

# Epi-Update

## Hepatitis C virus (HCV) in youth aged 15 to 24 years

### At a Glance

The reported rate of newly diagnosed HCV among Canadian youth aged 15 – 24 years in 2008 was 0.02% (21.1 per 100,000 population).

The prevalence of HCV is as follows:

- ▶ Among street-involved youth (Enhanced Street Youth Surveillance, E-SYS, 1999-2005): 4.5%
- ▶ Among street-involved youth who inject drugs (E-SYS, 1999-2005): 18.3%
- ▶ Among youth who inject drugs (I-Track, 2003-2005): 34.7%

Using univariate analysis, demographic and social factors associated with HCV in street-involved youth participating in E-SYS include:

- ▶ Older age (20-24 years vs. 15-19 years)
- ▶ Aboriginal ethnicity
- ▶ History of injecting drugs
- ▶ History of interaction with social services or the justice system
- ▶ Involvement in illicit activities for income (e.g., stealing, sex trade, dealing drugs)
- ▶ High-risk sexual behaviour
- ▶ History of sexual abuse

### Introduction

The estimated prevalence of HCV among Canadian youth aged 15 to 24 years is low (0.2%) according to 2007 statistical modelling estimates.<sup>1</sup> However, for youth who are homeless, “street-involved” or who inject drugs, the risk of becoming infected with HCV is significantly higher. These youth have to cope with unstable living conditions and are often marginalized, even if their homelessness is temporary. They experience mental health problems, drop out of school early, are often exposed to violence, and experience higher health-related morbidity and mortality rates than their peers.<sup>2</sup> Their circumstances may place them at increased risk of contracting and transmitting HCV and other sexually transmitted and bloodborne infections (STBBIs), such as chlamydia, gonorrhea, syphilis, hepatitis B and HIV/AIDS.

Studies in Vancouver and Montreal indicate that a high rate of HCV infection occurs within a few years of initiation of injection drug use. In a cohort study of people who inject drugs in Vancouver, 46% of those aged 13 to 24 years tested positive for HCV at enrolment.<sup>3</sup> Almost half of Montreal street-involved youth aged 14 to 25 years recruited in a cohort study reported having injected illicit drugs, and the overall HCV prevalence in this group was 12.6%.<sup>4</sup> However, data on the prevalence of HCV and factors associated with this infection among youth at a national level are scarce. This *EpiUpdate* presents such information using routinely reported data of newly diagnosed HCV cases from provinces and territories and from enhanced surveillance data to more closely examine the prevalence of HCV and factors associated with HCV infection among a sub-population of youth: street-involved youth and youth who report injecting drugs.

\* “Street-involved” is defined as individuals who have a history of unstable housing (i.e. have run away, been “thrown out” of home, or have had no fixed address for three or more consecutive days).



## Analyses

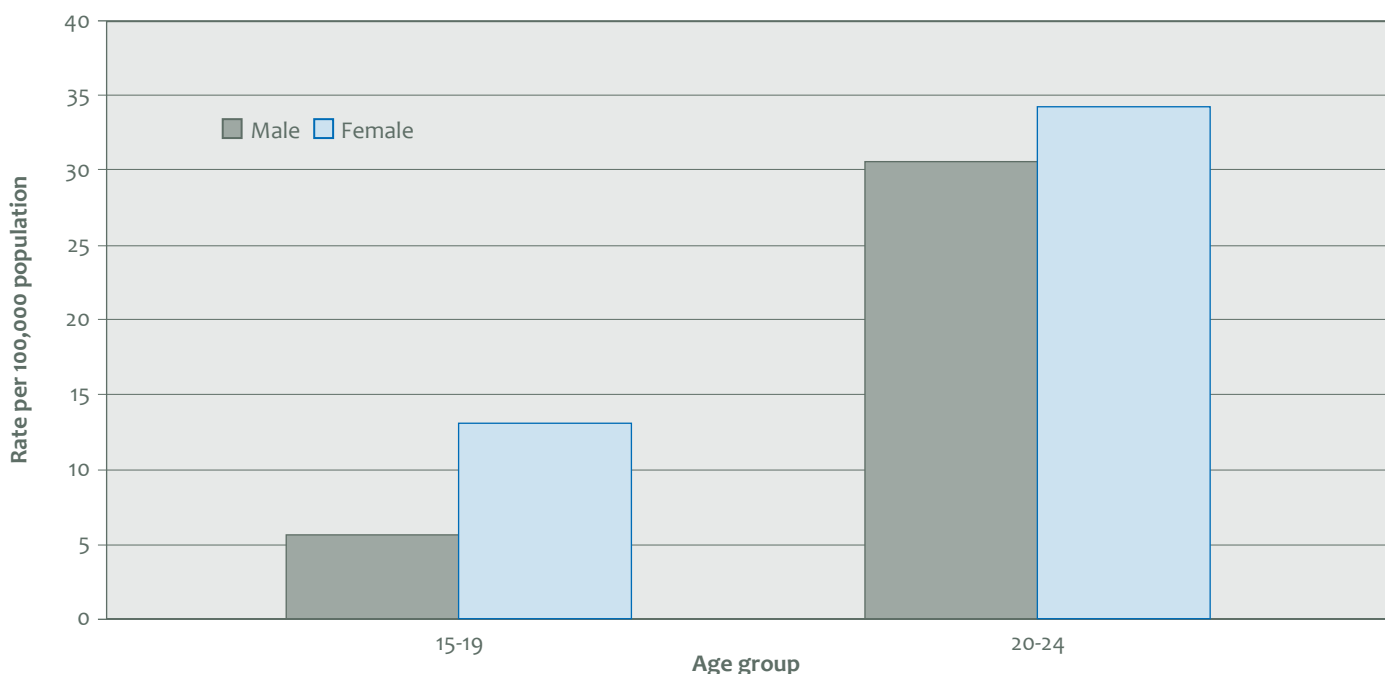
Reported rates of newly diagnosed HCV from the Canadian Notifiable Disease Surveillance System (CNDSS) data were determined using 2008 preliminary post-censal population estimates provided by Statistics Canada. Unadjusted odds ratios (uOR) and chi-square tests were performed for bi-variate analyses to assess the relationship between various risk factors and HCV infection. Note: since multivariate analyses and adjusted odds ratios are not included in this *EpiUpdate*, interpretation of factors associated with HCV must be made with caution as the effects of other confounders were not controlled for in this document.

## Results

### Reported rates of HCV in Canadian youth aged 15 to 24 years

- ▶ According to routine surveillance data from CNDSS, the overall rate of newly diagnosed and reported HCV cases among youth aged 15 to 24 years during 2008 was 21.1 per 100,000 population, or 0.02%.
- ▶ The reported rate of HCV is higher among older youth compared with their younger counterparts: 32.5 per 100,000 population in those aged 20-24 years compared with 9.5 per 100,000 population in those aged 15-19 years (Figure 1).

**Figure 1: Reported rate of HCV among Canadian youth by age group and sex, CNDSS, 2008**



### HCV among youth who inject drugs (IDU)

The analyses presented below were restricted to IDU aged 15 to 24 years who participated in I-Track between 2003-2005, consented to provide a biological specimen (blood or oral fluid sample) for HCV testing, and had HCV antibody results ( $n = 430$ ).

- ▶ The overall prevalence of HCV among youth IDU was 34.7%.

- ▶ The percentage of youth IDU who were HIV positive was 5.1%. Of these, 81.8% also tested positive for HCV antibodies.
- ▶ Older youth IDU (aged 20 to 24 years) were 5.2 times more likely to have evidence of past or present HCV infection than their younger counterparts (aged 15 to 19 years). Sex, education, and self-reported Aboriginal ethnicity were not associated with HCV among youth IDU (Table 1).

**Table 1: Demographic factors associated with HCV infection among IDU aged 15-24 years, I-Track, Phase 1, 2003-2005**

| Variable                                      | Total (n = 430) | HCV + <sup>‡</sup> (n = 192) | uOR** (95% CI)     | p value* |
|---|-----------------|------------------------------|--------------------|----------|
| Age   |                 |                              |                    |          |
| 15-19   | 100             | 12 (12.0%)                   | Reference category | <0.001   |
| 20-24   | 330             | 137 (41.5%)                  | 5.2 (2.7-9.9)      |          |
| Sex   |                 |                              |                    |          |
| Female  | 184             | 71 (38.6%)                   | 1.3 (0.9-2.0)      | 0.2      |
| Male  | 244             | 78 (32.0%)                   | Reference category |          |
| Highest level of education (excludes missing) |                 |                              |                    |          |
| Primary                                       | 283             | 100 (35.3%)                  | 0.9 (0.6-1.4)      | 0.7      |
| Secondary +                                   | 144             | 48 (33.3%)                   | Reference category |          |
| Ethnicity                                     |                 |                              |                    |          |
| Aboriginal                                    | 83              | 32 (38.6%)                   | 1.2 (0.8-2.0)      | 0.4      |
| Other ethnicities                             | 344             | 116 (33.7%)                  | Reference category |          |

▶ <sup>‡</sup> HCV testing was performed using the Ortho® HCV version 3.0 enzyme immunoassay. Confirmatory testing was not performed for samples that tested positive. A positive result indicates past or present HCV infection and does not discriminate acute from chronic or resolved infections. ▶ \* Statistically significant at p < 0.05. ▶ \*\* uOR (95% CI) = unadjusted odds ratio (95% confidence interval).

- ▶ Youth IDU who reported injecting regularly (at least once or twice a week) were 1.8 times more likely to be HCV sero-positive, compared to those who did not inject or injected less frequently (sometimes or never) in the previous month. Those who reported most frequently injecting in a public place were 1.9 times more likely to be HCV sero-positive than those who reported injecting elsewhere (Table 2).
- ▶ Approximately 30% of youth IDU reported borrowing used needles in the previous 6 months; they were approximately 3 times more likely to be HCV sero-positive than those who did not borrow needles (Table 2).

**Table 2: Injecting risk behaviours associated with HCV among IDU aged 15-24 years, I-Track, Phase 1, 2003-2005**

| Variable                                       | Total (n = 430) | HCV + <sup>‡</sup> (n = 192) | uOR** (95% CI)     | p value* |
|--|-----------------|------------------------------|--------------------|----------|
| Frequency of injection in the last month       |                 |                              |                    |          |
| Regularly (more than 1 times/week)             | 279             | 109 (38.8%)                  | 1.8 (1.1-2.8)      | 0.01     |
| Sometimes or never                             | 147             | 38 (26.2%)                   | Reference category |          |
| Most frequent place of injection               |                 |                              |                    |          |
| Public (e.g., parks, alleys, stairwells, etc.) | 154             | 67 (43.5%)                   | 1.9 (1.3-2.9)      | 0.002    |
| Other (e.g., home, private venues)             | 267             | 77 (28.8%)                   | Reference category |          |
| Borrowed needles in the last 6 months          |                 |                              |                    |          |
| No   | 301             | 83 (27.6%)                   | Reference category | <0.001   |
| Yes  | 123             | 63 (51.2%)                   | 2.8 (1.8-4.3)      |          |

▶ <sup>‡</sup> HCV testing was performed using the Ortho® HCV version 3.0 enzyme immunoassay. Confirmatory testing was not performed for samples that tested positive. A positive result indicates past or present HCV infection and does not discriminate acute from chronic or resolved infections. ▶ \* Statistically significant at p < 0.05. ▶ \*\* uOR (95% CI) = unadjusted odds ratio (95% confidence interval).

- ▶ Among male youth IDU, having a male sex partner(s) in the previous 6 months increased the odds of HCV sero-positivity by 4.5 times; male youth IDU who reported sex work with male clients in the previous 6 months were 8 times more likely to be HCV sero-positive than those who did not engage in sex work (Table 3).
- ▶ Female youth IDU who reported sex work with male clients in the previous 6 months were 3 times more likely to be HCV sero-positive than those who did not engage in sex work (Table 3).

**Table 3: Sexual risk behaviours associated with HCV among IDU aged 15-24 years, I-Track, Phase 1, 2003-2005**

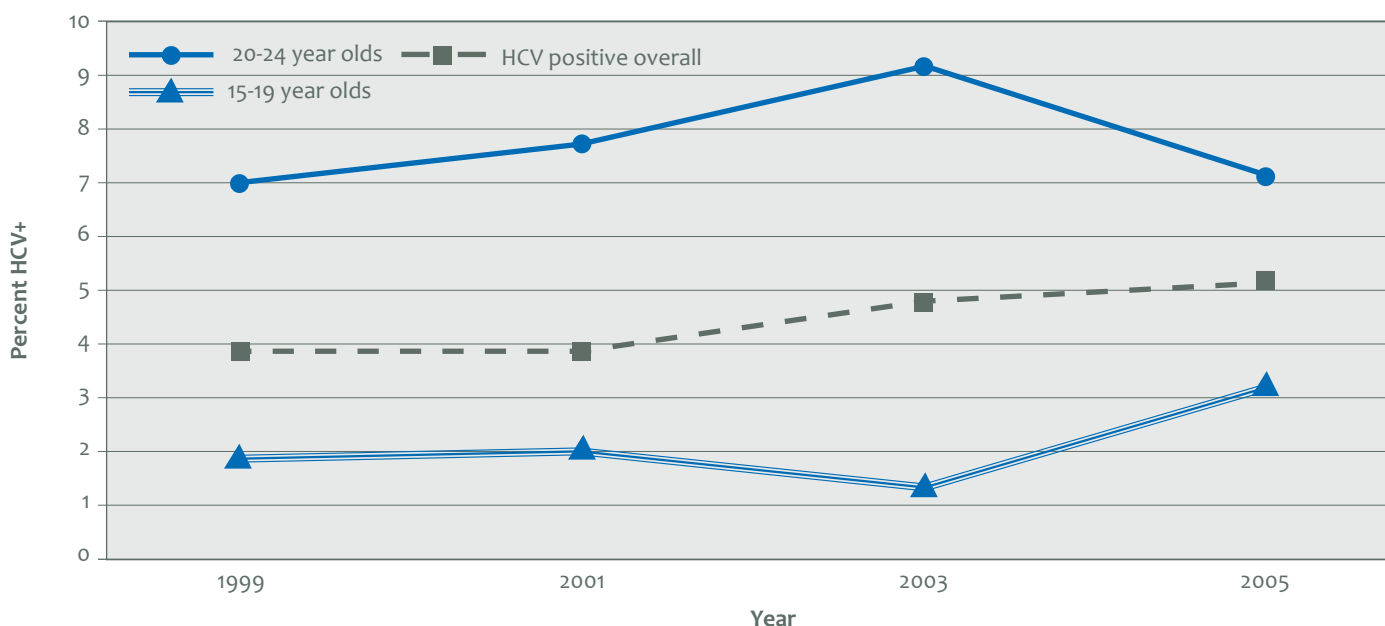
| Variable  |     | Total (n = 430) | HCV + <sup>§</sup> (n = 192) | uOR** (95% CI)                       | p value* |
|---|-----|-----------------|------------------------------|--------------------------------------|----------|
| Same sex partner in the last 6 months (males only; n = 244)     | No  | 207             | 55 (26.8%)                   | Reference category<br>4.5 (2.2-9.3)  | <0.001   |
|   | Yes | 37              | 23 (62.2%)                   |                                      |          |
| Same sex partner in the last 6 months (females only; n = 184)   | No  | 142             | 58 (40.9%)                   | Reference category<br>0.6 (0.3-1.4)  | 0.2      |
|   | Yes | 42              | 13 (31.0%)                   |                                      |          |
| Traded sex in the last 6 months (n = 430)                       | No  | 354             | 103 (29.1%)                  | Reference category<br>3.7 (2.2-6.2)  | <0.001   |
|   | Yes | 76              | 46 (60.5%)                   |                                      |          |
| Males who traded sex with male clients (n = 244) <sup>^</sup>   | No  | 217             | 58 (26.7%)                   | Reference category<br>7.8 (3.1-19.5) | <0.001   |
|   | Yes | 27              | 20 (74.1%)                   |                                      |          |
| Females who traded sex with male clients (n = 184) <sup>^</sup> | No  | 140             | 45 (32.1%)                   | Reference category<br>3.0 (1.5-6.1)  | 0.002    |
|   | Yes | 44              | 25 (59.1%)                   |                                      |          |

► § HCV testing was performed using the Ortho® HCV version 3.0 enzyme immunoassay. Confirmatory testing was not performed for samples that tested positive. A positive result indicates past or present HCV infection and does not discriminate acute from chronic or resolved infections. ► \* Statistically significant at  $p < 0.05$ . ► \*\* uOR (95% CI) = unadjusted odds ratio (95% confidence interval). ► ^ The number of female clients was small and did not affect the significance of the relationship.

### HCV in street-involved youth

The analyses presented below are restricted to street-involved youth who participated in E-SYS between 1999-2005, consented to provide blood for HCV testing, and had HCV antibody results ( $n = 4455$ ).

► The overall prevalence of HCV sero-positivity among youth participating in E-SYS was 4.4%; there was an increase from 3.9% in 1999 to 5.2% in 2005 ( $p < 0.05$ ).

**Figure 2: Prevalence of HCV among street-involved youth**

► Older street-involved youth, females, Canadian-born and Aboriginal youth (i.e. aged 20 to 24 years vs. aged 15 to 19 years), all were independently associated with

being HCV sero-positive. Youth who had completed fewer years of schooling were also more likely to be HCV sero-positive (Table 4).

**Table 4: Demographic factors associated with HCV among street-involved youth, E-SYS, 1999-2005**

| Variable                                      |                                 | Total (n = 4,455) | HCV + (n = 199)          | uOR** (95% CI)                      | p value* |
|---|---------------------------------|-------------------|--------------------------|-------------------------------------|----------|
| Age   | 15-19<br>20-24                  | 2,604<br>1,851    | 54 (2.1%)<br>145 (7.8%)  | Reference category<br>4.0 (2.9-5.5) | <0.001   |
| Sex   | Female<br>Male                  | 1,725<br>2,729    | 92 (5.3%)<br>107 (3.9%)  | 1.4 (1.0-1.8)<br>Reference category | 0.03     |
| Ethnicity                                     | Aboriginal<br>Other ethnicities | 1,565<br>2,889    | 114 (7.3%)<br>85 (2.9%)  | 2.6 (1.9-3.5)<br>Reference category | <0.001   |
| Birthplace                                    | Canada<br>Other countries       | 4,067<br>384      | 192 (4.7%)<br>7 (1.8%)   | 2.7 (1.2-5.7)<br>Reference category | 0.009    |
| Highest level of education (excludes missing) | Primary<br>Secondary +          | 121<br>4,095      | 14 (11.6%)<br>171 (4.2%) | 3.0 (1.7-5.4)<br>Reference category | <0.001   |

► \* Statistically significant at  $p < 0.05$ . ► \*\* uOR (95% CI) = unadjusted odds ratio (95% confidence interval).

► The most significant risk factor for HCV among street-involved youth was a history of injecting drugs. About 18% of street-involved youth reported having ever injected drugs, and these youth were 32.8 times more likely to be HCV sero-positive (Table 5).

- 88% of HCV sero-positive street-involved youth had injection drug use as a risk factor (Table 5).
- The HCV sero-positivity rate among street-involved youth who injected drugs was 18.3%, compared to

0.7% among street-involved youth who had never tried injecting drugs (Table 5).

- Of the respondents who had injected drugs and answered the question about sharing needles or equipment, about 30% said they did not always use clean, new needles or gear (e.g., water, filters, spoons). Those who reported borrowing needles were 2.3 times more likely to be HCV sero-positive (Table 5).

**Table 5: Drug use risk behaviours associated with HCV among street-involved youth, E-SYS, 1999-2005**

| Variable  |           | Total (n = 4,455) | HCV + (n = 199)          | uOR** (95% CI)                         | p value* |
|---|-----------|-------------------|--------------------------|--|----------|
| Ever used non-injection drugs                                       | No<br>Yes | 255<br>4,198      | 1 (0.4%)<br>198 (4.7%)   | Reference category<br>12.6 (1.8-90.0)  | 0.001    |
| Ever used injection drugs   | No<br>Yes | 3,473<br>955      | 24 (0.7%)<br>175 (18.3%) | Reference category<br>32.2 (20.9-49.7) | <0.001   |
| Injected cocaine in the past 3 months <sup>^</sup>                  | No<br>Yes | 328<br>217        | 63 (19.2%)<br>77 (35.5%) | Reference category<br>2.3 (1.6-3.4)    | <0.001   |
| Injected morphine in the past 3 months <sup>^</sup>                 | No<br>Yes | 367<br>178        | 80 (21.8%)<br>60 (33.7%) | Reference category<br>1.8 (1.2-2.7)    | 0.003    |
| Always used clean needles or other injecting equipment <sup>^</sup> | No<br>Yes | 130<br>305        | 54 (41.5%)<br>72 (23.6%) | 2.3 (1.5-3.6)<br>Reference category    | 0.0002   |

► \* Statistically significant at  $p < 0.05$ . ► \*\* uOR (95% CI) = unadjusted odds ratio (95% confidence interval). ► <sup>^</sup> Among those who injected drugs more than once.

- ▶ HCV sero-positivity among street-involved youth was higher among those with history of involvement with social service agencies or the justice system. Street-involved youth who had ever been in foster care were 2.3 times more likely to be sero-positive for HCV, and those who had spent one night or longer in a detention facility were 4.2 times more likely to be infected.
- ▶ Street-involved youth who reported leaving home because of sexual abuse were two times more likely to be HCV sero-positive than those who did not report sexual abuse as a reason for leaving home.
- ▶ Street-involved youth who reported that their primary sources of recent income were activities such as stealing, sex work or dealing drugs were significantly more likely to be HCV sero-positive than those who were not involved in these activities.
- ▶ Males who reported having sex with other males were significantly more likely to be positive for HCV antibody than those who did not report having sex with males (Table 6).
- ▶ Respondents who reported exchanging sex for money, drugs or other goods were significantly more likely to be HCV sero-positive than those who did not report these activities (Table 6).

**Table 6: Sexual risk behaviours associated with HCV infection among street-involved youth, E-SYS, 1999-2005**

| Variable  |     | Total (n = 4,455) | HCV + (n = 199) | uOR** (95% CI)                      | p value* |
|---|-----|-------------------|-----------------|-------------------------------------|----------|
| Ever had a same sex partner (males only; n = 2,584)   | No  | 2,215             | 79 (3.6%)       | Reference category<br>2.1 (1.4-3.4) | 0.0008   |
|   | Yes | 369               | 27 (7.3%)       |                                     |          |
| Ever had a same sex partner (females only; n = 1,660) | No  | 1,109             | 46 (4.2%)       | Reference category<br>2.1 (1.4-3.2) | 0.0004   |
|   | Yes | 551               | 46 (8.4%)       |                                     |          |
| Ever traded sex                                       | No  | 3,398             | 98 (2.9%)       | Reference category<br>4.2 (3.2-5.6) | <0.001   |
|   | Yes | 891               | 99 (11.1%)      |                                     |          |

▶ \* Statistically significant at  $p < 0.05$ . ▶ \*\* uOR (95% CI) = unadjusted odds ratio (95% confidence interval).

## Discussion

The prevalence of antibody to HCV (implying present or past exposure to HCV) in at-risk youth populations such as street-involved youth and those who inject drugs appears to be increasing. Between 1999 and 2005 the proportion of these youth who tested positive for HCV antibody increased by one-third.

As in the general Canadian population, injecting drugs and sharing injection equipment are the predominant risk factors for HCV transmission among youth. Thirty percent of youth who inject drugs said they did not always use clean, new needles: an omission that significantly increases the risk of further transmission not only of HCV,

but of other bloodborne infections. The associations (if any) of male-to-male sex and sex trade with HCV transmission needs to be further explored. Furthermore, the indirect relationships between distal factors such as abuse and education levels and HCV transmission are unclear.

Prevention and control efforts must consider the social and cultural factors that influence risky practices and potentially put some young people at greater risk of HCV infection. If HCV and other related infections are to be prevented and related health outcomes for at-risk youth are to be improved, provision of comprehensive services and support must be available and accessible.



## Data Sources

The data sources used in this report are described below. Since enhanced and routine surveillance systems collect data through different mechanisms, direct comparisons between data sources must be made with caution.

**Canadian Notifiable Disease Surveillance System (CNDSS):** Through routine surveillance, provincial and territorial Ministries of Health voluntarily submit data on diagnosed and reported cases of HCV (both newly acquired and chronic) to the Public Health Agency of Canada (PHAC) on an ongoing basis through the CNDSS. These data reflect only cases that have been diagnosed and do not take into account under-reporting or reporting delays (i.e. the time between a positive HCV test result and receipt of this report by PHAC). Moreover, data collected through routine surveillance do not distinguish between newly acquired and chronic (longer-term) HCV infection.

**I-Track:** I-Track is a multi-site, enhanced surveillance system that monitors changing patterns in drug use and injecting practices, sexual risk behaviours, HIV and HCV prevalence, and testing behaviours among people who inject drugs (IDU) in Canada. Information presented about youth IDU is based on data collected during Phase 1 of I-Track, which was completed between October 2003 and May 2005 and which included 3,031 participants recruited from sites in Victoria, Edmonton, Regina, Winnipeg, Sudbury, Toronto, and the SurvUDI sites: Abitibi-Témiscamingue, Estrie, Mauricie/Centre du Québec, Montérégie, Montréal, Ottawa, Outaouais, Québec, and Saguenay/Lac St-Jean.<sup>5</sup>

**Enhanced Street Youth Surveillance (E-SYS):** E-SYS is a multi-centre, enhanced surveillance program that describes the prevalence of STBBIs, risk behaviours, testing behaviours and socio-economic factors associated with STBBIs among Canadian street-involved youth. The information presented is based on data collected from 6,053 street-involved youth recruited between 1999 and 2005 from seven sites: Vancouver, Edmonton, Saskatoon, Winnipeg, Toronto, Ottawa, and Halifax.<sup>6</sup>

## Acknowledgements

Routine surveillance for HCV is possible at the national level due to the reporting of positive HCV cases to the Public Health Agency of Canada by the provinces and territories.

I-Track is possible as a result of collaboration between the Public Health Agency of Canada and researchers, provincial and local health authorities, and community-based organizations from participating sites across Canada; coordination is provided by the Public Health Agency of Canada's Surveillance and Risk Assessment Division; HCV and HIV testing is performed by the National HIV and Retrovirology Laboratory. Special thanks to the I-Track study participants. Further information on I-Track may be obtained at <http://www.phac-aspc.gc.ca/aids-sida/about/itrack-eng.php>.

Enhanced Street Youth Surveillance (E-SYS) is possible as a result of collaboration between the Public Health Agency of Canada and researchers, provincial and local health authorities, and community-based organizations from participating sites across Canada; coordination is provided by the Public Health Agency of Canada's Community Acquired Infections Division; and STBBI testing is performed by local laboratories and the National HIV and Retrovirology Laboratory. The names of the organizations and people associated with E-SYS can be found at <http://www.phac-aspc.gc.ca/sti-its-surv-epi/youth-jeunes-eng.php>. Special thanks to the street-involved youth who consented to participate in E-SYS.

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