

Sociodemographic and Health Profile of Heterosexual Men Living With HIV in Ontario, Canada

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Abstract

In Ontario, Canada, the number of heterosexual men living with HIV has increased over time, yet they remain an understudied population. The study objective was to describe the sociodemographic and clinical characteristics of this population, using data from a multisite clinical cohort of patients receiving HIV care. Sociodemographic and clinical characteristics of men interviewed between 2010 and 2012 were compared according to their self-identified sexual orientation, followed by multivariable linear and logistic regression to assess the association of sexual orientation with CD4 cell count, viral load, hepatitis C co-infection, self-rated health, and mental health concerns after adjustment for covariates. A total of 552 men identified as heterosexual, 2,023 as gay, and 171 as bisexual. Compared to gay and bisexual men, heterosexual men were more likely to have been born outside of Canada (34.8%); more likely to report African, Caribbean, or Black ethnicity (26.4%) or Indigenous ethnicity (13.6%); and more likely to have low socioeconomic status (59.5% earning less than \$20,000 per year), and/or a history of injection drug use (31.7%). Relative to gay men, heterosexual men had 5.19 times the odds of co-infection with hepatitis C virus regardless of injection drug use history (95% confidence interval = 3.87-6.96), and 40% lower odds of rating their health as excellent or good (95% confidence interval = 0.50-0.84). HIV-positive heterosexual men in Ontario constituted a socially marginalized group characterized by a high prevalence of injection drug use history and hepatitis C co-infection.

Keywords

HIV, men, sexual orientation, heterosexual

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Background

In developed countries, heterosexual men account for an increasing proportion of people living with HIV (Camoni et al., 2013; Castelnovo et al., 2003; Chadborn, Delpech, Sabin, Sinka, & Evans, 2006; de Olalla et al., 2011; Kivelä, Krol, Salminen, & Ristola, 2010). Heterosexual acquisition of HIV accounted for 18.9% of Canada's new diagnoses among men in 2014, compared with less than 1% prior to 1991 (Public Health Agency of Canada, 2014); approximately 28.6% of heterosexually infected males report exposure in countries with generalized HIV epidemics (Public Health Agency of Canada, 2014). These statistics were similar for 2014 in the province of Ontario (Gilbert, 2015), which is home to more than 40% of

Canada's HIV-positive population (Public Health Agency of Canada, 2014). Ontario offers universal health coverage for medically necessary services, with 17 HIV clinics available across the province to provide specialized care

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for people living with HIV (Government of Ontario, 2016). A high proportion of HIV-positive people in the province are engaged in care and on antiretroviral therapy (Burchell et al., 2015).

Despite the increased number of heterosexual men living with HIV, a recent scoping review identified relatively little research focused on their health and health service use in Canada and other Western nations (Kou, Djioemetio, Agha, Tynan, & Antoniou, 2016). Available evidence suggests a tendency for late entry to care, sub-optimal treatment response, reduced care engagement, and greater isolation and stigma among heterosexual men living with HIV relative to HIV-positive gay men or women. The lack of an identifiable HIV community for heterosexual men in Ontario and similar settings may contribute to these challenges (Doyal, Anderson, & Papparini, 2009; Kou et al., 2016; Persson, 2012).

The objective of the present analysis was to develop a profile of heterosexual men living with HIV in the province of Ontario, Canada, by describing their sociodemographic characteristics, selected HIV-related health indicators, and comorbid conditions, and comparing these variables to those of HIV-positive gay and bisexual men, while adjusting for potentially confounding factors. These data may inform health service delivery for heterosexual men with HIV. To meet the aforementioned objective, the study team analyzed data from a large, multisite HIV clinical cohort in Ontario.

Method

A cross-sectional analysis was performed using data from the Ontario HIV Treatment Network Cohort Study (OCS), a multisite clinical cohort of people receiving HIV care. The design of the OCS has been previously described (Rourke et al., 2013). Eligible participants have documented HIV infection, are aged 16 years and older, and receive care at one of nine specialty HIV clinics across the province. Data are obtained from medical chart abstractions, annual interviewer-administered questionnaires, and via record linkage with the provincial public health laboratory. Participation is voluntary. The study protocol, consent forms, and research instruments have received ethical approval from the University of Toronto HIV Research Ethics Board (REB# 23954) and individual study sites.

Using data available as of December 31, 2012, the study team derived a cross-sectional, analytical sample restricted to cis-gendered male participants (as recorded in clinical and interview data) whose most recent interview was between 2010 and 2012. Men's sexual orientation was classified as heterosexual, bisexual, or gay using self-reported data from their last interview. Sociodemographic characteristics included age (years), ethnicity (White, African/Caribbean/Black, Indigenous, Other/multiple

ethnicities), highest level of education completed (less than high school, high school, some postsecondary, completed postsecondary), employment status (employed, unemployed and seeking work, not in labor force, disability), marital status (single, married, separated/divorced/widowed), whether the participant had children (yes, no), residence (urban, rural), and whether the participant was Canadian or foreign-born. Behavioral characteristics included injection drug use (IDU) history (yes, no) and sexual activity within the past 3 months (yes, no); the latter was measured via self-completed questionnaire. Clinical characteristics included nadir and current CD4 cell count, use of antiretroviral medications (yes, no), viral load at last follow-up (suppressed with <200 copies/mL; not suppressed with 200 copies/mL or greater), and coinfection with hepatitis B or C.

Mental health status was captured using two scales. At clinics administering a shortened version of the questionnaire, psychological distress was measured using the Kessler Psychological Distress Scale (K10). The K10 quantifies the frequency and severity of depression and anxiety-related symptoms in the 30 days prior to completing the scale using a five-level response option that ranges from, "none of the time = 1" to "all of the time = 5" (Kessler et al., 2003). The K10 score was reversed and calculated to provide a score between 10 and 50, with scores of 25 to 29 and 30 to 50 considered to represent high and very high levels of distress, respectively. At clinics administering a longer version of the questionnaire, mental health status was assessed using the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). The CES-D includes 20 items evaluating the frequency of depressive symptoms over the past week. Each item includes four response categories ranging from "rarely or none of the time (less than 1 day)" to "most or all of the time (5-7 days)". Item scores are added together to create a summary score ranging from 0 to 60, with scores above 16 indicating the presence of clinical depression. To create a composite measure previously validated with this cohort (Choi et al., 2015), men were considered to have higher mental health concerns if they scored 22 or above on the K10, or 23 or above on the CES-D; all those with lower scores on either the K10 or CES-D were classified as having lower mental health concerns. All participants self-rated their own overall health (categorized as excellent/very good/good or fair/poor).

Statistical analyses were conducted using SAS version 9.3 (SAS Institute, Inc., Cary, NC). Chi-square or Fisher's exact tests were used to compare categorical variables. For continuous variables, ANOVA was used as an omnibus test and Tukey's post hoc tests for specific pairwise comparisons. Next, multivariable regression analyses were performed to determine whether differences observed between sexual orientation groups remained after adjustment for age, ethnicity, personal income,

history of IDU, and years since HIV diagnosis. This involved the use of linear regression for comparisons of current CD4 cell count among men on antiretroviral therapy (a continuous outcome), and logistic regression for the remaining binary outcomes (current viral suppression among men on antiretroviral therapy, hepatitis C co-infection, mental health concerns, and self-rated health). The referent group for all comparisons was gay-identified men. *P* values were two-sided and statistical significance was determined as being *p* value of <.05.

Results

Out of a total of 6,129 participants in the cohort as of December 31, 2012, there were 2,746 men who met the criteria for inclusion in the analysis, of whom 552 (20.1%), 171 (6.2%), and 2,023 (73.7%) self-identified as heterosexual, bisexual, or gay, respectively (Table 1). Mean ages of heterosexual, bisexual, and gay men were 48.7, 52.0, and 48.5 years, respectively (*p* = .001). In pairwise comparisons, there were no age differences between heterosexual and gay men (*p* = .97), but bisexual men were significantly older than heterosexual men (*p* = .001). Compared with gay and bisexual men, heterosexual men were more likely to have been born outside of Canada with a larger proportion being of African, Caribbean, or Black ethnicity or Indigenous ethnicity (*p* < .0001). Differences in indicators of socioeconomic status were observed (Table 1). Gay and bisexual men had higher educational attainment and personal income than heterosexual men, who were less likely to be employed and more likely to be receiving assistance through the publicly funded Ontario Disability Support Program (*p* < .0001). Compared with gay (10.6%) and bisexual (15.8%) men, heterosexual men (31.7%) were more likely to have a history of IDU (*p* < .001) and more likely to have injected drugs in the preceding 6 months. On average, HIV diagnosis had been more recent among heterosexual men compared with gay and bisexual men (Table 1). The mean nadir CD4 count was significantly lower among heterosexual men compared with gay and bisexual men (*p* < .0001), with a greater proportion of heterosexual men with a nadir below 200 cells/mm³. In addition, heterosexual men were more likely than gay men to have ever been diagnosed with an AIDS-defining illness (*p* = .01).

Just less than half (45.9%, 252/549) of self-identified heterosexual men were married or in a committed relationship; 36.3% were single, and 17.9% were separated, divorced, or widowed. Almost two thirds (63.7%, 351/551) were fathers, of which 37.6% reported living with their children. The majority of men (94.6%, 488/516) completed the self-administered sexual behavior questionnaire at their last visit. Among responders, 44.3% (216/488) had been sexually active within the past 3

months; of these, 97.7% reported a female partner and 11.1% reported a male partner. Most sexually active respondents (78.4%) reported having only one sexual partner over the past 3 months.

In unadjusted comparisons compared with gay men, heterosexual men had lower current CD4 cell counts, were less likely to have suppressed viral load, and were more likely to have hepatitis C co-infection, higher mental health concerns, and to self-rate their health as fair or poor (Table 2). Following multivariable adjustment for sociodemographic and IDU history covariates, heterosexual men had greater odds of hepatitis C infection (odds ratio 5.19; 95% confidence interval 3.87 to 6.96) relative to gay men. Conversely, heterosexual men had significantly lower odds of rating their health as excellent, very good, or good compared with gay men (odds ratio 0.65; 95% confidence interval = 0.50-0.84). Other clinical characteristics did not significantly differ between heterosexual and gay men after covariate adjustment.

Discussion

In a large, multisite clinical HIV cohort in Ontario, Canada, heterosexual men with HIV tended to be a socioeconomically marginalized group characterized by high prevalence of IDU history, hepatitis C co-infection, and psychological distress. Most were on antiretroviral medication and were virologically suppressed. The CD4 cell counts of heterosexual men were not as high as those of gay and bisexual men, and detectable HIV, when it occurred, was most likely among heterosexual men. Some of these between-group differences according to sexual orientation were confounded by age, ethnicity, personal income, history of IDU, and years since HIV diagnosis. However, even after adjustment for the aforementioned variables, heterosexual men had higher odds of hepatitis C co-infection and worse self-rated health. This study provides a rich characterization of this population beyond routinely collected surveillance and clinical data, highlighting key differences between heterosexual, bisexual, and gay men that may inform patient support services and clinical care.

Strengths of the study include a large sample of heterosexual men living with HIV and robust measurement of characteristics from diverse sources including interviewer-administered questionnaires. There were also limitations. As with all voluntary observational cohort studies, selection bias was possible. Although participants are generalizable to people living with HIV in Ontario according to sex, region, age at diagnosis, and HIV exposure category, the cohort overrepresents people in regular HIV care (Burchell et al., 2015), underrepresents recent diagnoses (Raboud et al., 2013), and necessarily excludes people not yet diagnosed. Altogether, the

Table 1. Characteristics of HIV-Positive Men by Sexual Orientation, OHTN Cohort Study, 2010 to 2012.

Characteristic as of last interview	Gay men	Bisexual men	Heterosexual men	p value
N	2023	171	552	
Mean age (SD)	48.5 (10.3)	52.0 (11.9)	48.7 (10.2)	.001
Ethnicity				
White	74.3 (1,502)	67.3 (115)	49.3 (272)	<.0001
African/Caribbean/Black	6.1 (124)	9.9 (17)	26.4 (146)	
Indigenous	7.3 (148)	8.8 (15)	13.6 (75)	
Other/multiple ethnicities	12.3 (249)	14.0 (24)	10.7 (59)	
Born in Canada				
No	22.4 (425)	34.8 (54)	38.5 (205)	<.0001
Yes	77.6 (1,471)	65.2 (101)	61.5 (327)	
Not reported/missing	127	16	20	
Highest level of education				
Less than high school	7.6 (154)	19.3 (33)	29.2 (161)	<.0001
High school	13.8 (279)	18.1 (31)	22.3 (123)	
Some postsecondary (incomplete)	21.1 (426)	19.9 (34)	14.3 (79)	
Completed postsecondary diploma or degree	57.5 (1,162)	42.8 (73)	34.1 (188)	
Gross yearly personal income				
Less than 20,000 CDN	34.0 (678)	46.4 (77)	59.5 (322)	<.0001
20,000 to <30,000 CDN	12.5 (249)	9.0 (15)	10.7 (58)	
30,000 to <50,000 CDN	20.4 (407)	16.9 (28)	14.0 (76)	
50,000 CDN or more	33.2 (663)	27.7 (46)	15.9 (86)	
Not reported/missing	26	≤5	10	
Current employment status				
Employed (full-time or part-time)	54.0 (1,089)	41.5 (71)	33.5 (185)	<.0001
Unemployed and seeking work	4.6 (93)	2.9 (≤5)	6.2 (34)	
Not in labor force	17.9 (360)	21.1 (36)	17.6 (97)	
Disability	23.5 (473)	34.5 (59)	42.8 (236)	
History of injection drug use				
No	89.4 (1,808)	84.2 (144)	68.3 (377)	<.0001
Yes	10.6 (215)	15.8 (27)	31.7 (175)	
Injection drug use in the past 6 months				
No	97.2 (1,967)	95.3 (163)	93.1 (514)	<.0001
Yes	2.8 (56)	4.7 (8)	6.9 (38)	
Mean years since HIV diagnosis (SD)	14.3 (7.8)	13.4 (7.4)	12.1 (7.2)	<.0001
Mean nadir CD4 cell count (SD)	205.2 (155.8)	201.1 (165.8)	170.4 (141.2)	<.0001
Ever had AIDS-defining condition				
No	67.3 (1,362)	60.8 (104)	61.1 (337)	.01
Yes	32.7 (661)	39.2 (67)	38.9 (215)	
Ever initiated ART as of last follow-up				
No	5.3 (106)	4.7 (8)	5.3 (29)	.95
Yes	94.7 (1,900)	95.3 (161)	94.7 (518)	
Unknown	17	≤5	≤5	
ART adherence: Last time medication was missed ^a				
Never	31.8 (215)	31.4 (22)	34.2 (67)	.8
More than 3 months ago	19.8 (134)	24.3 (17)	19.9 (39)	
1-3 months ago	17.6 (119)	15.7 (11)	13.3 (26)	
Within the past 4 weeks	30.8 (208)	28.6 (20)	32.7 (64)	
Hepatitis B virus co-infection				
No	90.3 (1,826)	89.5 (153)	90.8 (501)	.9
Yes	9.7 (197)	10.5 (18)	9.2 (51)	

Note. SD = standard deviation; ART = antiretroviral treatment.

^aMeasures of antiretroviral adherence were available for a subset of 198 heterosexual, 73 bisexual, and 685 gay men who attended clinics where such questions were administered at annual interviews.

Table 2. Clinical Status of HIV-Positive Men, by Sexual Orientation, With Adjustment for Sociodemographic Characteristics.

	Gay men	Bisexual men	Heterosexual men
Current CD4^a			
Mean (SD)	549.4 (272.9)	550.5 (290.8)	503.5 (279.7)
Unadjusted difference	Ref	-48.8*	-45.8***
Adjusted difference ^b	Ref	-40.3	-25.7
Current viral load^c			
Suppressed (<200 copies/mL)	93.20%	89.30%	88.30%
Unsuppressed (≥200 copies/mL)	6.80%	10.70%	11.70%
OR (95% CI): suppressed vs. unsuppressed			
Unadjusted	Ref	0.61 (0.36-1.04)	0.55 (0.40-0.77)***
Adjusted ^b	Ref	0.60 (0.35-1.05)	0.76 (0.53-1.10)
Hepatitis C co-infection			
Yes	8.90%	15.20%	36.20%
No	91.20%	84.80%	63.80%
OR (95% CI): yes vs. no			
Unadjusted	Ref	1.85 (1.18-2.88)**	5.85 (4.64-7.38)***
Adjusted ^b	Ref	1.77 (1.06-2.94)*	5.19 (3.87-6.96)***
Composite mental health measure^d			
Higher mental health concerns	15.60%	31.60%	27.70%
Lower mental health concerns	78.90%	68.50%	72.30%
OR (95% CI): higher vs. lower concerns			
Unadjusted	Ref	1.73 (1.22-4.43)**	1.44 (1.16-1.78)***
Adjusted ^b	Ref	1.60 (1.10-2.31)**	0.99 (0.77-1.23)
Self-rated health			
Excellent/very good/good	83.10%	75.40%	71.70%
Fair/poor	16.90%	24.60%	23.30%
OR (95% CI): Excellent/very good/good vs. fair/poor			
Unadjusted	Ref	0.62 (0.43-0.90)**	0.52 (0.41-0.64)***
Adjusted ^b	Ref	0.71 (0.48-1.04)	0.65 (0.50-0.84)***

Note. SD = standard deviation; OR = odds ratio; CI = confidence interval; IDU = injection drug use; K10 = Kessler Psychological Distress Scale; CES-D = Center for Epidemiologic Studies Depression Scale.

^aCurrent CD4 were the most recent values at last follow-up within a 12-month window; these were available for 2,518 men and missing for 61 men. ^bAdjusted for age, ethnicity, personal income, history of IDU, and years since HIV diagnosis. ^cCurrent viral loads were the most recent values at last follow-up within a 12-month window; these were available for 2,567 men and missing for 12 men. ^dComposite variable according to responses from 1,676 men who completed the K10 and 1,001 men who completed the CES-D. The K10 category "No or moderate psychological distress" and CES-D category "Unlikely to be clinically depressed (score <16)" were combined to create the composite outcome category "Lower mental health concerns." The K10 category "High or very high psychological distress" and CES-D category "Higher mental health concerns" were combined to create the composite outcome category "Higher mental health concerns." See text for details.

* $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0001$.

clinical status of men in the cohort is likely better than the overall provincial population of men living with HIV.

For many measures of socioeconomic status and health indicators in this sample of men with HIV, there appeared to be a gradient across sexual orientations, such that, on average, gay men had better health status, heterosexual men had worse health status, and bisexual men were intermediate. In a study of 13 clinical cohorts across North America, people infected via heterosexual activity had lower CD4 cell counts at diagnosis compared with those infected via other means (Althoff et al., 2010). In the present analysis, heterosexual men had the lowest

nadir CD4 cell count with a mean of 170 cells/mm³. This may partially account for lower current CD4 cell counts as the magnitude of CD4 recovery is strongly correlated with CD4 count at initiation of antiretroviral treatment (Moore & Keruly, 2007).

Worse health status among heterosexual men may also be due to less frequent contact with the health care system. It has been previously reported that heterosexual men in the OCS were less likely to be in continuous HIV care, defined as having at least two viral load measures ≥90 days apart in a single calendar year (Burchell et al., 2015). Qualitative work in Ontario suggests that heterosexual

men may avoid attending HIV clinics and AIDS-service organizations to avoid inadvertent disclosure of their status among their social networks if they are seen engaging with these sites (Antoniou, Loutfy, Glazier, & Strike, 2012). Furthermore, in the Canadian Community Health Survey, gay men had higher odds of consulting medical specialists, nurses, social workers, psychologists, and alternative care providers than heterosexual men, even after controlling for potential confounders including chronic conditions and mood disorders (Tjepkema, 2008).

Hepatitis C remained more common among heterosexual men relative to gay and bisexual men even after controlling for IDU histories. This could be due to heterosexual men being more likely to deny IDU or gay men being less likely to share injection equipment (e.g., due to using steroids rather than narcotics; Aitken, Delalande, & Stanton, 2002; Blashill & Safren, 2014).

People living with HIV commonly report a high burden of distress and depression (Mao et al., 2008; Williams et al., 2005). In the current analysis, compared with gay men, heterosexual and bisexual men were more likely to report mental health concerns, although this association became nonsignificant for heterosexual men after adjustment for age, ethnicity, income, history of IDU, and years since HIV diagnosis. Income and history of IDU were the most important confounders, suggesting that the high prevalence of mental health concerns among HIV-positive heterosexual men is linked to broader socioeconomic challenges faced by this group. Acculturation-related stress, including economic hardship and racial discrimination, may also be more common among heterosexual men living with HIV, given that many report being foreign-born (Chen et al., 2014; Persson & Newman, 2008). Research abroad with HIV-positive immigrants suggests that they may experience significant HIV-related stigma and discrimination based on beliefs in their home countries (Anderson et al., 2008; Cannon Poindexter, Henrickson, Fouché, Brown, & Scott, 2013; Chinouya, Hildreth, Goodall, Aspinall, & Hudson, 2017), with the experience of stigma and depressive symptoms potentially linked to unfavorable outcomes such as treatment nonadherence and detectable viral load (Sumari-de Boer, Sprangers, Prins, & Nieuwkerk, 2012).

These findings have implications for the care of heterosexual men living with HIV. Social and health care services should be assessed to ensure that they are inclusive and welcoming for men of all sexual orientations (Antoniou et al., 2012; Burchell et al., 2015; Newman, Persson, Paquette, & Kidd, 2013). The emerging profile of heterosexual men in these data suggests an important intersection of ethnicity, socioeconomic status, and health equity for this population. Interventions and policies that address the social determinants of health may be particularly important for heterosexual men living with HIV

given that they are more likely to be Indigenous, African/Caribbean/Black, or foreign-born, with lower levels of formal education and income, and unemployed or disabled. The higher prevalence of Hepatitis C co-infection, regardless of injection drug use history, suggests that heterosexual men may be at especially high risk. As a result, periodic hepatitis C testing among HIV mono-infected heterosexual men may be warranted. Finally, the high prevalence of distress and depression among HIV-positive men, regardless of their sexual orientation, reinforces the importance of helping men to navigate the mental health care system for ongoing support. This finding may be especially important for heterosexual men with HIV in light of previous research demonstrating that these men were less likely to be referred for specialist mental health care than men who have sex with men (Orr, Catalan, & Longstaff, 2004).

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Authors' Note

The opinions, results, and conclusions are those of the authors only. No endorsement by the Ontario HIV Treatment Network or Public Health Ontario is intended or should be inferred.

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