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A new surveillance system for monitoring HIV infection in Victoria, Australia

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Abstract. ***Objectives:*** To establish a new mechanism for monitoring patterns of HIV infection, in the context of a sustained increase in HIV diagnosis among men who have sex with men (MSM) in Victoria. ***Methods:*** Between April 2004 and August 2005, a linked voluntary HIV sentinel surveillance system was implemented at five medical clinics with a high case load of MSM. Using a questionnaire, doctors collected HIV testing history, demographic and sexual risk behaviour information from all clients undergoing voluntary HIV testing. Questionnaires were linked with HIV test results. Logistic regression analysis was conducted to determine factors associated with HIV infection. ***Results:*** Of 3435 MSM tested for HIV at participating sites, 1.7%, (95% CI = 1.2–2.2) were newly diagnosed with HIV; between 2004 and 2005 the proportion increased from 1.3% (95% CI = 1.2–1.5) to 2.0% (95% CI = 1.8–2.2), $P = 0.107$. There was no significant change in the number of HIV tests conducted per month or in demographic characteristics, testing history and sexual behaviour characteristics between time periods. In multivariate analysis, reporting unprotected anal intercourse (UAI) with any partner, UAI with a HIV-positive partner/s and being aged 30–39 years or 40 years or greater were significantly associated with HIV infection. ***Conclusion:*** This new surveillance mechanism, based on linked testing at participating clinics, indicates that the increase in HIV notifications in 2005 was unrelated to changes in testing and data from a Melbourne sexual behavioural survey suggests the increase was more likely to be attributed to increases in transmission within the past few years. The sentinel system highlighted UAI, especially with HIV positive partner/s are important transmission factors.

Additional keywords: HIV, sentinel surveillance, voluntary testing.

Introduction

As in most of Australia, the majority of reported new HIV diagnoses in Victoria occur in men who have sex with men (MSM); 74% of diagnoses in 2005 were in this group.[1] Over the past 7 years, Victoria has seen a marked increase in annual new HIV diagnoses from 130 in 1999 to 242 in 2005.[1] This rise in Victoria has been accompanied by an ongoing debate as to whether the rise reflects increased transmission or the detection of previously undiagnosed cases through testing.

Existing data sources do not provide enough information to resolve this debate. The passive surveillance system, based on the reporting of cases from diagnosing clinicians and laboratories, does not collect information on anyone except those diagnosed positive. The annual Melbourne Gay Community Periodic Survey tracks sexual and drug risk behaviour but does not involve any HIV testing and therefore cannot be used to assess associations between behaviour and HIV infection rates.[2] Finally, HIV testing and incidence trends reported from a national surveillance network,[3] including only one large Victorian public sexual health clinic cannot be assumed to provide a representative sample of the population at risk in Victoria,[4,5] because the bulk of HIV testing and diagnosis among MSM in Victoria takes place through general practitioners.

To enhance the public health system's ability to interpret trends in HIV diagnosis and evaluate ongoing interventions aimed at increasing testing or reducing transmission, we developed a new HIV sentinel surveillance system in Victoria, based on voluntary testing at a network of private and public medical practices that have a substantial MSM clientele. The present study describes the results of the pilot investigation that was undertaken to develop the network.

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Methods

The Victorian HIV Sentinel Surveillance system was designed to be a network of clinical sites, working through a central coordination unit at the Burnet Institute. Ethical approval was granted by the Victorian Department of Human Services. The pilot phase was conducted between 1 April 2004 and 31 August 2005 at five sites (four metropolitan and one regional). The sites selected had a high case load of MSM and were responsible for making about one-quarter of annual diagnoses of HIV among MSM in Victoria.

All patients who attended one of the sites for HIV testing were eligible to participate in the study. We excluded from the analysis those who had previously tested positive for HIV and were tested for confirmatory reasons.

Each participant had a unique study number. A paper-based questionnaire was used to collect demographic, clinical and behavioural information from participants. Consistent with usual clinical practice, the preceding 12 months was chosen as the time frame for questions about sexual history. The questionnaire was administered by the clinician, and its completion was taken as implied consent. Testing for HIV antibody was undertaken by each site's routine laboratory service provider, with confirmatory testing for all sites taking place at the Victorian Infectious Diseases Reference Laboratory (VIDRL).

The Burnet Institute collected completed questionnaires from sites for data entry and analysis. In fulfillment of its role in the Victorian passive surveillance system, VIDRL routinely forwarded details on each new HIV diagnosis to the Burnet Institute. HIV positive results from the sentinel sites were linked with the questionnaire data using the unique identifier number, request date, year of birth and postcode on the questionnaire.

To estimate the overall response rate to the questionnaire we obtained the number of HIV tests requested through VIDRL by the sentinel sites over the study period and compared the total to the number of surveys received. A 100% response rate was unachievable because questionnaires were not administered on patients tested for HIV more than once within a short-time frame (i.e. consecutive tests over a 2-month period). To calculate the data completeness rate, we applied the total number of responses received for all variables to all possible responses.

For comparisons over time, the study period was divided into two intervals; the first being April–December 2004 and the second being January–August 2005. The proportion of participating MSM diagnosed with HIV (diagnosis rate) was calculated and a two sample test for proportions was used to determine the differences in the diagnosis rate between the two intervals.

Linear regression was conducted to determine if there was any trend in the number of HIV tests per month and the χ^2-test for proportions was used to determine if there was any change in the characteristics of those tested for HIV between the two time intervals. A *t*-test for proportions was conducted to determine if there was a significant increase in HIV prevalence between the two time periods.

Multiple logistic regression analysis using forward exclusion was undertaken to identify factors independently associated with HIV infection.

Finally, Stata statistical software (Version 9; Stata, College Station, TX, USA) was used to conduct all analyses. A cut-off of $P < 0.005$ was used for all statistical tests.

Results

Overall

At the five sites, the total number of surveys completed was 5033; 4147 (82.4%) among males, 797 (15.8%) among females, 72 (1.4%) among transgender individuals and 17 (0.3%) among individuals where the sex was unknown. The overall survey response rate was 89% and the overall data completeness rate was 90%.

Of the 5033 surveys, 3518 (69.9%) were conducted among men who had sex with men (MSM) in the past 12 months and 83 were also identified as sex workers and were excluded as a result of the potential biases these participants might introduce to the sexual behaviour questions, particularly the number of male sexual partners. Thus, 3435 was used as the denominator for MSM.

The breakdown of surveys among other risk groups were as follows: 506 (10%) among individuals identified as sex workers (112 males, 346 females, 48 transgender individuals); 174 (3.5%) among individuals identified as injecting drug users (125 males, 48 females and one transgender individual); 710 (14.1%) who had heterosexual contact but were not sex workers (398 males and 312 females); 51 (1.0%) women who reported female to female sex; 272 (5.4%) individuals for whom the gender of sexual partner was not specified and 17 (0.3%) the gender of the individuals was not reported. These risk groups were not mutually exclusive.

There were a total of 63 HIV diagnoses in the study period, all were male: 57 were among MSM, two among MSM identified as sex workers and four among males where no information was provided on the gender of their sexual partner/s.

Men who have sex with men

The median age of MSM was 36 years (range: 16–80), 92% of MSM resided in metropolitan Melbourne and 77% were born in Australia (Table 1).

Of the 3435 participating MSM, 57 (1.7%, 95% CI = 1.2–2.2) were newly diagnosed with HIV; 24 (1.3%, 95% CI = 1.2–1.5) in the first study interval (April–December 2004) and 33 (2.0%, 95% CI = 1.8–2.2) in the second (January–August 2005). The change in proportions between the two study intervals was not statistically significant ($P = 0.107$).

There was no statistically significant linear trend in the number of HIV tests conducted per month and no change in demographic characteristics, testing history and sexual behaviour characteristics between time the two study intervals (Table 1).

In univariate and multivariate analysis, reporting unprotected anal intercourse (UAI) with any partner, UAI with a HIV-positive partner/s, or being aged 30–39 years or 40 years and above were significantly associated with HIV infection (Table 2).

Discussion

The current pilot study has demonstrated the feasibility of establishing a system for monitoring testing uptake and HIV

Table 1. Characteristics of MSM tested at five sentinel clinics in Victoria, April 2004 to August 2005
MSM, men who have sex with men

Demographic/sexual behaviour or testing history	Category	Period 1		Period 2		Overall	
		n	(%)	*n*	(%)	*n*	(%)
All		1802		1633	(100.0)	3435	(100.0)
Timing of previous negative HIV test	<1 year ago	768	(42.6)	676	(41.4)	1444	(42.0)
	1 year or more	759	(42.1)	721	(44.2)	1480	(43.1)
	No previous test	119	(6.6)	82	(5.0)	201	(5.9)
	Unknown	156	(8.7)	154	(9.4)	310	(9.0)
Median age (range) years		35 (16–80)		36 (17–79)		36 (16–80)	
Region of residence	Metropolitan	1628	(90.3)	1516	(92.8)	3144	(91.5)
	Regional	59	(3.3)	50	(3.1)	109	(3.2)
	Unknown	115	(6.4)	67	(4.1)	182	(5.3)
Country/region of birth	Australia	1404	(77.9)	1254	(76.8)	2658	(77.4)
	Asia	122	(6.8)	104	(6.4)	226	(6.6)
	UK/Ireland	62	(3.4)	71	(4.3)	133	(3.9)
	New Zealand	57	(3.2)	51	(3.1)	108	(3.1)
	Other	107	(6.0)	114	(7.0)	221	(6.4)
	Unknown	50	(2.8)	39	(2.4)	89	(2.6)
Number of male partners[B]	>10	255	(14.2)	231	(14.1)	486	(14.1)
	≤10	1547	(85.8)	1402	(85.9)	2949	(85.9)
Unprotected anal intercourse (UAI)[B]	Yes	704	(39.1)	655	(40.1)	1369	(39.9)
	No	1070	(59.4)	955	(58.5)	2025	(59.0)
	Unknown	28	(1.6)	13	(0.8)	41	(1.2)
UAI with a HIV-positive partner/s[A,B]	Yes	130	(7.2)	118	(7.2)	248	(7.2)
	No	1639	(91.0)	1498	(91.7)	3137	(91.3)
	Unknown	33	(1.8)	17	(1.0)	50	(1.5)
UAI with a partner/s of unknown HIV status[A,B]	Yes	494	(27.4)	453	(27.7)	947	(27.6)
	No	1273	(70.6)	1162	(71.2)	2435	(70.9)
	Unknown	35	(1.9)	18	(1.1)	53	(1.5)
UAI with a HIV-negative partner/s[A,B]	Yes	575	(31.9)	475	(29.1)	1050	(30.6)
	No	1194	(66.3)	1141	(69.9)	2335	(68.0)
	Unknown	33	(1.8)	17	(1.0)	50	(1.5)

[A]Data were not mutually exclusive.
[B]In the past 12 months.

Table 2. Predictors for HIV infection among MSM
MSM, men who have sex with men

	Variable	Univariate			Multivariate		
		Odds ratio	95% confidence interval	*P*- value	Odds ratio	95% confidence interval	*P*- value
HIV test in past 12 months	No	0.89	0.51–1.55	0.69			
	Yes	1.00					
Age group	<30	1.00					
	30–39	4.38	1.70–11.28	<0.005	4.02	1.55–10.42	0.004
	40+	2.83	1.06–7.57	<0.05	1.78	1.03–7.45	0.04
Country of birth	Australia	1.76	0.79–3.91	0.16			
	Other	1.00					
Region of residence	Regional	2.33	0.83–6.59	0.11			
	Metropolitan	1.00					
Number of male sexual partners	>10	1.51	0.87–2.62	0.14			
	≤10	1.00					
Unprotected anal intercourse (UAI) with any partner/s	Yes	2.45	1.29–4.66	<0.01	1.96	0.99–3.85	0.05
	No	1.00					
UAI with a HIV positive partner/s	Yes	4.08	2.16–7.71	<0.001	3.10	1.59–6.06	0.001
	No	1.00					
UAI with HIV status unknown partner/s	Yes	1.36	0.78–2.39	0.28			
	No	1.00					
UAI with HIV negative partner/s	Yes	0.76	0.41–1.39	0.37			
	No	1.00					

prevalence and its predictors among MSM through routine testing at primary care sites in a large Australian city. Although not statistically significant, the study identified an increase in HIV prevalence between 2004 and 2005, consistent with the increase in diagnoses report via passive surveillance over the same time frame. The fact that the number of tests and characteristics of those tested did not change between 2004 and 2005, suggests that the increase in diagnoses report via passive surveillance was unrelated to changes in testing.

This new surveillance system also permitted the identification of risk factors for HIV diagnosis. MSM aged 30–39 years were four times more likely to be diagnosed with HIV, compared to those aged less than 30 years. This finding is consistent with the median age of 37 at HIV diagnosis reported among MSM through the passive surveillance system.[6] UAI with any partner and UAI with an HIV-positive partner in the past 12 months were also found to be significant risk factors for HIV infection. These finding supports the need for health promotion activities to focus on regular relationships, particular serodiscordant ones.[7]

We did not find any association between HIV prevalence and reported UAI with partners of unknown status, many of whom are likely to be casual.[2] In contrast, an earlier study in Melbourne showed UAI with casual partners was a significant risk factor for HIV.[8]

Although the difference was not significant, MSM living in regional Victoria were twice as likely to be diagnosed with HIV as those living in metropolitan Melbourne, an important finding to monitor over the next few years.

There was no significant change in the proportion of participants reporting UAI between the two study intervals, consistent with the Melbourne Gay Community Periodic Survey results for 2004 and 2005. However, the survey had previously detected an significant increasing trend between 1998 and 2003, particularly with casual partners in Melbourne,[2] a finding also observed in Sydney,[9] suggesting that the more recent increase in HIV prevalence might have been associated with changes in behaviour before 2004.

Factors in addition to those recorded in the current study that might also have contributed to the increase in HIV cases among MSM including other sexually transmissible infections (STI), which are known to be important co-factors for HIV transmission.[10–12] In Victoria, there has been an increase in notifications of STI over the past decade,[6] but no prevalence data are available for MSM. It is also possible that increases in the numbers of people living with HIV infection as a result of antiretroviral therapy might have increased the likelihood of transmission in the community.[13] Despite the potential effect of antiretroviral therapy in reducing viral load and hence transmission risk per contact, increases in STI and UAI have been shown to counterbalance these potential effects.[14,15]

The Victorian HIV Sentinel Surveillance has some methodological limitations. First, although there was an increase in HIV prevalence, the limited sample size prevented assessment of whether the increase was statistically significant. Second, the system relied on clinicians to administer the questionnaire. Some sexual history questions were of a sensitive nature, and it is possible that this information might have been underreported. Third, implementation of the system at medical clinics only includes MSM seeking health services and thus the results cannot be assumed to apply to all MSM. Furthermore, the pilot was primarily aimed at tracking HIV prevalence rather than incidence, which is a more direct consequence of changes in transmission risk.

This new surveillance mechanism, based on linked testing at participating clinics, showed that the increase in HIV notifications in 2005 was unrelated to changes in testing and data from the periodic survey suggests the increase was more likely to be attributed to increased transmission occurring before 2004. UAI, especially with HIV-positive partner/s is an important transmission factor to be considered in ongoing health promotions campaigns. In light of the success of the pilot study, the Burnet Institute, in collaboration with the Department of Human Services, the Victorian Infectious Diseases Reference Laboratory and the Melbourne Sexual Health Centre, has expanded sentinel surveillance to include not only HIV, but chlamydia, syphilis and hepatitis C and the system will have a cohort design allowing for monitoring of HIV incidence. This expanded system will include more sites for each disease and thus provide a larger sample size to assess differences in prevalence estimates over time.

Conflicts of interest

None exist.

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References

1 Yohannes K. Sexually transmissable infections – human immunodeficiency virus (HIV) infection. *Vic Infect Dis Bull* 2006; 10: 23–6.

2 Hull P, Van de Ven P, Prestage G, Rawstorne P, Kippax S, Horn G, *et al.* Melbourne gay community periodic survey. National Centre in HIV Social Research 2005. Available at: http://nchsr.arts.unsw.edu.au/pdf%20reports/Melbourne2005.pdf [Accessed 6 November 2006]

3 McDonald A, Donovan B, O'Connor C, Packham D, Patten J, Chuah J, *et al.* Time trends in HIV incidence among homosexually active men seen at sexual health clinics in Australia, 1993–1999. *J Clin Virol* 2001; 22: 297–303. doi: 10.1016/S1386-6532(01)00202-5

4 Donovan B, McDonald A. The value of sentinel surveillance of HIV infection in sexual health clinics in Australia. Australian HIV Surveillance Report 2000; 16: 5–7 Available at http://web.med.unsw.edu.au/nchecr/Downloads/apr00survrpt.pdf [accessed 6 November 2006].

5 National Centre in HIV Epidemiology and Clinical Research. HIV/AIDS, viral hepatitis and sexually transmissible infections in Australia-annual surveillance report 2004. Sydney: National Centre in HIV Epidemiology and Clinical Research, The University Of New South Wales; 2005. Available at: http://web.med.unsw.edu.au/nchecr/Downloads/05_ansurvrp.pdf [accessed 6 November 2006].

6 Guy R, Lim M, Tomnay J, Hatch B, Carter T, Breschkin A, *et al.* Sustained increase of HIV diagnoses in Victoria: epidemiology, testing and interventions. Vic Infect Dis Bull 2006; 9: 6–11. Available at: http://www.health.vic.gov.au/ideas/surveillance/bulletin.htm [accessed 6 November 2006].

7 Crawford JM, Kippax SC, Mao L, Van de Ven PG, Prestage GP, Grulich AE, *et al.* Number of risk acts by relationship status and partner serostatus: findings from the HIM cohort of homosexually active men in Sydney, Australia. *AIDS Behav* 2006; 10: 325–31. doi: 10.1007/s10461-005-9057-3

8 Read TR, Hocking J, Sinnott V, Hellard M. Risk factors for incident HIV infection in men having sex with men: a case–control study. *Sex Health* 2007; 4: 35–9. doi: 10.1071/SH06043

9 Prestage G, Mao L, Fogarty A, Van de Ven P, Kippax S, Crawford J, *et al.* How has the sexual behaviour of gay men changed since the onset of AIDS: 1986–2003. *Aust N Z J Public Health* 2005; 29: 530–5.

10 Wasserheit J. Epidemiological synergy: interrelationships between human immunodeficiency virus infection and other sexually transmitted diseases. *Sex Transm Dis* 1992; 19: 61–77.

11 Cohen M, Hoffman I, Royce R, Kazembe P, Dyer J, Costello Daly C, *et al.* Reduction of concentration of HIV-1 in semen after treatment of urethritis: implications for prevention of sexual transmission of HIV-1. *Lancet* 1997; 349: 1868–73. doi: 10.1016/S0140-6736(97)02190-9

12 Atkins M, Carin E, Emery V, Griffiths P, Boag F. Fluctuations of HIV load in semen of HIV positive patients with newly acquired sexually transmitted diseases. *BMJ* 1996; 313: 342–3.

13 Marrone J, Fairley CK, Chen M, Hocking JS. Comparisons of trends in antiretroviral use and HIV notification rates between three Australian states. *Aust N Z J Public Health* 2007; 31: 131–4. doi: 10.1111/j.1753-6405.2007.00030.x

14 Law MG, Prestage G, Grulich A, Van de Ven P, Kippax S. Modelling HIV incidence in gay men: increased treatment, unsafe sex and sexually transmissible infections. *AIDS* 2002; 16: 499–501. doi: 10.1097/00002030-200202150-00029

15 Law MG, Prestage G, Grulich A, Van de Ven P, Kippax S. Modelling the effect of combination antiretroviral treatments on HIV incidence. *AIDS* 2001; 15: 1287–94. doi: 10.1097/00002030-200107060-00011

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