HIV diagnoses in Australia: diverging epidemics within a low-prevalence country

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ABSTRACT

Objective: To describe recent trends in the diagnosis of HIV infection in Australia.

Design and setting: Analysis of national surveillance system data for 1993–2006.

Main outcome measures: Number and population rate of new HIV diagnoses by year, exposure route and demographic characteristics.

Results: Between 1993 and 2006, 12 313 new diagnoses of HIV infection were reported in Australia. From 1993 to 1999, the annual number of diagnoses declined by 32% from 1056 to 718, and then increased by 31% from 763 in 2000 to 998 in 2006. Between 2000 and 2006, diagnosis rates significantly increased in Victoria, Queensland, South Australia and Western Australia. The most frequent route of HIV exposure was male-to-male sex, accounting for 70% of diagnoses. Heterosexual contact accounted for 18% of cases, with just over half of these people born in or having a sexual partner from a high-prevalence country. Exposure by injecting drug use remained infrequent.

Conclusions: The number of HIV diagnoses has risen in the past 7 years, but not in New South Wales, which has long had the highest rates. The differences in rates between states/territories are likely to be due to divergent trends in sexual risk behaviour in men having male-to-male sex, which remains the predominant route of HIV transmission in Australia. There is a need for effective, innovative and evidence-based programs for HIV prevention, particularly among men having male-to-male sex.

MJA 2007; 187: 437–440

eMJA RAPID ONLINE PUBLICATION 20 JULY 2007

Australia is recognised internationally for an effective response to the HIV epidemic — a response that is evidence-based and conducted through a partnership involving government, non-government organisations, health professionals and the communities most affected, including people living with HIV infection. Regularly published analyses have shown that male-to-male sexual contact has been the major route of transmission of HIV in Australia and that transmission occurs less frequently by other routes.[1,2] The incidence of HIV infection was at its highest in the early to mid 1980s,[1] and both the prevalence and incidence of HIV infection in Australia are now very low compared with most other countries.[3]

Despite the apparent successes in Australia's HIV response, concern has been raised over a recent increase in the annual number of people diagnosed with HIV, following more than a decade of decline. Surveillance reports indicate that there has also been a divergence between Australian states in the trends and patterns of diagnosis.[2] These differences in trends have led to debate about the reasons for them, and whether they indicate inconsistencies in the level and effectiveness of response between jurisdictions.

Here we explore the most recently available data on the epidemiological patterns of HIV diagnosis in Australia, with a particular focus on jurisdictional differences in time trends and characteristics of reported infections. We also consider explanations for any differences observed between the jurisdictions.

METHODS

Surveillance procedures for HIV infection in Australia have been described previously.[1,2] Briefly, state and territory health authorities report newly diagnosed cases of infection to the National Centre in HIV Epidemiology and Clinical Research. Information sought on each case includes demographic and clinical characteristics (including CD4+ cell count), as well as information on the most likely route of exposure to HIV.

The classification of HIV exposure categories is based on patient self-report, and includes sexual exposure (male-to-male sex or heterosexual contact), history of injecting drug use, and the receipt of blood, blood products or tissue. People who report heterosexual contact are further classified according to whether they or their sexual partners were born in a country with high HIV prevalence (at least 1% in adults),[3] or whether they report sexual partners in a behavioural category associated with increased HIV risk.

Here, we analysed all reported cases with a new diagnosis in Australia between 1993 and 2006, including cases first diagnosed overseas. Analyses were by year of HIV diagnosis, route of exposure, demographic variables, testing history, and clinical characteristics. For analyses of specific fields, missing data were excluded.

Per capita rates of HIV diagnosis per 100 000 population, directly standardised to the national population in 10-year age groups, were calculated by state/territory and year using Australian Bureau of Statistics mid-year population estimates.[4,5] For diagnoses associated with male-to-male sex, rates per 100 000 male population were also calculated by state/territory. The proportions of the national population reported as Indigenous or overseas-born were obtained from 2001 census data.[6,7] Cases newly diagnosed in Australia were analysed by Indigenous status for 1993–2006; in the Australian Capital Territory and Victoria, where routine reporting of Indigenous status at HIV diagnosis began in January 2005 and June 1998, respectively, cases diagnosed since these dates were included.[2] Analyses by country of birth were limited to cases newly diagnosed in Australia from 2002, when reporting of country of birth was introduced nationally.

Analyses were conducted in Stata version 9 (StataCorp, College Station, Tex, USA). The χ^2 test was used to assess time trends, with a significance level of 0.05.

RESULTS

Between 1993 and 2006, there were 12 313 new diagnoses of HIV infection reported in Australia. The annual number decreased

between 1993 and 1999, from 1056 to 718 (32% decrease), and then increased between 2000 and 2006, from 763 to 998 (31% increase). Of the 12 313 cases, 6062 (49%) occurred in New South Wales, 2822 (23%) in Victoria, 1834 (15%) in Queensland, 761 (6%) in Western Australia, 568 (5%) in South Australia, 120 (1%) in the ACT, 90 (0.7%) in the Northern Territory, and 56 (0.5%) in Tasmania. The proportion diagnosed in NSW fell from 56% (590/1056) in 1993 to 40% (395/998) in 2006, while the Victorian proportion increased from 21% (221/1056) to 29% (286/998).

In 1993–2006, the proportion of cases in people reported as Indigenous was 2.4% (271/11 181), compared with 2.4% in the Australian population overall. In 2002–2006, people born overseas accounted for 34% of cases (1412/4141), compared with 27% in the Australian population overall. There was no statistically significant change in the proportion of diagnoses in these categories over time.

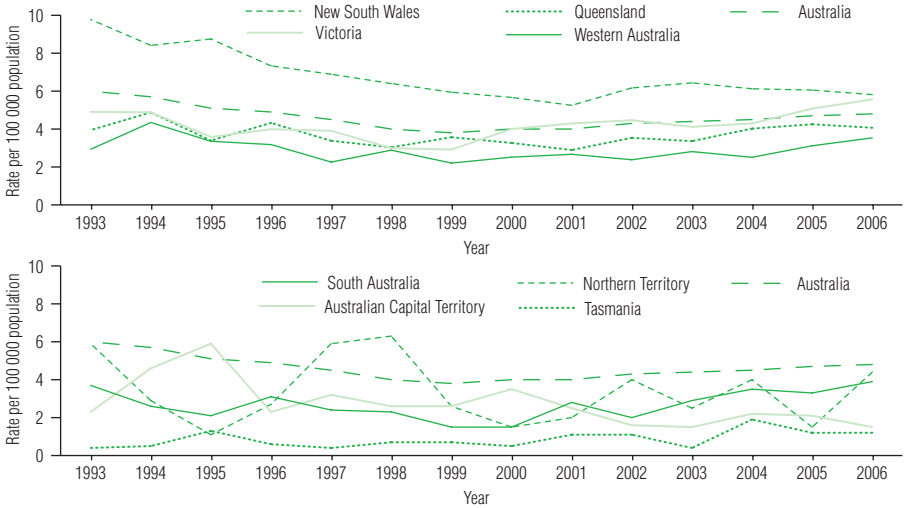
On a per capita basis (Box 1), there was a downward trend in HIV diagnoses in NSW, Victoria, Queensland, WA and SA until around 2000. There then appeared to be a divergence, with rates in NSW stabilising at 5.8 per 100 000 population in 2006, while the other four states increased with a significant trend. Victoria was the first state to show increased rates per 100 000 population, from 2.9 in 1999 to 4.5 in 2002, and by 2006 it had almost equalled NSW, with an annual rate of 5.6 diagnoses per 100 000 population.

The most frequently reported route of HIV exposure was male-to-male sex, in 8680 cases (70% of the total), including 551 with a history of injecting drug use. The proportion of diagnoses associated with male-to-male sex nationally decreased from 77% in 1993 to 66% in 2006 ($P < 0.01$), with similar trends observed in NSW, Queensland, SA and the ACT. In Victoria and Tasmania, the proportion of diagnoses associated with male-to-male sex decreased from 78% and 100%, respectively, in 1993 to 64% in 1999 in Victoria and none in Tasmania in 2000, before increasing to 78% in Victoria and 83% in Tasmania in 2006. Male-to-male sex accounted for less than half of new HIV diagnoses in WA (49%, 376/761) and the NT (44%, 40/90) in 1993–2006.

The per capita rate of diagnosis associated with male-to-male sex (per 100 000 male population) in 1993–2006 was 6.5, with the highest rate reported in NSW (9.6), followed by Victoria (6.5) and Queensland (5.3). Similar to the overall per capita rate, there was a significant downward trend in this rate until around 2000; rates then increased in Victoria, Queensland, WA and SA from 2001 onwards, but the trend was only significant in Victoria. By 2006, the rate in Victoria had surpassed NSW (8.7 v 7.8 per 100 000 male population; Box 2).

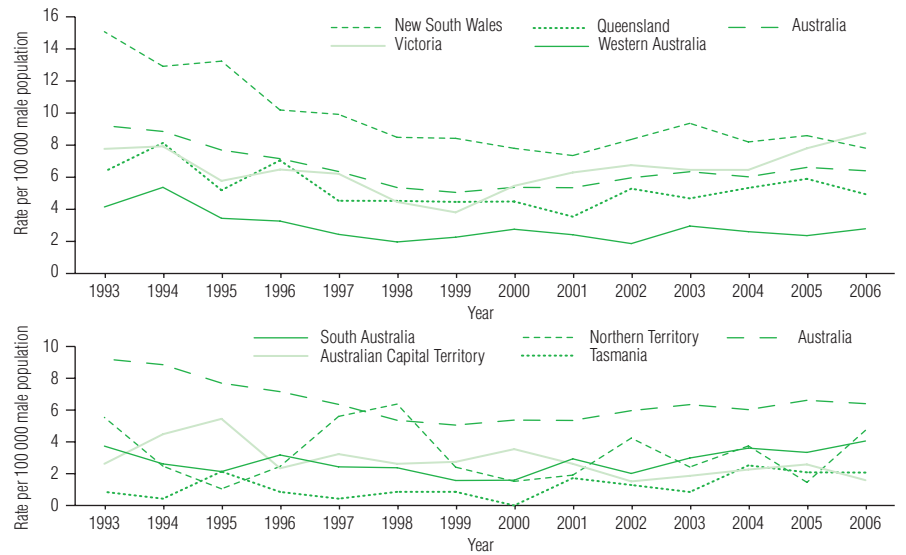
Further analyses focused on the cases associated with male-to-male sex. Among these men, the median age at diagnosis increased from 32 years to 38 years over the study period; this pattern was observed in NSW, Victoria, Queensland, WA and SA. The overall proportion of men with a CD4+ cell count above 500 cells/μL (indicating an early stage of infection) was 44%; the proportion significantly increased from 39% in 1993 to 42% in 2006 ($P < 0.01$). This trend was statistically significant only in NSW and Queensland. Among homosexually active men with a prior testing history, the overall proportion with new HIV diagnoses within 12 months of their diagnosis was 56%, increasing significantly over time from 54% in 1993 to 60% in 2006 ($P = 0.02$). This change was most marked in Victoria, with an increase from 41% in 1993 to 56% in 2006.

1 HIV diagnosis rates per 100 000 population, 1993–2006*



*Per capita rates per 100 000 population directly standardised to the national population in 10-year age groups. ◆

2 HIV diagnosis rates associated with male-to-male sex per 100 000 male population, 1993–2006*



*Crude per capita rates per 100 000 male population. ◆

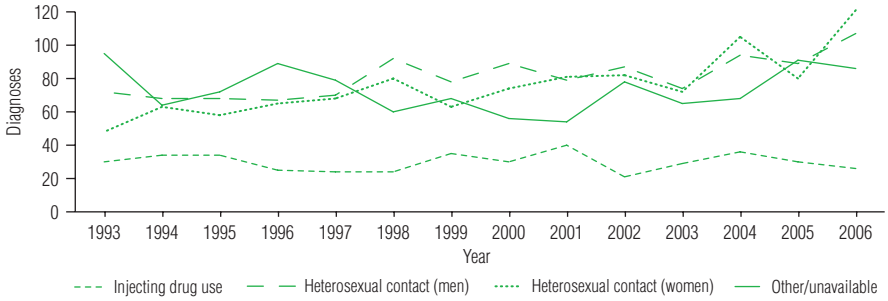
Among the 1134 cases in men reported as heterosexually acquired, 27% were in men born in a high-prevalence country and 26% in men who had a partner from a high-prevalence country. There were 1060 women with heterosexually acquired infection, including 39% from a high-prevalence country, 12% with a partner from a high-prevalence country, and a further 8% who reported a bisexual man as a partner (Box 3). Between 2004 and 2006, the average annual per capita rate of diagnosis associated with heterosexual contact was 0.97 per 100 000 population, with the highest per capita rates in the NT (2.42), followed by WA (1.45) and NSW (1.06). Lower per capita rates of HIV infection attributed to heterosexual contact were reported in Victoria (0.89), SA (0.88), Queensland (0.78), ACT (0.50) and Tasmania (0.21). Although the annual number of diagnoses associated with heterosexual contact increased steadily each year, the trend in the per capita rate of diagnosis was not statistically significant.

Among men and women with heterosexually acquired infection, the median age at diagnosis increased from 32 years to 36 years over the study period. The overall proportion of these men and women with a CD4+ cell count above 500 cells/μL was 28%, with no change over time.

In diagnoses not associated with male-to-male sex, a history of injecting drug use was reported in 416 cases (269 with a history of heterosexual contact and 147 with no sexual exposure history specified), representing 3.4% of the total number of diagnoses in the study period. There was little change in the proportion of diagnoses in this category over time.

Most states and territories had less than 5% of exposure responses recorded as undetermined, except NSW (10.9%), Queensland (6.5%) and the ACT (5.8%). In Queensland, the proportion increased from 4.9% in 1993 to 13.4% in 2006. Of 919 cases of undetermined exposure, 7% were in women.

3 Number of HIV diagnoses by route of exposure (other than male-to-male sex), Australia, 1993–2006



DISCUSSION

After an extended period of decline in the 1990s, the annual rate of new HIV diagnoses in Australia began to climb from around the year 2000. The increases in rates over the past few years largely occurred outside NSW, which has long been the centre of Australia's HIV epidemic, but is now virtually equalled by Victoria on a per capita basis. Male-to-male sex has continued to be the predominant route of HIV transmission in Australia, but its contribution to the total number of HIV diagnoses varies considerably across the country.

Time trends and geographic differences in the rate of reported HIV diagnosis may arise for several reasons. First, diagnosis is dependent on the uptake of testing for HIV infection. Regular surveys of men having male-to-male sex suggest that testing coverage among them is high, with between 50% and 70% of HIV-negative respondents saying that they are tested at least annually.[8-10] There has been a small increase over the past few years in the proportion of respondents reporting annual HIV testing[8-10] — a finding also seen in this analysis and corresponding to the increasing CD4+ cell counts seen at diagnosis — but these trends show little geographic variation and are therefore unlikely to explain the divergent diagnosis rates between jurisdictions.

Another factor may be the size of subgroups associated with increased risk of HIV transmission. In particular, variations in the population distribution of men having male-to-male sex would be likely to have a strong influence on these rates. Despite the ongoing concentration of gay men in Sydney,[11] a national survey conducted in 2001–2002 found that the proportion of male respondents who had a male sex partner in the previous year did not vary considerably across the country.[12] There is no information on the extent to which these proportions may vary over time, due to internal migration or other factors.

A third explanation for the geographic differences in HIV diagnosis trends may be divergent trends in sexual risk behaviour. Support for this possibility comes from the Gay Community Periodic Surveys, which recruit repeat cross-sectional samples in several Australian cities. When the surveys began in the late 1990s, participants from Sydney were the most likely to report having had unprotected anal intercourse with casual partners. The next few years saw a steady increase in all cities in the proportion of men reporting this practice, but the Sydney proportion reached a plateau around 2001, while in Brisbane and Melbourne this risk behaviour continued to rise.[8-10] These behavioural trends in Australia's three largest cities essentially match the corresponding state-specific trends in HIV diagnoses reported here.

Many other Western countries have reported recent increases in HIV diagnoses among men having male-to-male sex,[13,14] and some have also reported increases in HIV-related risk behaviour in this population.[14] These increases have been linked to changing perceptions about the seriousness of HIV infection due to the availability of effective treatments.[15] Increases in sexually transmitted infections and the greater numbers of people living with HIV are also crucial determinants of new transmission,[13,16] but we have no evidence that these factors are changing in a differential manner across jurisdictions.

Based on a much smaller number of cases, diagnoses related to heterosexual contact have also increased, but the per capita rate remains low and unchanged over time. The coverage of HIV testing among heterosexuals is quite low (about 25% reported a test in 2001–2002, compared with 56% of men with male sexual partners[17]), so there may be a greater degree of underdiagnosis than in the cases associated with male-to-male sex, but evidence from HIV screening of blood donors and testing in sexual health clinics would appear to confirm low and unchanging prevalence in this group. As in several European countries, many of the heterosexually acquired HIV cases in Australia are linked to countries of high HIV prevalence in Africa and Asia.[13,18] Despite having a relatively comprehensive national system for HIV surveillance, Australia could improve the quality and validity of the information it produces. Serological assays are available that can distinguish between newly acquired and established HIV infections; these could be used more widely[19-23] to provide a better indication of recent HIV transmission.[24] New clinic-based sentinel surveillance systems have been devel-

oped in some parts of the country and could be used to provide more comprehensive information about HIV testing and prevalence. Surveillance to monitor the prevalence of drug-resistant strains among new infections could also be considered. Analysis of acute primary HIV infection cases diagnosed at St Vincent's Hospital in Sydney indicated a substantial drop in the frequency of primary nucleoside analogue reverse transcriptase inhibitor resistance mutations from 29.3% before 1996 to 9.0% after 1996, following the introduction of highly active antiretroviral therapy into the transmitting community.[25] Ongoing monitoring is required to detect changes in the prevalence and characteristics of transmitted resistance.

While Australia remains a low-prevalence country for HIV, with a national prevalence more than 100 times lower than some of the worst affected countries, and five times lower than the highest-prevalence countries of Europe and North America, there is evidence that the recent increase in diagnoses is linked to changes in risk behaviour, raising questions about the effectiveness of current prevention strategies. The national HIV surveillance data demonstrate a need to maintain effective, innovative and evidence-based programs and interventions for HIV prevention, particularly among men having male-to-male sex.

ACKNOWLEDGEMENTS

The National Centre in HIV Epidemiology and Clinical Research (NCHECR) is funded by the Australian Government Department of Health and Ageing, and is affiliated with the Faculty of Medicine, University of New South Wales. The NCHECR Surveillance Program is a collaborating unit of the Australian Institute of Health and Welfare. Its work is overseen by the Ministerial Advisory Committee on AIDS, Sexual Health and Hepatitis.

COMPETING INTERESTS

None identified.

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(Received 6 Jun 2007, accepted 9 Jul 2007) ❑