A new national chlamydia sentinel surveillance system in Australia: Evaluation of the first stage of implementation

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Abstract

The Australian Collaboration for Chlamydia Enhanced Sentinel Surveillance (ACCESS) was established with funding from the Department of Health and Ageing to trial the monitoring of the uptake and outcome of chlamydia testing in Australia. ACCESS involved 6 separate networks; 5 clinical networks involving sexual health services, family planning clinics, general practices, antenatal clinics, Aboriginal community controlled health services, and 1 laboratory network. The program ran from May 2007 to September 2010. An evaluation of ACCESS was undertaken in early 2010, 2 years after the program was funded. At the time of the evaluation, 76 of the 91 participating sites were contributing data. The jurisdictional distribution of the 76 sites generally matched the jurisdictional distribution of the Australian population. In 2008, the chlamydia testing rates in persons aged 16–29 years attending the 26 general practices was 4.2% in males and 7.0% in females. At the 25 sexual health services, the chlamydia testing rates in heterosexuals aged less than 25 years in 2008 was 77% in males and 74% in females. Between 2004 and 2008, the chlamydia positivity rate increased significantly in heterosexual females aged less than 25 years attending the sexual health services, from 11.5% to 14.1% ($P < 0.01$). Data completeness was above 85% for all core variables except Aboriginal and/or Torres Strait Islander status and country of birth, which ranged from 68%–100%, and 74%–100%, respectively, per network. There were delays in establishment of the system due to recruitment of 91 sites, multiple ethics applications and establishment of automated extraction programs in 10 different database systems, to transform clinic records into a common, pre-defined surveillance format. ACCESS has considerable potential as a mechanism toward supporting a better understanding of long-term trends in chlamydia notifications and to support policy and program delivery. *Commun Dis Intell* 2010;34(3):319–328.

Keywords: chlamydia, sentinel surveillance, Australia

Introduction

The primary role of public health surveillance is to guide the planning and evaluation of policy and programs, through the collection, analysis and interpretation of statistical information. In Australia, the main form of chlamydia surveillance is passive reporting of cases to health departments by doctors or laboratories.[1] Passive surveillance has shown *Chlamydia trachomatis* to be the most commonly notified infection in Australia with rates having risen nearly 4-fold in the past decade.[1]

Passive surveillance has a natural appeal, in that it can be established on an ongoing basis, provides full geographic coverage and does not involve substantial programmatic expense. On the other hand, passive surveillance may be biased by testing patterns, as indicated by the strong correlation between the number of diagnoses and number of tests.[2–4] Also, notification data do not routinely include information on characteristics such as gender of sex partner and in several jurisdictions are far from complete with regard to indigenous status.[5]

A supplementary approach to surveillance is the use of selected clinical sites to collect systematic data on uptake and the outcome of chlamydia testing. Such data can be used to evaluate clinic-based initiatives, broader prevention programs and help interpret trends in passive surveillance.[6,7]

In May 2007 the Australian Government Department of Health and Ageing (DoHA) funded the trialling of a new national sentinel surveillance system, entitled the Australian Collaboration for Chlamydia Enhanced Sentinel Surveillance (ACCESS) (www.access-study.org), based on 5 networks of clinical sites and a laboratory network. This paper reports on an evaluation of this new system.

Methods

This evaluation of ACCESS was conducted from 1 January to 31 March 2010 by project staff, using the framework promulgated by the US Centers for Disease Control and Prevention.[8] Specific goals were to:

1. assess the simplicity, flexibility, acceptability, timeliness, stability, validity, usefulness and representativeness of ACCESS;

2. assess the data quality of the system by examination of the first 12 months of data collection; and

3. make recommendations to improve the system.

For each ACCESS variable, completeness was the proportion of entries that were not missing or unknown. To determine representativeness, the proportion of ACCESS sites per jurisdiction was compared with the proportion of the population in the jurisdiction. The ratio of metropolitan and non-metropolitan ACCESS sites was also compared with this ratio for the Australian population. Population data were accessed from the 2006 Australian Bureau of Statistics data.[9] Other surveillance attributes were assessed qualitatively through feedback from other ACCESS members and select partners, ACCESS meeting Minutes and quarterly progress reports submitted to DoHA.

Results

Description of ACCESS

ACCESS was established as a collaboration between the National Centre in HIV Epidemiology and Clinical Research (NCHECR) and the Perinatal and Reproductive Epidemiology and Research Unit at the University of New South Wales (UNSW), the Burnet Institute's Centre for Population Health, and the National Serology Reference Laboratory (NRL). UNSW (via NCHECR) and the Burnet Institute are jointly responsible for ACCESS. Other partners are the participating sentinel sites (Appendix), the National Aboriginal Community Controlled Health Organisation (NACCHO) and its state and territory based affiliates; and DoHA as funding agency.

The overall aim of ACCESS is to establish a sentinel surveillance system to evaluate the impact of interventions to control genital chlamydia infection. Specific objectives were to:

1. establish 6 separate surveillance networks, each providing unique information on chlamydia testing;

2. enhance the data management systems of sentinel sites with a view to routinely sending chlamydia surveillance data to a central location;

3. monitor the extent of chlamydia testing at these sites;

4. determine the chlamydia positivity in priority populations; including young heterosexuals (< 25 years), men who have sex with men (MSM), Aboriginal and/or Torres Strait Islander people, pregnant women and sex workers; and

5. interpret trends determined by other chlamydia surveillance mechanisms.

ACCESS involves 5 clinical networks made up of sexual health services, family planning clinics, general practices, antenatal clinics and Aboriginal community controlled health services, and a laboratory network. Each network involves multiple sites, chosen under the following criteria (which varied by network):

1. a specified minimum number of chlamydia tests per year;

2. geographic representation; and

3. a minimum number of tests in priority populations specified by the *National Sexually Transmissible Infections Strategy 2005–2008,*[10] as defined in Table 1.

On a quarterly or 6-monthly basis, a core set of data in de-identified line-record format were extracted from sites (apart from the antenatal clinic network) and include patient demographic and chlamydia testing information. Additional information was collected from some specific networks; 'gender of sexual partners', 'current sex work', 'sex overseas in the last 12 months', 'traveller or migrant status' (sexual health service network), 'parity' (antenatal clinic network) and specimen type (laboratory network). Extraction programs were developed to transform these records into a common, pre-defined format.

Analyses were conducted of the proportion of patients tested for chlamydia and the proportion of those tested found to have infection (chlamydia positivity). Both were restricted to new or unique patients (those attending the clinic or tested for the first time in the surveillance period). Analyses

Table 1: Priority populations seen at ACCESS network sites

Network	Priority populations
Sexual health service network	Young men and women (<25 years), men who have sex with men, Aboriginal and/or Torres Strait Islander people, and sex workers
Family planning clinic network	Young women and men aged 16–29 years
Antenatal clinic network	Young pregnant women aged 16–24 years including Aboriginal and/or Torres Strait Islander people
Aboriginal community controlled health service network	Aboriginal and/or Torres Strait Islander people aged 16–39 years
General practice network	Young women and men aged 16–29 years
Laboratory network	All individuals tested for chlamydia

for the sexual health service network were further broken down into heterosexuals aged less than 25 years, MSM, Aboriginal and/or Torres Strait Islander people, and sex workers. The sexual health service network was able to compile retrospective data at the time of this evaluation. An analysis of time trends could be undertaken in the annual proportion of patients undergoing a chlamydia test on their first visit and of chlamydia positivity over time. Significance of the trend was assessed with a chi-squared test.

Feasibility

Feasibility was demonstrated by success in recruiting and establishing sites. By the end of February 2010, 91 sentinel sites across 6 networks had agreed to participate in ACCESS, representing all jurisdictions in Australia (Table 2).

Of the 91 sites, 76 (84%) provided data at the time of the evaluation (Table 3). The 5 clinical networks compiled information on about 90,000 episodes of care in new patients and the laboratory network compiled information on about 40,000 chlamydia tests, (which may have overlapped with the clinical networks).

Feasibility was also demonstrated in the ability to estimate the proportion of patients tested for chlamydia and chlamydia positivity in a range of priority populations. In young men and women, the general practice network found that 4.2% of males and 7.0% of females aged 16–29 years who attended the 26 clinics, were tested and chlamydia positivity was 9.9% and 7.0% respectively. In the sexual health service network, 77% of males and 74% of females aged less than 25 years were tested in the same period and positivity was 9.5% and 9.1%, respectively. The overall chlamydia positivity rate was 7.0% among pregnant women aged 16–24 years in the antenatal network.

In the laboratory network, the chlamydia positivity estimate was 6.2% in rectal swabs collected

Table 2: ACCESS participating sentinel sites, 1 March 2010, by network and state or territory

Location of sentinel sites	Population[9]		Network							
			GP	FPC	SHS	ANC	ACCHS	Lab	All	
	n	%	n	n	n	n	n	n	n	%
ACT	339,865	1.6	0	1	1	1	0	0	3	3.3
NSW	6,889,072	32.8	5	1	15	1	2	3	27	29.7
NT	214,975	1.0	0	1	2	1	1	0	5	5.5
Qld	4,182,062	19.9	6	1	4	1	2	4	18	19.8
SA	1,584,513	7.5	4	1	0	0	0	2	7	7.7
Tas	493,341	2.3	2	1	1	0	0	1	5	5.5
Vic	5,205,216	24.8	8	1	1	4	1	5	20	22.0
WA	2,105,783	10.0	2	1	1	1	1	0	6	6.6
Aust	21,017,222	100	27	8	25	9	7	15	91	100.0

GP=General practice, FPC=Family planning clinic, SHS=Sexual health service, ANC=Antenatal clinic, ACCHS=Aboriginal community controlled health service, Lab=Laboratory

Table 3: ACCESS operational sentinel sites, 1 March 2010, by network and state or territory

Location of sentinel sites	Population[9]		Network							
			GP	FPC	SHS	ANC	ACCHS	Lab	All	
	n	%	n	n	n	n	n	n	n	%
ACT	339,865	1.6	0	1	1	1	0	0	3	3.9
NSW	6,889,072	32.8	4	1	15	1	0	0	21	27.6
NT	214,975	1.0	0	1	2	1	0	0	4	5.3
Qld	4,182,062	19.9	6	0	4	1	2	3	16	21.1
SA	1,584,513	7.5	4	1	0	0	0	0	5	6.6
Tas	493,341	2.3	2	1	1	0	0	0	4	5.3
Vic	5,205,216	24.8	8	1	1	4	1	3	18	23.7
WA	2,105,783	10.0	2	0	1	1	1	0	5	6.6
Aust	21,017,222	100	26	6	25	9	4	6	76	100.0

GP=General practice, FPC=Family planning clinic, SHS=Sexual health service, ANC=Antenatal clinic, ACCHS=Aboriginal community controlled health service, Lab=Laboratory

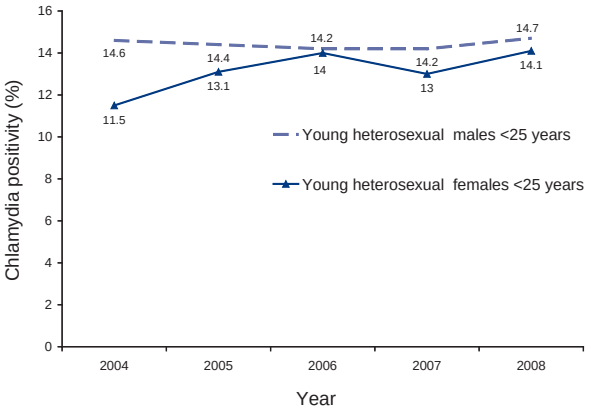
in men who were most likely to be MSM. In the sexual health service network, chlamydia positivity was 7.2% in MSM.

The feasibility of reporting time trends was demonstrated through the sexual health network. Between 2004 and 2008 at 19 sexual health services the annual proportion of patients tested for chlamydia on their first visit increased significantly for all priority populations, $P<0.001$ (Table 4) and chlamydia positivity increased significantly in heterosexual females from 11.5% to 14.1%, $P<0.001$ (Figure), but not other populations.

Simplicity

The automatic collation of routine clinical data from the network sites, apart from antenatal clinics, reflects simplicity. The 2 key outcomes are relatively straightforward to calculate from the variables compiled. Also, although not formally assessed, the ACCESS system is likely to be very much cheaper than repeated community surveys of this magnitude.

Figure: Chlamydia positivity among new heterosexual patients (<25 years) at the 19 sexual health services in ACCESS, 2004 to 2008, by sex



On the other hand, initiation of 91 sentinel sites was complex because of the multiple ethics applications required, and the range of patient management systems used at these sites. The antenatal clinic network used a model that differs from other networks, because underlying testing rates

Table 4: Chlamydia testing rates among new patients at the 19 sexual health services in ACCESS, 2004 to 2008, by priority population

Priority population	2004 (%)	2005 (%)	2006 (%)	2007 (%)	2008 (%)
Young heterosexuals <25 years	60.9	64.9	67.5	70	71.1
Men who have sex with men	74.8	77.3	78.9	80.9	78.0
Aboriginal and/or Torres Strait Islanders	48.9	49.5	54.6	55.8	53.0
Sex workers	60.9	64.9	67.5	70.0	71.1

The population breakdowns are not exclusive and individuals may be present in more than 1 priority population

were low in this setting. Accordingly, the network introduced chlamydia testing for consecutively recruited women aged 16–24 years, based on written consent, which substantially increased the human resources required to carry out the study. The recent increase in birth rates put further pressure on antenatal clinics participating in ACCESS.

Representativeness

Across networks, the jurisdictional distribution of the 76 operational sites generally matched the distribution of the Australian population (Table 2). For example, the proportion of sites in New South Wales, Victoria and Queensland were 28%, 24% and 21%, compared with the proportion of the resident population in these jurisdictions of 33%, 25%, 20% respectively (Table 2).

The correspondence was poorer within networks, with only 2 jurisdictions represented in the laboratory network, four in the ACCHS network and five in the family planning and general practice networks (Table 2).

Overall, 70% of the operational sites were located in metropolitan areas, 28% in regional areas and 3% in remote areas (Table 5), which is similar to the distribution of the resident population in Australia of 66%, 31% and 3%, respectively.[13]

Flexibility

Health surveillance system can adapt to changing information needs or operation conditions with little additional time, personnel, or allocated funds.[11] Apart from the antenatal clinic network, ACCESS was based on collection of routine clinical data, so as long as any additional information is systematically recorded in the patient management system by sites, ACCESS has the capacity to be modified relatively easily including collection of data on additional infections such as syphilis, gonorrhea and HIV.

Timeliness

The ACCESS system has not been operational long enough to demonstrate whether or not its outputs are sufficiently timely to support public health programs and policy. However, all of the networks (except the antenatal clinic network) are now in a position to undertake regular data collection automatically, and generate reports 3–6 months after the end of each calendar year. Given that sexually transmitted infections (STIs) do not generally require an acute public health response, this time frame should respond well to the needs of program planning and evaluation.

Sustainability

The key feature of ACCESS is that it utilises routinely collected data from clinical and laboratory settings. Therefore as long as staffing is available for analysis and reporting, the system will be sustainable.

Acceptability

Acceptability is reflected by the willingness of persons and organisations to participate in the surveillance system.[11] The entire premise of ACCESS was to establish data collection systems that operate automatically and have no impact on routine clinical operations. Each network was overseen by a steering committee that includes representation from sites to ensure that operations are acceptable to the clinicians and data managers at the sites. No participating sites withdrew from participating once they became operational. One general practice site recently became ineligible due to changing to a patient management system not

Table 5: Location of operational sentinel sites in the 5 clinical networks, 1 March 2010

Clinical network	Location of sentinel site							
	Metropolitan		Regional		Rural		Total	
	n	%	n	%	n	%	n	%
GP	19	73.1	7	26.9	0	0.0	26	100
FPC	5	100.0	0	0.0	0	0.0	5	100
SHS	16	64.0	8	32.0	1	4.0	25	100
ANC	7	77.8	1	11.1	1	11.1	9	100
ACCHS	1	25.0	3	75.0	0	0.0	4	100
All	48	69.6	19	27.5	2	2.9	69	100

The laboratory network was not included as most laboratories service all areas.

GP=General practice, FPC=Family planning clinic, SHS=Sexual health service, ANC=Antenatal clinic, ACCHS=Aboriginal community controlled health service

compatible with the extraction program, but was interested in participating in the future if ACCESS was able to develop a compatible interface.

Data quality

Overall, the completeness of the data from ACCESS sites was excellent, and for most variables, exceeded the recommendation of 85% in the CDC surveillance standards.[12] The exceptions were Aboriginal and/or Torres Strait Islander status and country of birth, which ranged from 68%–100%, and 76%–100%, respectively, per network. Aboriginal and Torres Strait Islander status was 95% complete in the 25 sexual health services who provided data at the time of the evaluation, 86% complete in the 4 Aboriginal community controlled health services and 68% in the general practice and family planning clinic networks. In the family planning clinic network the 'country of birth' variable had a 76% completion rate.

Validity

There are several ways in which validity might be assessed. At a basic level of reporting accuracy, the performance of the software used to identify chlamydia tests in the patient management systems of 3 clinics in the general practice network can be compared with testing data from the same clinics, collated directly from laboratory services participating in a separate Victorian surveillance project.[13] When linked to version 2 of Medical Director as used by 1 clinic, the ACCESS reporting software detected 84% of the chlamydia tests reported by the laboratories, and the sensitivity increased to 97% at the other 2 clinics, which used version 3 of Medical Director. Conversely all of the tests detected via the ACCESS software were identified in the Victorian surveillance dataset (specificity).

The validity of the system was also supported by the stability of the reported profile of patients attending the participating clinics. At the 19 sexual health services, annual numbers of new patients remained quite steady (between 21,929 and 23,267). The median age was 28 years from 2004 to 2005 then 27 years from 2007 to 2008.

Sensitivity

Sensitivity is generally quantified as the proportion of cases of a disease or health event that are detected by a surveillance system.[12] ACCESS does not aim to capture all chlamydia diagnoses in Australia but instead focuses on priority populations attending clinical sites, and monitors testing uptake and chlamydia positivity in these groups. In this context, the main factor that could have an impact on sensitivity is under-reporting. As noted above under validity, ACCESS data extractions rely on the test and result being recognisable and extractable in the patient management system, and appear to have high sensitivity when compared with an alternative data source in the general practice network.

Usefulness

The sexual health service network has provided some important data on time trends, as described under feasibility. These findings suggest that the steadily increasing chlamydia diagnoses observed through passive surveillance in recent years in Australia may reflect a true increase in chlamydia incidence in Australia. In the long term, outcomes from other networks will be important to interpret alongside those observed in the sexual health service network. Another important finding from the sexual health service network and laboratory network was the chlamydia positivity estimates in MSM, based on testing of rectal swabs in men.

Discussion

The first 2 years of ACCESS demonstrated that it is possible to establish a national network of diverse clinical and laboratory sites for the purpose of collecting, analysing and reporting standardised data on the uptake and outcome of testing for chlamydia. ACCESS has also demonstrated that clinical services can routinely compile information on chlamydia positivity in large numbers of patients. Although alternative models were not costed, it is likely that ACCESS costs a fraction of what would be required to conduct repeated surveys among the priority populations.

The evaluation led to 6 main recommendations about how the operation of ACCESS could be improved (Box).

As shown in other countries, systems similar to ACCESS can help to interpret trends in chlamydia passive surveillance.[7,14–17] Data from the sexual health network indicated a 23% increase in chlamydia positivity in young heterosexual women between 2004 and 2008, in contrast to the much sharper rise in case counts reported from passive surveillance in the same time period, suggesting some of the increase in case counts is likely to be related to increased testing.

For populations such as MSM who undergo frequent testing for Chlamydia, the sexual health service network will be able to provide national incidence estimates, that have previously only been available from single study cohorts.[18] Incidence is

Box: Key evaluation recommendations for the ACCESS system

1. Each network should undertake validity studies along the lines of those conducted by the general practice network;
2. ACCESS findings should be disseminated widely, to ensure that all relevant stakeholders can use them to plan and evaluate interventions related to chlamydia testing;
3. The general practice network should be enhanced by the addition of more sites in certain jurisdictions and expanded to a much larger number of clinics over the long-term;
4. Subject to community consultation, the Aboriginal community controlled service network should be expanded to include more sites over the long term, particularly in New South Wales and Queensland.
5. A less resource-intensive surveillance system should be used for antenatal services such as the model used in other networks of ACCESS;
6. The collection of information on other sexually transmissible infections such as syphilis and gonorrhoea should be considered.

the most sensitive indicator of changes in disease transmission, but is very expensive to assess through prospective cohorts. Line-listed records, linked by unique personal identifiers and information related to serial consultations can be used to provide incidence data.[19]

Although the system has been developed for monitoring chlamydia, its design is such that it could easily be adapted to the monitoring of other treatable bacterial STIs, such as syphilis and gonorrhea, or viral STIs such as HIV. The marginal cost of expanding the surveillance system to other infection would be far less than the cost of starting new systems for each of these infections.

ACCESS provided information on some variables not available through national chlamydia passive surveillance, in particular the sex of sexual partner, which allows trends to be analysed separately for MSM and heterosexual populations. As with passive surveillance, completeness in ACCESS was poorest for Aboriginal and Torres Strait Islander status, but ACCESS did achieve somewhat higher completeness rates for this variable than passive surveillance in New South Wales, Queensland, the Australian Capital Territory and Tasmania.[5]

The evaluation found that ACCESS sites were represented in all jurisdictions. The general practice network could be further expanded to increase the capacity of jurisdictions to evaluate local testing initiatives. In the longer term, data collected through ACCESS, particularly the general practice network, would also be able to provide pre– and post-descriptions of clinical populations, as a basis for evaluating new programs. Another application of ACCESS data would be the assessment of compliance with clinical testing guidelines.[20] The laboratory network also provides a very large sample size to ensure very robust chlamydia positivity rate estimates and in the long term will provide important population level testing data, covering both the public and private laboratory sectors.

ACCESS would also be able to provide valuable information about testing and chlamydia positivity rates in Aboriginal and/or Torres Strait Islander people attending a variety of clinical services in urban, regional and remote areas in Australia. Currently, the limited available data about STI testing undertaken by health services in Aboriginal and Torres Strait Island people are biased toward remote and regional settings.[21–23] Also because health departments in New South Wales and Queensland, with substantial Aboriginal populations, rely on laboratory notifications, the results of passive STI surveillance cannot be used to describe the STI epidemiology in this population.[5] A clearer picture may emerge if there was expansion of the Aboriginal community controlled health service network over the long term, particularly in New South Wales and Queensland. Any future directions of this network are subject to community consultation.

The antenatal clinic network methodology proved much more expensive and complex to implement because chlamydia testing is not routine in that setting. Nevertheless, this network has netted invaluable data on the prevalence of chlamydia in pregnant women in Australia. It is anticipated

that antenatal chlamydia testing will increase in the future, so the model used in other ACCESS networks could provide a less resource-intensive surveillance system for antenatal services.

There is no perfect surveillance mechanism for monitoring the prevalence of infections such as chlamydia in populations. Surveys of the whole population are inevitably subject to bias because of incomplete participation, and surveys that aim to recruit particular population groups inevitably rely on sampling frames that can not truly replicate the membership of these groups. The approach adopted by ACCESS is to monitor chlamydia positivity rates, as a surrogate for prevalence, in patients attending specialised clinical services. This approach has similar limitations to the population surveys, in that it is unknown how representative these patients are of any wider group from which they are drawn. Chlamydia positivity rates may be influenced by the proportion and nature of the patients being tested. Some groups may undergo testing at particular times in response to campaigns, or clinics may change testing policies resulting in more asymptomatic patients being tested. The restriction of the analysis to new patients (or those testing for the first time in the surveillance period) was intended to reduce the impact of this potential bias and provide accurate chlamydia positivity for surveillance purposes.

Passive notification data demonstrated that chlamydia diagnoses have increased sharply over the past decade in Australia. ACCESS has the potential to complement this observation by providing a systematic means of measuring any changes in testing levels by specific priority populations and monitoring trends in chlamydia positivity in these groups, thereby enhancing our capacity to respond to and control this infection.

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References

1. Australian Government Department of Health and Ageing. National Notifiable Diseases Surveillance System data. Number of notifications of chlamydial infections, Australia, 2007 by age group and sex. Accessed on 29 February 2008. Available from: http://www1.health.gov.au/cda/Source/Rpt_5.cfm

2. Chen MY, Fairley CK, Donovan B. Nowhere near the point of diminishing returns: correlations between chlamydia testing and notification rates in New South Wales. *Aust N Z J Public Health* 2005;29(3):249–253.

3. Chen MY, Karvelas M, Sundararajan V, Hocking JS, Fairley CK. Evidence for the effectiveness of a chlamydia awareness campaign: increased population rates of chlamydia testing and detection. *Int J STD AIDS* 2007;18(4):239–243.

4. Hocking J, Fairley C, Counahan M, Crofts N. The pattern of notification and testing for genital *Chlamydia trachomatis* infection in Victoria, 1998–2000: an ecological analysis. *Aust N Z J Public Health* 2003;27(4):405–408.

5. National Centre in HIV Epidemiology and Clinical Research. *Bloodborne viral and sexually transmitted infections in Aboriginal and Torres Strait Islander People. Surveillance Report 2007.* Sydney, NSW: National Centre in HIV Epidemiology and Clinical Research, The University of New South Wales; 2007.

6. Slater W, Sadler K, Cassell JA, Horner P, Low N. What can be gained from comprehensive disaggregate surveillance? The Avon Surveillance System for Sexually Transmitted Infections. *Sex Transm Infect* 2007;83(5):411–415.

7. Fine D, Dicker L, Mosure D, Berman S. Increasing chlamydia positivity in women screened in family planning clinics: do we know why? *Sex Transm Dis* 2008;35(1):47–52.

8. Centers for Disease Control and Prevention. Updated guidelines for evaluating public health surveillance systems: recommendations from the Guidelines Working Group. *MMWR Recomm Rep* 2001;50(RR13):1–35.

9. Australian Bureau of Statistics. Population by Age and Sex, Australian States and Territories. Canberra: Australian Bureau of Statistics. Catalogue No: 3201.0 – A. June 2008.

10. Australian Government Department of Health and Ageing. *National Sexually Transmissible Infections Strategy 2005–2008.* Canberra; 2005. Accessed 6 June 2006. Available from: http://www.health.gov.au/internet/main/publishing.nsf/Content/phd-sti-strategy-cnt.htm/$FILE/sti_strategy.pdf

11. UNAIDS. *Guidelines for Second Generation HIV Surveillance.* Geneva: UNAIDS; 2000. Report No: WHO/CDS/CSR/EDC/2000.5.

12. Centers for Disease Control and Prevention. Guidelines for national human immunodeficiency virus case surveillance, including monitoring for human immunodeficiency virus infection and acquired immunodeficiency syndrome *MMWR Recomm Rep* 1999;48(RR–13):1–27, 9–31.

13. Goller J, Guy R, Gold J, et al. Establishing a linked sentinel surveillance system for BBVs and STIs, methods, system attributes and early findings. *Sex Health* In press.

14. Hiltunen-Back E, Haikala O, Kautiainen H, Paavonen J, Reunala T. A nationwide sentinel clinic survey of *Chlamydia trachomatis* infection in Finland. *Sex Transm Dis* 2001;28(5):252–258.

15. Giuliani M, Suligoi B, The STD Surveillance Working Group. Sentinel surveillance of sexually transmitted diseases in Italy. *Euro Surveill* 1998;3(6):55–58.

16. Defraye A, Sasse A. STI surveillance by a sentinel network of physicians in Belgium. *Acta Clin Belg* 2005;60(2):70–74.

17. Bachmann LH, Macaluso M, Hook EW 3rd. Demonstration of declining community prevalence of *Chlamydia trachomatis* infection using sentinel surveillance. *Sexy Transm Dis* 2003;30(1):20–24.

18. Jin F, Prestage GP, Zablotska I, Rawstorne P, Kippax SC, Donovan B, et al. High rates of sexually transmitted infections in HIV positive homosexual men: data from two community based cohorts. *Sex Transm Infect* 2007;83(5):397–399.

19. Lee DM, Binger A, Hocking J, Fairley CK. The incidence of sexually transmitted infections among frequently screened sex workers in a decriminalised and regulated system in Melbourne. *Sex Transm Infect* 2005;81(5):434–436.

20. Guy R, Goller J, Spelman T, El-Hayek C, Gold J, Lim M, et al. Does the frequency of HIV and STI testing among MSM in primary care adhere with Australian guidelines? *Sex Transm Infect* 2010. PMID: 20460263 [Epub ahead of print].

21. Huang RL, Torzillo PJ, Hammond VA, Coulter ST, Kirby AC. Epidemiology of sexually transmitted infections on the Anangu Pitjantjatjara Yankunytjatjara Lands: results of a comprehensive control program. *Med J Aust* 2008;189(8):442–445.

22. Latif AS, Smith KS. Sexually transmitted infections in Central Australia – time for concerted action. *Public Health Bulletin South Australia.* 2006;4:32–34.

23. Su JY, Skov S. An assessment of the effectiveness of the Tiwi Sexual Health Program 2002–2005. *Aust N Z J Public Health* 2008;32(6):554–558.

Appendix: Participating ACCESS sites

Note: some participating sites preferred not to be named in this paper

Sexual health service network

Hunter New England Sexual Health Service; NSW

Sydney West Area Health Service – Clinical Sexual Health Services; NSW

Illawarra Sexual Health, Wollongong; NSW

Royal Prince Alfred Hospital Sexual Health, Camperdown; NSW

Holden Street Clinic, Gosford; NSW

Lismore/ Tweed Heads Sexual Health & AIDS Services, Lismore; NSW

Northern Sydney Sexual Health Service, St Leonards; NSW

Greater Southern Area Health Service; NSW

Orange Sexual Health Service, Orange; NSW

Kirketon Road Centre, Darlinghurst; NSW

Sydney Sexual Health Centre, Sydney; NSW

Short Street Sexual Health Clinic, NSW

St George Hospital, St George; NSW

Coffs Harbour Sexual Health Service, Coffs Harbour; NSW

Grafton Sexual Health Clinic, Grafton; NSW

Gold Coast Sexual Health Clinic, Miami; Qld

Cairns Sexual Health Services, Cairns Base Hospital, Cairns; Qld

Princess Alexandra Sexual Health, Princess Alexandra Hospital, Woolloongabba, Qld

Townsville Sexual Health Service, Townsville, Qld

Melbourne Sexual Health Centre, Carlton, Vic

Hobart, Devonport and Launceston Sexual Health Service, Tas

Fremantle Hospital, Fremantle, WA

NT Sexual Health and BBV Unit, NT

Family planning clinic network

Sexual Health and Family Planning, ACT,

Newcastle FPNSW Centre, Cooks Hill, NSW

Family Planning NT, Coconut Grove, NT

Family Planning Queensland, Toowoomba, Qld

Shine SA (Sexual Health information networking and education Inc), SA

Family Planning Tasmania, Hobart, Tas

Family Planning Victoria, (Action Centre), Melbourne, Vic

Quarry Health Centre for under 25s, Fremantle, WA

General practice clinic network

Charlestown Family Medical Services, Charlestown, NSW

Midway Family Medical Centre, Denistone East, NSW

Glendale Medical Centre, Glendale, NSW

Young District Medical Centre, Young, NSW

Brindabella Family Practice, Queanbeyan, NSW

Angaston Medical Centre, Angaston, SA

Genesis Medical Centre, Brighton, Vic

Footscray Medical Centre, Footscray , Vic

Goulburn River Group Practice, Seymour, Vic

Wellness Centre Medical Clinic, Malvern East, Vic

Brighton Medical Clinic, Brighton, Vic

Mooroopna Medical Centre, Mooroopna, Vic

Duncraig Medical Centre, Duncraig , WA

AK medical/dental Clinic, Kelmscott, WA

Chancellor Park Family Medical Practice, Sippy Downs, Qld

Nambour Medical Centre, Nambour, Qld

Eli Waters Medical Centre, Eli Waters, Qld

Yeppoon Family Practice, Yeppoon , Qld

Kewarra Family Practice, Kewarra Beach, Qld

Turton St Medical Centre, Sunnybank, Qld

O'Brien Street Practice, Adelaide, SA

Davey Street Medical Centre , Hobart, Tas

Newstead Medical, Launceston, Tas

Duncraig Medical Centre, Duncraig, WA

Brighton Medical Clinic, Brighton, Vic

North Sydney Medical Practice, North Sydney, NSW

Centre Clinic, St Kilda, Vic

Aboriginal community controlled health service network

Aboriginal Medical Service Western Sydney, Mount Druitt Village, NSW

Durri Aboriginal Corporation Medical Service, Kempsey, NSW

Victorian Aboriginal Health Service, Fitzroy, Vic

Geraldton Regional Aboriginal Medical Service, Geraldton, WA

Danila Dilba Health Service, Darwin, NT

Carbal Medical Service, Toowoomba, Qld

Goondir Health Service, Dalby, Qld