The changing demographics of women living with HIV/AIDS in southern Alberta from 1982 to 2006

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INTRODUCTION: Women account for a growing proportion of HIV infections in Canada. This has implications with respect to prevention, diagnosis and treatment. OBJECTIVE: To describe the female population presenting for HIV care in southern Alberta and to examine the impact of opt-out pregnancy screening.

METHODS: A retrospective review of demographic and clinical characteristics of all patients presenting to the Southern Alberta HIV Clinic (SAC) care program from 1982 to 2006, was performed.

RESULTS: The proportion of newly diagnosed patients who were female increased from 7.5% before 1998 to 21.5% after 1998. Women were more likely to be from vulnerable populations, such as intravenous drug users (31.3% versus 13.7%, P<0.001), Aboriginals/Métis (21.5% versus 8.7%, P<0.001), blacks (28.9% versus 4.9%, P<0.001) and immigrants (36.6% versus 14.7%, P<0.001). Heterosexual intercourse was the main risk factor for HIV acquisition (43.7%). Women were less likely than men to have requested HIV testing (20.9% versus 37.8%, P<0.001). Opt-out pregnancy screening accounted for 12.7% of HIV-positive tests in women, following its introduction in 1998. Of the women diagnosed by pregnancy screening, 62.1% were from HIV-endemic countries. There was an association between reason for testing and CD4 count at presentation; women who requested their HIV test had higher median CD4 counts than those diagnosed because of illness (478 cells/mL, interquartile range [IQR]=370 cells/mL versus 174 cells/mL, IQR=328 cells/mL, P<0.001) or pregnancy screening (478 cells/mL, IQR=370 cells/mL versus 271 cells/mL, IQR=256 cells/mL, P<0.001).

CONCLUSIONS: Women were less likely than men to have requested HIV testing and were more likely to be diagnosed by population-based screening methods. Women, especially vulnerable groups, account for a growing number and proportion of newly diagnosed HIV infections in Alberta. The implications of expanded screening in this population merit further consideration.

Key Words: HIV/AIDS, Pregnancy screening, Testing behaviours, Women

At the end of 2008, 65,000 people in Canada were living with HIV/AIDS (1). Despite increasing awareness of HIV/AIDS, it is estimated that 26% of HIV-positive Canadians do not know their status (1). This undiagnosed population presents a challenge in terms of prevention (2). Additionally, these patients are unable to benefit from early initiation of highly active antiretroviral therapy (HAART), which could improve health and survival (3) and help to avoid some of the financial costs associated with late presentation (4).

Similar to the rest of the world (5), Canada is experiencing a feminization of the HIV epidemic, with women accounting for 28% of new positive HIV test reports in 2006 (1) compared with 12% in 1985 (6). The same trend is observed in Alberta, which has the fourth highest number of HIV cases among the provinces and territories. Since 1985, 21% of Alberta’s 5237 positive HIV test reports have been reported among women (1). More recently, that proportion has increased, with women accounting for 35% of new positive HIV test reports in 2008 (7).

Only 30% of Canadian women have ever been tested for HIV, and 54% of women are diagnosed with HIV less than 12 months before AIDS diagnosis, with those born outside Canada, Aboriginal, black
and Asian women more likely to test late (8). Poverty, marginalization, social isolation and sexual violence increase women’s vulnerability to HIV infection (5,8) and likely also influence testing behaviours.

The introduction of opt-out pregnancy screening in Alberta in 1998 led to a dramatic increase in HIV testing among women. More than 95% of women accessing prenatal care in Alberta are screened for HIV, leading to a positive test rate of 3.3 in 10,000 in 2000 (9). The sociodemographic and clinical characteristics of women diagnosed as a result of pregnancy screening in northern Alberta have been described recently (10).

Although few Canadian studies have focused on women, factors associated with HIV testing have been described previously, with only 35% of Canadians having ever been tested for HIV and less than 17% reporting voluntary testing. Among those who had been tested, the highest rates were seen among those reporting at least one risk factor for HIV. Even so, 40% of injection drug users (IDUs), and 70% of men and 62% of women reporting high-risk sex partners had never been tested (11). Similarly, laboratory surveillance data in Alberta suggests that HIV testing is accessed infrequently, with 70% of newly diagnosed and 62% of women reporting high-risk sex partners had never been tested (11). Similarly, laboratory surveillance data in Alberta suggests that HIV testing is accessed infrequently, with 70% of newly diagnosed individuals discovering their status at their first HIV test. Even repeat testers, many of whom had risk factors for HIV, had a median interval of almost two years between their last negative and first positive test (12).

A longitudinal database has been maintained on all patients receiving HIV care in southern Alberta since 1982, presenting a unique opportunity to describe epidemiological trends, reasons for testing and the impact of pregnancy screening on the female population presenting for HIV care seeking treatment over the entire history of HIV within a complete geographical region. We wished to define the changing and the impact of pregnancy screening on the female population presenting for HIV care in southern Alberta from 1982 to 2006 and to examine demographic changes over time. The objective of the present retrospective review was to describe the sociodemographic and clinical characteristics of the female population presenting for HIV care in southern Alberta over time with particular focus on reasons for HIV testing and the impact of opt-out pregnancy screening. We also examined the clinical and sociodemographic differences between women and men with HIV in southern Alberta.

METHODS

Study participants and design
All HIV-positive individuals referred for HIV assessment and care are automatically enrolled in the Southern Alberta Clinic (SAC). Likely risk activity for HIV acquisition was assigned by a clinician according to a standard hierarchy. Data on characteristics at first presentation with HIV that were focused on were: age, self-reported ethnicity, marital status, highest achieved education level, reason for HIV testing, hepatitis C virus coinfection, country of birth and initial CD4 cell count at presentation to the Southern Alberta HIV Clinic (SAC). Likely risk activity for HIV acquisition was assigned by a clinician according to a standard hierarchy. Data were stratified according to date of presentation (Pre-HAART [defined

A retrospective review of demographic and clinical characteristics, as a series of secondary analyses in this cohort over the study period, was performed.

Outcomes of interest
The objective of the present retrospective review was to describe the female population presenting for HIV care in southern Alberta from 1982 to 2006 and to examine demographic changes over time. The characteristics at first presentation with HIV that were focused on were: age, self-reported ethnicity, marital status, highest achieved education level, reason for HIV testing, hepatitis C virus coinfection, country of birth and initial CD4 cell count at presentation to the Southern Alberta HIV Clinic (SAC). Likely risk activity for HIV acquisition was assigned by a clinician according to a standard hierarchy. Data were stratified according to date of presentation (Pre-HAART [defined

Women with HIV/AIDS in southern Alberta

TABLE 1
Characteristics of female patients accessing HIV care in southern Alberta over time

|                        | 1982-1996 (n=95) | 1997-2006 (n=244) | P   |
|------------------------|------------------|-------------------|-----|
| Age at presentation, years, mean±SD | 33.4±12.9 | 32.7±9.7 | 0.63 |
| Median education level  | High school     | High school       |     |
| Birth outside of Canada| 19 (20.0)       | 105 (43.0)        | <0.001 |
| Ethnicity              |                 |                   |     |
| Caucasian              | 62 (65.3)       | 80 (32.8)         | <0.001 |
| Black                  | 12 (12.6)       | 86 (35.2)         | <0.001 |
| Aboriginal/Métis       | 13 (13.7)       | 60 (24.5)         | 0.031 |
| Other                  | 5 (5.3)         | 11 (4.5)          | 0.76  |
| Unknown                | 3 (3.2)         | 7 (2.9)           |     |
| Marital status         |                 |                   |     |
| Single                 | 4 (4.2)         | 64 (26.2)         | <0.001 |
| Married/common law     | 43 (15.8)       | 80 (9.4)          | 0.17  |
| Divorced/separated/widower | 23 (24.2) | 46 (18.9)         | 0.57  |
| Never married          | 23 (24.2)       | 21 (8.6)          | 0.001 |
| Unknown                | 2 (2.1)         | 33 (13.5)         |     |
| Risk factor for HIV    |                 |                   |     |
| Heterosexual           | 56 (58.9)       | 92 (37.7)         | <0.001 |
| Heterosexual and endemic area | 3 (3.2) | 62 (25.4)         | <0.001 |
| Intravenous drug use   | 26 (27.4)       | 82 (33.6)         | 0.26  |
| Homosexual             | 0 (0.0)         | 1 (0.4)           | <0.001 |
| Blood transfusion      | 11 (11.6)       | 5 (2.0)           | 0.001 |
| Maternal fetal         | 1 (1.1)         | 1 (0.4)           | 0.51  |
| Unknown                | 0 (0.0)         | 1 (0.4)           |     |
| Reason for testing     |                 |                   |     |
| Patient request        | 16 (16.8)       | 55 (22.5)         | 0.20  |
| Physician request      | 19 (20.0)       | 46 (18.9)         | 0.90  |
| Contact                | 25 (26.3)       | 25 (10.2)         | <0.001 |
| Illness                | 22 (23.2)       | 39 (16.0)         | 0.16  |
| Routine pregnancy screening* | 0 (0.0) | 29 (11.9)         | <0.001 |
| Immigration            | 1 (1.1)         | 30 (12.3)         | 0.011 |
| Insurance              | 4 (4.2)         | 5 (2.0)           | 0.30  |
| Blood                  | 8 (8.4)         | 1 (0.4)           | 0.0040|
| Other screening        | 0 (0.0)         | 7 (2.9)           | <0.001 |
| Unknown                | 0 (0.0)         | 7 (2.9)           |     |
| CD4 count at presentation, median (IQR) | 342 (450) | 347 (345) | 0.93 |

Data presented as n (%) unless otherwise indicated. *Routine opt-out pregnancy screening was introduced in Alberta in 1998. IQR Interquartile range

Figure 1) Absolute number of new HIV diagnoses in southern Alberta from 1982 to 2006.
as before 1997] compared with HAART [defined as 1997 and after]. Additionally, female and male populations were compared using the same parameters.

Testing behaviours among women with different risk factors for HIV, including the impact of opt-out pregnancy screening, were reviewed. The median CD4 counts at presentation of women with different reasons for HIV testing were also examined.

### Statistical analyses

Tests for association were performed using a $\chi^2$ test, or a Fisher's exact test as appropriate. Differences between sexes in continuous variables, such as baseline median CD4 counts and age at presentation, were evaluated using a Mann-Whitney and two-sample t test, respectively. In all analyses, patients with missing data were excluded from that particular analysis but were included for all others where data were present. All analyses were two-tailed, with statistical significance evaluated at the 0.05 level.

### RESULTS

Demographic characteristics of women presenting to SAC from 1982 to 2006 are described in Table 1. Over time, the female population presenting for HIV care in southern Alberta has become more diverse. Before 1997, most women diagnosed with HIV were Caucasian, and the main risk factor for HIV was heterosexual activity. From 1997 onward, women presenting for HIV care were significantly more likely to be black (35.2% versus 12.6%, $P<0.001$) or Aboriginal/Métis (24.5% versus 13.7%, $P=0.03$). Heterosexual intercourse (excluding women from endemic areas) remained the most common risk factor for women but accounted for a significantly smaller proportion of women presenting post-HAART than previously (37.7% versus 58.9%, $P<0.001$).

Compared with men, women tended to present at a younger age (32.9 versus 35.5 years of age, $P=0.001$) (Table 2) and were more likely to have been in a committed relationship at some point (56.7% versus 48.1%, $P=0.03$). Heterosexual intercourse (excluding women from endemic areas) accounted for a significantly smaller proportion of women presenting post-HAART than previously (37.7% versus 58.9%, $P<0.001$).

### Reasons for testing

Women in this population had a wide variety of reasons for HIV testing (Table 1). Reasons for testing changed as opt-out pregnancy screening was introduced in 1998 and mandatory HIV screening, as part of the immigration process, was implemented in 2002 (1,13).

Among women with different risk factors, there was considerable heterogeneity of reasons for undergoing testing (Table 3). Female IDUs were more likely to discover their HIV-positive status due to opt-out pregnancy screening (18.1% versus 7.7%, $P<0.001$). Compared with men, patients who were more likely to be diagnosed through population-based screening (18.1% versus 7.7%, $P<0.001$).

### Reasons for HIV testing among women with different risk factors for HIV

| Reason for HIV test | Heterosexual women (n=148) | Heterosexual women from endemic areas (n=65) | Female injection drug users (n=106) |
|--------------------|---------------------------|-------------------------------------------|----------------------------------|
| Patient request    | 27 (17.0)                 | 2 (3.7)                                   | 41 (38.7)                        |
| Physician request  | 24 (15.1)                 | 10 (18.5)                                 | 27 (25.5)                        |
| Contact            | 32 (23.3)                 | 3 (5.6)                                   | 9 (8.5)                          |
| Illness            | 26 (16.4)                 | 7 (13.0)                                  | 23 (21.7)                        |
| Pregnancy screening| 9 (6.1)                   | 18 (27.7)                                 | 2 (1.9)                          |
| Immigration        | 9 (6.1)                   | 20 (37.0)                                 | 0 (0.0)                          |
| Insurance          | 7 (4.4)                   | 0 (0.0)                                   | 0 (0.0)                          |
| Blood              | 1 (0.1)                   | 0 (0.0)                                   | 0 (0.0)                          |
| Other screening    | 4 (2.5)                   | 0 (0.0)                                   | 1 (0.9)                          |
| Unknown            | 2 (1.3)                   | 2 (2.8)                                   | 3 (2.8)                          |

Data presented as n (%)
positive status so that they can receive treatment and reduce HIV transmission. By contrast, current Canadian guidelines recommend voluntary counselling and risk-based testing for HIV (17), but this may lead to delayed diagnosis for many women in our population. Although women diagnosed via physician-initiated testing tended to have CD4 counts that were comparable with women who initiated HIV testing, only one in five women were diagnosed as a result of a physician-requested test. Nearly the same number of women were diagnosed by healthy population-based screening, most notably opt-out pregnancy screening.

Data from pregnancy screening are often used for sentinel surveillance (8,18) but likely underestimate the prevalence of HIV infection in the heterosexual population. Although >95% of pregnant women in Alberta are screened, women who opt out are actually three times more likely to be HIV positive (19) and often do so based on an erroneous assessment of their risk for HIV (20). Obviously, women who never become pregnant are also missed by this screening method. Pregnancy screening in our population mainly diagnosed a specific subset of young, black women from HIV-endemic countries. We were not able to determine whether these patients came to Canada before the implementation of mandatory HIV testing during the immigration process in January 2002 (1,13), were diagnosed initially at immigration and lost to follow-up, or were infected after arrival. The low median CD4 count of women in our population diagnosed via pregnancy screening is concerning, because it may suggest a delay in diagnosis. A recent study suggests that initiating HAART when CD4 counts are between 351 cells/mL to 500 cells/mL improves survival rates by 70% (3); the median CD4 count in our female cohort after the introduction of HAART was only 347 cells/mL, which indicates that one-half of our women were unable to benefit from early treatment. Aside from the health implications, previous studies in our population have shown that the direct costs associated with HIV infection are inversely related to CD4 count at presentation (4). Data from the United States suggests that expanded screening is cost-effective even when the prevalence of undiagnosed HIV infection is as low as 0.20% (21). Given these factors, there may be a rationale for expanded HIV screening in our population.

There are some limitations that should be considered in generalizing these findings to the rest of Canada. Our results are those of a
retrospective, observational study. There was a small number of women compared with men in our population and we may not have had sufficient power to detect small differences. Additionally, our population may be unique in terms of the high proportion of immigrants from sub-Saharan Africa; even within Alberta, there are considerable demographic differences between northern and southern Alberta (10,12,22). The length of our study period and the comprehensive nature of a geographically defined population may mitigate some of these limitations.

In southern Alberta, women from vulnerable groups appear to be at disproportionate risk for HIV infection. Women are less likely than men to be diagnosed due to patient request, and this may be related to lower CD4 counts at presentation. Further research is needed to determine strategies for prevention and diagnosis in women, especially women from HIV-endemic countries. In particular, the impact of expanded HIV screening merits further consideration.

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