

Association between neighbourhood-level material deprivation and HIV care interruption in the Canadian Observational Cohort Collaboration (CANOC)

Shane Thomas¹, Taylor McLinden², Jason Chia³, Erin Ding³, Guillaume Colley³, Katelyn Merritt³, Jodi-Ann Dattadeen³, Mona Loutfy⁴, Tony Antoniou⁴, Janet Raboud⁴, Ann Burchell⁴, Sean Rourke⁴, Robert Hogg³, Joseph Cox²

¹ CANOC Community Investigator Program, Vancouver, BC, ² McGill University, Montreal, QC, ³ BC Centre for Excellence in HIV/AIDS, Vancouver, BC, ⁴ University of Toronto, Toronto, ON

Background

In Canada, neighbourhood-level **material deprivation** is measured using 3 indicators taken from the 2006 Canadian Census:

1. Average household income
2. Unemployment rate
3. High school education rate

Existing evidence indicates that any of these factors may be associated with sub-optimal retention in clinical HIV care at the individual-level [1-2]

HIV care interruptions could lead to incomplete HIV viral load suppression, resulting in HIV transmission & negative health outcomes [3]

Hypothesis: HIV-positive persons who live in materially deprived neighbourhoods may be more likely to experience a **12-month HIV care interruption** than those who do not live in a deprived neighbourhood

Objective

To use a neighbourhood-level measure as a proxy to estimate the effect of material deprivation (in 2006) on the time to a first HIV care interruption during follow-up from 2006 – 2014

Using prospective longitudinal cohort data from 547 HIV-positive persons in Canada (BC, ON, QC) who initiated antiretroviral therapy (ART) in 2006

Methods

Summary statistics [N (%) or median (Q1, Q3)] were used to describe the study sample at baseline (2006). *P*-values comparing categorical variables (by material deprivation) were calculated by Chi-square & Fisher's exact tests, whereas continuous variables were compared by Wilcoxon's Rank-Sum tests

Exposure: Material deprivation indices were derived using the methodology of Pampalon & Raymond (2000), where neighbourhoods with an index > 0 were coded as deprived & those with an index ≤ 0 were coded as not deprived based on 2006 Canadian Census data

Outcome: HIV care interruption was defined as not having had a CD4 or HIV viral load test over a 12 month period of follow-up. Subsequent re-initiation of care was used to define an "interruption"

Statistical analyses: Cause-specific hazards models (competing risks of death/loss to follow-up) were used to estimate unadjusted & adjusted hazard ratios associated with the time to a HIV care interruption. Material deprivation (2006) was used as a time-fixed **exposure** & **confounders** included: gender, province, ethnicity, ART regimen, HIV transmission group, HCV status, baseline age, HIV viral load, CD4, & social deprivation

Results

- N = 547 CANOC participants (initiated ART in 2006)
- 31% lived in a materially deprived neighbourhood in 2006 **[exposure]**
- 2006 - 2014: 24% experienced a 12-month HIV care interruption **[outcome]**

Table 1. Descriptive characteristics of 547 HIV-positive persons in Canada stratified by neighbourhood-level material deprivation

| | Neighbourhood-level material deprivation (2006) [exposure] (N = 547) | | | | P-value |
|---|---|--------------------------|--------------------------------|--------------------------|---------|
| | Not deprived [index ≤ 0] (N = 379) | | Deprived [index > 0] (N = 168) | | |
| | N or median | Percentage (%) or Q1, Q3 | N or median | Percentage (%) or Q1, Q3 | |
| 12-month HIV care interruption (2006-2014) [outcome] | | | | | |
| Yes | 80 | 21 % | 49 | 29 % | 0.041 |
| No | 299 | 79 % | 119 | 71 % | |
| Deceased | | | | | |
| Yes | 28 | 7 % | 14 | 8 % | 0.702 |
| No | 351 | 93 % | 154 | 92 % | |
| Lost to follow-up (18 months without contact) | | | | | |
| Yes | 62 | 16 % | 32 | 19 % | 0.442 |
| No | 317 | 84 % | 136 | 81 % | |
| Gender | | | | | |
| Male | 319 | 84 % | 128 | 76 % | 0.026 |
| Female | 60 | 16 % | 40 | 24 % | |
| Province | | | | | |
| British Columbia | 188 | 50 % | 55 | 33 % | <0.001 |
| Ontario | 132 | 35 % | 53 | 32 % | |
| Quebec | 59 | 16 % | 60 | 36 % | |
| Ethnicity | | | | | |
| Caucasian | 159 | 42 % | 57 | 34 % | 0.243 |
| Black | 40 | 11 % | 26 | 15 % | |
| Aboriginal | 18 | 5 % | 12 | 7 % | |
| Other | 40 | 11 % | 18 | 11 % | |
| Unknown / missing | 122 | 32 % | 55 | 33 % | |
| Antiretroviral therapy (ART) regimen | | | | | |
| 2 NRTI + NNRTI | 146 | 39 % | 68 | 40 % | 0.103 |
| 2 NRTI + PI Boosted | 197 | 52 % | 75 | 45 % | |
| 2 NRTI + PI Single | 27 | 7 % | 22 | 13 % | |
| Other | 9 | 2 % | 3 | 2 % | |
| HIV transmission group: men-who-have-sex-with-men | | | | | |
| No | 115 | 30 % | 84 | 50 % | <0.001 |
| Yes | 202 | 53 % | 68 | 40 % | |
| Unknown | 62 | 16 % | 16 | 10 % | |
| HIV transmission group: injection drug user | | | | | |
| No | 281 | 74 % | 114 | 68 % | 0.010 |
| Yes | 67 | 18 % | 47 | 28 % | |
| Unknown | 31 | 8 % | 7 | 4 % | |
| HIV transmission group: heterosexual | | | | | |
| No | 197 | 52 % | 86 | 51 % | 0.055 |
| Yes | 120 | 32 % | 66 | 39 % | |
| Unknown | 62 | 16 % | 16 | 10 % | |
| Hepatitis C virus (HCV): infection status | | | | | |
| Not co-infected with HCV | 287 | 76 % | 105 | 63 % | 0.005 |
| Co-infected with HCV | 80 | 21 % | 52 | 31 % | |
| Unknown | 12 | 3 % | 11 | 7 % | |
| Baseline age (2006) (years) | 41 (median) | 35, 47 (Q1, Q3) | 40 (median) | 33.5, 46.5 (Q1, Q3) | 0.190 |
| Baseline HIV viral load (Log₁₀ copies/mL) | 5 (median) | 4.54, 5.00 (Q1, Q3) | 4.93 (median) | 4.43, 5.00 (Q1, Q3) | 0.200 |
| Baseline CD4 cell count (cells/mm³) | 200 (median) | 130, 260 (Q1, Q3) | 190 (median) | 130.5, 260.0 (Q1, Q3) | 0.431 |
| Neighbourhood social deprivation index (2006) | 0.87 (median) | 0.31, 1.59 (Q1, Q3) | 0.43 (median) | 0.06, 1.04 (Q1, Q3) | 0.001 |

Table 2. Unadjusted and adjusted cause-specific hazard ratios quantifying the association between neighbourhood-level material deprivation and the time to a 12-month HIV care interruption (2006-2014)

| Exposure | Hazard ratio (HR) | 95% confidence interval (CI) |
|--|-------------------|------------------------------|
| Material deprivation (2006 Census) – Unadjusted | 1.55 | 1.04 – 2.31 |
| Material deprivation (2006 Census) – Adjusted | 1.16 | 0.76 – 1.78 |

Conclusions

- After adjustment for confounding: there was a positive but non-significant association between neighbourhood-level material deprivation & time to a 12-month HIV care interruption in 547 HIV-positive persons in Canada
- Given these preliminary findings: future research could explore associations between individual-level exposure variables related to material deprivation (e.g., income, employment status, education level) & HIV care interruptions

References:
 1. Ruth J, et al. (2008). Impact of Neighborhood-Level Socioeconomic Status on HIV Disease Progression in a Universal Health Care Setting. *JAIDS*.
 2. Ahoonkhai AA, et al. (2016). High rates of unplanned interruptions from HIV care early after antiretroviral therapy initiation in Nigeria. *BMC Infect Dis*.
 3. Giordano TP, et al. (2007). Retention in Care: A Challenge to Survival with HIV Infection. *Clin Infect Dis*.

Acknowledgements: We would like to thank all of the participants for allowing their information to be a part of the CANOC Centre. CANOC is supported by the Canadian Institutes of Health Research (CIHR) & by the CIHR Canadian HIV Trials Network (CTN 242).