Original article

Incident sexually transmitted infections and their risk factors in an Aboriginal community in Australia: a population based cohort study

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Objective: To identify risk factors for incident sexually transmitted infections (STI) in a remote Aboriginal community in Australia.
Design: A population based cohort study.
Setting: An Aboriginal community in central Australia.
Participants: 1034 Aboriginal people aged 12–40 years, resident in the study region, seen during the period 1 January 1996 to 30 June 1998 for STI diagnosis.
Main outcome measures: Incident rate of gonorrhoea, chlamydia, and syphilis per 100 person years.
Results: There were 313 episodes of incident gonorrhoea, 240 of incident chlamydial infection, and 17 of incident syphilis. For gonorrhoea, risk factors were age, substance abuse, and previous prevalent chlamydial infection with a rate ratio (RR) of 3.2 in people aged 15–19 years, 1.6 in people who abused alcohol, and 3.2 in women who had sniffed petrol on a regular basis. For chlamydia, risk factors were sex, age, and a previous history of STI with a RR of 2.7 in people aged 15–19 years. Similar factors were associated with an increased risk of syphilis but the associations were not statistically significant.
Conclusion: This study identified objective predictors of incident STI which can be used to target interventions and maximise their impact. The results of this study may well have relevance to indigenous communities in other countries that are faced with high levels of STI and substance abuse.
(*Sex Transm Inf* 2001;77:21–25)

Keywords: Aborigines; sexually transmitted infections; risk factors; Australia

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Accepted for publication
12 October 2000

website *extra*

Extended tables can be found on the STI website

www.sextransinf.com

Introduction

Remote Aboriginal communities in northern and central Australia, like indigenous groups in some other developed countries, experience high rates of unemployment,[1 2] poverty,[3] poor housing,[4] poor health status,[5] high rates of substance abuse,[6–8] and sexually transmitted infection (STI).[3 9–11] Gonorrhoea, chlamydial infection, and syphilis have been shown to be hyperendemic in central Australian indigenous communities.[12 13] While there have been significant gains in STI control following improved access to diagnosis, and treatment[14] a better knowledge of the factors that predict STI occurrence could be used to maximise the effectiveness of the limited resources that are available for prevention, diagnosis and treatment.

There have been few population based studies of incident STI in the world and none in indigenous Australians. To identify factors associated with STI acquisition we carried out a population based cohort study of incident gonorrhoea, chlamydia, and syphilis in a remote Aboriginal community.

Methods

SETTING

This study was conducted by Nganampa Health Council (NHC), an Aboriginal controlled health service responsible for all healthcare delivery on the Anangu Pitjantjatjara (AP) Lands in central Australia. This region covers 103 000 square kilometres with a population of approximately 2600 Aboriginal people living in six population centres and 30 smaller family groupings. This geographical area is defined by land rights legislation, has well defined boundaries, and is held by the traditional owners under freehold title. The population is almost exclusively Aboriginal. The number of non-Aboriginal people living in the area is small; the majority are employed by the community and they do not have resident status.

STUDY DESIGN

The study used a cohort design. The cohort was defined to include people born in the period 1 January 1956 and 31 December 1983 who were resident on the AP Lands, as documented in the NHC population register[14] (n=1374). Residents were classified as permanent residents or regular visitors (who are resident for part of each year). The cohort was followed prospectively through the study period. Members of the cohort who were seen during the period 1 January 1996 to 30 June 1998 for STI diagnosis at one of the nine clinics operated by NHC were included in the study (n=1034). Testing activity resulted from self referral, opportunistic screening, and the annual community-wide screening programme. Audiocassettes in Pitjantjatjara (the indigenous language) and English, one for men another for women, were used to ensure first person informed consent for tests.[15–17] Second copies of all pathology results were forwarded to the study coordinator. Chart review was used if

treatment details were missing. Ownership of the data and right of publication remained with the health service.

The NHC clinics provided polymerase chain reaction (PCR) tests, based on urine specimens,[14] for gonorrhoea and chlamydia and standard syphilis serology in several ways. Tests were routinely provided to people who presented with symptoms, antenatal women, in conjunction with cervical cytology screens, and to named sexual contacts. In addition NHC conducted an annual age based screening programme. All people aged 12–40 years were annually offered urine PCR screening for gonorrhoea and chlamydia during a 6 week period in April–May of each year. Treatment and follow up were according to international protocols,[18 19] with regional modification.[14]

SPECIMEN PROCESSING

Urine specimens were refrigerated and transported to the regional centre for assay for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* by PCR (Amplicor PCR, Roche, Branchberg, NJ, USA).[14]

Serum samples were tested using a combination of treponemal and non-treponemal tests. In 1998 the screening test treponemal ELISA (Captia Syphilis-G, Centocor, Malvern, PA, USA: Enygnost syphilis, Behring, Merburg, Germany) was restricted to individuals who had no record of a positive treponemal test. Confirmatory fluorescent treponemal absorbed antibody tests (FTA-Abs, Zeus Scientific Inc, Raritan, NJ, USA) were performed on sera giving a positive or equivocal ELISA, except when the laboratory syphilis register documented a previously reactive FTA-Abs. If there was a discrepancy between the ELISA and the FTA-Abs an agglutination assay was performed (*Treponema pallidum* haemagglutination assay, Fujirebio, Tokyo, Japan; *Treponema pallidum* particle agglutination assay, Seroidia-TPPA, Fujirebio, Tokyo, Japan). Rapid plasma reagin (RPR) tests (RPR Carbon Antigen, CSL Biosciences, Porterville, Vic, Australia; Micro-vue RPR card test, Becton Dickinson, Maryland, USA) were performed on all treponemal positive sera.

SOCIODEMOGRAPHIC VARIABLES

Age, sex, and residence were obtained from the NHC population register and data on petrol sniffing from the NHC petrol sniffing register, both of which are updated annually. (The deliberate inhalation of petrol (petrol sniffing) is an endemic form of substance abuse in a number of central Australian indigenous communities.) The petrol sniffing register has a high degree of completeness. In this population, petrol sniffing is often a public activity and regular sniffers are easily identified by community members. Occasional use was verified from several sources before inclusion in the register. In small remote indigenous communities, Aboriginal health workers have an intimate knowledge of marital status and substance abuse within the community, and were considered the most accurate source of coding on these variables. Alcohol abuse was defined as binge drinking or regular heavy use.

INCIDENT CASES

An incident case of gonorrhoea or chlamydia was defined as a positive result on PCR (first void urine or swab) or culture in a person who had a previous negative result, or positive result with appropriate treatment recorded, within the study period. The date of incidence for gonorrhoea and chlamydia was taken as halfway between the date of the previous negative test or the date of treatment of the previous positive test and the positive test. Equivocal and discrepant PCR results were entered as positives. Within the individual, recurrent infection (for gonorrhoea and chlamydia) was defined as reinfection with an STI occurring more than 4 weeks after adequate treatment was documented.

An incident case of syphilis was defined as documented treponemal seroconversion (FTA-Abs) in a person who had a previous negative treponemal result within the study period, or reactive treponemal serology with a rise in the RPR titre of two or more titres in a person who had a previous RPR within the study period. Data on previous prevalent or incident syphilis in the period 1991–5 were collected from the NHC syphilis register which records serial titres dating from the mid-1970s onwards, details of treatment, and relevant clinical details.

DATA MANAGEMENT AND ANALYSIS

Under strict data privacy protocols[20 21] data were entered into the linked database maintained by the STI control programme. All people in the study population who had two or more tests in the study period were included in the analyses. Incident rates for gonorrhoea, chlamydia, and syphilis were calculated using the person years

Table 1 Baseline characteristics by study population

	Included in incidence analyses (n=1034)	*Not included in incidence analyses (n=340)*
Sex		
Male	485 (47%)	200 (59%)
Female	549 (53%)	140 (41%)
Age (years) (at 1 Jan 1996)		
30+	235 (23%)	127 (37%)
25–29	203 (20%)	62 (18%)
20–24	233 (23%)	64 (19%)
15–19	222 (21%)	56 (16%)
12–14	141 (14%)	31 (9%)
Resident status		
Permanent	938 (91%)	159 (47%)
Visitor	86 (8%)	104 (31%)
Deceased	7 (1%)	13 (4%)
Removed	3 (0.3%)	64 (19%)
Marital status		
Never married	302 (29%)	63 (19%)
One spouse	615 (59%)	143 (42%)
Two + spouses	5 (0.5%)	1 (0.3%)
Widow	13 (1%)	6 (2%)
Past marriage	61 (6%)	19 (6%)
Not known	38 (4%)	108 (32%)
Alcohol		
No abuse	607 (59%)	99 (29%)
Abuse	374 (36%)	133 (39%)
Not known	53 (5%)	108 (32%)
Petrol sniffer		
No regular use	834 (81%)	316 (93%)
Ever occasional	62 (6%)	7 (2%)
Ever regular	138 (13%)	17 (5%)

*Table 2 Risk factors for incident gonorrhoea infections**

	Univariate analysis‡					
	No†	*Obs*	*Py*	*Rate*	*RR*	*p Value*
Sex						
Male	488	145	653.5	22.2	1.0	
Female	511	168	818.6	20.5	0.91	0.469
Age (years) at first incident gonorrhoea						
30+	227	36	348.6	10.3	1.0	
25–29	195	72	295.8	24.3	2.43	<0.001
20–24	227	88	339.5	25.9	2.60	<0.001
15–19	204	95	301.2	31.5	3.22	<0.001
12–14	116	22	186.9	11.8	1.16	0.620 (<0.001)
Time						
<June 1997	934	171	807.5	21.2	1.0	
≥June 1997	834	142	664.6	21.4	1.03	0.758
Resident status						
Permanent	895	296	1381.8	21.4	1.0	
Removed	74	17	90.3	18.8	0.95	0.842
Marital status						
Never married	288	87	445.8	19.5	1.0	
1+ wives	579	191	880.8	21.7	1.11	0.508
Widow/past	69	22	105.2	20.9	1.02	0.952
Not known	33	13	40.3	32.2	1.97	0.056 (0.290)
Alcohol						
No abuse	578	175	927.5	18.3	1.0	
Abuse	342	128	477.4	26.8	1.46	0.007
Not known	49	10	67.1	14.9	0.80	0.537 (0.015)
Petrol sniffing						
Never	776	216	1180.7	18.3	1.0	
Male ever occasional	34	16	50.2	31.9	1.86	0.051
Male ever regular	107	37	158.3	23.4	1.26	0.264
Female ever occasional	26	17	43.5	39.0	2.24	0.015
Female ever regular	26	27	39.3	68.7	4.16	<0.001 (<0.001)
Chlamydia§ in study period						
No	852	223	1206.2	18.5	1.0	
Prevalent	102	42	112.9	37.2	2.12	<0.001
Incident	170	48	144.9	33.1	1.45	0.051 (0.002)
No test	14	0	8.0	—	—	
Syphilis§ in study period						
No	886	266	1268.9	21.0	1.0	
Prevalent	27	8	28.2	28.4	1.45	0.376
Incident	15	4	15.7	25.4	1.15	0.813
No test	186	35	159.3	22.0	1.24	0.251 (0.569)
Syphilis in 1991–5						
No	684	206	1067.5	19.3	1.0	
Prevalent infection	104	49	149.4	32.8	1.80	0.003
Incident infection	91	43	134.8	31.9	1.71	0.011
No test	90	15	120.5	12.5	0.66	0.149 (<0.001)
Prevalent¶ gonorrhoea						
No	823	248	1275.3	19.4	1.0	
Yes	146	65	196.8	33.0	1.78	0.001

*Included in analysis are those people with at least two gonorrhoea tests during the study period, and who are considered to have been uninfected with gonorrhoea during the study period.
†No = the number of people (sums to 969 for all variables except "chlamydia" and "syphilis" for which subjects can contribute to more that one level); Obs = number of incident infections; Py = person years of follow up; rate = incident rate per 100 person years.
‡In univariate analysis each variable is fitted separately. p Values in parentheses are overall test for heterogeneity.
§Prevalent infection is at first test during study period. Incident infections are up to 7 days before date of relevant incident gonorrhoea infection during study period. Levels are hierarchical: "no test," "no," "prevalent," "incident" (a person contributes only to relevant levels).
¶Prevalent gonorrhoea infection is at time of first gonorrhoea test during study period.

method.[22] Newly eligible individuals (including people who moved into the study area and those returning from other regions) contributed to the study from the date of their first test during the study period. Person years of follow up were calculated on the time between an individual's first negative test and their last negative test or estimated date of positive test. For individuals with incident infections and who received treatment, person years of follow up subsequent to an infection were calculated from 4 weeks after the date of the positive test. For individuals with incident infection who did not receive treatment, person years of follow up subsequent to an infection were calculated from the next date of a negative test. Incident rates of syphilis, gonorrhoea, and chlamydia were calculated per 100 person years of follow up. Univariate and multivariate analyses were performed using a Poisson model incorporating random effects which accounted for the recurrent event nature of the data (that is, an individual may have repeated incident infections).[23]

Ethical approval for this study was granted by the Aboriginal board of management of NHC which operates as the research ethics committee.

Results

PARTICIPATION AND BASELINE COMPARABILITY

During the study period a total of 1034 people, representing 75% of the study population, had 11 176 tests for gonorrhoea, chlamydial infection, or syphilis. Table 1 presents demographic characteristics of people who had one or more tests compared with those who were recorded on the NHC population register who did not have a test in the study period. People who did not have a test were more likely to be male, young, regular visitors, or to have left the study area.

GONORRHOEA INCIDENCE

A total of 313 incident gonorrhoea infections were recorded in 243 people in the study population, with 1472 person years of follow up, yielding an overall incidence of 21.3 per 100 person years. In multivariate analyses, age, alcohol abuse, petrol sniffing, and previous prevalent chlamydial infection were all associated with incident gonorrhoea (table 2). The highest incidence was in the 15–29 year age group, particularly in the 15–19 years age group, and overall there was a clear inverse gradient with age. People aged 15–19 years had a rate ratio (RR) of incident gonorrhoea of 3.2 compared with those aged 30 years or more. People who abused alcohol had a RR of incident gonorrhoea of 1.6 compared with people who did not abuse alcohol. The association between petrol sniffing and incident gonorrhoea was significant in women who have sniffed petrol on a regular basis (RR = 3.2).

An association was also seen between incident gonorrhoea and a previous history of STI (prevalent chlamydia in the study period, and prevalent syphilis in the 5 years preceding the study). People with two or more of the risk factors, age 15–29 years, petrol sniffing, and alcohol abuse (n=179), accounted for 57% of incident gonorrhoea cases.

CHLAMYDIA INCIDENCE

A total of 240 incident chlamydial infections were recorded in 198 people in the study population, with 1522 person years of follow up, yielding an incidence of 15.8 per 100 person years. In multivariate analyses, sex, age, and a history of previous STI were associated with incident chlamydia (table 3). Women had a 1.4 RR of incident chlamydia compared with men. The highest incidence was in the 15–29 year age group, particularly in the 15–19 years age group. People aged 15–19 years had a RR of incident chlamydia of 2.7 compared with those aged 30 years or more. There was also a clear association between incident chlamydia and a history of previous STI (incident gonorrhoea in the study period, incident syphilis in the study period, and

*Table 3 Risk factors for incident chlamydia infections**

	Univariate analysis‡					
	No†	*Obs*	*Py*	*Rate*	*RR*	*p Value*
Sex						
Male	454	89	680.1	13.1	1.0	
Female	524	151	841.7	17.9	1.36	0.040
Age (years) at first incident chlamydia						
30+	231	29	357.9	8.1	1.0	
25–29	200	50	308.8	16.2	2.06	0.004
20–24	226	73	344.4	21.2	2.76	<0.001
15–19	206	79	320.4	24.7	3.16	<0.001
12–14	115	9	190.4	4.7	0.57	0.159 (<0.001)
Time						
<June 1997	950	135	837.8	16.1	1.0	
≥June 1997	846	105	684	15.4	0.95	0.707
Resident status						
Permanent	898	217	1426.9	15.2	1.0	
Removed	80	23	94.9	24.2	1.65	0.047
Marital status						
Never married	289	54	463.0	11.7	1.0	
1+ wives	587	159	908.7	17.5	1.55	0.011
Widow/past	70	23	107.1	21.5	1.77	0.048
Not known	32	4	43.0	9.3	0.80	0.689 (0.038)
Alcohol						
No abuse	583	146	954.7	15.3	1.0	
Abuse	347	88	499.0	17.6	1.18	0.282
Not known	48	6	68.1	8.8	0.57	0.211 (0.210)
Petrol sniffing						
Never	785	173	1216.0	14.2	1.0	
Male ever occasional	34	10	54.3	18.4	2.30	<0.001
Male ever regular	107	25	163.3	15.3	1.25	0.269
Female ever occasional	26	21	43.7	48.6	3.62	<0.001
Female ever regular	26	11	44.5	24.7	1.79	0.110 (0.001)
Gonorrhoea§ in study period						
No	815	131	1130.4	11.6	1.0	
Prevalent	148	50	171.8	29.1	2.53	<0.001
Incident	219	51	197.5	25.8	2.01	<0.001
No test	66	8	22.0	36.3	3.39	0.001 (<0.001)
Syphilis§ in study period						
No	894	199	1311.9	15.2	1.0	
Prevalent	23	5	28.3	17.7	1.27	0.489
Incident	15	9	14.7	61.3	3.87	0.003
No test	200	27	166.9	16.2	1.15	0.498 (0.023)
Syphilis in 91–95						
No	689	147	1106.5	13.3	1.0	
Prevalent infection	105	36	153.7	23.4	1.85	0.004
Incident infection	93	45	139.0	32.8	2.48	<0.001
No test	91	12	122.7	9.8	0.75	0.357 (<0.001)
Prevalent¶ chlamydia						
No	877	199	1384.2	14.4	1.0	
Yes	101	41	137.6	29.8	2.22	<0.001

*Included in analysis are those people with at least two chlamydia tests during the study period, and who are considered to have been uninfected with chlamydia during the study period.
†No = the number of people (sums to 978 for all variables except "gonorrhoea" and "syphilis" for which subjects can contribute to more that one level); Obs = number of incident infections; Py = person years of follow up; rate = incident rate per 100 person years.
‡In univariate analysis each variable is fitted separately. p Values in parentheses are overall test for heterogeneity.
§Prevalent infection is at first test during study period. Incident infections are up to 7 days before date of relevant incident chlamydia infection during study period. Levels are hierarchical: "no test," "no," "prevalent," "incident" (a person contributes only to relevant levels).
¶Prevalent chlamydia infection is at time of first chlamydia test during study period.

incident and prevalent syphilis in the 5 years preceding the study). After adjusting for other risk factors we did not observe an increase in risk of incident chlamydia associated with alcohol abuse (RR 1.2) or petrol sniffing.

SYPHILIS INCIDENCE

Seventeen incident syphilis infections were recorded in 17 people in the study population, with 1479 person years of follow up, yielding an incidence of 1.15 per 100 person years. Of the 17 incident cases 14 were aged 15–24 years. No associations were found with incident syphilis that were statistically significant at the 0.05 level (table 4).

Discussion

In this study, which appears to be the first population based analysis of risk factors for incident STI in an indigenous community, three strong predictors of incident STI were identified: age (15–29 years), substance abuse, and a history of previous STI. Particularly vulnerable were people aged 15–19 years and women with a history of regular petrol sniffing.

It is possible to identify some methodological limitations to the study design. In particular, there may have been some underascertainment of incident cases either because of diagnosis outside the study area or non-return for testing, particularly among men and some misclassification of alcohol abuse, petrol sniffing, and marital status. It is also possible that, in using the Roche Amplicor PCR, a few false positives have been included as incident cases of gonorrhoea. It is, nevertheless, unlikely that these limitations will have a material impact on the associations observed.

Age was a strong predictor of both incident gonorrhoea and incident chlamydia particularly among young people aged 15–19 years. The high level of incident syphilis in the age group 15–24 years may well have been significant with a larger sample size.

Alcohol abuse was a significant predictor of incident gonorrhoea but not of incident chlamydia. People who abuse alcohol accounted for 36% of people included in the analysis. Interventions which reduce high risk behaviour in this relatively large subgroup of the population could be expected to reduce the incidence of gonorrhoea but would require greater resource allocation than interventions targeted at smaller higher risk groups such as female petrol sniffers.

While there is considerable anecdotal evidence of the association between sniffing and STIs, there is very little evidence in the literature. A high prevalence of infectious syphilis among petrol sniffers in northern Australia was reported in the late 1970s[24] and an association between treponemal seropositivity and petrol sniffing has been noted in the study population.[25] Petrol sniffers are a small, disadvantaged, and vulnerable group[7] in a community already characterised by poverty and poor health status. Petrol sniffers are more likely to experience inadequate housing, poor income, poor nutrition, and poor access to healthcare services. Women with a history of sniffing petrol on a regular basis represent a small group (n=26) with a high risk of incident gonorrhoea. Male petrol sniffers were at slightly greater risk of incident gonorrhoea than non-sniffers, but not significantly so. Most petrol sniffers in the study population are young, male, and sniff petrol on a regular basis.

A history of previous STI was a strong predictor of both incident gonorrhoea and incident chlamydia.

This study has identified several population subgroups at high risk of STI that can be approached with standard core group strategies.[26] Candidate groups identified by the study could be defined by age group, previous STI, and substance abuse. However, these strategies bring with them the potential for the community to "blame" and stigmatise individuals associated with such groups.[26] Ultimately, the effectiveness of a core group

*Table 4 Risk factors for incident syphilis infections**

	Univariate analysis‡					
	No†	*Obs*	*Py*	*Rate*	*RR*	*p Value*
Sex						
Male	422	7	626.9	1.12	1.0	
Female	513	10	852.0	1.17	1.05	0.919
Age (years) at first incident chlamydia						
25+	406	3	618.1	0.49	1.0	
20–24	222	6	350.2	1.71	3.53	0.074
15–19	192	6	316.9	1.89	3.90	0.054
12–14	115	2	193.6	1.03	2.13	0.408 (0.230)
Time						
<June 1997	905	12	799.4	1.50	1.0	
≥June 1997	830	5	679.4	0.74	0.49	0.180
Resident status						
Permanent	864	16	1385.0	1.16	1.0	
Removed	71	1	93.9	1.07	0.92	0.937
Marital status						
Never married	278	6	456.2	1.32	1.0	
1+ wives	558	10	876.3	1.14	0.87	0.783
Widow/past	67	1	104.4	0.96	0.73	0.769 (0.989)
Not known	32	0	41.9	0	—	
Alcohol						
No abuse	564	12	923.7	1.30	1.0	
Abuse	323	4	488.9	0.82	0.63	0.423
Not known	48	1	66.3	1.51	1.16	0.886 (0.702)
Petrol sniffing						
Never	746	12	1173.0	1.02	1.0	
Male ever occasional	32	1	48.7	2.05	2.01	0.503
Male ever regular	103	2	164.2	1.22	1.19	0.819
Female ever occasional	27	2	45.8	4.37	4.27	0.057 (0.428)
Female ever regular	27	0	47.1	0	—	
Gonorrhoea§ in study period						
No	748	9	1015.8	0.89	1.0	
Prevalent	135	3	168.5	1.78	2.01	0.295
Incident	222	5	220.3	2.27	2.56	0.092 (0.367)
No test	139	0	74.2	0	—	
Chlamydia§ in study period						
No	793	13	1117.6	1.16	1.0	
Prevalent	94	1	122.8	0.81	0.70	0.731
Incident	180	3	175.2	1.71	1.47	0.546 (0.910)
No test	100	0	63.3	0	—	
Syphilis in 91–95						
No	656	13	1048.5	1.24	1.0	
Prevalent infection	104	1	160.7	0.62	0.50	0.507
Incident infection	91	3	149.3	2.01	1.62	0.451 (0.767)
No test	84	0	120.4	0	—	

*Included in analysis are those people with at least two syphilis tests during the study period, and who are considered to have been uninfected with syphilis during the study period.
†No = the number of people (sums to 935 for all variables except "gonorrhoea" and "syphilis" for which subjects can contribute to more that one level); Obs = number of incident infections; Py = person years of follow up; rate = incident rate per 100 person years.
‡In univariate analysis each variable is fitted separately. p Values in parentheses are overall test for heterogeneity.
§Prevalent infection is at first test during study period. Incident infections are up to 7 days before date of relevant incident chlamydia infection during study period. Levels are hierarchical: "no test," "no," "prevalent," "incident" (a person contributes only to relevant levels).

strategy in reducing STI may depend on how well health services provide for high risk groups.

It has also been noted that the targeting of high risk groups in a population can generate a false sense of security for those outside the group who are engaging in high risk behaviour.[26] In conjunction with core group strategies it is therefore important to maintain community-wide strategies that include education, improved access to diagnosis, and treatment and promotion of behaviour change.

Through this study we have identified objective predictors of incident STI which can be used to target interventions and maximise their impact. The results of this study may well have relevance to indigenous communities in other countries that are faced with high levels of STI and substance abuse.

This article is published with the permission of the Nganampa Health Council (NHC) Aboriginal board of management. We acknowledge the significant contribution of Wayne Hateley, Josephine Mick, Nura Ward, Mayana Burton, Pantjiti Lewis, and Makinti Minutjukur in overseeing programme activity; and of NHC clinic staff in providing testing for STI, case management, and data collection, including Maggie Flemming, Stewart Roper, Caroline Wilksch, Clare Stainsby, Diana Rees, Gwendoline Piesse, Lee Lawrie, Marlene Doolan, Peter Hanisch, Cyril McKenzie, Robyn Pitt, Maringka Lennon, Gary Barnes, Barbara Barnes, Kerrie Gell, Katie Ragheb, Iain Everett, Desley Moreton, Joan Wilson, Sinead de Paor, Paul Williams, Meryl Burden, Leah Tapscott, and Clive Jupp. We also acknowledge Anke van der Sterren and Ushma Scales for ethnographic input and Greg Dore for his editorial comments. The NHC STI and HIV control programme is funded by the Office for Aboriginal and Torres Strait Islander Health, Commonwealth Department of Health and Family Services. The National Centre in HIV Epidemiology and Clinical Research is supported by the Commonwealth Department of Health and Aged Care through the Australian National Council on AIDS and Related Diseases.

Contributors: All investigators contributed to the interpretation of results and the preparation of the paper. PJM was responsible for study design, implementation, fieldwork, and data management; ML was responsible for data analysis and interpretation; PJT was involved in study design, implementation, field activities, and community negotiations; JK oversaw study design, execution, and data analysis.

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