Filarial antigenemia surveys to decide if mass drug administrations to eliminate lymphatic filariasis can be stopped: a manual for survey planners

Michael Deming, MD, MPH
Division of Parasitic Diseases
Centers for Disease Control and Prevention
Atlanta, Georgia

Hyunshik Lee, PhD
Westat
Rockville, Maryland

Prepared for
The Lymphatic Filariasis Support Center
Task Force for Child Survival and Development
Decatur, Georgia

Introduction

The 2005 World Health Organization manual Monitoring and epidemiological assessment of the programme to eliminate lymphatic filariasis at implementation unit level provides an algorithm for deciding if mass drug administrations (MDAs) can be stopped.[1] The final step in this algorithm is a survey of the prevalence of filarial antigenemia among school entrants using lot quality assurance sampling (LQAS). MDAs are stopped only if the survey demonstrates statistically that antigenemia prevalence is <0.1%. The guidelines for the LQAS survey are to select a systematic sample of 3000 school entrants and to conclude that MDAs can be stopped only if no child is among the 3000 is found to be antigenemic.

In August 2008, a meeting convened by the World Health Organization (WHO) on when to stop MDAs made recommendations for changing the antigenemia survey guidelines in the 2005 manual.[2] The recommendations are summarized below as well as the modifications of these recommendations agreed on in subsequent meetings.

> --Raise the target antigenemia prevalence range for stopping MDAs from <0.1% to <1.0%, recognizing that the range may need to be narrowed to <0.5% in some Pacific island nations where *Aedes polynesiensis* is the principal vector. As explained in the meeting notes, the target antigenemia prevalence range was subsequently changed to <2.0% while recognizing it may need to be lowered to <1.0% in areas where *Aedes polynesiensis* is the principal vector.
>
> --Decrease the risk of false-negative conclusions. Using the LQAS survey described by the 2005 manual, there is only a 22% chance there would be no antigenemic child among the 3000 children in the sample in IUs where antigenemia prevalence has been lowered to 0.05%, half the threshold value. Therefore, there would be a 78% chance of a false-negative conclusion, meaning that there would be one or more antigenemic children, leading to the conclusion that the threshold hold of prevalence of 0.1% has not been reached. This manual proposes survey designs and sample sizes that ensure that in IUs where antigenemia prevalence has been lowered to half the threshold value, at least 75% will "pass" and MDAs will (correctly) be stopped.
>
> --Offer cluster-sample survey design guidelines for IUs with a large number of primary schools in order to reduce the number of schools that need to be visited. The use of LQAS requires visiting almost every school. The need reduce the number of schools visited came to light as antigenemia surveys were planned in Sri Lanka. In the first IU to be surveyed, a total of 324 schools needed to be visited if LQAS were used.
>
> -- Establish a criterion for when household surveys of children in the community should be conducted rather than surveys of children in schools, and propose sampling designs for such surveys.

[1] Monitoring and epidemiological assessment of the programme to eliminate lymphatic filariasis at implementation unit level. World Health Organization. Geneva. WHO/CDS/CPE/CEE/2005.50.
[2] Report of the Working Group on Guidelines for Stopping MDA and Post-MDA Surveillance for the Elimination of Lymphatic Filariasis Geneva, Switzerland Aug. 7 & 8, 2008 [draft].

--Keep the analysis of cluster-sample surveys as simple as possible by retaining the use of a critical value in the analysis, so that the decision to stop or continue MDAs (as in LQAS surveys) is based solely on whether the number of antigenemic children in the sample is less than or equal to the critical value, or greater than the critical value.

--Consider widening the usual target survey population to include more than just school entrants in school surveys and a correspondingly age range in household surveys, and allow flexibility in regard to grade and age range so that it can be adjusted to match different epidemiological settings. Subsequently, the grade range 1-5 and age range 6-10 were suggested since no gradient in antigenemia prevalence has been found among children from the lower to upper ends of these ranges. Finally, agreement was reached on grades 1-2 and years 6-7 as the usual default survey target groups since these ranges result in smaller sample sizes due to the finite population correction without increasing the number of clusters that need to be visited in cluster sample surveys in order to attain the needed sample size.[3]

While working on this manual, the decision was made to adjust all sample sizes for finite population since this adjustment results in major sample-size reductions. This is also a change, since the 2005 guidelines proposed the use of a single sample size in all IUs.

The 2005 manual describes steps that should be taken before a survey is conducted to decide if MDAs can be stopped, to ensure there is a reasonable likelihood that the survey will show they can be stopped. The recommended changes in these steps are summarized in the summary of the August 2008 meeting.[2]

Intended readers

This manual is intended for program managers or other persons responsible for planning filarial antigenemia prevalence surveys.

Computer-assisted use of manual

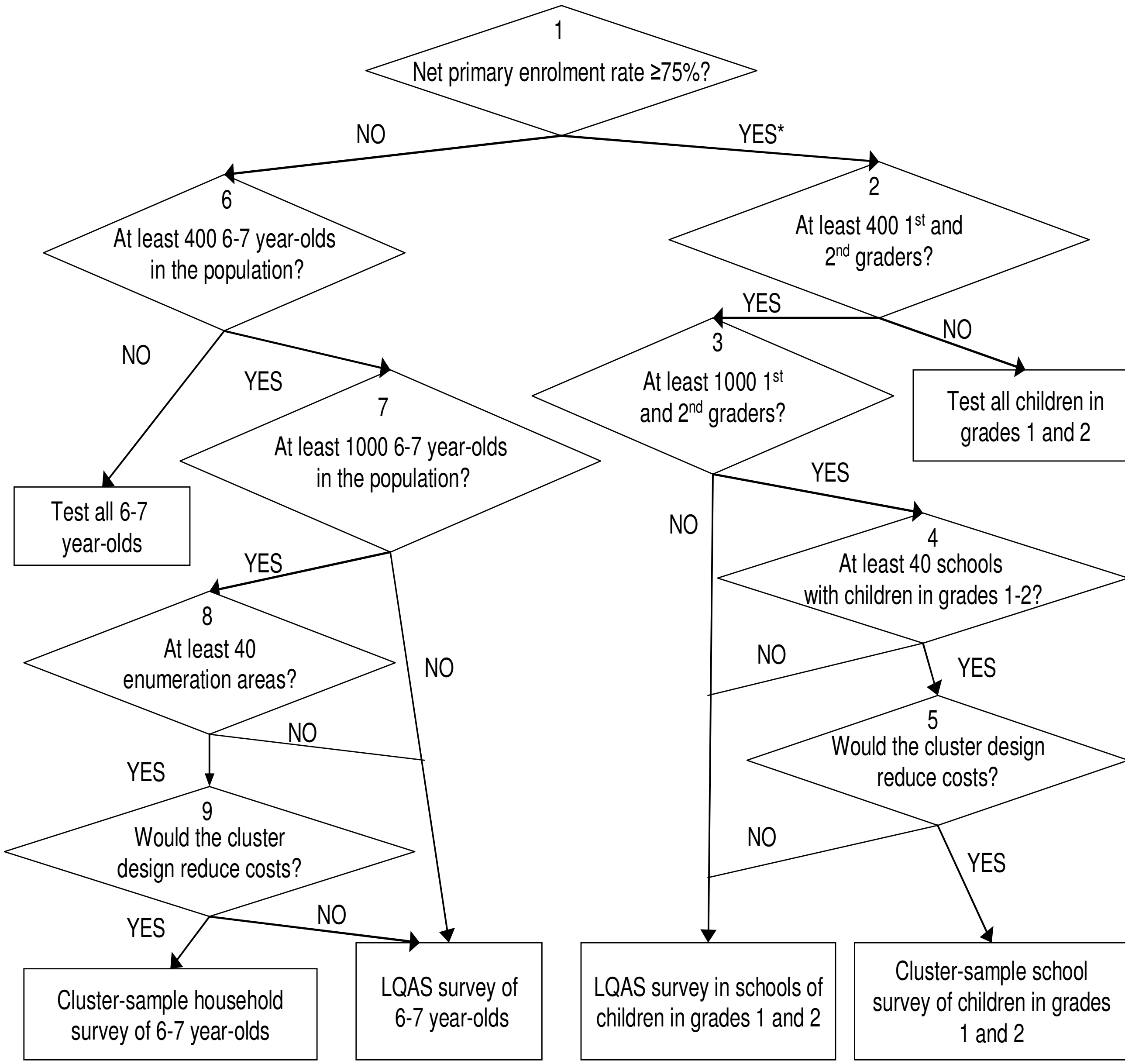
A computer program is being prepared at the Lympatic Filariasis Support Center, The Task Force for Global Health to assist survey planners in using the algorithm described in this manual. It will request the data needed, show the indicated survey design or options, and automatically provide sample sizes.

Background and technical notes

A separate module of background data and technical notes has been prepared that explains in more detail the choices made in developing the algorithm presented in this module.3

[3] Deming M, Hyunshik L. Background and technical notes for *Filarial antigenemia surveys to decide if mass drug administrations to eliminate lymphatic filariasis can be stopped: a manual for survey planners*. [Draft].

Algorithm for choice of survey population, survey design, and survey analysis for IUs where the antigenemia target range is <2.0%[4,5]



*Surveys of children 6-7 in the population provide more representative results in all IUs where the net primary enrolment rate is <100%. Therefore, program managers may decide to do a population-based survey rather than a school survey even in IUs where the net primary enrolment rate is ≥75%.

[4] See Figure 2 for UIs where the target antigenemia prevalence range is <1.0%.
[5] See Box 17 if target population is other than children 6-7 year-old in the population.

Explanation of algorithm steps

1. Is the net primary enrolment rate in the IU ≥75%?

   Yes: Continue with Step 2. Sampling can be done in schools.
   No: Skip to Step 6. Sampling should be done of 6-7 year-old children in the community.

   Note: The net primary enrolment rate is the number of pupils in the primary school age range expressed as a percentage of the total number of children in this age range. It is normally available from the Ministry of Education. If it is lower than 75%, a household survey should be conducted rather than a school survey for results to be adequately representative. If the net primary enrolment rate is not known and if there is any likelihood that it is <75%, then the answer to this question should be "no". Since surveys of children aged 6-7 years in the population provide more representative results than surveys of 6-7 year-old schoolchildren wherever primary school enrolment is less than 100%, program managers may decide to conduct a household survey choose to conduct a household survey instead of a school survey when the net primary enrolment rate is ≥75%

2. Are there at least 400 first- and second-grade schoolchildren in the IU?

   Yes: Continue with Step 3.
   No: Visit every school and test every first- and second-grade child in school. The IU passes only if antigenemia prevalence <2.0%. **NO FURTHER SAMPLING DECISIONS.**

   Note. If there are fewer than 400 first-and second-grade schoolchildren, it is not worth the time and effort of selecting a sample first and second graders rather than testing all of them, because the sampling fraction would be high.

3. Are there at least 1000 children in first- and second-grade schoolchildren in the IU?

   Yes: Continue with Step 4 to decide between an LQAS survey and cluster-sample survey.
   No: Conduct an LQAS survey of first and second graders (Boxes 1-3). The IU passes only if there are no more than *d* antigenemic children (see Table 1). **NO FURTHER SAMPLING DECISIONS.**

   Note: If the answer to Question 3 is "no", then the sampling fraction with cluster sampling would be so high that it would result in little reduction in the number of schools visited.

4. Are there at least 40 schools with children in first and second grades?

   Yes: Continue with step 5 to decide between an LQAS survey and cluster-sample survey.
   No: Conduct an LQAS survey of children in first and second grade (see Boxes 1-3). The IU passes only if there are no more than *d* antigenemic children (see Table 1). **NO FURTHER SAMPLING DECISIONS.**

   Note: The sample size for cluster-sample surveys is larger than for LQAS surveys. Cluster sampling can reduce the number of schools that need to be visited, thereby reducing travel costs and the time needed to arrange for visits, but since there should be at least 30 primary schools, the reduction in schools to be visited in a cluster sample would be small unless there is a total of at least 40 primary schools.

5. Would the cluster design reduce the survey cost compared to an LQAS survey? Answering this question includes a comparison of the sample size and the number of schools to be visited with each sampling design and may be facilitated by use of the ratio of the cost of visiting a school compared to the cost of testing a child once the school has been visited (see Boxes 4-6 and Table 1).

   Yes: Conduct a cluster-sample survey of children in grades 1 and 2 (see Boxes 5-8). IU passes if there are no more than *d_cluster* antigenemic children for the cluster sample design (Table 1). **NO FURTHER SAMPLING DECISIONS.**
   No: See Boxes 1-3 for conducting an LQAS survey of schoolchildren in first and second grade. The IU passes if there are no more than *d* antigenemic children for the LQAS survey (Table 1). **NO FURTHER SAMPLING DECISIONS.**

   Note: Each program manager should decide if the reduced number of schools that need to be visited in a cluster-sample survey outweighs the need in a cluster-sample survey for a larger sample size than the LQAS survey design requires. .

6. Are there at least 400 6-7 year-old children in the IU?

   Yes: Continue with Step 7.
   No: Visit every household and test every child 6-7 years old. The IU passes only if the prevalence of antigenemia is <2.0% (see Box 16). **FURTHER SAMPLING DECISIONS.**

7. Are there at least 1000 6-7 year-old children in the IU?

   Yes: Continue with Step 4 to decide between an LQAS survey and cluster-sample survey.

No: Conduct an LQAS survey of children 6-7 years old in the community. See Boxes 9-10 and 16. The IU passes only if there are no more than *d* antigenemic children for the LQAS survey (Table 1). **NO FURTHER SAMPLING DECISIONS.**

8. Are there at least 40 census enumeration areas in the IU?

Yes: Continue with step 5 to decide between an LQAS survey and cluster-sample survey.

No: Conduct an LQAS survey of children 6-7 years old in the community. See Boxes 9-10 and 16. The IU passes only if there are no more than *d* antigenemic children.

9. Would the cluster-survey design reduce costs? (See Box 15 and Table 1; review Boxes 9-14).

Yes: Conduct a cluster-sample survey of children aged 6-7 in the community. The IU passes only if there are no more than *d_cluster* antigenemic children for the cluster sample design (Table 1). **NO FURTHER SAMPLING DECISIONS.**

No: Conduct an LQAS survey of children 6-10 years old in the community. See Boxes 9-10. The IU passes only if there are no more than *d* antigenemic children (Table 1).

See sample data recording forms in Annexes 2-4.

Box 1: Prepare lists of numbers for systematic sampling of first- and second-grade schoolchildren for an LQAS survey

--In the first column of Table1 ("Population Surveyed"), find the row with number that is closest to the total number of children in grades 1 and 2 in the IU without being higher.

- Example: if there are 3400 schoolchildren in grades 1 and 2, select the row with the value 3200.

--The second column shows the sampling fraction for an LQAS survey, and the third row shows the sampling interval that corresponds to this sampling fraction (the sampling interval is the reciprocal of the sampling fraction).

- Example: For the row with "Population Surveyed"=3200, the LQAS sampling fraction is 0.214 and the sampling interval is 4.68.

--Randomly identify the first child in first or second grade to be tested as follows:

- Use a random numbers table (Table 3) to select as many digits as there are in the sampling interval, use these digits to form a number, and multiply by 0.01. If the resulting number is ≤ the sampling interval, then it can be used as the starting point for systematic sampling.
  - Example: The sampling interval is 4.68. The digits 178 are selected. Multiplying by 0.01 = 1.78 which is in the range 0.01 to 4.68. Therefore, 1.78 is the starting point.
  - The sampling interval is 10.44. The digits 0315 are selected. Multiplying by 0.01 = 3.15 which inside the range 0.01-10.44. Therefore, 3.15 is the starting point.

- If the digits selected in the random numbers table multiplied by 0.01 do not fall in the range of the sampling interval, choose a new set of digits.
  - Example: The sampling interval is 3.30. The digits selected in the random numbers table are 562. Multiplying by 0.01=5.62, above the range 0.01-3.30. Use the table to choose another 3 digits.
  - Example: The sampling interval is 23.20. The digits selected in the random numbers table are 8704. Multiplying by 0.01=87.04, above the range 0.01-3.30. Use the table to another 4 digits.

- Identify the first child in grades 1 and 2 to be selected by rounding the starting point up to the nearest integer.
  - Example: The starting point is 3.15, which rounds up to the integer 4, so child 4 would be the first child in grades 1 and 2 selected.

--Prepare List A of first and second graders to be selected.

- This list should begin with the first schoolchild to be selected, identified as above. Next, the sampling interval is added to the random starting point multiple times.
  - Example: if the random starting point is 3.15 and the sampling interval is 4.68, the series of numbers 3.15, 7.83, 12.51, etc., should be generated. The list of numbers should be long enough so that the highest number on the list is several sampling intervals higher than the number of first and second graders in the school that has the most first and second graders. This is to ensure that even if

the largest school has a few more first and second graders than expected, there will be enough numbers on the list to complete systematic sampling.
    ◦ Example: There are a total of 173 first and second graders in the primary school with the largest number of first and second graders. In constructing List A, the sampling interval should be added to the random starting point enough times so that the highest number on the list is higher than 173. For example, if the sampling interval is 6.31, the list might be continued until it reaches about 200.

- Each number on the list should be rounded up to the nearest integer, indicating the number of the student to be selected (see example in Box 2).

--Prepare List B of first and second graders to be selected

- Prepare this list in the same way as List A except use a different starting point calculated as follows: Subtract the starting point used for List A from the sampling interval used for List A.
  ◦ Example: If the starting point and sampling interval for List A are 3.15 and 4.68, respectively, then the starting point for List B would be 4.68-3.15=1.53 and the number of the first child in first or second grade to be selected would be 2. Then, 4.68 would be added multiple times to 1.53 to identify subsequent schoolchildren.

Note: The reason to construct two lists is to have greater control over the final sample size. If the starting point in list A is high (close to the sampling interval), then use of the same starting point in each school would tend to produce a smaller sample size than if the starting point were low. By randomly selecting List A or List B for use at each school (see Box 3), the final sample size should, on average, be closer to the desired sample size.

Box 2: Example of Lists A and B for LQAS sampling in schools.

List A		List B	
Sampling interval	4.68	Sampling interval	4.68
Random starting point	3.15	Random starting point	4.68-3.15=1.53
The number of each schoolchild to be selected		The number of each schoolchild to be selected	
With decimal	Rounded up	With decimal	Rounded up
3.15	4	1.53	2
7.83	8	6.21	7
12.51	13	10.89	11
17.19	18	15.57	16
21.87	22	20.25	21
26.55	27	24.93	25
31.23	32	29.61	30
35.91	36	34.29	35
40.59	41	38.97	39
45.27	46	43.65	44
49.95	50	48.33	49
54.63	55	53.01	54
59.31	60	57.69	58

Continue until the highest number on each list is higher than the number of first and second graders in the school that has the most first and second graders.

Box 3: Instructions to survey teams for systematic sampling of school entrants.

--Each survey team should be given a list of schools to visit.

--After arrival at a school, the team should ensure all children in first and second grade are in an order or sequence in which they can be counted. For example, they could all be asked to form a line in the school yard. The first pupil in line would then be number 1 and the second pupil number 2, and so forth until the last pupil in the line. Alternatively, the team could walk systematically along each row in each first-grade and second-grade classrooms, consecutively numbering the students (a piece of paper could be given to each student with the assigned number).

--By flipping a coin, randomly select List A or List B.

--Children are selected according to the numbers on the list.

- Example: If the list has numbers 4, 9, 14, 19, etc., then the first- and second-grade pupils with the numbers 4, 9, 14, and 19 would be selected.

--The teams do not need to number all first- and second-grade pupils before children with the numbers on the sampling list are identified. As long as children in these grades are in a line or in a sequence of rows in classrooms, numbering and selection can take place at the same time.

- Example: While counting and numbering first and second graders who are standing in a line in the school courtyard, the interviewing team identifies (and asks to stand in a separate area) those corresponding to the sampling list numbers.

--Sampling at a school has been completed when the next number on the list is higher than the total number of first and second graders at the school.

- Example: If the list of pupils to select on List A includes the numbers …54, 63, 72…and is a total of 57 first and second graders at the school, then the last child chosen by systematic sampling would be child 54.

--In the unlikely event that there are fewer first and second graders at a school than the first number on the list, then none is selected for the sample.

- Example: If List B begins with 11 and there are only 9 first and second graders at the school, then none would be selected.

--See Annex 2 for a sample data collection form. For each child tested, the name of the child and the name of the child's teacher are requested so that the child can be identified in the future if it is decided to check the village or neighborhood where the child lives for evidence of continued focal transmission or to do confirmatory testing.

Box 4: Calculating how many schools would need to be visited using an LQAS survey design

---Using the LQAS survey design, all schools would need to be visited that have at least as many first and second graders as the lowest number on whichever list is used for the school (List A or B). If the number of first and second graders at a school is unknown, the school should be visited.

- Example: The lowest number on List A is 11 and the lowest number of List B is 19. All schools have at least 9 pupils in first and second grade. All schools should be visited.
- Example: The lowest number on List A is 29 and the lowest number of List B is 18. Based on reliable information, three schools have fewer than 18 pupils in first and second grade. These schools do not need to be visited, since no child would be selected at them. All other schools need to be visited.
- Example: The number of enrolled pupils at each school by year of age is not available. All schools should be visited.

Box 5 *Calculating how many schools need to be visited in a cluster-sample survey of first and second graders.*

--Calculate the average number of children in first and second grade per primary school.

--Identify the sample size for the cluster sample design from the row of Table 1 that has the number in the Population Survey column closest to the total number of first and second graders in the IU but not higher.

- Example: The total number of first and second graders is 15,454. Use the row of Table 1 with "Population surveyed" = 14,000. The required sample size for a cluster-sample survey is 1,548.

--Divide the required sample size for a cluster-sample survey in Table 1 by the average number of first and second graders per school and round up to the nearest integer.

- If this integer is ≥30, then it is equal to the number of schools to be selected in a cluster-sample survey. In this scenario, all first and second graders in the selected schools would be included in the survey sample.
    - Example: The Table 1 cluster-design sample size is 1,548 and the average number of first and second graders per school is 37, then 1548/37=42 (rounded up from 41.8), and so the number of schools in the sample=42.
- If this integer is <30, then 30 schools should be selected for the sample.

Box 6: Comparing the costs of an LQAS survey in schools and a cluster-sample school survey.

The cost differential between an LQAS survey in schools and a cluster-sample school survey may be obvious to survey planners. If so, they should select the least-costly survey design unless they have another reason for preferring one method over the other. If the cost differential is not obvious, then the following method can be used to compare costs quantitatively. The method requires an estimate of two costs, each of which should be inclusive: a) the cost of visiting a school, including the time and communication that may be needed to contact school administrators to arrange the visit, all transportation costs, driver and survey team salaries and per diems for the time spent travelling and for introductory meetings with school staff; b) the cost of testing a pupil at the school once the school has been visited, including the cost of the antigen card test and the time required for the survey team to conduct the testing and record the result.

Using these costs, calculate the ratio of the average cost of visiting a school to the cost of testing a child once the school has been visited. Suppose this ratio (ignoring actual costs in a specific currency) is 30:1 (30 for visiting a school and 1 for testing a child once the school has been visited). Further, assume that the IU has a total of 4,800 first and second graders, that an LQAS survey would require visiting 80 schools, and that a cluster-sample survey would require visiting 30 schools. Table 1 shows that the required sample sizes are 690 for the LQAS survey and 1,380 for the cluster-sample survey. The relative cost of the cluster-sample survey would be 30x30 + 1x1380=2.280, whereas the cost for the LQAS survey would be 30x80 + 1*690 = 3090. Therefore, in this example, the LQAS design would cost more (3090/2280=1.4 times more) than the cluster-sample design.

Cost analysis becomes more complex when different types of cost are covered by different sources. For example, if antigen card tests are provided free of charge to a country's lymphatic filariasis elimination program, they may no longer be seen as a cost from the program's point of view. Also, salaries may be covered by the program's routine ministry of health budget while costs like survey team per diems and fuel for the survey need to come from another source. For these reasons, each survey planning team is encouraged to make its own decision about which survey method (LQAS school survey or cluster-sample school survey) makes the best use of resources.

Box 7: Selecting schools in a cluster-sample school survey.

--Schools are selected by systematic sampling among all primary schools without regard to the number of first and second graders at each school.

--Make sure the schools are listed in a way they can be numbered. Ideally, the list should be in order of geographic proximity. For example, if the IU is divided into sub-districts, all the schools in each sub-district should be together on the list.

--Number the schools consecutively from 1 to the last school on the list.

--Calculate the sampling interval by dividing the number of schools on the list by the number of schools to be selected as clusters and rounding down to the nearest tenth.

- Example: The number of schools on the list=117 and there should be 46 schools in the sample. Therefore, the school sampling interval = 117/46=2.5.

--To identify the first school in the sample, select a random starting point between 0.1 and 2.5 and round up to the nearest integer (similarly to the procedure described in Box 1).

- Example: The random starting point is 2.2, so the first school is school 3.

--Add the sampling interval multiple times to the starting point (as per the procedure described in Boxes 1 and 2) until the last number on the list is higher than the total number of schools with at least one school entrant.

- Example: If the total number of schools on this list is 117, then generate the numbers 2.2, 2.2+(1x2.5), 2.2+(2x2.5), 2.2+(3x2.5),etc. until reaching a number higher than 117.

--Round each number on the list up to the nearest integer. The list of integers corresponds to the numbers of the schools to be included in the sample.

Box 8: The sampling fraction and sampling procedure for selecting first and second graders within schools in a cluster-sample school survey.

--See Box 5. If the number of schools in the sample is >30, then test all school entrants at each school in the sample (the sampling fraction of first and second graders within schools is 1).

-- If the number of schools in the sample is 30 because the sample size divided by the average number of first and second graders per school is 30, then test all first and second graders at each school in the sample.

--If the sample size divided by the average number of first and second graders is <30 (call this number *k*), then 30 schools are visited but a sampling fraction of <1 is used so that the total number first and second graders selected is close to the desired sample size. The sampling fraction = *k*/30.

- Example: the cluster-design sample size is 1333 and the average number of first and second graders per school is 54, then 1333/54=25. Therefore, the within-school sampling fraction is 25/30=5/6.

--Using this sampling fraction, calculate a sampling interval, a starting point, and Lists A and B, as explained in Boxes 1 and 2.

--Use these lists to select school entrants in each of the 30 schools in the sample, as explained in Box 3.

--See Annex 2 for a sample data collection form. For each child tested, the name of the child and the name of the child's teacher are requested so that the child can be identified in the future if it is decided to check the village or neighborhood where the child lives for evidence of continued focal transmission or to do confirmatory testing.

Box 9: Preparing lists of numbers for the systematic sampling of 6-7 year-old children in the community

--These steps are similar to those described in Box 1 for the systematic selection of schoolchildren. Instead of using systematic sampling within each school, systematic sampling is used within each census enumeration area (often referred to as "EA") in the IU.

--Estimate the total number of children 6-7 year-olds in the IU. This can usually be done with population projections from the last census. If there is a projection for the total number of children 5-9 year olds, it can be multiplied by 0.4 (2/5) for an approximation of the number of 6-7 year-olds. If there is only a population pyramid showing what percentage of the total population constituted by children 5-9 years old (it might be for an area that includes the IU but is larger than the IU), then the total population of the EA could be multiplied by this percentage to estimate the total number of 5-9 year-olds in the IU, and this number could then be multiplied by 0.4 to estimate the number of 6-7 year-olds.

- Example: The projected total population for the IU (a district) in the year of the survey is 32,000 (systematic sampling will be needed only in smaller IUs) and the population pyramid from the census shows that children 5-9 constitute about 13.6% of the population of the region of which the district is a part. Therefore, the estimated number of 5-9 year-old children in the IU is 0.136 x 32,000 = 4350, and the estimated number of 6-7 year-old children is 4350x0.4=1740.

--In the first column of Table 1 ("Population Surveyed"), find the row with number that is closest to the total estimated number of 6-7 year-old children in the IU without being higher. For example, if there are an estimated 1740 6-7 year-old children, select the row with the value 1400.

--On the same row, find the LQAS sampling interval. For the row with Population Surveyed=1400, the LQAS sampling interval is 18.09.

--Randomly select a starting number between 0.01 and the sampling interval and add the sampling interval to produce Lists A and B as described in Box 1. The highest number on each list should be higher than number of 6-7 year-olds in the EA with the greatest number of 6-7 year-olds.

Box 10: Selecting a systematic sample of 6-7 year-olds within each EA

--As in LQAS school surveys, Lists A and B will be used to select 6-7 year-old children from within each census enumeration area (EA) in the IU (see Boxes 1-3).

--The survey team should work with a local guide to identify EA borders and to plan a route through EA households that will ensure that every household is visited. This can often be done best by dividing the EA into segments and completing each segment one at a time.

--After deciding on the route to be followed through the households and on the starting household, use a coin toss to select List A or List B.

--Go to every household in the EA, following the previously agreed-on route. At each household, ask if any member of the household is 6-7 years old and assign consecutive numbers to each 6-7 year-old in the household in order of age.

- Example: There is no child 6-7 years old in the first two households visited. In the third household, there is one 6-7 year-old, who is considered 6-7 year-old child number 1. In the fourth household there are two 6-7 year-olds. The youngest is considered 6-7 year-old number 2 and the oldest is considered 6-7 year-old number 3.

--Select each 6-7 year-old for the survey sample whose number corresponds to the next number on List A or List B (whichever is being used).

- Example: List B is being used, and the first numbers on the list are 3, 9 and 15. The first child selected for the survey sample would be 6-7 year-old child number 3, as enumerated above. The next two 6-7 year-olds selected for the sample would be the 6-7 year-old children numbered 9 and 15.

--Since 6-7 year-olds may be in school when the survey is conducted, survey teams should work at times when schoolchildren are normally at home.

Box 11: Calculating the number of clusters for a cluster-sample household survey of 6-7 year-old children.

--Estimate the total number of 6-7 year-old children in the IU, as in Box 9.

- Example: The estimated total number of 6-7 year-olds in the IU is 7400.

--Divide this number by the total number of EAs in the IU

- Example: In all, the IU has 65 EAs, so the estimated average number of 6-7 year-olds per EA is 7400/65 = 114.

--Divide the sample size for the cluster-sample survey in Table 1 by the average number of 6-7 year-olds per EA and round up to the nearest integer. If this integer is ≥30, then it is the number of EAs that should be selected as clusters. If it is <30, then 30 EAs should be selected as clusters.

- Example: The sample size for a cluster-sample survey from Table 1 divided by the average number of 6-7 year-olds per EA=52 (rounded up from 51.3). Select 52 EAs from among all EAs in the IU.
- Example: The cluster sample size divided by the average number of 6-7 year-olds per EA=30 (rounded up from 29.7). Select 30 EAs from among all EAs in the IU.
- Example: The cluster sample size divided by the average number of 6-7 year-olds per EA=24 (rounded up from 23.8). Select 30 EAs from among all EAs in the IU.

Box 12: Selecting clusters systematically for a cluster-sample household survey of 6-7 year-old children.

--The systematic selection of clusters (EAs) is similar to the systematic selection of schools for a cluster-sample survey of school entrants.

--EAs are selected among all EAs in the IU, without regard to EA size.

--Make sure the EAs in the IU are in a list. Ideally, it should be in order of geographic proximity. For example, if the IU is divided into sub-districts, all the IUs in each sub-district should be together on the list.

--Number each EA on the list, from 1 to the total number of EAs.

--Calculate the sampling interval by dividing the total number of EAs by the number of EAs in the sample (see Box 11) and rounding up to the nearest tenth.

- Example: In all, 46 EAs are to be chosen for the sample and there are 117 EAs in the IU. The sampling interval = 117/46=2.5.

--Select a random starting point between 0.1 and the sampling interval (2.5 in the example above) and round up to the nearest integer to identify the first EA (see instructions in Box 1).

- Example: The random starting point is 2.2, so the first EA is EA 3.

--Add the sampling interval multiple times to the starting point (as in Boxes 1 and 2) until the last number on the list is higher than the total number of EAs.

- Example: Using the above results, generate the numbers 2.2, 2.2+(1x2.5), 2.2+(2x2.5), 2.2+(3x2.5),etc., until reaching the first number higher than 117.

--Round each number on the list up to the nearest integer. The list of integers corresponds to the EAs to be included in the sample.

- Example: The EAs that would be selected in the example immediately above are EAs 3, 5, 8, 10, etc.

--Obtain a sketch map of each selected EA from the local, regional or national census office. The sketch maps show the EA borders, landmarks, structures that can easily be identified, and an indication of where households are concentrated.

Box 13: The sampling fraction for selecting 6-7 year-old children within EAs in a cluster-sample household survey.

--If the estimated number of children 6-7 years old in the IU divided by average number of 6-7 year-old children per EA (quotient rounded up to the nearest integer) is ≥30, then the sampling fraction is 1. In this case, all 6-7 year-old children living in each EA in the sample should be tested.

--If the estimated number of children 6-7 years old in the IU divided by average number of 6-7 year-old children per EA (quotient rounded up to the nearest integer) is <30, then the sampling fraction is this integer divided by 30.

- Example: The estimated number of children 6-7 years old in the IU divided by average number of 6-7 year-old children is 24 (rounded up from 23.4). The sampling interval for 6-7 year-olds in each of the 30 clusters in the survey sample is 24/30=4/5.

Box 14: Selecting 6-7 year-old children in EAs selected for the cluster sample.

--The survey team is assigned a set of selected EAs.

--The team members need to find the EA and ensure they know where the borders of the EA are.

--A local guide is usually needed in rural EAs.

--It is helpful for a census bureau staff member to be part of the team, or at least to help with survey team training.

--The data recording forms should identify the EA so that it is know in the analysis which children live in the same EA.

--To ensure that all households are visited, it is often useful to divide the EA into segments and complete household visits one segment at a time.

--If the sampling interval is 1, the survey teams should systematically visit every household within the EA and test every 6-7 year-old child in each household visited whose parents give consent.

--The survey team should not let local guides lead them directly to households where children 6-7 years old live.

--If the sampling fraction is <1, survey team planners should prepare Lists A and B as described in Boxes 1-3 for systematic sampling of children 6-7 years old within each EA in the sample. The highest number on each list should be higher than the largest number of 6-7 year-old children expected in any single EA in the IU.

--The survey team would then use the lists to select children from each EA in the sample in exactly the same way described for LQAS sampling in Box 10.

Box 15: Comparing the costs of an LQAS survey and a cluster-sample survey in the community.

As for school surveys, the cost differential between an LQAS survey in the community and a cluster-sample household survey may be obvious to survey planners. If so, they should select the least-costly survey design unless they have another reason for preferring one method over the other

If the cost differential is not obvious, then the method for comparing costs to make a choice between these two survey designs is the same. It requires an estimate of each of the following inclusive average costs (expressed as a ratio): a) of visiting an enumeration area, including the time and communication that may be needed to contact local authorities, all transportation costs, driver and survey team salaries and per diems for the time spent travelling and for introductory meetings with local authorities; and b) the cost of testing a 6-7 year-old child within an enumeration area, including the cost of the antigen card and the time required to identify the child's household, to the testing and conduct a second visit to the household for children who are not at home at the time of the first visit but are expected back before the survey team leaves the cluster.

As an example, assume that the ratio of estimated costs for visiting an enumeration are and locating and testing a 6-7 year-old child is again 30:1 and that there an estimated 2700 6-7 year-olds in the IU and that the IU has 50 enumeration areas. If an LQAS survey were conducted, survey teams would need to visit all 50 enumeration areas, but would need to test only 614 children (see Table 1). Thus the relative cost would be 50*30+614=2114. If a cluster-sample survey were conducted, 1,228 children would need to be tested (Table 1). Since about 54 6-7 year-old children would be expected per cluster (2700/50), the sample size could be obtained by going to only 23 clusters (1228/54). However, since there should be a minimum of 30 clusters in a cluster-sample survey, 30 enumeration areas would need to be visited, giving a relative cost of 30*30+1228=2128. In this example, the estimated costs of the two methods are very similar, so either method could be used, depending on preferences unrelated to costs.

As for the corresponding decision in school surveys, cost analysis becomes more complex when different types of cost are covered by different sources. For example, antigen card tests and some survey team salaries may be provided free of charge to a country's lymphatic filariasis elimination program and not seen as costs from the program's point of view. Survey planners could decide whether, for their purposes, such costs should be included cost comparisons of the two survey designs.

--Box 16: Filling out the household survey data collection forms.

--See the sample data collection form in Annex 2 for EAs where all 6-7 year-old children are tested and Annex 3 for EAs where a sample of 6-7 year-old children is tested. The reason for recording the name of the child, of the head of the child's compound (if relevant), and of the head of the child's household is to ensure that the child can be found in the future if confirmatory testing is needed.

--The data collection form for EAs where only a sample of 6-7 year-olds are tested asks for the name of every 6-7 year-old child in the EA. The reason for this is to promote survey team adherence to the guideline of identifying all 6-7 year-olds as the team proceeds with the task of identifying a systematic sample of 6-7 year-olds for testing.

--For sampling purposes, 6-7 year-olds who are absent should count the same as 6-7 years who are present. For example, if a 6-7 year-old corresponds to a number on the sampling list but is absent, the result "A" on the data recording form should be circled and sampling continued in the same way as if the child had been tested. Conversely, if the absent child is not a child to test according to the sampling list, "A" is circled and the survey team continues using the list in the same was as if the child were present. Children who are selected but are absent should not be replaced by other children who are present.

Box 17: Using this manual for target groups other than school entrants and children 6-7 years old in the community.

--The algorithm and examples in this manual have referred to first and second graders and 6-7 year-old children in the community. However, the manual can also be used without any change in the algorithm, tables and instructions in boxes for other target grade and age groups.

--If another group is used, the values under "Population Surveyed" in the first column of Tables 1 and 2 refer to the members of that group.

- Example: The decision is made to measure the prevalence of antigenemia among children in grades 1-5 (or among children aged 6-10 years if the net primary enrolment rate is <75%). If there are an estimated 9300 pupils in grades 1-5 in the IU, then the row in Table 1with "Surveyed Population"=8000 should be used. The same row would be used in an IU with an estimated 9300 children aged 6-10 years old where the net enrolment rate is <75%.

Table 1. Sampling fractions, sampling intervals, sample sizes and critical values for antigenemia prevalence surveys in IUs where the target prevalence range is <2.0%, by survey population size.

Population surveyed[1,2]	Sampling Fraction	Sampling interval	LQAS Sample Size (n)	LQAS Critical Cut-off (d)	Sample Size for Cluster Design[3]	Number of clusters if cluster-sample survey is: school-based	Number of clusters if cluster-sample survey is: a household survey	Cluster design critical cut-off ($d\_cluster$)	Risk of Type I error[4]	Power (1 – Type I error)[5]
< 400	1 (census)	1.00	N	$0.02N$	NA	NA	NA	NA	0.0000	1.000
400	0.710	1.41	284	3	Cluster-sampling not recommended. Use LQAS, systematic sampling and the corresponding values of n and d				0.0488	0.7475
600	0.608	1.64	365	4					0.0489	0.7548
800	0.548	1.83	438	5					0.0490	0.7854
1,000	0.506	1.98	506	6	759	Divide the sample size for cluster design by the average number of target-grade children per school and round up to the nearest integer. If this integer is <30, then the number of clusters is 30.	Divide sample size for cluster design by the estimated average number of target-age children per EA and round up to the nearest integer. If this integer is <30, then the number of clusters is 30.	9	0.0500	0.8193
1,200	0.433	2.31	520	6	780			9	0.0497	0.7776
1,400	0.379	2.64	530	6	795			9	0.0495	0.7502
1,600	0.371	2.69	594	7	891			11	0.0491	0.7933
2,000	0.303	3.30	606	7	909			11	0.0493	0.7640
2,400	0.256	3.91	614	7	1,228			14	0.0494	0.7457
2,800	0.242	4.13	678	8	1,356			16	0.0499	0.7818
3,200	0.214	4.68	684	8	1,368			16	0.0493	0.7700
3,600	0.191	5.23	688	8	1,376			16	0.0493	0.7620
4,000	0.173	5.80	690	8	1,380			16	0.0500	0.7573
5,000	0.139	7.18	696	8	1,392			16	0.0498	0.7458
6,000	0.127	7.87	762	9	1,524			18	0.0491	0.7749
8,000	0.096	10.44	766	9	1,532			18	0.0498	0.7669
10,000	0.077	12.99	770	9	1,540			18	0.0494	0.7603
14,000	0.055	18.09	774	9	1,548			18	0.0493	0.7535
18,000	0.043	23.20	776	9	1,552			18	0.0493	0.7500
24,000	0.032	30.85	778	9	1,556			18	0.0492	0.7467
30,000	0.026	38.56	778	9	1,556			18	0.0498	0.7462
40,000	0.021	47.51	842	10	1,684			20	0.0495	0.7749
50,000	0.017	59.38	842	10	1,684			20	0.0499	0.7745
≥ 50,000			846	10	1,692			20	0.0493	0.7687

[1] Refers to whatever population is being surveyed, for example first and second graders or children 6-7 years old in the community.
[2] For a population size between two adjacent Ns in the table, the sampling fraction and d for the lower N are recommended to use.
[3] For the cluster design, if the population size < 2,400, a design effect of 1.5 is assumed but a design effect of 2 is assumed if the population size ≥ 2,400.
[4] The Type I error is the risk of false-positive conclusion that antigenemia prevalence is < 2.0% when in fact it is not. Its target is 5% or less with the smallest sample size.
[5] The power is given by 1 – Type II error, where the Type II error is the risk of false negative conclusion that antigenemia prevalence is > 1.0% when in fact it is ≤ 1.0%. Its target was 75% or greater with the smallest sample size.

Table 2. Sampling fractions, sampling intervals, sample sizes and critical values for antigenemia prevalence surveys in IUs where the target prevalence range is <1.0%, by survey population size.

Population surveyed[1,2]	Sampling Fraction	Sampling interval	LQAS Sample Size (n)	LQAS Critical Cut-off (d)	Sample Size for Cluster Design[3]	Number of clusters if cluster-sample survey is school-based	Number of clusters if cluster-sample survey is a household survey	Cluster design critical cut-off ($d\_cluster$)	Risk of Type I error[4]	Power[5]
< 1000	1 (census)	1.00	N	$0.01N$	NA	NA	NA	NA	0.0000	1.000
1000	0.704	1.42	704	4	Cluster-sampling not recommended. Use LQAS, systematic sampling and the corresponding values of n and d				0.0437	0.8278
1200	0.608	1.64	730	4					0.0498	0.7542
1400	0.610	1.64	854	5					0.0488	0.8286
1600	0.548	1.83	876	5					0.0499	0.7847
1800	0.498	2.01	896	5	1344	Divide the sample size for cluster design by the average number of target-grade children per school and round up to the nearest integer. If this integer is <30, then the number of clusters is 30.	Divide sample size for cluster design by the estimated average number of target-age children per EA and round up to the nearest integer. If this integer is <30, then the number of clusters is 30.	8	0.0492	0.7510
2000	0.507	1.97	1014	6	1521			9	0.0499	0.8170
2400	0.434	2.30	1042	6	1563			9	0.0497	0.7753
2800	0.419	2.39	1172	7	1758			11	0.0493	0.8140
3200	0.371	2.69	1188	7	1782			11	0.0499	0.7927
4000	0.304	3.29	1214	7	1821			11	0.0495	0.7620
5000	0.270	3.70	1350	8	2700			16	0.0495	0.7891
6000	0.227	4.40	1364	8	2728			16	0.0499	0.7739
7000	0.197	5.09	1376	8	2752			16	0.0496	0.7621
8000	0.173	5.78	1384	8	2768			16	0.0497	0.7541
9000	0.168	5.96	1510	9	3020			18	0.0498	0.7875
10000	0.152	6.60	1516	9	3032			18	0.0497	0.7820
12000	0.127	7.87	1524	9	3048			18	0.0499	0.7745
14000	0.109	9.15	1530	9	3060			18	0.0500	0.7690
16000	0.096	10.42	1536	9	3072			18	0.0496	0.7641
≥18,000	Not needed	Calculate[6]	1540	9	3080			18	0.0495	0.7606

[1] Refers to whatever population is being surveyed, for example first and second graders or children 6-7 years old in the community.

[2] For a population size between two adjacent Ns in the table, the sampling fraction and d for the lower N are recommended to use.

[3] For the cluster design, if the population size < 4,000, a design effect of 1.5 is assumed but a design effect of 2 is assumed if the population size ≥ 4,000.

[4] The Type I error is the risk of false-positive conclusion that antigenemia prevalence is < 1.0% when in fact it is not. Its target was 5% or less with the smallest sample size.

[5] The power is given by 1 – Type II error, where the Type II error is the risk of false negative conclusion that antigenemia prevalence is > 0.5% when in fact it is ≤ 0.5%. Its target was 75% or greater with the smallest sample size

[6] Divide the size of the surveyed population by 1540, rounding down to the nearest tenth. For example, if the size of the survey population is 20,000, then the sampling interval is 20,000/1540=12.99.

Table 3. Random numbers table.[6]

Use of the table.

Step 1: Know how many digits are needed to choose a random starting point. For systematic sampling in antigenemia prevalence surveys it will always be at least 2 digits, sometimes 3.

- Example: if the sampling interval is 0.1 to 2.7 (see Box 1), two digits are needed and the allowable range of digits is 01 to 27.

Step 2: Decide the direction in which the numbers from the table will be read (right, left, up or down).

Step 3: Close your eyes and touch the random number table with a pointed object. Open your eyes. The digit closest to the point where you touched the table is the starting point. The row numbers and column numbers do not count as random numbers.

Step 4: Read the number of digits required. If you reach the top of a column, continue at the bottom of the column. If you reach the bottom of a column, continue at the top of the column. If you reach the left side of a row, continue at the right side of a row. If you reach the right side of a row, continue at the left side.

Step 5: If the digits you choose are outside the allowable range, then try again. For example, if the allowable range is 01 to 27 and the digits 51 or selected, you would need to try again. Continue selecting the necessary number of digits until they are in the allowable range.

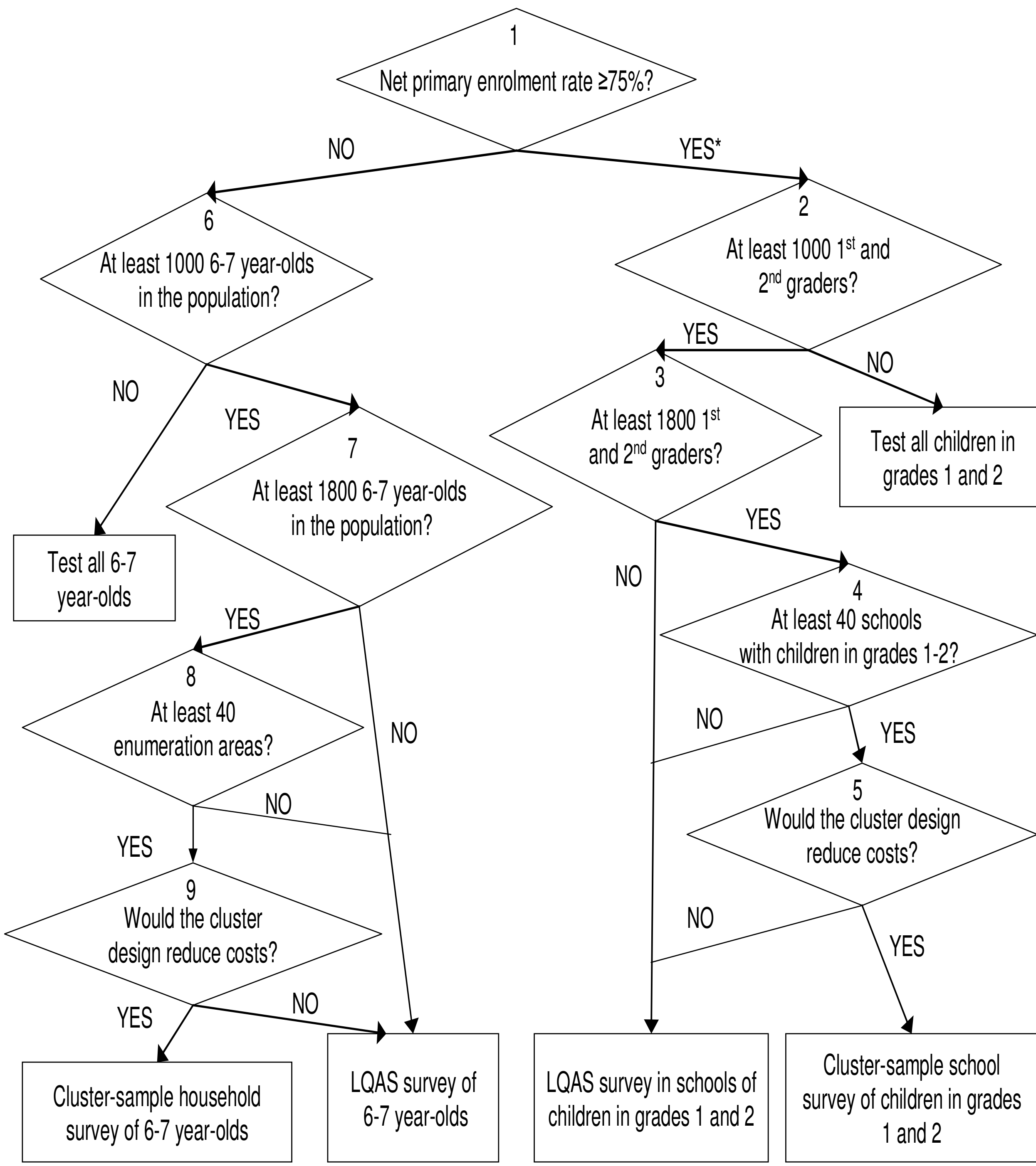
Step 6: When digits in the allowable range are selected, remember to re-enter the decimal point. For example, if the sampling interval is 0.1 to 2.7 and the 2 digits selected are 17, then the starting point for systematic sampling would be 1.7.

[6] Instructions (modified) and the table are from Training for mid-level managers. The EPI coverage survey. Expanded Programme on Immunization. World Health Organization. Geneva. 2001. WHO/EPI/MLM/91.10.

Table 3, continued.

Row	Column 0	1	2	3	4	5	6	7	8	9
01	44689	54994	14911	62414	78085	18910	39772	00017	01178	13563
02	56811	20730	65177	89748	84459	06043	72385	84402	14200	93511
03	56412	15949	73584	59593	46841	18463	06845	07974	63016	30136
04	04576	04739	79884	49252	06132	96840	41028	85689	51396	54599
05	81564	50271	88625	89193	97979	96982	37730	63963	72478	08333
06	38926	89980	54322	63699	18475	91018	13286	06243	71666	02529
07	97132	51838	31847	30237	68016	41288	57395	51333	36202	89595
08	55618	40873	60069	94816	02205	26176	97712	85777	36870	89633
09	10287	07237	95759	44055	26247	48886	81309	15868	95587	41042
10	19420	10916	03096	67942	94577	81085	54619	50538	07305	61411
11	19131	29434	31739	94717	14453	40565	83631	87159	81073	69904
12	54092	38575	58042	98087	04520	73553	38448	00982	07557	78757
13	03268	12734	19706	86182	81681	03026	51892	85384	90730	01614
14	49655	98461	04291	28133	33212	78497	87176	99490	64457	68355
15	35948	59176	34140	34788	16403	28186	18121	04584	66607	99740
16	59327	46487	63348	84466	14499	56627	25399	00394	57966	07036
17	80425	01071	66643	49957	26089	24045	01807	41623	63599	10666
18	87190	03835	32110	43505	40826	50931	03656	85049	56774	94075
19	08610	63708	55971	31543	10283	37737	48744	43042	42796	01853
20	25461	08322	26316	22349	84347	40611	49930	80833	19803	15878
21	30372	72054	98586	94559	59237	31180	89565	61427	25626	47515
22	12899	24245	36391	55611	01626	09836	33366	98272	21570	16498
23	97374	28121	40007	75107	13590	51321	73990	83518	45569	98357
24	23764	31267	88976	84872	53035	19542	79593	32987	08248	17390
25	81881	24337	18893	66195	22709	79534	87746	26584	53251	03096

Figure 2. *Algorithm for choice of survey population, survey design, and survey analysis for IUs where the antigenemia target range is <1.0%* (the changes made in the algorithm for the target range <1.0% are in bold italics).



Annex 1: Explanation of algorithm steps for IUs where the antigenemia target range is <1.0%

1. Is the net primary enrolment rate in the IU ≥75%?

   Yes: Continue with Step 2. Sampling can be done in schools.
   No: Skip to Step 6. Sampling should be done of 6-7 year-old children in the community.

   Note: The net primary enrolment rate is the number of pupils in the primary school age range expressed as a percentage of the total number of children in this age range. It is normally available from the Ministry of Education. If it is lower than 75%, a household survey should be conducted rather than a school survey for results to be adequately representative. If the net primary enrolment rate is not known and if there is any likelihood that it is <75%, then the answer to this question should be "no". Since surveys of children aged 6-7 years in the population provide more representative than surveys of 6-7 year-old schoolchildren wherever there is less than 100% primary school enrolment, program managers may decide to conduct a household survey choose to conduct a household survey instead of a school survey when the net primary enrolment rate is ≥75%

2. Are there at least 1000 first- and second-grade schoolchildren in the IU?

   Yes: Continue with Step 3.
   No: Visit every school and test every first- and second-grade child in school. The IU passes only if antigenemia prevalence <1.0%. NO FURTHER SAMPLING DECISIONS.

   Note. If there are fewer than 1000 first-and second-grade schoolchildren, it is not worth the time and effort of selecting a sample of school entrants rather than testing all school entrants, because the sample fraction would be high.

3. Are there at least 1800 children in first- and second-grade schoolchildren in the IU?

   Yes: Continue with Step 4 to decide between an LQAS survey and cluster-sample survey.
   No: Conduct an LQAS survey of children in first and second grades (Boxes 1-3). The IU passes only if there are no more than d antigenemic children (see Table 2). NO FURTHER SAMPLING DECISIONS.

   Note: If the answer to Question 3 is "no", then the sampling fraction with cluster sampling would be so high that it would result in little reduction in the number of schools visited.

4. Are there at least 40 schools with children in first and second grades?

   Yes: Continue with step 5 to decide between an LQAS survey and cluster-sample survey.

No: Conduct an LQAS survey of children in first and second grade (see Boxes 1-3). The IU passes only if there are no more than d antigenemic children (see Table 2). NO FURTHER SAMPLING DECISIONS.

Note: The sample size for cluster-sample surveys is larger than for LQAS surveys. Cluster sampling can reduce the number of schools that need to be visited, thereby reducing travel costs and the time needed to arrange for visits, but since there should be at least 30 primary schools, the reduction would be small in a cluster sample unless there is a total of at least 40 primary schools.

5. Would the cluster design reduce the survey cost compared to an LQAS survey? Answering this question includes a comparison of the sample size and the number of schools to be visited with each sampling design and may be facilitated by use of the ratio of the cost of visiting a school compared to the cost of testing a child once the school has been visited (see Boxes 4-6 and Table 2).

Yes: Conduct a cluster-sample survey of children in grades 1 and 2 (see.Boxes 5-8). IU passes if there are no more than d_cluster antigenemic children for the cluster sample design (Table 2). NO FURTHER SAMPLING DECISIONS.
No: See Boxes 1-3 for conducting an LQAS survey of schoolchildren in first and second grade. The IU passes if there are no more than d antigenemic children for the LQAS survey (Table 2). NO FURTHER SAMPLING DECISIONS.

Note: Each program manager should decide if the reduced number of schools that need to be visited in a cluster-sample survey outweighs the need in a cluster-sample survey for a larger sample size than the LQAS survey requires.

6. Are there at least 1000 6-7 year-old children in the IU?

Yes: Continue with Step 7.
No: Visit every household and test every child 6-7 years old. The IU passes only if the antigenemia prevalence <1.0% (see Box 16). FURTHER SAMPLING DECISIONS.

7. Are there at least 1800 6-7 year-old children in the IU?

Yes: Continue with Step 4 to decide between an LQAS survey and cluster-sample survey.

No: Conduct an LQAS survey of children 6-7 years old in the community. See Boxes 9-10 and 16. The IU passes only if there are no more than d antigenemic children for the LQAS survey (Table 2). NO FURTHER SAMPLING DECISIONS.

8. Are there at least 40 census enumeration areas in the IU?

   Yes: Continue with step 5 to decide between an LQAS survey and cluster-sample survey.
   No: Conduct an LQAS survey of children 6-7 years old in the community. See Boxes 9-10 and 16. The IU passes only if there are no more than d antigenemic children.

9. Would the cluster-survey design reduce costs? (See Box 15 and Table 2; review Boxes 9-14).

   Yes: Conduct a cluster-sample survey of children aged 6-7 in the community. The IU passes only if there are no more than d_cluster antigenemic children for the cluster sample design (Table 2). NO FURTHER SAMPLING DECISIONS.
   No: Conduct an LQAS survey of children 6-10 years old in the community. See Boxes 9-10. The IU passes only if there are no more than d antigenemic children (Table 2).

See sample data recording forms in Annexes 2-4.

Annex 1: Sample data recording form for use at schools

Name of school ______________________ Sub-district ________________

Total number of school entrants enrolled ______ Number absent ______

Name of school entrant selected for sample[1]	Age in years	Name of teacher (can use ditto marks)[2]	Result of testing (circle) P=positive N=negative I-=invalid R=refused
________________	_____	______________	P N I R
________________	_____	______________	P N I R
________________	_____	______________	P N I R
________________	_____	______________	P N I R
________________	_____	______________	P N I R
________________	_____	______________	P N I R
________________	_____	______________	P N I R
________________	_____	______________	P N I R
________________	_____	______________	P N I R
________________	_____	______________	P N I R
________________	_____	______________	P N I R
________________	_____	______________	P N I R
________________	_____	______________	P N I R

(Provide additional pages as needed. Heading on pages should include name of school and sub-district and pages should be stapled together).

[1] "selected for sample" not needed if survey team instructions are to test every school entrant at each school.
[2] The purpose of asking for the name of the teacher is to ensure that the student can be identified in the future, if needed, for confirmatory testing.

Annex 2: Sample data collection form for use in census enumeration areas (EAs) where every 6-7 year-old should be tested

Complete form for every 6-7 year-old child in the EA

Number of EA _______ Sub-district ___________________

Name of child	Name of head of compound[1] (can use ditto marks)	Name of head of household	Result (circle) P=positive N=negative I=invalid R=refusal A=absent
________	________	________	P N I R A
________	________	________	P N I R A
________	________	________	P N I R A
________	________	________	P N I R A
________	________	________	P N I R A
________	________	________	P N I R A
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________	________	________	P N I R A
________	________	________	P N I R A
________	________	________	P N I R A
________	________	________	P N I R A
________	________	________	P N I R A
________	________	________	P N I R A

(Provide additional pages as needed. Heading on pages should include EA number and sub-district).

[1] The goal is to provide the information needed to return to the EA and find the child, if needed, after the survey. "Head of compound" may not be useful in some settings and should be replaced by other information.

Annex 3: Sample data collection form for use in census enumeration areas (EAs) where a sample of 6-7 year-old is be tested

Complete form for every 6-7 year-old child in the EA

Number of EA _______ Sub-district ___________________

Name of child	Name of head of compound[1] (can use ditto marks)	Name of head of household	Selected for sample?		Result (circle) P=positive N=negative I=invalid R=refusal A=absent				
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A
________	________	________	Y	N	P	N	I	R	A

(Provide additional pages as needed. Heading on pages should include EA number and sub-district).

[1] The goal is to provide the information needed to return to the EA and find the child, if needed, after the survey. "Head of compound" may not be useful in some settings and should be replaced by other information.