The Future Face of Coinfection

Prevalence and Incidence of HIV and Hepatitis C Virus Coinfection Among Young Injection Drug Users

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Summary: The purpose of this study was to determine the prevalence and incidence of HIV and hepatitis C virus (HCV) coinfection among young (aged 29 years or younger) injection drug users (IDUs) and to compare sociodemographic and risk characteristics between (HIV/HCV) coinfected, monoinfected, or HIV- and HCV-negative youth. Data were collected through the Vancouver Injection Drug Users Study (VIDUS). To date, more than 1400 IDUs have been enrolled and followed, of whom 479 were aged 29 years or younger. Semiannually, participants have completed an interviewer-administered questionnaire and have undergone serologic testing for HIV and HCV. Univariate and multivariate logistic regression analyses were undertaken to investigate predictors of baseline coinfection. Cox regression models with time-dependent covariates were used to identify predictors of time to secondary infection seroconversion. A Cochran-Armitage trend test was used to determine risk associations across 3 categories: no infection, monoinfection, and coinfection. Of the 479 young injectors, 78 (16%) were coinfected with HIV and HCV at baseline and a further 45 (15%) with follow-up data became coinfected during the study period. Baseline coinfection was independently associated with being female, being aboriginal, older age, greater number of years injecting, and living in the IDU epicenter. Factors independently associated with time to secondary infection seroconversion were borrowing needles and greater than once-daily cocaine injection, and accessing methadone maintenance therapy in the previous 6 months was protective. There were clear trends across the 3 categories for increasing proportions of female subjects, aboriginal subjects, older age, greater number of years injecting, living in the IDU epicenter, and daily cocaine use. There were a shocking number of youth living with coinfection, particularly female and aboriginal youth. The median number of years injecting for youth seroconverting to a secondary infection was 3 years, suggesting that appropriate public health interventions should be implemented immediately.

Key Words: HIV and HCV coinfection, injection drug use, youth, female and aboriginal

(*J Acquir Immune Defic Syndr* 2004;36:743–749)

HIV and hepatitis C virus (HCV) coinfection is a growing concern in North America, particularly among injection drug users (IDUs), in whom the majority of coinfections are concentrated.[1,2] It has been estimated that approximately 40% of individuals living with HIV are also coinfected with HCV, and among HIV-positive IDUs, the estimate is between 50% and 90%.[1] Although the impact of HCV infection on HIV disease progression remains unclear,[3–6] evidence suggests that coinfection has been associated with more rapid HCV progression.[7] In addition, some of the antiretroviral therapy used to ward off HIV disease progression has been shown to be associated with liver toxicity.[8] Thus, coinfection among IDUs is a growing concern in terms of public health as well as HCV and HIV treatment.[9]

The age of individuals becoming infected with HIV and HCV in North America is decreasing.[10,11] Studies of IDUs have suggested that youth and recent initiates were at higher risk for both HIV[12] and HCV[13,14] infection. HIV infections among IDUs in North America have been concentrated among marginalized populations; African Americans in the United States and aboriginals in Canada have been disproportionately affected by the epidemic.[15,16] Given the evidence suggesting higher morbidity and mortality among coinfected individuals, there is an urgent need to document the incidence and prevalence of coinfection to understand the magnitude of the epidemic and to characterize target populations for intervention programs and future treatment strategies. Young IDUs provide an important opportunity to examine the incidence of coinfection due to more recent initiation into injection drug use, lower baseline infection(s), and increased risk for seroconversion.

Received for publication August 13, 2003; accepted December 4, 2003.

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Cari L. Miller is supported through the Canadian Graduates Scholarship Program and the Michael Smith Foundation for Health Research, and Martin T. Schechter is a Canadian Institutes of Health Research Senior Investigator.

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Since 1996, Vancouver, British Columbia, has experienced an explosive and ongoing epidemic of HIV among IDU populations.[17] The public health response to the epidemic has focused on enforcement-based interventions, whereas drug treatment and other HIV and HCV prevention measures have remained desperately underfunded. Vancouver youth who use injection drugs have not been spared. We have documented an HIV incidence rate of 4.37 per 100 person-years[18] and an HCV incidence rate of 37.3 per 100 person-years[19] among IDUs aged 24 or younger. We undertook the current study to estimate the prevalence of coinfection and the time to HIV and HCV coinfection among IDUs aged 29 or younger and to characterize sociodemographic characteristics and risk factors for coinfection.

METHODS

Data were collected within a prospective open cohort study of IDUs, the Vancouver Injection Drug Users Study (VIDUS). A description of this study has been published.[20] The VIDUS has recruited more than 1400 Vancouver area IDUs since May 1996. The study office is located in a storefront in the Downtown Eastside (DTES) of Vancouver. The DTES is Vancouver's poorest neighborhood, where an estimated 5000 IDUs reside in an area of approximately 10 city blocks and inexpensive housing in the form of hotels and single-room occupancies (SROs) abounds. The DTES is the epicenter of illicit drug-related activity in Vancouver.

Eligibility criteria included residing in the city of Vancouver and surrounding municipalities and having injected in the previous month before enrollment. Participants must be aged 14 years or older to enroll. Participants were administered a questionnaire by trained nurses and interviewers and were eligible to return for follow-up every 6 months. At each visit, eligible participants were tested for HIV and HCV antibodies through a venous blood sample. This study was approved by the St. Paul's Hospital Committee on Human Experimentation.

Instrument

The VIDUS questionnaire elicits information regarding sociodemographic, sexual, and drug risk characteristics. Behavioral variables were elicited in reference to the previous 6 months before the interview. This includes the variables of sex trade work, frequency of injection, neighborhood, sexual behaviors, needle sharing, and methadone. Sex trade was defined as trading sex for money, drugs, or shelter.

Statistical Analysis

For the purposes of this study, young injectors were defined as those aged 29 years or less at the time of recruitment. Young injectors identified at baseline as HIV- and HCV-negative or monoinfected with 1 virus were compared with those who were baseline HIV and HCV coinfected using contingency table analysis. χ^2 and Fisher exact tests were used to compare categoric variables, and the Wilcoxon rank sum test was used to compare continuous variables. All relevant sexual and risk variables available through the VIDUS survey were examined in univariate analysis. All variables significant at the $P < 0.05$ level were reported in the tables as well as variables of significance from the literature. All multivariate models described were fit using the same protocol of adjusting for all variables that were significant ($P < 0.05$) in univariate analysis. All reported probability values were 2-sided.

Youth who became HIV and HCV coinfected during the study period were compared with youth who remained monoinfected or negative and had at least 1 follow-up visit. The date of seroconversion for a secondary infection was estimated using the midpoint between the last negative test result and the first positive test result. Cumulative incidence rates of coinfection were calculated using Kaplan-Meier methods. In these analyses, time 0 was defined as the date of enrollment. Participants who entered the study and remained seronegative or monoinfected were considered to be right-censored at the time of their most recent negative test result. Annual rates of seroconversion for the secondary infection were calculated using actuarial methods. Relative risks (RRs) and 95% confidence intervals (CIs) were obtained for variables of interest. Adjusted and unadjusted time-dependent Cox regression models were used to identify associations with seroconversion to coinfected status among the young participants. All probability values reported are 2-sided.

In addition, we undertook a Cochran-Armitage trend test to profile trends between 3 groups of youth: HIV- and HCV-negative, monoinfected, and coinfected youth. For this analysis, baseline prevalent youth and those who became coinfected during the study period were combined. Ordinal logistic regression of the trichotomous-dependent variable (no infection, monoinfection, or coinfection) was undertaken simultaneously to adjust the associations of a number of sociodemographic and risk factors with infection status. For all models, the proportional odds assumption was tested by the score test. For the trend test, infection status (not infected, monoinfected, or coinfected) was assessed at the latest follow-up visit for each participant. All reported probability values are 2-sided.

RESULTS

Of the 1478 participants enrolled in the VIDUS, 479 were aged ≤29 years at baseline (median age = 24 years). Of the young participants, 78 (16%) were HCV and HIV coinfected and 401 (84%) were either monoinfected (211 [53%] were HCV-positive and 12 [3%] were HIV-positive) or negative 178 (44%) at baseline. The median age of coinfected youth was 26 (interquartile range [IQR]: 24–28) years, and they had been injecting for a median duration of 7 (IQR: 5–11) years. The median age of monoinfected or negative youth was 24

(IQR: 20–26) years, and they had been injecting for a median of 3 (IQR: 1–7) years.

Table 1 compares baseline sociodemographic, drug, and sexual risk variables between coinfected versus monoinfected and negative youth. Baseline coinfected youth were more likely to be female (62% vs. 42%; $P = 0.002$), to be of aboriginal ancestry (45% vs. 22%; $P = <0.001$), to have a history of sexual abuse (53% vs. 38%; $P = 0.014$), to reside in the IDU epicenter (69% vs. 46%; $P = <0.001$), to be engaged in sex trade work (63% vs. 38%; $P = <0.001$), to have had greater than 100 lifetime sexual partners (59% vs. 31%; $P = <0.001$), to inject cocaine (63% vs. 38%; $P = <0.001$) and speedballs (28% vs. 16%; $P = 0.012$) at least daily, and to use condoms always with clients (47% vs. 28%; $P = <0.001$). There was no difference between the 2 groups with respect to injecting heroin at least daily (45% vs. 53%; $P = 0.170$), requiring help to inject (42% vs. 47%; $P = 0.458$), borrowing needles (37% vs. 40%; $P = 0.595$), and always using condoms with regular (17% vs. 18%; $P = 0.825$) and casual (15% vs. 23%; $P = 0.117$) sexual partners.

Independent associations with baseline coinfection (data not shown) included being female (odds ratio [OR] = 1.18, CI: 1.07, 1.31), being of aboriginal ancestry (OR = 2.44, CI: 1.41, 4.25), older age (OR = 1.18, CI: 1.07, 1.31), a greater number of years injecting (OR = 1.17, CI: 1.05, 1.21), and living in the IDU epicenter (OR = 1.87, CI: 1.06, 3.28).

Among the monoinfected or negative youth, there were a total of 297 (112 both HIV- and HCV-negative, 178 HCV-positive, and 7 HIV-positive) youth who had follow-up data and 104 who were lost to follow-up. There was no difference between the youth who returned for follow-up and those who did not with respect to HIV serostatus, female gender, being engaged in sex trade work, age, years injecting, or types of drugs used. Aboriginal youth were significantly more likely than nonaboriginal youth to return for follow-up visits. Baseline HCV-positive youth were significantly more likely to return for follow-up than HCV-negative youth (42% vs. 56%; $P = 0.014$).

In total, there have been 45 youth with follow-up data who seroconverted to a secondary infection during the study period (infected with both HCV and HIV [27%], HCV only [9%], or HIV only [64%]). The incidence rate for coinfection among VIDUS youth was 5.2 (CI: 3.8, 6.9) per 100 person-years. The median age of the seroconverters was 24 years, they had been injecting for a median of 3 years, 25 (55%) were female, and 20 (45%) were of aboriginal ancestry.

Table 2 presents the results of our Cox regression model. There were no differences between those who became HIV and HCV coinfected and those who remained negative or monoinfected with respect to female gender (RR = 1.12, CI: 0.61, 2.05) and requiring help to inject (RR = 1.92, CI: 0.94, 3.91). Unadjusted only associations with seroconversion were detected in those youth residing in the IDU epicenter (RR = 1.98, CI: 1.03, 3.82), of aboriginal ancestry (RR = 1.99, CI: 1.08, 3.64), and those injecting heroin (RR = 3.46, CI: 1.83, 6.52) and speedball (RR = 3.86, CI: 2.05, 7.25) greater than

TABLE 1. A Comparison of Sociodemographic and Risk Variables Between Young IDU's Baseline Coinfected and Those Monoinfected (HCV only, N = 211 [53%] or HIV only, N = 12 [3%]) or Not Infected With Either HCV or HIV (N = 178 [44%]) (≤29 years, N = 479)*

	HIV/HCV Coinfected (78, 16%)	Monoinfected or Negative (401, 84%)	OR (95% CI)	P*
Female	48 (62%)	170 (42%)	2.17 (1.32, 3.57)	0.002
Aboriginal	35 (45%)	88 (22%)	2.91 (1.75, 4.81)	<0.001
Sexual abuse	41 (53%)	151 (38%)	1.83 (1.13, 3.01)	0.014
Residing in DTES	54 (69%)	184 (46%)	2.65 (1.61, 4.46)	<0.001
Unstable housing	54 (69%)	242 (60%)	1.51 (0.91, 2.51)	0.141
≥1 daily heroin	35 (45%)	214 (53%)	0.71 (0.44, 1.16)	0.170
≥1 daily cocaine	49 (63%)	152 (38%)	2.77 (1.68, 4.57)	<0.001
≥1 daily speedball	22 (28%)	65 (16%)	2.03 (1.16, 3.56)	0.012
Needle borrowing	27 (37%)	162 (40%)	0.87 (0.53, 1.44)	0.595
Help injecting	33 (42%)	188 (47%)	0.83 (0.51, 1.41)	0.458
Sex trade	49 (63%)	154 (38%)	2.71 (1.64, 4.47)	<0.001
Condom with regular sexual partners	13 (17%)	71 (18%)	0.93 (0.49, 1.78)	0.825
Condom with casual sexual partners	12 (15%)	94 (23%)	0.59 (0.31, 1.15)	0.117
Condom with client's	37 (47%)	111 (28%)	2.36 (1.44, 3.87)	<0.001

*All reported probability values are 2-sided.

TABLE 2. Cox Regression Analysis of the Prognostic Factors Associated With Time to Coinfection (both HIV and HCV, 12 [27%]; HCV, 4 [9%]; or HIV, 29 [65%]) Among Youth in the VIDUS Cohort (N = 45)

Characteristic	RR (95% CI)	Adjusted RR (95% CI)
Female gender	1.12 (0.61, 2.05)	
Aboriginal	1.99 (1.08, 3.64)	
Help injecting	1.92 (0.94, 3.91)	
IDU epicenter	1.98 (1.03, 3.82)	
≥1 daily heroin	3.46 (1.83, 6.52)	
≥1 daily cocaine	4.05 (2.21, 7.43)	3.85 (2.09, 7.10)
≥1 daily speedball	3.86 (2.05, 7.25)	
Methadone*	0.25 (0.09, 0.64)	0.23 (0.09, 0.59)
Borrowing needles	2.14 (1.32, 3.47)	2.41 (1.21, 4.85)

*Methadone maintenance therapy in the previous 6 months.

once daily. Unadjusted only associations with seroconversion were independently associated with seroconversion. In addition, accessing methadone maintenance therapy in the previous month (RR = 0.23, CI: 0.09, 0.59) was protective in the final model.

Of the 479 youth in the VIDUS, including baseline prevalent and study period incidence, there were a total of 123 (26%) youth coinfected with HIV and HCV. Table 3 presents the results of our Cochran-Armitage trend test comparing sociodemographic and risk variables between HIV- and HCV-negative youth, monoinfected youth, and coinfected youth. There were clear trends across the 3 categories ranging from no infection to coinfected youth for increasing age (median = 22, 24, 25; $P = <0.001$), greater number of years injecting (median = 3, 5, 7; $P = <0.001$), female gender (37%, 43%, 59%; $P = <0.001$), aboriginal ethnicity (10%, 24%, 45%; $P = <0.001$), greater than 100 lifetime partners (20%, 34%, 55%; $P = <0.001$), living in the IDU epicenter (33%, 47%, 71%; $P = <0.001$), daily cocaine (18%, 44%, 62%; $P = <0.001$) and speedball (3%, 22%, 26%; $P = <0.001$) injection, sex trade work (23%, 42%, 63%; $P = <0.001$), history of sexual abuse (32%, 41%, 47%; $P = 0.014$), and always using condoms with clients (18%, 29%, 47%; $P = <0.001$). There were no statistical differences between the 2 groups with respect to daily heroin injection (38%, 61%, 49%; $P = 0.110$), borrowing needles (38%, 44%, 35%; $P = 0.675$), and always using condoms with regular (23%, 15%, 17%; $P = 0.204$) and casual (26%, 23%, 16%; $P = 0.072$) sexual partners.

Table 4 presents the results of our ordinal logistic regression model comparing risk association covariates across the 3 categories of no infection, monoinfection, and coinfection. Adjusted risk associations for coinfection among the youth were increased age (RR = 1.12, CI: 1.06, 1.19), greater number of years injecting (RR = 1.07, CI: 1.02, 1.13), aboriginal an-

TABLE 3. A Comparison of Sociodemographic and Risk Variables Between Coinfected and Monoinfected Young IDUs and Those Young IDUs Not Infected With HCV and HIV (≤29 years, N = 479)*

	No Infection (120, 25%)	Mono Infection (236, 49%)	HIV/HCV Infection (123, 26%)	P*
Age†	22 (SD = 3)	24 (SD = 4)	25 (SD = 3)	<0.001
Years injecting†	3 (SD = 3)	5 (SD = 4)	7 (SD = 4)	<0.001
Female	44 (37%)	101 (43%)	73 (59%)	<0.001
Aboriginal	12 (10%)	56 (24%)	55 (45%)	<0.001
>100 life partners	24 (20%)	80 (34%)	68 (55%)	<0.001
DTES	39 (33%)	112 (47%)	37 (71%)	<0.001
≥1 daily cocaine	22 (18%)	103 (44%)	76 (62%)	<0.001
≥1 daily speedballs	4 (3%)	51 (22%)	32 (26%)	<0.001
≥1 daily heroin	46 (38%)	143 (61%)	60 (49%)	0.110
Sex trade	27 (23%)	99 (42%)	77 (63%)	<0.001
Sexual abuse	38 (32%)	96 (41%)	58 (47%)	0.014
Needle borrowing	45 (38%)	103 (44%)	43 (35%)	0.675
Condom with regular sexual partners	28 (23%)	35 (15%)	21 (17%)	0.204
Condom with casual sexual partners	31 (26%)	55 (23%)	20 (16%)	0.072
Condom with client's	22 (18%)	68 (29%)	58 (47%)	<0.001

*Cochran-Armitage trend test; all reported probability values are 2-sided.
†by ANOVA.

TABLE 4. Logistic Regression Analysis of the Sociodemographic and Risk Variables Independently Associated With HCV and HIV Coinfection Among the Young (≤29 years old) IDUs in the VIDUS Cohort

Variable	Adjusted OR (95% CI)
Age (per year)	1.12 (1.06, 1.19)
Years injecting (per year)	1.07 (1.02, 1.13)
Aboriginal (yes vs. no)	2.89 (1.83, 4.31)
DTES (yes vs. no)	1.85 (1.27, 2.69)
Female (yes vs. no)	1.54 (1.06, 2.25)
Frequent cocaine injection (≥1 per day)	2.15 (1.46, 3.17)

Because of the collinear relationship between the variables female and sex trade, we have only included female gender in the model.

cestry (RR = 2.89, CI: 1.83, 4.31), residing in the IDU epicenter (RR = 1.85, CI: 1.27, 2.69), daily cocaine injection (RR = 2.15, CI: 1.46, 3.17), and being female (RR = 1.54, CI: 1.06, 2.25).

DISCUSSION

The number of youth HIV and HCV coinfected identified in this study is concerning. Alarming was the finding that the median age of youth becoming coinfected was 24 years and that they had been injecting for a median of only 3 years. Coinfection was concentrated among young female and aboriginal youth engaged in sex trade work and living in the IDU epicenter. These findings do not bode well for the future of coinfection without the immediate implementation of a comprehensive evidence-based prevention strategy for high-risk youth. Additionally, attention must to be given to working with female and aboriginal IDUs to facilitate the initiation of treatment and begin addressing access- and adherence-related issues among youth who are already living with coinfection.

Baseline Coinfection Among Young Injection Drug Users

There were a number of associations with baseline coinfection identified among youth at enrollment. Youth identified as being coinfected at baseline were older, had been injecting a greater number of years, and were more likely to be female and aboriginal. The finding that the burden of infection lies with female and aboriginal people was consistent with the findings of other studies conducted on HIV prevalence and incidence in this cohort.[16,17,20] These findings were more pronounced among the youth, however, where more than 60% of the coinfections were among female subjects and more than 45% were among aboriginal populations. Additionally, 63% of the youth infected were involved in the sex trade. These findings beg the question why, given the overwhelming vulnerability of young women involved in the sex trade, there are not resources available such as 24-hour services to access clean needles, inject safely, and seek care.

Incidence of Coinfection Among Young Injection Drug Users

Youth particularly vulnerable to acquiring coinfection were frequent cocaine injectors and those who borrowed needles. Cocaine injection has been associated with HIV and HCV incidence in a number of studies, including in our setting in Vancouver, likely because of the more frequent patterns of injection characterizing cocaine use.[13,21] Not surprising was the finding that the use of methadone maintenance therapy in the previous 6 months was protective. In our experience, youth at highest risk for blood-borne infections are females engaged in sex trade work and who use cocaine as well as other drugs frequently.[22] These findings suggest that there is a need for more research on how to make methadone and other forms of substitution therapy more accessible for youth and how to improve harm reduction services such as needle exchange programs to improve access to health care and drug treatment as well as injection safety programs.

Trend Comparison

When we combined the prevalent and study period incidence of coinfected youth and looked at trends in risk across the 3 categories of no infection, monoinfection, and coinfection, we found several increasing levels of risk associated with coinfection. Confirmed was increasing prevalence among female and aboriginal youth and sex trade across the 3 categories. Additionally, there were clear sexual- and drug-related trends in risk, whereby a history of sexual abuse, a high number of lifetime sexual partners, and greater than once-daily cocaine and speedball injection all increased with the level of infection. Young people, particularly female youth, who have histories of sexual abuse, who face continued predation through sex trade work, and who engage in polydrug use are consistently at high-risk for blood-borne infections in our setting and others.[22–24] Sexual abuse, sex trade work, and drug risk appear to be interrelated with blood-borne infections among youth, suggesting that there is a need for a continuum of care for vulnerable youth that includes sex abuse counseling within drug intervention programs.

In most of our analysis of coinfection among the youth, residing in the DTES, Vancouver's IDU epicenter, was associated with coinfection. In fact, more than 70% of the coinfected youth lived in the IDU epicenter. This is likely related to the higher prevalence of infection among the contacts of study

participants residing there. A series of poor public policy decisions have led to the concentration of the epidemic in the DTES.[25] The ongoing public health emergency is not surprising, given that a recent study found that 95% of Canada's drug strategy is directed to law enforcement,[26] despite the fact that there is no study indicating that law enforcement is an effective strategy for dealing with health problems related to addiction. The positive aspect of having communities with IDU epicenters is that high-risk drug-using practices are concentrated in a small area, thus facilitating the implementation of evidence-based public health intervention strategies.

Limitations

There are several limitations that should be noted with regard to this study. We have included cross-sectional data of the baseline coinfected youth to characterize young IDUs who may be most at risk for coinfection and the types of behaviors they may be engaged in; however, causal inference based on cross-sectional data needs to be interpreted with care. Furthermore, the results may be diluted by combining monoinfected and negative youth; however, despite this potential limitation, there were a number of strong associations found.

Another important limitation was that young IDUs who were HCV-positive at baseline were more likely to return for follow-up, suggesting that youth included in our time to analysis may have been a higher risk group than other populations of young IDUs. As in other observational studies with voluntary recruitment, however, our study may have limited potential for generalization. Although our results are likely not applicable to general populations, despite the loss to follow-up, they likely reflect urban centers experiencing high prevalence of injection drug use and blood-borne infections among these populations. We know of no difference in sampling for the VIDUS project that may have selected for any specific youth characteristics differing from those of other young IDUs. An additional limitation of the present study is that there were insufficient numbers of HIV-monoinfected individuals to explore rates of coinfection among this group. Consequently, we were unable to discern differences between sexual- and drug-related risk between monoinfected to incident HIV- and HCV-coinfected youth. Exploring these issues in future studies would provide significant contributions to the literature.

CONCLUSIONS

There are several important issues identified in terms of medical care for this young population. To begin with, identifying such a young coinfected population whose median age is 24 years at the time of infection raises concerns about the morbidity and mortality related to disease progression that these individuals may face over time.[27,28] Studies on treating HIV and coinfection are usually conducted in older populations; thus, little is known about treatment early in disease progression. There is some evidence to suggest that treating HCV before starting HIV therapies may be important for coinfected individuals.[3] Furthermore, IDUs are less likely to receive antiretroviral therapies, especially female and young IDUs, even when such therapies are distributed free of charge.[29,30] Looking at trends in AIDS, less likely to receive therapy are aboriginal and African-American populations, who make up proportionally more of the IDU population in North America.[15,30] Hence, in terms of treating coinfection, young IDUs, particularly marginalized populations, will become increasingly important.

The number of people in this study identified as HIV and HCV coinfected was alarming, particularly in light of their young age. Regardless of differences in transmissibility, the similarity in transmission routes between HIV and HCV may make coinfection a universal phenomenon for high-risk youth living in HIV and HCV endemic areas unless immediate preventative action occurs. Given the scientific uncertainty surrounding appropriate treatment of coinfection and the interaction between the 2 infections, the future life expectancy and quality of life for these youth are under severe threat. The data from this study suggest that this is no small problem and that coinfection may become ubiquitous for young IDUs living in endemic areas.

REFERENCES

1. Centers for Disease Control and Prevention. Hepatitis C virus and coinfection. Atlanta: Centers for Disease Control and Prevention; 2002. Available at: http://www.cdc.gov/idu.
2. Centers for Disease Control and Prevention. Frequently asked questions and answers about coinfection with HIV and hepatitis C virus [fact sheet]. Atlanta: Centers for Disease Control and Prevention; 2002.
3. Torre D, Tambini R, Cadario F, et al. Evolution of coinfection with human immunodeficiency virus and hepatitis C virus in patients treated with highly active antiretroviral therapy. *Clin Infect Dis*. 2001;33:1579–1585.
4. Torti C, Patroni A, Tinelli C, et al. Influence of hepatitis C virus coinfection on lipid abnormalities in HIV-positive patients after highly active antiretroviral therapy. *J Acquir Immune Defic Syndr.* 2002;29:315–317.
5. Bruno R, Puoti M, Sacchi P, et al. Management of hepatitis C in human immunodeficiency virus-infected patients. *Dig Liver Dis.* 2002;34:452–459.
6. Rancinan C, Neau D, Saves M, et al. Is hepatitis C virus co-infection associated with survival in HIV-infected patients treated by combination antiretroviral therapy? *AIDS*. 2002;16:1357–1362.
7. Martin-Carbonero L, Soriano V, Valencia E, et al. Increasing impact of chronic viral hepatitis on hospital admissions and mortality among HIV-infected patients. *AIDS Res Hum Retroviruses.* 2001;17:1467–1471.
8. Heath KV, Singer J, O'Shaughnessy MV, et al. Intentional nonadherence due to adverse symptoms associated with antiretroviral therapy. *J Acquir Immune Defic Syndr.* 2002;31:211–217.
9. Sulkowski MS, Thomas DL. Hepatitis C in the HIV-infected person. *Ann Intern Med.* 2003;138:197–207.
10. Health Canada. *HIV and AIDS Among Youth in Canada*. Ottawa: Bureau of HIV/AIDS, STD and TB Update Series; 2001.
11. Centers for Disease Control and Prevention. *Young People at Risk. HIV/AIDS Among America's Youth*. Atlanta: Centers for Disease Control and Prevention; 2002.
12. Thorpe LE, Bailey SL, Huo D, et al. Injection-related risk behaviors in young urban and suburban injection drug users in Chicago (1997–1999). *J Acquir Immune Defic Syndr.* 2001;27:71–78.

13. Hahn JA, Page-Shafer K, Lum PJ, et al. Hepatitis C virus infection and needle exchange use among young injection drug users in San Francisco. *Hepatology*. 2001;34:180–187.
14. Diaz T, Des Jarlais DC, Vlahov D, et al. Factors associated with prevalent hepatitis C: differences among young adult injection drug users in lower and upper Manhattan, New York City. *Am J Public Health*. 2001;91: 23–30.
15. Centers for Disease Control and Prevention. *HIV/AIDS Among African Americans. Key Facts*. Atlanta: Centers for Disease Control and Prevention; 2002.
16. Craib KJ, Spittal PM, Wood E, et al. Risk factors for elevated HIV incidence among Aboriginal injection drug users in Vancouver. *CMAJ*. 2003; 168:19–24.
17. Spittal PM, Craib KJ, Wood E, et al. Risk factors for elevated HIV incidence rates among female injection drug users in Vancouver. *CMAJ*. 2002;166:894–899.
18. Miller CL, Tyndall M, Spittal P, et al. HIV incidence and associated risk factors among young injection drug users. *AIDS*. 2002;16:491–493.
19. Miller CL, Johnston C, Spittal PM, et al. Opportunities for prevention: hepatitis C prevalence and incidence in a cohort of young injection drug users. *Hepatology*. 2002;36:737–742.
20. Strathdee SA, Patrick DM, Currie SL, et al. Needle exchange is not enough: lessons from the Vancouver injecting drug use study. *AIDS*. 1997;11(Suppl):F59–F65.
21. Wood E, Tyndall MW, Spittal PM, et al. Factors associated with persistent high-risk syringe sharing in the presence of an established needle exchange programme. *AIDS*. 2002;16:941–943.
22. Miller CL, Spittal PM, LaLiberte N, et al. Females experiencing sexual and drug vulnerabilities are at elevated risk for HIV infection among youth who use injection drugs. *J Acquir Immune Defic Syndr*. 2002;30: 335–341.
23. Des Jarlais DC, Friedman SR, Perlis T, et al. Risk behavior and HIV infection among new drug injectors in the era of AIDS in New York City. *J Acquir Immune Defic Syndr*. 1999;20:67–72.
24. Federal Provincial and Territorial Advisory Committee on Population Health. *Reducing the Harm Associated with Injection Drug Use in Canada*. 2001. Available at: http://www.hc-sc.gc.ca/hecs-sesc/cds/pdf/injectiondrug_e.pdf
25. Broadhead R, Kerr T, Grung J, et al. Safer injection facilities in North America: their place in public policy and health initiatives. *J Drug Issues.* 2001;329–356.
26. Wood E, Kerr T, Spittal PM, et al. The potential public health and community impacts of safer injecting facilities: evidence from a cohort of injection drug users. *J Acquir Immune Defic Syndr*. 2003;32:2–8.
27. Page-Shafer KA, Cahoon-Young B, Klausner JD, et al. Hepatitis C virus infection in young, low-income women: the role of sexually transmitted infection as a potential cofactor for HCV infection. *Am J Public Health*. 2002;92:670–676.
28. Hahn JA, Page-Shafer K, Lum PJ, et al. Hepatitis C virus seroconversion among young injection drug users: relationships and risks. *J Infect Dis*. 2002;186:1558–1564.
29. Schechter MT, Strathdee SA, Cornelisse PG, et al. Do needle exchange programmes increase the spread of HIV among injection drug users?: an investigation of the Vancouver outbreak. *AIDS*. 1999;13(Suppl): F45–F51.
30. Strathdee SA, Palepu A, Cornelisse PG, et al. Barriers to use of free antiretroviral therapy in injection drug users. *JAMA*. 1998;280:547–549.
31. Office of the Auditor General Canada. Illicit drugs: the federal government's role. Ottawa. In: *2001 Report of the Auditor General of Canada*. 2001. Available at: http://www.oag-bvg.gc.ca/domino/reports.nsf/html/01meno_e.html; chap11
32. Nunez M, Lana R, Mendoza JL, et al. Risk factors for severe hepatic injury after introduction of highly active antiretroviral therapy. *J Acquir Immune Defic Syndr*. 2001;27:426–431.

