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Rapid assessment for prioritisation of trachoma control at community level in one district of the Kaolack Region, Senegal

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Summary The objective of this study was to use a modified Lot Quality Assurance Sampling methodology to classify communities according to prevalence of active trachoma and to estimate the prevalence of trachoma and trichiasis in Nioro department, Kaolack Region, Senegal. A survey was conducted using two-stage cluster sampling to select 50 children aged 2—5 years in each of 33 clusters. In total 1648 children were examined for active trachoma. Information on trachoma risk factors was collected through interviews with the mother or the household head of the child. Adults (>40 years) with trichiasis were identified through case finding. Nineteen clusters had a low prevalence of active trachoma in children aged 2—5 years (<20%), 11 had medium prevalence (20—40%) and three had high prevalence (>40%). The prevalence of active trachoma in children aged 2—5 years was 17.4% (95% CI 12.9—21.8%). Multivariate-adjusted predictors of active trachoma were: age, facial cleanliness, hygiene practices and keeping cattle in the household. The prevalence of trichiasis in adults aged over 40 years was 1.77% (95% CI 1.24—2.51), equating to 985 adults (95% CI 765—1250) with trichiasis in Nioro department. In conclusion, a survey using rapid methodology showed that trachoma is a problem of public significance in Nioro department, Senegal.

1. Introduction

Trachoma is the leading infectious cause of blindness worldwide, responsible for approximately 1.3 million cases of blindness (Resnikoff et al., 2004). Blindness from trachoma is the result of repeated

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infection with *Chlamydia trachomatis*, which is transmitted through fomites, flies and from person to person (Grayston et al., 1985). Infection with *C. trachomatis* can lead to conjunctival inflammation, which may be classified as trachoma follicular (TF) or trachoma intense (TI) depending on the clinical signs present (Thylefors et al., 1987). Episodes of active trachoma (TF and/or TI) can lead to scarring of the upper tarsal conjunctiva, which can distort the upper eyelid, turning the eyelashes inwards to rub against the globe. This is called trachomatous trichiasis (TT). Trichiasis may ultimately lead to corneal opacity and irreversible blindness.

The WHO has endorsed the SAFE strategy for the control of blinding trachoma. This consists of Surgery to correct trichiasis, Antibiotics to eliminate *C. trachomatis*, and Facial cleanliness and Environmental change (improved water supply and sanitation) to reduce the transmission of *C. trachomatis*. The surgical component of the programme is needed wherever trichiasis is found, but the 'AFE' components are required only in districts or communities where the prevalence of active trachoma in children aged 1—9 years exceeds 10% (WHO, 2003). Data on the prevalence of active trachoma are therefore required to plan and monitor trachoma control programmes.

Trachoma control programmes are often limited in resources and therefore need to allocate these resources as efficiently as possible. The paucity of data concerning the prevalence of trachoma has been a major constraint on the efficient implementation of the SAFE strategy (Mariotti et al., 2003). Rapid methods, notably the Trachoma Rapid Assessment (TRA), have been developed to prioritise communities for trachoma control (Negrel et al., 2001). In TRA, 50 children from the poorest households in the community (i.e. village or urban area) are assessed for trachoma, and in addition the presence of trachoma risk factors and trichiasis are measured to give the community a score. This scoring system allows priority areas for intervention to be identified; however, TRA does not produce prevalence estimates and there are questions as to its validity (Limburg et al., 2001). As a result, the Lot Quality Assurance Sampling (LQAS) method was developed to classify rapidly, yet validly, communities according to the prevalence of trachoma (Myatt et al., 2003). In LQAS, up to a maximum of 50 children are sampled to constitute one cluster, and the cluster is assigned a prevalence category depending on the number of children in the sample with trachoma. Sampling ceases when enough information has been collected to classify the community according to trachoma prevalence (i.e. when enough cases have been identified) or when the maximum sample size has been reached (in which case the community is 'low prevalence'), that is, a stopping rule exists. This means that there is no fixed sample size for LQAS and data collection and analysis occur at the same time.

In Senegal, a national survey estimated that the prevalence of active trachoma was 10.8% (95% CI 9.2—11.4%) in children aged under 10 years living outside of Dakar (Saal et al., 2003). The national estimate conceals wide variation in the prevalence within Senegal, ranging from 3.3% in Dakar to 14.2% in Thies-Diourbel. The Kaolack Region in the centre-west of Senegal is characterised by a poor agricultural economy and it suffers from drought for up to 9 months of the year. The national survey showed that the prevalence of trachoma was relatively low in Kaolack Region (prevalence in children aged 1—9 years was 6.8%), however this estimate was based on a small sample size and there may be foci of high prevalence within the region.

The objective of this study was to use a modified LQAS survey methodology (where clusters of 50 children aged 2—5 years were sampled without the stopping rule) to classify communities according to the prevalence of active trachoma and to estimate the prevalence of trachoma and trichiasis in Nioro department, Kaolack Region, Senegal.

2. Materials and methods

2.1. Study population

The expected prevalence of active trachoma in children aged 2—5 years was estimated to be 15%, based on the results of the national survey and the assumption that the prevalence is approximately double that in children aged 1—9 years (Saal et al., 2003). Allowing for a required confidence of 95%, a worst acceptable result of 12.5% (i.e. precision of 16.7%), a design effect of 2, a population size of 35 000 children aged 2—5 years (Anonymous, 1992) and 7.5% non-response, the required sample size is 1650 subjects aged 2—5 years (using Epi Info 6.04; CDC, Atlanta, GA, USA). In total, 33 clusters of 50 children aged 2—5 years were required for this survey.

Kaolack Region has approximately 1.4 million inhabitants (2002 estimate) and is divided administratively into four departments (which are the equivalent of districts). The present cross-sectional survey was conducted in one of these departments, namely Nioro, which consists of ten rural divisions that each contain several villages and one urban area, Nioro du Rip. Estimates of the 2003 population of the rural villages and the urban zone in

Nioro were determined through demographic projection, achieved by applying an average national annual growth rate of 2.8% to the previous census population figures from 1988 (Anonymous, 1992).

Nioro department was stratified into ten distinct rural divisions (equivalent to subdistricts). Three clusters were selected from each rural division through probability-proportionate-to-size sampling. For each stratified group, a list of villages with their respective size was drawn up with a column showing the cumulative population size across the villages. The total population of the stratified group was divided by the number of clusters required (i.e. three within each stratified group) to derive the sampling interval. The first cluster was selected by multiplying the sampling interval with a random number between 0 and 1. The resulting number was traced in the cumulative population column and the first cluster was taken from the corresponding village. The following cluster was identified by adding the sampling interval to the previous number, and this was repeated to identify the third cluster. This was repeated for each of the rural divisions. One cluster was also selected at random from each of the three urban sectors of Nioro du Rip. In total, 33 clusters of 50 children aged 2—5 years were selected for this survey.

Within each cluster, households were selected at random from the updated village rural taxation list of household heads. For the purposes of this study, a household was defined as a group of people living and eating together at least 6 months of the year who recognise the same head of household. To maximise community acceptance, the village was informed 1 or 2 days before the survey team's visit and the enumerators were accompanied by the village chief or a guide appointed by the chief. The survey enumerators visited each selected household on the list, sequentially, until 50 children aged 2—5 years had been identified. There was no cessation of sampling before the cluster size of 50 children was reached, regardless of how many cases of active trachoma were identified. When a child was absent, the survey team returned at least two times to the household to examine the child before leaving the area. The survey continued in the neighbouring village when the required cluster size could not be achieved in one village. Each eligible child aged 2—5 years was registered, after obtaining informed consent for inclusion in the study from the mother or household head. The survey team consisted of two ophthalmic nurses, a supervising ophthalmologist, an enumerator and a driver.

Cases of trichiasis were identified in the clusters on the day of the survey through a combination of local key informants and door-to-door visits. Eligible cases were restricted to those aged 40 years and above living in the selected clusters. Care was taken to ensure that cases from neighbouring settings were not included.

2.2. Outcome assessment

Each child was examined by an experienced trachoma grader using a 2.5 magnification binocular loupe. Outcome assessment was based on the WHO simplified grading system (Thylefors et al., 1987). TF was diagnosed by the presence of five or more follicles in the upper tarsal conjunctiva of at least 0.5 mm in size. TI was diagnosed by the presence of pronounced inflammatory thickening of the tarsal conjunctiva that obscured more than one-half of the normal deep tarsal vessels. The examination team also recorded whether the child had a dirty face (i.e. presence of ocular or nasal discharge on the child's face before examination) or flies on the face (i.e. flies present on the child's face when the team arrived in the household before examination). Trichiasis cases were defined by the presence of one or more eyelashes rubbing on the eyeball or evidence of epilation. Before commencement of the survey the trachoma graders attended two standardisation sessions and their interobserver variation was low.

2.3. Risk factor assessment

The mother or head of household of each child subject was interviewed in person by a trained interviewer. Information was collected about hygiene practices (frequency of bathing, access to water), other trachoma risk factors (presence of cattle, pit latrine, crowding) and socio-economic status (education, employment, dwelling characteristics). Information was collected from the chief of the village regarding village characteristics. Patients with trichiasis were asked why they had not gone for surgery.

2.4. Statistical analysis

The prevalence of active trachoma in children aged 2—5 years was calculated for each cluster, and these clusters were then classified as low prevalence (<20%), medium prevalence (20—40%) or high prevalence (>40%). The prevalence of active trachoma in children aged 2—5 years was estimated for the entire sample, taking into account the design effect (DEFF) and the intracluster correlation coefficient (ICCC). The DEFF and the ICCC were calculated with the complex survey analysis programme

(CSURVEY) in Epi Info (version 6.04b), based on the Taylor linearised deviation method for determining survey variances for cluster sample surveys. The ICCC was calculated according to the inflated variance method, as described by Böhning and Greiner (1998). The prevalence of trichiasis was estimated using the updated Senegalese census data as the denominator of adults aged over 40 years in Nioro department. Multivariate logistic regression was used to generate odds ratios (OR) and 95% CI for the association between risk factors and active trachoma, adjusting for age and using a stepwise selection procedure. Tests for trends were performed by modelling the group scores of exposures (e.g. age 2, 3, 4 or 5 years) as one variable. A Gaussian kernel density plot of cluster-specific prevalence estimates of active trachoma in children aged 2—5 years was created using Stata (Stata Corp., College Station, TX, USA). This is a non-parametric technique for probability density estimation that uses the data to estimate the functional form of the density, rather than specifying it beforehand. The purpose of presenting the distribution of trachoma by cluster in this way was to examine whether the clusters were grouped into three levels of prevalence (low/medium/high).

2.5. Ethical issues

Ethical approval for the study was given by the Senegalese Ministry of Health and the London School of Hygiene and Tropical Medicine. The mother of each child identified with active trachoma was given two tubes of 1% tetracycline eye ointment and was instructed to apply this ointment to the child's eyes twice a day for 6 weeks. Each trichiasis case identified was referred to the trichiasis surgical camps where surgery was conducted free of charge. Other eye problems that were identified during the course of the survey were referred to the eye health centre of Kaolack Regional Hospital.

3. Results

A total of 1648 children aged 2—5 years were included in the study from 930 different households. There were slightly more girls (52.5%) than boys (47.5%) in the sample. The children aged 2 years made up a significantly larger proportion of the sample (33.0%) than children aged 3, 4 or 5 years (23.1%, 17.7% and 26.3%, respectively). The study participants were generally from low income households. Only 3.3% of children lived in households that owned a bicycle. Just 39.7% of children lived in a house that had a sheet metal roof, whilst the remainder lived under a thatch roof. One-quarter of the children (24.5%) lived in a dwelling made out of cement, whilst the rest lived in mud brick houses.

Nineteen communities had a low prevalence of active trachoma (TF/TI, <20%), 11 had medium prevalence (20—40%) and three had high prevalence (>40%) (Table 1). The Gaussian kernel density plot of the cluster-specific active trachoma prevalence data demonstrates that there are three distinct levels (low/medium/high) of trachomatous disease in children within different clusters (Figure 1). In total, there were 286 children with active trachoma. This gave a prevalence of active trachoma in children aged 2—5 years of 17.4% (95% CI 12.9—21.8%) for the whole sample (Table 2). The vast majority of children with active trachoma presented with TF only ($n = 268$; prevalence = 16.3%; 95% CI 12.0—20.5%), 16 children (1.0%; 95% CI 0.5—1.4%) had both TF and TI, and just 2 children (0.1%; 95% CI 0—0.4%) had TI only. There was a lack of correlation between the population size of the village and the prevalence of active trachoma ($R = -0.15$; $P = 0.40$).

The prevalence of active trachoma decreased significantly with age (for trend, $P < 0.0001$) (Table 3). Girls were no more likely to have active trachoma than boys. Both having a dirty face (OR = 3.80, 95% CI 2.83—5.09) or flies on the face (OR = 2.26, 95% CI 1.43—3.58) were significant predictors of active trachoma. Hygienic behaviour, including using more than 10 litres of water daily to wash the child, high frequency of face washing, using soap for face washing and (non-significantly) living close to water were protective for active

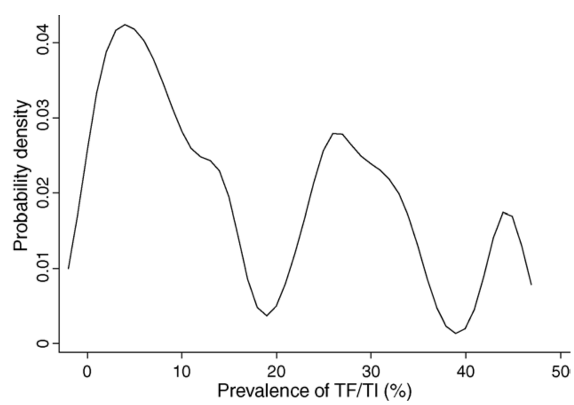

Figure 1 Gaussian kernel density plot of the village-specific prevalence of active trachoma in children aged 2—5 years. TF: trachoma follicular; TI: trachoma intense.

Table 1 Prevalence of active trachoma in children aged 2—5 years by village

Village name	Village population size[a]	Number of children aged 2—5 years sampled	Prevalence (%) of TF/TI in children aged 2—5 years	Classification of prevalence
Bustan Ker Kaba	46	51	3.9	Low
Daru Salam Nioro	2093	51	0	Low
Fass Hlm Nioro	1938	51	2.0	Low
Fass Keur Oumar Tounkara	737	49	0	Low
Fetto	444	50	8.0	Low
Jama Chewe	1467	46	6.5	Low
Jamagen Nioro	2599	53	15.1	Low
Kere Walo	72	49	44.9	High
Keur Alassane Khodia	396	50	28.0	Medium
Keur Ayib Gueye	1168	50	22.0	Medium
Keur Cheikhou Oumar	329	50	32.0	Medium
Keur Landing Boussoura	137	50	10.0	Low
Keur Maba Awa	1037	49	10.2	Low
Keur Madiabel	980	50	2.0	Low
Keur Massire Diawara	220	50	14.0	Low
Keur Samba Ndoukou	256	50	26.0	Medium
Lohene Walo	172	50	4.0	Low
Loyene	2279	50	44.0	High
Mbapp (France)	529	49	6.1	Low
Medina Bahen	43	50	8.0	Low
Medina Ndiankou	282	50	26.0	Medium
Naolerou	616	50	26.0	Medium
Ndienguene Ibra	435	50	30.0	Medium
Ndienguene Keur Mamour	103	50	30.0	Medium
Nguer Babou	577	50	14.0	Low
Ngueyene Ndary	172	50	12.0	Low
Sancha Bege Diallo	187	50	6.0	Low
Sangoulaye	169	50	4.0	Low
Santhie Thaimene	1373	50	2.0	Low
Sinch Ndahar	158	51	33.3	Medium
Taif	423	50	44.0	High
Thianda-Ndiago.2	318	49	34.7	Medium
Thiarene Mactar	880	50	24.0	Medium

TF: trachoma follicular; TI: trachoma intense.
[a] The survey continued in the neighbouring village when the required cluster size of 50 children aged 2—5 years could not be achieved in one village.

trachoma. Children were more likely to have active trachoma if they had their faces wiped after washing (OR = 1.66, 95% CI 1.27—2.17) or lived in households where cattle were kept (OR = 4.02, 95% CI 3.04—5.33). Contrary to expectations, the exclusive use of latrines by the household members and lack of crowding were positively associated with trachoma. The multivariate logistic regression model produced by the stepwise selection procedure showed that young age, dirty face, flies on

Table 2 Prevalence, 95% CI, design effect (DEFF) and intracluster correlation coefficient (ICCC) for different categories of trachomatous eye symptoms ($n = 1648$)

Trachoma symptoms	Cases	Prevalence (%)	95% CI	DEFF	ICCC
TF and/or TI	286	17.4	12.9—21.8	5.9	0.18
TF only	268	16.3	12.0—20.5	5.6	0.10
Both TF and TI	16	1.0	0.5—1.4	0.9	0.007
TI only	2	0.1	0—0.4	2.0	0.02

TF: trachoma follicular; TI: trachoma intense.

Table 3 Predictors of the prevalence of active trachoma in children aged 2—5 years

Risk factor	Number without TF and/or TI[a]	Number with TF and/or TI[a]	Age-adjusted odds ratio (95% CI)
Demographic variables			
Age (years)			
2	420 (30.8%)	124 (43.4%)	2.54 (1.76—3.68)
3	312 (22.9%)	68 (23.8%)	1.88 (1.25—2.82)
4	242 (17.8%)	49 (17.1%)	1.75 (1.13—2.70)
5	388 (28.5%)	45 (15.7%)	Baseline
Sex			
Male	636 (46.7%)	146 (51.0%)	Baseline
Female	726 (53.3%)	140 (49.0%)	0.87 (0.67—1.12)
Hygiene variables			
Dirty face			
Yes	170 (12.5%)	102 (35.7%)	3.80 (2.83—5.09)
No	1192 (87.5%)	184 (64.3%)	Baseline
Flies on face			
Yes	63 (4.6%)	30 (10.5%)	2.26 (1.43—3.58)
No	1299 (95.4%)	256 (89.5%)	Baseline
Distance to water (m)			
<25	281 (21.3%)	46 (16.8%)	Baseline
25—49	249 (18.9%)	59 (21.6%)	1.49 (0.97—2.28)
50—99	353 (26.8%)	79 (28.9%)	1.39 (0.93—2.07)
≥100	435 (33.0%)	89 (32.6%)	1.24 (0.84—1.82)
Amount of water used daily to bathe child (l)			
<10	469 (35.6%)	178 (65.2%)	Baseline
≥10	849 (64.4%)	95 (34.8%)	0.28 (0.22—0.37)
Times washed face/day			
Not daily	28 (2.1%)	10 (3.7%)	Baseline
1	106 (8.1%)	27 (10.0%)	0.67 (0.31—1.43)
≥2	1177 (89.8%)	232 (86.2%)	0.49 (0.26—0.93)
Use soap for face washing			
Yes	800 (60.8%)	109 (39.9%)	0.41 (0.31—0.54)
No	516 (39.2%)	164 (60.1%)	Baseline
Wiped face			
Yes	451 (34.2%)	123 (45.1%)	1.66 (1.27—2.17)
No	867 (65.8%)	150 (54.9%)	Baseline
Sanitation variables			
Latrine			
Yes	803 (60.9%)	180 (65.9%)	Baseline
No	515 (39.1%)	93 (34.1%)	0.82 (0.62—1.08)
Pit latrine used			
No	519 (40.7%)	93 (34.1%)	0.56 (0.41—0.76)
Sometimes	125 (9.8%)	16 (5.9%)	0.38 (0.21—0.67)
Always	332 (26.0%)	105 (38.5%)	Baseline
Only by household head	299 (23.5%)	59 (21.6%)	0.59 (0.42—0.85)
Garbage in yard			
Yes	26 (2.0%)	7 (2.6%)	1.25 (0.53—2.94)
No	1292 (98.0%)	266 (97.4%)	Baseline
Cattle kept in household			
Yes	259 (19.7%)	129 (47.3%)	4.02 (3.04—5.33)
No	1059 (80.3%)	144 (52.7%)	Baseline
Crowding			
Children/room			
1	77 (5.9%)	25 (9.2%)	Baseline
2	269 (20.4%)	89 (32.6%)	1.12 (0.67—1.88)
3	386 (29.3%)	72 (26.4%)	0.63 (0.38—1.06)
4	328 (24.9%)	44 (16.1%)	0.45 (0.26—0.79)
≥5	256 (19.5%)	43 (15.8%)	0.56 (0.32—0.98)

TF: trachoma follicular; TI: trachoma intense.
[a] There are some missing values.

Table 4 Multivariate-adjusted predictors of the prevalence of active trachoma in children aged 2—5 years[a]

Risk factor	Multivariate-adjusted odds ratio (95% CI)
Age (years)	
2	2.90 (1.93—4.35)
3	1.92 (1.23—2.99)
4	1.83 (1.13—2.95)
5	Baseline
Dirty face	
Yes	4.07 (2.83—5.84)
No	Baseline
Flies on face	
Yes	1.85 (1.04—3.30)
No	Baseline
Amount of water used to bathe child (l)	
<10	Baseline
≥10	0.45 (0.33—0.62)
Times washed face/day	
Not daily	2.50 (1.11—5.60)
At least daily	Baseline
Use soap for face washing	
Yes	0.52 (0.38—0.70)
No	Baseline
Cattle kept in household	
Yes	3.11 (2.25—4.29)
No	Baseline

[a] The variable 'two children per room' was also a significant predictor of prevalence of trachoma. However, since the comparison for this was versus one, three, four or five children per room, this was not felt to be aetiologically significant and so was excluded.

face, using less than 10 litres of water for washing the child daily, not washing the face daily, not using soap for face washing and keeping cattle in the household were predictors of active trachoma (Table 4).

A total of 66 adults aged 40 years and older were identified with trichiasis through case finding in the surveyed communities. There were an estimated 3725 people over 40 years of age living in the 33 clusters of the study, giving a prevalence of trichiasis in adults over 40 years of 1.77% (95% CI 1.24—2.51%). The age-standardised prevalence of TT was higher in women (1.93%, 95% CI 1.29—2.88) than in men (1.59%, 95% CI 0.98—2.53). Age and sex standardisation of the trichiasis results to the population of Nioro department produced an estimate of 985 adults aged over 40 years (95% CI 765—1250) with trichiasis in Nioro department.

Only 19 (28.8%) of the 66 trichiasis patients identified knew that surgery could help their problem. Among those who knew that surgery could help their problem, the reasons for not going for surgery were lack of knowledge about availability of surgery in Senegal (68.4%), lack of money (31.6%), lack of time (21.1%) and fear (15.8%). None of the trichiasis patients reported that they had been advised not to go for surgery.

4. Discussion

In this study we used the modified LQAS method, sampling full clusters of 50 children aged 2—5 years without the stopping rule, to classify communities in Nioro department, Kaolack Region according to the prevalence of trachoma. We found that 19 communities had a low prevalence of TF/TI (<20%), 11 had medium prevalence (20—40%) and 3 had high prevalence (>40%). Categorising the clusters into three groups based on prevalence is supported by the Kernel density plot, which indicated that this was the underlying pattern of trachoma prevalence in children aged 2—5 years within the clusters. Since we did not apply the stopping rule for sampling of children, but instead sampled 50 children for each cluster, we were able to estimate the prevalence of active trachoma in children aged 2—5 years in Nioro department, and we found this to be 17.4% (95% CI 12.9—21.8%). The prevalence of trichiasis in adults aged 40 years or more was approximately 1.8%, showing that there are approximately 985 adults (95% CI 765—1250) with trichiasis in Nioro department. The results of this survey therefore suggest that trachoma is a problem of public health significance in Nioro department and that trachoma control activities can be planned accordingly. The survey could be repeated to monitor the impact of the trachoma control activities on the prevalence of trachoma. Risk factors for active trachoma were identified as: young age, lack of hygiene, having a dirty face and keeping cattle in the household, which was consistent with the findings of other studies (reviewed by, Emerson et al., 2000; Kuper et al., 2003). There was low awareness that surgery could alleviate trichiasis, suggesting that a health promotion campaign to raise awareness about the need for and availability of trichiasis surgery is a priority.

TRA does not yield prevalence estimates (Limburg et al., 2001) and therefore is not useful for identifying communities that meet the criteria for requiring implementation of the 'AFE' strategy (WHO, 2003). In contrast, the LQAS method allows communities to be categorised by prevalence, so that decisions about control strategies can be made (Myatt et al., 2003). LQAS samples only children aged 2—5 years, who are likely to be found within the household, whilst TRA also includes children aged 6—9 years who are often away from the household. Limiting the sample to children aged 2—5 years also has the advantage of reducing the number of children included per household and thereby the influence of household-level clustering of trachoma (Bailey et al., 1989; Katz et al., 1988). Since the LQAS stopping rule for sampling of children was not applied in this study, an estimate could be obtained of the prevalence of active trachoma in children aged 2—5 years across the clusters. The paucity of trachoma prevalence data has been a major constraint on effective implementation of the SAFE strategy, and so the use of LQAS methods may boost the trachoma control initiatives (Mariotti et al., 2003). The development of a rapid method for estimating the prevalence of onchocerciasis (and, of course, the availability of a free and effective drug) contributed a great deal to the success of the onchocerciasis elimination programme (Ngoumou et al., 1994).

There were certain limitations to this survey. The probability-proportionate-to-size sampling used the updated data from the 1988 census, yet there could have been considerable migration in, out and within this area in the intervening years. The trichiasis case-finding method was unlikely to identify all the cases in the community (e.g. because not all houses were visited and people with mild trichiasis who epilated may have been overlooked) and so the prevalence of trichiasis is likely to have been underestimated in this survey. Alternatively, the prevalence of trichiasis may have been overestimated if trichiasis cases were included from neighbouring villages or if the population of the village aged >40 years was underestimated. There was the potential for information bias, as positive behaviours may have been over-reported. The prevalence of active trachoma was estimated only for children aged 2—5 years, yet the WHO criteria for implementation of the 'AFE' strategy are based on the prevalence in children aged 1—9 years. The LQAS method focuses on measuring the presence of active disease, however active disease without infection has been documented (Burton et al., 2003). LQAS methodology recommends that children are examined until either 50 have been surveyed or enough cases of trachoma have been identified to allow classification of the community; however, in our study we sampled the full cluster without a stopping rule. This would have had no impact on the classification of communities by prevalence. Occasionally, slightly more or less than 50 children were sampled owing to logistical issues (range, 46—53), for instance because the final household contained more than one eligible child or because there were no more eligible children in the village yet there was not enough time to start sampling in a new village.

There were also strengths to the study. The team was experienced and well trained and was led by an ophthalmologist trained in research methods. The fieldworkers found the survey relatively easy to conduct and were able to survey one cluster per day. Random sampling of households within the village was used to select the sample of children, giving an equal chance of every household being chosen and thus reducing the chance of selection bias. The associations detected between risk factors and the prevalence of trachoma reported from this survey were consistent with those from other studies (Emerson et al., 2000; Kuper et al., 2003), further supporting the study's validity.

In summary, a survey using LQAS rapid methodology showed that trachoma is a problem of public health significance in Nioro department, Senegal.

Conflicts of interest statement
The authors have no conflicts of interest concerning the work reported in this paper.

References

Anonymous, 1992. Recensement Général de la Population et de l'Habitat de 1988, Rapport Regional Résultats Définitifs Kaolack. Ministère de l'Economie, des Finances et du Plan, Direction de la Prévision et de la Statistique, Dakar.

Bailey, R., Osmond, C., Mabey, D.C., Whittle, H.C., Ward, M.E., 1989. Analysis of the household distribution of trachoma in a Gambian village using a Monte Carlo simulation procedure. Int. J. Epidemiol. 18, 944—951.

Böhning, D., Greiner, M., 1998. Prevalence estimation under heterogeneity in the example of bovine trypanosomosis in Uganda. Prev. Vet. Med. 36, 11—23.

Burton, M.J., Holland, M.J., Faal, N., Aryee, E.A., Alexander, N.D., Bah, M., Faal, H., West, S.K., Foster, A., Johnson, G.J., Mabey, D.C., Bailey, R.L., 2003. Which members of a community need antibiotics to control trachoma? Conjunctival *Chlamydia trachomatis* infection load in Gambian villages. Invest. Ophthalmol. Vis. Sci. 44, 4215—4222.

Emerson, P.M., Cairncross, S., Bailey, R.L., Mabey, D.C., 2000. Review of the evidence base for the 'F' and 'E' components of the SAFE strategy for trachoma control. Trop. Med. Int. Health 5, 515—527.

Grayston, J.T., Wang, S.P., Yeh, L.J., Kuo, C.C., 1985. Importance of reinfection in the pathogenesis of trachoma. Rev. Infect. Dis. 7, 717—725.

Katz, J., Zeger, S.L., Tielsch, J.M., 1988. Village and household clustering of xerophthalmia and trachoma. Int. J. Epidemiol. 17, 865—869.

Kuper, H., Solomon, A.W., Buchan, J., Zondervan, M., Foster, A., Mabey, D., 2003. A critical review of the SAFE strategy for the prevention of blinding trachoma. Lancet Infect. Dis. 3, 372—381.

Limburg, H., Bah, M., Johnson, G.J., 2001. Trial of the Trachoma Rapid Assessment methodology in The Gambia. Ophthalmic Epidemiol. 8, 73—85.

Mariotti, S.P., Pararajasegaram, R., Resnikoff, S., 2003. Trachoma: looking forward to Global Elimination of Trachoma by 2020 (GET 2020). Am. J. Trop. Med. Hyg. 69, 33—35.

Myatt, M., Limburg, H., Minassian, D., Katyola, D., 2003. Field trial of applicability of lot quality assurance sampling survey method for rapid assessment of prevalence of active trachoma. Bull. World Health Organ. 81, 877—885.

Negrel, A.D., Taylor, H.R., West, S., 2001. Guidelines for the rapid assessment for blinding trachoma. World Health Organization, Geneva.

Ngoumou, P., Walsh, J.F., Mace, J.M., 1994. A rapid mapping technique for the prevalence and distribution of onchocerciasis: a Cameroon case study. Ann. Trop. Med. Parasitol. 88, 463—474.

Resnikoff, S., Pascolini, D., Etya'ale, D., Kocur, I., Pararajasegaram, R., Pokharel, G.P., Mariotti, S.P., 2004. Global data on visual impairment in the year 2002. Bull. World Health Organ. 82, 844—851.

Saal, M.B., Schemann, J.F., Saar, B., Faye, M., Momo, G., Mariotti, S., Negrel, A.D., 2003. Trachoma in Senegal: results of a national survey. Med. Trop. (Mars.) 63, 53—59.

Thylefors, B., Dawson, C.R., Jones, B.R., West, S.K., Taylor, H.R., 1987. A simple system for the assessment of trachoma and its complications. Bull. World Health Organ. 65, 477—483.

WHO, 2003. Report on the 2nd Global Scientific Meeting on Trachoma. World Health Organization, Geneva.