LF Surveillance Strategy

for Pacific Island Countries and Territories

(Final – 07/07/07)

TABLE OF CONTENTS

Process and Contributors

This document was prepared by Dr Clare Huppatz, a Short Term Consultant for the WHO, employed to draft the ongoing LF surveillance strategy for the PICTs. This document was presented at the PacCARE meeting held on 19th June, 2007, in Nadi, Fiji. Following discussion, it was decided that this strategy would be trialled in three countries, namely, Vanuatu, Tonga and Niue. This strategy was also presented to the LF Program Managers meeting on 20th June, 2007.

It is expected that this document will become a "working document" and continue to be changed and modified where appropriate, particularly as new information and research findings become available.

Prior to the preparation of this document, a review of all the Pacific Island LF elimination program data available to date (1999 - June 2007) took place. This review forms an appendix (Appendix 7) to this document.

During preparation of the draft surveillance strategy, extensive discussions were conducted with others in the field, many of whom are listed below as authors. Their valuable contributions and time spent reviewing preliminary drafts are gratefully acknowledged. Technical advice and document review was also received from Tom Burkot and Mark Bradley. A special thanks is extended to Ms Masayo Ozaki, who assisted with the preparation of several of the appendices and provision of information to assist with the data review.

Other grateful acknowledgements are extended to a team who met in CDC, Atlanta, to review an early draft of this surveillance strategy and assist with finding answers to several of the challenging questions that post MDA LF surveillance poses. This group comprised: Rafe Henderson, Michael Deming, Tom Burkot, Frank Richards, Steve Williams, Pat Lammie and Eric Ottesen. In addition, discussions regarding the issues of Post MDA LF surveillance took place with Els Mathieu, who willingly shared her experiences from the LF elimination program in Togo, Africa.

List of Contributors:

Dr Clare Huppatz
Prof David Durrheim
Dr Corinne Capuano
Dr Patrick Lammie
Dr Wayne Melrose
Prof Eric Ottesen
Assoc Prof Paul Kelly

LIST OF ACRONYMS

CTS – Child Transmission Survey
ICT – Immunochromatographic test
LF – Lymphatic Filariasis
MDA – Mass Drug Administration
MF - Microfilariae
PICTs – Pacific Island Countries and Territories
PacCARE – Program Coordinating and Review Group, Pacific Programme for the Elimination of Lymphatic Filariasis
WHO – World Health Organization

Goal

PRIMARY GOALS:

- To detect all remaining foci of transmission
- To detect any new foci of transmission
- To ensure that transmission has been interrupted

Overview

This surveillance strategy is designed to be in effect until all PICTs reach the target of "No ongoing transmission of LF". It is hoped that this can be achieved within five years of stopping Mass Drug Administration (MDA), i.e. by 2012 for the first PICTs and by 2017 for most of the other endemic PICTs. It is acknowledged that Papua New Guinea will require a modification of this strategy due to its larger population; this should be developed as PNG nears completion of MDA.

In 2004, the WHO Pacific Program to Eliminate LF defined interruption of transmission as <0.1% of 5-year-olds being ICT positive by D survey. Interruption of transmission is extremely important, as it shows that the MDAs have been successful. However, it is the ONGOING absence of transmission that is required to prove elimination.

The LF Surveillance Strategy provides a means of demonstrating that transmission has stopped permanently within a population. It requires countries to look for transmission of LF with more rigor than previously. This is necessary, as the disease has become less prevalent. In addition, this strategy provides a mechanism of *detecting* and *eliminating* small foci of infection within a country, with an intentionally intensive follow-up of positive cases.

The strategy uses a *Primary* surveillance strategy, called the ***Child Transmission Survey (CTS).*** This is a modification of the previous D Survey. The endpoint marker remains the same, that is, evidence of interruption of transmission has occurred once <0.1% of children are ICT positive. Built into this new strategy is a mechanism of detecting and eliminating the source of transmission within the community, termed "Close Contact Testing". In addition, the recommended surveillance algorithms require repeated confirmation that transmission has been interrupted, over several years, so that a country can be sure that transmission has stopped permanently. It is anticipated that all countries will participate in this *Primary* surveillance strategy.

In order to augment the Child Transmission Survey, a ***"Hot Spot" Survey,*** which looks more closely for transmission in areas of previously high prevalence is recommended, for countries that are able to identify such an area.

In addition, a secondary surveillance strategy, called ***Border Detection,*** is proposed for consideration as a trial in some countries. It is recommended that some countries participate in Border Detection, which aims to detect potential sources of reintroduction of infection from outside the country.

Also contained within this document is a description of two *Control Measures* that can be used by countries to assist their progression towards elimination. These *Control Measures* are recommended to assist countries when they find that they have ongoing transmission of LF and are not meeting their target.

In addition, this document contains several appendices that offer further clarification for the main body of the document. The first of these (Appendix 1) is a *Rationale*, providing an explanation for many of the decisions that needed to be made to formulate the strategy. Appendices 2 and 3 contain flowcharts, maps and algorithms to further explain some of the main strategies within the text. Appendices 4, 5 and 6 contain additional protocols, guidelines and record keeping sheets required for implementing the CTS and Targeted MDA. The final appendix (Appendix 7) is an analysis of the available data from the Pacific elimination program between 1999 and June, 2007.

It is hoped that the next few years will bring new research findings that will provide recommendations that further refine this surveillance strategy so that the PICTs remain LF-free. It is anticipated that surveillance will need to continue in some form until elimination has been achieved throughout the world. Verification of elimination (leading to certification) will be performed by an outside team. Verification of elimination is beyond the scope of this document and does not form part of the LF Surveillance Strategy. It has been assumed during the preparation of this strategy that the process of verification will require countries to have more than a single survey demonstrating the interruption of transmission. Hence, it is hoped that participation in this LF Surveillance Strategy will help prepare each country for Verification.

SUMMARY OF SURVEILLANCE STRATEGIES and CONTROL MEASURES

Surveillance Strategies

1. **Primary Surveillance I –** ***Child Transmission Survey (CTS)***
   Detection of transmission in children followed by ACTION to *detect* and *eliminate* the source of infection within the community if present

2. **Primary Surveillance II – "Hot Spot" Survey**
   Additional method to detect transmission in children in identified "Hot Spot" areas, followed by ACTION to *detect* and *eliminate* the source of infection

3. **Secondary Surveillance –** ***Border Detection***
   Detection and elimination of a source of infection at its point of introduction from outside the country

Control Measures

A. ***Targeted Mass Drug Administration (Targeted MDA)***
Control measure using MDA within a target group that has a high prevalence of infection

B. ***Vector Control (suitable countries only)***
Control measure using vector control to reduce transmission in areas where primary vector is *Anopheles sp.* or *Culex sp*.

General Principles

- The goals of this surveillance strategy are in keeping with those of the Global Programme for Elimination of Lymphatic Filariasis.
- Children will be used to detect areas where there may be residual pockets or 'foci' of transmission still occurring within a country. This *primary* surveillance strategy is called the **Child Transmission Survey (CTS)**.
- Children ≤8 years old are likely to provide the best indicator of new transmission, as these children were born after the MDAs commenced. However, as it is not feasible for countries to test ALL children ≤8 years old, the Child Transmission Survey (CTS) proposes various sampling methods. In the first, School Year 1 children have been chosen, because they are relatively easy to access through the school system. For countries in which school attendance is low (<80%), it is recommended that surveillance is done through villages/communities, as well as schools. In this method, one age group is targeted (5 year olds).
- Country LF Managers will need to choose between the two survey methods (Primary School vs. Community) prior to the implementation of the survey in their country.
- While the proposed CTS strategy identifies School Year 1 (or 5 year old) children as the suitable 'marker' of transmission, ongoing research is being done to compare the results of testing children of different age groups. As such, when the research findings are known, the age group recommended for the CTS may change to reflect these research findings.
- It is necessary to test **ALL** School Year 1 (or 5 year old) children, as LF is now becoming increasingly rare within the PICTs community and it is important that no infections are missed. By testing a group such as School Year 1 children or 5 year olds, the intention is that the method will include samples from all villages/communities, to address the heterogeneity demonstrated by LF. In addition, this surveillance strategy uses repeated surveys which will increase the likelihood that all villages are adequately sampled over time.
- Papua New Guinea will require a modification of this surveillance strategy that uses a different sampling method (and a smaller sample size), given their larger population.
- A School Year 1 (or 5 year old) child that is ICT positive is a "marker" that there is a source of infection within their community. The important next step is to find and treat that source of infection within the community. "Close Contact Testing" has been devised to ensure elimination of the source of infection is achieved.
- "Close Contact Testing" aims to find the source of infection within the child's community. It is recommended that all *household contacts* of the child and all *near neighbours* are tested.
- *Near neighbours* to the index case (the child found to be ICT positive) that need to be tested can be found by one of two methods described within this strategy. The first of these methods requires the measurement of 200m around the household of the index case and the second requires counting 24 houses around the index case. It is hoped that these two methods will be trialled and compared by mapping studies in the next year to verify each method. For now, the decision about which method to use will need to be made by each Country LF Manager, prior to implementation

within each country. One method only should be used within each country for Close Contact Testing. This decision should be based on which method will be more *feasible* for field workers to perform.

- If anyone (child or adult) is found to be ICT positive, they need to be treated until their ICT becomes negative. The ICT should be done yearly and the person treated every time the ICT is still found to be positive. This may take several years.

- Where feasible, it is recommended that ICT testing of children >8 years and adults be supplemented with MF slide testing. This testing should be repeated on any MF positive person one month after their first treatment, then yearly, to ensure microfilariae have been and remain suppressed. MF testing should continue until the ICT test becomes negative.

- Treatment of someone who is ICT positive should be with Albendazole and DEC. It is recommended that as a minimum, a single dose regime, given yearly, is used and treatment **must be observed**. Treatment can stop once the ICT is negative. It may be necessary to treat an ICT positive person for a few years (sometimes 5 years) using these drugs. Following consultation with a country Medical Officer, a more intensive regime could be considered for people found to be MF positive by slide (eg Stat dose of DEC and Albendazole, followed by 12 days of DEC).

- The **"Hot Spot" Survey**, calls for countries to identify at least 2 known "hot spots" (areas of previously high prevalence) and survey all children 4-8 years old (inclusive) in these areas. This will be done in conjunction with the Child Transmission Survey with the intention of augmenting it.

- If a "target group" with a high prevalence is identifiable, the recommended *Control Measure* is to give that group a **Targeted MDA**. Such a "target group" may be a geographic group, such as a village, or another population group, such as middle-aged men. As a minimum, the MDA would need to be given yearly for 5 years, however, more frequent dosing schedules could be considered. Treatment must be **observed** in the target population and **>80% coverage** needs to be achieved. During this time, the CTS surveillance strategy *should* continue at the planned intervals.

- Vector control is a Control Measure that is recommended for some countries, particularly in areas where the mosquito vectors bite between dusk and dawn (i.e. *Anopheles sp* or *Culex sp* vectors). Implementation of this strategy should only follow consultation with WHO/SP office and/or vector control experts.

- It is highly recommended that if a country does not meet their CTS target, the reasons for this are discussed with the WHO/SP office and assistance is provided. Prior to the implementation of further rounds of MDA or Targeted MDA, it is recommended that **social science research** be undertaken to determine any barriers to the continued use of MDA.

- To prevent reintroduction from outside the country, a *Secondary* surveillance strategy has been proposed, called **Border Detection**. This is to identify anyone entering the country that will stay for > 6 months that may be a source of LF infection. Such a person may be a migrant from an endemic country, or a returning national who missed some or all of the MDAs. As the value of such surveillance is unknown, it is recommended that some countries commence Border Detection surveillance to trial its effectiveness.

Recommended LF Surveillance and Control Measures

	Primary Surveillance I "CTS"	**Primary Surveillance II "Hot Spot" Survey**	**Secondary Surveillance "Border Detection"**	**Control Measure "Targeted MDA"**	**Control Measure "Vector Control"**
Endemic Countries	Recommended to do 3 times over 10 years	Recommended to do at the same time as the first CTS	Recommended to trial in some countries	Recommended if C survey ≥ 1% or CTS ≥ 0.1%	Recommended if *Anopheles sp* or *Culex sp* is Primary Vector
Partially Endemic Countries	Recommended to do 3 times over 10 years	Recommended to do at the same time as the first CTS		Recommended if C survey ≥ 1% CTS ≥ 0.1%	Recommended if *Anopheles sp* or *Culex sp* is Primary Vector
Non Endemic Countries	Recommended to do at least once		Suggest to trial in some countries		

1. PRIMARY SURVEILLANCE I: CHILD TRANSMISSION SURVEY (CTS)

Aim: Detection of transmission in children with ACTION leading to *detection* and *elimination* of the source of infection from the community

Target: Country CTS target is **<0.1%** ICT positive[1]

Options (choose most appropriate method for each country):

1.1 Primary School Method:

If countrywide school attendance is ≥80%, it is recommended that **ALL** Primary School Year 1 children are sampled. This may include children of ages 4-7 years, which is acceptable, as all children ≤8 years old can be markers of new transmission.

1.2 Community Method:

If country wide school attendance is <80%, it is recommended that **ALL** 5 year old children are sampled, through village or community visits, which will involve recruiting children in the community. Such a method should utilise existing groups within the community, such as primary schools, churches, mother's groups, day-care, and primary health care centres (medical clinics). This may involve two survey teams visiting each area at the same time. One team could access the Year 1 children in the Primary School and the second team could seek out any 5 year old children within the community who are not attending school.

NOTE: Papua New Guinea will require a customised CTS surveillance plan with sampling of 5 year olds or School Year 1 children, given their large population size.

Case Definition:

"LF Case": Any Child ≤ 8 years old who is ICT positive on repeat testing (same day)

OR

Any community member who is subsequently found to be ICT positive (repeat ICT testing is not required, as they have an epidemiological link to the Index child)

"LF Source": Any person who is MF positive by MF slide testing

[1] For number of children that a country would expect to find positive if target of <0.1% is achieved, refer to Appendix 1, Table 2.

1.1 Child Transmission Survey (CTS): Primary School Method

1. Testing is to be done in **ALL** primary schools within a country – may need to obtain consent from Education Dept/Ministry, school, community and parent/carer, as appropriate within the specific PICT.

2. Test **ALL** children in Year 1 at primary schools (need to test as near to 100% of enrolled children as possible). If possible, do this in conjunction with another primary school health program. May require the same school or area to be revisited several times.

3. Test children by ICT AND read strictly at 10 minutes (refer Appendix 4.1).

4. If a Year 1 child is ICT positive – retest (same day) by ICT with strict attention to testing protocol (Appendix 4.1).

5. If a Year 1 child is positive on repeat testing by ICT – follow protocol for "LF case" below.

Protocol for "LF Case" found by Primary School Method:

(i) Every child ≤ 8 years old who is ICT positive, should be treated with Albendazole and DEC and **Close Contact Testing** should be performed (see method outlined below and Appendix 2 "maps").

(ii) **Close Contact Testing**:
For every child ≤ 8 years old test ALL people living within the child's home (as source may be within their home).

For every child ≤ 8 years old test ALL people living within 200m of that child's home OR in the closest 24 surrounding houses to the child's home (as the "source" may be from nearby their home). Refer to the description and maps in Appendix 2.

NOTE: The decision on which approach to use (200m or 24 houses) must be made by Country LF Manager prior to survey and only one method should be used consistently within a country.

Additionally, for every child ≤ 8 years old who is found to be ICT positive, their parent/carer should be asked if that child visits another home/household daily. If they visit another house daily, that is >200m from their own home, then the other house could be where (or near) the source of infection. This second house should also be treated as the "child's home" and **Close Contact Testing** for this home should be completed by the same method as for the Child's home.

Testing of children >8 years and adults should be with ICT AND MF slide. If a country is unable to process MF slides, these can be sent by arrangement to another country for testing (discuss with WHO/SP office).

(iii) Everyone who is found to be ICT positive must be treated with Albendazole and DEC and their name recorded for follow-up (refer Appendix 5).

(iv) Follow-up 12 months later in a child ≤ 8 years old that was positive, is by ICT alone. If negative, no further follow-up is needed. If positive, the child must be treated and followed up 12 months later. Each child who is found to be ICT positive again, will need to be treated and tested yearly until their ICT is negative.

(v) Follow-up in adults and children >8 years that was positive, should be by ICT and MF slide (if possible). Testing and treatment must continue 6 monthly until ICT is negative. If an individual is found to be MF positive, they are considered an "MF source" and a repeat MF slide should be taken 1 month after treatment to ensure that the MF are suppressed by the treatment (more intensive therapy, such as 12 day DEC treatment could be considered for people found to be MF positive). Future testing for MF positive individuals should include an MF slide, however, the decision to stop treatment and testing should be made only once the ICT is negative.

Special notes:

- If **any school** is found to have **>5 ICT positive children from different villages**, who are ≤8 years old, the WHO/SP office should be notified immediately for assistance. It may not be feasible for the testing team to perform Close Contact Testing for >5 children during the visit and Targeted MDA could be considered.
- If **a village or small community** is found to have **>2 ICT positive children** who are ≤8 years old, the WHO/SP office should be notified immediately for assistance. Once again, the village may be considered for Targeted MDA instead of Close Contact Testing (unless the ICT positive children are from the same household).
- If **>2 people** in one community are found to be **MF slide positive** amongst the "Close Contacts", then the WHO/SP office should be notified immediately for assistance and targeted MDA may be considered.

Record Keeping:

1. Record the names and ages of all Year 1 children enrolled in the primary school and their record of testing by ICT, including the unique identifier that allows the school and child to be identified if the test is positive. If a Year 1 child was not tested, record the reason for not testing (refer Appendix 6.1).

2. For each "LF case" that is ≤ 8 years old: make a separate record of Close Contact Testing performed (see Appendix 6.3). This will need to include the names of everyone living in the positive child's home and the names of everyone in the houses within 200m from their home or in the 24 houses closest to their home, as well as the record of testing +/- treatment.

3. Record the names and addresses of all ICT positive people and a record of the treatment given and arrange for 12 monthly follow-up.

Registry:

Results should be sent to country LF Manager AND to WHO/SP office. The target of ICT positive children should be **<0.1%**, using all data from the country-wide CTS.

1.2 Child Transmission Survey (CTS): Community Method

1. Testing is to be done on **ALL** 5 year old children within a country – obtain consent from parents prior to testing, as appropriate for the specific country.

2. Plan to visit EVERY VILLAGE or inhabited area within a country. Within each community, plan to visit all the existing groups that may include 5 year old children, such as: primary schools, churches, mother's groups, day-care, and primary health care centres (medical clinics).

3. Test all 5 year old children. This may require the same area to be revisited several times.

4. Test children by ICT AND read strictly at 10 minutes (refer Appendix 4.1).

5. If a 5 year old child is ICT positive – retest immediately by ICT with strict attention to testing protocol (Appendix 4.1).

6. If a 5 year old child is positive on repeat testing by ICT – follow protocol for "LF case" below.

Protocol for "LF Case" found by Community Method:

(i) Every child ≤ 8 years old who is ICT positive, should be treated with Albendazole and DEC and **Close Contact Testing** should be performed (see method outlined below and Appendix 2 "maps").

(ii) **Close Contact Testing**:
For every child ≤ 8 years old test ALL people living within the child's home (as source may be within their home).

For every child ≤ 8 years old test ALL people living within 200m of that child's home OR in the closest 24 surrounding houses to the child's home (as the "source" may be from nearby their home). Refer to the description and maps in Appendix 2.

NOTE: The decision on which approach to use (200m or 24 houses) must be made by Country LF Manager prior to survey and only one method should be used consistently within a country.

Additionally, for every child ≤ 8 years old who is found to be ICT positive, their parent/carer should be asked if that child visits another home/household daily or a childcare facility. If they visit another house or facility daily, that is >200m from their own home, then the other house or facility could be where (or near) the source of infection. This second house or facility should also be treated as the "child's home" and **Close Contact Testing** for this home should be completed by the same method as for the Child's home.

Testing of children >8 years and adults should be with ICT AND MF slide. If a country is unable to process MF slides, these can be sent by arrangement to another country for testing (discuss with WHO/SP office).

(iii) Everyone who is found to be ICT positive must be treated with Albendazole and DEC and their name recorded for follow-up (refer Appendix 5).

(iv) Follow-up 12 months later in a child ≤ 8 years old that was positive, is by ICT alone. If negative, no further follow-up is needed. If positive, the child must be treated and followed up 12 months later. Each child who is found to be ICT positive again, will need to be treated and tested yearly until their ICT is negative.

(v) Follow-up in adults and children >8 years that was positive, should be by ICT and MF slide (if possible). Testing and treatment must continue 6 monthly until ICT is negative. If an individual is found to be MF positive, they are considered an "MF source" and a repeat MF slide should be taken 1 month after treatment to ensure that the MF are suppressed by the treatment (more intensive therapy, such as 12 day DEC treatment could be considered for people found to be MF positive). Future testing for MF positive individuals should include an MF slide, however, the decision to stop treatment and testing should be made only once the ICT is negative.

Special notes:

- If **a village or small community** is found to have **>2 ICT positive children** who are ≤8 years old, the WHO/SP office should be notified immediately for assistance. Once again, the village may be considered for Targeted MDA instead of Close Contact Testing (unless >2 ICT positive children are from the same household).

- If **>2 people** in one community are found to be **MF slide positive** amongst the "Close Contacts", then the WHO/SP office should be notified immediately for assistance and targeted MDA may be considered.

Record Keeping:

1. Record the names and ages of all 5 year old children tested and their record of testing by ICT, including the unique identifier that allows the community and child to be identified if the test is positive. If a 5 year old child was not tested, record the reason for not testing (refer Appendix 6.2).

2. For each "LF case" that is ≤8 years old: make a separate record of the Close Contact Testing performed. This will need to include the names of everyone living in the LF case's home and the names of everyone in the houses within 200m of their home or in the 24 houses closest to their home, as well as the record of testing +/- treatment (refer Appendix 6.3).

3. Record the names and addresses of all ICT positive people and a record of the treatment given and arrange for 12 monthly follow-up.

Registry:

Results should be sent to country LF Manager AND to WHO/SP office. The target of ICT positive children should be <0.1%, using all data from the country-wide CTS.

2. Primary Surveillance II: "Hot Spot" Survey

Aim: To augment the Child Transmission Survey by an expanded sampling of children in known "Hot Spots". This will be followed by ACTION leading to *detection* and *elimination* of the source infection from the community

Definition of "Hot Spots":

Each country is asked to identify at least TWO "Hot Spots", or areas known to have a population with a high LF prevalence in previous surveys. More than two "Hot Spots" can be identified if this is appropriate and if funding is available to do testing. "Hot Spots" should be villages (or suburbs)[2] for which the prevalence was the highest when all surveys performed since 1999 are compared (recommended total population for a single "Hot Spot" no more than 1,000 people, this will lead to testing of approx 125 children aged 4-8 years).

Testing:

Within each "Hot Spot" ALL children between 4 and 8 years of age (inclusive) should be tested. The method of finding and testing children should be the same as that described for the Child Transmission Survey 1.2: "Community Method", however, instead of testing only 5 year old children, ALL children aged 4-8 are tested. Such a method should utilise existing groups within the community, such as primary schools, churches, mother's groups, day-care, and primary health care centres (medical clinics). This testing should be done at the SAME TIME as the CTS.

Case Definition:

"LF Case": Any Child ≤ 8 years old who is ICT positive on repeat testing (same day)

Method:

1. Testing is to be done on **ALL** 4-8 year old children (inclusive), within a "Hot Spot" – obtain consent from parents prior to testing.

2. Plan to visit the village or area identified as a "Hot Spot" at the same time as the CTS is being conducted. Within the community, plan to visit all the existing groups that may include 4-8 year old children, such as: primary schools, churches, mother's groups, day-care, and primary health care centres (medical clinics).

[2] It is recommended that districts/provinces are not used, as the area is too large.

3. Test ALL children aged 4-8 (inclusive) by ICT AND read strictly at 10 minutes (Appendix 4.1).

4. If a 4-8 year old child is ICT positive – retest immediately by ICT with strict attention to testing protocol (Appendix 4.1).

5. If a 4-8 year old child is positive on repeat testing by ICT – follow protocol for "LF case" and perform Close Contact Testing (refer to protocol outlined above in CTS and Appendix 2).

Interpretation of Results:

If a "Hot Spot" is found to have **>2 ICT positive children** who are ≤ 8 years old, the WHO/SP office should be notified immediately for assistance. The village/community may be considered for Targeted MDA instead of Close Contact Testing (unless >2 ICT positive children are from the same *household*).

Only results from School Year 1 children or 5 year olds who participate in the "Hot Spot" survey should be included with the CTS results for the same year (i.e. only those children who would have been targeted in the CTS should be used for the CTS results).

If a "Hot Spot" survey has been performed in a village/community and **NO children** between 4-8 years are found to be ICT positive, the village/community should **no longer be considered a "Hot Spot"**. Future testing at such villages should be only as part of the routine CTS surveillance.

3. Secondary Surveillance: Border Detection

Aim: Prevent reintroduction of LF from outside the country by *detecting* and *eliminating* any possible sources of infection in new arrivals to the country.

Status: These surveillance strategies are currently under development, as the actual threat that this poses is NOT KNOWN. Once developed, the WHO/SP office will assist those countries that are interested in Border Detection to set up a suitable surveillance system.

Migrants and Returning Nationals

Border Detection surveillance after the cessation of LF transmission will need to detect the reintroduction of the organism into a country or area. One obvious source of reintroduction is the arrival of a migrant from an endemic country. Another source is the return of a former resident who was absent from their country during some or all of the MDAs. Border Detection surveillance needs to consider the risk posed by these groups of people for reintroducing infection. It has been suggested that screening of such people needs to occur, either at country ports of entry or once they are within the country.

It is generally accepted that LF transmission requires several inoculations by infected mosquitoes. Thus, for a new arrival or former resident who returns and is a potential source, they may pose a limited risk for reintroduction if their stay is brief. It may be more cost effective to test those individuals who plan to stay for a longer period that is arbitrarily set (i.e. at six months). The exact length of time that poses a risk for reintroduction from a single source needs to be decided, as do the practical methods that might be used to test for reintroduction.

For a country to test migrants or returning residents at their border, a testing station would need to be operational at every international air and sea port. It may be more feasible to make LF testing a condition of certain visa or permanent resident applications. An alternative may be to provide information to migrants or returning residents at the borders and make free testing voluntary through the medical clinic system although this does not guarantee testing will occur.

Two of the questions that need to be answered to stop reintroduction of LF:

1. Do PICTs Nationals living in another country pose a risk if they come home to the PICTs?

2. Do migrants from LF endemic countries (or previously endemic countries) pose a risk of reintroduction to PICTs?

For countries that are interested in this type of surveillance, the WHO/SP office will assist in the implementation of trial surveillance systems. A surveillance plan that is tailored to the specific country is recommended.

Control Measures

A. Control Measure I: Targeted MDA

Aim: To decrease community reservoir of LF by providing MDA to a "target group"

Definition of a "target group":

A population group, defined by geographical area, gender, occupation, age or other identifiable characteristic for which there is evidence from a recent prevalence survey that there is a high prevalence of ICT positive individuals within that group.

When to use this Optional Control Measure:

When a population has a high prevalence of ICT positive people, as determined by:

C survey ≥ 1%
D survey or CTS ≥ 0.1%

How to identify a "target group":

From C survey: A single geographical cluster with a rate ≥ 1%

From C survey: A population group (eg males or all adults aged 30-40), with a rate ≥ 1%

From CTS: A Primary School found to have >5 ICT positive children (from different villages) that are ≤ 8 years old
OR
A single village has >2 ICT positive children ≤ 8 years old (not in the same household)
OR
A single village has >2 MF positive people >8 years old (not in the same household)

Note: It may not always be possible to identify a "target group". If a C survey finds a rate of ≥1% is in several areas across the country, whole country MDA may be considered instead of Targeted MDA. This decision should be made on a "case-by-case" basis in consultation with WHO/SP office.

Method for Targeted MDA:

1. It is important to discuss this Control Measure with the WHO/SP office and seek their assistance in identifying the "target group" and providing MDA to them. The WHO/SP office may recommend that **social science research** is conducted within the community to determine barriers to further MDA, prior to the commencement of Targeted MDA. This is particularly relevant where there is evidence of previous poor coverage or compliance. If it is anticipated that Targeted MDA may gain poor community support, a method of mass testing

and treatment should be considered (i.e. test all community members and treat only the positives).

2. Targeted MDA is provided to all people with the “target group” characteristics, i.e. they live in the same place, or they are of the same gender, occupation, age or other identifiable characteristic.

3. Targeted MDA should be with Albendazole and DEC (See Appendix 5.3).

4. Targeted MDA must be **observed therapy**.

5. Targeted MDA Coverage must be **>80% of the target population**.

6. Targeted MDA should continue yearly for 5 years (unless a different method is discussed with the WHO/SP office).

7. During the Targeted MDA period, surveillance by CTS SHOULD continue (i.e. perform next CTS at the time at which it is due).

B. Control Measure II: Vector Control

Aim: To decrease community prevalence of LF by conducting mosquito control programs

When to use this Control Measure:

Vector control is appropriate in ALL countries where *Culex sp*. or *Anopheles sp*. are the primary LF vectors.

However, it is very important that a country considers increasing its vector control efforts when a population has a high prevalence of ICT positive people, as determined by:

C survey ≥1%
OR
CTS ≥ 0.1%
AND
If the mosquito vector that *PRIMARILY* transmits LF is *Culex sp*. or *Anopheles sp.*

Method:

1. The addition of vector control is only appropriate for the dusk to dawn biting vector mosquitoes of the *Anopheles sp* and *Culex sp*.

2. Mosquito control methods could include the following (as detailed in PacMAN book):

    i. Insecticide impregnated bed nets and curtains
    ii. Breeding source reduction of domestic containers
    iii. Polystyrene beads in pit latrines
    iv. *Bacillus sphaericus* in polluted water
    v. Drainage of permanent water sources
    vi. Repellents and mosquito coils
    vii. Screening houses

The choice of which methods to use are dependant on the vector and its breeding, feeding and resting characteristics. These methods should be discussed with the WHO/SP office and/or relevant vector experts prior to implementation.

Appendix 1: Rationale

Primary Surveillance

Endpoints

The goals of this surveillance program are in keeping with the goals proposed by the Global Programme for Elimination of Lymphatic Filariasis (1), being:

1. Cessation of transmission of LF (the primary surveillance objective)
2. Decrease of burden of disease caused by LF

The second goal of the Global Programme forms a separate pillar of the WHO/SP LF elimination program and as such, is dealt with elsewhere.

To confidently state that cessation of transmission has occurred and is likely to be sustained in the long term, concentrated surveillance activity needs to occur over a reasonable period of time. Ideally, surveillance should occur over the lifetime of an adult worm. If no transmission has been found during that time period, it can safely be assumed that new transmission after this time is unlikely to occur (as all the adult worms would be dead). When planning this surveillance system, the compromise that was reached was that surveillance should occur for a minimum of 4 years (for endemic countries and areas). The reason for this period is that by the time countries do their final CTS, it will be approximately seven years since they had their last round of MDA. If transmission has not occurred within those seven years, future transmission is unlikely, as the adult worms would be dead or past their reproductive capabilities.

The aim of the CTS is that < 0.1% of School Year 1 or 5 year old children are found to be ICT positive. The approximate number of children that this rate (of <0.1%) represents for each country is shown in Table 1. It is recommended that the 95% confidence limits be used to judge the success or otherwise of the CTS. In calculating the number of children, an assumption has been made that the CTS has sampled approximately 2.5% of the total population. It is believed that this would be achieved by either method described for the CTS (i.e. Primary School Method or Community Method).

Given that the ultimate goal for the PICTs is elimination of LF, this surveillance strategy aims to be extremely rigorous in its approach. It was felt that there is now, more than ever before, a necessity to have a systematic and thorough approach to uncovering ongoing transmission and discovering sources of infection. In addition, treatment and follow-up of individuals would also need to be intensive. It is believed that such an approach is particularly warranted in areas where *Aedes sp* are the primary LF transmitting mosquito vector, as they are known to be more efficient transmitters of infection. It is hoped that the final endpoint of 0.1% of children is adequate for transmission to cease permanently; however, it must be acknowledged that this is, as yet, unproven.

Testing

Testing for LF infection can be done using one of several testing modalities. The attributes of various tests have been summarised in Table 2. The relative advantages and disadvantages of using each test in the Pacific Region were considered.

Given that LF is becoming increasingly rare in the PICTs, there is a need to use a very sensitive and specific test. Although the ICT is believed to be extremely specific, it is not sensitive enough to use on its own, without fear that some infections will be missed. Therefore, for the CTS, the use of two tests, done in parallel is recommended, as this increases the sensitivity (likelihood of finding all true positives). It is acknowledged that occasionally the ICT can read as a "false positive". This is thought to be due to operator error, such as holding the test card vertically or waiting longer than 10 minutes before reading. It is hoped that this error will be overcome if the same child is retested by ICT and ACTION is only based on the outcome of a second test being positive.

As was noted in the General Principles section of this document, the current recommendation for the CTS is to test Year 1 children at school or 5 year old children in the community. However, research is currently underway to compare the results of testing children of different age groups. It may be that there is a difference in accuracy of the tests (ICT and Bm14 Antibody) between age groups that makes it advantageous to use children of a different age group to the one recommended here. As such, when the research findings are known, the age group recommended for the CTS may change to reflect those research findings.

The age selected represents expert consensus that a positive ICT test is likely to provide the best indicator of new transmission, as the targeted children were born after the MDAs commenced.

Sampling

A major challenge for the surveillance of a disease that occurs at very low prevalence is deciding on the best type of sampling method. For previous LF surveys, several sampling techniques have been proposed and some of these have been trialled.

Cluster surveys, such as the Multiple Indicator Cluster Survey (MICS), have the advantage of using small cluster sizes and therefore, inconveniencing a smaller number of people, while still providing an estimate of prevalence within the population. Lot Quality Assurance Surveys (LQAS) have been proposed as useful when trying to determine if a rare event exists and where resources are scarce, as testing can cease once an unacceptable number of positive results have been found.

The usefulness of both of these surveys is limited by the geographical heterogeneity of Lymphatic Filariasis. It can be argued that both surveys can only be certain to find foci of infection if the "cluster" or "lot" size is reduced to the "village" level. However, once such surveys are reduced to village level, the advantages are likely to be outweighed by the disadvantages, as the procedures are relatively complicated, involving randomisation of participants.

The role of sampling only “high risk” individuals within the population of PICTs is still to be determined. Thus far, no high risk groups have been consistently identified. There is some anecdotal evidence from the PICTs that some groups may be at higher risk of carrying LF, as a result of their lack of participation in the MDAs or possibly due to higher baseline prevalence.

In theory, to identify recent transmission within a population, the most useful sample is children born after the commencement of MDAs. One would expect that such children have not been infected with LF and if found positive by any of the available testing techniques, this would indicate relatively recent transmission. Various methods of sampling children are possible; however, the best way of managing sampling limitations is by testing all children of a certain age group, particularly if attempting to determine remaining geographical pockets or ‘foci’ of infection. It is for this reason that the current surveillance strategy focuses on testing children in School Year 1 (who would normally be aged 5-6 years) or 5 year old children. It is assumed that such a sample will represent approximately 2.5% of the total population. In addition, Year 1 children generally have good school enrolment and attendance rates and may already be the subject of other health screening or treatment initiatives that the LF surveillance program could partner.

ACTION to follow the finding of a positive child

Finding an ICT positive School Year 1 or 5 year old child indicates recent transmission and therefore a geographical area in which there is a source of infection. The actions that follow this finding aim to find and eliminate the source of the child’s infection.

The Primary School and Close Contact Testing described is based on an understanding of the behaviour of common mosquito LF vectors in the Pacific. It is beyond the scope of this document to describe in detail vector behaviours and these details are provided elsewhere. It is likely that the mosquito that infected the child would have been infected from a human reservoir in the relatively close vicinity of the child. As this age child spends the majority of their time at school or home, the infectious human reservoir is likely to have been in or close to one of these environments.

Thus following the finding of an ICT positive School Year 1 or 5 year old child, every child and adult in the school (if they attend) needs to be tested, as well as a number of people within their community. Testing within the community includes all household members from the child’s home and the closest houses to the child’s home. Ideally, the household members in all the houses within a distance of approximately 200m from the child's home need to be tested. Where it is anticipated that a distance of 200m will be difficult for the testing team to judge, the closest 24 houses are recommended to be tested. An important point to make is that that number of 24 households has been selected arbitrarily. This has been judged as likely to cover an area of 50-100 metres around the child’s house, and the nearest 100-150 people. Importantly, the use of 24 households will ensure that mosquitoes living within the area will have adequate “blood meals” to feed upon, and are likely to remain within such an area.

It is worthwhile conducting Close Contact Testing for all children ≤ 8 years old who are found to be ICT positive during any of the testing performed. Infection in these children probably represents transmission since the start of the MDAs, and may lead to detection of residual sources of infection within the community.

Where only one or two children are found to be ICT or antibody positive by the CTS, the source of that infection is likely to be found by testing all people that are living close-by those children. Where it is found that larger numbers of children are infected (i.e. >5 children aged ≤ 8 years old), not only would it be unfeasible to test all the people living close to them, it may not be an adequate public health response to ensure transmission is contained. For this reason, limits have been recommended as points at which advice should be sought from the WHO/SP office and Targeted MDA may be considered.

Primary Surveillance II: "Hot Spot" Survey

The "Hot Spot" Survey is a surveillance method devised to increase the sampling performed in an area of suspected high prevalence (assumed to be a "high risk area"). It uses recent historical records (since 1999) to identify geographical areas where there may be residual sources of infection within the population. This method assumes that if a village or small area demonstrated a relatively high prevalence in the recent past, it is still likely to be an area of higher prevalence than other areas in the country. It is hoped that this additional survey leads to more children that are ICT positive being detected (increasing the detection of ongoing transmission), which is improving the detection rate of the overall surveillance system.

Secondary Surveillance: Border Detection

Surveillance after the cessation of LF transmission may need to detect the reintroduction of the organism into a country or area. One obvious source of reintroduction is the arrival of a migrant from an endemic country. Another source is the return of a former resident who was absent from their country during MDAs. Ongoing LF surveillance needs to consider the risk posed by these groups of people for reintroducing infection. As the importance of this mode of reintroduction to a country is unknown, two research questions have been proposed.

It is generally accepted that LF transmission requires several inoculations by infected mosquitoes. Thus, for a new arrival or former resident who returns and is a potential source, they may pose a limited risk for reintroduction if their stay is brief. It may be more cost effective to test those individuals who plan to stay for a longer period. The exact length of time that poses a risk for reintroduction from a single source is not known. Therefore, this decision will need to be made arbitrarily (i.e. at six months) until direct evidence is available.

For a country to test migrants or returning residents at their border, a testing station would need to be operational at every international air and sea port. It may be more feasible to make LF testing a condition of certain visa or permanent resident applications. An alternative may be to provide information to migrants or returning residents at the borders and make free testing voluntary through the medical clinic system, although, this does not guarantee that testing will occur.

Decisions about whom, when and how to test can be made by individual countries that wish to participate in this form of surveillance. It may be more acceptable to smaller countries that are non-endemic or recently endemic. It is recommended that some countries participate in this form of surveillance as part of a research project, as the findings will be useful for their country and all of the PICTs in the future to ensure the PICTs remain LF free.

Control Measure I: Targeted MDA

The Targeted MDA is proposed to be used when there is evidence that there is a group within the population that has a high prevalence. This is likely to be a group residing in a small geographical area that is defined by the primary school catchment area. It may also be found that there is a population group within a country that has missed out on the previous rounds of MDA and are therefore, more likely to be sources of infection.

The decision to use Targeted MDA should be made by the country LF Manager in consultation with the WHO/SP office. It is recommended that social science research is conducted prior to commencement of any further MDAs to establish if there are barriers to the successful implementation of MDA.

Control Measure II: Vector Control

It has been suggested that MDA alone will not be enough to achieve cessation of transmission of LF, particularly for some countries. The ubiquitous nature of *Aedes sp.* means that current vector control programs will have limited success in areas where they are the primary vector for LF. However, for countries in which *Anopheles sp.* or *Culex sp.* are the primary vectors, vector control might be a useful additional measure in response to surveillance findings. Therefore, this has been recommended for those countries with *Anopheles sp* or *Culex sp* as the primary LF vector, to be considered if surveillance targets are not being met.

A Regional Approach

This LF Surveillance Strategy provides a generic template from which all PICTs can plan their ongoing LF surveillance. By necessity, it requires all countries to be vigilant in their approach to identification of LF transmission, and thorough in their efforts to find and eliminate all remaining sources of LF infection.

Although the PICTs are at different stages of their elimination program and will continue to be at different stages of surveillance, the time is drawing nearer when all PICTs will reach the final goal. Although Papua New Guinea is likely to be the last country that finishes MDA, the updated plan from PNG shows that the final rounds of MDA are due for completion in 2013. This means that after 2013, all countries in the Pacific will have entered into a phase of ongoing surveillance, which will be a great achievement.

For the Pacific region to be declared “LF free”, the records of ALL countries will need to be reviewed, by external expert auditors. It may be that surveillance will need to continue to some extent, for all PICTs, until world-wide elimination has been achieved; however, such surveillance is likely to be less intense than that which is required now. For now, it is hoped that each of the individual PICTs can continue LF surveillance until the region is certified as “LF free” and deemed to be safe from reintroduction.

Table 1: PICTs total population, estimated primary school population and estimated CTS target group population

Country	Population size (SPC estimate, 2000)	Estimated Number of Primary School Children (15% of total population)	CTS Target Group Population: Estimated number of School Year 1 Children or 5 year olds (2.5% of total population)	Number of School Year 1 or 5 year old children expected to be ICT positive if no LF transmission is occurring (maximum number *)
American Samoa	64,100	9,615	1,602	1 (4)
Cook Islands	18,700	2,705	468	0 (2)
Fed States Micronesia	118,100	17,715	2,953	2 (7)
Fiji	824,700	123,705	20,617	20 (29)
French Polynesia	233,000	34,950	5,825	5 (11)
Guam	148,200	22,230	3,705	3 (8)
Kiribati	90,700	13,605	2,267	2 (5)
Marshall Is	51,800	7,770	1,295	1 (4)
Nauru	11,500	1,725	287	0 (2)
New Caledonia	212,700	31,905	5,317	5 (10)
Niue	1,900	285	47	0 (1)
Northern Mariana Is	76,700	11,505	1,917	1 (5)
Palau	19,100	2,865	477	0 (2)
PNG	4,790,800	718,620	119,770	119 (135)
Pitcairn Is	47	7	0-2	0 (n/a)
Samoa	169,200	25,380	4,230	4 (8)
Solomon Is	447,900	67,185	11,197	11 (17)
Tokelau	1,500	225	37	0 (1)
Tonga	100,200	15,030	2,505	2 (6)
Tuvalu	9,900	1,485	247	0 (1)
Vanuatu	199,800	29,970	4,995	4 (9)
Wallis & Futuna	14,600	2,190	365	0 (2)

* Upper limit of 95% Confidence Interval

Table 2. Comparisons between tests available for diagnosing LF infection

Test name	Stage of parasite detected by test	Sensitivity	Specificity	Time after infection test reads positive	Time after death of worm, test reads negative	Operator considerations	Use in 5 year old children
MF thick blood film	Microfilariae	Poor. Reduced with low prevalence and low density (<20mf/ml)	100% - only with a trained microscopist	>1 year	Days	Needs significant training of operator	Limited – few children are MF+ following MDA
Og_4C_3 Antigen test	Adult worm	High (>95%) Reduced with low prevalence and low density[2]	99-100%[2]	Months - years	Months - years[2]	Sophisticated laboratory equipment	Has detected Ag in children <4 years, although limited experience
Antibody Test (IgG_4 antibody to Bm14)	Microfilariae or adult worm; possibly also L3 exposure	91%[7] for MF+ persons	Low in areas with L.loa and O. volvulus [7]	Likely within months after L3 infection	Months - years	Sophisticated laboratory equipment; blood collection stable on filter paper	Have identified Ab in 3 year olds, but likely depends on transmission intensity
ICT card NB: Should use Og_4C_3 for QA on 10% of ICT cards	Adult worm	High (>95%)[5,6] Reduced with low prevalence and low density[2]	100%[5,6] NB: No cross reactivity with immune markers[4]	Months - depends on intensity of transmission	Months - years	Relatively easy to use field test[3,5,6] Potential problems: If read >10mins or held vertically: false positive (reader error) If card kept at >8degC: reads false negative If card is expired: reads false negative	Has been positive in children as young as 2 years old in PICTs data collected so far
Blood Elisa PCR	Microfilariae	Still experimental, results unknown					
Vector PCR	MF, L1, L2, L3	High	100%	Immediate	N/A	Not feasible for general field use in PICTs setting currently	NA
Vector microscopy	Not feasible in PICTs setting currently						

References

1. *Monitoring and epidemiological assessment of the programme to eliminate lymphatic filariasis at implementation level.* World Health Organization, 2005. Available at: http://www.searo.who.int/LinkFiles/New_Lymphatic_Filariasis_OMS_LF_ME_Assessment.pdf (Accessed April, 2007)

2. *Lymphatic Filariasis*. Nutman, TB. Imperial College Press, UK, 2000. (Chapter 6: Diagnosis of Lymphatic Filarial infections, James McCarthy, pages 135-141).

3 Weil, G.J., and Ramzy, R.M.R. (2006). Diagnostic tools for filariasis elimination programs. TRENDS in Parasitology; 23(2). Available at: www.sciencedirect.com (Accessed April, 2007)

4. Weil, G.J., Lammie, P.J., and Weiss, N. (1997) The ICT Filariasis Test: A Rapid-format Antigen Test for Diagnosis of Bancroftian Filariasis. *Parasitology Today*; 13(10):401-4.

5. Njenga, S.M., and Wamae, C.N. (2001) Evaluation of ICT filariasis card test using whole blood capillary blood: comparison with Knott's concentration and counting chamber methods. *Journal of Parasitology.* Oct, 2001; 87(5): 1140-3.

6. Pani, S.P., Hoti, S.L., Elango, A., Yuvaraj, J., Lall, R. and Ramaiah, K.D. (2000) Evaluation of the ICT whole blood antigen card test to detect infection due to nocturnally periodic Wuchereria bancrofti in South India. *Tropical Medicine and International Health*. 2000; 5(5): 359-363.

7. Lammie, P.J., Weil, G., Rahmah, N., Kaliraj, P., Steel, C., Goodman, D., Lakshmikanthan, V.B., and Ottesen, E. (2004). Recombinant antigen-based antibody assays for the diagnosis and surveillance of lymphatic filariasis – a multicenter trial. Filaria Journal; 3:9. Available at: www.filarijournal.com/content/3/1/9 (Accessed May, 2007)

Appendix 2 : CTS Flowcharts and Close Contact Testing Maps

2.1 CTS Flowchart – Primary School Method

2.2 CTS Flowchart – Community Method

2.3 Close Contact Testing Procedure

2.4 Map 1: Close Contact Testing by 200m rule: Village

2.5 Map 2: Close Contact Testing by 200m rule: Town/City

2.6 Map 3: Close Contact Testing by 24HH rule: Village

2.7 Map 4: Close Contact Testing by 24HH rule: Town/City

2.1 CTS Flowchart – Primary School Method

Primary School

Test all Year 1 children by ICT

Follow protocol for reading ICT test

ICT -

ICT +

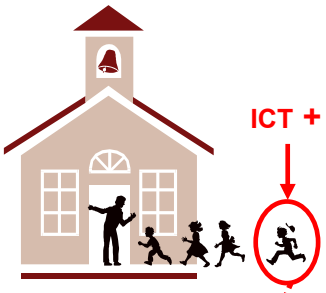
No Further Action for this school

ICT -

Repeat ICT

ICT +

"LF CASE"



ICT +

ICT +
Each person that is considered to be an "LF Case" MUST be treated and their name recorded for follow-up

Every child ≤ 8 years old represents NEW transmission.

In one school, how many children ≤ 8 years old are ICT positive?

> 5

≤ 5

ACTION:

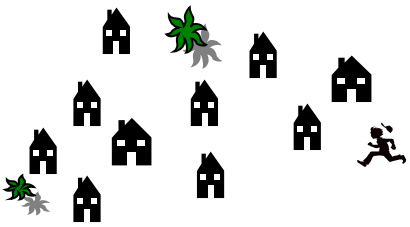
ALERT WHO/SP office immediately

Do "Close Contact Testing" for all children ≤ 8 years old:

1. Test all household members
2. Test everyone in nearest houses

(See Maps next pages)

2.2 CTS Flowchart – Community Method



Village or Community

Test all **5 year old** children by ICT

Follow protocol for reading ICT test

ICT -

No Further Action for this village/community

ICT +

Repeat ICT

ICT -

No Further Action for this village/community

ICT +

"LF CASE"

ICT +
Each person that is considered to be an "LF Case" MUST be treated and their name recorded for follow-up

Every child ≤ 8 years old represents NEW transmission.

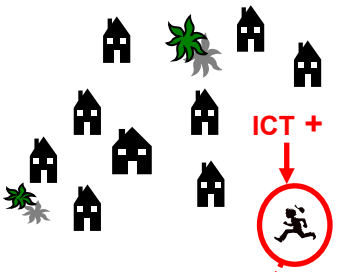
In one village, how many children ≤ 8 years old are ICT positive?

> 2

ACTION:

ALERT WHO/SP office immediately

≤ 2



Do "Close Contact Testing" for all children ≤ 8 years old:
1. Test all household members
2. Test everyone in nearest houses

(See Maps next page)

2.3 Close Contact Testing Procedure

STEP 1. For every child ≤ 8 years old test ALL people living within the child's home (as source may be within their home).

STEP 2. For every child ≤ 8 years old test ALL people living within 200m from that child's home (see Map 1 and 2)

OR

ALL people living in the closest 24 surrounding households (HH) to the child's home (see Map 3 and 4)
(as the "source" may be from nearby their home).

A decision about which method to use must be made by the Country LF Manager prior to survey implementation

NOTE: Testing for children ≤ 8 years should be by ICT alone
(refer Appendix 5.1)
Testing for people > 8 years should be by ICT and MF slide
(refer Appendix 5.2)

STEP 3. Additionally, for every child ≤ 8 years old who is found to be ICT positive, their parent/carer should be asked if that child visits another home/household daily.

If they visit another house daily, that is >200m from their own home, then the other house could be where (or near) the source of infection.

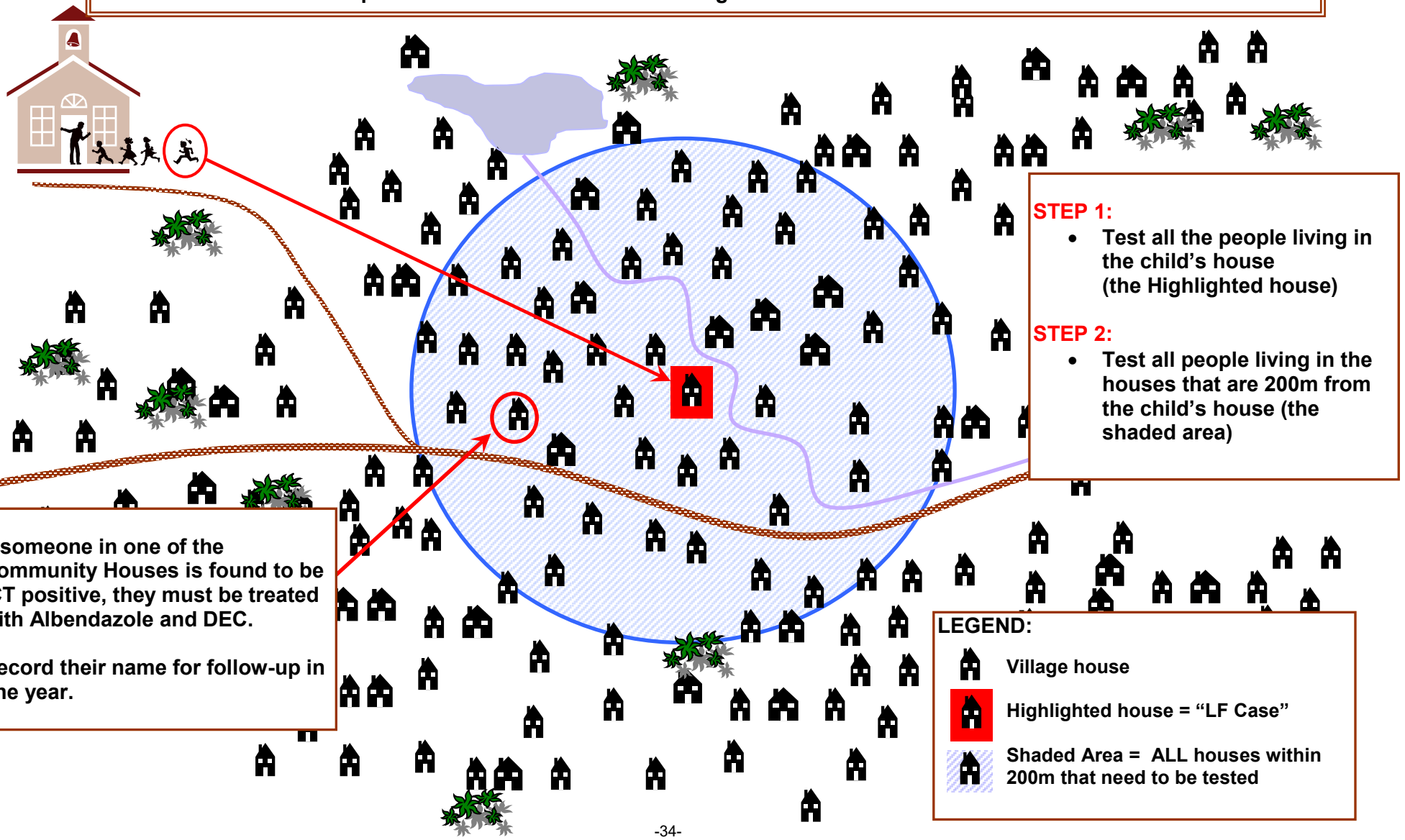
This second house should also be treated as the "child's home" and Close Contact Testing for this home should be completed by the same method as for the Child's home (i.e. test all members of the household and all members of the houses that are 200m around it).

STEP 4. Everyone who is found to be ICT positive must be treated with the recommended doses of Albendazole and DEC (refer Appendix 5) and their name recorded for follow-up.

STEP 5. Follow up needs to be performed on EVERYONE who has a positive test result, depending on their age and the test.

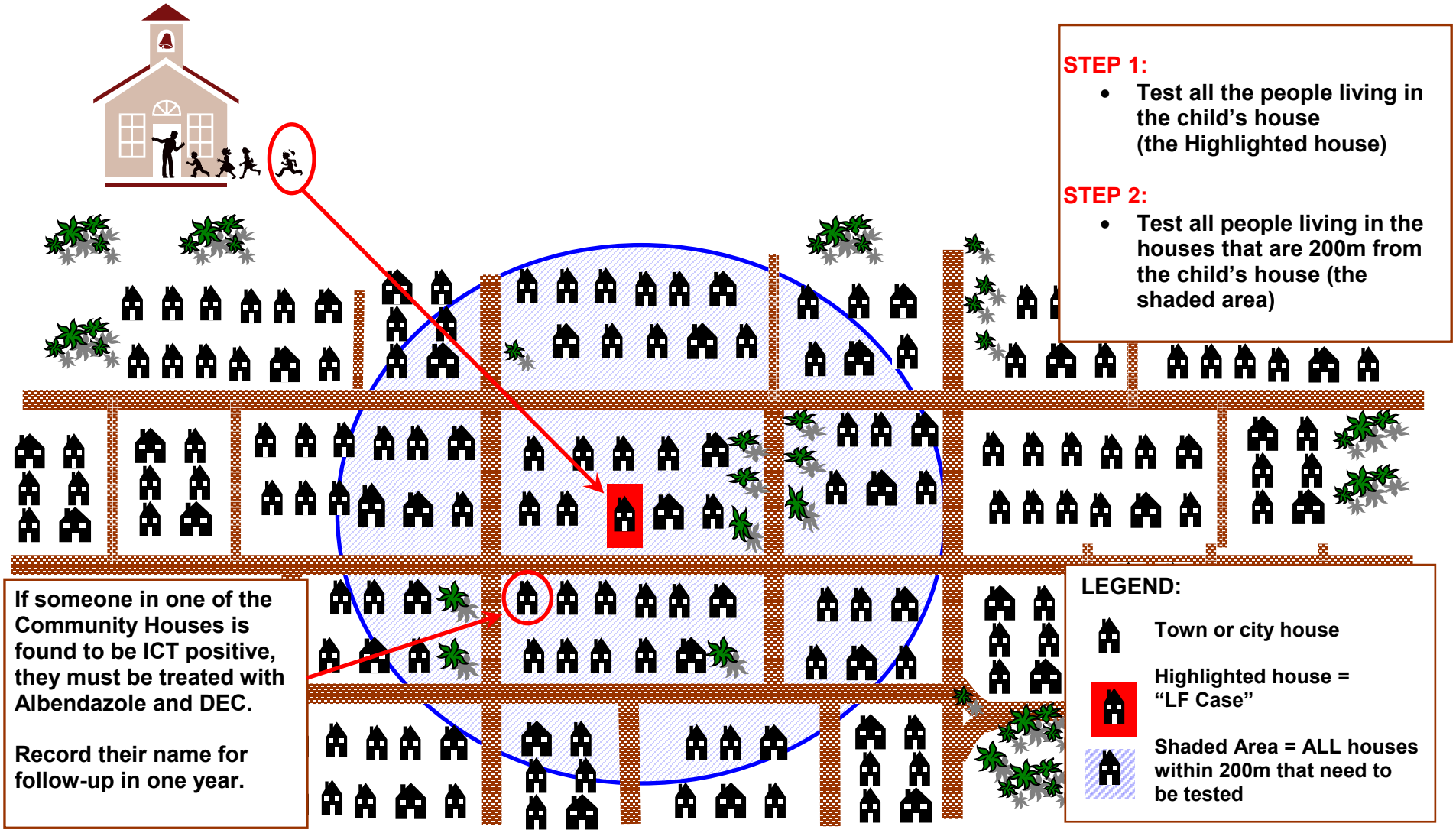
2.4 Map 1: Close Contact Testing by 200m rule: Village

During Primary School or Community testing, if a child (≤ 8 years old) is found to be ICT positive, they are considered an "LF Case". Follow the steps needed for Close Contact Testing:



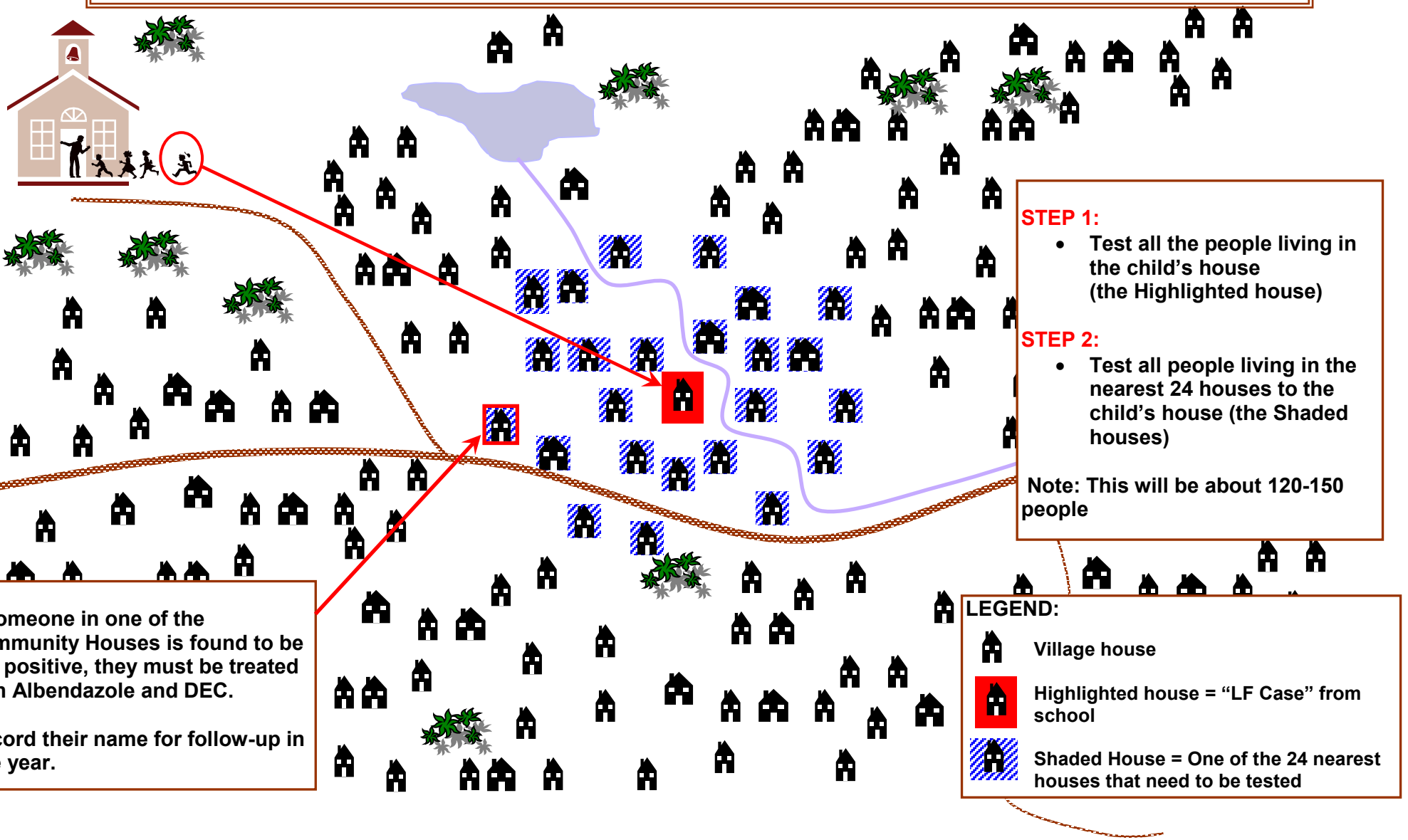
2.5 Map 2: Close Contact Testing by 200m rule: Town/City

During Primary School or Community testing, if a child (≤ 8 years old) is found to be ICT positive, they are considered an "LF Case". Follow the steps needed for Close Contact Testing:



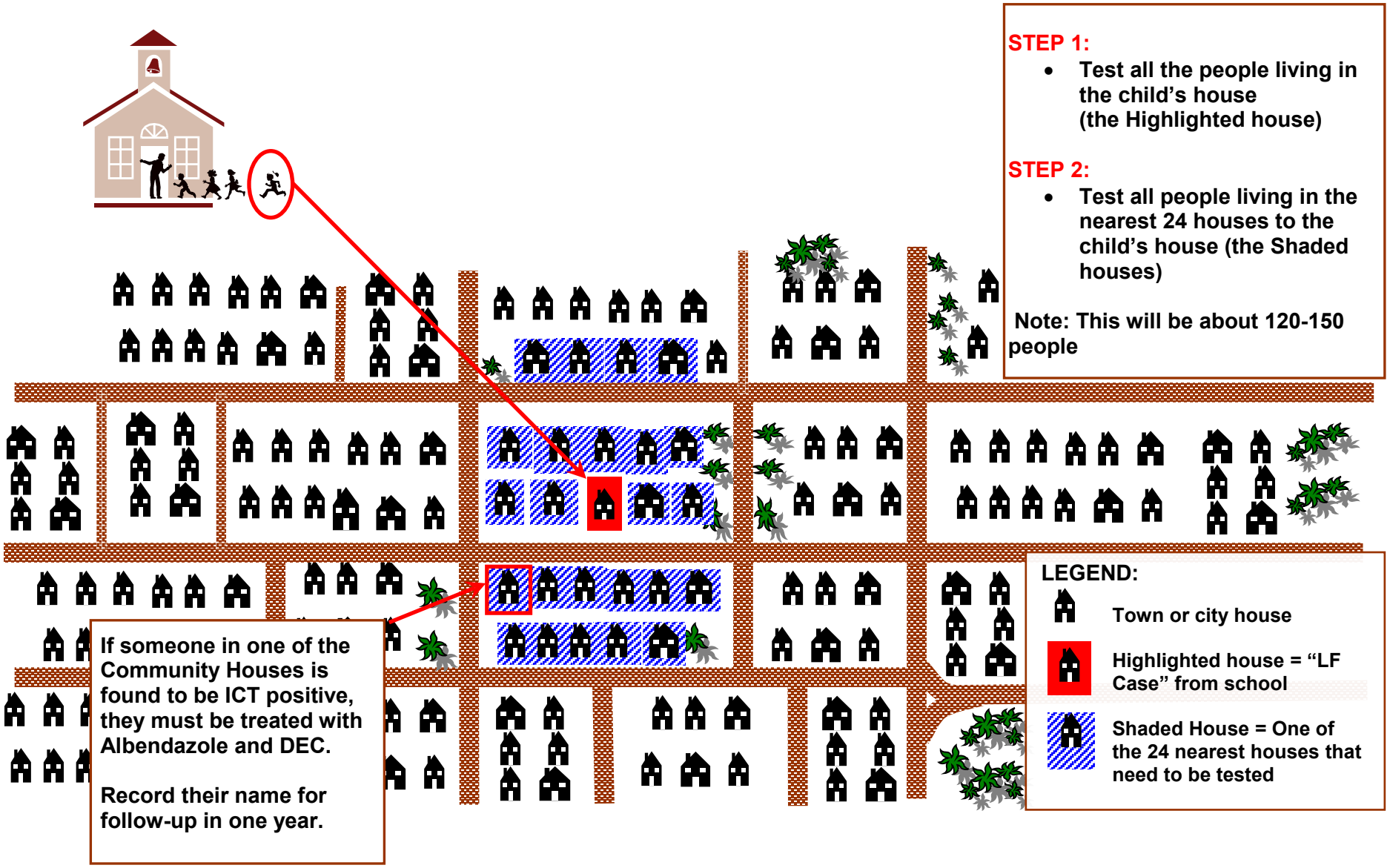
2.6 Map 3: Close Contact Testing by 24HH rule: Village

During Primary School or Community testing, if a child (≤ 8 years old) is found to be ICT positive, they are considered an "LF Case". Follow the steps needed for Close Contact Testing:



2.7 Map 4: Close Contact Testing by 24HH rule: Town/City

During Primary School or Community testing, if a child (≤ 8 years old) is found to be ICT positive, they are considered an "LF Case". Follow the steps needed for Close Contact Testing:

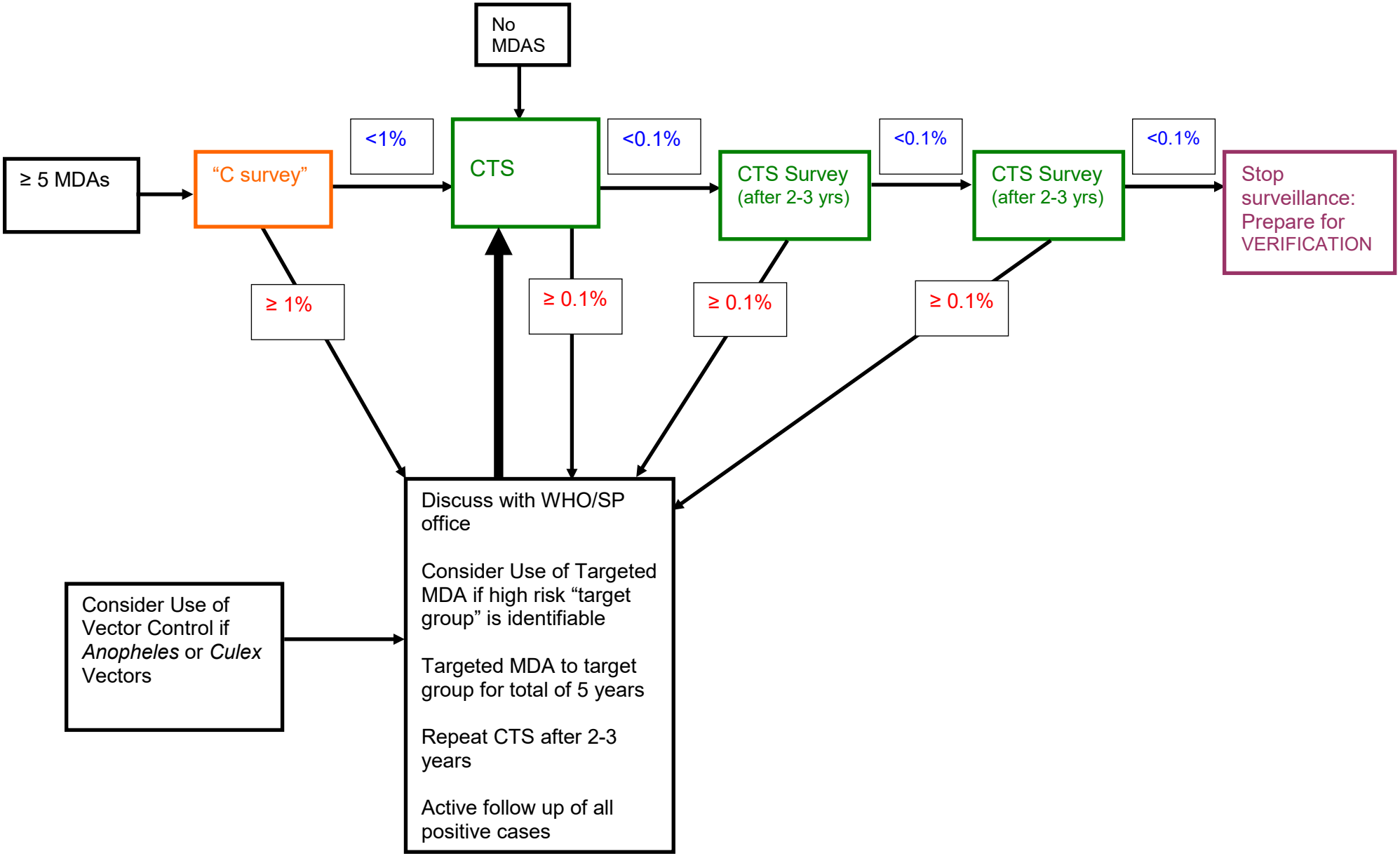


Appendix 3 : LF Surveillance Algorithms

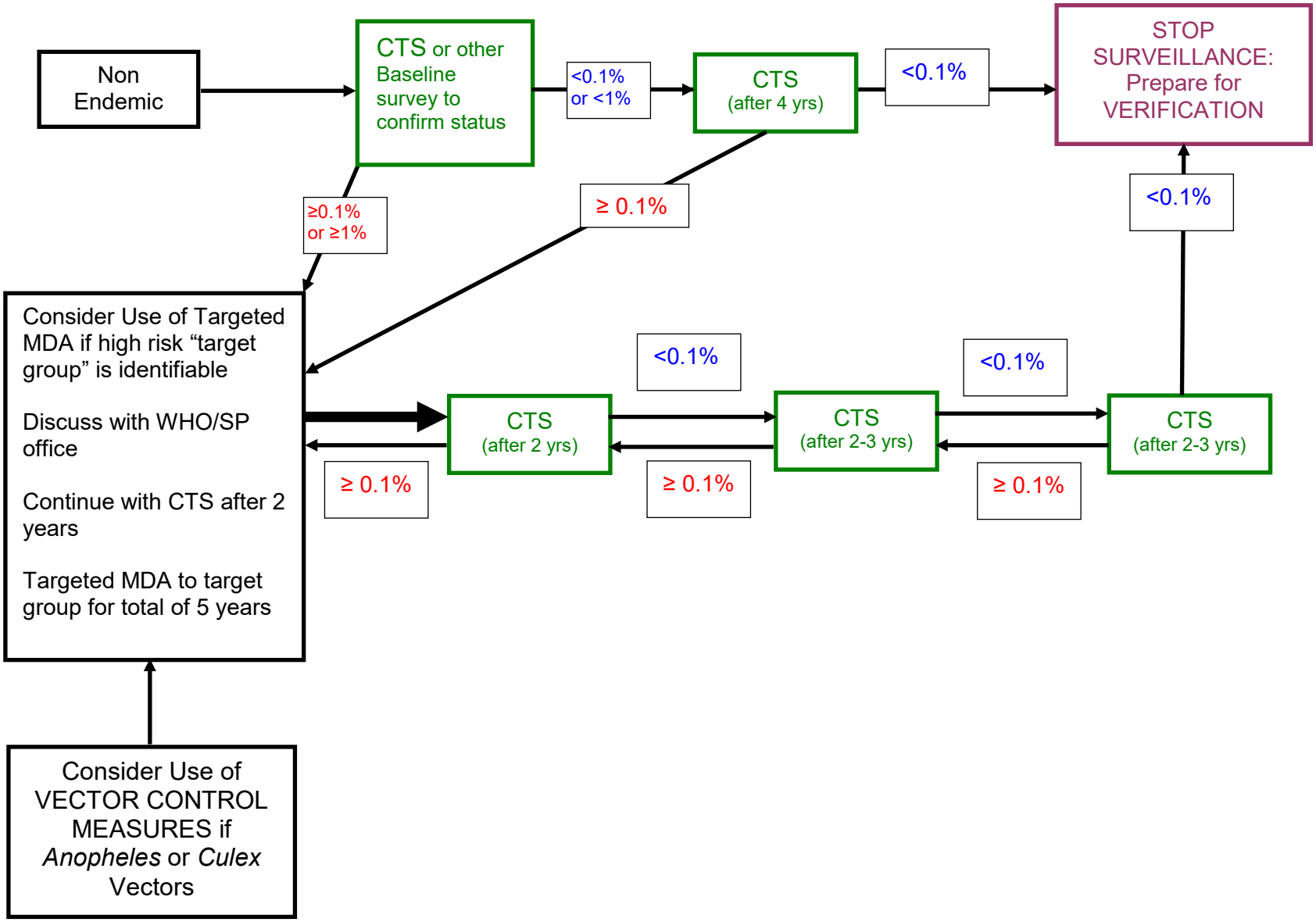
3.1 ALGORITHM FOR ENDEMIC and PARTIALLY ENDEMIC COUNTRIES

3.2 ALGORITHM FOR NON ENDEMIC COUNTRIES

3.1 ALGORITHM FOR ENDEMIC and PARTIALLY ENDEMIC COUNTRIES



3.2 ALGORITHM FOR NON ENDEMIC COUNTRIES



Appendix 4: Testing Protocols

4.1 ICT testing protocol

4.2 MF testing protocol

4.3 MF blood collection times

4.4 Collecting Blood Spots for Antibody Test

4.1 ICT testing protocol[3]

Materials

ICT kit contains these materials

- ☐ ICT test card
- ☐ Gloves
- ☐ Sterile blood lancets
- ☐ 100ul heparin coated capillary tubes
- ☐ Alcohol wipes
- ☐ Clean cotton wool
- ☐ Sharps container
- ☐ Yellow plastic bag for collecting biohazardous material
- ☐ Pen
- ☐ Timer or watch

Procedure

1. Collect all materials (supplied with the card) necessary for the test and prepare your working area.

2. Remove the card from the silver pouch just before use.

3. Write the name of person who will be examined and the date of test on the front of test card (use a pen).

4. Open the test card and lay it flat.

5. Wear gloves.

6. Collect blood sample by finger prick into the 100ul capillary tube (**full**).

7. Add all the blood in the capillary tube **onto the top (white area)** of the pink and white pad on the left hand side of the test card. **Slowly** drop by drop. The tip of the tube can touch the pad.

8. **Wait until the blood has reached into the pink area**. This may take one minute or so. If you do not wait, the test may not work.

9. Remove the adhesive tape on the right hand side of the card and close the card.

10. Press firmly along the window of the card from right to left and the top to the bottom.

11. **Start timing for 10 min**.

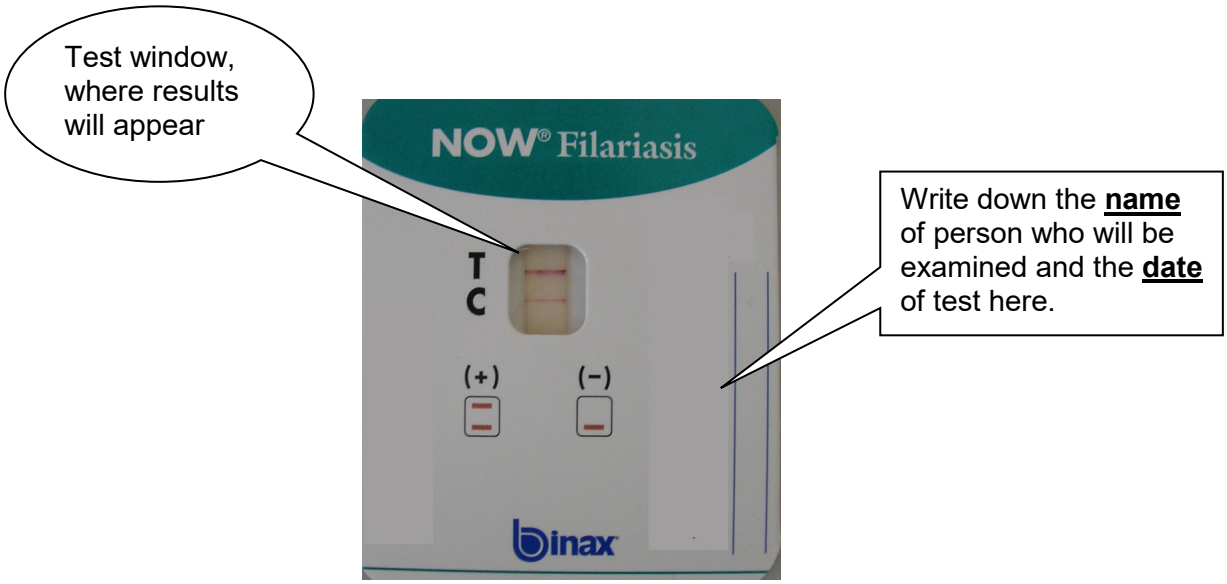
12. Read the result through the window **at exactly 10 minutes**. You must read the result at 10 min to ensure the test works.

13. Record the result on the card and on the appropriate form (Appendix 6).

14. Discard the used capillary tube and lancet into the sharp container. The rest should be collected in the yellow plastic bag.

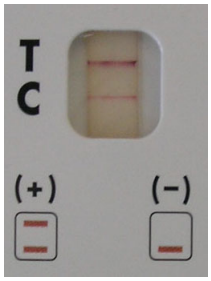
15. Keep the test card in an appropriate container and inform the person who was tested of their result.

[3] Source: Adapted from Standard Operating Procedures, Mataika House and PacELF Office, Suva, Fiji.



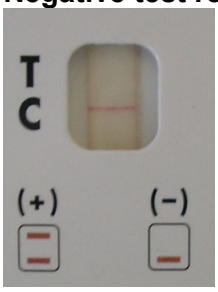
Interpretation of results

Positive test result



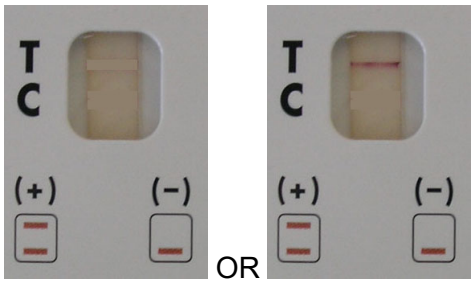
When two lines (both T and C) are observed in the window of the card at 10 min, the test is positive. Even if the top line (T) is only slightly visible, the test is considered as positive.

Negative test result



If only the bottom line (C) appears at 10 min, the test is negative.

Invalid test result



The test is invalid, if the bottom line (C) does not appear at 10 min (e.g. only the T line or no lines). The test needs to be repeated with a new card.

Manufacturer
Binax, INC.
Portland, ME, USA
Product name
NOW® ICT FILARIASIS
A rapid immunochromatographic test for the quantitative detection of *Wuchereria bancrofti* antigen

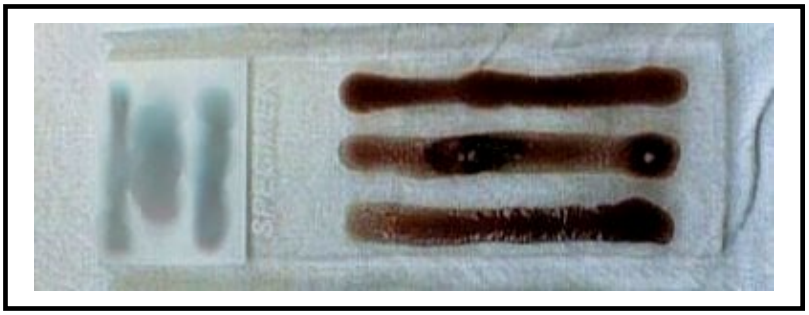
4.2 MF slide testing protocol

Three line method – for MF blood smear[4]

Purpose
To ensure proper preparation of 3 line blood smear for microscopic examination of microfilariae of *Wuchereria bancrofti*.

Notes

- 60ul of whole blood is required for the preparation of the slide.
- The sample should be collected between the ideal times, depending on the primary mosquito vector (refer Appendix 4.3, next page).
- Specimen (blood) should be collected in a heparin coated container (test tube, capillary etc) according to one of the following methods:
- Finger prick blood collection: the sample should be collected in a 100ul capillary tube supplied with the ICT kit. The sample should be used immediately.
- Venous blood collection by any standard venipuncture method in a heparin coated tube. The blood can be stored at 2 to 8 °C for three days



Materials
Single use gloves
Clean glass microscope slides
Sterile blood lancets
Cotton wool
Alcohol wipe
Capillary tube
Pencil
Sharps container
Tissue/paper and box to wrap slides for transport to laboratory

Procedure

1. Prepare all necessary materials.
2. Wear gloves.
3. Write the name of test subject and the date of test on the slide (frosted end) using a pencil.
4. Collect blood sample by finger prick or standard venipuncture. The sample should be collected in (or transferred to) a heparin coated capillary tube up to 60ul line or the two thirds of the 100ul tube.
5. With the filled capillary tube using all the blood in the tube, draw three lines of equal width (3mm) and length onto the microscope slide.
6. Allow the blood slide to dry in a flat position protected from insects, dust and heat. Minimum drying time is 30minutes, but drying may take several hours.
7. Discard the used materials in appropriate containers (i.e. lancet and capillary tube in sharps container; other items in the yellow plastic bag).
8. Pack prepared slides appropriately to transport to laboratory.

[4] Adapted from: Protocol used for Mataika House and PacELF Office, Suva, Fiji.

4.3 MF blood collection times[5]

Recommended times for collection of blood specimens for testing for *Wuchereria bancrofti* microfilariae in the South Pacific

Type	Recommended collection time
Diurnally sub-periodic	15:00 – 17:00 (peak 16:00)
Nocturnally periodic	22:00 – 01:00 (peak 24:00, midnight)

By country

Country/region	Filaria type	Primary vector	Recommended collection time
American Samoa	Diurnally sub periodic	Aedes polynesiensis	15:00 – 17:00 (peak 16:00)
Cook Islands	Diurnally sub periodic	Aedes polynesiensis	15:00 – 17:00 (peak 16:00)
Fiji	Diurnally sub periodic	Aedes polynesiensis	15:00 – 17:00 (peak 16:00)
French Polynesia	Diurnally sub periodic	Aedes polynesiensis	15:00 – 17:00 (peak 16:00)
Kiribati	Nocturnally periodic	Culex quinquefasciatus	22:00 – 01:00 (peak 24:00, midnight)
Niue	Diurnally sub periodic	Aedes cooki	15:00 – 17:00 (peak 16:00)
Papua New Guinea	Nocturnally periodic	Anopheles	22:00 – 01:00 (peak 24:00, midnight)
Samoa	Diurnally sub periodic	Aedes polynesiensis	15:00 – 17:00 (peak 16:00)
Tonga	Diurnally sub periodic	Aedes tabu	15:00 – 17:00 (peak 16:00)
Tuvalu	Diurnally sub periodic	Aedes polynesiensis	15:00 – 17:00 (peak 16:00)
Vanuatu	Nocturnally periodic	Anopheles	22:00 – 01:00 (peak 24:00, midnight)
Wallis and Futuna	Diurnally sub periodic	Aedes polynesiensis	15:00 – 17:00 (peak 16:00)
FSM	Diurnally sub periodic	Culex annulirostris s.l.	15:00 – 17:00 (peak 16:00)
Marshall	Diurnally sub periodic	Culex quinquefasciatus	15:00 – 17:00 (peak 16:00)
Palau	Nocturnally periodic	Culex quinquefasciatus	22:00 – 01:00 (peak 24:00, midnight)
Guam	Nocturnally periodic	Culex quinquefasciatus	22:00 – 01:00 (peak 24:00, midnight)
Nauru	Nocturnally periodic	Culex quinquefasciatus	22:00 – 01:00 (peak 24:00, midnight)
New Caledonia	Diurnally sub periodic	Aedes vigilax	15:00 – 17:00 (peak 16:00)
NMI	Nocturnally periodic	Culex quinquefasciatus	22:00 – 01:00 (peak 24:00, midnight)
Pitcairn	Diurnally sub periodic	Aedes polynesiensis	15:00 – 17:00 (peak 16:00)
Solomon	Nocturnally periodic	Anopheles	22:00 – 01:00 (peak 24:00, midnight)
Tokelau	Diurnally sub periodic	Aedes polynesiensis	15:00 – 17:00 (peak 16:00)

[5] **References**:
Monitoring and epidemiological assessment of the programme to eliminate lymphatic filariasis at implementation unit level. World Health Organization, 2005.
PacELF Data Book 2006. Pacific programme to Eliminate Lymphatic Filariasis, 2006.

4.4 Collecting Blood Spots for Antibody Test (at same time as ICT testing)[6]

Note: This will be used only by some countries, after consultation with WHO/SP office and LF Coordinating Centre, JCU, Townsville, Aust.

Additional Materials Needed

- ☐ Filter paper "disk" from laboratory for antibody testing
- ☐ Freezer bags ("zip-lock" bags)
- ☐ Pencil or pen

Procedure

1. Use one disk for each person. Each disk has 6 "ears."
2. Push out the disk from the card (Figure 1).
3. Remove the smaller disk from the centre to leave a hole.
4. Write the person's name and registration number on the disk.
5. After collecting blood for the ICT test either use the same capillary tube to put blood on to the "ears" or touch the ears to the finger. Fill all 6 ears.
6. Push a pencil through the centre hole in the disk. You can put many disks on to the same pencil but leave room between them so then don't touch each other. Alternatively, push each filter paper through a metal spike, making sure that they do not touch while they dry (Figure 2).
7. Leave the disks on the pencil until completely dry – usually about four hours.
8. After they are dry, put disks into plastic bags in groups of 100. It would be helpful to the lab if they were grouped 1 to 100, 101-200, etc.
9. Place the bags in the freezer.

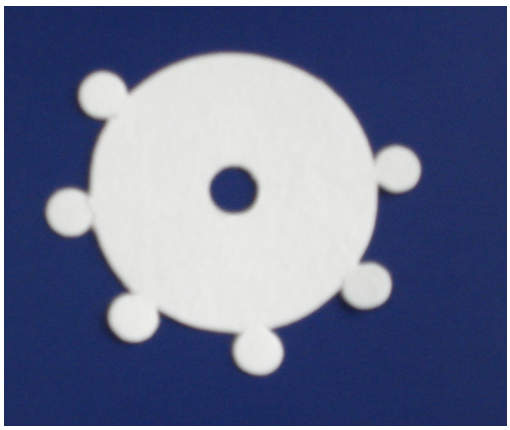


Figure 1: Filter paper "disk" ready for use

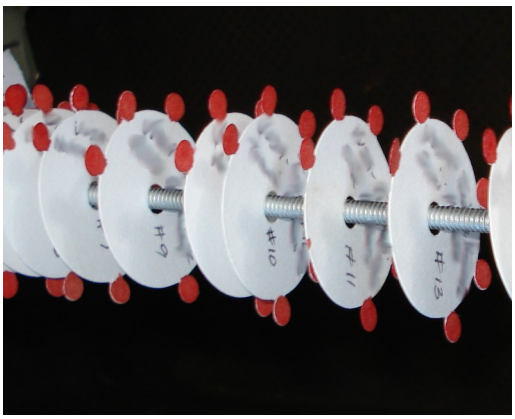


Figure 2: Filter papers drying on metal spike

[6] Source of information: Dr Wayne Melrose, LF Coordinating Centre, James Cook University, Townsville, Aust.
Photos: Dr Corinne Capuano

Appendix 5: Treatment Protocols

5.1 Treatment protocol: ICT positive case

5.2 Treatment protocol: MF positive case

5.3 Targeted MDA dosing schedule

5.1 Treatment protocol: ICT positive case

For people found to be ICT positive, treatment is as follows[7]:

Single dose of Albendazole and single dose of DEC (6mg/kg)

Dosage:
Doses for DEC must be given by WEIGHT, using the table on the following pages
(Refer to Appendix *5.4: Doses by weight for DEC and Albendazole tablets*)

Young Children:
Drug Administrators should be advised to take special care in administering tablets to young children. The tablets should be always administered to children under the supervision of the drug distributor or a responsible adult. Do not leave tablets unattended where children can reach them.

The albendazole tablet is relatively large. The Albendazole has a pleasant taste and can be chewed by the child (or crushed and given). In no circumstances should small children be forced to swallow the tablet, as it may obstruct the airway resulting in breathing problems. Crying and/or distressed children should be calmed before the administration of tablets.

Exclusion[7]:
For DEC and Albendazole co-administration, the following groups should be excluded from treatment:

- Sick individuals
- Children less than 2 years of age
- Pregnant women

Side Effects[7]:
DEC and Albendazole are both safe and well-tolerated drugs.

General reactions, in decreasing order of frequency, are: headache, body ache, fever, dizziness, decreased appetite, malaise, nausea, urticaria, vomiting and sometimes bronchial asthma. General reactions and fever are positively associated with the prevalence and intensity of microfilaraemia. Reactions occur early during the treatment and generally do not last more than 3 days.

Local reactions are most commonly scrotal nodules due to death of the adult worm. Others include lymphadenitis (inflamed lymph node), funiculitis ("boil"), epididymitis , orchalgia (painful testicles), and lymphangitis. Rarely, abscess formation, ulceration or transient lymphoedema have been reported. They tend to occur later (1-3 weeks after treatment) and last longer.

[7] **Source:** Preparing and Implementing a National Plan to Eliminate Lymphatic Filariasis
World Health Organization. Geneva, Switzerland. 1999.
Document Ref: WHO/CDS/CPE/2000.15

5.2 Treatment protocol: MF positive case

For people found to be MF positive, treatment is as follows[8]:

Single dose of Albendazole and single dose of DEC (6mg/kg)

Dosage:
Doses for DEC must be given by WEIGHT, using the table on the following pages
(Refer to Appendix *5.4: Doses by weight for DEC and Albendazole tablets*)

Young Children:
Drug Administrators should be advised to take special care when administering tablets to young children. The tablets should be always administered to children under the supervision of the drug distributor or a responsible adult. Do not leave tablets unattended where children can reach them.

The albendazole tablet is relatively large. The Albendazole has a pleasant taste and can be chewed by the child (or crushed and given). In no circumstances should small children be forced to swallow the tablet, as it may obstruct the airway resulting in breathing problems. Crying and/or distressed children should be calmed before the administration of tablets.

Exclusion[8]:
For DEC and Albendazole co-administration, the following groups should be excluded from treatment:

- Sick individuals
- Children less than 2 years of age
- Pregnant women

Side Effects[8]:
DEC and Albendazole are both safe and well-tolerated drugs.

General reactions, in decreasing order of frequency, are: headache, body ache, fever, dizziness, decreased appetite, malaise, nausea, urticaria, vomiting and sometimes bronchial asthma. General reactions and fever are positively associated with the prevalence and intensity of microfilaraemia. Reactions occur early during the treatment and generally do not last more than 3 days.

Local reactions are most commonly scrotal nodules due to death of the adult worm. Others include lymphadenitis (inflamed lymph node), funiculitis ("boil"), epididymitis , orchalgia (painful testicles), and lymphangitis. Rarely, abscess formation, ulceration or transient lymphoedema have been reported. They tend to occur later (1-3 weeks after treatment) and last longer.

[8] **Source:** Preparing and Implementing a National Plan to Eliminate Lymphatic Filariasis
World Health Organization. Geneva, Switzerland. 1999. Page 17.
Document Ref: WHO/CDS/CPE/2000.15

5.3 Targeted MDA dosing schedule

During Targeted MDA, Treatment is as follows:

Single dose of Albendazole and single dose of DEC (6mg/kg)

Must be given **every 12 months**

Must be given to **>80% of the target population**

Give for **5 consecutive years**

Dosage:
Doses for DEC must be given by WEIGHT, using the table on the following pages
(Refer: *5.4 Doses by weight for DEC and Albendazole tablets*)

Young Children:
Drug Administrators should be advised to take special care when administering tablets to young children. The tablets should be always administered to children under the supervision of the drug distributor or a responsible adult. Do not leave tablets unattended where children can reach them.

The albendazole tablet is relatively large. The Albendazole has a pleasant taste and can be chewed by the child (or crushed and given). In no circumstances should small children be forced to swallow the tablet, as it may obstruct the airway resulting in breathing problems. Crying and/or distressed children should be calmed before the administration of tablets.

Exclusion[9]:
For DEC and Albendazole co-administration, the following groups should be excluded from treatment:

- Sick individuals
- Children less than 2 years of age
- Pregnant women

Side Effects[9]:
DEC and Albendazole are both safe and well-tolerated drugs.

General reactions, in decreasing order of frequency, are: headache, body ache, fever, dizziness, decreased appetite, malaise, nausea, urticaria, vomiting and sometimes bronchial asthma. General reactions and fever are positively associated with the prevalence and intensity of microfilaraemia. Reactions occur early during the treatment and generally do not last more than 3 days.

Local reactions are most commonly scrotal nodules due to death of the adult worm. Others include lymphadenitis (inflamed lymph node), funiculitis ("boil"), epididymitis , orchalgia (painful testicles), and lymphangitis. Rarely, abscess formation, ulceration or transient lymphoedema have been reported. They tend to occur later (1-3 weeks after treatment) and last longer.

---

[9] **Source:** Preparing and Implementing a National Plan to Eliminate Lymphatic Filariasis
World Health Organization. Geneva, Switzerland. 1999. Page 17.
Document Ref: WHO/CDS/CPE/2000.15

5.4 Doses by Weight for DEC and Albendazole tablets[10]

Use the tables below to work out the number of tablets needed.
First CHECK which type of DEC tablets the country is using, 50mg or 100mg.

For DEC and Albendazole co-administration, the following groups should be **excluded** from treatment:

- Sick individuals
- Children less than 2 years of age
- Pregnant women

DRUG DOSAGE CHART BY WEIGHT FOR TREATMENT WITH DEC AND ALBENDAZOLE

USING 50mg DEC TABLETS

BODY WEIGHT (kg)	NUMBER OF TABLETS	
	DEC **(50mg)**	Albendazole (400mg)
10-13	1	1
14-22	2	1
23-29	3	1
30-38	4	1
39-46	5	1
47-52	6	1
53-63	7	1
64-71	8	1
72-79	9	1
80+	10	1

DRUG DOSAGE CHART BY WEIGHT FOR TREATMENT WITH DEC AND ALBENDAZOLE

USING 100mg DEC TABLETS

BODY WEIGHT (kg)	NUMBER OF TABLETS	
	DEC **(100mg)**	Albendazole (400mg)
10-13	½	1
14-22	1	1
23-29	1 ½	1
30-38	2	1
39-46	2 ½	1
47-52	3	1
53-63	3 ½	1
64-71	4	1
72-79	4 ½	1
80+	5	1

[10] Source: PacELF HandBook. Facts and Methods for Lymphatic Filariasis Elimination in the Pacific. Published by PacELF Home Office, February, 2004.

Appendix 6: Record Keeping

6.1 CTS – Primary School Method: Form for recording testing by the Primary School Method

6.2 CTS - Community Method: Form for recording testing by the Community Method

6.3 “Close Contact Testing” Form

6.1 CTS – Primary School Method: Form for recording testing in Primary Schools

1. Country: _____
2. State/Region: _____
3. Name of Person performing the testing: _____
4. School Name:_____
5. School Address: _____
6. Date: _____

ID	Name (List all School Year 1 children enrolled at the school)	School year	Age	Gender (M or F)	ICT		If positive, record address of positive person	IF not tested, give reason	Treatment given	
					performed (Y/N)	result (+/-)			DEC (number tablets)	Albend. (number tablets)
001	*Example ONLY:* Ruby Citizen	1	6	F	Y	+	3 Long Lane, Quiet Village, Big Island		2	1

6.2 CTS - Community Method: Form for recording testing in Community/Village

1. Country: _____
2. State/Region: _____
3. Name of Person performing the testing: _____
4. Village/Community Name:_____
5. Date: _____

ID	Name (List all known 5 year old children in the Community/Village)	Age	Gender (M or F)	ICT		If positive, record address of positive person	IF not tested, give reason	Treatment given	
				performed (Y/N)	result (+/-)			DEC (number tablets)	Albend. (number tablets)
021	*Example ONLY:* Danny Citizen	5	M	Y	-				

6.3 “Close Contact Testing”: Form for recording the testing in the Community

1. Country: _____
2. State/Region: _____
3. Name of Person performing the testing: _____
4. Village/Community Name:_____
5. Date: _____

6. **Close Contact Record for : Name:_____ Address:_____**
   (Name of “index” child for whom the testing is being done) (Address of “index” child for whom the testing is being done)
   (NOTE: a separate form must be started for each child for whom Close Contact Testing is being done.)

ID	Name of all Close Contacts (List ALL people in the “index” child’s household and ALL their nearest neighbours)	Age	Gender (M or F)	Type of Contact: Household (HH) or Neighbour (N)	ICT		If positive, record address of positive person.	MF slide		IF not tested, give reason	Treatment given	
					performed (Y/N)	result (+/-)		performed (Y/N)	result (+/-)		DEC (number tablets)	Albend. =(number tablets)
031	*Example ONLY:* Paul Citizen	38	M	HH	Y	+	3 Long Lane, Quiet Village, Big Island	Y			8	1

Appendix 7. Data Analysis: A Summary of *PICTs LF Elimination Program Data 1999 - June 2007*