An evaluation of a SAFE-style trachoma control program in Central Australia

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ABSTRACT

Objectives: To evaluate the effectiveness of a trachoma control program in a remote community before and after major environmental health improvements.

Design: Before-and-after cross-sectional design. The control program was in three rounds — each consisting of community census, screening of children < 13 years, health promotion activities and antibiotic treatment. There were two housing and infrastructure surveys.

Interventions: Treatment of affected children and their households with azithromycin at baseline, 7 and 21 months, and health promotions. Housing and sewerage infrastructure improvements were completed at 12 months.

Setting: Large, remote Central Australian Aboriginal community, 1998–2000.

Participants: All community residents.

Main outcome measures: Prevalence of active trachoma among children under 13 years; community population changes; and adequacy of housing facilities for healthy living practices.

Results: The prevalence of trachoma among children was 40% (95% CI, 32%–46%) at baseline, 33% (95% CI, 26%–40%) at 7 months' follow-up and 37% (95% CI, 29%–46%) at 21 months. These proportions were neither clinically nor statistically significantly different. There was a high degree of population mobility over the study period, with only 32% of residents appearing in all three censuses. The proportion of houses with completely adequate facilities increased from 0 to 16%.

Conclusions: Population mobility (both within and between communities), inadequate housing and continued crowding (despite improvements), as well as uncertainty about compliance with antibiotic treatment, are the likely factors contributing to the lack of effect of this trachoma control program. Because of high population mobility, a region-wide approach is needed for effective trachoma control.

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TRACHOMA is a keratoconjunctivitis caused by *Chlamydia trachomatis*. Recurrent chronic infection in childhood can lead to conjunctival scarring, trichiasis (inturned lashes which damage the cornea) and ultimately blindness through corneal opacification later in life. In Australia it is now almost exclusively a disease of Aboriginal people.[1,2] High prevalence rates have been associated with poor environmental health conditions, inadequate hygiene, crowding, low socioeconomic status and an arid environment.[3,4] The main reservoir of infection and transmission is among children and those who care for them.[1,5]

The World Health Organization has developed the SAFE strategy (*S*urgery for trichiasis, community *A*ntibiotic programs, *F*acial cleanliness, and *E*nvironmental health improvements) for trachoma control,[6] but there is currently no systematic SAFE program in Australia. To date, Australian studies of trachoma control have had limited follow-up, and have not incorporated environmental changes.[7,8] The longer-term effectiveness and optimal design of the SAFE strategy need to be established in the setting of Australian Indigenous communities.

We conducted a study in a Central Australian community. Although there have been major reductions in the prevalence of infectious trachoma in some regions of Australia, this has not occurred in Central Australia.[2,9,10] Surveys in the study community in 1956, 1976 and 1985 found prevalences of trachoma in children of 42%, 63% and 69%, respectively,[2] and a survey in 1990 of a neighbouring region found that 45% of blindness was due to trachoma.[11]

Our study contained three elements of the SAFE strategy — community antibiotic programs, facial cleanliness, and environmental health improvements. We aimed to evaluate the population-level effectiveness of a reproducible community trachoma control program, before and after major community environmental health improvements by the National Aboriginal Health Strategy – Environmental Health Program (NAHS-EHP) and the Indigenous Housing Authority of the Northern Territory. As part of the NAHS-EHP, intersectoral and community collaboration was promoted and a trachoma control program was implemented. We describe here one set of projects that contributed to an evaluation of the health impacts of the NAHS-EHP.[12]

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METHODS

Study community

The study community is a remote community 300 km from Alice Springs with a population of about 1000, about 90%

1: Trachoma control program — sequence of the process, data collections and interventions

Preparation May 1998	Community consultations and publicity commences (6 months)	
	Data collection	**Interventions**
Round 1 November 1998	■ Survey of housing and community health infrastructure ■ Community census and obtaining of consent ■ Screening of children < 13 years	■ Health promotion (4 weeks) ■ Treatment of infected children and household members
Round 2 June 1999 *7-month follow-up*	■ Community census and obtaining of consent ■ Screening of children < 13 years	■ Health promotion (4 weeks) ■ Treatment of infected children and household members
Environmental improvements November 1999	Completion of building or renovation of houses, installation of a sewerage system, grassing of the main playing field, sealing of roads	
	Data collection	**Interventions**
Round 3 August 2000 *21-month follow-up*	■ Community census and obtaining of consent ■ Screening of children < 13 years ■ Survey of housing (October 2000)	■ Health promotion (4 weeks) ■ Treatment of infected children and household members

of whom are Aboriginal. Paid local community workers and Aboriginal health workers facilitated the censuses, consent and screening processes and guided the conduct of the researchers in all aspects of the community work.

Many community groups became involved in the project one way or another, ensuring that it had a high local profile. Only one household refused to participate in all stages of the program.

Sequence of events

The key elements and sequence of events of the intervention and evaluation are described in Box 1. There were three rounds of data collection (census, screening of children), and intervention, two before and one after the environmental health improvements, and two housing surveys.

Community census: Three door-to-door censuses recorded those who "currently live in the community "and those "present last night" or "away". Visitors were recorded separately. At the same time, consent was obtained for the screening of children and for all treatment.

Screening of children: An experienced doctor screened children for trachoma using the WHO grading system and two-times magnification loops.[13] All children under 13 years of age in the community were encouraged to participate in the three screening events. Our sample sizes had greater than 80% power to detect a 20% fall in prevalence in the first follow-up (at 7 months) and a 21% fall in the second follow-up (at 21 months), which is well within the size of impact expected from efficacy studies.[14-16]

Antibiotic treatment: Azithromycin (20 mg per kg single dose, maximum 1 g) was dispensed to all identified cases and their entire household(s). Children aged under six months were given erythromycin (7 mg/kg four times a day for 14 days). In Round 1, the antibiotic was brought to each house and individual doses were prepared. Many took their dose when delivered, especially children, and doses were left with a responsible adult for those not at home at the time. In Round 2, treatments were dispensed as household kits, together with relevant health promotional material. In Round 3, antibiotic doses were supervised.

Health promotion: A health promotion expert orchestrated the health promotion activities, which included sessions with every school class, a trachoma video made for Aboriginal children, and local production and screening of a new video about trachoma (and scabies) control in the local language. Keeping children's faces clean was emphasised. There were many discussions about trachoma held with small groups of people during the census and consent-gathering processes. There was no mechanism to evaluate the impact of the health promotion activities separately from other components of the interventions.

Housing survey: In the two housing surveys, environmental health officers scored houses using the Northern Territory Environmental Health Housing Survey, after standardising their survey interpretation. Data were analysed along the lines of the National Indigenous Housing Guidelines priority healthy living practices.[17] Detailed codes for each house were collapsed into three grades for how well the house facilitated washing of people, clothes washing, removal of waste, and preparation and cooking of safe, healthy food. The grade of "adequate facilities" approximates the minimum standards recommended in the National Indigenous Housing Guidelines.[17] Details of this analysis process will be published elsewhere.[12]

Community environmental health improvements: In 1999, the NAHS-EHP and the Indigenous Housing Authority of the Northern Territory built or renovated 24 houses, installed a reticulated sewerage system and treatment works, grassed the main sports oval and sealed some community roads.

Ethical approval

The Central Australian Human Research Ethics Committee, the Community Council and the Community Health Management Group approved the study and its publication.

Statistical analysis

Statistical analysis was carried out using SPSS (Statistical Package for the Social Sciences) and Epi Info.[18,19]

2: Screening coverage and prevalence of infectious trachoma in three rounds of screening children under 13 years of age

Round	Screening coverage*	Prevalence of trachoma (95% CI)
1	189/234 (80%)	40% (32%–46%)
2	170/206 (83%)	33% (26%–40%)
3	123/251 (49%)†	37% (29%–46%)

*Of those actually "present last night" in the community, the screening coverage was 90%, 89%, and 55% in Rounds 1, 2 and 3, respectively. †This lower coverage resulted from social–cultural activity taking place at the same time as the screening.

3: Housing survey — proportion of houses with adequate facilities for healthy living practices

Healthy living practice	Housing survey 1998 ($n = 65$)*	Housing survey 2000 ($n = 76$)*
Wash people	25%	33%
Wash clothes	25%	45%
Remove waste	21%	47%
Cook and prepare food	23%	31%

*Survey coverage of Indigenous houses in 1998 was 100% and in 2000 was 94%. Differences between the 1998 and 2000 values for adequate facilities are not statistically significant ($P = 0.05$).

RESULTS

Prevalence of trachoma

The coverage of screening and the prevalence of infectious trachoma in children are given in Box 2. The screening coverage is based on the census data for the number of children "currently living in the community". This included children temporarily away from the community. All identified cases of infectious trachoma were in Aboriginal people.

The difference in the prevalence of infectious trachoma between Rounds 1 and 2 was not statistically significant ($\chi^2 = 1.46$; $P = 0.22$), and neither was the difference between Rounds 2 and 3 ($\chi^2 = 0.49$; $P = 0.47$), or between Rounds 1 and 3 ($\chi^2 = 0.16$; $P = 0.68$). The lower screening coverage in Round 3 was due to social–cultural activity at the time. However, even if all unscreened children in Round 3 did not have trachoma, the difference in prevalence between Rounds 2 and 3 would still not be significant.

The high prevalence and treatment strategy led to more than 70% of the Aboriginal population in the community being dispensed azithromycin in each round. There are no data on who actually consumed the medication in Rounds 1 and 2, although our impression was that the program had wide support and we observed a large number of children and adults taking their dose as it was dispensed.

Censuses and community mobility

There were 1287 residents (including residents temporarily away) in one or more of the three censuses. Of these, only 32% were currently living in the community at all three censuses, with the other 68% "living elsewhere" during at least one census. As well as movement in and out of the community, there was a high level of movement between houses within the community, and 13%–17% of children under 13 years were identified as concurrently living in more than one house in the community at each census.

There were 337 different children screened at least once. Of these, 53 (24%) children were screened three times, and the prevalences in this group were 44%, 40%, and 30% in Rounds 1, 2 and 3 respectively.

Housing surveys

Inspections by environmental health officers established that the new sewerage system was a major improvement on the previous septic tank systems.[12] For each healthy living practice, the proportion of houses that had "adequate" facilities increased somewhat, as shown in Box 3. The proportion with "adequate" facilities in all four areas improved from zero in 1998 to 16% in 2000, and the proportion with poor or no facilities for all four areas decreased from 12% in 1998 to zero in 2000. The average number of people per house (Aboriginal housing only) fell from 10 in 1998 to 8.5 in 2000, despite a net 7% growth in the Aboriginal population of the community. The average number of people per bedroom was 4.4 in 1998 and 3.2 in 2000 (including some houses with a mix of Aboriginal and non-Aboriginal residents).

DISCUSSION

Although we anticipated a synergistic impact on trachoma from widespread community involvement, improved housing, less crowding, antibiotic treatment and health promotion, the overall impact on the prevalence of trachoma was small. There are a number of important lessons and implications from this study.

Firstly, it is likely that some people did not take the dispensed medication. After discussing the results of Rounds 1 and 2 with the community members, they agreed with the idea of supervised dosing in the future, and this was used in Round 3. The timing of repeat interventions is likely to be important, especially if housing improvements are insufficient. Mathematical modelling of trachoma control suggests that, even without a mobile population, six-monthly treatment programs are required if the aim is elimination rather than intermittent control in populations with high prevalences.[20]

Secondly, the housing in this community remains inadequate in number, and most homes were inadequate in functionality one year after the new housing was occupied. The environmental health improvements were unlikely to be sufficient to reduce transmission of trachoma. The level of crowding remains well above the Australian Bureau of Statistics recommendations for number of people per bedroom, and the average size of 9–10 is three times the national average of 2.7 persons per house.[21,22]

While provision of improved health hardware, such as housing, is almost certainly a necessary prerequisite to reduced trachoma transmission, it is not

in itself sufficient. Maintenance of the hardware and certain health behaviours are also needed to derive health benefits from new housing.

The third major influence on the outcomes is the high degree of population mobility. This is probably the most important factor leading to an accelerated build-up of trachoma infection. Simultaneous community treatment with azithromycin aims to reduce the force of infection within the community to reduce community prevalence. People with trachoma moving into the community would increase the chance of treated individuals becoming re-infected.

A high proportion of children resided in more than one community or in more than one house within the community.[12] This high degree of "communal" living in kinship networks has also been documented by local anthropological studies.[23] This internal mobility limits the possibility of analysis of an association, at the individual level, between housing quality and trachoma, or between changes in housing quality and re-infection rates. We believe that because of this mobility, which is similar to that found in another Central Australian community, a coordinated regional approach to control of trachoma and other infectious diseases is required.[10,24]

While environmental improvements occurred, far more needs to be done to improve environmental conditions, and such projects need to have a regional focus. Antibiotic-based programs for trachoma should only be seen as interim measures until the conditions for transmission have changed. This will require region-wide, sustained changes in both health hardware such as housing, including maintenance, and health behaviours. This, in turn, is not likely to occur without underlying socioeconomic changes. Efforts to identify and provide surgery for the late effects of this disease are also required.

Single-community programs such as described here will not achieve elimination of trachoma in the near future. Long-term eradication is not guaranteed until widespread changes in the conditions that allow transmission of trachoma are achieved in the whole region. This requires not only community motivation, but also sustained political will and support.

COMPETING INTERESTS

None identified.

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