Field trial of applicability of lot quality assurance sampling survey method for rapid assessment of prevalence of active trachoma

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Objective To test the applicability of lot quality assurance sampling (LQAS) for the rapid assessment of the prevalence of active trachoma.

Methods Prevalence of active trachoma in six communities was found by examining all children aged 2–5 years. Trial surveys were conducted in these communities. A sampling plan appropriate for classifying communities with prevalences ⩽20% and ⩾40% was applied to the survey data. Operating characteristic and average sample number curves were plotted, and screening test indices were calculated. The ability of LQAS to provide a three-class classification system was investigated.

Findings Ninety-six trial surveys were conducted. All communities with prevalences ⩽20% and ⩾40% were identified correctly. The method discriminated between communities with prevalences ⩽30% and >30%, with sensitivity of 98% (95% confidence interval (CI) = 88.2–99.9%), specificity of 84.4% (CI = 69.9–93.0%), positive predictive value of 87.7% (CI = 75.7–94.5%), negative predictive value of 97.4% (CI = 84.9–99.9%), and accuracy of 91.7% (CI = 83.8–96.1%). Agreement between the three prevalence classes and survey classifications was 84.4% (CI = 75.2–90.7%). The time needed to complete the surveys was consistent with the need to complete a survey in one day.

Conclusion Lot quality assurance sampling provides a method of classifying communities according to the prevalence of active trachoma. It merits serious consideration as a replacement for the assessment of the prevalence of active trachoma with the currently used trachoma rapid assessment method. It may be extended to provide a multi-class classification method.

Keywords Trachoma/epidemiology; Prevalence; Quality assurance, Health care; Sampling studies; Validation studies; Health surveys; Cnfidence intervals; Sensitivity and specificity; Predictive value of tests; Malawi (*source: MeSH, NLM*).

Mots clés Trachome/épidémiologie; Prévalence; Garantie qualité soins; Etude échantillon; Etude validation; Enquête santé; Intervalle confiance; Sensibilité et spécificité (Epidémiologie); Valeur prédictive tests; Malawi (*source: MeSH, INSERM*).

Palabras clave Tracoma/epidemiología; Prevalencia; Garantía de la calidad de atención de salud; Muestreo; Estudios de validación; Encuestas epidemiológicas; Intervalos de confianza; Sensibilidad y especificidad; Valor predictivo de los tests; Malawi (*fuente: DeCS, BIREME*).

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Voir page 883 le résumé en français. En la página 884 figura un resumen en español. يمكن الاطلاع على الملخص بالعربية في صفحة **884**

Introduction

According to WHO estimates, 5.6 million people are blind or severely visually impaired because of trachoma, and 146 million people currently have active disease (*1*). Resource constraints in countries in which trachoma is endemic mean that interventions for trachoma should be as cost effective as possible. A method of identifying areas with high prevalences of trachoma so that resources can be used where they are most needed is thus a necessary component of trachoma control strategies. The trachoma rapid assessment (TRA) method was developed for this purpose. It is a survey method designed to determine whether trachoma is a public health problem in a community. It is rapid in terms of the time needed to collect and analyse data and simple in that local staff are able to conduct assessments without external assistance. The method uses a two-stage sample. The selection of communities to be sampled and the selection of people within communities are both biased optimally towards selecting those at highest risk (*2*). The second stage of TRA does not use a standardized sampling procedure. People are sampled with the subjective judgement of members of the survey team. This sampling method cannot be relied upon to estimate or classify prevalence of trachoma. At best, TRA can indicate the presence or absence of trachoma in a community. Despite this, data from TRA surveys are taken consistently to indicate prevalence and used to make comparisons between communities.

A recent assessment of TRA compared the results of two TRA surveys with door-to-door surveys of the same communities.

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The results of the TRA surveys were not consistent with each other or with the door-to-door surveys in their estimates of the prevalence of active trachoma (*3*). The ability of TRA to classify reliably by prevalence communities in which trachoma is endemic, rather than distinguishing between communities in which active trachoma is present and those in which active trachoma is probably absent, is doubtful. A survey method that is reliable, rapid, and simple enough to be performed by staff currently employed in TRA surveys is needed. Sequential sampling methods produce reliable results with small sample sizes (that is, they have the potential to be used as rapid methods) (*4*). The method that has received most attention for public health applications is lot quality assurance sampling (LQAS), which is used widely in the manufacturing industry to judge the quality of a lot (batch) of items. In this context, LQAS is used to identify lots that are likely to contain an unacceptably large number of defective items. In the public health context, LQAS may be used to identify communities with low levels of service coverage or high prevalences of disease. Lot quality assurance sampling produces data that are easy to analyse. Data analysis is performed as the data is collected and consists of counting the number of "defects" (for example, children with active trachoma or incomplete vaccination records) in the sample and checking whether a predetermined number has been exceeded. Most public health applications of LQAS have focused on use of the method to evaluate service delivery (*5–11*). Less work has been conducted on its use to assess disease prevalence (*11–15*).

Data from LQAS are collected and analysed with a sampling plan that specifies a maximum sample size and the number of defects that are allowed in the sample before a community is classified as "high prevalence". Sampling plans are developed by specifying a classification system (that is the levels of prevalence that define situations of high and low prevalence) and acceptable probabilities of error. The use of a sampling plan in the field is straightforward. Sampling stops when the maximum sample size is met or the number of defects allowed in the sample is exceeded. If the maximum sample size is met without the number of defects allowed in the sample being exceeded, the community is classified as low prevalence. If the number of defects allowed in the sample is exceeded, sampling stops and the community is classified as high prevalence.

An LQAS sampling plan appropriate to the rapid assessment of communities with respect to the prevalence of active trachoma was tested in a series of trials in rural Malawi. Trials were also conducted in order to provide an estimate of the time needed to complete each process of the LQAS-based survey method.

Methods

Between August and October 2002, trials were conducted in six communities in the Salima District of Malawi in order to evaluate the applicability of LQAS for classifying communities by the prevalence of active trachoma.

Salima district borders Lake Malawi in central Malawi. It has an estimated population of 250 000 people and a population density of 80 people/km^2. The mean household size is 4.2 people. An estimated 65% of the population lives below the poverty line — a level close to the average for Malawi. The main sources of income are agriculture and fishing on a subsistence scale. The fieldwork for this study took place at the end of the dry season, when fly breeding is relatively low. Little migration takes place during this period because labour is needed to prepare land before the rains arrive in late October.

Two ophthalmic medical assistants and four ophthalmic clinical officers (examiners) and eight community eye health workers (recorders) were introduced to LQAS and the survey instruments. All were familiar with trachoma in their everyday work. Three examiners and all eight recorders had conducted TRA surveys with WHO's current method in the previous year (*2*). A refresher course on how to grade trachoma with the WHO simplified trachoma grading scheme was given with WHO's manual and slide set (*16, 17*). The population of a nearby village was examined for signs of trachoma as a practical component of this course. The examiners were divided into two groups of three. For each group, each person to be examined was given a slip of paper with a unique identifying number and was examined by all members of the group. Each examiner recorded the examined person's identifying number and the diagnosis for both eyes. If needed, drugs were prescribed by the most senior examiner, who was also the final examiner. The individual examiner's assessment of the absence of signs of trachoma and the stage of trachoma were compared with those of the most experienced examiner in each group. Interobserver agreement, as measured by the κ coefficient (*18*), ranged between 0.73 and 0.83, which is considered to show very good or excellent interobserver agreement beyond chance (*19*). No trials of LQAS were undertaken in the village in which survey workers were trained.

Fieldwork was undertaken in three phases: mapping, household enumeration and examination of all children aged 2–5 years who lived in the selected communities, and trials of LQAS in enumerated and examined communities.

Mapping

A mapping team constructed maps that showed the locations of roads, tracks, rivers, streams, water points, schools, churches, mosques, health centres, sports fields, shops, restaurants, and landmarks (large trees, water towers, and power lines). The mapping team then visited each house in the community, marked its location on the map, and assigned it a unique number. This number was marked on the door of the house and on the map.

Household enumeration and examination

After mapping was complete, the community was divided into segments that contained roughly equal numbers of houses. Segments were assigned to teams consisting of an examiner and a recorder. These teams visited each house in their assigned segments and examined all children aged 2–5 years for signs of active trachoma (that is, follicular trachoma or inflammatory trachoma, or both). The age of each child was ascertained from the child's "Road to Health" card or, when a card was not available, from the child's mother.

Community leaders were forewarned about the survey and asked to ensure that mothers and children would be present in their homes on the day of the survey. When survey teams found an empty house, neighbours were asked whether a family with children aged 2–5 years lived in that house. If not, the house was registered as having no eligible children. If children did live in the house, attempts were made to locate them. In most cases, the mothers and children were close to home and were called by neighbours. If mothers and children could not be located immediately, houses were visited again at the end of the survey. Mothers from "empty" houses were keen to have their children examined and often would seek out the survey team when they returned home.

All cases of active trachoma were treated with eye ointment that contained 1% tetracycline. The treatment procedure

was explained and shown to the child's mother, who was then asked to apply the ointment herself to confirm that she could apply it effectively. Mothers were instructed to continue the treatment three times daily for six weeks. Enough ointment to ensure a full course of treatment could be followed was left with the child's mother.

The house number, household name, child's name, child's age, and trachoma status were recorded in a community register. These data were used to calculate the prevalence of active trachoma in each community, which was taken to be a precise estimate of the prevalence of active trachoma in children aged 2–5 years in each community.

One aim of the enumeration and examination phase was to identify communities with a wide range of prevalences of active trachoma. This proved impossible because the communities identified as probable low prevalence communities in desk exercises consistently were found to have a high prevalence of active trachoma (≥40%). To test a survey method designed to classify communities as high or low prevalence needs trial populations with a wide range of prevalences. To counter this problem, we used the community registers to create a set of pseudocommunities. We randomly changed cases to non-cases with a procedure analogous to tossing a weighted coin. The number of cases needed to create a pseudocommunity with a given prevalence was calculated. The probability of a case in the real community remaining a case in the pseudocommunity was calculated as the ratio of the number of cases needed to the number of cases found. A pseudorandom number generator was used to produce a list of uniformly distributed random numbers between zero and one. Each case found in the community was assigned a number sequentially from this list. Cases whose assigned number exceeded the calculated probability were converted to non-cases. Community and pseudocommunity registers were then condensed to lists that showed house number, household name, and number of children aged 2–5 years in each house.

Trials of LQAS

Trial survey teams consisted of an examiner and a recorder. This was the composition of teams it was envisaged would be responsible for undertaking rapid assessment surveys with LQAS. Comprehensive lists of houses and children were available from the enumeration and examination surveys. These were not used for sampling in the trial surveys because such lists normally would not be available to survey teams. Instead, houses were sampled by drawing a sketch map of the community, dividing the community into segments containing roughly equal numbers of houses, and taking subsamples from each segment with an appropriate sampling method. In segments in which houses were organized in ribbons, a systematic sample of houses was taken. In segments in which houses were organized in clusters, houses were sampled with a random walk method (*20*). The maximum sample size for each trial survey was 50 children aged 2–5 years. This sample size was chosen because it was considered to be the maximum number of children that a survey team could sample and examine in a single day. It is also the sample size used in the TRA method, although that method samples children aged from 1–9 years with an optimally biased sampling method (*2*). Examination of two registers selected at random showed that, on average, there were 1.25 children aged 2–5 years in houses that contained at least one child in that age range. To sample 50 children, an initial sample size of 40 houses was specified. The number of houses to be sampled from each segment of a community was calculated as 40 divided by the number of segments in that community. Segments were sampled in a random order. If all segments but less than 50 children had been sampled, the survey team returned to the largest segment to collect the remainder of the overall sample.

Sampled children were not re-examined. Instead, the trachoma status of each child sampled was found by reference to the community register. This allowed us to conduct considerably more trials than would have been possible if children were examined for each trial survey. Communities were visited more than once and by more than one survey team. Each trial survey was, however, an independent trial (one survey undertaken by one team with case numbers ascertained from one register). Data were not recycled for use with different registers.

A sampling plan appropriate for classifying communities with prevalences ≤20% (low prevalence) and ≥40% (high prevalence) with reasonable levels of expected error (maximum sample size 50 and 14 allowed defects) was created with cumulative binomial probabilities. The probability of finding ≤14 cases in a sample of 50 people from a community with prevalence ≤20% is 0.9393, so classification of samples with ≤14 cases as low-prevalence populations should correctly identify 93.93% of low-prevalence communities. This corresponds to an α error of 0.0607. The probability of finding ≤14 cases in a sample of 50 people from a community with prevalence ≥40% is 0.0539, so classification of samples with >14 cases as high-prevalence populations should correctly identify 94.61% of high-prevalence communities. This corresponds to a β error of 0.0539.

Data were analysed with the R language for data analysis and graphics by applying the sampling plan to the data from each trial and calculating classification probabilities and the sample size required to make a classification (*21*). These were plotted as operating characteristic (classification probability by prevalence) and average sample number (sample size needed to make a classification by prevalence) curves. An analysis of how well the sampling plan could discriminate between communities with prevalences ≤30% and >30% was also undertaken by constructing a two-by-two table of prevalence category by classification and calculating standard screening test indices.

Ordinarily, LQAS provides a binary classification system. A finer classification system may be provided by applying alternative sampling plans to data already collected and classified as coming from low-prevalence communities by previously applied sampling plans. This approach starts by collecting data with a sampling plan designed to identify very high prevalence communities. A second sampling plan designed to identify moderately high-prevalence communities is then applied to the data from communities not classified as "very high prevalence" by the previous sampling plan. This process continues until all communities have been classified. To test this procedure, data were analysed by applying the sampling plan specified above (maximum sample size 50 and 14 allowed defects) to identify communities with prevalences >30%. A second sampling plan to identify communities with prevalences >20% (maximum sample size 50 and nine allowed defects) was then applied to the data from communities not classified as "high" prevalence by the first sampling plan. Communities identified as high prevalence by the first sampling plan were classified as "high" prevalence, communities identified as high prevalence by the second sampling plan as "medium" prevalence, and the remaining communities as "low" prevalence. The agreement between actual prevalence classes and the classifications made with the two sampling plans was calculated.

After the trial surveys had been completed, the method was applied in two communities for which there was no prevalence data from enumeration and examination surveys and that had not been visited previously by any member of the survey teams. The aim was to provide an estimate of the time needed to complete each process of the LQAS method in communities that had not been visited previously by the survey teams.

Results

Ninety-six trial surveys were undertaken in six communities. Table 1 shows prevalence of trachoma in each community, number of trials undertaken in each community, number and proportion of trials that classified the community as high prevalence, and mean sample size needed to make a classification. The operating characteristic curve found in trial surveys with the first sampling plan (maximum sample size 50; number of defects allowed 14) is shown in Fig. 1. The average sample number curve for the sampling plan and the sample size needed to make a classification in each trial by prevalence is shown in Fig. 2.

All communities with a prevalence of active trachoma ⩾40% were classified correctly by the trials as high-prevalence communities. All communities with a prevalence of active trachoma ⩽20% were classified correctly as low-prevalence communities. Communities with a prevalence of active trachoma between 20% and 40% were classified as either high- or low-prevalence communities. The probability of such a community being classified as high or low prevalence was proportional to the proximity of the prevalence in that community to the classification thresholds. Communities with prevalences closer to 40% tended to be classified as high-prevalence communities and communities with prevalences closer to 20% as low prevalence.

The sampling plan discriminated between communities with prevalences ⩽30% and communities with prevalences >30% with sensitivity of 98.0% (95% confidence interval (CI) = 88.2–99.9%), specificity of 84.4% (CI = 69.9–93.0%), positive predictive value of 87.7% (CI = 75.7–94.5%), and negative predictive value of 97.4% (CI = 84.9–99.9%). Of the 96 trials, 88 (91.7%, CI = 83.8–96.1%) correctly identified communities with prevalences ⩽30% and communities with prevalences >30%.

Table 2 shows the number of communities classified as high, medium, and low prevalence by the application of two sampling plans. The observed agreement between the true prevalence classes and the classifications made with the two sampling plans was 84.4% (CI = 75.2–90.7%). No communities were entirely misclassified (that is, no low-prevalence communities were classified as high-prevalence or vice versa).

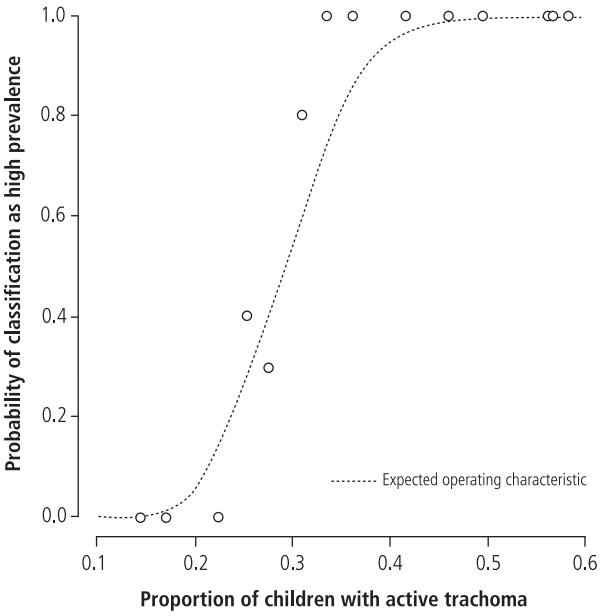
Table 3 shows the times needed to complete the two LQAS surveys in the non-trial communities. The surveys needed 3.75 and 5.5 hours to complete. In surveys of low-prevalence communities and surveys in which the survey could not be stopped

Table 1. **Prevalence, number of trials, classification probabilities, and mean sample sizes in study of applicability of lot quality assurance sampling to estimate prevalence of trachoma**

Community	Results	Prevalence class		
		High (⩾40%)	Medium (>20% and <40%)	Low (⩽20%)
Kunkhongo	Prevalence (%)	56.0[a]	36.0[b]	
	Number of trials	5	8	
	Classified as high prevalence	5 (100)[c]	8 (100)	
	Mean sample size	28	33	
Mawale	Prevalence (%)	45.8[a]	25.2[b]	14.5[b]
	Number of trials	6	10	10
	Classified as high prevalence	6 (100)	4 (40)	0
	Mean sample size	26	49	50
Mgawi	Prevalence (%)	49.3[a]	30.8[b]	
	Number of trials	5	5	
	Classified as high prevalence	5 (100)	4 (80)	
	Mean sample size	25	38	
Mwalala	Prevalence (%)			17.1[b]
	Number of trials			5
	Classified as high prevalence			0 (0)
	Mean sample size			50
Nsadzu	Prevalence (%)	58[a] 41.4[b]	27.4[b] 22.3[b]	
	Number of trials	4 3	10 10	
	Classified as high prevalence	4 (100) 3 (100)	3 (30) 0 (0)	
	Mean sample size	27 26	49 50	
Simaiwa	Prevalence (%)	56.4[a]	33.3[b]	
	Number of trials	5	10	
	Classified as high prevalence	5 (100)	10 (100)	
	Mean sample size	25	36	

[a] Prevalence in enumerated/examined community.
[b] Prevalence in pseudocommunity.
[c] Figures in parentheses are percentages.

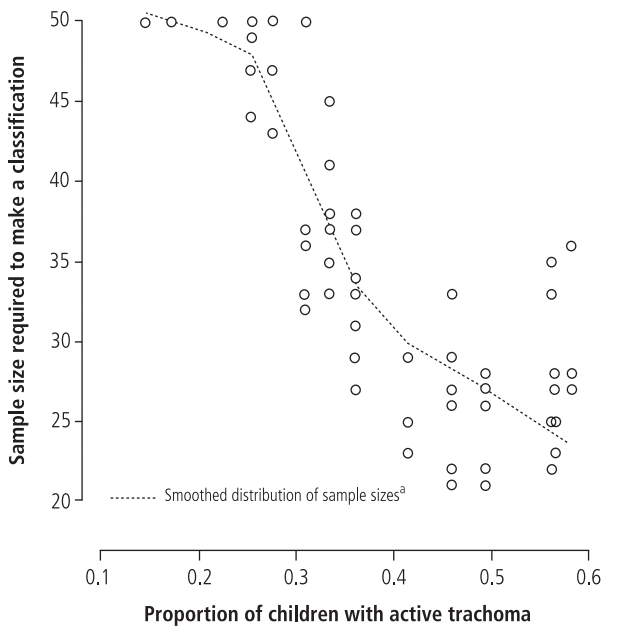
Fig. 1. **Probability of classifying community as having prevalence ≥40% by prevalence[a]**



[a]Binominal probability of finding ≥14 cases of active trachoma in sample of 50 children by prevalence.

WHO 03.210

Fig. 2. **Sample size required to make classification in each trial survey by prevalence[a]**



[a]Calculated using a locally weighted regression method (*22*).

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early because the allowable number of defects was not exceeded, LQAS surveys were estimated to need 5.5–8.5 hours to complete. These estimates are based on a maximum sample size of 50 children. The time needed to complete a survey seemed to be proportional to the size, in terms of both population and area, of the community surveyed.

Discussion

Classifications made from sample surveys are probabilistic in nature, which inevitably will lead to some inappropriate classifications. Any assessment method should minimize the frequency of misclassification. Methods based on prevalence should consistently return a high-prevalence classification when prevalence is high and a low-prevalence classification when prevalence is low. This desired behaviour is summarized in Table 4. The behaviour of a sampling plan is summarized by its operating characteristic curve, which shows the probability of making a high prevalence classification at different levels of prevalence. In Fig. 1, the probability of a high prevalence classification is zero in low prevalences situations and 100% in high prevalence situations, and the curve increases smoothly and rapidly between the two classification thresholds. This matches the behaviour outlined in Table 4. The classification of communities between the two classification thresholds as either high- or low-prevalence communities is not as important a limitation as it may first seem. A medium-prevalence community could be classified as either high prevalence or low prevalence. A high-prevalence classification is reasonable, because the community has a prevalence above the lower threshold and, although intervention is not a priority, it still would be appropriate. A low-prevalence classification is also reasonable, because although the prevalence may not be low, it is not high, and so the community is not a priority for intervention.

The ability to stop sampling once the number of defects allowed in the sample has been exceeded means that LQAS surveys do not have a fixed sample size. The average sample size needed to make a decision decreases with increasing prevalence (Fig. 2). This allows classifications to be made in high-prevalence communities with relatively small sample sizes and has the advantage of leaving the survey team time to collect data useful for planning and delivery of services to the community once the classification has been made. The time needed to complete the survey procedure was consistent with the requirement for a survey to be completed in one day. For highly populous communities and for communities spread over a large area, the provision of additional resources or an extension of the survey time should be considered.

Table 2. **Number of communities classified as high, medium, or low prevalence with two sampling rules in study of applicability of lot quality assurance sampling to estimate prevalence of trachoma**

	Classified prevalence (classification rule)		
Prevalence class	**Low ⩽20% (⩽9 cases)**	**Medium >20% and ⩽30% (>9 and ⩽14 cases)**	**High >30% (>14 cases)**
Low (⩽20%)	13	2	
Medium (>20% and ⩽30%)	5	18	7
High (>30%)		1	50

Table 3. **Times required for lot quality assurance sampling survey activities to estimate prevalence of trachoma in two communities**

Location	Activity	Time (hours)	Notes
Community one[a]	Draw map	1	Drawn with assistance of village headman. In separate exercise, position of each house (ascertained with hand-held global positioning satellite (GPS) device) recorded and plotted. Sketch map and plotted GPS data were consistent with each other.
	Confirm map	0.75	Walkabout survey to confirm accuracy and completeness of map and confirm segment structures.
	Sample and examine children	2	Community classified as having prevalence ⩾40%. Sampling stopped after 15 cases found in 27 children. Estimated 3.7 hours needed to sample 50 children.
Community two[b]	Draw map	1.5	Drawn with assistance of village headman.
	Confirm map	1.5	Walkabout survey to confirm accuracy and completeness of map and confirm segment structures.
	Sample and examine children	2.5	Community classified as having prevalence ⩾40%. Sampling stopped after 15 cases found in 23 children. Estimated 5.4 hours needed to sample 50 children. Mapping and sampling process slower in this community because it was considerably larger and had a larger spread than community one.

[a] 253 houses in two ribbons and one cluster.
[b] 550 houses in four ribbons and three clusters.

For the trials presented in this report, the chosen sampling plan was appropriate for classifying communities as low prevalence when the actual prevalence was ⩽20% and as high prevalence when the actual prevalence was ⩾40%. Alternative sampling plans can be constructed to distinguish between prevalence thresholds relevant to any local situation. Sampling plans may also be changed as control programmes progress (both prevalence thresholds can be lowered to reflect an improving situation). Table 5 shows some examples of sampling plans, with a maximum sample size of 50, for different prevalence thresholds.

Although LQAS was designed to provide a binary classification method, the method can be extended to provide a finer classification system if this is required. One application of this approach might be to classify communities by treatment strategy. WHO recommends mass treatment in communities where the prevalence of active trachoma is ⩾20%, family treatment in communities where the prevalence of active trachoma is 5–20%, and individual case treatment in communities where the prevalence of active trachoma is <5% (*16*). A suitable classification system can be constructed with two sampling plans:

- first sampling plan with a maximum sample size of 50 and nine allowed defects to identify communities with prevalences >20%
- second sampling plan with a maximum sample size of 50 and one allowed defect to identify communities with prevalences >5%.

The study population comprised children aged 2–5 years rather than children aged 1–9 years, which is used in the TRA method (*2*). This age group was chosen because in many locations where trachoma is endemic, children aged >5 years often are engaged in activities (for example, school, work, or play) that take them away from home during the day. This may result in samples that are not representative of the population of children aged 1–9 years in surveyed communities. This problem may be particularly important if there is a "healthy worker" effect in respect to the condition being surveyed. If, for example, children without active trachoma are more likely to be away from home than children with active trachoma then surveys would give upwardly biased estimates of prevalence. Patterns of child labour and access to education are likely to vary from community to community. In such situations, survey samples in respect of age, sex, and trachoma status will also vary between communities and will reflect socioeconomic rather than demographic differences. The solution of revisiting households to sample eligible people who could not be sampled on the day of the survey used in some surveys is not feasible for a rapid assessment method. Any rapid survey method that is appropriate for general use in developing countries is restricted to sampling households rather than individuals. Restriction of the eligible survey population to children aged 2–5 years effectively reduces the number of people examined in each sampled household. This reduces the effect of problems caused by a lack of sampling independence as well as the effects of within-household clustering. Restriction of the eligible survey population also causes survey teams to visit more households. This yields a sample that is more spatially diverse. In many situations, the prevalence of active trachoma peaks in young age groups. If the disease is being transmitted in a community, the probability that children aged 2–5 years will have signs of active disease is high (*23–49*).

The data presented in this report support the use of the LQAS method as a rapid and reliable tool for classifying communities according to the prevalence of active trachoma.

Table 4. **Preferences for frequency of classifications based upon prevalence**

	Prevalence in sampled community				
Classification	**Very low**	**Low**	**Moderate**	**High**	**Very high**
High prevalence	Never	Seldom	Sometimes	Often	Always
Low prevalence	Always	Often	Sometimes	Seldom	Never

Table 5. **Sampling plans for different prevalence thresholds for lot quality assurance sampling**

Prevalence thresholds (%)		Expected errors		Sampling plan	
Lower	**Upper**	**Provider error (α)**	**Consumer error (β)**	**Maximum sample size**	**Number of defects allowed in sample**
1	9	0.0894	0.0532	50	1
5	20	0.0378	0.0480	50	5
10	30	0.0245	0.0402	50	9
20	40	0.0607	0.0539	50	14
30	50	0.0848	0.0594	50	19
40	60	0.0978	0.0573	50	24
50	70	0.0594	0.0848	50	30

The method merits serious consideration as a replacement for the second stage of the current TRA method (assessment of prevalence of active trachoma in a community). Further work is needed to assess the rapidity, reliability, and ease of use of the proposed method in operational contexts in different settings. ■

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Résumé

Essai sur le terrain de l'applicabilité des sondages pour le contrôle de la qualité des lots en vue de l'évaluation rapide de la prévalence du trachome évolutif

Objectif Tester l'applicabilité de la méthode LQAS (lot quality assurance sampling = sondage pour le contrôle de la qualité des lots) à l'évaluation rapide de la prévalence du trachome évolutif.

Méthodes La prévalence du trachome évolutif a été déterminée dans six communautés en examinant tous les enfants de 2 à 5 ans. Des enquêtes tests ont été réalisées dans ces communautés. Un protocole d'échantillonnage adapté à la classification des communautés où la prévalence est ⩽20 % ou ⩾40 % a été appliqué aux données des enquêtes. Les courbes des caractéristiques opérationnelles et de l'effectif moyen des échantillons ont été établies, et les caractéristiques propres classiques du test de dépistage calculées. La capacité de la méthode LQAS à produire une classification en trois classes a été examinée.

Résultats Quatre-vingt-seize enquêtes tests ont été réalisées. Toutes les communautés dans lesquelles la prévalence était ⩽20 % ou ⩾40 % ont été identifiées correctement. La méthode a permis de repérer les communautés où la prévalence était ⩽30 % et celles où elle était ⩾30 %, avec une sensibilité de 98 % (intervalle de confiance à 95 % (IC) : 88,2-99,9 %), une spécificité de 84,4 % (IC : 69,9-93,0 %), une valeur prédictive positive de 87,7 % (IC : 75,7-94,5 %), une valeur prédictive négative de 97,4 % (IC : 84,9-99,9 %) et une exactitude de 91,7 % (IC : 83,8-96,1 %). L'accord entre d'une part les trois classes de prévalence et d'autre part la classification résultant de l'enquête était de 84,4 % (IC : 75,2-90,7 %). Le temps nécessaire pour réaliser entièrement les enquêtes est compatible avec le besoin d'effectuer entièrement une enquête en un jour.

Conclusion Le sondage pour le contrôle de la qualité des lots est une méthode qui permet de classer les communautés en fonction de la prévalence du trachome évolutif. Cette méthode mérite d'être considérée attentivement, pour remplacer la méthode d'appréciation rapide du trachome utilisée actuellement pour évaluer la prévalence du trachome évolutif. Elle pourra être développée pour fournir un système de classification multiclasses.

Resumen

Ensayo sobre el terreno de la aplicabilidad de las encuestas de muestreo para la garantía de la calidad de lotes a la evaluación rápida de la prevalencia del tracoma activo

Objetivo Determinar las posibilidades de aplicar el muestreo para la garantía de la calidad de los lotes (LQAS) a la evaluación rápida de la prevalencia del tracoma activo.

Métodos Se determinó la prevalencia del tracoma activo en seis comunidades examinando a todos los niños de 2 a 5 años de edad. Se llevaron a cabo encuestas experimentales en esas comunidades, y se aplicó a los datos encuestales un plan de muestreo apropiado para clasificar las comunidades con prevalencias ⩽ 20% y ⩾ 40%. Se representaron gráficamente las curvas de eficacia y del número medio de muestras, y se calcularon los índices de la prueba de cribado. Por ultimo, se investigó la capacidad del LQAS para generar un sistema de clasificación de tres categorías.

Resultados Se llevaron a cabo 96 encuestas experimentales. Todas las comunidades con prevalencias⩽ 20% y ⩾ 40% fueron correctamente identificadas. El método discriminó entre las comunidades con prevalencias ⩽ 30% y > 30%, con una sensibilidad del 98% (intervalo de confianza (IC) del 95% = 88,2%-99,9%), una especificidad de 84,4% (IC = 69,9%-93,0%), un valor predictivo positivo de 87,7% (IC = 75,7%-94,5%), un valor predictivo negativo de 97,4% (IC = 84,9%-99,9%) y una precisión de 91,7% (IC = 83,8%-96,1%). El acuerdo entre las tres clases de prevalencia y las clasificaciones realizadas mediante las encuestas fue del 84,4% (IC = 75,2%-90,7%). El tiempo necesario para rellenar las encuestas permitía terminarlas en un solo día.

Conclusión El muestreo de aseguramiento de la calidad de los lotes es un método que permite clasificar las comunidades de acuerdo con la prevalencia de tracoma activo, y merece ser considerado seriamente como alternativa a la determinación de esa prevalencia basada en el método de evaluación rápida actualmente utilizado. Es posible ampliarlo para disponer de un método de clasificación con varias categorías.

ملخص

إجراء القرعة لجمع عينات ضمان الجودة لانتشار التراخوما النشيطة

تجربة ميدانية حول قابلية تطبيق طريقة المسح بإجراء قرعة عند جمع العينات حول ضمان الجودة للتقييم السريع لانتشار التراخوما النشيطة

الهدف: معرفة مدى قابلية تطبيق جمع عينات ضمان الجودة للتقييم السريع لانتشار التراخوما النشيطة.

الطريقة: تم تحديد انتشار التراخوما النشيطة في ستة مجتمعات بإجراء الفحص لكل الأطفال الذين تتراوح أعمارهم بين ٢ ٥ سنوات، وأجريت مسوحات في هذه المجتمعات، وطبقت خطة لأخذ النماذج ملائمة لتصنيف المجتمعات وفق معطيات المسح بين ما يقل عن ٢٠٪ وما يزيد عن ٤٠٪، ورسمت مواصفات التشغيل ومنحنى العدد الوسطي للعينات وحسبت مناسب اختبارات التحريات، ودرست قدرة جمع عينات ضمان الجودة على تقديم نموذج للتصنيف ذي ثلاث فئات.

الموجودات: تم إجراء ٩٦ دراسة مسح. وقد استفردت جميع المجتمعات التي كان معدل الانتشار فيها يقل عن ٢٠٪ أو يزيد عن ٤٠٪ بشكل صحيح. كما كانت الطريقة تميز بين المجتمعات التي يقل فيها معدل الانتشار عن ٣٠٪ وتلك التي يزيد فيها معدل الانتشار عن ٣٠٪ بحساسية تصل إلى ٩٨٪ (وبفاصلة ثقة تعادل ٩٥٪ و تتراوح بين ٨٨,٢ و٩٩,٩٪) وبنوعية تصل إلى ٨٤,٤٪ (وبفاصلة ثقة تتراوح بين ٩٦,٩ و٩٣,٠٪) وكانت القيمة التنبؤية الإيجابية ٨٧,٧٪ (وبفاصلة ثقة تتراوح بين ٧٥,٧٪ و٩٤٪) فيما كانت القيمة التنبؤية السلبية ٩٧,٤٪ (بفاصلة ثقة تتراوح بين ٨٤,٩ و٩٩,٩٪). وكانت المضبوطية تعادل ٩١,٧٪ (بفاصلة ثقة تتراوح بين ٨٣,٨ و٩٦,١٪) وكان التوافق بين الفئات الثلاثة من حيث معدلات الانتشار والتصنيفات المعمول بها في المسوحات ٨٤,٤٪ (وبفاصلة ثقة تتراوح بين ٧٥,٢ ٩٠,٧٪). وكان الزمن اللازم لإنجاز المسوحات متماشياً مع الحاجة لاستكمال مسح واحد كل يوم.

النتيجة: تقدم طريقة إجراء القرعة لجمع العينات حول ضمان الجودة أحد الطرق التي يتم من خلالها تصنيف المجتمعات وفقاً لمعدلات انتشار التراخوما النشيطة. وهي طريقة تستحق أخذها باهتمام شديد كبديل لتقييم الانتشار للتراخوما النشيطة باتباع الطرق المعمول بها حالياً في التقييم السريع للتراخوما. ويمكن توسيع هذه الطريقة لتصبح تصنيفاً متعدد الطبقات.

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