

BACKGROUND

Previous research suggests that people living with HIV (PLWH) in rural areas are less likely to achieve optimal HIV treatment outcomes, depending on the manner in which rural residency is defined¹⁻⁴. However, these studies are from the early 2010s prior to full implementation of the STOP HIV supports for treatment retention in British Columbia (BC).

It is important to examine how rurality affects HIV clinical outcomes, such as treatment interruptions and lack of virologic suppression, after the expansion of the STOP HIV/AIDS program in BC.

Research Question: Does rural residence impact HIV clinical outcomes in a cohort of PLWH in BC?

METHODS

Purposive sampling → obtained a sample representative of the larger PLWH population in the BC HIV Drug Treatment Program (DTP)

Recruited PLWH aged ≥19 in BC into the STOP HIV/AIDS Project Evaluation (SHAPE) Study from January 2016 - September 2018

1 survey at enrollment and 2 follow-up surveys ~18 months apart

Linked participant survey data to the DTP clinical registry for longitudinal analysis

Independent variable: degree of rurality and metropolitan influence based on a modified version of the Statistical Area Classification (SAC) categories^{4,5}: **Large cities** (population 100,000+), **moderately sized cities or suburbs** (population 10,000 - 99,999) and **rural areas** (population <10,000) → classified using participants’ postal code

Primary outcome variable: 6-month proportions of participants with **treatment interruptions (TIs)** (>60 days late for medication refills) – *Inclusion criteria:* initiated ART prior to enrollment

Secondary outcome variable: yearly proportions of at least one **unsuppressed viral load (VL)** (≥200 copies/mL) between 2016-2023 as recorded in the BC HIV DTP.

Statistical analysis: generalized estimating equation Poisson regression analyses to model TI incidence by SAC category.

RESULTS

608 participants included

3.0% in rural areas

17.3% in medium-sized/ suburban areas

79.8% in large cities

Median age: 50 years (Q1-Q3: 43-57)

21.5% female
77.0% male

No statistically significant differences in the **yearly proportions of unsuppressed VL** among participants residing in rural (odds ratio [OR] = 0.89; 95% CI: 0.38–2.05) or medium-sized/suburban (OR = 1.38; 95% CI: 0.94–2.04) areas compared to those in large cities.

No statistically significant differences in **TI incidence** between participants residing in rural (incidence rate ratio [IRR] = 1.10; 95% CI 0.50-2.40) or medium-sized/suburban (IRR = 1.23; 95% CI 0.88-1.73) areas compared to large cities (Table 2).

In the **final multivariable model** after adjusting for potential confounding variables, there was no association between residing in rural/medium-sized/suburban areas and **TI incidence** compared to large cities (IRR= 0.92; 95% CI 0.66 - 1.27) (Table 2).

Table 1: Descriptive characteristics of the study population by Statistical Area Classification (SAC) category at enrollment (N=608)

	Large cities (N=485) Median(Q1-Q3)	Medium-sized/suburban areas (N=105) Median(Q1-Q3)	Rural areas (N=18) Median(Q1-Q3)	P-value
HIV stigma score	45(30-60)	53(38-63)	53(38-68)	0.047
Social support system (MOSS SSS) score	66(42-86)	61(41-83)	84(57-93)	0.188
Year of ART initiation	2007(1999-2012)	2009(2007-2012)	2009(2001-2012)	0.021
	Large (N = 485) N (column%)	Moderate (N = 105) N (column%)	Rural (N = 18) N (column%)	P-value
Age				
Less than 40	91(18.8)	17(16.2)	<5	0.572
40 to 49	135(27.8)	37(35.2)	5(27.8)	
50 to 59	173(35.7)	39(37.1)	8(44.4)	
60 or older	86(17.7)	12(11.4)	<5	
Gender				
Male	388(80.0)	70(66.7)	10(55.6)	0.004
Female	89(18.4)	31-34 (29.5-32.4)	8(44.4)	
Other	8(1.6)	<5		
HIV risk group				
MSM only	284(58.6)	33(31.4)	6(33.3)	<0.001
IDU only	83(17.1)	31(29.5)	6(33.3)	
Both MSM and IDU	34(7.0)	5(4.8)		
Neither MSM nor IDU	84(17.3)	36(34.3)	6(33.3)	
Education				
Less than high school	92-95 (19.0-19.6)	36(34.3)	<5	<0.001
High school	137(28.2)	38(36.2)	<5	
Greater than high school	252(52.0)	31(29.5)	13(72.2)	
Other	<5			
Homeless in the past year				
No	423(87.2)	86(81.9)	14-17 (77.8-94.4)	0.215
Yes	62(12.8)	19(18.1)	<5	

Table 2: Poisson regression analysis of factors associated with having a treatment interruption (TI) at follow-up

	Overall (N=608) N (%)	Incidence Rate Ratio (IRR) [95% CI]	P-value	Adjusted IRR [95% CI]	P-value
Statistical Area Classification (SAC) category					
Large cities	485(79.8)				
Moderate/suburban areas	105(17.3)	1.23 [0.88, 1.73]	0.233		
Rural areas	18(3.0)	1.10 [0.50, 2.40]	0.816		
SAC category (regrouped)					
Large cities	485(79.8)				
Moderate/suburb/rural	123(20.2)	1.21 [0.88, 1.67]	0.244	0.92 [0.66, 1.27]	0.600
Age (categorized)					
Less than 40	111(18.3)				
40 to 49	177(29.1)	0.71 [0.50, 1.02]	0.061	0.72 [0.50, 1.03]	0.071
50 to 59	220(36.2)	0.57 [0.40, 0.80]	0.001	0.61 [0.42, 0.88]	0.008
60 or greater	100(16.4)	0.38 [0.23, 0.63]	<0.001	0.50 [0.29, 0.86]	0.012
Gender					
Male (cis)	468(77.0)				
Female (cis)	131(21.5)	1.53 [1.14, 2.06]	0.005		
Other	9(1.5)	0.85 [0.26, 2.75]	0.780		
HIV risk group					
MSM only	323(53.1)				
IDU only	120(19.7)	2.08 [1.46, 2.96]	<0.001	2.05 [1.42, 2.96]	<0.001
Both MSM and IDU	39(6.4)	2.45 [1.52, 3.95]	<0.001	2.41 [1.50, 3.87]	<0.001
Neither MSM nor IDU	126(20.7)	2.34 [1.69, 3.25]	<0.001	2.35 [1.69, 3.28]	<0.001
	Median (Q1-Q3)	IRR [95% CI]	P-value	Adjusted IRR [95% CI]	P-value
HIV stigma scores	48(33-60)	1.00 [0.99, 1.01]	0.897		
Social support system (MOSS SSS) scores	64(42-86)	1.00 [0.99, 1.00]	0.488		
Year of ART initiation	2008(2000-2012)	1.03 [1.01, 1.05]	0.002	1.02 [1.00, 1.04]	0.112

CONCLUSIONS

No differences in TI incidence or unsuppressed VL among PLWH residing in smaller or more rural areas relative to large cities.
→ Efforts by the provincial STOP HIV/AIDS program to mitigate residence-based disparities


Future research should further investigate residence-based disparities by including a larger rural sample from different geographic settings.


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References: 1) Lima 2012, PloS one 7:11; 2) MacKenzie, 2017, AIDS Care 29:10; 3) Lourenco, 2014 PloS one 26:9; 4) Jaworsky, 2020 CMAJ OPEN 8:4; 5) Statistics Canada, 2021, *Statistical Area Classification*.


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Conflict of Interest Disclosure: I have no conflicts of interest.

SHAPE
THE STOP HIV/AIDS PROGRAM EVALUATION STUDY

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