Using lot quality-assurance sampling and area sampling to identify priority areas for trachoma control: Viet Nam

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Objective To report on the use of lot quality-assurance sampling (LQAS) surveys undertaken within an area-sampling framework to identify priority areas for intervention with trachoma control activities in Viet Nam.

Methods The LQAS survey method for the rapid assessment of the prevalence of active trachoma was adapted for use in Viet Nam with the aim of classifying individual communes by the prevalence of active trachoma among children in primary school. School-based sampling was used; school sites to be sampled were selected using an area-sampling approach. A total of 719 communes in 41 districts in 18 provinces were surveyed.

Findings Survey staff found the LQAS survey method both simple and rapid to use after initial problems with area-sampling methods were identified and remedied. The method yielded a finer spatial resolution of prevalence than had been previously achieved in Viet Nam using semiquantitative rapid assessment surveys and multistage cluster-sampled surveys.

Conclusion When used with area-sampling techniques, the LQAS survey method has the potential to form the basis of survey instruments that can be used to efficiently target resources for interventions against active trachoma. With additional work, such methods could provide a generally applicable tool for effective programme planning and for the certification of the elimination of trachoma as a blinding disease.

Keywords Trachoma/epidemiology/prevention and control; Health surveys; Data collection/methods; Cross-sectional studies; Sampling studies; Schools; Child; Viet Nam (*source: MeSH, NLM*).

Mots clés Trachome/épidemiologie/prévention et contrôle; Enquête santé; Collecte données/méthodes; Etude section efficace; Etude échantillon; Etablissement scolaire; Enfant; Viet Nam (*source: MeSH, INSERM*).

Palabras clave Tracoma/epidemiología/prevención y control; Recolección de datos/métodos; Encuestas epidemiológicas; Estudios transversales; Muestreo; Escuelas; Niño; Viet Nam (*fuente: DeCS, BIREME*).

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Voir page 762 le résumé en français. En la página 762 figura un resumen en español.

Introduction

Trachoma is endemic in Viet Nam. Trachoma control programmes began in the 1960s, and significant progress towards eliminating the disease has been made. The overall prevalence of active trachoma has fallen from an estimated 17.5% in 1975 to an estimated 7.0% in 1995 (1). These national figures, however, conceal the uneven spatial distribution of the disease as well as the high prevalence of active disease among children. Survey data available in 2003 were consistent with the following epidemiological profile (1–3).

- Clusters of high prevalence of the active disease are known to exist in the central and northern areas of the country. The exact location and extent of these clusters remains largely unknown (1, 2).

- The prevalence of active disease is highest among school-age children. There is a higher than typical relative prevalence among adults and a lower than typical relative prevalence among children aged ≤ 5 years (1–21).

The International Trachoma Initiative started work in Viet Nam in 1999. Semiquantitative rapid assessment surveys for trachoma (22) identified 13 districts in 8 provinces as areas that should be prioritized to receive interventions. The SAFE strategy (surgery, antibiotic treatment, facial cleanliness, environmental change) (23) was implemented in these districts. A second phase of interventions was initiated in 2002. Semiquantitative rapid assessment surveys and a multistage cluster-sample survey identified a further 11 districts in 7 provinces in the

northern highlands, central coastal plains and the Red River Delta as priority areas for intervention (2). Interventions using the SAFE strategy were implemented in these districts.

Concerns about the reliability of the semiquantitative rapid assessment surveys (24– 26) and the lack of spatial resolution available from surveys using multistage cluster sampling prompted the International Trachoma Initiative to select the lot quality-assurance sampling (LQAS) method to rapidly assess the prevalence of active trachoma in order to identify relatively compact priority areas for intervention (i.e., communes) for a third phase of activities planned for April 2004. This method is also known as the acceptance sampling trachoma rapid assessment (ASTRA) method (27).

Between October 2003 and November 2003, a total of 719 communes in 41 districts in 18 provinces were surveyed and classified by prevalence of trachoma using the LQAS method. These surveys represent the first-large scale use of the LQAS method to prioritize areas to receive interventions against active trachoma and the first use of the method to map the prevalence of active trachoma over wide areas. This article reports on the adaptations made to the method to suit local conditions and, as an illustration of the capabilities of the LQAS method when nested within an area-sampling framework (28–31), the results of surveys from one district.

Methods

The surveys reported here used an adapted form of the LQAS method for classifying communities by the prevalence of active trachoma (27). The specific adaptations made to the method are described below.

- The intervention unit chosen was the commune rather than the village. (In Viet Nam a commune is a subdistrict containing a number of villages.)
- Sampling was school-based rather than community-based.
- Area sampling techniques were used to determine sampling locations within each commune (28–31).
- A complete sample was collected from each commune (i.e. sampling continued even after classification was possible using the selected LQAS sampling plan).
- Partial samples were taken from within-commune sampling locations. The size of these partial samples was proportional to the population at the sampling location.

Intervention units

The costs associated with the large number of sampling locations required to produce reasonably precise estimates of prevalence from multistage cluster-samples (i.e., 30 or more) meant that previous surveys of trachoma prevalence in Viet Nam had selected the district as the smallest unit of area for which prevalence could be feasibly estimated (1, 2). Progress towards eliminating trachoma as a blinding disease in Viet Nam appeared to be associated with increasing patchiness in the distribution of prevalence rather than with a generalized lowering of prevalence over wide areas. It was felt, therefore, that effective targeting of interventions required the use of a survey method capable of estimating or classifying prevalence with a finer spatial definition than had been achieved by previous surveys. In the surveys reported here, the commune was chosen as the intervention unit. This is the smallest political, administrative and health-service delivery unit in Viet Nam.

School-based sampling

The surveys sampled children attending primary schools (i.e. children aged 6–11 years). In Viet Nam attendance at primary school is compulsory. The national net intake rate (i.e., new entrants to primary grade 1 who are of the official primary school entrance age as a percentage of the corresponding population) was reported to be 94.6% in 1999 and to be following an upward secular trend (32). Sampling this age group thus ensured that a high risk (or reservoir) group was surveyed. Multistage cluster-sample surveys undertaken by the Viet Nam National Institute of Ophthalmology and the International Trachoma Initiative reported that the highest prevalence of active disease occurred in this age group (18.84% and 18.23%, respectively) (1, 2). Sampling in schools also reduced sampling overheads and allowed a larger sample to be collected at less cost than would have been possible if community-based sampling had been used. Examination is also quicker and easier in this population than in younger children. Since one school typically serves many villages within a commune, sampling in schools allowed us to sample children from more villages in a commune than would have been feasible if community-based sampling had been used.

School-based sampling does have disadvantages. Sampling is limited to days when schools are in session. This prevented sampling from occurring during weekends and school holidays. Sampling would also have been prevented during school examination periods in December and May. More importantly, the use of school-based sampling may have introduced a selection bias. Primary school attendance is lower in the mountainous areas and the Mekong Delta than in other parts of the country (32). There is also a small gender disparity in the net intake rate in the most rural areas (93.54% for boys and 91.77% for girls) (32). Sampling was limited to children attending schools on the day of the survey. This could have introduced a selection bias if a "healthy worker effect" operated with respect to active trachoma – that is, if children with active trachoma were more likely to be away from school on the day of the survey than children without active trachoma. It is unlikely that a generally mild condition with hardly any symptoms, such as active trachoma (33), would have introduced any significant bias. Trachoma is, however, a hygiene-related disease (33), and non-attendance may have been due to another hygiene-related disease, such as diarrhoea. This may have introduced a small bias to the surveys reported here. A more important problem is that of excluding children who habitually do not attend school. These children may belong to the poorest and most marginalized social groups and may be at a high risk of infection. This may have introduced a significant bias to the surveys reported here. Community-based sampling was, however, not an alternative to school-based sampling because the majority of the high risk population are in school during the day. Community-based sampling would, therefore, have been restricted to populations with lower prevalence or to weekends, evenings and school holidays.

### School sampling and area sampling

Each commune has one or more primary schools, and each primary school has one or more school sites distributed across the school's catchment area. (In Viet Nam a school is an administrative entity. A school administers one or more sites in which teaching and learning take place.) Sampling a single school site would have limited the spatial cover of the sample. Therefore,

Fig. 1. **Examples of segmentation techniques used to determine within-commune sampling locations for different shapes of commune.** School sites closest to the centre of each segment were sampled
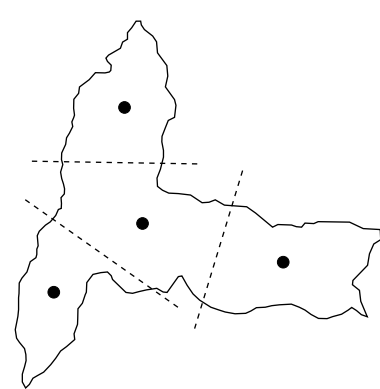
a) Bounding rectangle projected on map of regularly shaped commune
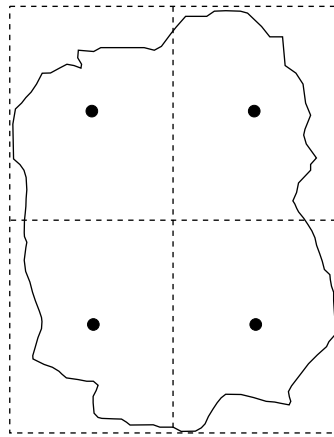
b) Commune consisting of a long narrow area divided into four contiguous segments of approximately equal area
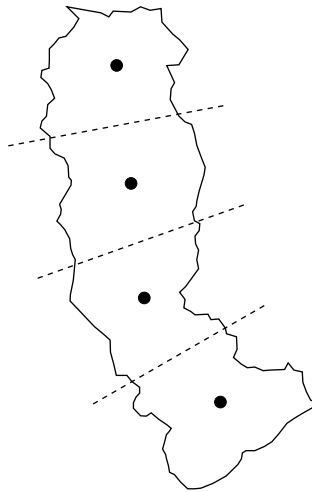
c) Commune with areas projecting outwards from centre divided into four contiguous segments of approximately equal area

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a two-stage design was adopted. A number of school sites in each commune were selected (stage one), and a proportion of the overall sample was taken from each school site (stage two). The school sites to be sampled were selected using an area-sampling approach. A bounding rectangle was drawn onto a map of the commune. This rectangle was then divided into four rectangles of equal area. The school site located closest to the centre of each rectangle that had more than half its area within the commune was sampled (Fig. 1a). If there were four or fewer school sites in the commune then the area-sampling approach was not used and all school sites in the commune were sampled. Once the school sites had been selected, a portion of the overall sample was taken from each school site. The size of the sample taken from each school site was weighted by the number of pupils registered at each school site so that larger school sites contributed more to the overall commune sample than did smaller school sites. Since a uniform sampling fraction was used, the overall commune sample was, therefore, a proportionate stratified sample (34).

Sampling children

Children attending the selected school sites on the day of the survey were sampled systematically from the school attendance register. Systematic sampling was used in preference to a simple random sample for reasons of simplicity (34–36). Provided there was no underlying periodicity in the school registers or that any underlying periodicity did not coincide with the sampling interval, systematic sampling would have been equivalent to simple random sampling in returning an unbiased sample (36). Sampling at more than one location acted to reduce the likelihood of such a periodicity affecting the overall within-commune sample. The school-site samples were combined, and an appropriate LQAS classification rule was applied to the overall commune sample.

The LQAS method allows sampling to stop once it is possible to make a classification from the data collected (37).

This procedure was not used in the surveys reported here; a complete sample was collected for each survey. Collecting a complete sample allowed data to be collected simultaneously at different school sites by different teams. This allowed two commune surveys to be completed in a single day during school hours. Using early stopping would have required that the survey teams be in constant contact with each other by radio. The equipment required for radio communication was not immediately to hand, and the purchasing and licensing of appropriate equipment, as well as the training and licensing of operators, seemed likely to prove both costly and time consuming, so this option was not pursued.

Sampled children were examined, and their age, sex, and trachoma status recorded (TF/TI). (TF refers to follicular trachomatous inflammation and TI to intense trachomatous inflammation.) Examination and classification followed WHO's simplified trachoma grading scheme (38). All children in the sample with trachoma graded as TF or TI were treated with a single dose of azithromycin (39); the dose was calculated using the child's height as a proxy for weight (40). This procedure was repeated at each of the selected school sites.

The LQAS method

LQAS data is collected and analysed using a sampling plan that specifies a maximum sample size (n) and a threshold number of cases (d) that are allowed in the sample before an intervention unit is classified as having a high prevalence of disease (37). Sampling plans are developed by specifying a classification system (i.e., the levels of prevalence that define high-prevalence and low-prevalence situations) and acceptable probabilities of classification error.

Using a sampling plan in the field is straightforward. Sampling stops when either the maximum sample size (n) is reached or the number of cases found in the sample exceeds a predefined threshold (d). If the maximum sample size is reached without the threshold number of cases allowed in the sample

being exceeded, the intervention unit is classified as having a low prevalence of disease. If the threshold number of cases allowed in the sample is exceeded, sampling stops and the intervention unit is classified as having a high prevalence of disease. In the surveys reported here, sampling stopped when the maximum sample size was met regardless of whether the threshold number of cases allowed in the sample was exceeded. This was done in order to allow the simultaneous sampling of selected school sites by separate survey teams.

After discussions between programme staff of the International Trachoma Initiative and personnel at the Ministry of Health's Department of Preventive Medicine and HIV/AIDS Control and the National Institute of Ophthalmology, the following classification system was adopted:

- communes with a prevalence ⩽ 5% were classified as low-prevalence communes;
- communes with a prevalence ⩾ 15% were classified as high-prevalence communes.

Acceptable probabilities of error were agreed to be 5% for both α and β errors. A list of candidate sampling plans was produced using ASTRA sampling plan calculator software (41). The sampling plan $n = 96$ and $d = 8$ was considered suitable for classifying communes using the agreed prevalence thresholds and levels of error. The expected α error for this sampling plan is 5.1%. The expected β error for this sampling plan is 3.9%. This sampling plan should, therefore, have correctly identified 94.9% of the low-prevalence communes surveyed (that is, it should have a specificity of 94.9%) and 96.1% of the high-prevalence communes surveyed (that is, it should have a sensitivity of 96.1%). Similar levels of error could have been achieved using slightly smaller sample sizes but $n = 96$ has the advantage of being easily divisible by 2, 3, 4, 6, 8, 12, 16, 24, 32 and 48, thereby easing the calculations required when dividing the overall commune sample between different sampling locations.

LQAS sampling plans classify communes as either high prevalence or low prevalence. Therefore, communes with prevalences between 5% and 15% would be classified as either high prevalence or low prevalence. The probability of a commune with a moderate prevalence being classified as high prevalence or low prevalence is proportional to the proximity of the prevalence in that commune to the classification thresholds. Communities with a moderate prevalence close to the high-prevalence classification threshold (i.e. communes with

prevalences > 10%) would tend to have been classified as high prevalence. Communes with a moderate prevalence close to the threshold of low prevalence (i.e. communes with prevalences < 10%) would tend to have been classified as low prevalence.

Ethical approval
Permission to undertake the work reported here was granted by Viet Nam's Ministry of Health. Technical oversight was provided by Viet Nam's National Eye Hospital and the Viet Nam National Institute of Ophthalmology.

Findings
A total of 719 communes in 41 districts in 18 provinces were surveyed. Data were collected on 69 120 children. The ratio of males to females found in the overall sample was 1.0925:1 and was similar to that estimated from official statistics (1.0875:1) (32, 41), suggesting that the sample was representative of children attending schools in rural Viet Nam. Table 1 shows the age and gender-specific prevalence of active trachoma found in the overall sample of 69 120 children. Prevalence was considerably lower than would have been expected from previous prevalence surveys (1, 2) but it should be noted that 24 of the 41 districts surveyed had already received comprehensive SAFE interventions: 13 districts had received up to 4 years of interventions and 11 had received up to 18 months of interventions.

Survey staff found the modified LQAS method both simple and rapid to apply. The original area-sampling method proved difficult to apply in communes that were either long and thin or had one or more relatively narrow strips of land projecting from the central area of the commune, so the method was modified during the pilot phase. In cases such as those described above, the commune was divided into four contiguous non-overlapping segments of approximately equal area (Fig. 1). School sites closest to the centre of each segment were sampled.

Table 2 shows the results of surveys of the 27 communes comprising the Kim Son district in Ninh Binh province in coastal northern Viet Nam. The LQAS sampling plan $n = 96$, $d = 8$ identified a central area for intervention consisting of 6 of 27 communes in the district. (Communes identified for intervention are those classified as having a high prevalence, see Table 2 and Fig. 2). Previous surveys had identified the entire district for intervention. Interventions using the antibiotic treatment, facial cleanliness and environmental change components of the SAFE strategy were implemented in all of

Table 1. **Age and gender-specific prevalence of active trachoma among 69 120 children examined in 719 lot quality-assurance samples**

Age (years)	Boys			Girls			Total		
	Cases of active trachoma (n)	No. of children examined	Preva-lence (%)	Cases of active trachoma (n)	No. of children examined	Preva-lence (%)	Cases of active trachoma (n)	No. of children examined	Preva-lence (%)
⩽ 6	189	3 837	4.93	225	3 443	6.53	414	7 280	5.69
7	291	6 171	4.72	355	5 828	6.09	646	11 999	5.38
8	352	7 579	4.64	458	6 965	6.58	810	14 544	5.57
9	420	8 190	5.13	503	7 452	6.75	923	15 624	5.90
10	501	9 454	5.30	680	8 754	7.77	1 181	18 208	6.49
⩾ 11	54	857	6.30	51	590	8.64	105	1 447	7.26
Total	**1807**	**36 088**	**4.73**	**2272**	**33 032**	**6.88**	**4079**	**69 120**	**5.90**

Table 2. **Results of lot quality-assurance sample (LQAS) surveys for active trachoma in 27 communes comprising Kim Son district, Ninh Binh province in coastal northern Viet Nam**

Commune	Maximum sample size (*n*)	Number of cases	Original LQAS classification[a]	Intervention priority[b]
Luo Phuong	96	11		
Than Than	96	11		
Van Hai	96	11	High	High
Dinh Hoa	96	10		
Yen Loc	96	9		
Kim My	96	9		
An Hoa	96	7		
Kim Tan	96	7		
Quang Thien	96	6		
Kim Chinh	96	5	Low	Moderate
Hung Tien	96	5		
Hoi Ninh	96	5		
Con Thoi	96	5		
Kim Trung	96	5		
Chat Binh	96	4		
Dong Huang	96	4		
Kim Dinh	96	4		
Lai Thanh	96	4		
Kim Hai	96	4		
Thuong Kiem	96	3		
Phat Diem Town	96	3		
Nua Hoa	96	3	Low	Low
Xuan Thien	96	3		
Binh Minh Town	96	3		
Kim Dong	96	3		
Yen Mat	96	2		
Chinh Tam	96	2		

[a] Classified using the sampling plan *n* = 96, *d* = 8. See text for additional information.
[b] Classified by applying the sampling plan *n* = 96, *d* = 4 to communes classified as having low prevalence by the sampling plan *n* = 96, *d* = 8.

the communes identified by the sampling plan as having a high prevalence of active trachoma. The availability of resources allowed additional interventions to be implemented. Communes were prioritized by classifying prevalence into three categories based on the number of cases of active trachoma found in the samples. Highest priority was given to communes identified by the original sampling plan; lower priority was given to communes identified by applying the sampling plan *n* = 96, *d* = 4 to communes classified as low prevalence by the original sampling plan (classified as having a moderate prevalence in Table 2 and Fig. 2). Communes classified as low prevalence by the second sampling plan received the lowest priority (classified as low prevalence in Table 2 and Fig. 2).

Discussion

Nesting the LQAS method within an area-sampling framework ensured that there was finer spatial resolution than is available using conventional prevalence estimation techniques, such as multistage cluster sampling. Finer spatial resolution is likely to become increasingly important as national programmes move towards eliminating trachoma as a blinding disease. Increasing the spatial resolution of a sample improves the targeting of interventions and reduces the cost of interventions (i.e., compared with poorly targeted interventions). If progress towards

elimination is associated with an increasing patchiness in the distribution of prevalence rather than with a generalized lowering of prevalence over wide areas then finer spatial resolution will help ensure that foci of transmission are identified and eliminated. If such foci are allowed to remain there is a risk of a resurgence of prevalence after elimination has been declared using data from surveys with coarser spatial resolution.

The surveys presented in this report were tailored to the specific local conditions pertaining in Viet Nam and, as such, cannot form a template for a generally applicable method. In particular, the high net intake rate of primary schools (32), the small gender disparity in attendance at primary schools (32) and the atypical peak in trachoma prevalence among school-age children (1, 2) allowed the use of school-based sampling. These conditions are unlikely to apply in many trachoma-endemic settings. In such settings, community-based sampling of children of preschool age should be used (27, 42). Community-based sampling is likely to require more resources than school-based sampling. For example, the map–segment–sample approach to community-based sampling, which has been validated for use with LQAS surveys of the prevalence of active trachoma (27, 42), gives one team 1 day to sample a single community, whereas the school-based sampling approach reported here allowed two units of area to be sampled in 1 day.

School-based sampling may have introduced a systematic bias since the sample was restricted to children attending school on the day of the survey. The potential for bias introduced by excluding children who habitually attend school but were not there on the day of the survey (e.g., due to illness) may be removed by examining non-attenders in their own homes. This procedure will be adopted in future surveys. The potential for bias introduced by excluding children who habitually do not attend is more difficult to remove since a large proportion of these children may not be listed in school registers. Community-based sampling is, however, likely to exclude many of the same children, particularly if they belong to nomadic groups or live in isolated rural hamlets. A census-and-sample approach would not completely address this problem because marginalized and nomadic populations may still be excluded. Additionally, using a census-and-sample approach would have created expectations among the survey population. This would have been a particular problem for the surveys reported here since their purpose was to identify areas that should be prioritized for intervention rather than to assess global needs (which would have been appropriate, for example, for estimating the trichiasis surgical load).
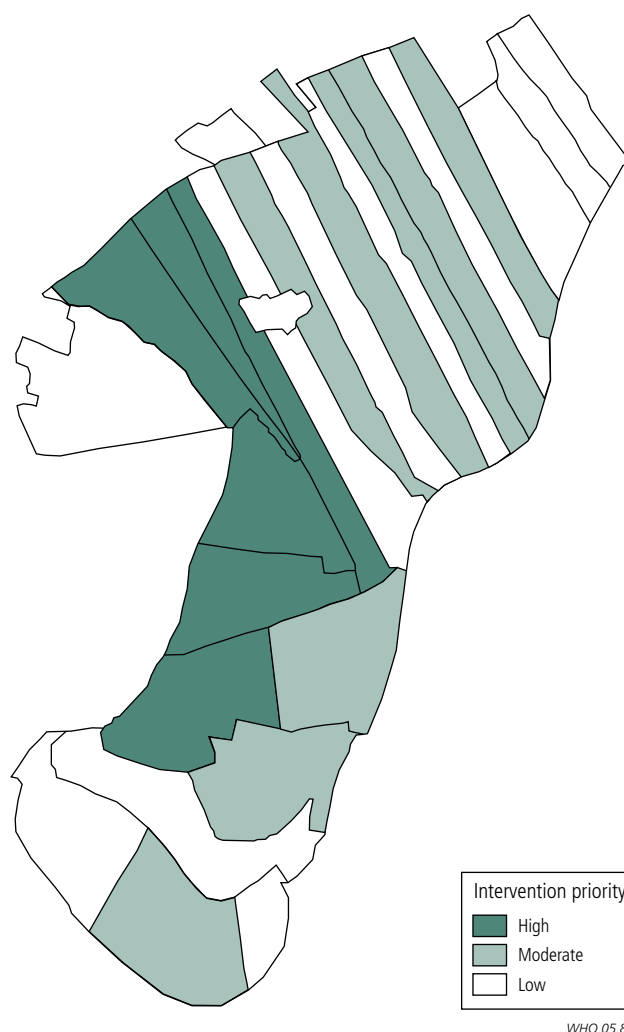
Area sampling proved simple to use in the field. This may not be the case if maps, which are required to define units for area sampling and identify sampling locations, are not available. This may be a problem in some trachoma-endemic areas particularly those, such as southern Sudan, where considerable displacement and resettlement of the population has taken place since the most recent maps were drawn. Area sampling is increasingly used to assess programme coverage during humanitarian emergencies and has been successfully applied in Ethiopia, Malawi and northern Sudan, suggesting that area sampling is feasible in many trachoma-endemic countries (43, 44).

LQAS surveys that classify individual communities by prevalence (27) and are nested within a grid-based area-sampling framework (28–31) may form the basis of a generally applicable method. Sampling efficiency could be increased, and overall survey costs reduced, by using a multistage approach with grid-based area-sampling during the first survey round and adaptive sampling (45) in subsequent survey rounds. The arbitrarily fine spatial resolution that adaptive sampling provides may also enable the development of a survey method suitable for use as an instrument to certify that trachoma has been eliminated locally as a blinding disease.

Conclusions

When used with area-sampling techniques, the LQAS survey method has the potential to form the basis of survey instruments that can be used to efficiently target resources for interventions against active trachoma. With additional work, such methods could provide a generally applicable tool for effective programme planning and for the certification of the elimination of trachoma as a blinding disease. ∎

Fig. 2. **Intervention priorities for 27 communes, Kim Son district, Ninh Binh province, Viet Nam**

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Résumé

Identification des zones prioritaires pour la lutte contre le trachome au Viet Nam par des méthodes de sondage aréolaire et d'échantillonnage par lots pour l'assurance de la qualité

Objectif Rendre compte de l'utilisation d'enquêtes par échantillonnage par lots pour l'assurance de la qualité (LQAS) dans le cadre d'un sondage aréolaire pour identifier les zones d'intervention prioritaire dans la lutte contre le trachome au Viet Nam.

Méthodes La méthode d'enquête LQAS, destinée à l'évaluation rapide de la prévalence du trachome actif, a été adaptée pour être appliquée au Viet Nam à la classification des communes en fonction de la prévalence du trachome actif chez les élèves du primaire. On a procédé à un sondage dans le cadre des écoles. Une démarche de type sondage aréolaire a permis la sélection des sites scolaires devant faire l'objet d'un sondage. Au total, l'étude a porté sur 719 communes, réparties dans 41 districts et 18 provinces.

Résultats Le personnel chargé de l'enquête a trouvé la technique LQAS à la fois simple et rapide, une fois les problèmes initiaux

rencontrés avec les méthodes de sondage aréolaire identifiés et réglés. Cette technique a fourni une résolution spatiale pour la prévalence plus fine que celle obtenue précédemment au Viet Nam à partir d'enquêtes par évaluation semiquantitative rapide et d'enquêtes par sondage en grappes à plusieurs degrés.

Conclusion Utilisée en association avec des techniques de sondage aréolaire, la méthode LQAS peut servir de base à des instruments d'enquête, applicables au ciblage efficace de la mise en oeuvre des ressources dont disposent les interventions contre le trachome actif. Moyennant quelques perfectionnements, cette méthode pourrait fournir un outil efficient de planification des programmes, applicable dans la majorité des cas et permettant de s'assurer de l'élimination du trachome en tant qu'affection céssitante.

Resumen

Muestreo por lotes para la garantía de la calidad y muestreo por áreas en la determinación de las áreas prioritarias para el control del tracoma en Viet Nam

Objetivo Informar sobre el uso de los estudios de muestreo por lotes para la garantía de la calidad (LQAS) emprendidos en un marco de muestreo por áreas a fin de identificar las áreas prioritarias para las actividades de control del tracoma en Viet Nam.

Métodos La aplicación del método LQAS a la evaluación rápida de la prevalencia del tracoma activo se adaptó para Viet Nam con el objetivo de clasificar distintas comunas en función de la prevalencia de tracoma activo entre los escolares de primaria. Optando por un muestreo basado en las escuelas, los centros escolares se seleccionaron mediante un método de muestreo por áreas. Se estudiaron en total 719 comunas de 41 distritos de 18 provincias.

Resultados Una vez identificados y solucionados algunos problemas iniciales con los métodos de muestreo por áreas,

el personal que participó en la encuesta consideró el método empleado fácil y sencillo. Se consiguió con él una resolución espacial de la prevalencia más precisa que la lograda anteriormente en Viet Nam mediante técnicas semicuantitativas de evaluación rápida y estudios multietápicos con muestreo por conglomerados.

Conclusión Empleado junto con técnicas de muestreo por áreas, el método LQAS puede ser la base de instrumentos encuestales que permitirían focalizar eficazmente los recursos para las intervenciones dirigidas contra el tracoma activo. Con algo más de trabajo, esos métodos podrían materializarse en un instrumento de aplicación general para planificar eficazmente los programas y certificar la eliminación del tracoma como enfermedad causante de ceguera.

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References

1. National Institute of Ophthalmology. Epidemiology survey of blindness and several eye diseases. Hanoi: National Institute of Ophthalmology; 1995.
2. International Trachoma Initiative. Vietnam trachoma survey. Hanoi: International Trachoma Initiative; 2001.
3. International Trachoma Initiative. Phase II baseline screening returns. Hanoi: International Trachoma Initiative; 2003.
4. Assefa T, Argaw D, Foster A, Schwartz E. Results of trachoma rapid assessment in 11 districts of South Gonder zone, Ethiopia. Trop Doc 2001;31:202-4.
5. Ballard RC, Fehler HG, Fotheringham P, Sutter EE, Treharne JD. Trachoma in South Africa. Soc Sci Med 1983;17:1755-65.
6. Ballard RC, Fehler HG, Baerveldt G, Owen G, Sutter EE, Mphahlele M. The epidemiology and geographical distribution of trachoma in Lebowa. S Afr Med J 1981;60:531-5.
7. Chumbley LC, Thomson IM. Epidemiology of trachoma in the West Bank and Gaza Strip. Eye 1988;2:463-70.
8. Dawson CR, Daghfous T, Messadi M, Hoshiwara I, Schachter J. Severe endemic trachoma in Tunisia. Br J Ophthalmol 1976;60:245-52.
9. Doci J, Masalati M. Prevalence and treatment of trachoma in the Libyan Arab Republic. Rev Int Trach 1974;51:85-97.
10. Dolin PJ, Faal H, Johnson GJ, Ajewole J, Mohamed AA, Lee PS. Trachoma in the Gambia. Br J Ophthalmol 1998;82:930-3.
11. Ezz al Arab G, Tawfik N, El Gendy R, Anwar W, Courtwright P. The burden of trachoma in the rural Nile Delta of Egypt: a survey of Menofiya governorate. Br J Ophthalmol 2001;85:1406-10.
12. Haddad NA. Trachoma in Lebanon: observations on epidemiology in rural areas. Am J Trop Med Hyg 1965;26:44-7.
13. Kupka K, Nizetic B, Reinhards J. Sampling studies on the epidemiology and control of trachoma in southern Morocco. Bull World Health Organ 1968;39:547-66.
14. Luna WEJ, Medina NH, Oliviera MB, de Barros OM, Vranjac A, Melles HH, et al. Epidemiology of trachoma in Bebedouro State of Sao Paulo, Brazil: prevalence and risk factors. Int J Epidemiol 1992;21:169-77.
15. Macjuck JF. A study of trachoma and associated infections in the Sudan. Bull World Health Organ 1966;35:262-72.
16. Salim AR, Sheikh HA. Trachoma in the Sudan: an epidemiological study. Br J Ophthalmol 1975;59:600-4.
17. Sukwa TY, Ngalande DH, Mwandu DH. Prevalence and distribution of trachoma in the Luapula Valley, Zambia. East Afr Med J 1992;69:34-6.
18. Taylor HR, Rapoza PA, West S, Johnson S, Munoz B, Katala S, et al. The epidemiology of infection in trachoma. Invest Ophthalmol Vis Sci 1989;30:1823-33.
19. Tielsch JM, West KP Jr, Katz J, Keyvan-Larijani E, Tizazu T, Schwab L, et al. The epidemiology of trachoma in southern Malawi. Am J Trop Med Hyg 1988;38:393-9.
20. West SK, Munoz B, Turner VM, Mmbaga BB, Taylor HR. The epidemiology of trachoma in central Tanzania. Int J Epidemiol 1991;20:1088-92.
21. West SK, Rapoza P, Munoz B, Katala S, Taylor HR. Epidemiology of ocular chlamydial infection in a trachoma-hyperendemic area. J Infect Dis 1991;163:752-6.
22. Negrel AD, Taylor HR, West S. Guidelines for the rapid assessment for blinding trachoma. Geneva: World Health Organization, International Trachoma Initiative; 2001 (WHO/PBD/GET/00.8).
23. Mariotti SP, Prüss A. The SAFE strategy: preventing trachoma, a guide for environmental sanitation and improved hygiene. Geneva: World Health Organization, International Trachoma Initiative; 2000 (WHO/PBD/GET/00.7).
24. Limburg H, Bah M, Johnson GJ. Trial of the trachoma rapid assessment methodology in the Gambia. Ophthalmic Epidemiol 2001;8:73-85.
25. Liu H, Ou B, Paxton A, Zhao P, Xu J, Long D, et al. Rapid assessment of trachoma in Hainan Province, China: validation of the new World Health Organization methodology. Ophthalmic Epidemiol 2002;9:97-104.
26. Rabiu MM, Alhassan MB, Abiose A. Trial of Trachoma Rapid Assessment in a sub-district of northern Nigeria. Ophthalmic Epidemiol 2001;4:263-72.
27. Myatt M, Limburg, H, Minassian D, Katyola D. A field trial of the applicability of the Lot Quality Assurance Sampling (LQAS) survey method to the rapid assessment of the prevalence of active trachoma. Bull World Health Organ 2003:81:877-85.
28. Rogers A. Statistical analysis of spatial dispersion: the quadrat method. London: Pion; 1974.
29. Cliff AD, Ord JK. Spatial processes: models and applications. London: Pion; 1981.
30. Krebs CJ. Ecological methodology. Menlo Park, CA: Addison Wesley Longman; 1999.
31. Milne A. The centric systematic area sample treated as a random sample. Biometrics 1959;15:270-97.
32. National Committee for EFA Assessment for the Socialist Republic of Vietnam. The assessment of education for all: Vietnam 1990–2000. Hanoi: Ministry of Education and Training; 1999.
33. Sandford-Smith J. Eye diseases in hot climates. 3rd ed. Oxford: Butterworth–Heinemann; 1997.
34. Kish L. Survey sampling. New York: John Wiley; 1965.
35. Moser CA, Kalton G. Survey methods in social investigation. 2nd ed. London: Heinemann Educational Books; 1979.
36. Cochran WG. Sampling techniques. 3rd ed. New York: John Wiley; 1977.
37. Valadez JJ. Assessing child survival programs in developing countries — testing Lot Quality Assurance Sampling. Boston, MA: Harvard University Press; 1991.
38. Thylefors B, Dawson CR, Jones BR, West SK, Taylor HR. A simple system for the assessment of trachoma and its complications. Bull World Health Organ 1987;65:477-83.
39. Bailey RL, Arullendran P, Whittle HC, Mabey DC. Randomised controlled trial of single-dose azithromycin in treatment of trachoma. Lancet 1993;342:453-6.
40. Basilion EV, Kilima PM, Turner VM, Mecaskey JW. Height as a proxy for weight in determining azithromycin treatment for paediatric trachoma. Trans Royal Soc Trop Med Hyg 2002;96:691-4.
41. General Statistics Office of Vietnam. Population and housing census Vietnam 1999. Hanoi: General Statistics Office; 2000.
42. Myatt M, Limburg, H, Minassian D, Katyola D. Acceptance Sampling TRA ASTRA: resource CD v1.04. New York: International Trachoma Initiative; 2004.
43. Myatt M, Feleke T, Sadler K, Collins S. A field trial of a survey method for estimating the coverage of selective feeding programmes. Bull World Health Organ 2005;83:20-6.
44. Collins S. CTC approach, emergency nutrition network supplement series No. 2: community-based therapeutic care. Oxford: Emergency Nutrition Network; 2004 .
45. Thompsom SK, Seber GAF. Adaptive sampling. New York: John Wiley; 1996.