

Factors associated with antiretroviral treatment interruptions among people living with HIV in British Columbia, Canada

Clara Tam¹, Tian Shen¹, Jason Chia¹, David Moore^{1,2}, Kate Salters^{1,3}, Tim Wesseling¹, Sean Grieve¹, Taylor McLinden^{1,3}, Tatiana Pakhomova¹, Nicole Dawydiuk¹, Paul Sereda¹, Robert Hogg^{1,3}, Rolando Barrios^{1,2}

1) British Columbia Centre for Excellence in HIV/AIDS, Vancouver, Canada; 2) University of British Columbia, Vancouver, Canada; 3) Simon Fraser University, Burnaby, Canada

Background

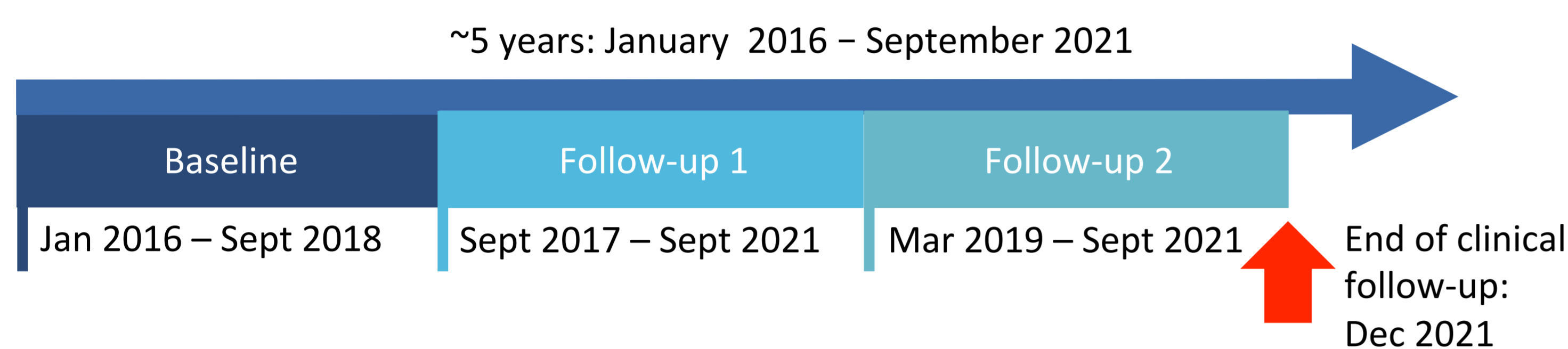
Treatment interruptions (TI) limit the therapeutic protection offered by modern antiretroviral therapy (ART), thereby leading to poorer health outcomes and increased risk of HIV transmission.

We evaluated factors associated with time-to-first TI event among people living with HIV (PLWH) enrolled in a prospective cohort study in British Columbia (BC), Canada.

Methods

The STOP HIV/AIDS Program Evaluation (SHAPE) study is a longitudinal cohort study designed to monitor health care engagement and therapeutic outcomes of PLWH in BC.

- **Eligibility:** PLWH ≥ 19 living in British Columbia, Canada
- **Recruitment:** Purposive sampling based on recruitment quotas from the provincial HIV Drug Treatment Program (DTP) in BC to ensure representative sampling by age, gender, geographic location, ethnicity, and key populations.
- **Data collection:** Participants who completed the baseline survey and had clinical data available from the provincial DTP were included in this analysis. Surveys collected sociodemographic information, as well as drug use, homelessness, and incarceration history.



- **Statistical analysis:** TI were defined as >60 days late for ART refill and a pharmacist-reviewed TI alert sent between enrolment and December 2020. We conducted bivariate analyses comparing baseline data from participants who did and did not experience TI.

Multivariable Cox proportional hazards regression was used to model time-to-first TI. Variables selected for inclusion in the model were based on a backwards stepwise technique using Type III p-values and Akaike Information Criterion. The variable with the highest Type III p-value was dropped at each step of the selection process until the model reached the lowest AIC (a lower AIC indicating better model fit).

Results

Among 639 PLWH included in this analysis, 21.3% identified as women, 59.0% self-identified as men who have sex with men, 69.6% identified as Caucasian, and 15.5% self-identified as Indigenous.

The median age at enrolment was 50 years (Q1-Q3: 42-57) and median follow-up time was 4.15 years (Q1-Q3: 2.98-4.65).

Of 154 (24.1%) participants who experienced a TI since enrolment, the median time to their first TI from enrolment was 15.9 months (Q1-Q3: 8.1-29.3), and median length of their first TI was 96 days (Q1-Q3: 76-154).

- We found participants who were experiencing greater socio-structural marginalization including lifetime experiences of incarceration or violence were more likely to experience treatment interruptions.
- Those who were older in age and had a greater level of education were less likely to experience treatment interruptions.

Key Findings

- Our findings illustrate the impacts of pervasive structural inequities across the life-course on ART treatment and engagement.
- In a context where ART is provided at no-cost to all eligible residents of BC, programs and services aimed at re-engaging participants in care should also take into consideration and aim to address structural factors impacting treatment

Table 1. Descriptive of sociodemographic characteristics of those who experienced at least one treatment interruption since study enrolment

Categorical Variables	Overall (N=639)		At least one treatment interruption during study period				p-value
	N	%	No (N=485)		Yes (N=154)		
Prior experiences of TI							
No	331	51.80	331	68.25	<5	<3.25	<.001
Yes	308	48.20	154	31.75	154	100.00	
Age							0.003
<40	123	19.25	82	16.91	41	26.62	
40-49	183	28.64	136	28.04	47	30.52	
50-59	228	35.68	175	36.08	53	34.42	
60+	105	16.43	92	18.97	13	8.44	
Gender							0.259
Male	493	77.15	381	78.56	112	72.73	
Female	136	21.28	96	19.79	40	25.97	
Others	10	1.56	8	1.65	<5	<3.25	
Key populations							<.001
MSM only	335	52.43	277	57.11	58	37.66	
IDU only	126	19.72	80	16.49	46	29.87	
MSM and IDU	42	6.57	26	5.36	16	10.39	
Neither MSM nor IDU	136	21.28	102	21.03	34	22.08	
Ethnicity							<.001
Caucasian	445	69.64	352	72.58	93	60.39	
Indigenous	99	15.49	59	12.16	40	25.97	
Asian/Black/Caribbean/African American/Latin	44	6.89	37	7.63	7	4.55	
Other	51	7.98	37	7.63	14	9.09	
Highest level of education							<.001
Less than high school	143	22.38	94	19.38	49	31.82	
High School	190	29.73	135	27.84	55	35.71	
Greater than high school	305	47.73	255	52.58	50	32.47	
Other	<5	<0.78	<5	<1.03	<5	<3.25	
Incarceration history							<.001
No	414	64.79	344	70.93	70	45.45	
Yes	225	35.21	141	29.07	84	54.55	
Homelessness ever							<.001
No	320	50.08	265	54.64	55	35.71	
Yes	319	49.92	220	45.36	99	64.29	
Food sufficiency							<.001
Insufficient	410	64.16	288	59.38	122	79.22	
Sufficient	228	35.68	196	40.41	32	20.78	
Unknown	<5	<0.78	<5	<1.03	<5	<3.25	
Injection drug use past year							<.001
Yes, but more than a year ago	141	22.07	103	21.24	38	24.68	
Yes, within the last year	130	20.34	77	15.88	53	34.42	
Never injection drug use	368	57.59	305	62.89	63	40.91	
Hazardous alcohol (AUDIT-C)							0.538
No	389	60.88	292	60.21	97	62.99	
Yes	250	39.12	193	39.79	57	37.01	
Smoking status							<.001
Never Smoker	177	27.70	149	30.72	28	18.18	
Current Smoker	303	47.42	203	41.86	100	64.94	
Former Smoker	159	24.88	133	27.42	26	16.88	
Lifetime violence							<.001
No	144	22.54	126	25.98	18	11.69	
Yes	483	75.59	349	71.96	134	87.01	
Prefer not to Answer	12	1.88	10	2.06	<5	<3.25	

Table 2. Univariable and multivariable cox proportional hazards model of time to first treatment interruption since baseline interview date

Categorical Variables	Univariable COX PH Model (Unadjusted)				Multivariable COX PH Model (Adjusted)			
	Hazard Ratio	95% Confidence Interval	p-Value		Hazard Ratio	95% Confidence Interval	p-Value	
Age								
<40	ref				ref			
40-49	0.73	0.48	1.11	0.142	0.61	0.38	0.97	0.036
50-59	0.63	0.42	0.95	0.026	0.63	0.41	0.97	0.038
60+	0.33	0.17	0.61	<.001	0.39	0.20	0.77	0.007
Gender								
Male	ref							Not selected
Female	1.33	0.92	1.90	0.126				
Others	0.79	0.20	3.21	0.746				
Key populations								
MSM only	ref							Not selected
IDU only	2.64	1.79	3.90	<.001				
MSM and IDU	2.79	1.60	4.85	<.001				
Neither MSM nor IDU	1.59	1.04	2.43	0.032				
Highest level of education								
Less than high school	ref				ref			
High School	0.76	0.52	1.12	0.160	1.03	0.67	1.59	0.896
Greater than high school	0.39	0.26	0.58	<.001	0.69	0.42	1.12	0.131
Main source of income								
All others	ref							Not selected
Income Assistance	2.18	1.45	3.29	<.001				
Incarceration history								
No	ref				ref			
Yes	2.71	1.97	3.73	<.001	1.97	1.33	2.91	<.001
Homelessness ever								
No	ref							Not selected
Yes	2.07	1.49	2.89	<.001				
Food sufficiency								
Insufficient	ref							Not selected
Sufficient	0.42	0.28	0.62	<.001				
Injection drug use past year								
Never injection drug use	ref							Not selected
Yes, but more than one year ago	1.73	1.16	2.59	0.008				
Yes, within the past one year	3.04	2.11	4.39	<.001				
Violence ever								
No	ref				ref			
Yes	2.48	1.51	4.05	0.003	1.94	1.12	3.37	0.019
Type of ART regimen change								
No regimen change	Ref							Not selected
No regimen change (only brand/generic change)	0.72	0.47	1.10	0.126				
Regimen change	1.03	0.67	1.59	0.895				

Acknowledgements: We respectfully acknowledge that our work takes place on the traditional, ancestral, and unceded territories of the Coast Salish peoples, including the x^wməθk^yʷəm (Musqueam Nation), Skwxwú7mesh Uxwumixw (Squamish Nation) and x^wəllilwə7 (Tsleil-Waututh Nation).

We would also like to thank all those who contributed their time and expertise to this project, especially SHAPE participants who shared their life experiences with us, participants who have passed away since the study began, the SHAPE team of peer research associates, co-investigators, collaborators, the BC-CFE, and all partnering community organizations and clinics that assisted with recruitment, data collection, and for their ongoing support and guidance.

Funding: The SHAPE study is funded by the BC Ministry of Health and British Columbia Centre for Excellence in HIV/AIDS. DM is supported by a Scholar Award from the Michael Smith Foundation for Health Research.