The Impact of Geographic Location on HIV Viral Suppression and Mortality among People Who Use Injection Drugs

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Background

- Healthcare in urban vs. rural:
  - More HIV-related service available in urban areas
  - More healthcare services for people who use injection drugs (PWUID) available in urban areas
- There is a need to analyze the impact of geographic location on health outcomes

Methods

Design: Observational cohort.

Participants:

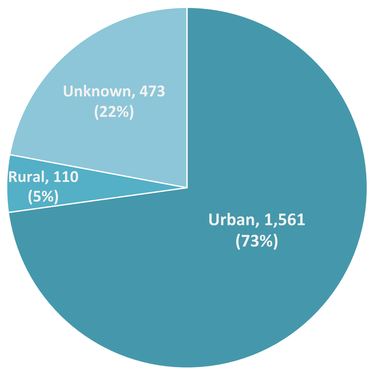
- HIV-positive PWUID aged ≥18 years who initiated antiretroviral (ARV) therapy for the first time between 01-Jan-2000 and 31-Dec-2016
- Enrolled in the Canadian Observational Cohort (CANOC).
  - Enrolled in participating centres and clinics from five provinces in Canada: British Columbia, Saskatchewan, Ontario, Quebec, and Newfoundland and Labrador

Analysis:

- Cox proportional hazards model
  - Geographic location and time to initial viral suppression (two consecutive viral load measurements <50 copies/mL) from the start date of first ARV treatment
    - Confounding covariates: gender (male, female, transgender), sexual orientation, ethnicity, province(BC, NL, ON, QC, SK), age, baseline viral load, number of viral load tests per year
  - Geographic location and time to all-cause mortality
    - Confounding covariates: ethnicity, province, ARV therapy regimen
- Urban = Canada Post urban delivery area; Rural = Canada Post rural delivery area
- Participants' postal codes collected at the time of first ARV initiation

Results

Figure 1. Proportion of Urban, Rural, and Unknown geographical location of the participants



Of 11,748 CANOC participants, 2,144 (18%) HIV-positive PWUID were included in this analysis

Table 1. Characteristics of PWUID study participants at baseline(n=2,144)

Characteristics	Overall n (%)	Rural n (%)	Urban n (%)	Unknown n (%)
Gender				
Female	1509(70)	81(74)	1112(71)	316(67)
Male	615(29)	29(26)	432(28)	154(32)
Transgender	20(1)	0(0)	17(1)	3(1)
Age at baseline*	40 (34, 46)	40.5 (34, 48)	41 (34, 47)	39 (33, 46)
MSM				
No	1668(78)	92(84)	1154(74)	422(89)
Yes	419(19)	13(12)	357(23)	49(10)
Unknown	57(3)	5(4)	50(3)	2(1)
Indigenous ethnicity				
No	987(46)	47(43)	783(50)	157(33)
Yes	505(24)	32(29)	340(22)	133(28)
Unknown	652(30)	31(28)	438(28)	183(39)
Province				
British Columbia	1709(80)	75(68)	1192(76)	442(93)
Saskatchewan	17(1)	5(5)	11(1)	1(1)
Ontario	278(13)	22(20)	250(16)	6(1)
Quebec	131(6)	6(5)	101(6)	24(5)
Newfoundland and Labrador	9(0)	2(2)	7(1)	0(0)
Experienced VL suppression				
No	230(11)	8(7)	169(11)	53(11)
Yes	1914(89)	102(93)	1392(89)	420(89)
VL suppression at 3 months				
No	1505(70)	78(71)	1080(69)	347(73)
Yes	409(19)	24(22)	312(19)	73(16)
Missing	230(11)	8(7)	169(11)	53(11)

*Results are presented as median (Q1,Q3)

Results (continued)

Table 2. Relationship between geographic location and time to first viral suppression (<50 copies/mL)

Geographical Location	Adjusted HR (95% CI)**	Type III P-value
Urban delivery area	1.00	0.0141
Rural delivery area	1.27(1.03, 1.56)	
Unknown	0.91(0.82, 1.02)	

**HR =Hazard Ratio, CI = Confidence Interval, confounding covariates used in the multivariable confounder model: gender (male, female, transgender), sexual orientation, ethnicity, province(BC, NL, ON, QC, SK), age, baseline viral load, and number of viral load tests per year

Table 3. Relationship between geographic location and time to all-cause mortality

Geographical Location	Adjusted HR (95% CI)***	Type III P-value
Urban delivery area	1.00	< 0.0001
Rural delivery area	0.84(0.69, 1.03)	
Unknown	1.29(1.16, 1.43)	

***Confounding covariates used in the multivariable confounder model: ethnicity, province (BC, NL, ON, QC, SK), and ARV therapy regimen

Discussion and Limitations

Viral suppression & Rural delivery area

- Residence in Rural delivery areas at the time of treatment initiation was significantly associated with higher hazard of viral suppression, compared to urban delivery area
  - However, this does not reflect the health outcomes of HIV-positive PWUID living in rural areas who are not captured in this dataset (accessing other clinics or not retained in care)
  - Most cohort centres are clinics in urban locations, and the participants in rural delivery area in this analysis are patients who already have access to these clinics
  - Further investigation on predictors of viral suppression for this subset of rural delivery area address
    - Investigate what contributes to positive health outcomes for people in rural areas

All-cause mortality & Unknown geographical location

- Unknown residence location was significantly associated with higher hazard of all-cause mortality, compared to urban delivery area
- A notable proportion of participants with unknown geographical location (22% of PWUID from this analysis)
  - Unknown geographical location might be due to: participants providing partial or no address, missing postal code records at the time of ARV initiation, and transient housing
  - There's a need to investigate this subset of participants

Urban and Rural definition

- With Canada Post's definition for geographical location, majority of participants' residence locations were classified as urban delivery area
  - Further analysis using different levels of urban areas is planned
    - Census metropolitan area, census agglomeration, and urban core/fringe/rural areas from Statistics Canada

Unknown residence location for PWUID

- Participants in the PWUID subset with unknown residence location is 22% for this analysis, which is comparable to 10% unknown residence location for the whole cohort of 11,748 CANOC participants

Investigators

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