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COHORT PROFILE

Cohort Profile: The Ontario HIV Treatment Network Cohort Study (OCS)

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The Ontario HIV Treatment Network Cohort Study (OCS) is an observational, open dynamic cohort of people who are receiving medical care for human immunodeficiency virus (HIV) infection in Ontario, Canada. Established in the mid-1990s, the OCS has its roots in AIDS activists' demands for research that would improve the quality of life of people living with HIV while respecting their privacy. It is a collaborative and community-driven study, including a Governance Committee made up of people with HIV and other stakeholders that evaluates analysis project proposals for community relevance and ethics. From 1995 to 2010, a total of 5644 participants were enrolled and 27 720 person-years of observation were accumulated; follow-up will continue until at least 2015. In the initial years of study, the focus was on clinical data from medical chart reviews. It has since evolved into a comprehensive study that collects extensive de-identified information on clinical, laboratory and psychosocial and behavioural measures based on medical chart abstractions, interviews using a standardized questionnaire and linkage with external administrative health databases in Ontario. Interested collaborators are encouraged to submit analysis project proposals as instructed on the study website (www.ohtncohortstudy.ca).

How did the Ontario HIV Treatment Network Cohort Study come about?

The Ontario HIV Treatment Network Cohort Study (OCS) is an anonymous, observational, open dynamic cohort of people living with HIV in Ontario, Canada, and who are receiving medical care for their HIV disease. Established in the mid-1990s, the OCS has its roots in AIDS activists' demands for research that would improve the quality of life of people living with HIV while respecting their privacy.[1] The OCS is unique compared with other HIV cohorts in that it is community driven. From its inception, the OCS has involved all stakeholders including people living with HIV, dedicated HIV care physicians, other HIV service providers, scientists, researchers and policy makers.[1] The OCS began with data extracted from patients' clinical records. It has evolved into a more comprehensive database that includes a psychosocial and behavioural questionnaire and linkages to testing data and health services administrative databases. It has also developed effective partnerships with other cohorts.

What are the principal aims of the OCS?

The vision of the OCS is to develop and sustain a unique prospective research database and cohort, governed by people living with HIV and used to support collaborative, rigorous clinical, socio-behavioural, population health and health services research that is going to have a direct impact on the health and well-being of the people living with HIV in Ontario. The OCS collects information on the clinical and health profiles of people receiving medical care for their HIV disease in Ontario in order to:

- understand the psychosocial, behavioural and health context of people living with HIV; their patterns of health services use; and issues related to mental health and addictions and other determinants of health; and
- examine HIV infection and its complications; HIV treatment and its complications including adverse events and HIV drug resistance; comorbid infections, diseases and conditions; and social, psychological and other factors related to behaviours that pose risks for secondary HIV transmission.

With the advent of anti-retroviral treatment and prophylaxis for major opportunistic infections, the clinical course of HIV has changed and AIDS-related mortality has declined appreciably. The OCS is committed to staying current with research needs and is currently focusing on questions related to: management of chronic infection, including the optimal nature and timing of anti-retroviral therapy; how best to improve and maintain quality of life; timely access to and utilization of health services; the prevention and management of comorbidities (e.g. co-infections, cancers, cardiovascular disease); and health concerns related to ageing among persons living with HIV.

How is the OCS administered?

The OCS is a collaborative, community-driven study.[1] Its administrative committees include scientists, clinicians and other health-care providers, policymakers and persons living with HIV. The Scientific Steering Committee and Working Groups oversee the scientific direction. The OCS Governance Committee, which is made up of people with HIV and other stakeholders in the Ontario HIV community, evaluates each project proposal for its community relevance and ethics of the intended data use, and recommends policies relating to data security and confidentiality. The OCS is funded by the provincial government as part of the core operations of the Ontario HIV Treatment Network. Active and ongoing follow-up of cohort participants will continue until at least 2015.

Who is in the OCS?

Source population

The source population is persons diagnosed with HIV and who are receiving medical care for their HIV disease in Ontario, Canada. The province of Ontario has publicly funded universal access to medically necessary health-care services. The OCS endeavours to recruit participants who reflect the Ontario HIV epidemic. As of 2009, approximately 69 800 persons had been diagnosed with HIV in Canada, with the largest proportion (44%) in the province of Ontario.[2] The predominant exposure category is men who have sex with men (MSM); this category was initially reported by 90% of cases in the 1980s and more recently by 40–50% of newly diagnosed persons.[3] Following a peak of new infections among injection drug users (IDUs) in the 1990s, incidence has declined in that group but remains unacceptably high in some regions, particularly in Ottawa and Sudbury.[3] The relative proportion of diagnoses in females and in heterosexuals has increased; moreover, persons born in HIV endemic countries have a prevalence several-fold higher than among the non-injecting heterosexual adult population.[3] Most diagnoses occur in the two largest urban centres of the province, Toronto and Ottawa.[3]

Eligibility criteria

People are eligible to participate in the OCS if they have documentation of a positive HIV-antibody test or other laboratory evidence of HIV infection, and are patients at a participating clinic. Children under the age of 16 years and adults incapable of providing informed consent are ineligible.

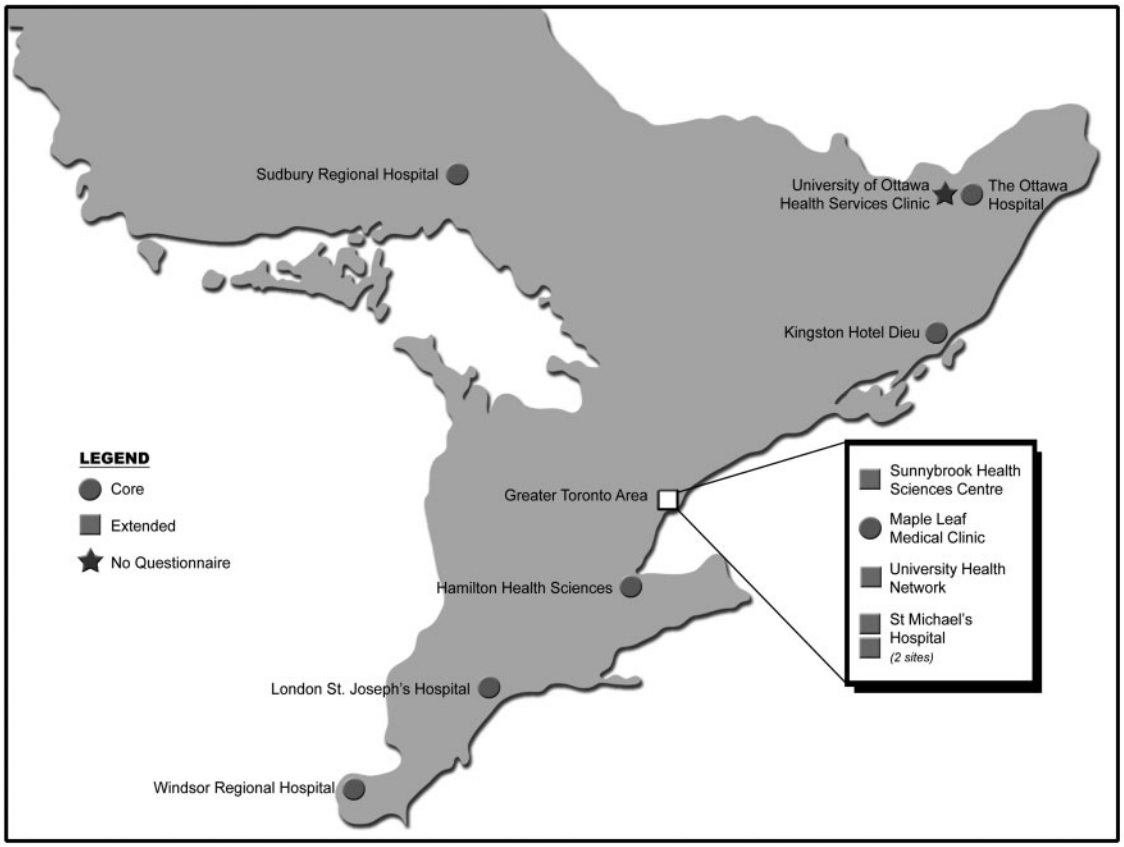

Figure 1 Location of clinic sites in the Ontario HIV Treatment Network Cohort Study. Circles are sites that administered the core questionnaire version. Squares are sites that administered the extended questionnaire version. Data collection has ceased at Hamilton Health Sciences

Recruitment

Participants are recruited from hospital-based specialty HIV clinics, hospital-based family practice units and community-based primary care physician practices throughout Ontario (Figure 1, Table 1). As of 2010, nine sites in Ontario were actively recruiting new participants and collecting data. Two sites were providing data only from previously enrolled participants, and one site ceased data collection in March 2010. These sites serve over three-quarters of HIV-positive patients undergoing viral load testing in the province (Carol Major, OHTN, personal communication, March 2010). Eligible patients, based on clinic chart review, are approached by a clinician or interviewer during a routine clinic visit. Participation is voluntary. All provide written informed consent. The study protocol, research instruments and forms received ethical approval from the University of Toronto Human Subjects Review Committee and from the individual study sites.

Enrolment

As of December 2010, a total of 5644 participants were enrolled in the OCS. To understand OCS enrolment, it is important to recognize the evolving design of this cohort.[1] The study was initiated in 1994 as the HIV Ontario Observational Database and recruited its first participant in 1995.[4–8] In that first phase, 3206 participants were enrolled and, as of December 2006, 1656 were still active participants. Phase II began in 2007, when the study was renamed the Ontario HIV Treatment Network Cohort Study (OCS) and annual interviewer-administered questionnaires were added. At that time, existing participants were formally re-consented into the study, and recruitment was reinvigorated to replace the large number of participants who died or were lost to follow-up in the intervening years. From 2007 to 2010, 2468 new participants were enrolled. The transition from Phase I to Phase II is reflected in the actual number of participants followed each year and in varying types of data collected between 1995 and 2010 (Figure 2). Enrolment was most active early in Phase I (1995–99) and again in Phase II (2007–10).

Characteristics of participants

There is considerable diversity among OCS participants who broadly represent the population of

Table 1 Participation in the OCS as of December 2010, by clinic site

Clinic site	Site Principal Investigator	Cumulative number enrolled in OCS (1995–2010)[a]	Approximate number of HIV-positive patients in clinic population as of 12/2010	Percentage (number) of clinic population who were active OCS participants as of 12/2010[b]
Toronto sites				
University Health Network	Irving Salit and Janet Raboud	981	1038	58 (604)
Maple Leaf Medical Clinic	Mona Loutfy and Fred Crouzat	1010	2400	40 (970)
Sunnybrook Health Sciences Centre	Anita Rachlis and Nicole Mittmann	790	990	54 (539)
410 Sherbourne Clinic, St Michael's Hospital	Ahmed Bayoumi and Kevin Gough	535	900	24 (219)
Positive Care Clinic, St Michael's Hospital	Ahmed Bayoumi and Kevin Gough	356	1200	20 (238)
Ottawa sites				
The Ottawa Hospital	Curtis Cooper	527	800	41 (331)
University of Ottawa Health Services Clinic[c]	Don Kilby	320	650	32 (205)
Sites elsewhere in Ontario				
Hamilton Health Sciences, Hamilton[d]	Marek Smieja	315	860	9 (8)
St Joseph's Hospital, London	Edward Ralph	511	400	79 (315)
Kingston Hotel Dieu Hospital, Kingston, ON	Wendy Wobeser	226	160	68 (108)
Windsor Regional Hospital, Windsor, ON	Jeffrey Cohen	207	270	54 (145)
Sudbury Regional Hospital, Sudbury, ON	Roger Sandre	201	200	66 (133)

[a]Includes 309 duplicate enrolments and 13 triple enrolments across sites.
[b]Calculated as the number of active OCS participants divided by the number of HIV-positive patients in the clinic population as of December 2010. These are not response rates as not all patients were invited to participate.
[c]The number actively participating at the University of Ottawa Health Services Clinic is shown as of October 2009 when data from that clinic site were last updated.
[d]Hamilton Health Sciences ceased participation in the OCS in March 2010. Participants that remain active are enrolled at another site.

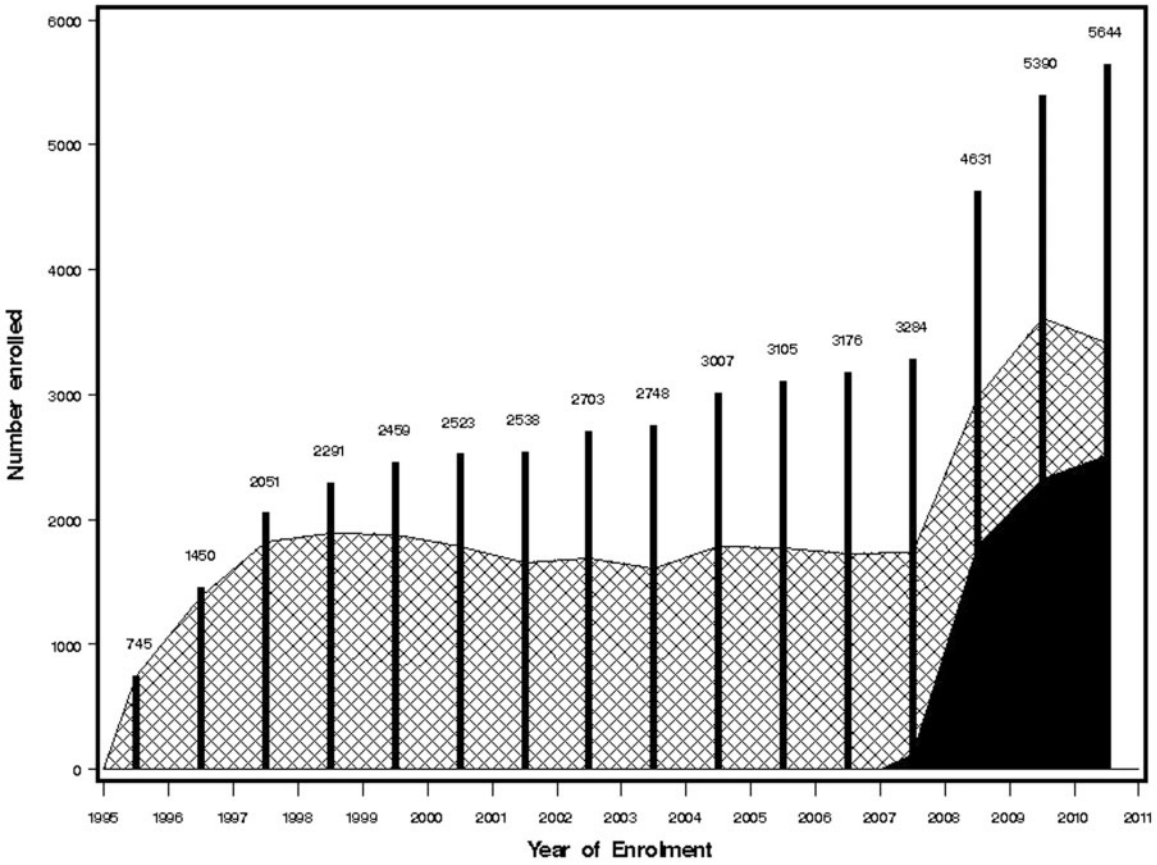

Figure 2 Number of persons participating in the OCS by year and nature of data provided. The vertical bars show cumulative enrolment, with a final total of 5644 enrolled by 2010. The cross-hatched area shows the number of participants providing only clinical data in each calendar year. The solid area shows the number of participants providing clinical and interviewer-administered questionnaire data (the latter initiated in 2007) for each calendar year. The remaining gap represents the cumulative number who died or were lost-to-follow-up

patients receiving HIV care in Ontario (Table 2). On average, participants were 41 years old at enrolment. The majority (60.3%) were MSM, although a sizeable minority (14.6%) were female and/or were infected through other modes of transmission. Of note, 8.8% previously resided in an HIV-endemic area. Many report non-White race. Compared with all new HIV diagnoses in Ontario,[3] the proportion of the OCS cohort that is female is similar, although the mean age at HIV diagnosis was slightly younger among OCS participants. There was a higher proportion of HIV-endemic and MSM-IDU risk exposures among OCS participants but this may be due to better capture of participants' demographic data in the cohort compared with surveillance data. A large proportion (42%) were diagnosed in the 1990s and most enrolled several years after diagnosis. More than half (56%) had undetectable viral load at enrolment and most (83.3%) had a clinical record of previous or current anti-retroviral therapy. A minority had signs of more advanced HIV infection at enrolment, with 26.2% having CD4 cell counts <200 and 26.4% having a history of diagnosis with an AIDS-defining condition. Hepatitis C co-infection was documented in 17.1% of participants.

What has been measured?

The OCS collects extensive de-identified information on clinical, laboratory and psychosocial and behavioural measures based on medical chart abstractions, interviews using a standardized questionnaire and linkage with external databases in Ontario.

Clinical data

Clinical data obtained as part of participants' routine health care are abstracted from clinic records. For clinics that use a computerized medical record system (CMS), data are directly extracted electronically and transferred to the OCS. For the others, data are collected through manual chart abstraction. Data from CMS and manual chart abstractions are similar in content, but coding systems may differ and some elements may be available from one clinic but not another. In general, clinical data available from all

Table 2 Characteristics of participants in the OCS

Participant Characteristics	Overall percentage (number) ($n = 5644$)	Percentage (number) of participants who completed at least one interviewer-led questionnaire in 2007 or later ($n = 3503$)
Female	14.6 (823)	16.7 (584)
Missing	0.4 (20)	
Age at enrolment (years)		
<25	3.0 (167)	3.2 (111)
25–34	23.5 (1326)	20.3 (711)
35–44	38.8 (2192)	37.3 (1308)
45–54	25.1 (1418)	27.9 (976)
⩾55	9.6 (541)	11.3 (397)
Mean (SD), range	41.2 (9.8), 16–85	42.1 (10.0), 16–85
HIV exposure category[a]		
MSM	60.3 (3403)	61.5 (2155)
MSM-IDU	4.9 (276)	5.4 (189)
IDU	8.3 (468)	7.0 (246)
Immigrant from HIV-endemic region	8.8 (499)	11.6 (408)
Heterosexual (non-endemic region)	10.5 (592)	10.7 (376)
Other/unknown	7.2 (406)	3.7 (129)
Race/ethnicity		
White	66.5 (3754)	64.4 (2255)
Black/African	10.7 (602)	13.4 (468)
Multiple race	4.5 (256)	6.1 (214)
Aboriginal	7.5 (426)	9.7 (339)
Other	5.2 (290)	6.2 (216)
Missing	5.6 (316)	0.3 (11)
Year of HIV diagnosis		
Prior to 1990	27.2 (1537)	21.3 (746)
1990–1999	41.7 (2356)	36.5 (1279)
2000–2010	29.2 (1648)	41.3 (1448)
Unknown	1.8 (103)	0.9 (30)
Median years since HIV diagnosis at enrolment (IQR)[b]	6.1 (2.7–10.4)	6.3 (2.8–11.4)
Viral load at enrolment[c]		
Available/non-missing	76.8 (4330)	87.1 (3048)
Mean log10 viral load (SD)	2.7 (1.2)	2.5 (1.2)
Percentage undetectable	55.8 (2417)	61.0 (1858)
CD4 cell count at enrolment[c]		
Available/non-missing	92.3 (5208)	97.5 (3415)
Mean (SD)	388 (269)	441 (263)
Treatment-naïve at enrolment	16.7 (916)	17.9 (617)
Missing	2.7 (152)	1.6 (56)
Diagnosed with AIDS-defining condition at enrolment	26.4 (1489)	21.7 (761)
Hepatitis C co-infection (ever)	17.1 (964)	15.1 (529)

[a]Hierarchical assignment.
[b]Excludes participants with missing HIV diagnosis dates ($n = 98$) or whose consent date preceded the first known HIV-positive date ($n = 5$).
[c]Defined as the viral load or CD4 cell count closest to and within 6 months of enrolment.
SD, Standard Deviation; IQR, Interquartile range

clinics include: participant demographics; HIV exposure category and date of diagnosis; lifetime and current smoking and illicit/recreational drug use; AIDS, HIV-related and comorbid diagnoses; adverse events; hospitalizations; medications and immunizations; primary source of drug coverage; CD4 cell counts and HIV viral loads; weight; and date and cause of death (if applicable).

Retrospective clinical data

When available, the abstraction of participants' retrospective clinical data dates back to the time of the patient's initial HIV diagnosis or when the clinic first saw the patient. Using a retrospective approach at baseline provides a more complete picture of clinical histories than would be possible with prospective data because participants were diagnosed a median of 6.1 years prior to enrolment (Table 2). Retrospective clinical data will help enrich information about the natural history of earlier disease.

Prospective clinical data

For sites using CMS systems, follow-up clinical information is obtained each time new information is added. New data are transferred from the care site to the OCS by secure electronic transmission at regular intervals. For other sites, trained data collectors perform manual chart abstractions every 6 months.

Demographic, psychosocial and behavioural data

In Phase I, participants self-completed a four-page questionnaire on socio-demographic characteristics, HIV antibody test history, sources of support and complementary therapies. In Phase II (2007 onwards), we added an annual, interviewer-administered, computer-assisted standardized questionnaire that has greatly enriched the extent of psychosocial and behavioural data. Depending on the clinic site, a core (30-min) or extended (120-min) questionnaire is used (Table 1). Participants are compensated for completing the questionnaire ($20 for the core or $50 for the extended version).

As of December 2010, almost two-thirds of participants (62.1%, 3503) had completed at least one interviewer-administered questionnaire (Figure 2, Table 2). Among those who were interviewed, 62% (2172) completed the core questionnaire and 38% (1331) completed the extended questionnaire. The core questionnaire includes sections on: demographics; immigration, race and ethnicity; employment status and occupation; income and education; housing status; cigarette smoking; alcohol use; non-medicinal drug use; risk factors for HIV prior to diagnosis and date of HIV diagnosis; health-related quality of life[9,10]; and depression.[11] The extended questionnaire includes additional or enhanced measures of alcohol dependence[12]; cannabis use; symptom distress[13]; body change and distress[14]; health-related quality of life[15] and health preference[16]; cognitive functioning[17]; adherence[18]; depression[19]; social support[20]; stigma[21–23]; recent stressful life events, chronic stress and early childhood adversities[24]; mastery[25]; coping[26]; use of dental services and complementary alternative medicines; and neuropsychological abilities (attention and working memory, complex psychomotor efficiency, learning and memory).[27–30] In 2010, the OCS added a new section on prevention and risk behaviour in both versions.

Linkage with other data sources

OCS data are enhanced through linkage with external health databases in Ontario. Currently, the OCS links with databases at the Public Health Laboratories, Public Health Ontario, which conducts serological, viral and bacteriological tests. In 2011, linkage is planned with data housed at the Institute for Clinical Evaluative Sciences, which include: records of hospital, continuing care and ambulatory care centre visits; drug benefit program data; physician billing claims; the Registered Persons Database (which records death dates); and other data holdings such as the Ontario Cancer Registry.

What are the retention and attrition rates?

Of the 5644 participants enrolled in the OCS thus far, 63% (3557) were still actively participating in the OCS as of December 2010, 825 had died (as reported by the clinic), 1080 were lost-to-follow-up (defined as $\geqslant$18 months since their last available clinic-based data or reported lost by the site); and follow-up was censored for 182 due to cessation of data collection at one site. Median follow up is 31.3 person-months since enrolment (inter-quartile range 20.2–90.7), for a total of 27 720 person-years of observation in the entire cohort.

The average annual attrition rate was 3.9 per 100 person-years (95% confidence interval 3.7–4.1) and a 12.2% cumulative probability of loss-to-follow-up at 3 years post-enrolment, with lower attrition rates in more recent calendar years. We suspect that some attrition is due to participants moving out of the province, moving to non-OCS sites, or only being seen by their primary-care physician and not the tertiary-care OCS site. Attrition was unrelated to immigration status, CD4 cell count or treatment status at enrolment. However, attrition was more likely among those who were younger, male, infected via injection drug use, White race, diagnosed in the more distant past, enrolled soon after diagnosis or had detectable HIV viral load at enrolment. The final vital status of persons lost to follow-up as of December 2010 is unknown; however, 37.1% (401/1080) of those lost-to-follow-up had a viral load measurement linked from the Public Health Laboratories in 2010, suggesting

that, at minimum, this proportion were alive and residents of Ontario. Planned data sharing with the Institute for Evaluative Clinical Sciences will allow us to conduct record linkage with the Ontario Registered Persons Database, which records information on all Ontarians who ever received an Ontario Health card number. That database contains the date of death as well as the date of last contact with the health-care system (including services by non-OCS affiliated providers), which will greatly improve our understanding of attrition patterns.

What has been found?

Early publications from Phase I identified factors associated with clinically important gaps in viral load testing,[4] anti-retroviral prescribing patterns and outcomes in the first years of their implementation,[6,8] symptom reporting[7] and preferred labels for people receiving health care.[5] With the reinvigoration of the cohort in 2007, implementation of the interviewer-administered questionnaire and accumulation of a critical mass of participant observations, research projects have ramped up considerably. Nearly 30 analysis projects are currently underway, with topics including health services utilization, treatment outcomes, co-infections and comorbidities, quality of life, neuropsychological and mental-health outcomes and disparities in health status. Moreover, sub-studies on employment, disability and attitudes toward the criminalization of HIV in Canada are conducting additional primary data collection among a subset of participants. Recent clinical findings include publications on HIV anti-retroviral medication outcomes, adherence and side effects.[31–35] Mastery has emerged as an important moderator of the ill effects of stigma and chronic stressors on mental health[36,37].

What are the main strengths and weaknesses?

The OCS's main strengths are the richness of its data, its flexibility in adding new data measures, its linkages with other provincial data sources (which greatly expands the scope of feasible research topics) and its success in achieving and maintaining community involvement and support.

The OCS has enrolled over 5600 participants from the HIV clinics that care for over three-quarters of HIV-infected patients in Ontario, the province with the largest number of people diagnosed with HIV in Canada.[2] Its participants broadly represent the population receiving HIV care in Ontario. The OCS has extensive clinical data for all participants as well as rich psychosocial and behavioural data from 3500 participants. The ongoing active role of community is due to the study's strong commitment to ethical practices and the protection of participants' data, which makes it easier to recruit and retain participants.[1]

Weaknesses include possible recruitment bias and measurement bias and error. Although participants broadly represent the HIV epidemic in Ontario, people who volunteer may differ from those who do not. For example, in a sub-study comparing OCS participants with non-participants at 4 of the 11 clinic sites, participants were more likely to be male, Caucasian and Canadian-born with lower viral load and higher CD4 cell counts (Raboud *et al*., manuscript under review, 2011). Ongoing recruitment efforts are focused on increasing participation by the under-represented (e.g. IDUs, persons from HIV endemic regions, the more recently diagnosed).

Clinical data are collected for administrative purposes and patient care rather than for research. The study is dependent on the quality of data entered by health-care providers into medical records. We attempt to validate clinical data and provide feedback to clinics to minimize errors and improve data recording. Nonetheless, data omissions can occur particularly when patients obtain care from non-OCS providers. Retrospective clinical data is particularly prone to missing data since it only becomes available from the point when the participant was first seen by the clinic. Data capture has improved with time, as more sites have implemented electronic medical and laboratory records. Linkage with other provincial databases, where possible, may address all of the above information gaps.

Collaborations with other cohort studies

The OCS shares de-identified data with other cohort studies to help answer research questions that cannot be adequately addressed by a single study or geographic region. Collaborations include the Canadian Observational Cohort (CANOC)[38] and the North American AIDS Cohort Collaboration on Research and Design (NA-ACCORD), which is part of the International epidemiologic Databases to Evaluate AIDS (IeDEA).[39]

How can I get hold of the data? Where can I find out more?

The OCS encourages new and past collaborators to submit proposals for analysis projects. Full details about the study, the submission process and how to contact us are available on the study website (www.ohtncohortstudy.ca).

Conclusions

The OCS is unique in its ability to involve people with HIV and in the richness of its data, which include

care and treatment information, health outcome measures and pyschosocial and behavioural data. Over the past 15 years, we expanded our capacity to recruit participants, collect, extract and analyse data and engage researchers in developing care- and policy-relevant research proposals. We are committed to sharing and promoting OCS research findings to help shape programs and policies that will improve the lives of people living with HIV.

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References

[1] McMurchy D, Challacombe L, Edmiston M *et al*. Gaining trust, ensuring security: the evolution of an Ontario HIV cohort study. In: Flood CM (ed.). *Data Data Everywhere: Access and Accountability?*. Montreal and Kingston: Queen's Policy Studies Series, McGill-Queen's University Press, 2010, pp. 1–28.

[2] Public Health Agency of Canada. *HIV and AIDS in Canada. Surveillance Report to December 31, 2008*. Ottawa: Surveillance and Risk Assessment Division, Centre for Communicable Diseases and Infection Control, Public Health Agency of Canada, 2009.

[3] Remis RS, Swantee C, Liu J. *Report on HIV/AIDS in Ontario, 2008*.http://www.phs.utoronto.ca/ohemu/doc/2011/PHERO 2008_report_final_rev_Sept2010.pdf: Dalla Lana School of Public Health, University of Toronto, 2010 (3 February 2012, date last accessed).

[4] Raboud JM, Abdurrahman ZB, Major C *et al*. Nonfinancial factors associated with decreased viral load testing in Ontario, Canada. *J Acquir Immune Defic Syndr* 2005;**39:**327–32.

[5] Deber RB, Kraetschmer N, Urowitz S, Sharpe N. Patient, consumer, client, or customer: what do people want to be called? *Health Expect* 2005;**8:**345–51.

[6] Furler MD, Einarson TR, Walmsley S, Millson M, Bendayan R. Longitudinal trends in antiretroviral use in a cohort of men and women in Ontario, Canada. *AIDS Patient Care STDS* 2006;**20:**245–57.

[7] Raboud J, Lesosky M, Sterling S, Phillips E, Walmsley S, Bayoumi A. An estimate of the proportion of symptoms reported in self-administered questionnaire that are captured as adverse drug events in an observational database. *HIV Clin Trials* 2007;**8:**311–19.

[8] Park-Wyllie LY, Levine MA, Holbrook A *et al*. Outcomes of dosage adjustments used to manage antiretroviral drug interactions. *Clin Infect Dis* 2007;**45:**933–36.

[9] Ware JE Jr, Kosinski M, Turner-Bowker D, Gandeck B. *User's Manual for the SF-12v2 Health Survey*. Lincoln, Rhode Island: Quality Metric Incorporated, 2002.

[10] Delate T, Coons SJ. The discriminative ability of the 12-item short form health survey (SF-12) in a sample of persons infected with HIV. *Clin Ther* 2000;**22:**1112–20.

[11] Kessler RC, Barker PR, Colpe LJ *et al*. Screening for serious mental illness in the general population. *Arch Gen Pyschiatry* 2003;**60:**184–89.

[12] Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction* 1993;**88:**791–804.

[13] Justice AC, Holmes W, Gifford AL *et al*. Development and validation of a self-completed HIV symptom index. *J Clin Epidemiol* 2001;**54:**S77–90.

[14] Neidig JL, Holmes W, Reynolds NR, Gifford AL, Zackin R, Wu AW. ACTG 5089: Development of assessment of body change distress (ABCD) questionnaire for evaluation of fat redistribution. *Int Conf AIDS*, Abstract no. B10609. 2002.

[15] Ware J, Kosinski M, Bjorner J, Turner-Bowker D, Gandek B, Maruish M. *User's Manual for the SF-36v2 Health Survey*. Lincoln, RI: QualityMetric Incorporated, 2007.

[16] Brooks R, Rabin R, de Charro F. *The Measurement and Valuation of Health Status using EQ-5D: a European Perspective*. Dordrecht: Kluwer Academic Publishers, 2003.

[17] Wu A, Revicki D, Jacobson D, Malitz F. Evidence for reliability, validity and usefulness of the Medical Outcomes Study HIV Health Survey (MOS-HIV). *Qual Life Res* 1997; **6:**481–93.

[18] Chesney MA, Ickovics JR, Chambers DB *et al*. Self-reported adherence to antiretroviral medications among participants in HIV clinical trials: the AACTG adherence instruments. *AIDS Care* 2000;**12:**255–66.

[19] Radloff LS. The CES-D Scale: a self-report depression scale for research in the general population. *Appl Psychol Measurement* 1977;**1:**385–401.

[20] Sherbourne CD, Stewart AL. The MOS Social Support Survey. *Soc Sci Med* 1991;**32:**705–14.

[21] Berger BE, Ferrans CE, Lashley FR. Measuring stigma in people with HIV: psychometric assessment of the HIV stigma scale. *Res Nurs Health* 2001;**24:**518–29.

[22] Wright K, Naar-King S, Lam P, Templin T, Frey M. Stigma scale revised: reliability and validity of a brief measure of stigma for HIV+ youth. *J Adolesc Health* 2007;**40:**96–98.

[23] Bunn J, Solomon S, Miller C, Forehand R. Measurement of stigma in people with HIV: a reexamination of the HIV stigma scale. *AIDS Educ Prev* 2007;**19:**198–208.
[24] Turner RJ, Wheaton B, Lloyd DA. The epidemiology of social stress. *Am Soc Rev* 1995;**60:**104–25.
[25] Pearlin L, Schooler C. The structure of coping. *J Health Soc Behav* 1978;**19:**2–21.
[26] Carver C. You want to measure coping but your protocol's too long: Consider the Brief COPE. *Int J Behv Med* 1997;**4:** 92–100.
[27] Wechsler, D. *Manual for Wechsler Adult Intelligence Scale – Revised (WAIS-R)*. San Antonio: The Psychological Corporation, 1981.
[28] Wechsler D. *Wechsler Memory Scale*. The Psychological Corporation. Harcourt Brace & Company, 1997.
[29] Brandt J, Benedict RHB. *Hopkins Verbal Learning Test-Revised*. Odessa, FL: Psychological Assessment Resources, Inc., 2001.
[30] Reitan RM, Wolfson D. Tucson, Arizona: Neuropsychology Press, 1993.
[31] Raboud J, Blitz S, Walmsley S *et al*. Effect of gender and calendar year on time to and duration of virologic suppression among antiretroviral-naive HIV-infected individuals initiating combination antiretroviral therapy. *HIV Clin Trials* 2011;**11:**340–50.
[32] Raboud J, Li M, Walmsley S *et al*. Once daily dosing improves adherence to antiretroviral therapy. *AIDS Behav* 2011;**15:**1397–409.
[33] Diong C, Raboud JM, Li M, Cooper C. Ontario HIV Treatment Network Cohort Study Team. HIV/hepatitis C and HIV/hepatitis B virus coinfections protect against antiretroviral-related hyperlipidaemia. *HIV Med* 2011;**12:** 403–11.
[34] Mittman N, Knowles SR, Koo M, Shear NH, Rachlis A, Rourke SB. Incidence of toxic epidermal necrolysis and Stevens-Johnson Syndrome in an HIV cohort. *Am J Clin Dermatol* 2011;**13:**49–54.
[35] Andany N, Raboud JM, Walmsley S *et al*. Ethnicity and gender differences in lipodystrophy of HIV-positive individuals taking antiretroviral therapy in Ontario, Canada. *HIV Clin Trials* 2011;**12:**89–103.
[36] Rueda S, Gibson K, Rourke SB *et al*. Mastery moderates the negative effect of stigma on depressive symptoms in people living with HIV. *AIDS Behav* 2011; doi: 10.1007/s10461-010-9878-6 [Epub 11 January 2011].
[37] Gibson K, Rueda S, Rourke SB *et al*. Mastery and coping moderate the negative effect of acute and chronic stressors on mental health-related quality of life in HIV. *AIDS Patient Care STDS* 2011;**25:**1–11.
[38] Palmer AK, Klein MB, Raboud J *et al*. Cohort profile: The Canadian Observational Cohort Collaboration. *Int J Epidemiol* 2011;**40:**25–32.
[39] Gange SJ, Kitahata MM, Saag MS *et al*. Cohort profile: the North American AIDS Cohort Collaboration on Research and Design (NA-ACCORD). *Int J Epidemiol* 2007;**36:**294–301.