Journal of Urban Health: Bulletin of the New York Academy of Medicine, Vol. 88, No. 4
doi:10.1007/s11524-011-9574-5

Residential Trajectory and HIV High-Risk Behaviors among Montréal Street Youth—A Reciprocal Relationship

Élise Roy, Marie Robert, Éric Vaillancourt, Jean-François Boivin, Jill Vandermeerschen, and Isabelle Martin

ABSTRACT *Evidence has linked residential instability and engagement in high-risk behaviors. This paper longitudinally examines the relationship between changes in residential stability and changes in HIV risk behaviors among Montréal street youth (SY). Between April 2006 and May 2007, 419 SY (18–25 years old) were recruited in a cohort study. SY (using Montréal street youth agencies services) were eligible if they had had at least one 24-hour episode of homelessness in the previous 30 days. Baseline and follow-up interviews, carried out every 3 months, included completion of a questionnaire (based on Life History Calendar Technique) assessing daily sleeping arrangements since the last interview, and monthly sexual and drug use behaviors. Using mixed-effects logistic regression method, we examined the association between various risk behaviors and residential stability, reached when a youth resided in any of the following settings for a whole month: own place; friends'/partner's/parent's place; any types of housing service (excluding emergency shelters). Analyses were carried out controlling for gender, age, education level, lifetime duration of homelessness, childhood sexual trauma, and lifetime mental health disorders. As of January 2009, 360 SY (79% boys) had completed at least one follow-up interview, representing 4,889 months of follow-up. Residential stability was significantly associated with the following: sex exchange (adjusted odd ratio [AOR], 0.25; 95% confidence interval [CI], 0.14–0.37), drug injection (AOR, 0.55; CI, 0.33–0.76), daily alcohol consumption (AOR, 0.58; CI, 0.42–0.74), polydrug consumption (AOR, 0.61; CI, 0.50–0.73), polydrug consumption excluding marijuana (AOR, 0.55; CI, 0.45–0.65), and multiple sex partners (≥3 partners; AOR, 0.57; CI, 0.40–0.74). Our results suggest a reciprocal relationship between residential instability and HIV risk behaviors. This calls for more integrated services combining both individual and structural-level interventions to improve the health of street youth.*

KEYWORDS *Residential stability, HIV risk behaviors, Homelessness, Street youth, IDU, Substance abuse, Sex exchange*

INTRODUCTION

Elevated HIV, hepatitis C virus (HCV), and sexually transmitted disease rates have been reported in North American street youth.[1] Risky behaviors involved in transmission of these infections are very common among these youth, whether it is problematic substance use or unsafe sexual behaviors. For instance, according to

Roy, Vaillancourt, Vandermeerschen, and Martin are with the Direction de santé publique, Montréal, Canada; Robert is with the Université du Québec en Outaouais, Gatineau, Canada; Boivin is with the McGill University, Montréal, Canada; Robert is with the Université du Québec en Outaouais, Gatineau, Canada; Boivin is with the McGill University, Montréal, Canada.

Correspondence: Élise Roy, Université de Sherbrooke, Longueuil, Canada. (E-mail: elise.roy@usherbrooke.ca)

various studies, between 30% and 40%[2–5]of street youth in the USA have injected drugs at least once, while in Canada, these proportions range from about 20% to 40%.[6–9] Incidence studies show that up to 8% of street youth start injecting every year.[10,11] Moreover, 10% to 25% of street youth report having traded sex for money, drugs, or other commodities for survival, and the incidence of this high-risk behavior is particularly high among girls.[7,12–14]

The contribution of environmental health factors to the production of risk has long been acknowledged.[15] More recently, in relation to HIV, the concept of "risk environment" was put forward as being "the space, whether social or physical, in which a variety of factors exogenous to the individual interact to increase vulnerability to HIV."[16] Many studies of vulnerable individuals such as injection drug users and the homeless have shown that these factors have a significant influence on their health since they shape daily risk taking.[17,18] In this perspective, housing has been identified as a major determinant that could both directly and indirectly fashion an individual's physical and mental health through his or her involvement in high-risk behaviors.[19,20] From the wide spectrum of possible residential status, homelessness, the most severe form of precarious housing status, has received considerable attention, particularly in the literature on HIV risk behaviors.[21–26] Evidence seems to point towards homelessness as a factor that facilitates engagement in risk behaviors which, in turn, increases the likelihood of infectious disease transmission.[27]

Beyond homelessness, the complexity of housing concept and its importance in health research have been recognized by several researchers. They have highlighted the need to better conceptualize and refine housing definitions, including homelessness (but not only), and to take into account both the dynamic nature of an individual's housing status and the type of physical setting in which people live (own place, temporary shelter, streets, etc.).[28,29] In fact, an individual's housing status may change a number of times over a relatively short time period. Consequently, consideration of the type of place and amount of time spent in these places, as well as longitudinal study design are key strategies to investigate housing and its relationship with health. Furthermore, frequent changes in housing status as well as a possible circular interaction make it difficult to establish the direction of the "causal" link between housing and high-risk behavior involvement.[25,30–32] Weir and colleagues[25] have proposed the notion of a reciprocal relationship. In their paper showing an association between several indicators of housing stability and a variety of HIV risk behaviors, these authors concluded that "the temporal proximity between changes in housing and HIV risk behavior is an important hallmark of causality but the analyses do not reveal the direction of these relationships. It is theoretically reasonable to expect that these relationships are reciprocal. Worsening of housing conditions may lead to risk behavior, and initiation of risk behavior may have a deleterious effect on housing." Therefore, when studying the link between residential stability and high-risk behaviors, it may be more interesting, or at least just as interesting, to examine if the changes related to one phenomenon correspond to changes in the other, and if these changes are heading in the same direction over time (improvement vs. deterioration).

Few studies have looked at the link between residential stability and risk behaviors among street-involved youth. Among a cohort of currently homeless or runaway youth (14 to 21 years old), having ever stayed in public places was significantly associated with HIV risk.[33] In a study of street-involved adolescents, injection drug use was found to be negatively associated with the number of places in which the youth had stayed, yet positively associated with the probability of

staying on the street.[34] In street-involved youth, including underage and older youth (aged 14 to 26), it was found that unstable housing (defined as living in a hostel or a shelter) was positively associated with greater number of sex partners.[30] In a prospective cohort study including 14- to 25-year-old street youth, homelessness episodes (at least 24 hours in the previous 6 months) were linked to increased risk of initiation into drug injection during follow-up.[11]

As a group, street-involved young adults (18–25 years old) have received very little attention despite their many distinctive characteristics from adolescent or older street-involved populations. As pointed out by the National Health Care for the Homeless Council,[35] once adolescents reach adulthood, most are forced out of the legal juvenile system and are left with no support or supervision. Furthermore, as they barely step out of adolescence, young adults find themselves at a developmental turning point, particularly on a social-skill level. Many of these youth will likely exit homelessness, while others will become more chronically homeless. Young homeless adults form a unique group of interest for the study of residential trajectory and its link to youth's health, particularly regarding risk behaviors that are very present in that age group. Therefore, this paper longitudinally examined the relationship between residential trajectory and HIV risk behavior among street-involved young adults. As stated above, this study examined if changes related to one phenomenon correspond to changes in the other and if these changes are heading in the same direction overtime.

METHODS

This paper is based on a prospective cohort study that was carried out between April 2006 and January 2009 in Montréal, Canada. The goal of the study was to examine the residential trajectory of street-involved youth and its relationship to health outcomes, including risk-taking behaviors. Ethical approval was provided by *Le comité d'éthique de la recherche en santé chez l'humain du Centre Hospitalier Universitaire de Sherbrooke et de l'Université de Sherbrooke*.

Participants

To be considered as street involved, a youth had to have used the services of Montréal (Québec, Canada) street youth agencies regularly (3 times or more) or to have been without a place to sleep more than once in the previous year.[11,36] Street-involved youth were eligible for the study if they had had at least one 24-hour episode of literal homelessness in the previous 30 days, i.e., had spent at least one night in a place that was unfit for human habitation or in an emergency shelter. Youth who, on a temporary basis, had spent at least one night at friends' or acquaintances' places because of having no personal place to sleep (couch surfing), were also included.[37] Other entry criteria were being 18–25 years of age, English or French speaking, able to provide informed consent and to complete an interviewer-administered questionnaire, and planning to stay in the Montréal area in the following year.

Procedures

Between April 5th, 2006 and May 31st, 2007, study interviewers recruited participants during regular visits to all major street youth agencies in Montréal. These were drop-in centers, emergency shelters, short- and long-term housing services, and outreach vans. Visit frequency, based on the number of youth served by each agency, ranged from once a month to three times a week. All youth present in the organization were invited to

participate in the study. If eligible, those who accepted were given an appointment for their interview at the study office, located in the downtown area where most homeless youth hang out. The majority of interviews were done in the afternoon or early evening to minimize the possibility that participants were intoxicated. Interviews included the signing of a consent form, collection of contact information, and completion of an interviewer-administered questionnaire. Participants received a financial compensation (CAD $30) at the end of the interview.

Follow-up interviews took place every 3 months. Due to the transient nature of street youth life, rigorous follow-up procedures were employed. To facilitate tracing, detailed contact information was updated at each interview. Interviewers contacted participants around the due date of the follow-up visits by telephone, pager, cell phone, email, and/or leaving messages with parents, friends, or at agencies known to be visited by youth. The project had a toll-free telephone number to facilitate contact by the subjects. A list of unreachable subjects was sent monthly to welfare agencies and detention centers. These organizations, when authorized by subjects on their consent form, provided current contact information or sent messages to participants. Tracing was also carried out through regular contacts with drug treatment centers. Interviewers traveled up to 200 km from Montréal to meet subjects who were unable to come to the study office for their follow-up interview. Finally, for subjects who could not be met by an interviewer, the questionnaire was completed by phone.

Measurements

Questionnaires were administered entirely by an interviewer and typically took between 90 and 120 minutes to complete for the baseline interview and 60 minutes for the follow-up visits. To document the residential status since the previous interview (or during the 3 months prior to intake interview), we developed a questionnaire based on the "Life History Calendar" technique and the residential follow-back calendar designed by the New Hampshire Dartmouth Research Center (1995).[38] Recent significant life events were assessed at each interview by asking participants if they had experienced any of 33 positive or negative life events in the previous 3 months or since the last interview (for example: broken ties with family, serious illness, drug overdose, traveling, new job, pregnancy). This information was then put back on a calendar used to document the participant's sleeping arrangements/locations on a daily basis, for the whole time period. A test–retest of the reliability of this tool was conducted with 30 participants who were met twice, at a 2-week interval. The concordance observed on a daily basis over the common period was satisfactory (1st quartile, 65%; median, 80%; 3rd quartile, 89%), and a kappa coefficient of 0.74 was obtained for the reliability of data on residential stability during this period (>0.75 is considered excellent).[40]

There is no standardized definition of residential stability. In some cases, housing environments considered "stable" do not include public housing resources, while in others this type of housing is included, except those offering temporary and short-term shelter.[39,41] Several studies add duration of continuance of housing over a determined period of time. Durations can vary widely: 14 or 30 days or 6, 12, 24, or 48 months.[42,43] In the present study, stability definition included both a temporal (housing continuity) and a physical criterion (housing environment).[44] Types of housing considered were those likely to favor the development of a *linkage* to mainstream society.[45] Emergency or short-term shelters as well as transitional facilities (residential treatment or recovery program, hospital, jail or prison, and corrections halfway house) were excluded. Mid- and long-term housing resources (resources offering housing for more than 1 month, in combination with financial

support and health or social services) were included in the list of stable housing environments. Residential stability was achieved when, during a whole month, a youth resided at his/her own home or his/her partner's/friends'/parents' home (not just as an emergency measure), or in any other type of mid- or long-term housing services including supportive housing. Any interruption of this living situation (1 day or more) during the month was classified as residential instability.

Life History Calendar Technique was used to measure risk behaviors at baseline (prior 3 months) and at all follow-up evaluations (month by month assessment of behaviors). These included daily alcohol consumption, polydrug consumption (consumption of more than one type of drug), drug injection, multiple sex partners (3 or more in the previous month), and sex exchange (sex in exchange for money or drugs). Since cannabis use is relatively widespread in Québec among the general youth population[46] and, therefore, less likely to be associated with being involved in the street milieu, a second definition of polydrug use was considered in the analyses: the consumption of more than one type of drug, excluding marijuana use.

Control variables with a known or suspected link with residential trajectory and risky behaviors were also measured at study entry: (1) childhood traumatic sexual events (having experienced sexual abuse before age 14);[32,36,47] (2) lifetime duration of homelessness, measured by computing total years (or fraction of year) of homelessness cumulated at baseline;[33,48] (3) lifetime diagnosis of any of the following mental disorders (MD):[49] major depression, bipolar disorder, anorexia/bulimia, schizophrenia, anxiety disorders, and substance use disorders (abuse and dependence).

Questions on risk behaviors, lifetime duration of homelessness, and sociodemographic characteristics (age, gender, country of birth, parents' country of birth, spoken language and education) came from questionnaires used previously with homeless people, either in previous cohort studies or in the Institut de la Statistique du Québec's survey of itinerant populations in Montréal and Québec.[11,36,50] Questions for the diagnoses of major depression, bipolar disorders, anorexia/bulimia and schizophrenia were taken from the World Mental Health Composite International Diagnostic Interview (CIDI) version 2.1.[51] Anxiety and alcohol/drug-related disorders were assessed using the CIDIS developed by Kovess and colleagues.[52] All these instruments are well-validated tools that can be administered by lay interviewers and produce psychiatric diagnoses according to the fourth version of the Diagnostic and Statistical Manual of Mental Health Disorders published by the American Psychiatric Association.[53]

Analyses

Analyses were carried out for each high-risk behavior separately. For descriptive purposes, proportions of stable and unstable months where youth reported a risk behavior were calculated. Using logistic mixed effect regression method,[54] the association between each risk behavior as a dependent variable and residential stability, as an independent variable, was examined. Analyses were based on data for all months of follow-up, which allowed the assessment of expected change in the probability that an individual would report a risk behavior should he/she stabilize. This method, by introducing random subject effects, explicitly takes into account interdependencies among the repeated observations within subjects. Analyses were carried out controlling for gender, age, level of education (high school completed), duration of homelessness at study entry, childhood sexual trauma and having received a lifetime diagnosis of a MD. MD was treated as a three-level variable with no MD as the category of reference: having a substance use disorder, having another

MD and having no MD. Six individual multivariate models were built to examine the odds of reporting a given risk behavior, should the participant stabilize. The corresponding 95% confidence interval were estimated for each model. The analyses were performed using PROC NLMIXED of SAS version 9.1.

RESULTS

A sample of 419 youths was recruited in the cohort between April 2006 and May 2007, and 3-month interval follow-ups were carried out until the end of the study in January 2009. A high proportion of participants (n=360; 85.9%) completed at least one follow-up questionnaire representing 4,889 months of observation over a 34-month period. The majority of participants included in this analysis were Canadian born (91.1%), male (79.2%), and the mean age at study entry was 21.9 years old. We estimated that most were of Caucasian/European ancestry (85.3%), and the majority (87.5%) reported French as their spoken language. Only 23.6% of participants had graduated from high school, college, or university. Main sources of income at baseline were, in decreasing order: conventional sources such as governmental sources or work (56.4%), followed by marginal sources such as squeegee or panhandling (25.8%), and criminal sources (17.8%) including robbery, possession of stolen goods, fraud, and selling drugs. At baseline, participants reported having been homeless for an average of 2.7 years (minimum, 0.05 year; maximum, 14 years; IQR, 3.25 years). The average age of first episode of homelessness was 16.2 years (median, 16 years).

Approximately 80.6% of participants reported using alcohol in the month preceding the study entry, while 88.6% reported using other substances (drugs and medication) for a high. Most frequently used substances were, by descending order: cannabis (78.9%), crack or powder cocaine (41.4%), ecstasy and other amphetamines (37.8%), medication for a buzz (22.5%), hallucinogens (18.6%), and heroin (12.8%, including speedball). Other substances used by l0% or less of participants were: mushrooms, inhalants, and other drugs. At study entry, 23.7% of youth reported having been sexually abused before the age of 14; 83.8% had received a substance use disorder diagnosis (with or without another disorder), while 4.5% had received another MD diagnosis (MD diagnosis only), leaving only 11.7% of participants having never been diagnosed with a MD.

Proportions of stable and unstable months where youth reported any of the six high-risk behaviors are presented in Table 1. Each behavior was reported more frequently during unstable months. For example, participants reported polydrug consumption during 31% of stable months as opposed to 44% during unstable months. As shown in Table 2, stability was associated with a decreased risk of having engaged in all behaviors under study. Residential stability decreased by 42% the odds of reporting daily alcohol consumption, when adjusted for gender, age, level of education, lifetime duration of homelessness, lifetime childhood sexual trauma, and lifetime MD. Risk also declined for polydrug consumption (39%), polydrug consumption excluding marijuana (45%), drug injection (45%), sex exchange (75%), and a high number of sexual partners (43%).

DISCUSSION

This is one of the first longitudinal studies of the link between residential stability and risky behaviors among street-involved young adults. In this study, residential stability was defined as a living situation involving continuity as well as places that were

TABLE 1 Proportion of stable months and HIV risk behaviors (4,889 months)

	Proportion of HIV risk behaviors in stable and unstable months		
HIV risk behavior	Stable months ($n=2,332$)	Unstable months ($n=2,557$)	All months ($n=4,889$)
Daily alcohol consumption	12%	18%	15%
Polydrug consumption (>1 type of drug)	31%	44%	38%
Polydrug consumption (>1 type of drug, without marijuana)	37%	52%	45%
Drug injection	9%	15%	12%
Sex exchange	4%	9%	7%
Multiple sex partners (≥3 partners)	7%	10%	8%

favorable to developing ties to mainstream society, as opposed to precarious living situations that lead to rupture and exclusion. Indeed, such living situations are likely to obstruct the development of trust relationships and positive linkages, which increases the risks of chronicization and maintains homelessness among street-involved youth.[45]

Building on others' work,[22,23,25,55,56] the present study longitudinally examined the occurrence of a variety of HIV risk behaviors in relation to changes in housing situation among street-involved youths. A major strength of this approach, based on mixed-effects regression, is that both risk behaviors and housing situations were allowed to vary not only across study participants but also among them, which controlled for unmeasured potential individual confounders. Our findings revealed that within individuals, episodes of housing stability were associated with lower odds of problematic substance use (including drug injection, daily alcohol consumption, or polydrug consumption), as well as lower odds of risky sexual behaviors (exchanging sexual favors for money or drugs and having multiple [non-commercial] sex partners). It is important to note that this association remained significant even after controlling for potential confounding factors.

The fact that episodes of residential instability (including homelessness) correspond with increased possibility of individual's involvement in risky behaviors over time reinforces the idea of reciprocity between the two phenomena, where worsening of housing conditions may lead to risk behavior, which in turn may have a deleterious effect on housing.[25] Furthermore, as stated by Johnson and

TABLE 2 Mixed-effects logistic regression models—residential stability on each HIV risk behavior

HIV risk behavior	AOR[a]	CI 95%	*p* value
Daily alcohol consumption	0.58	0.42–0.74	<0.0001
Polydrug consumption (>1 type of drug)	0.61	0.50–0.73	<0.0001
Polydrug consumption (>1 type of drug, without marijuana)	0.55	0.45–0.65	<0.0001
Drug injection	0.55	0.33–0.76	0.0028
Sex exchange	0.25	0.14–0.37	<0.0001
Multiple sex partners (≥3 partners)	0.57	0.40–0.74	0.0002

[a]Adjusted for gender, age, education level (high school completed), lifetime duration of homelessness, childhood traumatic sexual events, and lifetime diagnosis of mental disorder

Chamberlain[57] about substance use and homelessness, knowing which comes first is of obvious interest, but limiting the debate to cause and consequence could underplay the complex nature of an individual's situation. As in the case for substance use, it is highly probable that reciprocity underlies the association between high-risk sexual behaviors, particularly sex exchange, and residential instability among street-involved youth. Trading sexual favors for either food, money, or a place to stay is, for many of them, a way to assure their survival.[2,58–60]

The notion of reciprocity between residential instability and risk behaviors further enhances our comprehension of the dynamic nature of their association. In fact, although it is clear that some personal, family, or social characteristics can cause young people to adopt risky behaviors prior to the first episode of homelessness, it is increasingly evident that the latter can perpetuate or even amplify youths' risk behaviors.[31,57] The same is true for less precarious forms of housing situation that are nonetheless unstable and temporary. In a qualitative study of processes involved in the relationship between housing and HIV risk behaviors among active drug users, Dickson-Gomez and colleagues[61] showed that, like living on the streets, other forms of residential instability, namely those involving temporary shelter at friends' places and even more permanent arrangements without subsidies, can also be linked to higher odds of engaging in risk behaviors. The omnipresence of drugs and dealers in some shelters or in some dwellings that have been transformed into drug use sites has caused certain participants to relapse or to increase their drug consumption. As well, others reported engaging in sex exchange for shelter.

The study's strengths and limitations should be kept in mind when interpreting the results. Firstly, our data collection method was based on self-reports, which may have introduced the possibility of both recall and social desirability biases. We believe that the impact of such biases was limited by the short time spans between interviews (3 months) and the open and non-judgmental attitude of the interviewers. Furthermore, the use of interviewer-administered questionnaires reduced the proportion of missing value to less than 1% in all models. Secondly, these results may not be generalized to street youth who might not use the services. However, participants were recruited from about 15 organizations offering a variety of services to homeless individuals living in Montréal (temporary shelters, day/night centers, mobile services), which enabled us to reach a variety of youth relating to experience of homelessness, as shown by the descriptive data on history of homelessness. According to the *Enquête auprès des clientèles des ressources pour personnes itinérantes des régions de Montréal-Centre et de Québec*, the number of youth not benefiting from services dedicated to street-involved individuals in Montreal is estimated to be low.[50] Finally, losses to follow-up probably did not induce a significant bias as most study participants were included in the analyses (360 of 419, 85.9%). Moreover, analyses comparing participants who completed all interviews with participants who did not, with respect to gender and HIV risk behaviors at baseline, showed no significant difference between the two groups. However, we do not know how generalizable our findings may be to street-involved young adults in other urban centres. In Montréal, at the time of study, there was no standardized policy regarding housing access for these youths. Some agencies had a low threshold policy, prioritizing the most vulnerable youth, namely those with mental health or drug use problems. Other agencies had higher threshold policies, including the requirement of alcohol and drug abstinence.

These results have both research and intervention implications. They highlight the need to further investigate the complex dynamics of residential trajectories. In order to do so, more subjective elements of youth's residential situation will have to be

considered and evaluated, namely youth's perception of their security, privacy, and autonomy.[16,25,61,62] As well, study findings stress the importance to longitudinally examine individual's housing trajectory and its link to engagement in risk behaviors in order to better understand the pathways of association between these two health determinants. Finally, the results underscore the need for health care providers and social service agencies to offer these vulnerable youth more integrated services addressing simultaneously their various health issues (drug use and mental health) and social problems (housing, security, schooling, and employment). Complementarity and continuity of services must take precedence over abstinence—contingent housing policies.

Overall, the study findings suggest the presence of a complex and dynamic reciprocal link between housing trajectories and risk behaviors among street-involved youth that may seriously jeopardize their well-being. They highlight the importance of offering integrated services to enhance youth linkages to mainstream society and safeguard their health and their development.

ACKNOWLEDGMENTS

This study was supported by a grant (no. MOP-77692) from the Canadian Institutes of Health Research.

The authors would like to thank the street youth and street youth agencies that collaborated in this study and all members of the research team.

REFERENCES

1. Boivin JF, Roy É, Haley N, du Galbaud FG. The health of street youth: a Canadian perspective. *Can J Public Health*. 2005;96:432-7.
2. Kral AH, Molnar BE, Booth RE, Watters JK. Prevalence of sexual risk behavior and substance use among runaway and homeless adolescents in San Francisco, Denver and New York City. *Int J STD AIDS*. 1997;8:109-17.
3. Pfeifer RW, Oliver J. A study of HIV seroprevalence in a group of homeless youth in Hollywood, California. *J Adolesc Health*. 1997;20:339-42.
4. Clatts MC, Davis WR, Sotheran JL, Atillasoy A. Correlates and distribution of HIV risk behaviors among homeless youths in New York City: implications for prevention and policy. *Child Welf*. 1998;77:195-207.
5. Gleghorn AA, Marx R, Vittinghoff E, Katz MH. Association between drug use patterns and HIV risks among homeless, runaway, and street youth in Northern California. *Drug Alcohol Depend*. 1998;51:219-27.
6. DeMatteo D, Major C, Block B, et al. Toronto street youth and HIV/AIDS: prevalence, demographics, and risks. *J Adolesc Health*. 1999;25:358-66.
7. Roy É, Haley N, Leclerc P, et al. Prevalence of HIV infection and risk behaviours among Montreal street youth. *Int J STD AIDS*. 2000;11:241-7.
8. Ochnio JJ, Patrick D, Ho M, Talling DN, Dobson SR. Past infection with hepatitis A virus among Vancouver street youth, injection drug users and men who have sex with men: implications for vaccination programs. *Can Med Assoc J*. 2001;165:293-7.
9. Kerr T, Stoltz J, Brandon DL, et al. Childhood trauma and injection drug use among high-risk youth. *J Adolesc Health*. 2009;45:300-2.
10. Parriot AM, Auerswald CL. Incidence and predictors of onset of injection drug use in a San Francisco cohort of homeless youth. *Subst Use Misuse*. 2009;44:1958-70.
11. Roy E, Haley N, Leclerc P, Cedras L, Blais L, Boivin JF. Drug injection among street youths in Montreal: predictors of initiation. *J Urban Health*. 2003;80:92-105.

12. Shields SA, Wong T, Mann J, et al. Prevalence and correlates of Chlamydia infection in Canadian street youth. *J Adolesc Health*. 2004;34:384-90.
13. Weber A, Boivin JF, Blais L, Haley N, Roy E. Predictors of initiation into prostitution among female street youths. *J Urban Health*. 2004;81:584-95.
14. Chettiar J, Shannon K, Wood E, Zhang R, Kerr T. Survival sex work involvement among street-involved youth who use drugs in a Canadian setting. *J Public Health*. 2010. doi:10.1093/pubmed/fdp126. *Advance Access* published on January 9.
15. Krieger J, Higgins DL. Housing and health: time again for public health action. *Am J Public Health*. 2002;92:758-68.
16. Rhodes T, Singer M, Bourgois P, Friedman SR, Strathdee SA. The social structural production of HIV risk among injecting drug users. *Soc Sci Med*. 2005;61:1026-44.
17. Rhodes T. The 'risk environment': a framework for understanding and reducing drug-related harm. *Int J Drug Policy*. 2002;13:85-94.
18. Généreux M, Bruneau J, Daniel M. Association between neighbourhood socioeconomic characteristics and high-risk injection behaviour amongst injection drug users living in inner and other city areas in Montréal, Canada. *Int J Drug Policy*. 2010;21:49-55.
19. Hwang SW. Homelessness and health. *Can Med Assoc J*. 2001;164:229-33.
20. Turnbull J, Muckle W, Masters C. Homeless and health. *Can Med Assoc J*. 2007;177:1066-1066.
21. Kipke MD, Weiss G, Wong CF. Residential status as a risk factor for drug use and HIV risk among young men who have sex with men. *AIDS Behav*. 2007;11:S56-69.
22. Corneil TA, Kuyper LM, Shoveller J, et al. Unstable housing, associated risk behaviour, and increased risk for HIV infection among injection drug users. *Health Place*. 2006;12:79-85.
23. German D, Davey M, Latkin CA. Residential transience and HIV risk behaviors among injection drug users. *AIDS Behav*. 2007;11:S21-30.
24. Wenzel SL, Tucker JS, Elliott MN, Hambarsoomians K. Sexual risk among impoverished women: understanding the role of housing status. *AIDS Behav*. 2007;11:S9-20.
25. Weir BW, Bard RS, O'Brien K, Casciato CJ, Stark MJ. Uncovering patterns of HIV risk through multiple housing measures. *AIDS Behav*. 2007;11:S31-44.
26. Salazar LF, Crosby RA, Holtgrave DR, et al. Homelessness and HIV-associated risk behavior among African American men who inject drugs and reside in the urban south of the United States. *AIDS Behav*. 2007;11:S70-7.
27. Galea S, Vlahov D. Social determinants and the health of drug users: socioeconomic status, homelessness, and incarceration. *Public Health Rep*. 2002;117:S135-45.
28. Dworsky AL, Piliavin I. Homeless spell exits and returns: substantive and methodological elaborations on recent studies. *Soc Serv Rev*. 2000;74:193-213.
29. Tsemberis S, McHugo G, Williams V, Hanrahan P, Stefancic A. Measuring homelessness and residential stability: the residential time-line follow-back inventory. *J Community Psychol*. 2007;35:29-42.
30. Marshall BDL, Kerr T, Shoveller JA, Patterson TL, Buxton JA, Wood E. Homelessness and unstable housing associated with an increased risk of HIV and STI transmission among street-involved youth. *Health Place*. 2009;15:783-90.
31. Whitbeck LB, Hoyt DR. *Nowhere to Grow: Homeless and Runaway Adolescents and their Families*. New York, NY: Aldine de Gruyter; 1999.
32. Chen X, Tyler KA, Whitbeck LB, Hoyt DR. Early sexual abuse, street adversity, and drug use among female homeless and runaway adolescents in the midwest. *J Drug Issues*. 2004;34:1-22.
33. Ennett ST, Federman EB, Bailey SL, Ringwalt CL, Hubbard ML. HIV-risk behaviors associated with homelessness characteristics in youth. *J Adolesc Health*. 1999;25:344-53.
34. Rhule-Louie DM, Bowen S, Baer JS, Peterson PL. Substance use and health and safety among homeless youth. *J Child Fam Stud*. 2008;17:306-19.
35. Ammerman SD, Ensign J, Kirzner R, et al. *Homeless young adults ages 18–24: examining services delivery applications*. Nashville, TN: National Health Care for the Homeless Council; 2004.

36. Haley N, Roy E, Leclerc P, Boudreau JF, Boivin JF. HIV risk profile of male street youth involved in survival sex. *Sex Transm Infect*. 2004;80:526-30.
37. Gaetz S. *The Homeless Hub—Ressource Homeless Hub—What is Homelessness?* 2009. http://www.homelesshub.ca/Library/View.aspx?id=46114&AspxAutoDetectCookieSupport=1. Accessed March 10, 2010.
38. New Hampshire Dartmouth Research Center. *Residential Follow-Back Calendar*. Lebanon, NH: Dartmouth Medical School; 1995.
39. Fleiss Jl. *Statistical Methods for Rates and Proportions*. 2nd ed. New York, NY: Wiley; 1981.
40. Tsemberis S, Gulcur L, Nakae M. Housing first, consumer choice, and harm reduction for homeless individuals with a dual diagnosis. *Am J Public Health*. 2004;94:651-6.
41. Orwin RG, Scott CK, Arieira CR. Transitions through homelessness and factors that predict them: residential outcomes in the Chicago target cities treatment sample. *Eval Program Plann*. 2003;26:379-92.
42. Sosin M, Piliavin I, Westerfelt H. Toward a longitudinal analysis of homelessness. *J Soc Issues*. 1990;46:157-74.
43. Tsemberis S, Eisenberg RF. Pathways to housing: supported housing for street-dwelling homeless individuals with psychiatric disabilities. *Psychiatr Serv*. 2000;51:487-93.
44. Argeriou M, McCarty D, Mulvey K. Dimensions of homelessness. *Public Health Rep*. 1995;110:734-41.
45. Slesnick N, Kang MJ. The impact of an integrated treatment on HIV risk behaviour among homeless youth: a randomized controlled trial. *Behav Med*. 2008;31:45-59.
46. Kairouz S, Boyer R, Nadeau L, Perreault M, Fiset-Laniel J. *Troubles mentaux, toxicomanie et autres problèmes liés à la santé mentale chez les adultes québécois. Enquête sur la santé dans les collectivités canadiennes (cycle 1.2)*. Québec: Institut de la statistique du Québec; 2008.
47. Kerr T, Kimber J, Rhodes T. Drug use settings: an emerging focus for research and intervention. *Int J Drug Policy*. 2007;18:1-4.
48. Rew L, Grady M, Whittaker TA, Bowman K. Interaction of duration of homelessness and gender on adolescent sexual health indicators. *J Nurs Scholarsh*. 2008;40:109-15.
49. Meade CS, Sikkema KJ. HIV risk behavior among adults with severe mental illness: a systematic review. *Clin Psychol Rev*. 2005;25:433-57.
50. Fournier L. *Enquête auprès de la clientèle des ressources pour personnes itinérantes des régions de Montréal-Centre et de Québec, 1998–1999 (Volume 2)*. Québec: Institut de la statistique du Québec; 2001.
51. Kessler RC, Ustun TB. The World Mental Health (WMH) Survey Initiative version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *Int J Methods Psychiatr Res*. 2004;13:93-121.
52. Kovess V, Fournier L, Lesage AD, Lebigre FA, Caria A. Two validation studies of the CIDIS; a simplified version of the CIDI. *Psychiatr Netw*. 2001;4:10-24.
53. American Psychiatric Association. *DSM-IV, Manuel diagnostique et statistique des troubles mentaux*. 4th ed. Paris, France: Masson; 2000 [French translation].
54. Zeger SL, Liang KY, Albert PS. Models for longitudinal data: a generalized estimating equation approach. *Biometrics*. 1988;33:1049-60.
55. Metraux S, Metzger DS, Culhane DP. Homelessness and HIV risk behaviors among injection drug users. *J Urban Health*. 2004;81:618-29.
56. Aidala A, Lee G, Garbers S, Chiasson MA. Sexual behaviors and sexual risk in a prospective cohort of HIV positive men and women in New York City, 1994–2002: implications for prevention. *AIDS Educ Prev*. 2006;18:12-32.
57. Johnson G, Chamberlain C. Homelessness and substance abuse: which comes first? *Aust Soc Work*. 2008;61:342-56.
58. Greene JM, Ennett ST, Ringwalt CL. Prevalence and correlates of survival sex among runaway and homeless youth. *Am J Public Health*. 1999;89:1406-9.

59. Kipke MD, Montgomery SB, Simon TR, Unger JB, Johnson CJ. Homeless youth: drug use patterns and HIV risk profiles according to peer group affiliation. *AIDS Behav*. 1997;1:247-59.
60. Halcon LL, Lifson AR. Prevalence and predictors of sexual risks among homeless youth. *J Youth Adolesc*. 2004;33:71-80.
61. Dickson-Gomez J, Hilario H, Convey M, Michelle-Corbett A, Weeks M, Martinez M. The relationship between housing status and HIV risk among active drug users: a qualitative analysis. *Subst Use Misuse*. 2009;44:139-62.
62. Johnson G. *On the Move: A Longitudinal Study of Pathways In and Out of Homelessness*. Ph.D. thesis. Melbourne, Australia: RMIT University; 2006.