

# SOCIO-SPATIAL INJECTING CONTEXT AND BINGE DRUG INJECTION IN A PROSPECTIVE COHORT OF PEOPLE WHO INJECT DRUGS IN MONTREAL, CANADA

Nanor Minoyan<sup>1,2</sup>, Stine Hoj<sup>2</sup>, Brendan Jacka<sup>2</sup>, Adelina Andreea Artenie<sup>1,2</sup>, Didier Jutras-Aswad<sup>2,3</sup>, Julie Bruneau<sup>2,4</sup>

<sup>1</sup>Department of Social and Preventive Medicine, School of Public Health, Université de Montréal; <sup>2</sup>Research Centre of the Centre Hospitalier de l'Université de Montréal; <sup>3</sup>Department of Psychiatry, Faculty of Medicine, Université de Montréal; <sup>4</sup>Department of Family and Emergency Medicine, Faculty of Medicine, Université de Montréal. contact: nanor.minoyan@umontreal.ca

## BACKGROUND

The marginalized nature of drug use may lead to concentration of high-risk behaviours, such as binge drug injection, within particular social and geographic settings. Previous epidemiologic studies have demonstrated heightened risk of HIV seroconversion<sup>1</sup>, needle-sharing<sup>2,3</sup>, hepatitis C virus infection<sup>4</sup>, and illicit drug use<sup>5,6</sup> in various physically defined spaces. Drug-related harms may additionally be favoured in high-risk social spheres, through mechanisms involving peer group norms, social network connectivity, gender-related power dynamics, and stigmatization of drug use<sup>7</sup>. Consideration of socio-spatial injecting contexts may inform understanding of high-risk drug use behaviours among people who inject drugs (PWID).

## VARIABLES

### Outcome Variable:

#### Binge drug injection:

Defined by a questionnaire item asking participants whether, in the past 3 months, they have injected large quantities of drugs for a sustained period, until they were no longer able to continue.

### Exposure Variable:

#### Socio-spatial injecting context

Defined by participants' self-reported postcodes of:

- The address or street intersection of the location where they have slept most often in the past month
- The location of their most recent injection episode with at least one other person present (asked of participants who report injecting with others in the past month)

Categorized as follows:

- Injecting alone:** did not inject with others in the past month
- Same location:** postcode A=B
- Different location:** postcode A≠B

## STATISTICAL ANALYSIS

Generalized estimating equations were used to estimate the association between socio-spatial injection context (coded as a 3-level categorical variable) and binge drug injection (coded as a binary variable), using an unstructured correlation matrix to account for repeated observations from participants. Analyses were adjusted for variables identified *a priori* as potential confounders of the relationship between socio-spatial injecting context and binge drug injection, namely, factors previously associated with high-risk drug use and neighbourhood of residence: age (<30, 30-49, ≥50), gender (male, female), past-month housing accommodation (street/shelter, unstable, stable, prison), and employment status (full or part-time employment in the past 3m, y/n)

### Sensitivity analyses

Sensitivity analyses were conducted using alternate definitions for the exposure variable, based on reported location of the most recent injection episode with other(s) (at home / not at home / injecting alone in the past month). Analyses were also conducted adjusting for past-month cocaine injection (y/n).

## OBJECTIVES

To examine the relationship between socio-spatial injecting context and high-risk drug use behaviour among people who inject drugs in Montreal, Canada

### Specific aim:

- To assess whether PWID who travel outside their dwellings to inject with others have a heightened risk of engaging in binge drug injection, compared to PWID who inject with others at their dwellings, and PWID who inject alone, respectively.

## DATA SOURCE

*Study design:* Prospective longitudinal cohort of PWID (HEPCO)

*Eligibility criteria:*

- Self-reported drug injection in the past 6 months, ≥18 years of age, residence in the greater Montreal area

*Recruitment:* Diverse sources (convenience sample)

*Study procedures:*

- Tri-monthly follow-up visits (March 2011-July 2017)
- Interviewer-administered semi-structured questionnaire collecting sociodemographic, life events and drug use data
  - + Detailed event-level data relating to the most recent injection episode with at least one other person present (past month)
  - + Past-month dwelling and injecting locations (postal codes)

## STUDY SAMPLE

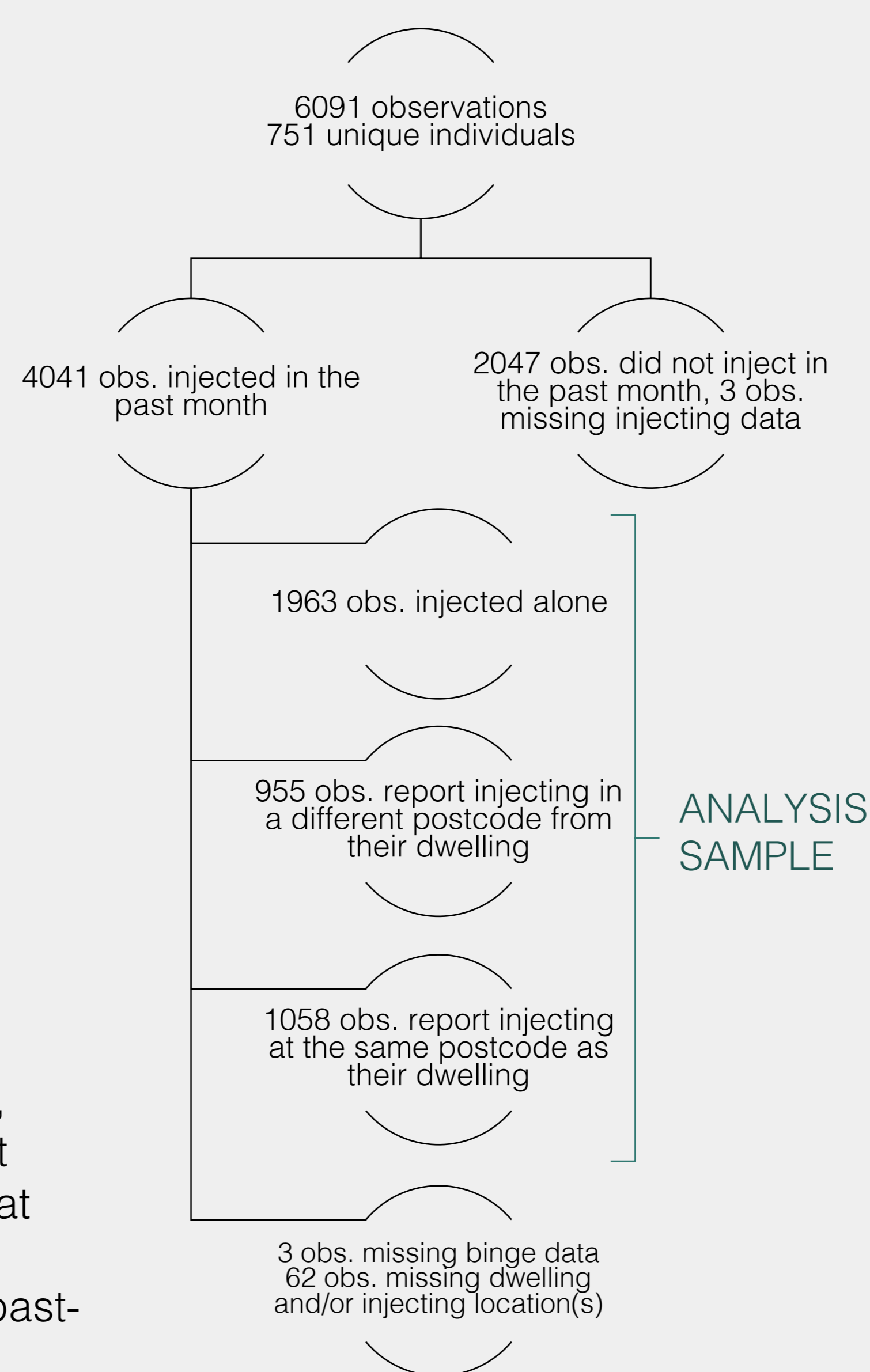


Table 1: Baseline characteristics of 670 eligible participants

	SOCIO-SPATIAL INJECTING CONTEXT		
	DIFFERENT LOCATION n=185	SAME LOCATION n=170	INJECTING ALONE n=315
Age (years)	35.6 [28.9-45.9]	37.6 [29.8-46.9]	42.7 [34.7-49.1]
Male gender	150 (81.1%)	124 (72.9%)	273 (86.7%)
Days injected, past mo.	16.0 [4.0-30.0]	16.0 [5.0-30.0]	5.0 [2.0-15.0]
Drugs injected, past mo.*			
Cocaine	61 (49.2%)	110 (64.7%)	190 (60.3%)
Heroin	77 (41.6%)	77 (45.3%)	81 (25.7%)
Prescription opioids	109 (58.9%)	81 (47.7%)	100 (31.8%)
Income sources, past mo.*			
Survival income <sup>a</sup> +/- other	99 (53.5%)	83 (48.8%)	88 (27.9%)
Stable / no survival income	12 (6.5%)	14 (8.2%)	42 (13.3%)
Welfare / no survival income	71 (38.4%)	70 (41.2%)	177 (56.2%)
Full-time employment	17 (9.2%)	17 (10.0%)	39 (12.4%)
Housing type, past mo.:			
Stable	86 (46.7%)	125 (73.5%)	202 (64.5%)
Unstable <sup>b</sup>	17 (9.2%)	20 (11.8%)	41 (13.1%)
Street or shelter	78 (42.4%)	24 (14.1%)	61 (19.5%)
Prison	3 (1.6%)	1 (0.6%)	9 (2.9%)
Public injection, past 3m	146 (78.9%)	77 (45.3%)	147 (46.8%)
Public injection at latest injection episode with other(s)	111 (65.3%)	22 (13.1%)	NA

\*Non-mutually exclusive categories

<sup>a</sup>Defined as obtaining income through crime, street-based activities, or sale of personal goods

<sup>b</sup>Defined as living in a hotel, rooming house, rehabilitation or psychiatric centre, or halfway house

## RESULTS

670 individuals contributed 3976 observations for the current analysis, reporting 766 unique injection postcodes, and 1209 unique dwelling postcodes. A wide range of locations were reported by participants over the course of follow-up, with many participants reporting dwellings outside the Greater Montreal area. Among those reporting valid dwelling & injecting locations, the median distance between reported sites was 4.1 km (IQR: 1.5-9.5).

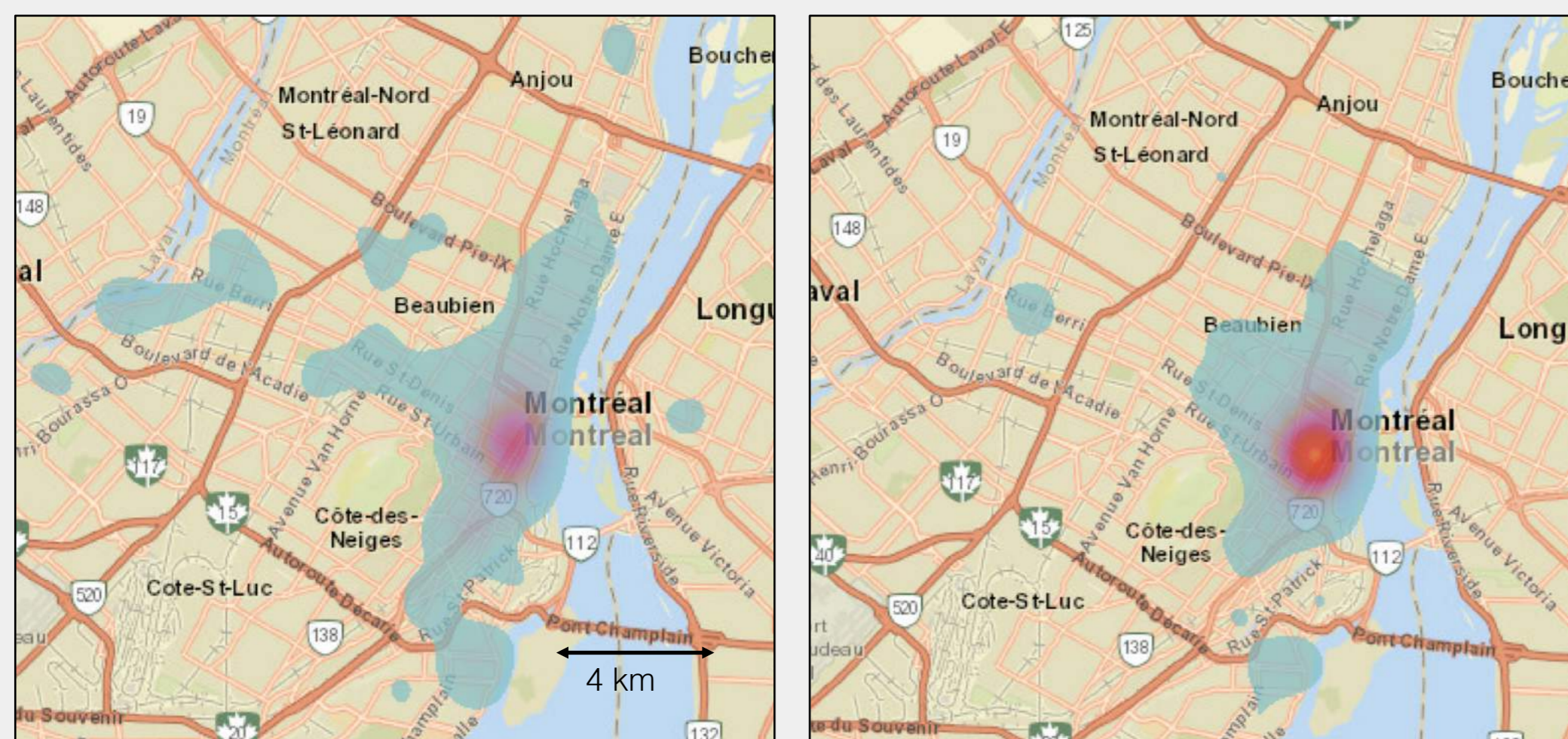


Figure 1: Heatmap illustrating geographic distribution of dwelling (left) & injecting (right) locations reported by HEPCO participants in Montreal

407 binge drug injection events were observed over the course of follow-up, among 229 unique individuals.

Compared to those injecting alone, PWID injecting with others were younger and less likely to be male, more likely to report past-month heroin or prescription opioid injection, and to obtain income through unconventional means. They also tended to inject more frequently. Compared to both other categories, those reporting different dwelling & injecting locations were less likely to inject cocaine, to live in stable housing accommodations, and were more likely to inject in public.

Table 2: Results of GEE analyses estimating the association between socio-spatial injecting context and binge drug injection

Socio-spatial injecting context (past month)	Binge Events (n)	Odds Ratio (crude)	95% CI	Odds Ratio (adjusted*)	95% CI
Different location	147	1.00	–	1.00	–
Same location	105	0.62	(0.48-0.81)	0.68	(0.53-0.87)
Injecting alone	155	0.53	(0.41-0.69)	0.59	(0.45-0.77)

\*analyses adjusted for age, gender, past-month housing accommodations, and part- or full-time employment in the past 3 months.

In multivariate analyses summarized in table 2, traveling to inject with others was significantly associated with a 47% and 69% greater odds of binge drug injection, compared to injecting with others at home and injecting alone, respectively. Sensitivity analyses additionally adjusting for past-month cocaine injection (not shown) and using an alternate definition of exposure based on participants' self reported location (table 3) did not substantively alter estimates (<10% change in ORs).

Table 3: Results of GEE analyses estimating associations between location of most recent injection episode with other(s)\* and binge drug injection (sensitivity analysis)

Location of most recent injection episode with other(s)	Odds Ratio (crude)	95% CI	Odds Ratio (adjusted*)	95% CI
At home	1.00	–	1.00	–
Not at home	0.53	(0.38-0.73)	0.63	(0.45-0.88)
Injected alone (1m)	0.51	(0.37-0.71)	0.58	(0.42-0.79)

\*83 Observations excluded due to missing injecting locations; analyses adjusted for the same variables as the primary analysis.

## CONCLUSIONS

In the current study, PWID who reported injecting with others exhibited heightened risk of binge injection, with those traveling outside their dwellings at greatest risk. This suggests a role for peer group norms and geographic spaces in shaping drug use behaviours. Future studies may examine specific features of risk-promoting environments, and consider the multiple spaces frequented by PWID. Considering upstream determinants of risk may inform the development of novel intervention strategies, moving beyond traditional approaches that target individual behaviours.

## REFERENCES

- Brouwer KC et al. Spatial Epidemiology of HIV among Injection Drug Users in Tijuana, Mexico. *Ann Assoc Am Geogr.* 2012;102(5):1190-9.
- Kori N et al. Correlates of injecting in an HIV incidence hotspot among substance users in Tijuana, Mexico. *Int J Drug Policy.* 2014 May;25(3):525-32.
- Boodram B et al. The role of social networks and geography on risky injection behaviors of young persons who inject drugs. *Drug Alcohol Depend.* 2015 Sep 1;154:229-35.
- Sacks-Davis R et al. The role of living context in prescription opioid injection and the associated risk of hepatitis C infection. *Addiction.* 2016 Nov;111(11):1985-96.
- Nandi A et al. Neighborhood poverty and injection cessation in a sample of injection drug users. *Am J Epidemiol.* 2010 Feb 15;171(4):391-8.
- Cooper HL et al. The aftermath of public housing relocation: relationship to substance misuse. *Drug Alcohol Depend.* 2013 Nov 1;133(1):37-44.
- Rhodes T et al. The social structural production of HIV risk among injecting drug users. *Soc Sci Med.* 2005 Sep;61(5):1026-44.

## ACKNOWLEDGEMENTS

NM, AAA, and BJ are supported through CanHepC PhD trainee scholarships. AAA is additionally supported by the Canadian Institutes of Health Research. JB is receiving advisor fees from Gilead Sciences and Merck and a research grant from Gilead Sciences, outside of this current work. None of the authors have commercial relationships that may pose a conflict of interest in connection with this work. The HEPCO Cohort is supported by the CIHR [MOP74581] and the FRQS [FRQS52905]. Authors would like to thank study participants and the staff working at the HEPCO Cohort research site, including Rachel Bouchard and Elisabeth Deschenes.