in both cities	Income < 10K= Tor: 31% Mon: 36%
Poulin et al., 1992	Cape Breton, Nova Scotia	needle exchange	3.4: 1	mean= 28 (m) and 26 (f)	--	--	43%	--	--	--	54% tested + for Hep B
Wolfe & Sykes, 1992 ¹	Edmonton	treatment centres	2.7: 1	41% < 30	--	52%	87%	--	--	low ²	0.5% HIV+
Elnitsky & Abernathy, 1993	Calgary	needle exchange	3:1	mean=32 42% < 30	--	57%	69%	32%	91% cocaine 42% heroin, 41% morphine	54%	29% living off crime
SADAC, 1993	Saskatchewan	treatment centres	1.6: 1	62% < 30	--	74%	63% + 30% less than full time	64% (nearly 1/2 women)	heroin, talwine, cocaine	--	

(Continued)

¹Unpublished report cited in McHutchion, 1996.²84% report never sharing or always cleaning needles.

Table 1: Characteristics of Canadian injection drug users in studies of persons in needle exchange programs and/or treatment

Reference	Site	Clinical setting	Ratio M : F	Age	% single	% < H.S. education	% not employed	% Native	Injection drugs of choice	% sharing needles	Other traits or comments
Bruneau, 1994	Montreal	treatment centres + shelters	3.7: 1	mean=32	--	--	88% (Income: 43%<\$10K)	--	69% cocaine	91%	11.4% HIV+ (16% among untreated)
Devillaer & Smye, 1994	Hamilton-Wentworth	treatment centres	2.9: 1	mean= 29 58% < 30	43%	--	72%	--	cocaine	47% in past year	mean duration of use=10.5 years
Poulin et al., 1995	Quebec City	needle exchange	2.6: 1 ³	mean=29	--	61%	--	-- ⁴	cocaine= 94%, heroin = 23%, PCP=10%	43% shared with HIV+=16%	Hepatitis= 29% (m), 37% (f)
Myers et al., 1994; Millson et al., 1995; Myers et al., 1995	Toronto	needle exchange	6.1: 1	mean 28 59%<30	--	--	77%	--	cocaine 70% heroin 15%	46%	81% jailed since injecting
Archibald et al., 1996	Vancouver	IDUs in treatment for HIV infection	2.1: 1	mean=35	--	--	88% on social assistance	33%	cocaine, heroin, speedballs	46% of those HIV+	2/3 attempted suicide once+
Belanger et al., 1996	Quebec City	needle exchange	2.7: 1	22% <20 mean =29.7 (m), 24.4 (f)	--	--	--	--	cocaine, heroin, PCP	54%	sharing related to young age and females
Sweet et al., 1996	Prince Edward Island	treatment centres	5.6: 1	22% < 25 58% <35	--	--	--	--	72% cocaine	61%	no HIV+ but not all tested
Romanowski et al., 1997	Alberta	sexually transmitted disease clinics	--	--	--	--	--	--	--	--	IDU among HIV+: 17% (m) & 3% (f)

(continued)

³The demographic characteristics apply to persons who attended the needle exchange program for at least 2 months.⁴Not reported, but 64% jailed at least once.

Table 1: Characteristics of Canadian injection drug users in studies of persons in needle exchange programs and/or treatment

Reference	Site	Clinical setting	Ratio M : F	Age	% single	% < H.S. education	% not employed	% Native	Injection drugs of choice	% sharing needles	Other traits or comments
Stratton et al., 1997, Lior and Stratton, 1998	semi-rural community in Nova Scotia	treatment centres	5.1: 1	mean = 30	63%	“44% completed some HS”	78% not full time	--	cocaine	64%--note: no needle exchange	5% HIV+ 23% HBV+ 47% HCV+
Strathdee et al., 1997	Vancouver	needle exchange	1.8: 1	median=35	--	81%	--	27%	cocaine 64% heroin 25%	69%	23% HIV+; 88% Hep C+
Bruneau et al., 1997	Montreal	needle exchange	5: 1	mean=32 50% < 30	--	--	(Income: 39% <\$10K and 71% <\$25K)	--	cocaine (64%)	76% (78% if in needle exchange and 72% if not)	10.7% HIV+ Higher HIV+ rate for needle exchange users ⁵

⁵Needle exchange attracts high-risk IDUs, but authors suspect that it may also bring some isolated injection drug users into contact with other IDUs and lead to some needle sharing that might not have otherwise occurred.

Table 2: Summary of Research Examining the Prevalence and Predictors of HCV

Authors	Location	Sample	HCV Prevalence	Predictors of HCV
Strathdee et al. (1997)	Vancouver, Canada	500 IDU	88%	-----
Patrick et al. (1998)	Vancouver, Canada	1,080 IDU	85%	Female, Ever Incarcerated, NEP Attendance, Borrowing syringes, Age, Duration of IDU
Romanowski et al. (1997)	Alberta, Canada	6,668 STD Clinic Patients	3.4%	IDU, Exchanging money or drugs for sex
Stratton et al. (1997)	Semi-rural, Nova Scotia	92 IDU 80 SIDU	47% 1%	-----
Lior et al. (1998)	Nova Scotia, Canada	194 prison population	28%	-----
Kemp et al. (1998)	New Zealand	323 IDU	64%	Increased Age, Duration of IDU
Van Beek et al. (1998)	Australia	1,078 IDU	45%	Age less than 20 years, history of imprisonment
Crofts and Aitken (1997)	Australia	626 IDU	62%	-----
Crofts et al. (1993)	Australia	410 IDU	68%	Women: Duration of IDU, history of methadone maintenance Men: Duration of IDU, Opiate use, History of imprisonment
Oliveira et al. (1999)	Brazil	102 IDU	70%	Needle sharing and longer duration of IDU
Thomas et al. (1995)	Maryland, USA	1,203 IDU	89%	Race, HIV infection, 5+years IDU, Daily drug use, cocaine
Fisher et al. (1997)	Alaska, USA	501 IDU	81%	Recent IDU, Cocaine
Baozhang et al. (1997)	China	176 Drug Addicts	36%	IDUs, Needle-sharing
Chang et al. (1999)	Taiwan	899 Drug Users	67% among IDUs	Duration of IDU
Smyth et al. (1999)	Ireland	735 IDU	62%	Duration of IDU, Increased daily drug expenditure
Garfein et al. (1998)	Maryland, USA	229 young IDU	38%	-----
Ogilvie et al. (1999)	Australia	90 youth-prison population	21%	-----
Pallas et al. (1999)	Spain	693 prison population	41%	Needle sharing
Massad et al. (1999)	South America	631 prison population	34%	-----
Butler et al. (1997)	Australia	408 prison population	37%	IDU, HBV, Past imprisonments
Crofts et al. (1995)	Australia	3627 prison population	39%	IDU, Younger age

* Some studies may be conducted on the same samples.