

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

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Abstract

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 $<$ or $=20\%$ and $>$ or $=40\%$ 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 $<$ or $=20\%$ and $>$ or $=40\%$ were identified correctly. The method discriminated between communities with prevalences $<$ or $=30\%$ 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.

Full text of article available:

<http://www.scielosp.org/pdf/bwho/v81n12/v81n12a06.pdf>

Synopsis provided by Dr. Mark Myatt

Acceptance Sampling Trachoma Rapid Assessment (ASTRA)

Resource constraints in trachoma-endemic countries demand that interventions should be as cost-effective as possible. A method of identifying areas of high trachoma prevalence in order for resources to be used where they are most needed is a necessary component of trachoma control programs. The WHO/TRA method was developed for this purpose. This method has, however, been found to be unreliable under field conditions. ASTRA is a replacement for the WHO/TRA method. ASTRA classifies communities by prevalence just like the WHO/TRA method but it improves upon the reliability of the original method by employing more rigorous sampling and analysis methods while remaining both rapid and easy to use.

ASTRA is an application of the *lot quality assurance sampling* (LQAS) method which is widely used in manufacturing to judge the quality of a *lot* (batch) of items. In the manufacturing 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 (e.g.) high prevalences of disease. Data analysis is performed as the data is collected and consists of counting the number of *defects* (e.g. children with active trachoma) in the sample and checking whether a pre-determined number has been exceeded. This combination of data collection and analysis is called a *sampling plan*. Using a sampling plan in the field is straightforward. Sampling stops when either 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*. Finer classifications may be achieved by applying more than one sampling plan.

The LQAS method requires that representative samples are taken from surveyed communities. This can be very difficult to do in many trachoma-endemic countries and has held back the widespread adoption of LQAS for use in rural settings in the developing world. A recently developed sampling method known as *map, segment, and sample* has now removed this hurdle. The combination of LQAS sampling plans and sampling methods suitable for use in urban and rural locations means that this important survey tool may now be used for public health problems almost anywhere in the world. ASTRA is the first application of this combination of LQAS and universally applicable sampling methods.

In 2002, the International Trachoma Initiative in collaboration with SightSavers International, The Institute of Ophthalmology at University College London, and the Malawi Ministry of Health undertook computer-based simulations (in the UK) and field trials (in Malawi) aimed at evaluating the applicability of LQAS using the *map, segment, and sample* sampling method to the problem of classifying communities by the prevalence of active trachoma. A sampling plan appropriate for classifying communities with prevalences $\leq 20\%$ and $\geq 40\%$ was applied to data collected in ninety-six surveys of communities in which the true prevalence was already known from door-to-door surveys. The ability of LQAS to provide a three-tier classification system ($\leq 20\%$, $> 20\%$ and $\leq 30\%$, and $> 30\%$) was also investigated using the same data. The results of the field trials were:

1. All communities with prevalences $\leq 20\%$ and $\geq 40\%$ were identified correctly.
2. The method discriminated between communities with prevalences $\leq 30\%$ and $> 30\%$ with a sensitivity of 98.0%, a specificity of 84.4%, a positive predictive value of 87.7%, a negative predictive value of 97.4%, and an accuracy of 91.7%.
3. The agreement between the three prevalence classes and survey classifications was 84.4%.
4. The time required to complete the a single ASTRA surveys was one day or less.

More details can be found at:

<http://www.who.int/entity/bulletin/volumes/81/12/en/877-885.pdf>

ASTRA is a rapid and reliable tool for classifying communities according to the prevalence of active trachoma. If coupled with spatial sampling techniques the method may be used to map trachoma prevalence over wide areas at reasonable cost. Operational research into using ASTRA to map the wide-area prevalence of trachoma is currently ongoing in Vietnam.

A CD-ROM describing the ASTRA method is available. This CD-ROM provides training material (video, slides, and manuals), background documents, and data-collections forms for the ASTRA method as well as easy to use software for developing LQAS sampling plans. The CD-ROM is available free of charge. If you would like a copy of the CD-ROM then you should contact: mark@brixtonhealth.com