

Neighbourhood-Level Material Deprivation and Immune and Virologic Response in the Canadian HIV Observational Cohort Collaboration (CANOC)

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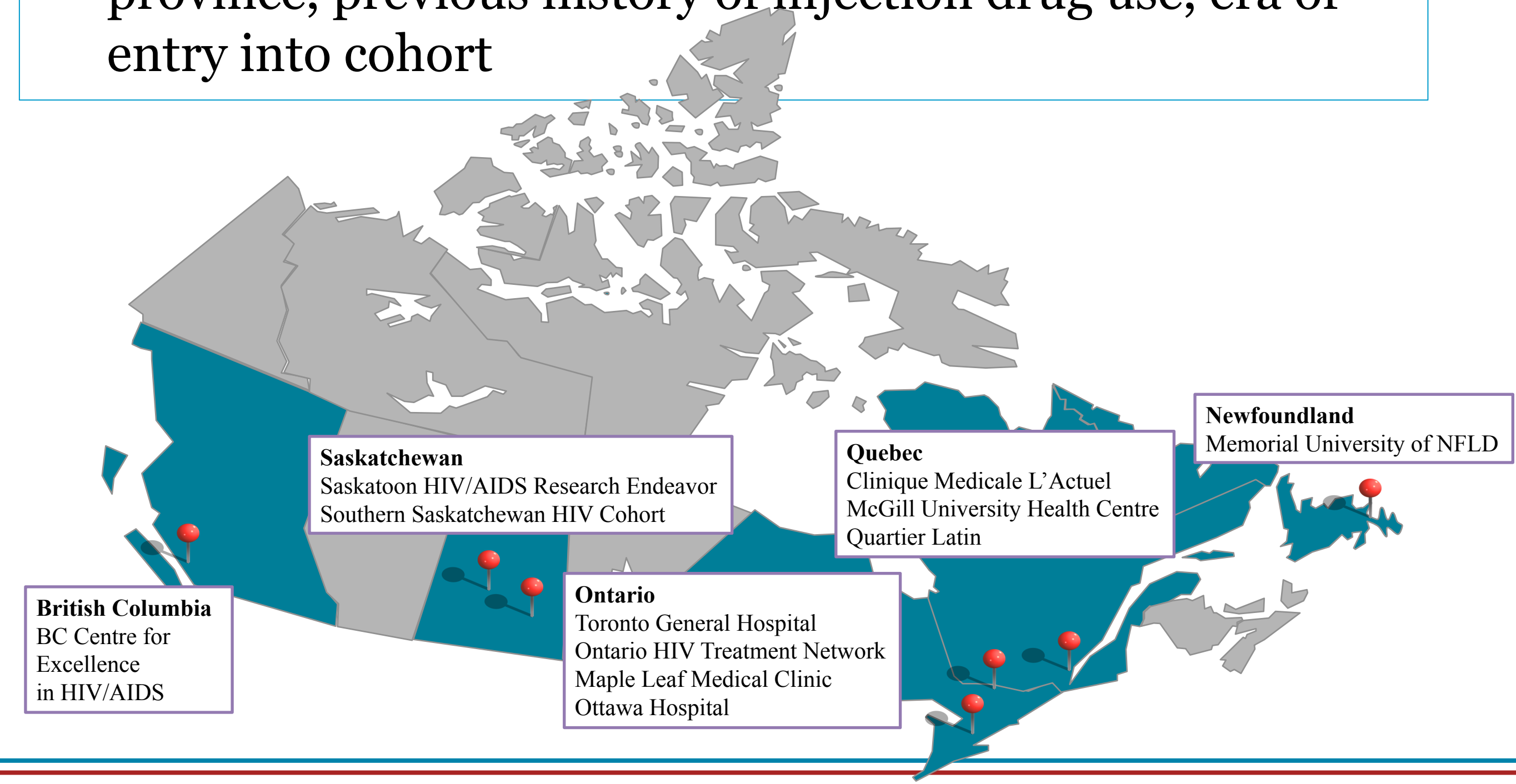
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Background

- Socioeconomic factors, including material deprivation, education level, unemployment, and annual income, have been associated with response to antiretroviral therapy (ART)^{1,2}
 - Neighbourhood level material deprivation is an indicator of neighbourhood socioeconomic status derived from Canadian census data on income, unemployment and education levels by geographic area³
- Hypothesis:** individuals living in materially deprived neighbourhoods will be more likely to achieve incomplete immune and virologic response

Methods

- The Canadian HIV Observational Cohort (CANOC) includes individuals initiating combined ART (cART) as ART-naïve between Jan 1, 2000 and Dec 31, 2016
- Study participants with (1) known sex at birth, (2) follow-up ≥6 months, (3) sufficient viral load (VL) and CD4 data (4) valid postal code were included
- Study participants were categorized (CD4+/VL+, CD4-/VL+, CD4+/VL-, or CD4-/VL-) based on a 6 month time window after cART initiation where
 - ❖ CD4+ corresponds to an increase in 50 cells/mm³
 - ❖ VL+ corresponds to achieving viral suppression <50 copies/mL
- Neighborhood level material deprivation indices developed using Canadian census data from 2006³
 - ❖ Geographic area at the dissemination area (DA) or census subdivision (CSD) level
 - ❖ Factor analysis: PROC FACTOR function with VARIMAX rotation in SAS used to calculate deprivation score at DA or CSD
 - ❖ Index score <0 = not deprived
 - >0 = deprived
- Univariable and multivariable multinomial regression used to model the relationship between neighborhood level material deprivation and immune and virologic response category
- Pre-specified confounders: sex at birth, age at baseline, province, previous history of injection drug use, era of entry into cohort



Results

- 10 133 individuals were included in the study (Table 1)
- Participants from materially deprived neighborhoods were more likely to achieve incomplete response (aOR 1.34, 95% CI 1.13-1.60; Table 2)

Table 1. Baseline characteristics (n= 10 133).

	Overall (N=10133)		Neighbourhood level material deprivation				p-values
	N	col %	No (N=6754)	col %	Yes (N=3379)	col %	
Outcomes							
Immune response							
Complete response (CD4+ VL+)	6277	61.95	4320	63.96	1957	57.92	<0.0001
Incomplete response (CD- VL-)	718	7.09	402	5.95	316	9.35	
Discordant response (CD4+ VL-)	2078	20.51	1344	19.9	734	21.72	
Discordant response (CD4- VL+)	1060	10.46	688	10.19	372	11.01	
Main exposure							
Neighborhood level material deprivation							
No	6754	66.65					
Yes	3379	33.35					
Characteristics							
Sex at birth							
Male	8572	84.59	5886	87.15	2686	79.49	<0.0001
Female	1561	15.41	868	12.85	693	20.51	
Ethnicity							
White	4409	43.51	2953	43.72	1456	43.09	<0.0001
African-Caribbean-Black	942	9.30	633	9.37	309	9.14	
Indigenous	720	7.11	281	4.16	439	12.99	
Asian (East/South)	498	4.91	379	5.61	119	3.52	
Hispanic	412	4.07	294	4.35	118	3.49	
Mixed	246	2.43	180	2.67	66	1.95	
Other	86	0.85	66	0.98	20	0.59	
Unknown	2820	27.83	1968	29.14	852	25.21	
Province							
BC	4485	44.26	3208	47.5	1277	37.79	<0.0001
SK	309	3.05	103	1.53	206	6.1	
ON	2960	29.21	2328	34.47	632	18.7	
QC	2339	23.08	1110	16.43	1229	36.37	
NL	40	0.39	5	0.07	35	1.04	
IDU							
No	6283	62.01	4296	63.61	1987	58.8	<0.0001
Yes	1923	18.98	985	14.58	938	27.76	
Unknown	1927	19.02	1473	21.81	454	13.44	
AIDS defining illness at baseline							
No ADI ever	8137	80.30	5430	80.4	2707	80.11	<0.0001
Had ADI before or on baseline	1116	11.01	749	11.09	367	10.86	
Had ADI after baseline	546	5.39	322	4.77	224	6.63	
Had ADI with unknown date	334	3.30	253	3.75	81	2.4	
Era of cART initiation							
2000-2003	1707	16.85	1142	16.91	565	16.72	0.48
2004-2007	2266	22.36	1539	22.79	727	21.52	
2008-2011	3315	32.71	2193	32.47	1122	33.21	
2011-2016	2845	28.08	1880	27.84	965	28.56	
cART regimen							
NNRTI	4115	40.61	2735	40.49	1380	40.84	0.76
PI	4365	43.08	2926	43.32	1439	42.59	
IIN (integrase)	1253	12.37	822	12.17	431	12.76	
Other	400	3.95	271	4.01	129	3.82	
	N	median (Q1, Q3)	N	Median (Q1, Q3)	N	median (Q1, Q3)	
Age at baseline (years)	10133	40 (32, 47)	6754	40 (32, 47)	3379	40 (33, 47)	0.90
CD4 at baseline (cells/mm3)	10133	250 (140, 380)	6754	250 (140, 380)	3379	246 (140, 372)	0.067
Baseline viral load (log10 copies/ml)	10133	4.85 (4.34, 5)	6754	4.86 (4.35, 5)	3379	4.82 (4.3, 5)	0.047
Follow-up time (months)	10133	76.19 (39.89, 116.5)	6754	77.06 (39.59, 118.57)	3379	74.71 (40.44, 113.35)	0.21

Investigators

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Table 2. Univariable and multivariable multinomial regression modelling immune response using complete response (CD4+ VL+) as reference category (n= 10 133).

	Incomplete response (CD4- VL-)		Discordant response (CD4+ VL-)		Discordant response (CD4- VL+)		p-values
	OR	95% CI	OR	95% CI	OR	95% CI	
Univariable model							
Neighborhood level material deprivation							
No [ref]	1.00		1.00		1.00		
Yes	1.74	1.48 2.03	1.21	1.09 1.34	1.19	1.04 1.37	<0.0001
Multivariable model †							
Neighborhood level material deprivation							
No [ref]	1.00		1.00		1.00		
Yes	1.34	1.13 1.60	1.11	0.99 1.24	1.12	0.97 1.29	0.0036

† Covariates included for adjustment include sex at birth, province, IDU, era of cART initiation, age at baseline

Discussion

- This research corroborates other studies which demonstrated an association between socioeconomic status and HIV-related outcomes
- Incomplete response at 6 months has been associated with increased risk of an AIDS-defining event⁴
- Next steps include examining whether the association between neighborhood level material deprivation and immune and virologic response is consistent across different genders and age groups
- Future work could explore individual-level associations between neighborhood level material deprivation and immune and virologic response

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