Early detection and treatment are considered important components of chlamydia prevention and control, particularly in asymptomatic individuals. Guidelines for sexually transmitted infections (STI) and preventive health highlight the importance of testing sexually active people from high risk populations.

Aboriginal and Torres Strait Islander peoples (the term Aboriginal is used throughout this study to refer to both the Aboriginal and the Torres Strait Islander populations) are disproportionately affected by genital chlamydia infection and its sequelae. Aboriginal Community Controlled Health Services (ACCHSs) provide culturally appropriate primary healthcare to Aboriginal Australians, including opportunistic testing for chlamydia. While large remote area ACCHSs with comprehensive sexual health programs have reduced STI incidence through high testing coverage and screening, and 73% of ACCHSs offer STI screening, the extent of chlamydia testing and diagnoses among patients attending ACCHSs is unclear.

This paper reports on opportunistic chlamydia testing and positivity rates among 16-39 year olds attending ACCHSs participating in the Australian Collaboration for Chlamydia Enhanced Sentinel Surveillance (ACCESS) program.

**Methods**

ACCESS is a chlamydia sentinel surveillance system of six networks, with the objective of monitoring the extent of chlamydia testing and infection among priority populations including Aboriginal Australians. The ACCHS network established through collaboration between the Burnet Institute, the Kirby Institute and Chlamydia sentinel surveillance in Aboriginal Community Controlled Health Services finds higher testing and positivity rates among younger people.

**Abstract**

**Objective:** To measure chlamydia testing and positivity rates among 16-39 year olds attending Aboriginal Community Controlled Health Services (ACCHSs).

**Methods:** Retrospective non-identifiable computerised records containing consultation and chlamydia testing data were collected for patients (16-39 years) attending eight ACCHSs during 2008-09 in urban, regional and remote settings for the Australian Collaboration for Chlamydia Enhanced Sentinel Surveillance (ACCESS) system. Annual chlamydia testing and positivity rates were estimated.

**Results:** Over two years, 13,809 patients aged 16-39 years (57.8% female, 82.3% Aboriginal or Torres Strait Islander) attended. The annual overall chlamydia testing rate was 13.0% (2008) and 16.0% (2009). Testing rates were higher among females ($p<0.001$) and among patients aged 16-29 than 30-39 years (males: $p=0.01$; females: $p<0.001$). Chlamydia positivity was 8.5% overall; similar in females (8.7%) and males (7.8%) ($p=0.46$); highest among 16-19 years (females: 17.4%; males: 13.0%), declining to 1.5% among females 35-39 years ($p<0.001$) and 4.8% among males 30-34 years ($p<0.001$).

**Conclusions:** Chlamydia testing at these ACCHSs approached recommended levels among some patient groups, however, it should increase. High positivity among younger people highlights they should be targeted.

**Implications:** Young people should be targeted for sexual health interventions. ACCHSs are well placed to provide enhanced sexual health services if appropriately resourced.

**Key words:** health services, Indigenous, chlamydia, epidemiology, Australia

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the National Aboriginal Community Controlled Health Organisation (NACCHO) comprises eight ACCHSs from five jurisdictions (Victoria, Queensland, New South Wales, Western Australia and Northern Territory). These ACCHSs included medium to large services in major cities (n=2), regional – inner and outer (n=5) and remote (n=1) areas\(^{14}\) that incorporate sexual health care into clinical and health promotion activities.

Retrospective, non-identifiable, routine line-listed data were collected electronically for ACCHS attendees aged 16-39 years during 2008 and 2009. Data items included ACCHS site, attendance date, year of birth, sex, Aboriginal status, postcode of residence, whether a chlamydia test was requested and test results. Non-identifiable but record-linkable data were extracted from the Clinical Information System using the GRHANITETM extraction tool.\(^{15,16}\)

Annual chlamydia testing rates (proportion of patients tested for chlamydia) and chlamydia positivity rates (proportion of those tested found to be infected) were calculated. Repeat testing was assessed as the proportion of individuals tested during 2008 who were retested in 2009.

Repeat attendances and tests within the same year were excluded from annual testing and positivity rates, as were tests without results. Data for one ACCHS lacked results for more than 15% of tests and were excluded from positivity estimates. Data for two ACCHSs with Aboriginal status unknown for more than 15% of patients were excluded from description of Aboriginality. Rates were compared using two-sample tests of proportions and chi-square test for trend, with a significance level of 0.05, in STATA version 10.

Formal approval for ACCHSs to participate in ACCESS was gained from each ACCHS governing board. Ethical approval was gained from the appropriate Human Research Ethics Committees (HREC) in each state with the Alfred Hospital, Victoria, being the primary HREC site.

Results

During 2008 and 2009, 13,809 individual patients aged 16-39 years (57.8% female) attended eight ACCHSs; they attended 94,255 times, with 7.9 and 5.4 mean attendances per female and male patients respectively over the two-year study period. The greatest proportion of female patients (22.6%) were aged 20-24 years, and male patients (22.8%) 35-39 years. At six ACCHSs, Aboriginal status was known for 94.9% of patients; 82.3% were Aboriginal, 12.6% non-Indigenous and 5.1% not reported. At seven ACCHSs, 86.6% of tests had results.

Overall chlamydia testing rates were 13.0% in 2008 and 16.0% in 2009 with a wide range observed between ACCHSs (2008: 8.7-24.1%; 2009: 9.4-33.7%). Testing rates were higher in 2009 than 2008 for females (p<0.001) and males (p<0.001) – see Table 1. In both years, higher proportions of females (2008: 15.7%; 2009: 18.5%) were tested than males (2008: 8.9%; 2009: 12.3%), p<0.001. By age, the testing rate over two years was higher among those aged 16-29 (males 11.4%; females 19.5%) than 30-39 years (males 9.7%; females 13.4%), p<0.001; females: p<0.001. Of individuals tested during 2008, 35.9% of females and 23.5% of males were retested in 2009. For individuals with a positive test in 2008, 41.4% (n=29) of females were retested in 2009 (31.0% retesting positive) and 23.3% (n=7) of males (none retesting positive).

Chlamydia positivity over the two years was 8.5% overall (females 8.7%; males 7.8%, p=0.46). By year, positivity was lower in 2009 than 2008 among males (2008: 11.7%; 2009: 5.4%, p=0.003) – see Table 2. Over both years, positivity was highest among 16-19 year olds (females: 17.4%; males: 13.0%) and declined to 1.5% among 35-39 year old females (p<0.001) and to 4.8% among 30-34 year old males (p<0.001).

<table>
<thead>
<tr>
<th>Table 1: Chlamydia testing rates among all patients attending eight ACCHSs by year.</th>
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<td><strong>Females</strong></td>
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Discussion

This is the first study that provides chlamydia testing and positivity rates in a large sample of patients attending metropolitan, regional and remote ACCHSs across Australia. Previous reports focused on STI screening in remote communities\textsuperscript{10,11,17} or other settings such as private fee for service general practices (GPs).\textsuperscript{18} Importantly, our analysis found that a fifth of 16-29 year old female attendees were tested annually for chlamydia as part of routine practice and more than a third of females aged 16-39 years tested in 2008 were retested in 2009. Other findings include lower testing rates among males and older patients.

The testing rates for 16-29 year old females (19.5\%) and males (11.4\%) were significantly higher than age equivalent rates among females (7.4\%) and males (4.3\%) observed in private GPs in ACCESS.\textsuperscript{6} While close to the 20-30\% annual testing coverage among those <25 or <30 years that mathematical modelling suggests could halve chlamydia prevalence in Australia over 10 years\textsuperscript{19} – particularly for females – it is important to recognise that the models were based on data largely relating to the general Australian population, among whom chlamydia prevalence,\textsuperscript{20-22} risk behaviours\textsuperscript{23} and access to primary healthcare\textsuperscript{24} are likely to be different to Aboriginal subpopulations. It is unclear what optimal testing coverage should be in subpopulations with higher infection rates but they may need to be higher than required for the general population.

The value of high testing coverage accompanied by high treatment rates via comprehensive sexual health programs has been demonstrated in remote Australian Aboriginal communities. One program in the Anangu Pitjantjatjara Yankuntjatjara lands of South Australia targeted high STI prevalence among 14-40 year olds via an annual population-wide screen and year-round opportunistic testing.\textsuperscript{10} Another program in the Tiwi Islands focused on opportunistic testing among 15-35 year olds to target chlamydia and gonorrhoea prevalence of around 5-6\%.\textsuperscript{11} Testing coverage of 61-78\% from 1996-2008\textsuperscript{10} and 82-84\% from 2002-2005\textsuperscript{11} was followed by reduced chlamydia and gonorrhoea prevalence in both regions.

Some guidelines and studies suggest population-wide screening is needed in addition to opportunistic screening to have an impact on high STI prevalence.\textsuperscript{3,10} However, integration of opportunistic testing into existing programs in comprehensive Aboriginal primary healthcare\textsuperscript{3,10} is more feasible and sustainable than population-wide testing. Chlamydia testing in this study was largely opportunistic and at some ACCHSs was complemented by health promotion and community education targeting high-risk groups and encouraging attendance for general and sexual health needs. Higher testing and retesting rates observed in females may reflect factors influencing opportunistic testing such as guidelines recommending STI testing during antenatal visits,\textsuperscript{3,5} with cervical screening during a women’s health check\textsuperscript{c} or when obtaining contraception.\textsuperscript{3} STI testing for men and women may be a priority in high-prevalence communities and may also be influenced by community awareness of the risks for STIs and simplicity of chlamydia testing and treatment.\textsuperscript{3,5} Higher testing rates in 2009 than for 2008 suggest increased testing, although a longer period is needed to determine reliable time trends.

Chlamydia positivity was highest among 16-19 year olds and declined with age, consistent with notification data.\textsuperscript{6,7} Reinfection is common among young people diagnosed with chlamydia\textsuperscript{26-28} and repeat testing of all infected individuals three\textsuperscript{2} to twelve\textsuperscript{4} months post treatment to check for reinfection is recommended. Of patients in this study found positive in 2008, two-fifths of females and one-fifth of males were retested in 2009. It is not possible to ascertain if

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline
\textbf{Sex} & \textbf{Characteristic} & \multicolumn{3}{c|}{\textbf{2008}} & \multicolumn{3}{c|}{\textbf{2009}} \\
\hline
\textbf{ } & \textbf{Tests} & \textbf{n} & \textbf{Positive} & \textbf{95\% CI} & \textbf{Tests} & \textbf{n} & \textbf{Positive} & \textbf{95\% CI} \\
\hline
\multirow{5}{*}{\textbf{Males}} & \textbf{All males} & 266 & 31 & 11.7 & 8.1-16.1 & 425 & 23 & 5.4 & 3.5-8.0 \\
& \textbf{Age groups (years)} & \textbf{16-19} & 46 & 9 & 19.6 & 9.4-33.9 & 77 & 7 & 9.1 & 3.7-17.8 \\
& & 20-24 & 63 & 11 & 17.5 & 9.1-29.1 & 102 & 8 & 7.8 & 3.4-14.9 \\
& & 25-29 & 51 & 7 & 13.7 & 5.7-26.3 & 81 & 6 & 7.4 & 2.8-15.4 \\
& & 30-34 & 49 & 4 & 8.2 & 2.3-19.6 & 76 & 2 & 2.6 & 0.9-7.1 \\
& & 35-39 & 57 & 0 & 0.0 & 0.0-0.6 & 89 & 0 & 0.0 & 0.0-0.4 \\
\hline
\textbf{Females} & \textbf{All females} & 716 & 72 & 10.1 & 7.9-12.5 & 896 & 69 & 7.7 & 6.0-9.6 \\
& \textbf{Age groups (years)} & \textbf{16-19} & 177 & 36 & 20.3 & 14.7-27.0 & 186 & 27 & 14.5 & 9.8-20.4 \\
& & 20-24 & 188 & 21 & 11.2 & 7.0-16.6 & 228 & 26 & 11.4 & 7.6-16.3 \\
& & 25-29 & 139 & 9 & 6.5 & 3.0-11.9 & 187 & 11 & 5.9 & 3.0-10.3 \\
& & 30-34 & 99 & 3 & 3.0 & 0.6-8.6 & 145 & 4 & 2.8 & 0.8-6.9 \\
& & 35-39 & 113 & 3 & 2.7 & 0.6-7.6 & 150 & 1 & 0.7 & 0.0-3.7 \\
\hline
\end{tabular}
\caption{Chlamydia positivity rates\textsuperscript{a,b} among all patients attending seven ACCHS by year.}
\footnotesize{\textsuperscript{a} Tests without results available were excluded from positivity estimates \textsuperscript{b} Positivity estimated from data for seven sites where test results was known for >85\% tests}
\end{table}
the remaining patients were offered testing but declined, were tested at other services, or were unable to be contacted. Low retesting is of concern because of the risk of reinfection\textsuperscript{26-28} but is common in private general practices.\textsuperscript{29} In part, low retesting following infection may reflect a lack of clear guidelines for when retesting should occur.

Participating ACCHSs received ACCESS results through a workshop chaired by NACCHO and a report detailing aggregated and service-level testing and positivity rates. Sites reported improved understanding of local testing practices which may foster local continuous quality improvement activity for opportunistic testing and sexual health programs.

A limitation of this analysis is that the pilot ACCHS network comprised few sites, reducing representativeness and the potential for analyses by jurisdiction or location. A second limitation is that the ACCESS system does not collect data on the total population in the catchment areas, precluding determination of attendance or population testing rates. Another limitation relates to completeness of test result and Aboriginal status data. Missing test results may bias positivity estimates. US Centers for Disease Control and Prevention surveillance standards regard ≥85% surveillance data as complete.\textsuperscript{30} Accordingly, in this analysis, data from one ACCHS with >15% test results missing were excluded from positivity estimates.

The ACCESS project successfully established a network for measuring chlamydia testing and positivity rates at ACCHSs throughout Australia. It provided new information on opportunistic testing levels and has assisted individual ACCHSs to use their data for local quality improvement and health promotion. This study found higher chlamydia testing rates within ACCHSs than in private GPs in ACCESS. At the same, time there is scope to increase opportunistic testing among clinic attendees. ACCHSs are well placed to provide enhanced sexual health services, particularly if they are appropriately resourced to do this in the context of the many competing health priorities they face. High chlamydia positivity among younger people highlights the importance of focusing on regular chlamydia testing in conjunction with appropriate clinical care and prevention services.

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Chlamydia sentinel surveillance findings


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