

## Chlamydia testing and retesting patterns at family planning clinics in Australia

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**Abstract.** *Introduction:* National guidelines recommend opportunistic chlamydia screening of sexually active 16- to 29-year-olds and encourage retesting 3–12 months after a diagnosed chlamydia (*Chlamydia trachomatis*) infection. We assessed chlamydia testing patterns at five Australian family planning clinics (FPCs). *Methods:* Using routine clinic data from 16- to 29-year-olds, we calculated chlamydia testing and positivity rates in 2008–2009. Reattendance, retesting and positivity rates at retesting within 1.5–4 and 1.5–12 months of a positive result were calculated. *Results:* Over 2 years, 13 690 individuals aged 16–29 years attended five FPCs (93% female). In 2008, 3159 females (41.4%), and 263 males (57.0%) were tested for chlamydia; positivity was 8% and 19%, respectively. In 2009, 3178 females (39.6%) and 295 males (57.2%) were tested; positivity was 8% and 23%, respectively. Of 7637 females attending in 2008, 38% also attended in 2009, of which 20% were tested both years. Within 1.5–4 months of a positive test, 83 (31.1%) females reattended; the retesting rate was 13% and 12% retested positive. Within 1.5–12 months of a positive test, 96 (57.5%) females reattended; the retesting rate was 36% and 13% retested positive. *Conclusions:* Approximately 40% of young people attending FPCs were tested for chlamydia but a smaller proportion were tested annually or were retested following chlamydia infection. High positivity rates emphasise that FPCs see a high-risk population. To maximise testing opportunities, clinical prompts, patient reminder systems and non-clinic testing strategies may be needed.

**Additional keywords:** *C. trachomatis*, positivity, screening, young people.

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### Introduction

Chlamydia (*Chlamydia trachomatis*) is the most notified infection in Australia and is a major cause of reproductive morbidity.<sup>1,2</sup> The highest proportion of reported chlamydia infections are among women aged 15–24 years and men aged 16–29 years.<sup>3</sup> Studies have reported a prevalence of 4–7%<sup>4–6</sup> and an incidence of 4.4%<sup>7</sup> in women aged 16–25 years. Chlamydia infections are asymptomatic in up to 85% of men

and women,<sup>8</sup> and, left untreated, may lead to serious complications, including pelvic inflammatory disease (PID) and infertility in women, as well as the risk of transmission to sexual partners.<sup>8</sup>

Screening is an important component of comprehensive chlamydia prevention and control, particularly to detect and manage chlamydia in asymptomatic individuals.<sup>8–10</sup> Nucleic acid amplification testing on urine samples or self-collected

vaginal swabs – standard practice in laboratories servicing family planning clinics (FPCs) in Australia – have made chlamydia screening feasible and acceptable; chlamydia diagnosis is simple, sensitive and specific, and infections are effectively treated by single-dose oral antibiotics.<sup>8,11</sup> There is no single national recommendation for chlamydia testing among young people; the 2008 National Management Guidelines for Sexually Transmissible Infections (STIs) recommend opportunistically screening asymptomatic people aged 16 to 29 years for chlamydia.<sup>12</sup> General practitioner guidelines emphasise annually testing young females.<sup>13</sup> For individuals diagnosed with chlamydia, Australian guidelines recommend contact tracing of sex partners from the previous 6 months with chlamydia testing and presumptive treatment.<sup>14</sup>

Chlamydia reinfection is common, particularly in young people,<sup>15,16</sup> with a prospective Australian cohort finding that 22% of 16- to 25-year-old women were reinfected within 12 months.<sup>7</sup> Chlamydia reinfection substantially increases the risk of PID and infertility compared with a single infection.<sup>17,18</sup> Consequently, the 2008 National Management Guidelines for STIs encouraged retesting at 3 months following a chlamydia diagnosis in order to identify and manage reinfections,<sup>12</sup> and the general practice guidelines suggest 3–12 months.<sup>13</sup> Retesting before 6 weeks is uniformly not advised, given that tests may remain positive for up to 4 weeks<sup>19,20</sup> and a test of cure is not recommended.<sup>12,13</sup> Evidence supports retesting at 3–6 months after the infection as a compromise between maximising the number of detectable reinfections and ensuring prompt identification to reduce the reproductive morbidity associated with reinfection.<sup>16</sup>

FPCs offer a range of sexual and reproductive health services and, importantly, see large numbers of sexually active young people, particularly females – a priority population for chlamydia control. Nationwide, ~35 FPCs are run by the state and territory-based family planning organisations under the umbrella organisation Sexual Health and Family Planning Australia. There are no recent data that simultaneously explore chlamydia testing, positivity and retesting in the FPC setting in Australia – an important consideration for national testing policy. To this end, this paper describes chlamydia testing uptake, positivity and retesting patterns in 16- to 29-year-olds attending five large FPCs in Australia in 2008–2009.

## Methods

Data were derived from the Australian Collaboration for Chlamydia Enhanced Sentinel Surveillance (ACCESS) system, which comprises six networks in clinical settings and laboratories, each monitoring chlamydia testing uptake and positivity in populations at high risk of chlamydia. The ACCESS methods have been described in detail previously.<sup>21</sup> FPCs constitute one network, which assesses chlamydia testing and positivity in 16- to 29-year-olds.<sup>22</sup> Seven FPCs were purposely recruited based on their having a high case load of young patients (at least 500 patients aged 16–24 years per year) and a compatible patient management system. Using GRHANITE software (Health Informatics Unit, Rural Health Academic Centre, Melbourne Medical School, University of Melbourne), nonidentifiable routine clinical and chlamydia

testing data were extracted retrospectively from computerised records of all consultations in 2008–2009 involving 16- to 29-year-olds at participating clinics.<sup>23</sup> At some sites, test requests or results were not systematically entered, leading to incomplete testing or pathology data; consequently, we assessed chlamydia testing rates based on five FPC sites (three metropolitan and two regional locations), and positivity and retesting rates based on four sites.

The following definitions were applied to calculations: The chlamydia testing rate was the proportion of individuals (unduplicated) with a test request for chlamydia at least once in a 12-month period, by calendar year. Annual attendance was the proportion of individuals who attended in 2008 who also attended in 2009. The annual testing rate was the proportion of those who attended both years and were also tested in both years. The chlamydia positivity rate was the proportion of individuals tested who returned a positive result at any test in a 12-month period. Positivity rates were based only on individuals tested for whom a result was available. The reattendance rate was the proportion of individuals with a positive chlamydia test who reattended after the initial positive test in the given period for any reason. The retesting rate was the proportion of individuals with a positive chlamydia test who had a repeat test within the given time period and chlamydia positivity at retest was the proportion of individuals retested in the given period who tested positive at the first retest.

Reattendance and retesting rates after a chlamydia infection were analysed within two time periods measured from date of specimen collection at first positive test to the date of the subsequent reattendance or test request: 1.5–4 months (42–120 days), based on initial positive tests occurring from 1 January 2008–2 September 2009, and 1.5–12 months (42–365 days), based on initial positive tests occurring from 1 January–31 December 2008. The dates of initial positive tests vary by retest period to ensure adequate follow-up time.

Binomial 95% confidence intervals (CIs) were calculated for all rates. Differences in testing and positivity rates by sex and age group were determined using  $\chi^2$ -tests of proportion. Age group was based on age at first consultation in the 12-month period for testing and positivity rates, and based on age at first positive test for retesting rates. All analyses were conducted using Stata ver. 10 (StataCorp, College Station, TX, USA) with a significance level of 0.05.

Approval for the FPC Network was gained from human research ethics committees of the Royal Australian College of General Practitioners, Family Planning NSW and Family Planning Victoria. Other FPCs endorsed the approvals given by these ethical committees.

## Results

### *Patient demographics*

Between 2008 and 2009, a total of 15 918 16- to 29-year-olds attended the seven participating FPCs. The demographic profile of attendees of these sites are shown in Table 1.

At five clinics providing chlamydia test data in 2008 and 2009, 8098 and 8543 16- to 29-year-olds, respectively, attended each year, providing data on a total of 13 690 individuals (Table 1). The majority were female (93.3%), with a median

**Table 1. Demographic profile of 16- to 29-year-olds attending seven participating family planning clinic sites, 2008–2009**

Site no.	Individuals		Sex				Age group (years)					
	<i>n</i>	Female		Male		16–19		20–24		25–29		
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
1 <sup>A</sup>	3262	2922	90	340	10	817	25	1196	37	1249	38	
2 <sup>A</sup>	3455	3322	96	133	4	917	27	1547	45	991	29	
3	1184	1153	97	31	3	309	26	428	36	447	38	
4 <sup>A</sup>	1939	1879	97	60	3	661	34	793	41	485	25	
5	1044	1028	98	16	2	315	30	482	46	247	24	
6 <sup>A</sup>	1487	1417	95	70	5	546	37	539	36	402	27	
7 <sup>B</sup>	3547	3236	91	311	9	1546	44	1983	56	18	1	
Total (all) <sup>C</sup>	15 918	14 957	94	94	6	5111	32	6968	44	3839	24	
Total (included) <sup>D</sup>	13 690	12 776	93	93	7	4487	33	6058	44	3145	23	

<sup>A</sup>Included in chlamydia testing and positivity analysis.

<sup>B</sup>Included in chlamydia testing analysis only.

<sup>C</sup>Total numbers reflect all seven participating sites.

<sup>D</sup>Total numbers reflect five sites included in the testing analysis.

age of 22 years (interquartile range (IQR): 19–24); the median age of males was 20 years (IQR: 18–23).

#### Testing rates

In 2008, the chlamydia testing rate was 41.4% (site range: 24.7–52.5%) among females and 57.0% (23.8–79.0%) among males ( $P < 0.01$ ; Table 2). In 2009, the chlamydia testing rate was 39.6% (20.6–54.3%) among females and 57.2% (22.3–81.8%) among males ( $P < 0.01$ ). Testing rates differed by age group in both sexes. In females, testing rates decreased with increasing age group ( $P \leq 0.01$ ; Table 2); in males, testing rates were higher in 20- to 24-year-olds compared with other age groups ( $P < 0.01$ ; Table 2).

#### Annual testing

A higher proportion of females than males attended FPCs annually ( $P < 0.01$ ). Of females who attended in 2008, 2879 (37.7%) reattended in 2009; of males who attended in 2008, 63 (13.7%) reattended in 2009. Of females attending in both years, 1171 (40.7%) were tested in one year (2008 or 2009) and 570 (19.8%) were tested in both years; removing females who tested positive in 2008 did not alter this annual testing rate (18.5%;  $P = 0.22$ ). The proportion of 16- to 29-year-old females tested annually decreased with increasing age group from 25% (16- to 19-year-olds) to 21% (20- to 24-year-olds;  $P = 0.02$ ) and to 10% (25- to 29-year-olds;  $P < 0.01$ ). Of males attending in both years, 14 (22.2%) were tested in one year and 29 (46.0%) were tested in both years.

#### Positivity rates

In 2008, chlamydia positivity was 7.8% (site range: 3.1–13.2%) among females and 19.1% (10.8–34.6%) among males ( $P < 0.01$ ; Table 2). In 2009, chlamydia positivity was 8.0% (3.2–10.6%) among females and 22.6% (15.6–28.1%) among males ( $P < 0.01$ ). Among females, positivity decreased with each increasing age group ( $P < 0.01$ ; Table 2); among males, there was no detected difference in positivity by age group ( $P = 0.30$  in 2008 and  $P = 0.22$  in 2009).

#### Retesting

The retesting rates of females and males are presented in Table 3. Of 267 females testing positive between 1 January 2008 and 2 September 2009, 83 (31.1%) reattended within 1.5–4 months. Of these, 34 (41.0%) were retested – an overall retesting rate of 12.7% (95% CI: 9.0–17.3) within 1.5–4 months; positivity at retesting was 12% (95% CI: 3.4–28.2).

Of 167 females testing positive between 1 January and 31 December 2008, 96 (57.5%) reattended within 1.5–12 months. Of these, 60 (62.5%) were retested – an overall retesting rate of 35.9% (95% CI: 28.7–43.7) – within 1.5–12 months; positivity at retest was 13% (95% CI: 5.9–24.6).

#### Discussion

We measured chlamydia testing and retesting patterns over a 2-year period among young people attending five FPCs across Australia. Our analysis found that a substantial proportion of 16- to 29-year-old attendees were tested for chlamydia at least once in a 12-month period, but annual testing rates and retesting after a positive test were low. Chlamydia testing in the FPC setting yielded high positivity rates, including among individuals undergoing retests.

Our finding that around 40% of young female FPC clients were tested in a 12-month period demonstrates that chlamydia testing is a strong focus of FPCs. FPC testing rates appear to be higher than the 6–8% tested in general practice but lower than the ~80% tested in sexual health clinics.<sup>24,25</sup> Clinicians have reported that it is more difficult to introduce chlamydia testing when it does not relate to the presenting complaint.<sup>26</sup> Consequently, variations in testing rates between clinical settings are likely to reflect the main clinical services offered; most young people attending a general practice clinic present for reasons other than sexual health; in sexual health services, the primary reasons for attendance are sexual health-related; and in FPCs, patients may present for contraception, sexual health or other reproductive health matters. Also, guidelines and opinions vary as to whether chlamydia screening of young people should be selective according to risk profile such as multiple or new

**Table 2. Chlamydia testing and positivity rates within a 12-month period among 16- to 29-year-olds attending family planning clinics**  
CI, confidence interval

Age group (years)	2008				2009			
	Individuals <i>n</i>	Testing rate <sup>A</sup> % (95% CI)	Positivity rate <sup>B,C</sup> % (95% CI)	<i>P</i> -value	Individuals <i>n</i>	Testing rate <sup>A</sup> % (95% CI)	Positivity rate <sup>B,C</sup> % (95% CI)	<i>P</i> -value
<b>Females</b>								
16–19	2367	46.6 (44.6–48.6)	12.1 (9.5–14.6)		2430	46.8 (44.8–48.8)	13.0 (10.3–15.7)	
20–24	3456	43.3 (41.7–45.0)	7.7 (6.0–9.4)	0.01 <sup>D</sup>	3582	42.1 (40.5–43.7)	7.5 (5.8–9.3)	<0.01 <sup>D</sup>
25–29	1814	55.9 (50.8–61.0)	2.9 (1.5–4.3)	<0.01 <sup>E</sup>	2006	26.6 (24.6–28.5)	3.0 (1.6–4.5)	<0.01 <sup>E</sup>
Overall (16–29)	7637	41.4 (40.3–42.5)	7.8 (6.6–8.9)	<0.01 <sup>F</sup>	8018	39.6 (38.6–40.7)	8.0 (6.8–9.2)	<0.01 <sup>F</sup>
<b>Males</b>								
16–19	192	45.8 (38.7–52.9)	26.2 (12.3–40.1)		199	45.2 (38.3–52.2)	29.4 (13.3–45.5)	
20–24	209	67.9 (61.6–74.3)	18.2 (8.6–27.7)	<0.01 <sup>D</sup>	247	69.2 (63.4–75.0)	24.1 (14.4–33.7)	<0.01 <sup>D</sup>
25–29	60	55.0 (42.0–68.0)	12.1 (0.4–23.9)	0.06 <sup>E</sup>	70	48.6 (36.6–60.6)	12.1 (0.4–23.9)	<0.01 <sup>E</sup>
Overall (16–29)	461	57.0 (52.5–61.6)	19.1 (12.6–25.7)	<0.01 <sup>F</sup>	516	57.2 (52.9–61.5)	22.6 (15.7–29.5)	<0.01 <sup>F</sup>

<sup>A</sup>Testing rates are based on five sites where test requests were known; the testing rate is the proportion of individual attendees tested for chlamydia at least once in a 12-month period.  
<sup>B</sup>Positivity was estimated from data for four sites where test results were known; the positivity rate is the proportion of individuals returning a positive result at any test in a 12-month period.  
<sup>C</sup>Tests without results available were excluded from positivity estimates; test results were known for 99.3% of individuals tested in 2008 and 99.4% of individuals tested in 2009.  
<sup>D</sup> $\chi^2$ -test of proportions: 16- to 19-year-olds v. 20- to 24-year-olds.  
<sup>E</sup> $\chi^2$ -test of proportions: 20- to 24-year olds v. 25- to 29-year-olds.  
<sup>F</sup> $\chi^2$ -test of proportions: overall by three age groups.

**Table 3. Reattendance, retesting and repeat positivity within 1.5–4 and 1.5–12 months of an initial positive test at four family planning clinics**  
CI, confidence interval

Age group (years)	1.5–4 months				1.5–12 months			
	Individuals testing positive <sup>A</sup> <i>n</i>	Reattended after a positive test <i>n</i> (%) (95% CI)	Retested after a positive test <i>n</i> (%) (95% CI)	Positive at retest <sup>B,E</sup> <i>n</i> (%) (95% CI)	Individuals testing positive <sup>C</sup> <i>n</i>	Reattended after a positive test <i>n</i> (%) (95% CI)	Retested after a positive test <i>n</i> (%) (95% CI)	Positive at retest <sup>D,E</sup> <i>n</i> (%) (95% CI)
<b>Females</b>								
16–19	127	39 (30.7) (22.8–39.5)	16 (12.6) (7.4–19.7)	–	75	42 (56.0) (44.1–67.5)	31 (41.3) (30.1–53.3)	–
20–24	115	37 (32.2) (23.8–41.5)	16 (13.9) (8.2–21.6)	–	76	46 (60.5) (48.6–71.6)	25 (32.9) (22.5–44.6)	–
25–29	25	7 (28.0) (12.1–49.4)	2 (8.0) (1.0–26.0)	–	16	8 (50.0) (24.7–75.3)	4 (25.0) (7.3–52.4)	–
Overall (16–29)	267	83 (31.1) (25.6–37.0)	34 (12.7) (9.0–17.3)	4 (12.1) (3.4–28.2)	167	96 (57.5) (49.6–65.1)	60 (35.9) (28.7–43.7)	8 (13.3) (5.9–24.6)
<b>Males</b>								
16–19	16	5 (31.3) (11.0–58.7)	2 (12.5) (1.6–38.3)	–	11	4 (36.4) (10.9–69.2)	4 (16.7) (2.1–48.4)	–
20–24	20	4 (20.0) (5.7–43.7)	2 (10.0) (1.2–31.7)	–	12	3 (25.0) (5.5–57.2)	2 (0.0)	–
25–29	7	1 (14.3) (0.4–57.9)	0 (0.0–41.0) <sup>E</sup>	–	4	2 (50.0) (6.8–93.2)	0 (0.0–60.2) <sup>F</sup>	–
Overall (16–29)	43	10 (23.3) (11.8–38.6)	4 (9.3) (2.6–22.1)	1 (25.0) (0.6–80.6)	27	9 (33.3) (16.5–54.0)	6 (22.2) (8.6–42.3)	2 (33.3) (4.3–77.7)

<sup>A</sup>Individuals with an initial positive test between 1 January 2008 and 2 September 2009.

<sup>B</sup>Based on retests where a result is known; results are known for 37 (97.4%) of retests.

<sup>C</sup>Individuals with an initial positive test between 1 January 2008 and 31 December 2008.

<sup>D</sup>Based on retests where a result is known; results are known for 39 (100%) of retests.

<sup>E</sup>Age-specific proportions of positivity at retesting are not presented due to small sample sizes.

<sup>F</sup>One-sided, 97.5% CI.

recent partners<sup>27,28</sup> or based on age alone.<sup>8,12,13,29–31</sup> Such differences in local guidelines and practice may also have contributed to variations in testing rates between FPC sites. Other potential reasons why not all young people were tested include being tested elsewhere, being considered at low risk and patient refusal. However, the impact of each of these potential factors on testing is not known and qualitative research is needed to explore this further.

Although overall testing rates were reasonably high in either year, annual testing rates among repeat attendees at FPCs were lower. Despite over one-third of females attending in 2008 reattending the same clinic in 2009, only 20% of these annual attendees were tested in both years. Lower annual testing rates may reflect the lack of a clear mandate on the appropriate frequency of asymptomatic screening at the time of the study, with only general practice guidelines specifically calling for annual screening.<sup>13</sup>

Chlamydia positivity in this population was high and varied by age and sex. In addition, wide variation by site was observed, which may be attributable to variable testing guidelines, practice and local chlamydia prevalence, but is also subject to wide CIs. Among females, chlamydia positivity was highest in 16- to 19-year-olds followed by 20- to 24-year-olds, which confirms young age as an important risk factor for chlamydia in females,<sup>2,8</sup> and highlights the importance of asymptomatic testing and prevention education among this population. Our findings suggest that younger females who attend FPCs are a particularly high-risk population, and potentially provide a rationale for assessing chlamydia risk and testing behaviours in populations younger than 16 years, although this presents many ethical challenges. Interestingly, in this analysis, males were more likely than females to be tested for chlamydia and to test positive, which may be biased by numerous males attending FPCs as a contact of a female client who had tested positive for chlamydia (pers. comm. – FPC health staff). Consequently, they attend with the specific intention of being tested and are more likely to be positive.

Due to the high risk of reinfection with associated complications following an initial chlamydia infection, retesting is often advised 3–12 months after treatment. In this study, only 13% of females were retested within 1.5–4 months of a positive test despite 30% reattending during this period. Retesting increased to 36% by 12 months. There was a trend towards higher reattendance and retesting rates among females than males, although this was not statistically significant, probably due to small absolute numbers. The high chlamydia positivity at retesting (12% among females at 1.5–4 months) highlights the value of retesting. Batteiger *et al.* recently demonstrated that 84% of repeat positive tests were due to reinfection with a new or existing partner,<sup>32</sup> and, importantly, reinfections are associated with a 4- to 6-fold greater risk of PID.<sup>16–18</sup> At present, Australian recommendations for chlamydia retesting are not directive and there is no single standard nationally or across family planning organisations. Current guidelines should be consolidated and endorsed nationally to ensure an explicit recommendation for retesting at a consistent interval after initial treatment, with sufficient promotion and dissemination across primary care settings. To maximise opportunities for repeat and annual testing, electronic

clinician prompts could potentially be implemented.<sup>33–35</sup> Also, additional systems for active patient recall, such as telephone or text message reminders,<sup>33,36,37</sup> have further potential to enhance reattendance and retesting. Mail-out chlamydia testing kits could provide clients a retesting alternative that does not require clinic reattendance.<sup>38,39</sup> In a randomised controlled trial in FPCs in the United States, the use of such kits in combination with reminder calls increased retesting rates at 3 months to 41%, compared with 21% using clinic-based testing with a reminder call.<sup>40</sup>

This study has a few limitations to consider. First, ACCESS data are based on clinical and laboratory information routinely entered into electronic patient management systems and thus may not reflect all clinical activity at the clinics. One site was not included in the positivity analysis due to nonavailability of pathology data, which may have altered the aggregated positivity rate. In addition, there is potential for the testing rates to be underestimated at FPCs that undertake outreach testing, where testing is not routinely electronically recorded but may lead to subsequent clinic attendance. Second, annual testing and retesting rates may be underestimated if patients received a retest at another service. Third, positivity rates at retesting may be biased by the clinicians' decision to retest high-risk patients and patients returning due to symptoms or risk. Finally, these findings are based on 5 of ~35 national FPCs and may not be representative of all Australian FPCs, particularly given the diversity of the clinics' patient profiles and observed variations in chlamydia testing and positivity.

In conclusion, we found high chlamydia positivity rates, including at retesting, which reiterate that young FPC attendees are a high-risk group for chlamydia and provide a strong rationale to implement routine screening and retesting in the FPC setting. Findings indicate that chlamydia is high on the agenda for FPCs, with two-fifths of young attendees tested in a year, but a smaller proportion were tested annually or retested following a positive diagnosis. Given that a substantial proportion of female FPC clients attended in both years and reattended after a chlamydia infection, FPCs are well placed to increase chlamydia testing, particularly among females. To maximise testing opportunities, a range of strategies may be needed, including consolidation and promotion of guidelines, clinician prompts, client recall and reminder systems, and nonclinic testing strategies.

### Conflicts of interest

None declared.

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