ORIGINAL ARTICLE

Comprehensive testing for, and diagnosis of, sexually transmissible infections among Australian gay and bisexual men: findings from repeated, cross-sectional behavioural surveillance, 2003–2012

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ABSTRACT

Objectives To analyse changes in testing for sexually transmissible infections (STI) among gay and bisexual men in Melbourne, Sydney and Queensland, Australia, particularly comprehensive STI testing (at least four tests from different anatomical sites in the previous year), and the characteristics of men who had such testing.

Method Data were analysed from repeated, cross-sectional, community-based surveys conducted during 2003–2012. Trends in specific STI tests and comprehensive testing were assessed and the characteristics of participants who reported comprehensive STI testing were identified using multivariate logistic regression, stratified by HIV status.

Results Among HIV-negative and unknown status men (n=51 009), comprehensive STI and HIV testing increased substantially from 13% in 2003 to 34% in 2012. During the same period, comprehensive STI testing (excluding HIV testing) increased from 24% to 57% among HIV-positive men (n=5532). In both HIV status groups, comprehensive testing was more commonly reported by men who had unprotected anal intercourse with casual partners, and men with higher numbers of partners. Among HIV-negative/unknown status participants, comprehensive STI and HIV testing was also associated with education level, regional location and finding partners online. Among HIV-positive men, comprehensive STI testing was also associated with free time spent with gay men and illicit drug use. Comprehensive testing was related to a high annual rate of diagnosis with STIs (20% of HIV-negative/unknown status men and 38% of HIV-positive men).

Conclusions There has been a substantial improvement in the proportion of gay and bisexual men in Melbourne, Sydney and Queensland who report comprehensive testing. Comprehensive testing is most likely among men whose practices put them at increased risk of infection, and is associated with a high rate of STI diagnosis. However, opportunities for comprehensive testing are still being missed, suggesting a need for its ongoing promotion.

INTRODUCTION

Over the last decade, there has been a concerted effort to increase the uptake of testing for HIV and other sexually transmissible infections (STI) among gay and bisexual men (GBM) in Australia. GBM are at increased risk of STIs, but opportunities for testing are often missed, increasing the likelihood of undiagnosed infections, onward transmission and disease sequelae.[1–3]

Current Australian guidelines recommend that all sexually active GBM should be tested at least annually for a range of STIs.[4] The guidelines, first released in 2002 and revised three times, currently recommend that screening should include serology for HIV, syphilis and hepatitides A, B and C, an anal swab for gonorrhoea and chlamydia, a pharyngeal swab for gonorrhoea, and first-void urine for chlamydia, irrespective of sexual practice. The use of anal swabs is emphasised, given the high incidence of asymptomatic rectal STIs among GBM and their association with an increased likelihood of HIV infection.[5 6] The guidelines suggest more frequent testing for HIV-positive men (incorporated in their routine HIV monitoring), men who have unprotected anal intercourse or more than 10 partners in the previous 6 months, participate in group sex or use recreational drugs during sex. A recent review suggests that the Australian guidelines are unique because they specify a minimum testing frequency (annually) and more frequent testing for those at increased risk.[7] The review found that European guidelines tend to be less specific (and less prescriptive), relying on clinical judgment to decide on the need for screening.

In addition to developing guidelines, a variety of other approaches has been used to promote comprehensive STI testing in Australia.[8] Since 2003, STI testing campaigns, notably WhyTest in Sydney (2004–2007), Check-It-Out in Melbourne (2004–2006) and the national Drama Down Under campaign (2008–date), have aimed to raise awareness of STIs and the need for regular testing.[9–11] The campaign websites inform GBM about STI testing, provide access to short message service or email reminders, and enable the anonymous notification of sex partners following a diagnosis.[9–11] Some clinics use prompts in patient information systems to remind clinicians to offer STI testing to GBM, while others have set up short message service (SMS) appointment reminders for patients.[8 12] Evaluation showed the Check-It-Out campaign did not alter STI testing rates in Melbourne during 2004–2006.[10] By contrast, the WhyTest and Drama Down Under campaigns achieved high levels of awareness,[9 11] and significant increases were observed in the number of STI tests performed by clinics and the proportions of GBM reporting any STI testing.[9 13]

By 2007, around two-thirds of Australian GBM reported at least one STI test (other than HIV) in the previous year.[13 14] Anal and throat swabs were much less common than serology and urine tests.[13] Repeated surveillance suggests that testing for a range of STIs has become more common, but there has been limited analysis of the completeness of this testing.[15] Testing for HIV is more commonly reported by Australian gay men than testing for other STIs, with up to 70% of HIV-negative and untested men reporting a HIV test in the previous year.[15–18] It appears that requests for HIV testing do not always prompt clinicians to suggest screening for other STIs (or vice versa). This disparity is partially explained by gay men continuing to view HIV as more important than other STIs.[19] Studies consistently find that men who engage in practices that increase their risk of infection, such as having a high number of sexual partners or engaging in unprotected anal intercourse, are more likely to seek testing for HIV and STIs, and to test more frequently.[2 13 16–18 20]

The aim of this analysis was to take stock of past achievements and identify future needs regarding the promotion of comprehensive STI and HIV testing to GBM. We examined changes in STI and HIV testing over the last 10 years to assess if improvements in comprehensive testing have continued or been sustained. In particular, we assessed the range of tests performed using specimens from different anatomical sites. Previous research has typically focused on men reporting *any* STI test,[9 10 13] but HIV and STI testing guidelines emphasise the need to concurrently test for multiple blood-borne viruses and STIs.[4] We anticipated that comprehensive testing has become more common over time and would be associated with an increased rate of STI diagnosis.[9 13 16 20] We also expected that men who were more at risk of HIV and other STIs would be more likely to report comprehensive testing.

METHODS

Participants and procedures

Data were obtained through the Gay Community Periodic Surveys (GCPS); repeated, cross-sectional surveys in six Australian states and territories that recruit men at gay venues, events and clinics.[14] Recruitment periods last for 2 weeks in each city and are timed to coincide with large, annual gay community events, such as Brisbane Pride, Midsumma in Melbourne and the Sydney Gay and Lesbian Mardi Gras. Eligible participants are adult men who regularly participate in the local gay community (ie, those who regularly attend local gay venues and events; temporary visitors are not eligible) and who have had sex with another man in the past 5 years. Participants are recruited by trained staff who ascertain whether men are eligible or not. Men who are eligible then opt to take part or not (the recruiters record the number who refuse). The response rate is typically 70%. Consenting participants complete an anonymous questionnaire about relationships, sexual behaviour, HIV and STI testing, drug use and demographics. The study protocol is approved by the University of New South Wales Human Research Ethics Committee (ref HREC 09209).

For this analysis, we only included GCPS data from 2003 to 2012 collected annually in Melbourne, Sydney and Queensland (Brisbane, the Gold Coast and Cairns). The analysis was restricted to these locations because STI testing data have been collected more consistently and for longer there than in the other participating states and territories.

Measures

Our primary outcome measures (dependent variables) were related to HIV and STI testing in the 12 months prior to survey. The most recent HIV test among HIV-negative and unknown status men was assessed with the question 'When were you last tested for HIV antibodies?', with responses ranging from 'Less than a week ago' to 'Never tested'. For this analysis, we dichotomised these responses into 'HIV test in the last 12 months' vs 'No HIV test in last 12 months'. STI testing for all participants was assessed with the question 'Which of these sexual health tests have you had in the last 12 months?' The listed tests included anal swab, throat swab, urine sample, blood test for syphilis, and other blood test. Response options ranged from 'None' to '3 or more'. It should be noted that samples taken from different anatomical sites may be used to test for the same STI.[4] The responses regarding blood test for syphilis and other blood test were combined into a new variable: any blood test other than HIV. Responses for anal swab, throat swab, urine sample and any blood test other than HIV were dichotomised (any test in last 12 months vs none). All men were classified as having undergone comprehensive STI testing if they reported an anal swab, throat swab, urine sample and any blood test other than HIV in the 12 months prior to survey. HIV-negative and unknown status participants were classified as having had comprehensive STI and HIV testing if *in addition* they reported having had a HIV test in the 12 months prior to survey. Scores on both comprehensive testing variables were dichotomised: 'comprehensive testing in last 12 months' vs 'no comprehensive testing'.

Independent variables included sociodemographic characteristics such as age, education level, employment status, residential location and sexual identity. Free time spent with gay men was included as a marker of involvement in gay social networks. Behavioural indicators that were assessed (for the 6 months prior to survey) included number of different male partners, any unprotected anal intercourse with casual male partners (UAIC) and any illicit drug use. We also assessed self-reported HIV status and self-reported diagnosis with any STI (other than HIV) in the 12 months prior to survey. For HIV-positive men, we included their HIV treatment status at the time of the survey and their last viral load test result. Details of these and other GCPS measures and indicators are available elsewhere.[14]

Data analysis

Analyses were conducted separately for HIV-negative and unknown status men and HIV-positive men. χ^2 tests for linear trends were conducted to examine changes in the proportions of participants who reported individual tests, any test and comprehensive testing over the time period 2003–2012. We also analysed trends in comprehensive testing among men who had engaged in any UAIC, and those who had more than 10 male sex partners in the 6 months prior to survey. For HIV-negative and unknown status men, trends in comprehensive testing with and without HIV testing are reported. Sociodemographic characteristics were examined to determine if there were any major changes to the sample composition over time. Because the main sample characteristics (eg, age, recruitment location) were reasonably stable, we did not control for these in trend analyses. Controlling for year of data collection, we used logistic regression to identify the likelihood of comprehensive testing by different HIV status groups, by men who did and did not report UAIC, and by men who had more than 10 vs 10 or fewer male partners. Bivariate analyses (χ^2 tests and t tests) were used to identify variables associated with comprehensive testing in 2012. Variables found to be associated at a significance level of $p<0.05$ were entered into a multivariate logistic regression analysis to assess independent associations with comprehensive STI testing in 2012. All analyses were conducted with SPSS (V.20).

Table 1 Trends in testing for sexually transmissible infections in the 12 months prior to survey, 2003–2012, by HIV status

	Year										
	2003 n (%)	2004 n (%)	2005 n (%)	2006 n (%)	2007 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	χ^2 test for trend (p)
HIV-negative and untested/unknown status men											
Anal swab	954 (20.1)	1149 (23.8)	1341 (29.5)	1755 (35.2)	1775 (35.2)	1813 (38.0)	1826 (37.4)	2324 (39.2)	2343 (40.5)	2163 (40.5)	880.2 (<0.001)
Blood test other than for HIV	2435 (51.3)	2519 (52.1)	2361 (51.9)	2672 (51.9)	2578 (51.2)	2503 (52.5)	2791 (57.2)	3738 (63.1)	3579 (61.8)	3352 (62.8)	397.2 (<0.001)
Throat swab	1293 (27.2)	1499 (31.0)	1629 (35.8)	2023 (39.3)	2031 (40.3)	1998 (41.9)	2010 (41.2)	2549 (43.0)	2537 (43.8)	2351 (44.1)	511.6 (<0.001)
Urine sample	1756 (37.0)	2040 (42.2)	2065 (45.4)	2434 (47.3)	2405 (47.7)	2432 (51.0)	2400 (49.2)	3109 (52.5)	3050 (52.7)	2836 (53.1)	422.8 (<0.001)
HIV test	2768 (58.5)	2936 (60.9)	2812 (62.1)	3264 (63.9)	3215 (64.6)	3052 (64.6)	3041 (63.5)	3596 (61.7)	3716 (65.2)	3366 (63.8)	19.3 (<0.001)
Any test (including HIV tests)	3402 (71.7)	3535 (73.1)	3308 (72.8)	3736 (72.6)	3656 (72.6)	3474 (72.9)	3490 (71.6)	4276 (72.2)	4305 (74.3)	3889 (72.9)	1.7 (0.20)
Comprehensive STI testing*	646 (13.6)	812 (16.8)	992 (21.8)	1316 (25.6)	1326 (26.3)	1374 (28.8)	1539 (31.6)	2093 (35.3)	2102 (36.3)	1963 (36.8)	1445.9 (<0.001)
Comprehensive STI and HIV testing†	604 (12.7)	763 (15.8)	940 (20.7)	1223 (23.8)	1262 (25.0)	1273 (26.7)	1434 (29.4)	1931 (32.6)	1955 (33.8)	1835 (34.4)	1280.8 (<0.001)
Total	4746 (100)	4837 (100)	4545 (100)	5146 (100)	5038 (100)	4768 (100)	4877 (100)	5923 (100)	5792 (100)	5337 (100)	
HIV-positive men											
Anal swab	186 (35.8)	206 (37.9)	212 (44.6)	267 (46.9)	281 (52.1)	288 (53.1)	300 (59.3)	379 (60.3)	410 (64.2)	356 (62.7)	199.0 (<0.001)
Blood test other than for HIV	387 (74.4)	405 (74.3)	353 (74.3)	425 (74.7)	407 (75.5)	410 (75.6)	437 (86.4)	549 (87.3)	567 (88.7)	493 (86.8)	106.4 (<0.001)
Throat swab	212 (40.8)	247 (45.3)	252 (53.1)	303 (53.3)	289 (53.6)	308 (56.8)	318 (62.8)	381 (60.6)	417 (65.3)	373 (65.7)	128.1 (<0.001)
Urine sample	244 (46.9)	270 (49.5)	256 (53.9)	321 (56.4)	322 (59.7)	340 (62.7)	337 (66.6)	442 (70.3)	480 (75.1)	417 (73.4)	205.3 (<0.001)
Any STI test	484 (93.1)	513 (94.1)	445 (93.7)	543 (95.4)	505 (93.7)	509 (93.9)	488 (96.4)	603 (95.9)	606 (94.8)	546 (96.1)	6.93 (0.008)
Comprehensive STI testing*	126 (24.2)	163 (29.9)	159 (33.5)	209 (36.7)	218 (40.4)	236 (43.5)	255 (50.4)	336 (53.4)	375 (58.7)	325 (57.2)	284.9 (<0.001)
Total	520 (100)	544 (100)	475 (100)	569 (100)	539 (100)	542 (100)	506 (100)	629 (100)	639 (100)	568 (100)	

*At least four different STI tests in the 12 months prior to survey, not including HIV testing.
†At least five different STI tests in the 12 months prior to survey, including HIV testing.
STI, sexually transmissible infection.

RESULTS

Participant characteristics

Overall, 56 541 men completed surveys in the period 2003–2012. Of these men, 79.5% reported that they were HIV-negative, 10.7% were untested for HIV or of unknown HIV status, and 9.8% were HIV-positive. Forty-two per cent of respondents were recruited in Sydney, 34.8% in Melbourne and 23.7% in Queensland. The majority of participants (84.9%) resided in a city/metropolitan area. The mean age of respondents was 35.7 years (SD=11.26) with a median of 35 (range 18–91). The majority of respondents was in paid employment (79.4%), had a university degree (50.3%), and identified as gay/homosexual (89.0%). Minorities of respondents identified as bisexual (6.7%) or heterosexual (1.8%) or reported an Aboriginal or Torres Strait Islander background (3.5%).

Changes in rates of STI testing from 2003 to 2012

Analyses of rates of testing for STIs from 2003 to 2012 show substantial upward trends for all types of STI tests and for comprehensive testing (see table 1). The most notable increases were in the use of anal and throat swabs. While the proportion of HIV-negative and unknown status participants reporting any STI test (including HIV tests) remained relatively stable at over 70%, the proportion reporting comprehensive STI and HIV testing increased markedly from 12.7% in 2003 to 34.4% in 2012. HIV-positive men were considerably more likely than HIV-negative and untested men to report STI testing, with the proportion of HIV-positive men reporting any STI test at over 90% during 2003–2012. Comprehensive STI testing became much more likely among HIV-positive men, increasing from 24.2% in 2003 to 58.7% in 2012. Controlling for the year of data collection, HIV-positive men were substantially more likely than HIV-negative and unknown status men to report comprehensive STI testing, excluding HIV testing (adjusted OR=2.05, 95% CI 1.94 to 2.17, p<0.001).

In every year (and in both HIV status groups), comprehensive testing was more common among men who had UAIC and men who had more than 10 male partners in the 6 months prior to survey (see table 2). Controlling for year of data collection, comprehensive testing (including HIV testing) was more likely to be reported by HIV-negative and unknown status men who had UAIC versus those who did not (AOR=1.88, 95% CI 1.79 to 1.97, p<0.001) and by HIV-negative and unknown status men who had more than 10 male partners versus those with fewer partners (AOR=2.42, 95% CI 2.31 to 2.53, p<0.001). Among HIV-positive men, comprehensive STI testing (not including HIV testing) was more likely among men who had UAIC versus those who did not (AOR=2.57, 95% CI 2.30 to 2.88, p<0.001), and those who had more than 10 versus fewer partners (AOR=2.41, 95% CI 2.15 to 2.71, p<0.001).

Factors associated with comprehensive testing in 2012

A range of factors was associated with an increased likelihood of comprehensive STI and HIV testing by HIV-negative and untested/unknown status men (see table 3), including living in a metropolitan area, identifying as gay, having a higher number of male partners, engaging in protected or unprotected anal intercourse with casual partners and finding male partners online. Among HIV-positive men, comprehensive STI testing was associated with spending more free time with gay men, having more than 10 male partners in the last 6 months, finding partners online and illicit drug use (see table 4). Comprehensive testing was not associated with HIV-positive men's current HIV

Table 2 Trends in comprehensive testing in the 12 months prior to survey by anal intercourse with casual partners, number of male partners and HIV status

Subgroup	Participants reporting comprehensive testing* by year										χ^2 test for trend (p)
	2003 n (%)	2004 n (%)	2005 n (%)	2006 n (%)	2007 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	
HIV-negative and untested/unknown status men											
Any unprotected anal intercourse with casual male partners	165 (18.3)	193 (21.7)	238 (28.6)	321 (32.6)	332 (35.4)	325 (36.0)	391 (38.4)	547 (45.5)	530 (47.5)	509 (50.8)	423.3 (<0.001)
No unprotected anal intercourse with casual male partners	439 (11.4)	570 (14.4)	702 (18.9)	902 (21.7)	930 (22.7)	948 (24.5)	1043 (27.0)	1384 (29.3)	1425 (30.5)	1326 (30.6)	874.1 (<0.001)
More than 10 male partners	259 (19.7)	314 (23.7)	388 (32.3)	447 (35.6)	414 (38.4)	443 (40.5)	475 (45.2)	656 (49.2)	652 (52.5)	617 (53.7)	627.2 (<0.001)
Ten or fewer male partners	339 (10.0)	444 (12.8)	540 (16.4)	760 (20.0)	838 (21.5)	813 (22.6)	942 (25.0)	1267 (27.9)	1290 (28.6)	1207 (29.1)	840.1 (<0.001)
HIV-positive men											
Any unprotected anal intercourse with casual male partners	72 (28.8)	85 (39.0)	89 (44.3)	108 (45.0)	125 (53.9)	129 (56.8)	159 (64.9)	191 (68.5)	206 (73.8)	209 (72.6)	211.2 (<0.001)
No unprotected anal intercourse with casual male partners	54 (20.0)	78 (23.9)	70 (25.5)	101 (30.7)	93 (30.3)	107 (34.0)	96 (36.8)	145 (41.4)	169 (46.9)	116 (41.4)	88.3 (<0.001)
More than 10 male partners	67 (28.8)	84 (39.8)	89 (45.6)	86 (44.8)	102 (56.7)	109 (59.9)	100 (59.5)	154 (66.1)	170 (79.1)	162 (75.3)	191.5 (<0.001)
Ten or fewer male partners	56 (20.3)	77 (23.3)	65 (24.0)	119 (32.2)	115 (32.6)	122 (34.9)	151 (45.6)	181 (46.1)	204 (48.2)	161 (46.3)	136.7 (<0.001)

*For HIV-negative and untested/unknown status men, comprehensive testing is defined as at least five different STI tests in the 12 months prior to survey, including HIV testing. For HIV-positive men, comprehensive testing is defined as at least four different STI tests in the 12 months prior to survey, not including HIV testing.
Note: Denominators vary depending on the number of men who answered the questions about anal intercourse with casual partners and number of male partners in the 6 months prior to survey.
STI, sexually transmissible infection.

Table 3 Factors associated with comprehensive STI and HIV testing by HIV-negative and untested/unknown status men in 2012

	No comprehensive testing (n=3502) n (%)	Comprehensive testing* (n=1835) n (%)	Unadjusted OR (95% CI)	p Value	Adjusted OR (95% CI)	p Value
Age in years (M, SD)	37.3 (12.5)	34.9 (10.5)	0.98 (0.98 to 0.99)	<0.001	0.98 (0.98 to 0.99)	<0.001
Free time spent with gay men						
None/some	2227 (63.6)	1009 (55.0)	1.00		1.00	
A lot	1275 (36.4)	826 (45.0)	1.43 (1.27 to 1.60)	<0.001	1.27 (1.12 to 1.44)	<0.001
Education						
Has not attended university	1686 (48.1)	799 (43.5)	1.00		1.00	
University degree	1816 (51.9)	1036 (56.5)	1.20 (1.08 to 1.35)	0.001	1.19 (1.05 to 1.35)	0.008
Employment						
Not in paid employment	672 (19.2)	295 (16.1)	1.00		1.00	
Any paid employment	2830 (80.8)	1540 (83.9)	1.24 (1.07 to 1.44)	0.005	1.12 (0.95 to 1.32)	0.19
Residential location						
Regional area	516 (14.7)	184 (10.0)	1.00		1.00	
City/metropolitan area	2986 (85.3)	1651 (90.0)	1.55 (1.30 to 1.85)	<0.001	1.49 (1.23 to 1.82)	<0.001
Sexual identity						
Bisexual/heterosexual/other	479 (13.7)	142 (7.7)	1.00		1.00	
Gay/homosexual	3023 (86.3)	1693 (92.3)	1.89 (1.55 to 2.30)	<0.001	1.57 (1.26 to 1.95)	<0.001
Number of male sex partners in last 6 months						
None	637 (18.3)	77 (4.2)	1.00		1.00	
1–10	2305 (66.4)	1130 (62.0)	4.06 (3.17 to 5.19)	<0.001	2.01 (1.52 to 2.64)	<0.001
More than 10	531 (15.3)	617 (33.8)	9.61 (7.39 to 12.51)	<0.001	2.92 (2.13 to 4.01)	<0.001
Sex with casual male partners in last 6 months						
No casual partners	1642 (46.9)	384 (20.9)	1.00		1.00	
Casual sex but no anal intercourse	497 (14.2)	194 (10.6)	1.67 (1.37 to 2.04)	<0.001	1.15 (0.92 to 1.44)	0.23
Condoms always used for anal intercourse	877 (25.0)	749 (40.8)	3.65 (3.15 to 4.23)	<0.001	2.10 (1.75 to 2.53)	<0.001
Any unprotected anal intercourse	486 (13.9)	508 (27.7)	4.47 (3.78 to 5.28)	<0.001	2.14 (1.74 to 2.64)	<0.001
Found male sex partners on internet in last 6 months						
No	2483 (70.9)	865 (47.1)	1.00		1.00	
Yes	1019 (29.1)	970 (52.9)	2.73 (2.43 to 3.07)	<0.001	1.44 (1.25 to 1.66)	<0.001
Diagnosed with any STI (other than HIV) in last 12 months						
No	3303 (94.3)	1464 (79.8)	1.00		1.00	
Yes	199 (5.7)	371 (20.2)	4.21 (3.50 to 5.05)	<0.001	3.01 (2.46 to 3.68)	<0.001
Any illicit drug use in last 6 months						
No	1282 (36.6)	447 (24.4)	1.00		1.00	
Yes	2220 (63.4)	1388 (75.6)	1.79 (1.58 to 2.04)	<0.001	1.36 (1.18 to 1.56)	<0.001
Recruitment venue						
Gay community events	1807 (51.6)	847 (46.2)	1.00		1.00	
Sexual health clinics	127 (3.6)	100 (5.4)	1.68 (1.28 to 2.21)	<0.001	1.96 (1.43 to 2.68)	<0.001
Social venues (eg, bars)	1135 (32.4)	645 (35.1)	1.21 (1.07 to 1.38)	0.003	1.05 (0.92 to 1.21)	0.47
Sex-on-premises venues	433 (12.4)	243 (13.2)	1.20 (1.00 to 1.43)	0.05	1.00 (0.82 to 1.23)	0.97

*Comprehensive testing is defined as at least five different STI tests in the 12 months prior to survey, including HIV testing.
STI, sexually transmissible infection.

treatment status. Men who reported comprehensive testing in 2012 were substantially more likely to report a diagnosis with an STI other than HIV (20.2% vs 5.7% among HIV-negative and untested men; 37.8% vs 7.4% among HIV-positive men).

DISCUSSION

Our investigation of trends in STI testing from repeated, behavioural surveillance of GBM in Melbourne, Sydney and Queensland found that comprehensive testing has become substantially more common. Between 2003 and 2012, there was a nearly threefold increase in comprehensive STI and HIV testing among HIV-negative and unknown status men, and a doubling of comprehensive STI testing among HIV-positive men. Urine samples, HIV tests and other blood tests, as well as pharyngeal and anal swabs, have all become considerably more likely to be reported. Comprehensive testing remains more common among men whose practices put them at increased risk of infection, notably men who report UAIC and men with higher numbers of sexual partners. HIV-positive men are more likely to report comprehensive testing for STIs than HIV-negative and untested/unknown status men. This is presumably a result of sexual health screening being incorporated into routine HIV monitoring.[4] These findings are consistent with previous research about which GBM are most likely to present for testing.[2 13 16–18 20] The high rates of STI diagnoses among men reporting comprehensive testing lend weight to the recommendation that all sexually active GBM should be screened for a range of STIs each year, irrespective of sexual practice.[4]

Despite substantial improvements, the proportion of men reporting comprehensive testing continues to lag well behind

Table 4 Factors associated with comprehensive STI testing by HIV-positive men in 2012

	No comprehensive testing (n=243) n (%)	Comprehensive testing* (n=325) n (%)	Unadjusted OR (95% CI)	p Value	Adjusted OR (95% CI)	p Value
Age in years (M, SD)	46.6 (10.5)	42.7 (10.0)	0.96 (0.95 to 0.98)	<0.001	0.98 (0.96 to 1.00)	0.048
Free time spent with gay men						
None/some	149 (61.3)	149 (45.8)	1.00		1.00	
A lot	94 (38.7)	176 (54.2)	1.87 (1.34 to 2.63)	<0.001	1.51 (1.01 to 2.27)	0.04
Education						
Has not attended university	143 (58.8)	183 (56.3)	1.00			
University degree	100 (41.2)	142 (43.7)	1.11 (0.79 to 1.55)	0.54		
Employment						
Not in paid employment	80 (32.9)	86 (26.5)	1.00			
Any paid employment	163 (67.1)	239 (73.5)	1.36 (0.95 to 1.96)	0.09		
Residential location						
Regional area	18 (7.4)	40 (12.3)	1.00			
City/metropolitan area	225 (92.6)	285 (87.7)	0.57 (0.32 to 1.02)	0.06		
Sexual identity						
Bisexual/heterosexual/other	12 (4.9)	19 (5.8)	1.00			
Gay/homosexual	231 (95.1)	306 (94.2)	0.84 (0.40 to 1.76)	0.64		
Number of male sex partners in last 6 months						
None	61 (25.4)	17 (5.3)	1.00		1.00	
1–10	126 (52.5)	144 (44.6)	4.10 (2.23 to 7.39)	<0.001	1.76 (0.79 to 3.93)	0.17
More than 10	53 (22.1)	162 (50.2)	10.97 (5.90 to 20.40)	<0.001	2.66 (1.05 to 6.72)	0.04
Sex with casual male partners in last 6 months						
No casual partners	104 (42.8)	44 (13.5)	1.00		1.00	
Casual sex but no anal intercourse	26 (10.7)	17 (5.2)	1.55 (0.76 to 3.13)	0.23	0.85 (0.36 to 2.04)	0.72
Condoms always used for anal intercourse	34 (14.0)	55 (16.9)	3.82 (2.20 to 6.65)	<0.001	1.84 (0.88 to 3.84)	0.11
Any unprotected anal intercourse	79 (32.5)	209 (64.3)	6.25 (4.04 to 9.68)	<0.001	1.90 (0.95 to 3.80)	0.07
Found male sex partners on internet in last 6 months						
No	164 (67.5)	116 (35.7)	1.00		1.00	
Yes	79 (32.5)	209 (64.3)	3.74 (2.63 to 5.32)	<0.001	1.42 (0.89 to 2.25)	0.14
Diagnosed with any STI (other than HIV) in last 12 months						
No	225 (92.6)	202 (62.2)	1.00		1.00	
Yes	18 (7.4)	123 (37.8)	7.61 (4.48 to 12.93)	<0.001	4.56 (2.54 to 8.20)	<0.001
On antiretroviral treatment for HIV at the time of the survey						
No	45 (18.5)	74 (22.8)	1.00			
Yes	198 (81.5)	251 (77.2)	0.77 (0.51 to 1.17)	0.22		
Last HIV viral load test result						
Detectable/don't know	47 (19.3)	74 (22.8)	1.00			
Undetectable	196 (80.7)	251 (77.2)	0.81 (0.54 to 1.23)	0.32		
Any illicit drug use in last 6 months						
No	74 (30.5)	36 (11.1)	1.00		1.00	
Yes	169 (69.5)	289 (88.9)	3.52 (2.26 to 5.46)	<0.001	1.77 (1.06 to 2.93)	0.03
Recruitment venue						
Gay community events	100 (41.2)	146 (44.9)	1.00		1.00	
Sexual health clinics	63 (25.9)	49 (15.1)	0.53 (0.34 to 0.84)	0.006	0.64 (0.37 to 1.10)	0.11
Social venues (eg, bars)	55 (22.6)	83 (25.5)	1.03 (0.68 to 1.58)	0.88	0.78 (0.47 to 1.28)	0.32
Sex-on-premises venues	25 (10.3)	47 (14.5)	1.29 (0.74 to 2.23)	0.37	1.06 (0.56 to 2.01)	0.86

*Comprehensive testing is defined as at least four different STI tests in the 12 months prior to survey, not including HIV testing.
STI, sexually transmissible infection.

those who have had any STI or HIV test in the previous year, illustrating that opportunities to perform comprehensive testing continue to be missed. Our findings echo previous research that found that anal and throat swabs are less likely to be reported by GBM compared with other types of specimen collection,[13] suggesting a continuing lack of adherence to testing guidelines.[4] This underlines the importance of the ongoing promotion of testing guidelines to GBM and their doctors. The observed higher rates of STI diagnosis among GBM who undergo comprehensive testing, regardless of their sexual practices, underline the importance of promoting a full STI screen for GBM at least once a year, irrespective of sexual practice. In Australia, this recommendation needs to be particularly promoted to general practitioners because they undertake the bulk of HIV/STI testing.[12] In terms of the development of international STI testing guidelines, our results suggest that 'risk profiling' may be useful in identifying GBM who would benefit from more frequent screening, but a focus on specific sexual

practices should not impede the promotion of a minimum screening frequency for sexually active GBM, such as once or twice a year.[7]

Some limitations of our study should be borne in mind. The GCPS specifically target sexually active GBM in metropolitan areas of Australia.[14] The sample is, therefore, not representative of all GBM in Australia, who may be younger, less educated and have fewer recent sexual partners.[14 21 22] Our sample does, however, provide a good representation of men at high risk for HIV and other STIs.[1 4 14] Because of the repeated, cross-sectional design it is not possible to identify changes in patterns of testing over time among the same individuals or groups of men, nor can we identify specific drivers of comprehensive testing or STI diagnoses. It should also be noted that our definition of comprehensive STI testing does not capture whether men had a range of STI tests on the same or different occasions (given the recall period was the 12 months prior to survey). Lastly, the reliance on self-report data means that the levels of STI testing presented here may be inflated by social desirability and recall biases.[2]

Despite these limitations, our analysis demonstrates that comprehensive STI testing has become more common over time among GBM in the three most populous states in Australia, and is more common among men for whom more frequent testing is recommended. We consider this to be at least partially the result of concerted efforts to promote comprehensive testing in educational campaigns, the development of testing guidelines and the use of automated reminders for patients and doctors.[4 9–12] However, our findings also show that a substantial proportion of GBM in Melbourne, Sydney and Queensland do not benefit from comprehensive STI testing, because they do not present for testing, are not offered testing, or receive some but not all of the recommended tests. Identifying why doctors only offer a limited range of tests when GBM request testing, for example, would merit further research.

Our findings suggest that efforts to publicise and encourage comprehensive STI and HIV testing among GBM in Melbourne, Sydney and Queensland have been partially successful. We encourage the development and implementation of effective strategies to increase the uptake and comprehensiveness of testing, particularly the promotion of regular comprehensive testing for all sexually active GBM, regardless of sexual practice.

Key messages

- Since 2003, substantially more gay and bisexual men in Melbourne, Sydney and Queensland report comprehensive sexually transmissible infections (STI) testing (at least four tests from different anatomical sites in the previous year).
- Comprehensive testing is most likely among men who engage in practices that put them at increased risk of STIs, and is associated with a substantially higher rate of STI diagnosis.
- Despite improvements over time, opportunities for comprehensive testing are still being missed, suggesting a need for the ongoing promotion of comprehensive testing.

Correction notice This article has been corrected since it was published Online First. In table 2, the two subgroups 'No anal intercourse with casual male partners' have been amended to 'No unprotected anal intercourse with casual male partners'.

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