Chlamydia Trends in Men Who Have Sex With Men Attending Sexual Health Services in Australia, 2004–2008

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Background: In most Australian settings, chlamydia notifications do not contain information on the gender of sexual partners. We assessed trends and predictors of chlamydia testing and positivity among men who have sex with men (MSM), attending sexual health services in Australia.

Methods: The Australian Collaboration for Chlamydia Enhanced Sentinel Surveillance (ACCESS) program was established in 2008 to collate demographic and chlamydia testing information from 25 sexual health services. We calculated the proportion tested and chlamydia positivity among MSM and assessed trends from 2004 to 2008 using a χ^2 test and predictors using logistic regression.

Results: In the 5-year period, 11,777 MSM attended as new patients (first visit ever to the service) and the proportion tested for chlamydia increased significantly from 71% in 2004 to 79% in 2008 ($P < 0.01$). Independent predictors of chlamydia testing were younger age, residing in a metropolitan area (adjusted prevalence ratio [APR] = 1.23; 95% confidence interval [CI]: 1.19, 1.27), being Australian-born (APR = 1.03; 95% CI: 1.01, 1.06), being a traveler or migrant (APR = 1.09; 95% CI: 1.06, 1.12), and sex overseas in the past year (APR = 1.05; 95% CI: 1.03, 1.07). Overall chlamydia positivity was 8.6% (95% CI: 8.0%–9.2%). There was no significant trend in chlamydia positivity between 2004 and 2008. Independent predictors of chlamydia positivity

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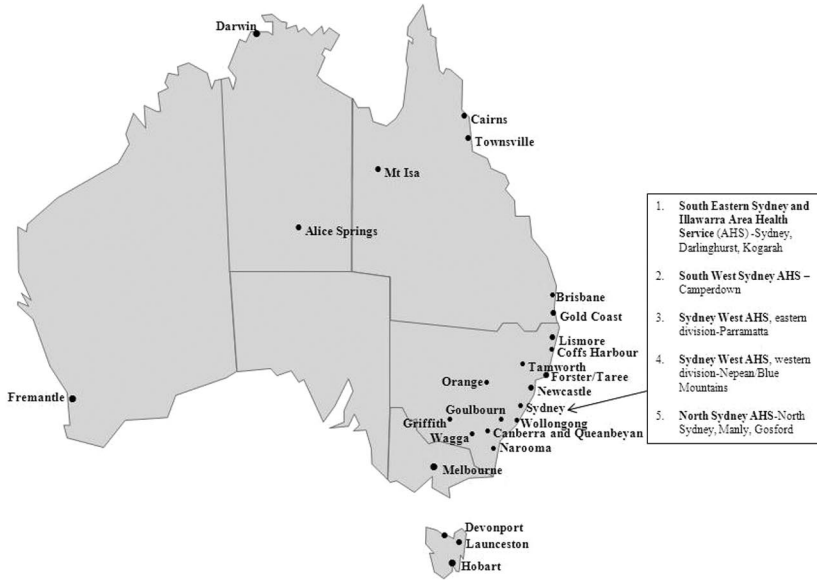


Figure 1. Geographical location of sexual health services in major cities in Australia.

were younger age, being a traveler or migrant (APR = 1.52; 95% CI: 1.26–1.84), and exclusive same-sex contact (APR = 1.28; 95% CI: 1.05–1.55).

Conclusions: This new national surveillance program demonstrates that the majority of MSM attending sexual health services was offered chlamydia testing and testing has increased over time. The MSM at highest risk of chlamydia were more likely to be tested. Chlamydia transmission was frequent but stable among MSM accessing clinical services.

Chlamydial infection is transmitted sexually, and can occur in the genitourinary tract and rectum and oropharynx in men who have sex with men (MSM). The infection causes morbidity in its own right, but is of additional public health importance in MSM because of its potential to increase the risk of acquisition and transmissibility of human immunodeficiency virus (HIV).[1,2] Regular testing is recognized as a key public health control strategy for chlamydia, as infection is mostly asymptomatic[3–5] and can be transmitted unknowingly if left undiagnosed. Enhancements to the detection and management of chlamydia also represent a strategy for reducing the transmission of HIV infection.[6] Sexually Transmissible Infection Testing Guidelines for MSM in Australia recommend testing for HIV and sexually transmitted infections (STIs) at least once a year for all MSM, regardless of whether they had symptoms.[7] The guidelines also call for rectal and urine testing for chlamydia.[7]

Our understanding of the pattern of chlamydia in the Australian population has largely been based on reported diagnoses, which have an uncertain relationship to the prevalence and incidence of infection, as they depend strongly on the pattern of testing. Nationally, *Chlamydia trachomatis* is the most commonly reported notifiable disease. The number of notifications has risen steadily in the past decade, from 16,964 in 2000 to 62,687 in 2009, with 41% of notifications reported in men,[5] but a number of ecological analyses have demonstrated that both chlamydia notifications and chlamydia tests are increasing at similar rates,[8–10] so there may not be a real increase in prevalence. In most Australian settings, chlamydia notifications do not contain information on the gender of sexual partners. One published article assessed chlamydia trends in MSM based on notifications of males in urban areas aged 20 to 39 years, a group which consists primarily of men who only have sex with women.[11]

Sentinel surveillance through sexual health services offers an opportunity to supplement data reported in the passive surveillance system by providing information on trends in the uptake of chlamydia testing and the proportion testing positive over time.[12] Sexual health services are widely dispersed across Australia and provide clinical services to a range of populations at risk, including MSM.[13] Approximately one-third of gay men in Australia report that their last STI test was conducted at a sexual health clinic (I. Zablotska, personal communication, 2010).

In this article, the first results on MSM derived from a national chlamydia sentinel surveillance system, the Australian Collaboration for Chlamydia Enhanced Sentinel Surveillance (ACCESS) program are reported.

METHODS

The ACCESS methods have been described in detailed elsewhere[14] and more detail can also be available at www.access-study.org. In summary, the Australian Government funded the National Centre in HIV Epidemiology and Clinical Research (NCHECR) and the Burnet Institute to implement 6 sentinel networks for surveillance of chlamydia testing and positivity in collaboration with the National Serological Reference Laboratory and the National Perinatal Statistics Unit.

One of the 6 networks involves 25 sexual health services and is managed by NCHECR in collaboration with a steering committee including representation from sexual health services. This network includes most of the largest sexual health services in Australia. These services are located across all states and territories, except South Australia (Fig. 1); 16 are located in metropolitan areas and 9 in regional/remote areas (Fig. 1). The sexual health service in South Australia was unable to participate due to database incompatibilities.

All of sexual health services use computerized medical records systems to collect information as part of routine care. On a 6-monthly basis, the services provide a core set of data

variables to NCHECR including a patient unique identifier, sex, age, postcode, country of birth, Aboriginal and/or Torres Strait Islander status, the gender of sexual partner/second in the past 12 months, history of current sex work, sex overseas in the last 12 months and traveler/migrant status defined as arrival in Australia in the last 2 years, and the date and outcome of the chlamydia test.

Only 1 of the 18 services, the Sydney Sexual Health Centre, was able to provide data to ACCESS on the specimen site (rectal, urogenital). Sydney is where the greatest population of MSM live in Australia.[15] Other sexual health services routinely conduct rectal testing in MSM but only record the site information if a diagnosis occurs.

Sydney Sexual Health Centre was also the only site able to provide data on the presence of anogenital symptoms at the time of chlamydia testing. MSM were recorded as symptomatic if the clinician documented that the patient reported any anogenital symptoms, though these may have been unrelated to chlamydia.

Information extracted from sites is deidentified before being forwarded in a line-listed format to a central database at NCHECR.

Statistical Analysis

We analyzed data on all MSM attending sexual health services during the 5-year period from January 1, 2004 to December 31, 2008. Of the 25 participating services, 18 were able to provide 5 years of retrospective data from 2004 to 2008 and the other 7 services provided between 1 and 4 years of data. We conducted all analyses with 18 services that provided data between 2004 and 2008.

New patients were defined as MSM attending the sexual health service for the first time ever. We used the term MSM to describe both men reporting sex only with men in the last 12 months (homosexual men) and men who reported sex with both men and women (bisexual men) in the last 12 months. The term traveler or migrant was used to describe patients who had arrived from another country in Australia in the current previous calendar year.

Patient Profile

Area of residence was based on the patient's postcode of residence and categorized into metropolitan, and regional/remote areas based on the Australian Bureau of Statistics geographical remoteness classification system.[16] At the Sydney Sexual health Centre, the presence of anogenital symptoms was described.

Chlamydia Testing Rate

The proportion of MSM tested on their first visit to the service was calculated each year. A Chi square test for trend was used to determine if there was a significant trend in the annual proportion of MSM undergoing a chlamydia test on their first visit. We also calculated the proportion of men not tested at first visit who went on to have a chlamydia test in a subsequent visit that year.

Chlamydia Positivity Rate

The proportion of new MSM patients diagnosed with chlamydia (chlamydia positivity) was calculated by the number of positive test results divided by the total number of test results. Indeterminate chlamydia results were excluded from this calculation. The overall chlamydia positivity estimate was a summary of the test results from all anatomical sites. If multiple sites were tested in a patient (rectal and urine), the patient was classified as positive for chlamydia if at least 1 site was positive.

At Sydney Sexual health Centre, chlamydia positivity was stratified by the presence or otherwise of anogenital symptoms at the time of the chlamydia testing. Rectal swab and urine chlamydia positivity was also calculated in MSM patients.

A Chi square test for trend was used to determine whether there was a significant change in annual chlamydia positivity in MSM over time.

Predictors of Chlamydia Testing and Positivity

Univariate and multivariate logistic regression analysis was undertaken to identify factors independently associated with chlamydia testing and positivity. The multivariate models considered all variables statistically significant ($P < 0.05$) in the univariate analysis and used forward stepwise methods. Prevalence ratios and 95% confidence intervals (CIs) were calculated for the associations with chlamydia testing and odds ratio and 95% CIs were calculated for the associations with chlamydia positivity.

Stata statistical software was used to conduct all analyses.[17] A cut off of $P < 0.05$ was used for all statistical tests.

Testing

Chlamydia testing by nucleic acid amplification tests is standard in sexual health services across Australia.[18]

Ethics

The project was approved by 24 Human Research Ethics Committees.

RESULTS

New MSM Patients

Of the total MSM patient attending the services, 11,777 MSM presented for the first time (new patients), which accounted for about 8% of total new patients. Of these, 9199 (78%) were homosexual and 2578 (22%) were bisexual. The median age of new MSM patients was 31 years, 80% resided in a metropolitan area, 65% were born in Australia, 26% reported sex overseas in the previous 12 months and 13% were categorized as a traveler or migrant (Table 1).

At the Sydney Sexual Health Centre, 28% of new MSM patients presented with anogenital symptoms and this proportion was stable over time (Table 1).

Characteristics of Bisexual Men Compared to Homosexual Men

The age breakdown of bisexual men was significantly different to homosexual men ($P < 0.001$) with a lower proportion aged 20 to 29 years (35%) and higher proportion aged 40 years or above (31%) compared to homosexual men where the proportions were 41% and 24%, respectively. A significantly higher proportion of bisexual men (25%) resided in nonmetropolitan areas compared to only 19% of homosexual men ($P < 0.001$) and a significantly higher proportion of bisexual men were Australian born (69%) compared to homosexual men (64%) ($P < 0.001$). A significantly lower proportion of bisexual men were recorded as travelers or migrants (8%) compared to homosexual men (14%) ($P < 0.001$).

TABLE 1. Characteristics of MSM Patients, ACCESS Sexual Health Service Network, 2004–2008

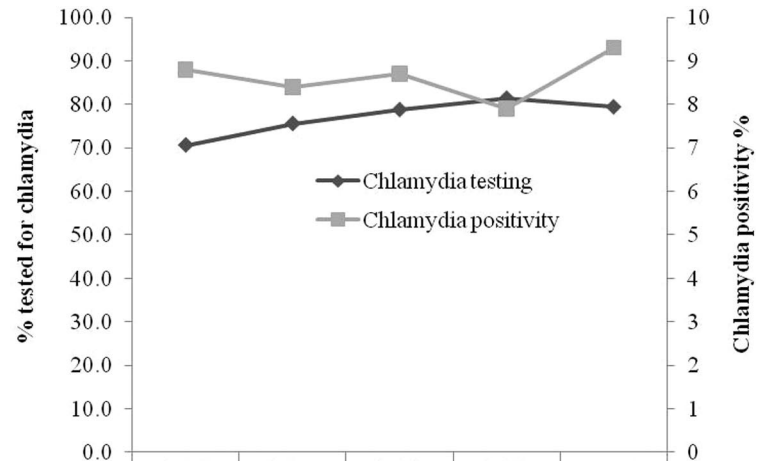
Characteristics	Overall n (%)	First Visit 2004–2008* 2004 n (%)	2005 n (%)	2006 n (%)	2007 n (%)	2008 n (%)
All 18 services						
Overall	11,777	2295	2352	2272	2415	2443
Median age (IQR)	31 (25–40)	32 (25–40)	31 (25–40)	31 (25–40)	30 (24–40)	30 (24–39)
Age group (yr)						
<20	635 (5)	122 (5)	115 (5)	115 (5)	138 (6)	145 (6)
20–29	4698 (40)	846 (37)	925 (39)	908 (40)	995 (41)	1024 (42)
30–39	3450 (29)	746 (33)	715 (30)	664 (29)	660 (27)	665 (27)
40–49	1909 (16)	373 (16)	382 (16)	367 (16)	392 (16)	395 (16)
50+	1084 (9)	208 (9)	215 (9)	217 (10)	230 (10)	214 (9)
Aboriginal and/or Torres Strait Islander	303 (2)	38 (2)	47 (2)	34 (2)	52 (2)	32 (1)
Australia born	7684 (65)	1497 (65)	1578 (67)	1485 (65)	1576 (65)	1548 (63)
Exclusive homosexual	9199 (78)	1729 (75)	1797 (76)	1774 (78)	1937 (80)	1962 (80)
Bisexual	2578 (22)	566 (25)	555 (24)	498 (22)	478 (20)	481 (20)
Traveler or migrant†	1488 (13)	249 (11)	232 (10)	278 (12)	339 (14)	390 (16)
Sex overseas (past year)	3026 (26)	491 (21)	577 (25)	581 (26)	677 (28)	700 (29)
Metropolitan residence	9408 (80)	1795 (78)	1867 (79)	1816 (80)	1977 (82)	1953 (80)
Tested for chlamydia	9093 (77)	1620 (71)	1777 (76)	1790 (79)	1966 (81)	1940 (79)
Tested at a further visit	1349 (12)	228 (10)	274 (12)	205 (9)	266 (11)	376 (5)
Not tested that year	1335 (11)	447 (19%)	301 (13)	277 (12)	183 (8)	127 (5)
1 service‡						
Anogenital symptoms	1282 (28)	255 (29)	251 (27)	285 (31)	279 (29)	212 (24)

*Data from 1 service only available between 2006 and 2008.
†Patients arrived in Australia within 2 years.
‡Patients arrived in Australia within 2 years.
IQR indicates inter-quartile range; MSM, men who have sex with men; ACCESS, Australian Collaboration for Chlamydia Enhanced Sentinel Surveillance; IQR, interquartile range.

Chlamydia Testing

Across the 18 services, overall 77% of MSM were tested for chlamydia on their first visit, with another 11% tested at a subsequent visit in the same year (Table 1). The proportion tested at first visit increased significantly over time from 71% in 2004 to 79% in 2008 ($P < 0.01$) (Fig. 2). The testing rates were >60% in 14 of the 18 clinics and varied from a low of 24.7% to a high of 90.1% per clinic (Table 2, Fig. 3).

Univariate and multivariate predictors of being tested for chlamydia on the first visit to the clinic were being aged less



	2004	2005	2006	2007	2008
Chlamydia testing	70.6	75.6	78.8	81.4	79.4
Chlamydia positivity	8.8	8.4	8.7	7.9	9.3

Figure 2. Chlamydia testing and positivity in new MSM patients by year, ACCESS sexual health service network, 2004–2008.

TABLE 2. Chlamydia Testing in New MSM Patients, Tested by Clinic, 2004–2008

Site	New MSM Patients n	Tested n	Tested %
1	364	90	24.7
2	362	197	54.4
3	850	488	57.4
4	177	102	57.6
5	567	345	60.8
6	141	90	63.8
7	250	167	66.8
8	147	99	67.3
9	266	190	71.4
10	1302	964	74.0
11	469	350	74.6
12	309	236	76.4
13	230	185	80.4
14	327	266	81.3
15	806	660	81.9
16	90	75	83.3
17	569	510	89.6
18	4551	4099	90.1
All clinics	11,777	9093	77.2

MSM indicates men who have sex with men.

than 35 years, residing in a metropolitan area, being Australian-born, being a traveler or migrant, and reporting sex overseas in the past year. Those recorded as Aboriginal and/or Torres Strait Islander were significantly less likely to be tested for chlamydia on their first visit to the sexual health service (Table 3).

At the Sydney Sexual Health Centre, the ratio of rectal specimens to urethral specimens was 0.83 (611 vs. 740, respectively) in 2004, increasing to 0.94 (748 vs. 979, respectively) in 2008 (Table 4).

Chlamydia Positivity

The overall chlamydia positivity among new MSM patients attending the 18 services in the period was 8.6% (95% CI: 8.0%–9.2%) with no significant trend between 2004 and 2008 (Fig. 2).

Univariate predictors of being diagnosed with chlamydia were being aged less than 35 years, reporting exclusive homosexual contact in the past year, being born overseas, being a traveler or migrant and, reporting sex overseas in the past year. In the multivariate analysis, all these factors remained significant except for sex overseas in the last year and being overseas born (Table 3).

At the Sydney Sexual Health Centre, the overall chlamydia positivity in new MSM patients was 7.3% in asymptomatic men and 10.5% in symptomatic men (Table 4) and rectal chlamydia positivity was 6.7% and it was 4.3% for urine specimens (Table 4).

DISCUSSION

The sexual health services participating in the ACCESS network examined over 10,000 new MSM patients between 2004 and 2008. A very high proportion (71%) was tested for chlamydia when they first presented and the level of testing increased significantly between 2004 and 2008. The overall chlamydia positivity remained constant at around 8.0%.

When testing rates are very high in populations, chlamydia positivity in clinical services can be an accurate indicator of trends in chlamydia prevalence in the population being tested.[19] Our data suggest that the transmission of chlamydia is stable in Australian MSM. Notably in the community-based cohort of over 1000 MSM in Sydney, there was no increase in the incidence of chlamydia between 2003 and 2007.[18] However, it is possible a rise in prevalence was masked by an increase over time in the proportion of lower-risk men attending the clinic. Annual behavioral surveys in Australia have demonstrated that STI testing in gay men has increased considerably over the period of our analysis,[20] but systematic information was not available through ACCESS on the change over time, if any, in the risk profile (for example, number of sexual partners) of clinic patients.

Most sexual health services routinely collect variables such as the gender and number of recent sexual partners and condom use. These variables were not transferred to ACCESS as the new sentinel surveillance system mainly aimed to assess the feasibility

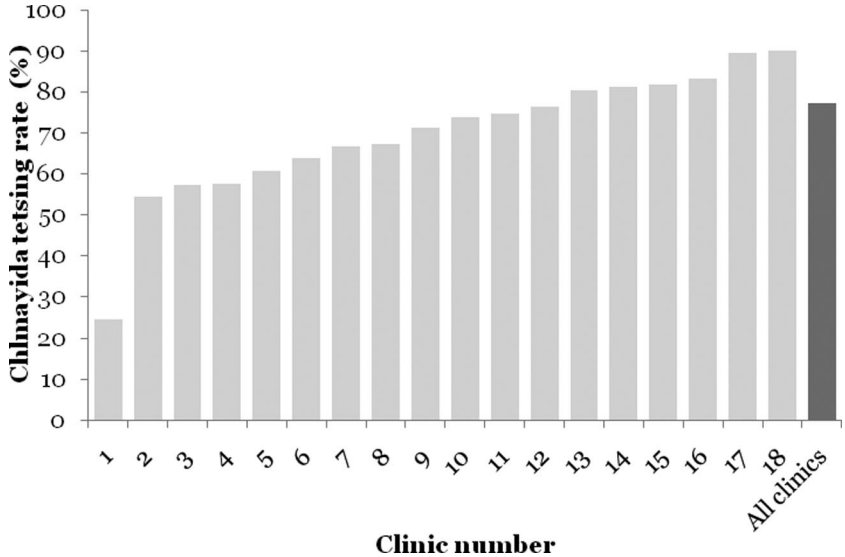


Figure 3. Chlamydia testing and positivity in new MSM patients tested, by clinic, 2004–2008.

TABLE 3. Predictors of Chlamydia Testing and Positivity Among New MSM Patients, ACCESS Sexual Health Service Network, 2004–2008

	Chlamydia Testing				Chlamydia Positivity			
	Univariate		Multivariate		Univariate		Multivariate	
	Prevalence Ratio (95% CI)	*P*	Prevalence Ratio (95% CI)	*P*	Odds Ratio (95% CI)	*P*	Odds Ratio (95% CI)	*P*
Age group (yr)								
≤24 yr	1.10 (1.09, 1.13)	<0.001	1.07 (1.05, 1.10)	<0.001	1.35 (1.11, 1.63)	0.002	1.29 (1.06, 1.56)	0.010
25–34 yr	1.11 (1.04, 1.14)	<0.001	1.06 (1.04, 1.09)	<0.001	1.26 (1.06, 1.50)	0.010	1.16 (0.97, 1.38)	0.107
35+			1		1			
Aboriginal and/or Torres Strait Islander								
No	1		1		1		—	—
Yes	0.81 (0.72, 0.90)	<0.001	0.89 (0.81, 0.98)	0.038	1.12 (0.62, 2.04)	0.710	—	—
Australian born								
No	1.11 (1.09, 1.14)	<0.001	1.03 (1.01, 1.06)	0.01	1.26 (1.08, 1.46)	0.003	—	—
Yes	1		1		1		—	—
Sexual partners in the last year								
Homosexual	1				1.34 (1.10, 1.62)	0.003	1.28 (1.05, 1.55)	0.013
Bisexual	1.01 (0.98, 1.03)	0.800			1		1	
Traveler or migrant*								
No	1		1		1		1	
Yes	1.19 (1.17, 1.22)	<0.001	1.09 (1.06, 1.12)	<0.001	1.59 (1.32, 1.91)	<0.001	1.52 (1.26, 1.84)	<0.001
Sex overseas in the last year								
No	1		1		1		—	—
Yes	1.12 (1.10, 1.14)	<0.001	1.05 (1.03, 1.07)	<0.001	1.26 (1.08, 1.48)	0.004	—	—
Area of residence								
Regional/rural	1		1		1		—	—
Metropolitan	1.27 (1.23, 1.31)	<0.001	1.23 (1.19, 1.27)	<0.001	0.90 (0.74, 1.08)	0.254	—	—

*Patients arrived in Australia within 2 years.
MSM indicates men who have sex with men; ACCESS, Australian Collaboration for Chlamydia Enhanced Sentinel Surveillance; CI, confidence interval.

of establishing a network of sites for estimation of chlamydia positivity. In the next phase of ACCESS, we intend collect additional variables such as sexual behavior and HIV status.

Although the overall testing rate was high, it was influenced by 1 large clinic who had the largest MSM client load and highest testing rate (90.1%). Testing rates in 7 other clinics were between 50% and 70%, which suggest there could be opportunities for improved screening in some services. That being said, testing rates based on new patients will slightly underestimate the true annual testing rate as our analysis showed that 11% of MSM of men did not receive a test at their first visit but went on to have a chlamydia test as part of a subsequent visit that year. A reason for not being tested on first visit may be because patients were referred for management of an STI diagnosis diagnosed at another clinic.

Although chlamydia was more common in symptomatic men, it was also detected in a substantial proportion of asymptomatic men. These findings support clinical guidelines that recommend HIV/STI testing at least once a year in MSM regardless of symptoms.[7]

TABLE 4. Chlamydia Positivity Stratified by Anatomical Site and Anogenital Symptoms in New MSM Patients Tested, Sydney Sexual Health Centre, 2004–2008

		Tests (n) and Chlamydia Positivity (%)					
Breakdown	Category	Overall n (%)	2004 n (%)	2005 n (%)	2006 n (%)	2007 n (%)	2008 n (%)
Site	Any site	4099 (9.1)	750 (7.9)	806 (8.8)	844 (10.1)	889 (9.2)	810 (9.3)
	Rectal	3650 (6.7)	611 (6.1)	707 (7.1)	783 (6.9)	801 (6.2)	748 (7.4)
	Urethral	4043 (4.3)	740 (4.6)	800 (3.6)	828 (5.1)	878 (4.3)	797 (5.0)
Anogenital symptoms	Yes	1282 (10.5)	255 (7.8)	251 (11.6)	285 (10.5)	279 (10.8)	212 (12.3)
	No	3269 (7.3)	626 (6.2)	666 (6.3)	647 (8.5)	674 (7.7)	656 (7.5)

MSM indicates men who have sex with men.

At Sydney Sexual Health Centre, the only site able to transfer data on rectal testing, it was demonstrated that by 2008 nearly all men who underwent testing for chlamydia had both a rectal and urine sample collected, consistent with clinical guidelines. Rectal testing is important as many MSM are infected rectally and not urogenitally. This was demonstrated by our analysis where chlamydial infection was more common in rectal swabs (6.7%) than urine samples (4.3%), consistent with the finding from a Sydney cohort of HIV negative men, in whom the baseline prevalences of rectal and urethral chlamydia infection were 4.4% and 0.9% respectively in 2003, and the incidences 7.4 and 5.0 per 100 person years in 2003–2005, respectively.[3]

Our analysis demonstrated that MSM aged less than 35 years were more likely to test positive for chlamydia than older men and, appropriately, a higher proportion in this younger age group were tested for chlamydia when they first attended the service. This higher positivity in younger MSM is also consistent with results from the Sydney HIV-negative MSM cohort.[3]

There were also higher chlamydia positivity and testing rates in MSM who reported sex overseas in the past year, and in those who had recently arrived in Australia. Australia receives about 6 million visitors per year but only 150,000 migrants so it is likely that the majority of recent arrivals was in fact travelers rather than migrants.[21] The increased risk of chlamydia associated with overseas travel or partner from overseas has also been observed among heterosexuals in Sydney.[22,23]

Among MSM, those who were exclusively homosexual were more likely to test positive, but less likely to be tested for chlamydia than men who had sex with both men and women. This finding may be due to more homosexual men being in regular relationships and clinicians not perceiving that these men require STI testing. The higher chlamydia positivity in homosexual men could be a explained by the higher levels of risk behavior compared to bisexual men.[24] It is possible that people who have been traveling have been putting themselves at greater risk and that they are more likely to recognize that risk. Equally, chlamydia prevalences may be higher in other countries.

The ACCESS system has some methodological limitations. First, clinic attendees are not necessarily representative of the entire population of MSM. However, it is reasonable to compare findings from year to year and infer population trends, provided there is not a major change in testing patterns or the profile of patients attending each year. The restriction of the analysis to new patients was intended to minimize this potential bias and provide accurate chlamydia positivity estimates for surveillance purposes.[25] Second, rectal testing data were only available from Sydney Sexual Health Centre limiting the ability to assess national uptake of rectal testing. The next phase of ACCESS intends to explore ways to improve the completeness of this information. Finally, the small sample sizes at some clinics precluded any meaningful analysis of clinic-level positivity trends. There was likely to be heterogeneity among the 18 participating clinics in terms of positivity, which was masked by their aggregation.

Overall, this new national sentinel surveillance program is able to describe chlamydia testing and positivity among high-risk populations, including MSM, for chlamydia infection in Australia. The chlamydia positivity estimates suggest that over a 5-year period the transmission of chlamydia was frequent, but stable in MSM attending sexual health services.

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