SQUEAC & SLEAC : Low resource methods for evaluating access and coverage in selective feeding programs

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SQUEAC

Semi-quantitative evaluation of access and coverage

SLEAC

Simplified LQAS evaluation of access and coverage

Introduction

One of the most important elements behind the success of the *community therapeutic care* (CTC) model of service delivery is its proven capacity for achieving and sustaining high levels of coverage over wide areas. The use of two-stage cluster sampled surveys to estimate the coverage of selective feeding programs suffers from several important limitations and a new survey method for estimating the coverage of selective feeding programs was developed by VALID International and Concern Worldwide. This survey method, known as the *Centric Systematic Area Sampling* (CSAS) method, uses a combination of stratified and systematic area sampling and active and adaptive case-finding. The CSAS survey method provides a rich set of information about program coverage. In particular, it provides a "headline" or overall estimate of program coverage, a map of the spatial distribution of program coverage (*Figure 1*), and a ranked list of program-specific barriers to service access and uptake (*Figure 2*). The CSAS method is, however, resource intensive. This has led to a tendency for it to be used for *program evaluation* rather than *program planning* purposes. The results of CSAS surveys have, therefore, often been able to explain why a particular program has failed to achieve a satisfactory level of coverage but this information arrives too late in the program cycle to institute effective remedial action. In addition, the CTC model of service delivery is now being adopted in developmental and post-emergency settings. Programs in these settings tend to suffer from considerable resource-scarcity compared to NGO-implemented emergency-response programs. There exists, therefore, a need for a low-resource method capable of evaluating program coverage and identifying barriers to service access and uptake. This article describes some aspects of such a method currently being developed by VALID International Ltd. in collaboration with Concern Worldwide, World Vision, and UNICEF.

Attributes of a low resource method for evaluating access and coverage

After discussions with implementing partners in NGO, UNO, and government sectors the following attributes were deemed desirable:

- The method must be both quick and cheap so as to allow frequent and ongoing evaluation of program coverage and identification of barriers to service access and uptake.

- The method must provide a similar richness of information as is provided by the CSAS method. Evaluation of the spatial pattern of coverage and the identification of barriers to service access and uptake were considered essential.

- The method should encourage the routine collection, analysis, and use of program planning and evaluation data.

- Individual components of the method should provide information capable of informing program activities and reforms.

Outline of the proposed method for evaluating access and coverage

The proposed method:

- Is *semi-quantitative*, using a mixture of *quantitative* (numerical) data collected from routine program monitoring activities and small-area surveys and *qualitative* (anecdotal) data collected using informal group discussions and interviews with a variety of informants.

- Makes use of routine program monitoring data (e.g. charts of trends in admission, exit, recovery, in-program deaths, and defaulting) and data that is already collected on beneficiary record cards (e.g. the home village of program beneficiaries).

- Makes use of data that may already be available from sources such as nutritional anthropometry surveys and food-security assessments. When this data is not readily available it may be collected using informal group discussions and interviews with a variety of informants.

- Makes use of data that may already be collected routinely by programs or may be collected with little additional work. This additional data has been selected so as to provide benefits to programs outside of the narrow requirement of evaluating access and coverage and concentrates on the monitoring and analysis of outreach activities and referrals.

- Uses small-area surveys to confirm or deny *hypotheses* about program coverage that arise from the analysis of program and anecdotal data.

The method achieves rapidity and low cost by collecting and analysing diverse data intelligently rather than by using the mechanistic and more focussed data collection and analysis techniques employed by the CSAS method.

The proposed method uses a *two-stage screening test* model:

> **STAGE 1 :** Identify areas of low and high coverage as well as reasons for coverage failure using routine program data, already available data, quantitative data that may be collected with little additional work, and anecdotal data.
>
> **STAGE 2 :** Confirm the location of areas of high and low coverage and the reasons for coverage failure identified in stage one (above) using small-area surveys.

The method is called ***SQUEAC*** (**S**emi-**QU**antitative **E**valuation of **A**ccess and **C**overage).

Data sources and methods of analysis : Routine program data

The most important item of routine program data is the number of admissions over time. This should be graphed with time on the *x*-axis and number of admissions on the *y*-axis. Since there is likely to be considerable weekly or monthly variation in the number of admissions it is advisable to apply some form of smoothing to the plot (*Figure 3*). This can be done in most spreadsheet, information graphics, and statistical software packages.

Experiences with CTC programs in a variety of emergency settings show that programs with reasonable coverage show a distinctive pattern in the plot of admissions over time. *Figure 4* shows this pattern over an entire program cycle for an emergency-response program. The number of admissions increases rapidly and then may fall away slightly before stabilising and finally dropping away as the emergency abates and the program is scaled down and approaches closure. Major deviations from this pattern in the absence of evidence of (e.g.) mass migration or significant improvements in the health, nutrition, and food-security situation of the program's target population indicates a potential problem with a program's recruitment procedures. For example, *Figure 5* shows a plot of admissions over time in an emergency-response CTC program that had neglected to undertake effective community mobilisation and outreach activities. Admissions initially increased rapidly and then fell away rapidly. Such a pattern is indicative of a program with limited spatial coverage relying on self-referrals. An acceptable pattern was established in this program after effective remedial action was undertaken.

The pattern of admissions in a developmental setting is likely to be more complicated and, once the program has been established, should vary with the prevalence of acute undernutrition. Making sense of the plot of admissions over time in such setting requires information about the *probable prevalence* of acute undernutrition. This can be determined using seasonal calendars of human diseases associated with acute undernutrition in children (e.g. diarrhoea, fever, and ARI) and food availability. This information may be available from food-security assessments. If this information is not already available then it should be collected at the start of the program. *Figure 6* shows a plot of admissions over time with seasonal calendars of human diseases and food availability. The pattern of the plot of admissions over time conforms to expectations (i.e. the program treated more cases at times when the prevalence of acute undernutrition was likely to be high). Deviation from the expected pattern indicates a potential problem with a program's recruitment procedures.

Using admissions over time ignores the problem of defaulters. Defaulters are children who should be in the program but are not in the program. This means that high defaulting rates are associated with low program coverage. Standard program indicator graphs should show a consistently low rate of defaulting. *Figure 7* shows a standard program indicator graph from a CTC program. This graph shows an increasing defaulting rate. This was due to the program having too few OTP sites. More cases were found and admitted as the program's outreach activities were expanded but more of these cases defaulted after the initial visit because beneficiaries and carers had to walk too far to access services. In some programs, defaulting rates may vary over time. This will usually be due to a deterioration in the security situation, meteorological conditions (e.g. difficulties travelling in rainy or very hot seasons), or patterns of labour demand. *Figure 8*, for example, shows a plot of the defaulting rate over time with a seasonal calendar of household labour demands. In this example, defaulting is associated with household labour demands. Such a problem could be corrected by reducing the cost of attendance by (e.g.) opening additional OTP sites, reducing contact frequency from weekly to fortnightly contact, or by reducing waiting times at OTP sites. Plots of defaulting rates over time should present defaults as a proportion of all program exists as is done in *Figure 7*. As with admissions data, it is advisable to apply some form of smoothing to the plot.

It should be recognised that some defaulters will be current cases and some defaulters will be recovering or recovered cases. Beneficiaries that default early in the treatment episode are likely to be current cases. Beneficiaries that default later in the treatment episode are likely to be recovering cases. Beneficiaries that default immediately prior to the final *proof-of-cure* visit are likely to be recovered cases. It may, in some situations, be useful to categorise defaulters into two or three classes:

Number of classes	Probable case status
Two	Current cases
	Recovering and recovered cases
Three	Current cases
	Recovering cases
	Recovered cases

Defaulting rates could then be calculated and presented for each class separately. High defaulting rates amongst probable current cases would indicate a serious problem. The extra work that such an analysis involves is unlikely to provide sufficient benefit for it to be worth doing on a routine basis. An analysis of defaulters by probable case status may, therefore, be undertaken only if a routine analysis of defaulting rates were to find either high or increasing rates of defaulting such as was found in the program described by *Figure 7*.

The home location of the beneficiary is usually recorded on the beneficiary record card. Mapping the home locations of beneficiaries attending each OTP site is a simple way of defining the *actual* (rather than the *intended*) catchment area of each OTP site. *Figure 9*, for example, shows the home location of each beneficiary attending an OTP site that was admitted to the program in the previous two months. This plot suggests that the program has limited spatial coverage with coverage restricted to areas close to OTP sites or along the major roads leading to OTP sites.

Mapping is also a useful way of assessing outreach activities. *Figure 10*, for example, shows the villages visited by program outreach workers in the previous two months. The pattern is similar to that observed from the map of the home locations of beneficiaries attending the OTP site (*Figure 9*) with outreach activities having limited spatial coverage (i.e. restricted to areas close to OTP sites or along the major roads leading to OTP sites). A complementary method is to record the dates of outreach visits against a *complete* list of villages in the program's intended catchment area (*Figure 11*). The coloured highlighting in *Figure 11* corresponds to:

Red : Zero or one outreach visits in the previous six months

Orange : Between two and four outreach visits in the previous six months

Green : Five or more outreach visits in the previous six months

Other categories could be used (e.g. based on the date of the most recent outreach visit) but it is best to work with three categories. From *Figure 10* and *Figure 11* it can be seen that the illustrated program has both a poor spatial and temporal coverage of outreach activities. Maps or lists of the home locations of community-based volunteers (CBVs) provide similar information for programs that use CBVs for case-finding and carer support and mentoring. The coverage of outreach activities may also be analysed (classified) using the LQAS techniques presented later in this article.

It is also useful to map the home locations of defaulting cases. *Figure 12*, for example, shows the home locations of beneficiaries who defaulted in the previous two months. Most defaulting cases come from villages far from the OTP site suggesting that lack of proximity to services (either to the OTP site or to outreach and support services) is a leading cause of defaulting. It may also be useful to record and map DNA referrals (i.e. probable current cases that *did not attend* the program despite having been referred to the program) that you find by referral monitoring (see below). Following-up of defaulting and DNA cases (i.e. with home visits) should also be undertaken in order to identify reasons for defaulting and non-attendance.

Mapping does **not** require the use of sophisticated mapping or GIS software packages or the use of GPS receivers. All of the mapping work outlined in this article can be performed with a paper map of useful scale, clear acetate sheets, adhesive masking tape (masking tape can be written on and is easy to remove which reduces damage to paper maps), Post-it™ notes, and marker pens. *Figure 13*, for example, shows a coverage assessment worker mapping the home locations of beneficiaries attending an OTP site. The use of clear acetate sheets, masking tape, and Post-it™ notes preserves paper maps for later coverage assessments or other purposes. Recording different data on separate acetate sheets and overlaying these on the map allows several dimensions of data to be compared and analysed at the same time.

An alternative to mapping is to use lists and tables. This approach is useful for analysing geographical data over time. This is illustrated in *Figure 11* which shows how a table may be used to identify "gaps" (in both space and time) in program outreach activities. Lists and tables are also useful when maps are not available or where mapping may prove difficult such as in urban areas. For example, *Table 1* shows how a table may be used to investigate the effect of distance (travel time) on admissions and defaulting. The data in *Table 1* suggests that, in this program, distance has an effect on both admissions (higher close to the clinic) and defaulting (rates higher further from the clinic).

Referrals who do not attend the program (DNAs) are, like defaulters, children who should be in the program but are not in the program. DNA referrals are also more likely than defaulters to be current cases. This means that high DNA rates are associated with low program coverage. DNA rates can be calculated by monitoring referrals. Mapping of DNA cases can provide information about problems of proximity to services and other barriers to service access and uptake that may also be spatially distributed (e.g. ethnic or religious groups). Following-up of DNA cases (i.e. with home visits) should be undertaken in order to identify reasons for non-attendance.

Community-based volunteers (CBVs) often have low levels of literacy and numeracy. This means that a different approach to referral monitoring may have to be adopted in programs that use CBVs. One approach is to use "cloakroom tickets" or "raffle tickets" for referral slips (*Figure 14*). These have two unique identifying numbers (which may be used to identify the referring CBV and the number of the referral) and are available in a variety of colours (which can be used to identify a particular zone of program operations, OTP site, or intervention). Routine analysis of referral slips can identify CBVs who may not be making referrals and, using a simple listing technique, provide data that can be used to estimate DNA rates. *Figure 15* shows an example of an analysis of referrals from a single CBV. The coloured highlighting in *Figure 15* corresponds to:

Red : DNA cases

Orange : Inappropriate referral

Green : Attending cases

In the example illustrated in *Figure 15*, we have a rough idea of how many cases have been referred by this particular CBV (15) and the number of DNA cases (7). The estimated DNA rate for referrals from this particular CBV is:

$$\text{DNA rate} = \frac{7}{15} \times 100 = 47\%$$

Defaulting and DNA rates may also be analysed (classified) using the LQAS techniques presented later in this article. The SPHERE minimum standard for defaulting rates is 15% (maximum). This standard may also be used for DNA rates.

Mapping of DNA cases (or DNA rates) can provide information about problems of proximity to services and other barriers to service access and uptake that may be spatially distributed. Follow-up of DNA cases (i.e. with home visits) may not be feasible with CBV referred cases as identifying and location data is not immediately available. This should not, however, be assumed and attempts should be made to follow-up DNA cases. Follow-up of defaulting and DNA cases is probably best undertaken as part of the routine work of program outreach workers.

Figure 16 shows a map of DNA rates for cases referred in the previous two months. DNA rates are highest in villages farthest from OTP sites suggesting that lack of proximity to services (either to OTP sites or to outreach and support services) is a leading cause of referrals not attending the program. In some situations it may be easier and more informative to map DNA cases rather than DNA rates.

Information provided by routine program data

The use of routine program data and readily available contextual data is capable of providing useful information about program coverage:

- Examination of the pattern of admissions over time can identify potential problems with recruitment procedures.

- Examination of the pattern of defaulters and DNA cases over time can identify potential problems with attendance costs, beneficiary retention, proximity to services, and contact frequency.

- Mapping of beneficiary home locations and outreach activities can identify potential problems with the spatial reach of a program. Simple listing techniques can identify potential problems with the spatial and temporal coverage of a program.

- Mapping of the home locations of defaulting and DNA cases can identify potential problems with proximity to services and other barriers to service access and uptake that may be spatially distributed. Simple listing techniques can be used to estimate or classify DNA rates.

Follow-up visits to defaulting and DNA cases identified from simple analyses of routine program data can be used to identify barriers to service access and uptake (see below).

Data sources and method of analysis : Anecdotal data

Three methods of collecting anecdotal data from a variety of sources are used in SQUEAC assessments. These are:

1. **Informal group discussions** with:

    - Carers of children attending OTP sites.

    - Relatively homogenous groups of *key-informants* (e.g. community leaders and religious leaders) and *lay-informants* (e.g. mothers and fathers).

    - Program staff.

2. **Semi-structured interviews** with *key-informants* such as:

    - Program staff.

    - Clinic staff.

    - Community-based informants such as schoolteachers, traditional healers, and traditional birth attendants.

    - Carers of defaulting and DNA cases.

3. **Simple structured interviews**, undertaken as part of routine program monitoring and during small-area surveys, with:

    - Carers of defaulting and DNA cases.

    - Carers of non-covered cases found by small-area surveys.

Other methods of collecting anecdotal data (e.g. formal focus groups and more structured and in-depth interviews) may also prove useful in some contexts.

The collection of anecdotal data should concentrate on discovering reasons for both non-attendance and defaulting.

Methods of collecting anecdotal data : Informal group discussions

With informal group discussions the interviewer has an idea of the topics that are to be covered in the interview but there is no strict order in which the topics are to be covered and there is no strict wording of the questions to be asked. The discussion should be informal and conversational. Informants are encouraged to express themselves in their own terms rather than those dictated by the interviewer. The key skill for a successful informal group discussion is the ability to stimulate informants to provide useful data without injecting too many of the interviewer's words and concepts into the discussion. The group discussion approach allows the interviewer to respond to differences between informants and to follow and explore "leads" as they arise. The basic focus of informal group discussions in SQUEAC assessments is to discover reasons for non-attendance and defaulting. The informants will usually either not have a child eligible for entry into the program (e.g. community leaders) or will already have a child attending the program (e.g. carers of children attending OTP sites). This means that the collected data is limited to perceptions of the motivations of others rather than direct reports of personal motives. Data collected using informal group discussions in these groups is, therefore, most useful for finding relevant questions and wordings for later semi-structured and structured interviews and should always be *triangulated* with data collected using other methods (see below).

Methods of collecting anecdotal data : Semi-structured interviews

Semi-structured interviews are based on an *interview guide*. This is a set of clear instructions comprising a list of questions that should be asked and topics that should be covered in the interview. The exact order and wording may differ from informant to informant and is likely to change as data collection proceeds and the focus of the data-collection effort changes. The interviewer does not have to stick strictly to the questions in the interview guide and may follow "leads" and new topics as they arise in the course of an interview, although all questions and topics outlined in the interview guide should be covered in each interview. The use of an interview guide helps the interviewer make efficient use of the time available for an interview. This is important when interviewing informants who may not be able or willing to spend a lot of time in an open-ended discussion with the interviewer. The structure imposed on the interview by the interview guide shows the informant that you are clear about what you want from the interview. This is important when dealing with (e.g.) clinic staff and government officials. The flexibility of being able to investigate new "leads" introduced by the informant sets this method apart from simple structured interviews (see below).

Two types of semi-structured interview have proved useful in SQUEAC assessments:

> **Focused interviews (in-depth interviews) :** Focused interviews are used to intensively investigate a single topic. The purpose of a focused interview is to gain a complete and detailed understanding of the topic under investigation. Focused interviews are best used towards the end of the data collection effort to resolve discrepancies in previously collected data or when collecting data from informants with an in-depth knowledge about a single topic (e.g. asking outreach workers and CBVs about probable reasons for non-attendance and defaulting).
>
> **Case-histories (case studies) :** A case-history is similar to history taking in clinical medicine, except that the emphasis of the history is less on eliciting a history of symptoms (although this is useful for identifying mismatches between program and community definitions of malnutrition) and more on eliciting the context to a specific situation. Case-histories are most useful when you need to understand a situation in depth and when information-rich cases (e.g. carers of defaulting and DNA cases) can be found.

Methods of collecting anecdotal data : Simple structured interviews

Structured interviews expose every informant to the same stimulus. This usually means that the same questions are asked in the same order. Survey questionnaires are an example of a structured interview and are used in both SQUEAC assessments and CSAS surveys. *Box 1* shows an example of a typical structured interview questionnaire that may be applied to carers of non-covered cases found during SQUEAC small-area surveys and CSAS surveys. Similar questionnaires could be applied to carers of defaulting and DNA cases. It should be noted, however, that the use of the case-history approach (see above) may yield important data from carers of defaulting and DNA cases that cannot be captured by a simple structured interview.

Validating and analysing anecdotal data

It is important that the collected anecdotal data is *validated*. In practice, this means that data is collected from as many different sources as possible. Data sources are then cross-checked against each other. If data from one source is confirmed by data from another source then the data can be considered to be useful. If data from one source is not confirmed by data from other sources then more data should be collected, either from the same sources or from new sources, for confirmation. This process is known as *triangulation*.

There are two types of triangulation:

- ***Triangulation by source*** refers to data confirmed by more than one source. It is better to have data confirmed by more than one type of source (e.g. community leaders **and** clinic staff) rather than just by more than one of the same type of source. Type of source may also be defined by demographic, socio-economic, and spatial attributes of informants. Lay-informants such as mothers and fathers are sources of differing gender. Lay-informants from different economic strata, different ethnic groups, different religious groups, or widely separated locations are also different types of source.

- ***Triangulation by method*** refers to data confirmed by more than one method. It is better to have data confirmed by more than one method (e.g. semi-structured interviews **and** informal group discussions) than by a single method.

When collecting data, you should try to ensure that your data is triangulated by **both** source and method. Data from anecdotal sources and methods is also triangulated with routine program data and data from small-area surveys (*Figure 17*).

Data collection using triangulation is a purposeful and intelligent process. Data from different sources and methods should be regularly and frequently compared with each other. Discrepancies in the data are then used to inform decisions about whether to collect further data. If further data collection is required, these discrepancies help determine which data to collect, as well as the sources and methods to be used.

It is important that the data is *exhaustive*. This means identifying as many useful data sources as possible and continuing to collect data until no new information is coming to light. This process is known as *sampling to redundancy.*

Data collection, validation, and analysis are **not** separate processes. Data is analysed during collection and more data is collected to confirm or deny findings using **both** triangulation and sampling to redundancy.

Combining and confirming findings from routine program data and anecdotal data

The data collected from routine program data and anecdotal data, when combined, provide information about where coverage is likely to be satisfactory and where coverage is likely to be unsatisfactory as well as information about the likely barriers to service access and uptake that exist within a program (*Figure 17*). This information can be considered as a set of *hypotheses* that can be *tested*. The SQUEAC method uses small-area surveys to confirm or deny these hypotheses.

Hypotheses about coverage should be stated **before** undertaking small-area surveys. Hypotheses about coverage will usually take the form of identifying areas where the combined data suggest that coverage is likely to be satisfactory and areas where the combined data suggest that coverage is likely to be unsatisfactory. Information collected regarding barriers to service access and uptake may also be used to inform the design of a questionnaire that is applied to carers of non-covered cases found by small-area surveys although a variation on the standard CSAS questionnaire, such as that shown in *Box 1*, will usually be used for this purpose.

Figure 18, for example, shows an area of probable low coverage identified by mapping beneficiary home locations, analysis of outreach activities, defaulter follow-up, and anecdotal data. The hypothesis about coverage in this area was:

- Coverage is below the SPHERE minimum standard for coverage of therapeutic feeding programs in rural settings of 50% due to:

    - A mismatch between the program's definition of malnutrition (i.e. anthropometric criteria and problems of food security) and the community's definition of malnutrition (i.e. as a consequence of illness, particularly diarrhoea with fever).

    - Patchy coverage of outreach services particularly with regard to the ongoing follow-up of children with marginal anthropometric status.

    - Distance to OTP sites and other opportunity costs.

A small-area survey was undertaken in this area to confirm this hypothesis. This survey involved using active and adaptive case-finding (see *Box 2*) in all villages in the area identified in *Figure 18* and the application of a questionnaire similar to that shown in *Box 1* to carers of non-covered cases found by the survey. Analysis of the collected data confirmed that coverage in the identified area was likely to be below 50% (see below for details of the analytical technique used with SQUEAC small-area survey data). *Figure 19*, shows the barriers to service access and uptake identified by analysis of the survey questionnaire. The findings of the small-area survey confirmed, in general terms, the hypothesis under test and also identified a problem with the application of case-definitions leading to some cases being admitted to the wrong program.

Data sources and method of analysis : Small-area surveys

Small-area surveys are used to confirm or deny hypotheses about coverage generated by the analysis of routine program data and anecdotal data. SQUEAC small-area surveys use the same in-community sampling and data-collection methods as CSAS surveys. Cases are found using an active and adaptive case-finding method (see *Box 2*). When a case is found the carer is asked whether the child is already in the program. A short questionnaire (e.g. *Box 1*) is administered if the malnourished child is not already in the program.

Severe acute undernutrition is a relatively rare phenomena. This means that the sample size (i.e. the number of cases found) in small-area surveys will usually be too small to *estimate* coverage with reasonable precision (i.e. as a percentage with a narrow 95% confidence interval). It is possible, however, to *classify* coverage (i.e. as being above or below a threshold value) with small sample sizes using a technique known as *Lot Quality Assurance Sampling* (LQAS).

Analysis of data using the LQAS technique involves examining the number of cases found (n) and the number of covered cases found. If the number of covered cases found exceeds a threshold value (d) then coverage is classified as being satisfactory. If the number of covered cases found does not exceed this threshold value (d) then coverage is classified as being unsatisfactory. The value of d depends on the number of cases found (n) and the standard against which coverage is being evaluated. A specific combination of n and d is called a *sampling plan*.

The SPHERE minimum standard for coverage of therapeutic feeding programs in rural settings is 50%. The following *rule-of-thumb* formula may be used to calculate a value of d appropriate for classifying coverage as being above or below a standard of 50% for any sample size (n):

$$d = \lfloor \frac{n}{2} \rfloor$$

The "⌊" and "⌋" symbols mean that you should round **down** the number between the "⌊" and "⌋" symbols to the nearest whole number. For example:

$$\lfloor 6.5 \rfloor = 6$$

With a sample size (n) of 11, for example, an appropriate value for d would be:

$$d = \lfloor \frac{n}{2} \rfloor = \lfloor \frac{11}{2} \rfloor = \lfloor 5.5 \rfloor = 5$$

For standards other than 50%, the following *rule-of-thumb* formula may be used to calculate a suitable value for d for any coverage proportion (p) and any sample size (n):

$$d = \lfloor n \times \frac{p}{100} \rfloor$$

For example, with a sample size (n) of 11 and a coverage proportion (p) of 70% (i.e. the SPHERE minimum standard for coverage of therapeutic feeding programs in urban settings) an appropriate value for d would be:

$$d = \lfloor n \times \frac{p}{100} \rfloor = \lfloor 11 \times \frac{70}{100} \rfloor = \lfloor 11 \times 0.7 \rfloor = \lfloor 7.7 \rfloor = 7$$

An alternative to using the simple *rule-of-thumb* formulae presented here is to use LQAS sampling plan calculation software. Consideration of the classification errors associated with candidate LQAS sampling plans should be informed by the *two-stage screening test* model used by SQUEAC. This is discussed in *Panel 1*.

Figure 20 shows the data collected in the small-area survey of the area shown in *Figure 18*. The survey found 12 cases and 3 of these cases were in the program. The appropriate value of *d* for a sample size (n) of 12 and a coverage standard of 50% is:

$$d = \lfloor \frac{n}{2} \rfloor = \lfloor \frac{12}{2} \rfloor = \lfloor 6 \rfloor = 6$$

Since 3 is **not greater** than 6, the coverage in the surveyed area is classified as being **below 50%**.

In a small-area survey undertaken in a rural CTC program, 9 cases were found and 6 of these cases were in the program. The appropriate value of *d* for a sample size (n) of 9 and a coverage standard of 50% is:

$$d = \lfloor \frac{n}{2} \rfloor = \lfloor \frac{9}{2} \rfloor = \lfloor 4.5 \rfloor = 4$$

Since 6 is **greater** than 4, the coverage in the surveyed area is classified as being **above 50%**.

In a small-area survey undertaken in an urban CTC program, 9 cases were found and 6 of these cases were in the program. The appropriate value of *d* for a sample size (n) of 9 and a coverage standard (p) of 70% (i.e. the SPHERE minimum standard for coverage of therapeutic feeding programs in urban settings) is:

$$d = \lfloor n \times \frac{p}{100} \rfloor = \lfloor 9 \times \frac{70}{100} \rfloor = \lfloor 9 \times 0.7 \rfloor = \lfloor 6.3 \rfloor = 6$$

Since 6 is **not greater** than 6, the coverage in the survey area is classified as being **below 70%**.

The LQAS technique may also be used to classify the coverage of outreach activities. For example, using the data presented in *Figure 11* and a coverage standard of 50% of villages in the program's intended catchment area receiving five or more outreach visits in the previous six months:

$$d = \lfloor \frac{n}{2} \rfloor = \lfloor \frac{25}{2} \rfloor = \lfloor 12.5 \rfloor = 12$$

In this example, there are 25 villages in the program's intended catchment area and 6 of these had received five or more outreach visits in the previous six months. Since 6 is **not greater** than 12, the coverage of outreach activities is classified as being unsatisfactory (i.e. below 50%).

The LQAS technique may also be used to classify defaulting and DNA rates. For example, using the data presented in *Figure 15* and a standard for DNA rates of 15% (maximum):

$$d = \lfloor n \times \frac{p}{100} \rfloor = \lfloor 15 \times \frac{15}{100} \rfloor = \lfloor 15 \times 0.15 \rfloor = \lfloor 2.25 \rfloor = 2$$

In this example there are 7 DNA cases from 15 referrals. Since 7 is **greater** than 2, the DNA rate for referrals from this particular CBV is classified as being unsatisfactory (i.e. above 15%).

SQUEAC Use-studies

The first SQUEAC use-study examined the ability of the LQAS method to classify coverage correctly and was undertaken by VALID International and World Vision in Ethiopia in March 2007. Six small-area surveys were undertaken:

- Six OTP sites were selected at random.
- Three villages (*kebeles*) were selected at random from each OTP site catchment area.
- Five localities / sub-villages (*gotts*) where then selected at random from each of the selected villages.
- Each locality / sub-village was sampled using active and adaptive case-finding.

The *true coverage* for each OTP site was estimated using data from a CSAS survey undertaken at the same time as the small-area surveys. The results from these small-area surveys are shown in *Table 2*. The LQAS method correctly classified coverage in each of the six OTP catchment areas.

The second SQUEAC use-study, undertaken in a Concern Worldwide CTC program in the Democratic Republic of Congo in November 2007, concentrated on the use and availability of routine program data and anecdotal data to identify areas with either low attendance rates or high defaulting and DNA rates and the ability of local program staff to collect and analyse data from these sources and to plan, undertake, and analyse data from small-area surveys. The results of this use-study are summarised in *Table 3*. Local staff proved capable of using routine program data to identify probable areas of low coverage and reasons for non-attendance and defaulting when these data were available and presented using simple graphs, tables, and maps. They had no difficulties mapping routine program data. The collection and analysis of routine program data needed to be improved and standardised. Such a change would lead to better program monitoring as well as facilitate coverage assessment using the SQUEAC method in the future. Local staff also had no difficulty undertaking small-area surveys and analysing survey data using the LQAS technique. Collection and analysis of anecdotal data by local program staff proved problematic, particularly with informal group discussions. This situation may improve with careful selection and training of local staff.

The third SQUEAC use-study, undertaken within a Ministry of Health (MoH) operated CTC program in Zambia in April 2008, was the first full test of the SQUEAC method including the use of LQAS techniques to classify “headline” or overall coverage using the SLEAC method (see below). Previous use-studies had been performed with considerable input and supervision from VALID staff. This use-study was performed with restricted input (i.e. two half-day training sessions) and supervision (i.e. telephone support). All fieldwork was conducted by MoH monitoring and evaluation staff. A small number of observational visits were undertaken by VALID staff. Only minimal levels of supervision and / or instruction were given during these visits. The use-test proved successful. The SQUEAC method can be used by MoH staff and and is capable of returning useful monitoring and evaluation data. The use of LQAS techniques to classify overall coverage (SLEAC) is also possible for MoH staff and proved capable of returning useful monitoring and evaluation data. The collection and analysis of anecdotal data by local program staff did not prove problematic in this use-study despite the minimal training given. This may have been because most of the survey staff were familiar with techniques such as clinical history taking and many had been recently involved in a community-based health and sanitation program which had used methods such as informal group discussions to determine needs and decide appropriate intervention modalities.

Application of the SQUEAC method

The SQUEAC method has been designed to allow periodic assessment of program coverage at reasonable cost. This means that it is suited to being used within a *clinical audit* framework.

Clinical audit is a quality improvement and monitoring method that seeks to improve service delivery through systematic review against specific *criteria* and *standards* and the implementation of change. The most commonly used framework for clinical audit is the *audit cycle* (*Figure 23*).

The six components of the audit cycle are:

> **Identify topic :** In SQUEAC assessments the topic is program coverage.
>
> **Set criteria and standard :** The *criteria* is what should be happening. In SQUEAC assessments this is:
>
> > *A child suffering from, or recovering from, severe acute undernutrition should be attending a therapeutic feeding program.*
>
> The *standard* is how frequently the criteria should be happening. The standard used for SQUEAC assessments should, as a starting point, be the appropriate SPHERE minimum standard (e.g. 50% coverage for a therapeutic feeding program in a rural setting). SPHERE standards are **minimum** standards and CTC programs are capable of delivering coverage levels that are much higher than SPHERE minimum standards. Initial SQUEAC assessments are likely to use the appropriate SPHERE minimum standard but this standard should be increased (e.g. for coverage) or decreased (e.g. for defaulting and DNA rates) in subsequent SQUEAC assessments (i.e. once the program is consistently meeting the appropriate SPHERE minimum standard).
>
> **Establish current practice :** This is done using the SQUEAC method or another method designed to classify or estimate program coverage and identify barriers to service access and uptake (e.g. SLEAC or CSAS).
>
> **Compare with standard :** The results of the SQUEAC assessment are compared with the current standard.
>
> **Identify and implement change :** The results of the SQUEAC assessment may indicate that the standard is not being met and why and where this is the case. The SQUEAC assessment identifies problems with the program and suggests remedial actions to be implemented.
>
> **Repeat audit :** Audit is a *cyclical process* and SQUEAC assessments should be repeated every three or four months in order to investigate how effective any changes have been and whether further work is required.

The audit cycle aims to provide continual and incremental improvements to practice. This means that the standard should be increased once a previous standard has been met. The aim of clinical audit is to approach *best practice* over a number of audit cycles. Once best practice has been achieved (e.g. in emergency-response CTC programs in rural settings this means coverage levels of 70% or higher), the audit process continues in order to confirm that best practice is being sustained.

Clinical audit, SQUEAC, and the observer effect

SQUEAC and other assessments tend to create an *observer effect* with the assessment itself acting to improve program coverage in the short term regardless of whether or not remedial action has been implemented or is appropriate. There are several reasons for this:

- Follow-up of defaulting cases may result in some cases returning to the program.
- Follow-up of DNA cases may result in some cases attending the program for the first time.
- Outreach workers, community-based volunteers, and other program staff may perform better when they know that their work is being assessed.
- Collection of anecdotal data may have a “community mobilisation” effect and increases awareness in the community with regard to the program's existence, purpose, location, clinic days and times, and admission criteria.
- Small-area surveys refer cases to the program from areas in which coverage was previously unsatisfactory.

SQUEAC assessments that are repeated too frequently are likely to observe these short term improvements in program coverage and spatial reach and, mistakenly, attribute such improvements to the remedial actions implemented as a result of the assessment. It is advisable, therefore, that SQUEAC assessments are performed at intervals of no shorter than three or four months. This will allow time for the observer effect to “fade” and for changes to be implemented and take effect. Analysis of (e.g.) the home locations of beneficiaries should be restricted to admissions in the two months prior to the start of the SQUEAC assessment.

SLEAC : Estimating and classifying "headline" program coverage

The SQUEAC method was **not** designed to provide "headline" or overall *estimates* of program coverage. Such estimates may be obtained using the CSAS survey method. It is possible, however, to *classify* "headline" coverage using LQAS techniques. The advantage of using LQAS techniques is that it requires a relatively small sample size in order to make a reliable *classification*. Using LQAS techniques to make a "headline" coverage classification requires:

A first stage sampling method : This is the sampling method that is used to select the villages to be sampled. CSAS assessments use the *centric systematic area sampling* or *quadrat* method to select villages to be sampled. If only a "headline" coverage classification is required then a similar method could be used to select villages to be sampled. The number of quadrats drawn on the map can be smaller than would be used for a CSAS assessment (this is the same as using larger quadrats). The villages to be sampled would then be selected by their proximity to the centre of each quadrat as is done in a standard CSAS survey (*Figure 24*). Such an approach would be appropriate for classifying coverage over a wide area such as a health district. In developmental settings it may be desirable to classify coverage over a wide area and also for individual clinic catchment areas. In such situations, a stratified (i.e. by clinic catchment area) sample could be taken with villages selected at random from a *complete* list of villages within each catchment area (*Figure 25*). This is similar to the approach taken in the first SQUEAC use-study (see above).

A within-community sampling method : This will usually be an active and adaptive case-finding method (see *Box 2*) or a house-to-house *census* sampling method.

An LQAS sampling plan : This provides a target sample size (n) which, together with prevalence and population estimates, is used to decide the number of villages to sample (see below). The target sample size (n) is larger than is required for the small-area surveys used in the SQUEAC method. This is because the classification will be made using a single stage screen (see *Panel 1*). Suitable sampling plans can be selected using the *rule-of-thumb* formulae presented earlier in this article or an LQAS sampling plan calculator. *Figure 26* shows an LQAS sampling plan calculator being used to select a sampling plan. This LQAS sampling plan calculator is available, free of charge, from:

`http://www.validinternational.org/pages/sub.cfm?id=1780`

As a rule, you should aim for a target sample size (n) of twenty (20) or more. Larger sample sizes yield more reliable results (see below). This means that you should aim for the largest sample size that it is practical to collect.

A sample size calculation : The target sample size (n) from the LQAS sampling plan together with estimates of the prevalence of severe acute undernutrition in the survey area and population data is used to calculate the number of villages that will need to be sampled:

$$n_{villages} = \frac{n}{average \;\; village \;\; popualtion_{all\,ages} \times \frac{percentage \;\; of \;\; population_{6\text{-}59\,months}}{100} \times \frac{prevalence}{100}}$$

Once these decisions and calculations have been made, sampling locations can be identified and the survey undertaken. A standard questionnaire, such as that shown in *Box 1*, should be applied to carers of non-covered cases found by the survey.

Here is an example of the calculations required:

Target sample size : A target sample size (n) of 39 cases was selected using an LQAS sampling plan calculator. This sampling plan (i.e. $n = 39$, $d = 19$) is shown in *Figure 26*.

Number of villages to be sampled : The following information was used to calculate the number of villages to be sampled:

Target sample size :	39
Average village population (all ages) :	600
Prevalence of severe acute undernutrition :	1%
Percentage of children aged between 6 and 59 months :	20%

The percentage of children aged between 6 and 59 months is usually assumed to be about 20% in developing countries. You should use 20% unless you have better information from (e.g.) a recent census or population survey.

Using this information the number of villages to be sampled was calculated to be:

$$n_{villages} = \frac{39}{600 \times \frac{20}{100} \times \frac{1}{100}} = 33$$

It is unlikely that a survey will return the target sample size (n) exactly. If a survey does not return the target sample size exactly then a value for the LQAS classification threshold value (d) for the achieved sample size should be calculated using the *rule-of-thumb* formulae presented earlier. For example:

Target sample size :	39
Achieved sample size :	43
Standard :	50%
d :	$\lfloor \frac{43}{2} \rfloor = \lfloor 21.5 \rfloor = 21$

LQAS sampling plan calculation software could also be used (*Figure 26*) to do this. Coverage is classified using the same technique as is used for SQUEAC small-area surveys. For example:

n :	43
d :	21
Covered cases found :	29
Coverage classification :	Satisfactory (since 29 > 21)

Analysis of data collected in individual clinic catchment areas is analysed in the same way although the probability of error may be considerable if sample sizes are very small.

Data collected using the standard questionnaire (*Box 1*) can be presented using a *Pareto* chart similar to those shown in *Figure 2* and *Figure 19*.

Sample sizes for "headline" coverage classifications

Classifications made from sample surveys are probabilistic in nature and this will, inevitably, lead to occasional misclassifications. The typical behaviour of an LQAS sampling plan is summarised in *Table 4*. The behaviour of a sampling plan may be summarised more formally using an *operating characteristic* curve. *Figure 27(A)*, for example, shows the operating characteristic curve of an LQAS sampling plan for the 50% coverage standard with a sample size of twenty cases created using the *rule-of-thumb* formula:

$$d = \lfloor \frac{n}{2} \rfloor = \lfloor \frac{20}{2} \rfloor = \lfloor 10 \rfloor = 10$$

Figure 27(A) shows that, using this sampling plan, the probability of a high coverage classification is zero when the true coverage is very low and one when the true coverage is very high. This matches the behaviour outlined in *Table 4*. The probability of this sampling plan returning a high coverage classification when the true coverage is 60% is approximately 0.75. With this sampling plan there is about a 25% chance of classifying a program with a coverage of 60% as having a coverage below 50%. The chances of making *classification errors* like this can be reduced by increasing the sample size used. For example, *Figure 27(B)* and *Figure 27(C)* show operating characteristic curves for LQAS sampling plans with sample sizes of forty and eighty cases respectively. The probability of making classification errors reduces as the sample size increases. Larger sample sizes yield more reliable results. This means that you should aim for the largest sample size that is is practical to collect.

Different levels of classification

The LQAS technique provide *binary* or *two-class* classifications. The method can be extended to provide more granular classifications. Three-class classifications require two sampling plans. These are created using the *rule-of-thumb* formulae presented earlier. There are two coverage proportions:

p_1 : The upper limit of the "low coverage" class

p_2 : The lower limit of the "high coverage" class

The "moderate coverage" class runs from p_1 to p_2. Two classification thresholds (d_1 and d_2) are used and are calculated as:

$$d_1 = \lfloor n \times \frac{p_1}{100} \rfloor \qquad d_2 = \lfloor n \times \frac{p_2}{100} \rfloor$$

Here is an example of the calculations required:

Sample size : 40

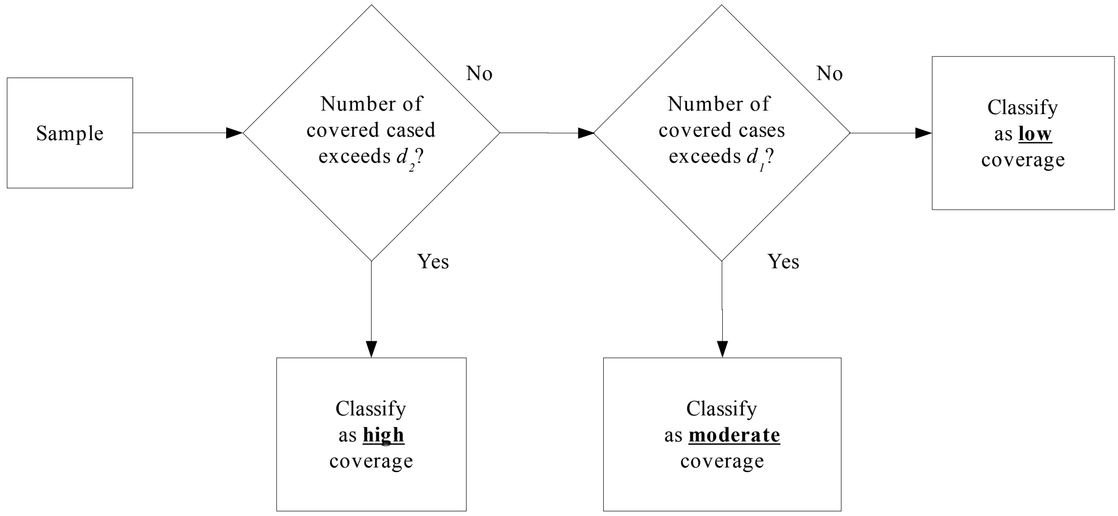
p_1 : 30%

p_2 : 70%

d_1 : $\lfloor n \times \frac{p_1}{100} \rfloor = \lfloor 40 \times \frac{30}{100} \rfloor = \lfloor 12 \rfloor = 12$

d_2 : $\lfloor n \times \frac{p_2}{100} \rfloor = \lfloor 40 \times \frac{70}{100} \rfloor = \lfloor 28 \rfloor = 28$

Classifications are made using the following algorithm:



Expressed in words:

if the number of covered cased > d_2 then classify as **high** coverage

  else ...

    if the number of coverage cases > d_1 then classify as **moderate** coverage

      else ...

        classify as **low** coverage

For example, a survey classifying coverage in individual clinic catchment areas using a target sample size of thirty cases for each catchment area and p_1 = 30% and p_2 = 70% returned the following data:

Clinic catchment area	Sample size	d_1	d_2	Number of covered cases	Classification
Chawama	28	8	19	21	High
Matero	32	9	22	15	Moderate
Makeni	33	9	23	26	High
Chipata	35	10	24	12	Moderate
Ngombe	24	7	16	9	Moderate
Kalingalinga	37	11	25	8	Low
Mtendere	32	9	22	3	Low
Kanyama	31	9	21	19	Moderate
All	**252**	**75**	**176**	**113**	**Moderate**

The typical behaviour of a three-class sampling plans used in this way is summarised in *Table 5*. The behaviour of a three-class sampling plan may be summarised more formally using a *probability of classification* plot. *Figure 28* shows probability of classification plots for three three-class LQAS sampling plans for p_1 = 30% and p_2 = 70% with sample sizes of twenty, forty, and eighty cases. As with two-class sampling plans, larger sample sizes yield more reliable results. This means that you should aim for the largest sample size that is is practical to collect.

Conclusions

The work presented in this article suggests that the SQUEAC approach is likely to prove a suitable method for frequent and ongoing evaluation of program coverage and identification of barriers to service access and uptake. The SQUEAC approach is also capable of providing a similar richness of information as is provided by the CSAS method.

If such an approach were to be adopted and integrated into program activities it would encourage the routine collection and appropriate analysis of program planning and evaluation data. Adoption and integration will involve the use of a standard monitoring dataset along with the use of standard monitoring tools. In particular, greater emphasis needs to be placed on the use of maps and *complete* lists of communities in program areas.

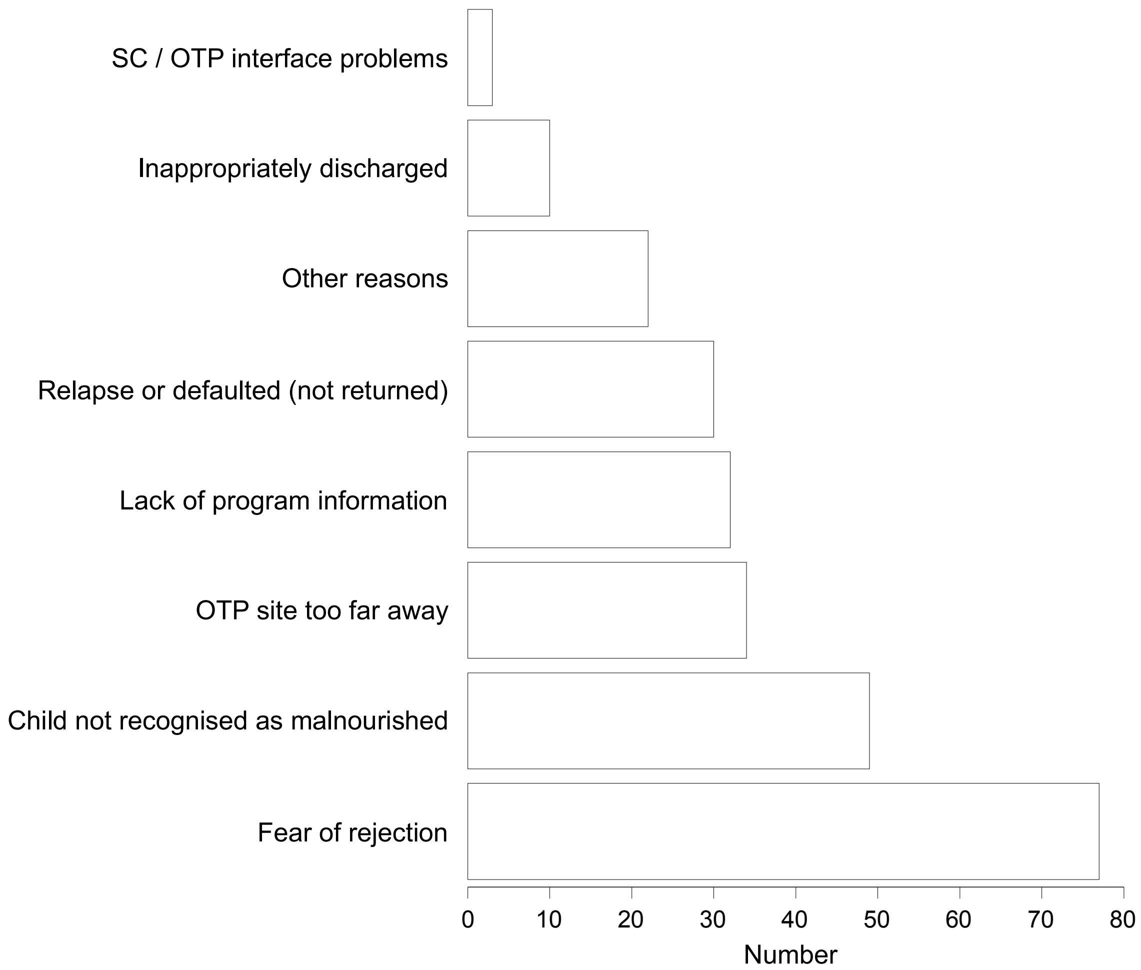
The LQAS method may be used to provide *classifications* of "headline" or overall coverage over wide areas using the SLEAC method. The low sample size requirement means that surveys using the SLEAC method are likely to be less resource intensive than standard CSAS surveys.

NGO staff who have worked in developmental programs and MoH staff are likely to prove capable of collecting and analysing anecdotal data with minimal training. NGO staff recruited for emergency work may require training in collecting and analysing anecdotal data. Work on developing field guides and other training materials for the SQUEAC method should address this issue.

Figure 1 : Map showing the spatial distribution of *point* and *period* coverage in a CTC program

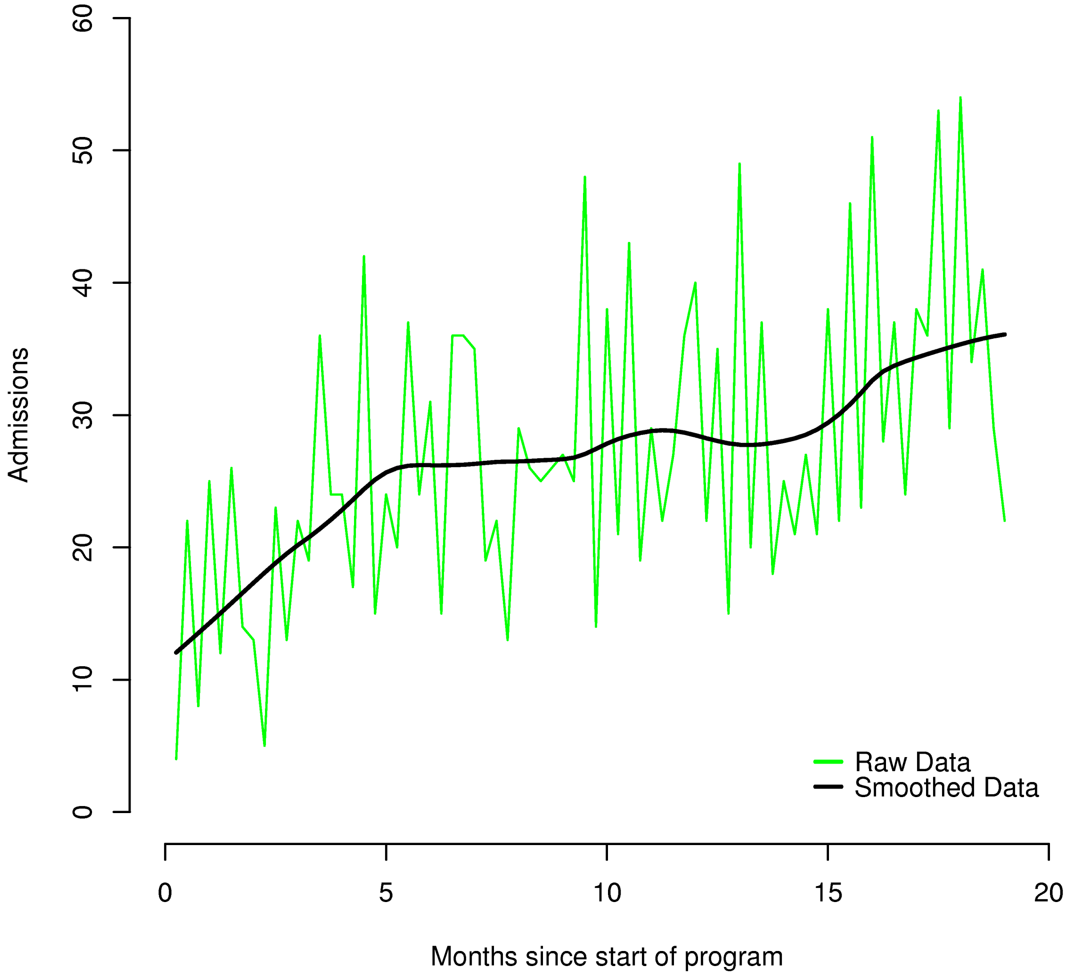
Data courtesy of SC-UK

Figure 2 : Barriers to service access and uptake in a CTC program



Data courtesy of SC-UK

Figure 3 : Plot of OTP and SC admissions over time



Data courtesy of Concern Worldwide

Figure 4 : Pattern of admissions over time over an entire program cycle for an emergency-response CTC program

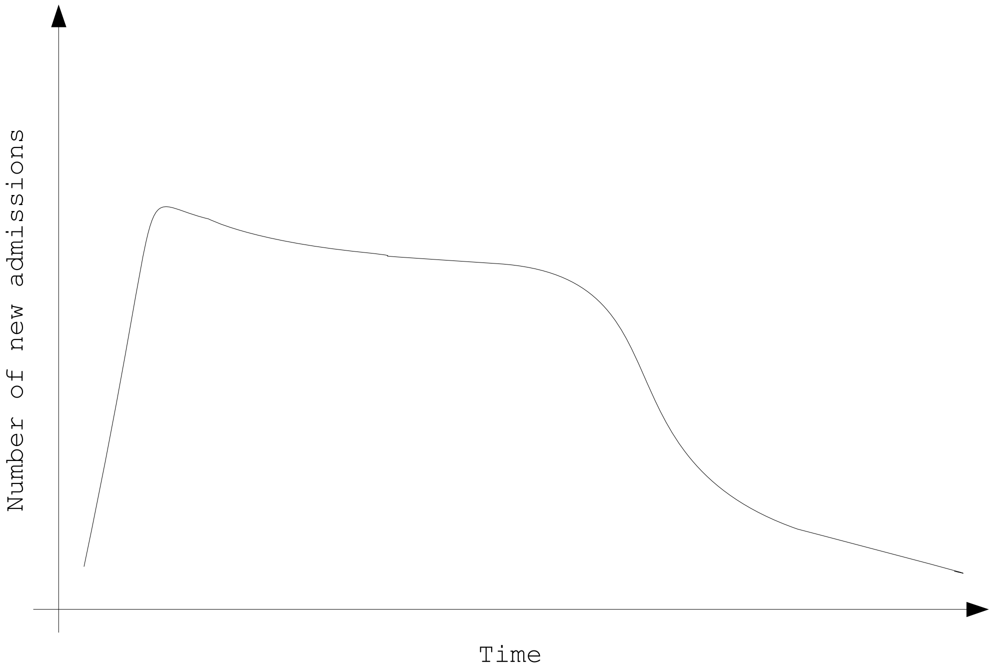


Figure 5 : Admissions over time in a CTC program with initially poor community mobilisation

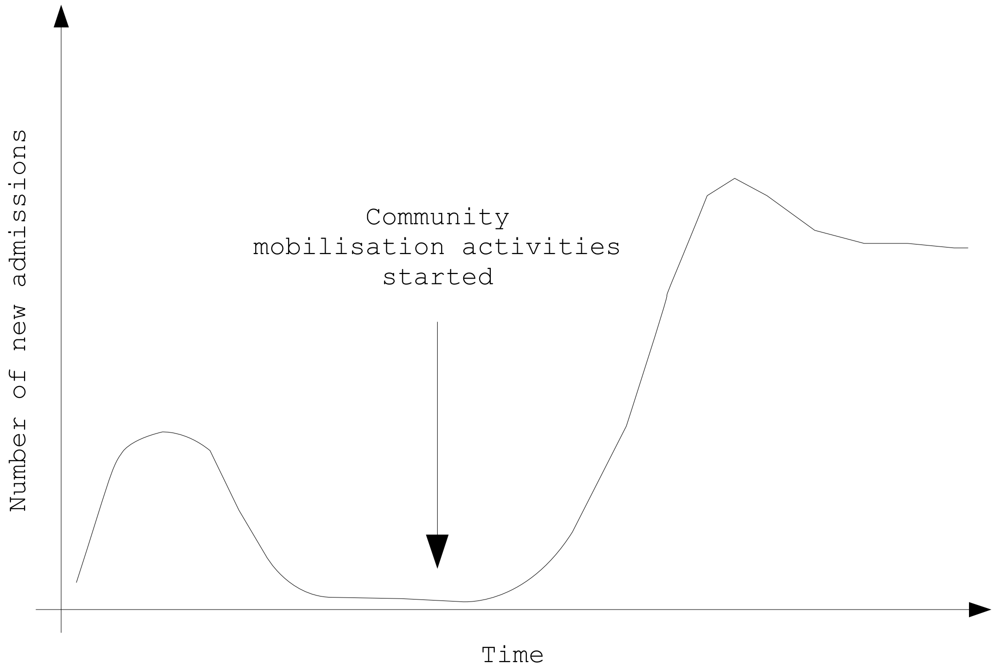


Figure 6 : Pattern of CTC admissions over time with seasonal calendars of human diseases associated with acute undernutrition in children and household food availability

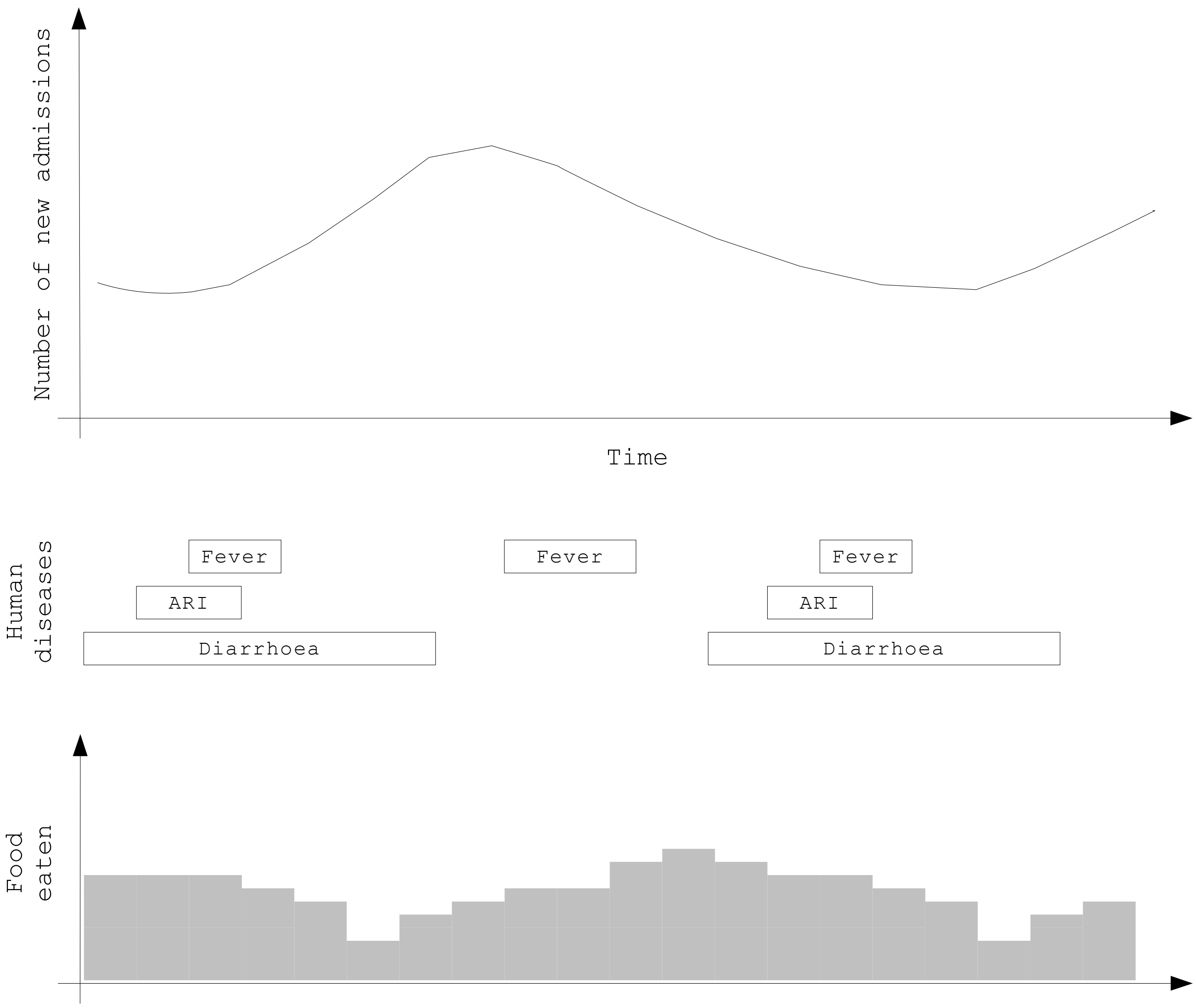
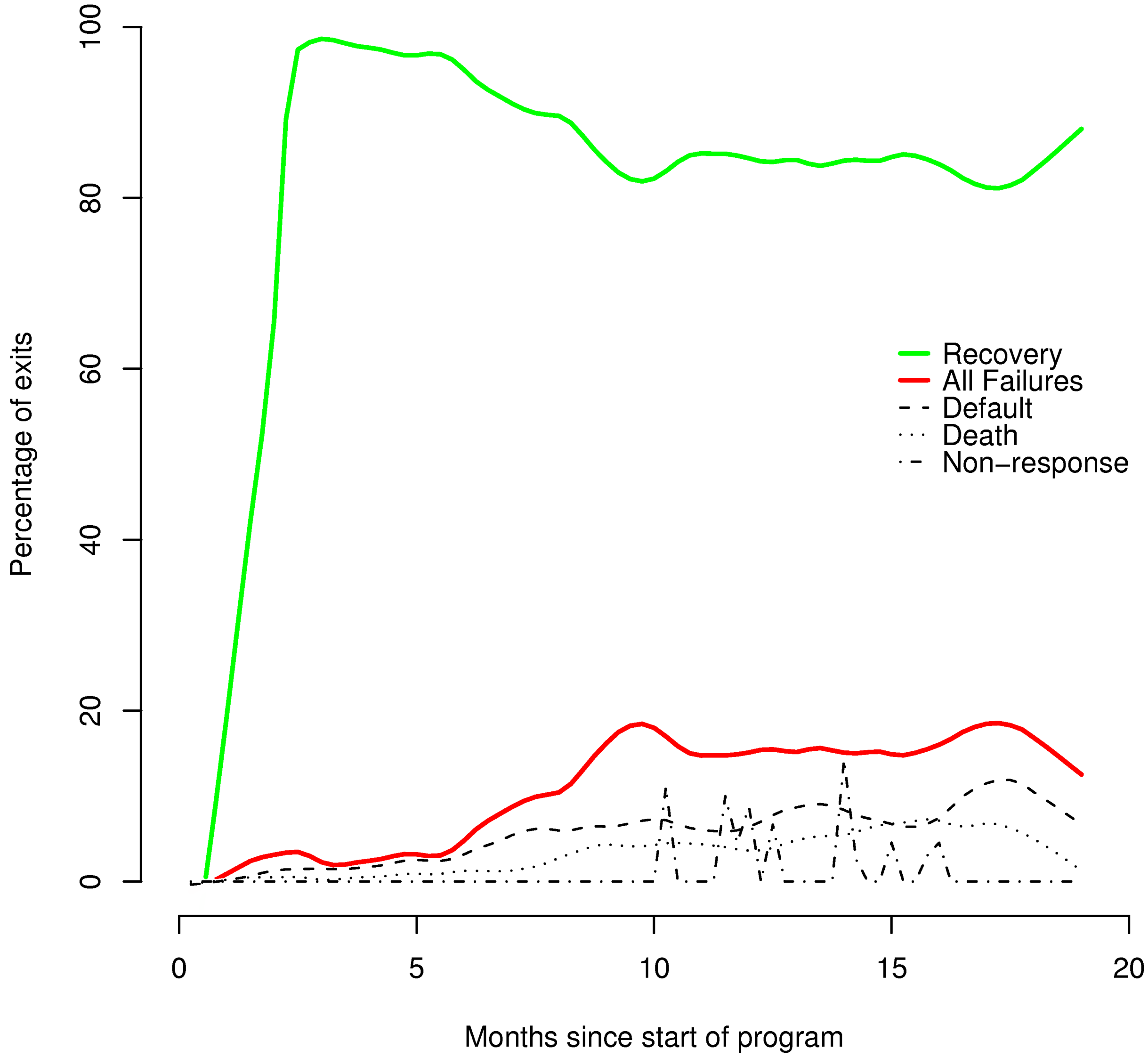


Figure 7 : Standard CTC / TFC program indicator graph



Data courtesy of Concern Worldwide

Figure 8 : Pattern of defaulting rates over time with a seasonal calendar of household labour demand

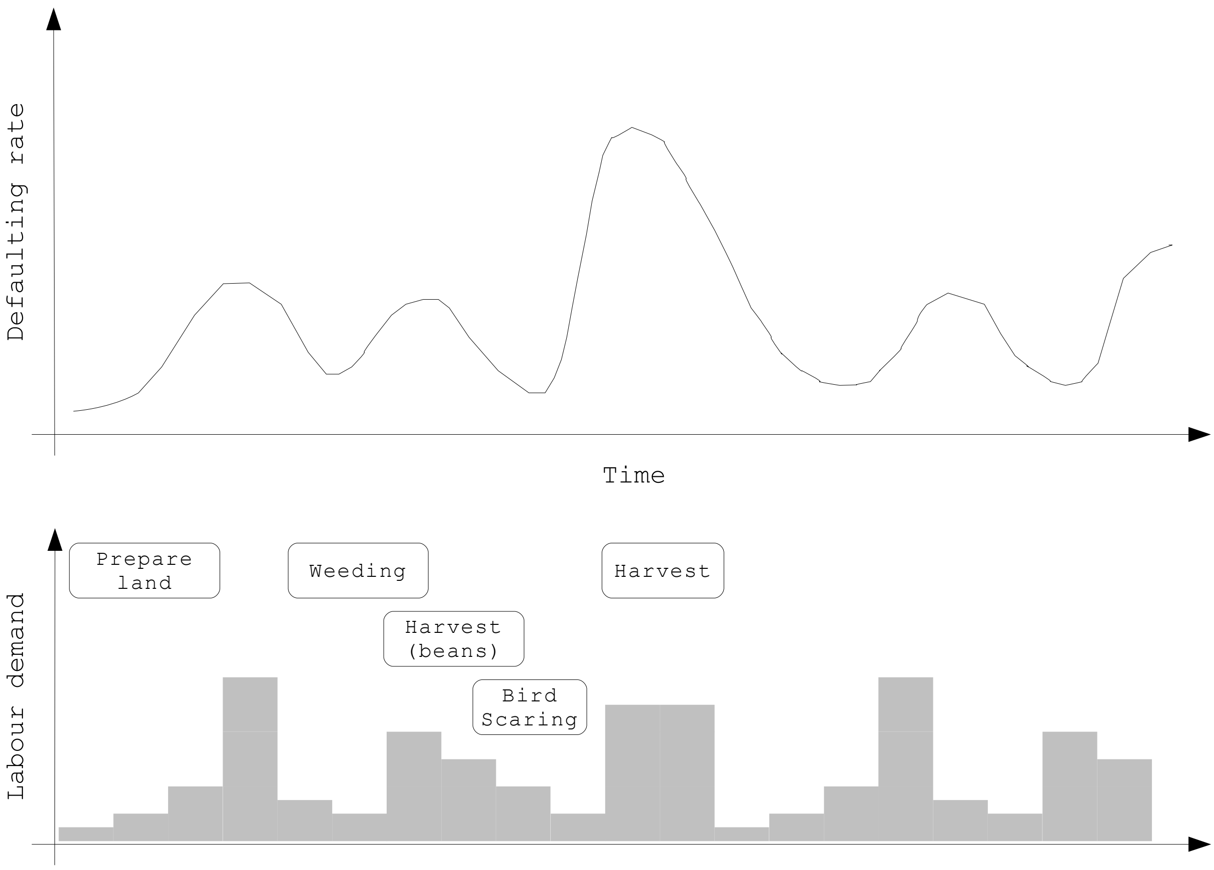


Figure 9 : Home locations of OTP beneficiaries

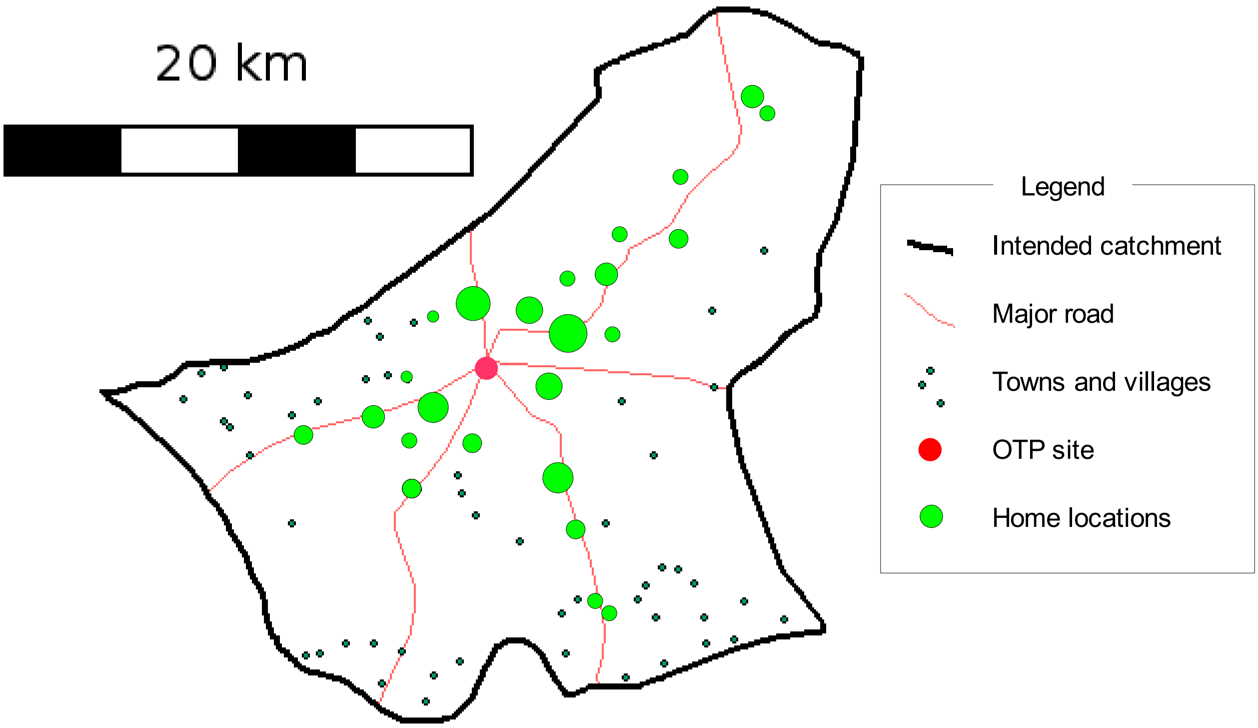


Figure 10 : Villages visited by program outreach workers in the previous two months

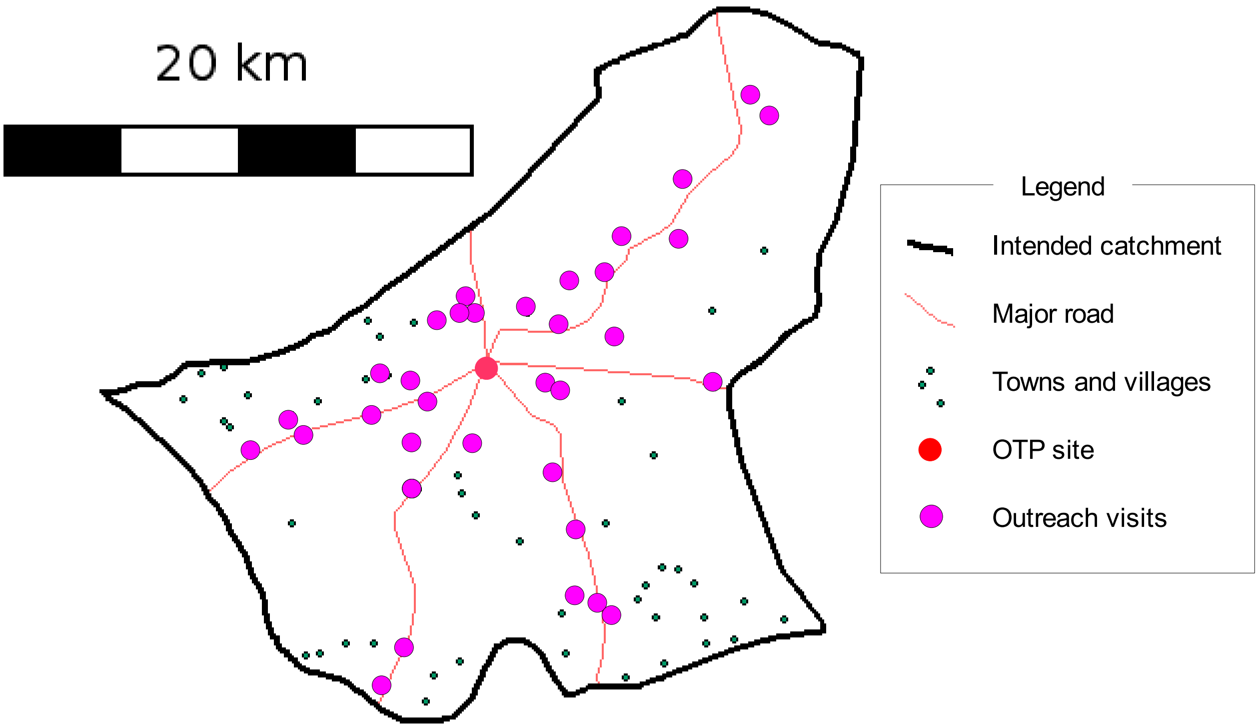


Figure 11 : Dates of outreach visits against a *complete* list of villages

		Month of visit					
Village	Team	Jun	Jul	Aug	Sep	Oct	Nov
Bene Mukenda	1	4/6/07	3/7/07	13/8/07	3/9/07	8/10/07	6/11/07
Bwanaali	2	11/6/07		14/8/07	3/9/07	10/10/07	6/11/07
Bwese	2	11/6/07	30/7/07	27/8/07			
Kamangu	2	18/6/07					
Kandolu	1						
Kasangati	1						
Kasha	2	11/6/07	30/7/07	27/8/07			
Kikumbi	2	18/6/07					
Kingombe	1	4/6/07	3/7/07	6/8/07	3/9/07	15/10/07	12/11/07
Kiyana	1	11/6/07	3/7/07	6/8/07	3/9/07	22/10/07	
Lumanisha	1	18/6/07					
Lwanga	2	25/6/07					
Mbaruku	2						
Milambi	2	18/6/07				9/10/07	
Misuyu	1	4/6/07					
Mubonga	2						
Munganga	1	11/6/07					
Mupuluzi	1		23/7/07	27/8/07			
Mushanyondo	2	4/6/07	3/7/07	6/8/07	10/9/07	15/10/07	28/11/07
Muyumba	1	25/6/07					
Muzee	1	18/6/07					
Mwaka	2	4/6/07	3/7/07	13/8/07			
Mwaza	2	4/6/07	9/7/07	13/8/07	18/9/07		21/11/07
Mwendebule	1	18/6/07	23/7/07				
Mwezia	2	25/6/07	23/7/07				

Figure 12 : Home locations of OTP beneficiaries who defaulted in the previous two months

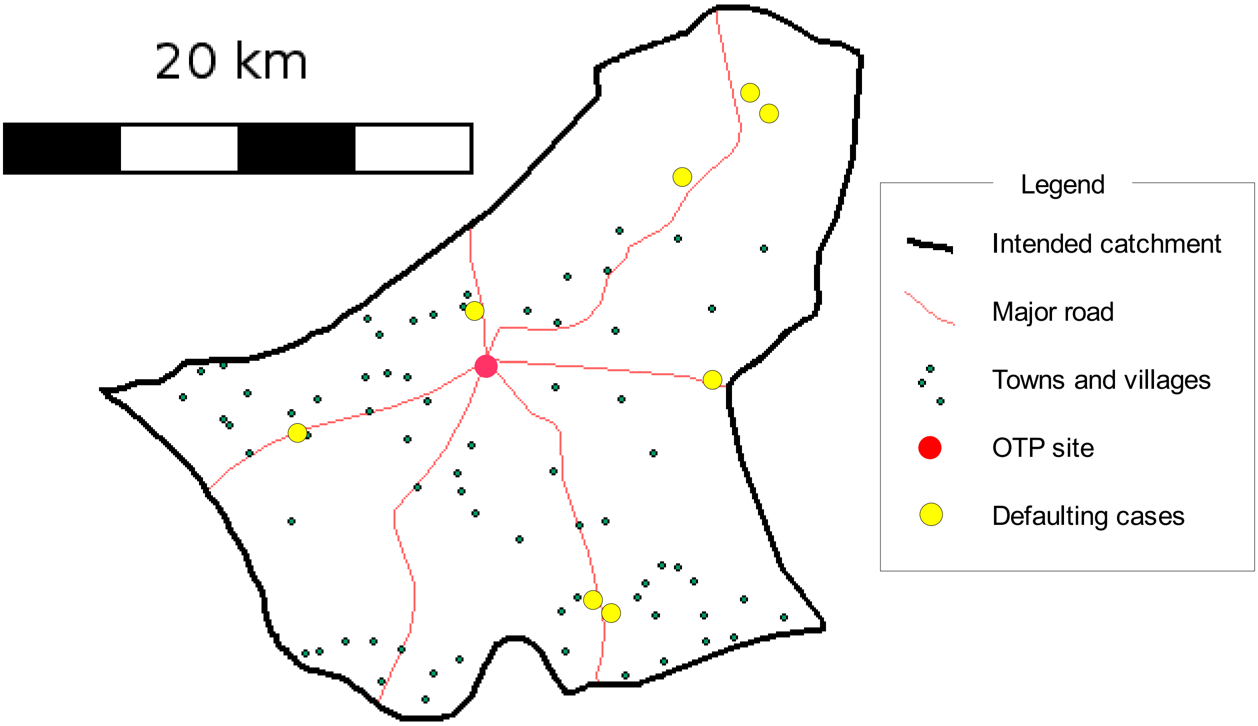
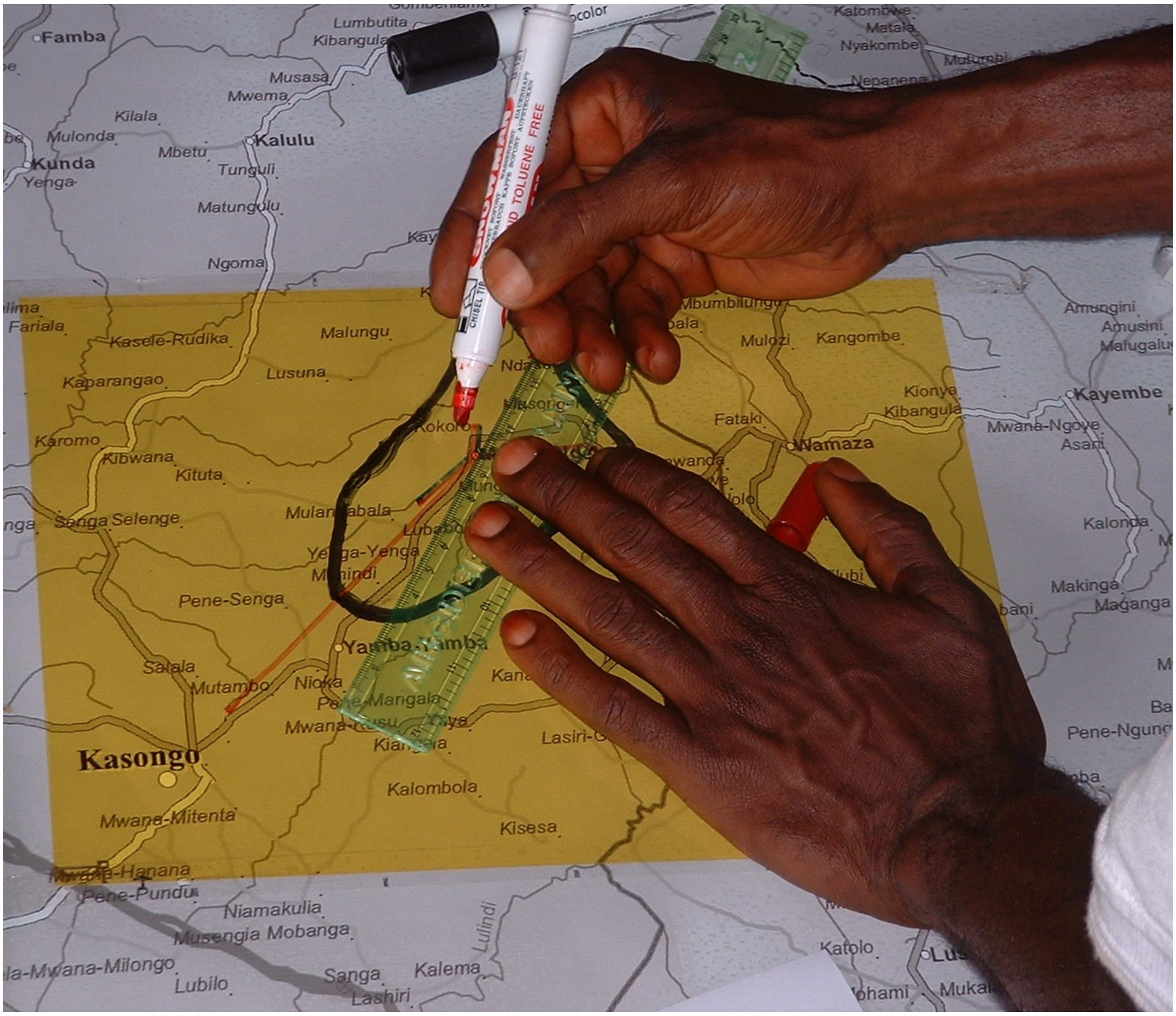


Figure 13 : A coverage assessment worker mapping the home locations of OTP beneficiaries



Photograph courtesy of Concern Worldwide

Table 1 : Use of a table to investigate the effect of distance on admissions and defaulting in the previous month in a single clinic catchment area

<table>
<tr><th>Health zone</th><th>Distance (time to travel)</th><th>Admissions</th><th>Defaulters</th><th>Grouped distance (time to travel)</th><th>Admissions</th><th>Defaulters</th><th>Ratio of defaulters : admissions</th></tr>
<tr><td>2</td><td>10 minutes</td><td>3</td><td>1</td><td rowspan="6">≤ 20 minutes</td><td rowspan="6">11</td><td rowspan="6">4</td><td rowspan="6">36%</td></tr>
<tr><td>1</td><td rowspan="3">15 minutes</td><td>2</td><td>0</td></tr>
<tr><td>4</td><td>1</td><td>1</td></tr>
<tr><td>5</td><td>2</td><td>2</td></tr>
<tr><td>6</td><td rowspan="2">20 minutes</td><td>0</td><td>0</td></tr>
<tr><td>7</td><td>3</td><td>0</td></tr>
<tr><td>3</td><td>30 minutes</td><td>0</td><td>0</td><td rowspan="5">> 20 minutes</td><td rowspan="5">2</td><td rowspan="5">1</td><td rowspan="5">50%</td></tr>
<tr><td>8</td><td rowspan="2">45 minutes</td><td>1</td><td>0</td></tr>
<tr><td>9</td><td>0</td><td>0</td></tr>
<tr><td>10</td><td>60 minutes</td><td>0</td><td>0</td></tr>
<tr><td>11</td><td>90 minutes</td><td>1</td><td>1</td></tr>
</table>

Figure 14 : Cloakroom ticket / raffle ticket referral slip

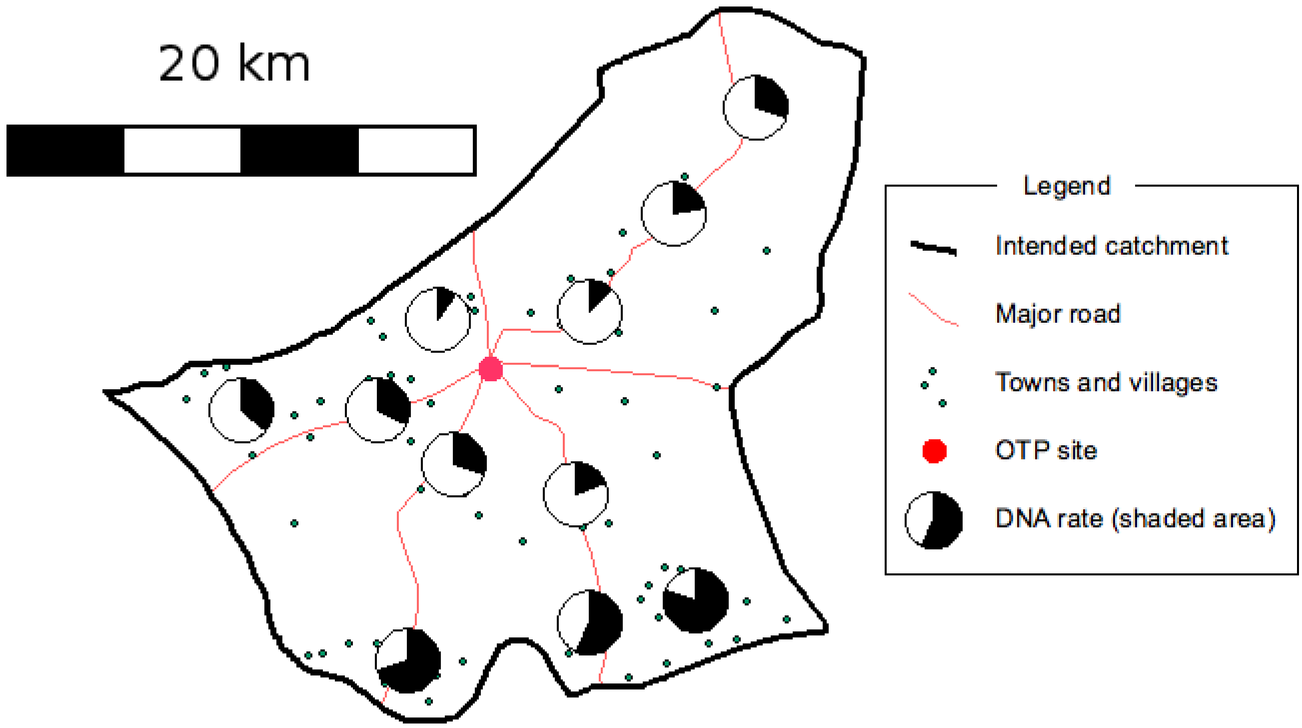
Program zone	:	**RED**
Referring CBV	:	**AC2V YR4R**
CBV Referral Number	:	**19**

Figure 15 : Example analysis of referrals from a CBV

AC2V YR4R		
Referral number	True case	Date of admission
1	Yes	4/6/07
2	Yes	11/6/07
3		
4		
5		
6	Yes	23/7/07
7		
8		
9	No	14/8/07 †
10		
11	Yes	17/8/07
12	Yes	17/8/07
13	Yes	17/8/07
14		
15	Yes	1/10/07

† This child was briefly admitted to program in order to prevent the negative impact on coverage associated with rejected referrals in CTC programs

Figure 16 : DNA rates for cases referred in the previous two months



Box 1 : Questionnaire to be applied to carers of non-covered cases

Questionnaire for carers of cases <u>not</u> in the program

Village : ____

OTP site : ____

Name : ____

1. Do you think that this child is malnourished? |__|

   If YES ...

   2. Do you know of a program that can treat malnourished children? |__|

      If YES ...

      3. What is the name of this program?

         ____

      4. Why is this child not attending this program?

         *Do **not** prompt. Probe "Any other reason?"*

         |__| OTP site is too far away
         |__| No time / too busy to attend the program
         |__| Carer cannot travel with more than one child
         |__| Carer is ashamed to attend the program
         |__| Difficulty with childcare
         |__| The child has been rejected by the program

         Record any other reasons ...

         ____

         ____

         ____

      5. Has this child ever been to the program site or examined by program staff? |__|

         If YES ...

         6. Why is this child not in the program now?

            |__| Previously rejected
            |__| Defaulted
            |__| Discharged as cured
            |__| Discharged as not cured

Thank carer. Issue a referral slip. Inform carer of site and date to attend.

The tick box items for question 4 were selected after analysis of the collected program and anecdotal data. Using tick boxes for the most commonly expected responses simplifies both data collection and analysis

Figure 17 : Triangulation of SQUEAC data

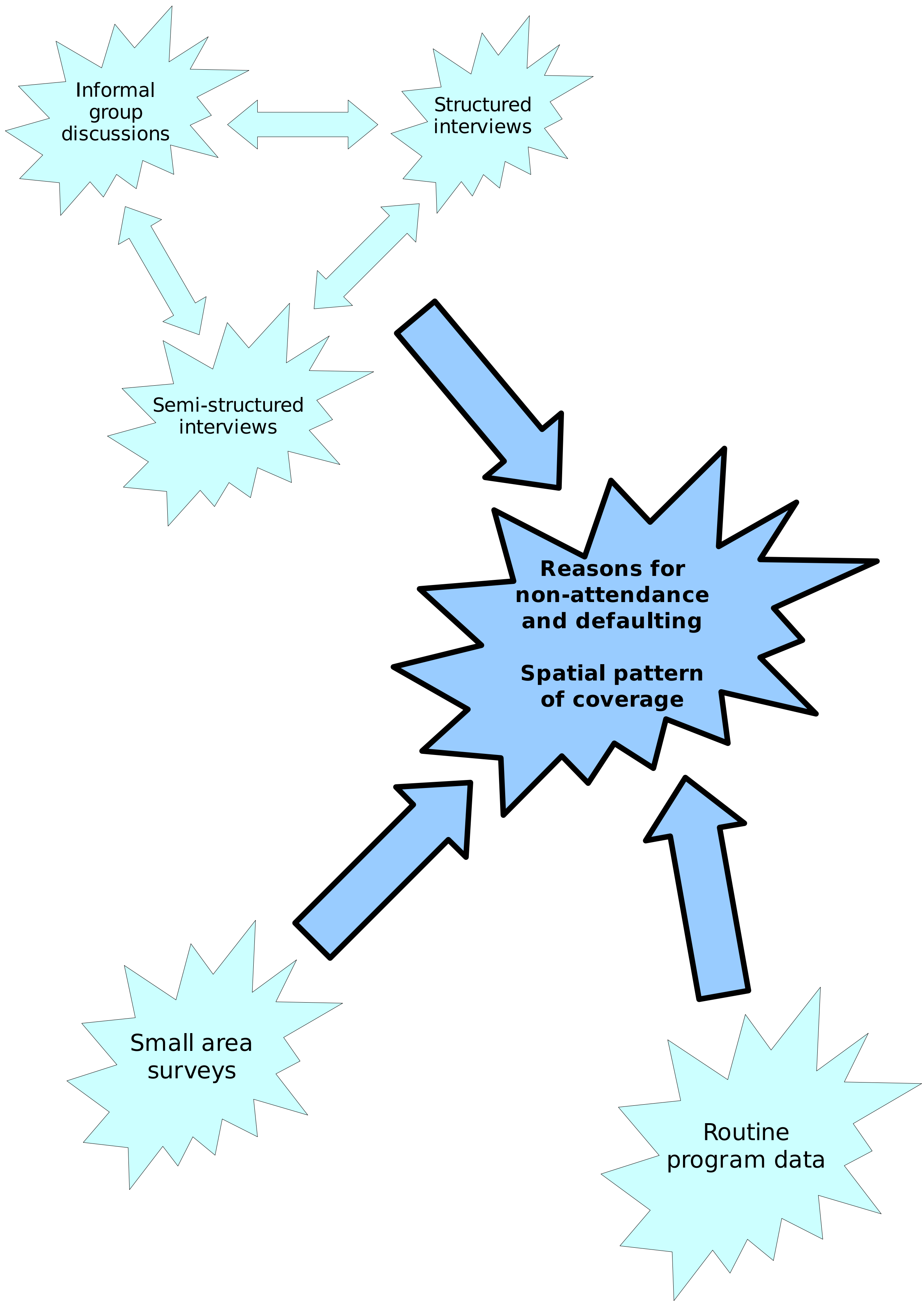
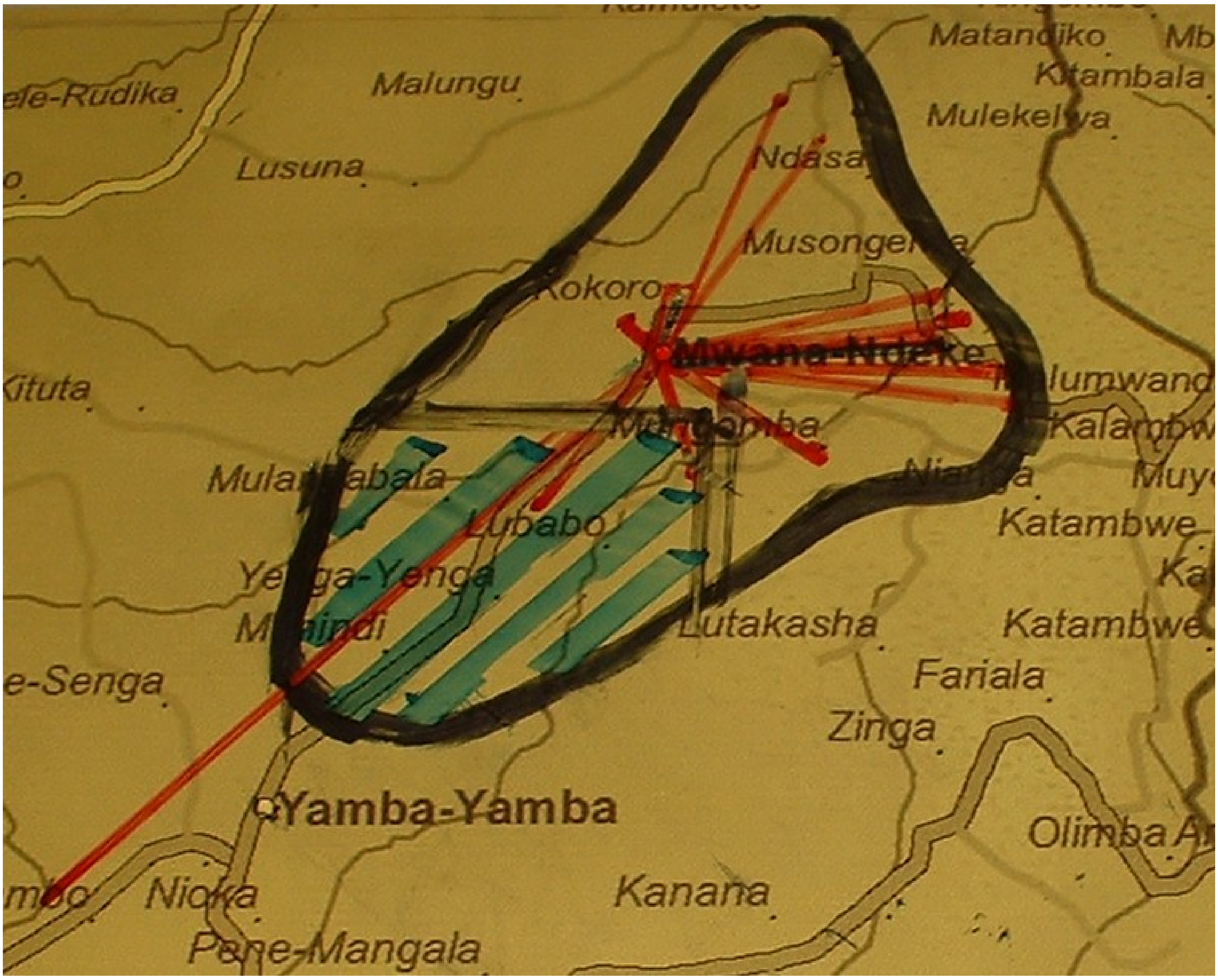


Figure 18 : Area of probable low coverage identified by mapping of home locations (shown), analysis of outreach activities, defaulter follow-up, and anecdotal data



Photograph courtesy of Concern Worldwide

Box 2 : Active and adaptive case-finding

The within-community case-finding method used in both SQUEAC small-area surveys, SLEAC, and CSAS surveys is *active* and *adaptive*:

> **ACTIVE :** The method actively searches for cases rather than just expecting cases to be found in a sample.
>
> **ADAPTIVE :** The method uses information found during case-finding to inform and improve the search for cases.

Active and adaptive case-finding is sometimes called *snowball sampling* or *optimally biased sampling*.

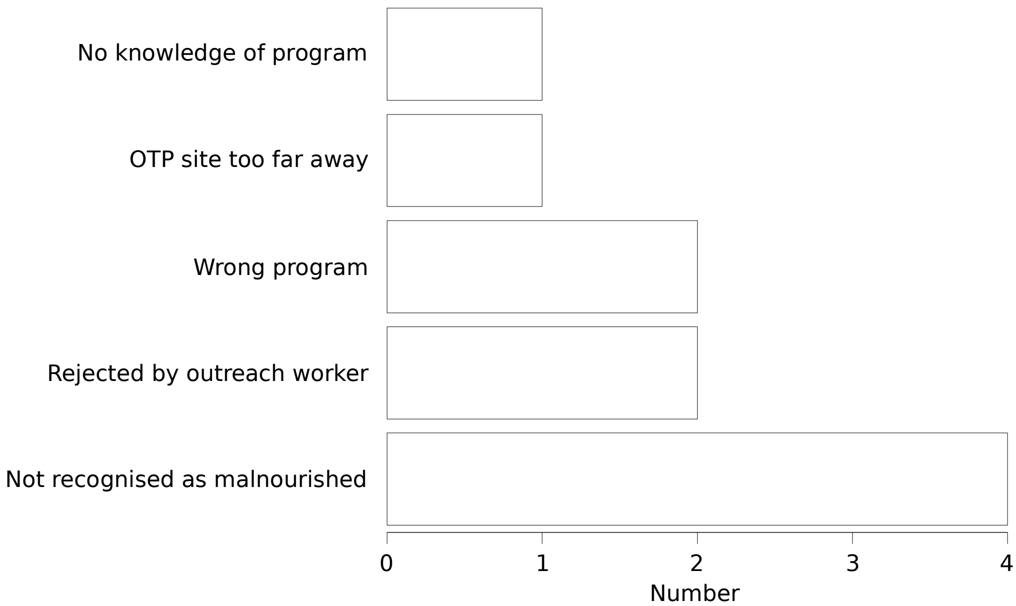
Experience with CSAS surveys indicates that the following method provides a useful starting point:

> Ask community health workers, traditional birth attendants, traditional healers or other key informants to take you to see "children who are sick, thin, or have swollen legs or feet" and then ask mothers and neighbours of confirmed cases to help you find more cases.

The basic case-finding question (i.e. "children who are sick, thin, or have swollen legs or feet") should be adapted to reflect community definitions of malnutrition and to use local terminology. Markers of risk (e.g. orphans, single parents, neglected or abused children, households without land or livestock, &c.) may also be included in the case-finding question.

It is important that the case-finding method that you use finds all, or nearly all, cases in the sampled communities.

Figure 19 : Barriers to service uptake found in a SQUEAC small-area survey



Data courtesy of Concern Worldwide

Panel 1 : Consideration of classification errors associated with LQAS sampling plans

It is important to realise what the two probabilities of error mean in *operational* terms in the LQAS sampling plans used in SQUEAC assessments. We will consider the following LQAS sampling plan:

Variable	Value	Notes
n :	9	Calculated using the *rule-of-thumb* formula for a 50% coverage standard
d :	4	
Low coverage :	30%	A *low* level of coverage
High coverage :	70%	A *high* level of coverage
Standard :	50%	The SPHERE minimum standard and the average of *Low* and *High* above
Lower error :	9.1%	Survey returns *high* when true proportion is *low*
Upper error :	9.7%	Survey returns *low* when true proportion is *high*

For simplicity of calculation we will assume that both errors are 10%. If we use this LQAS sampling plan to classify coverage in 100 survey areas of which 10 (10%) have unsatisfactory coverage we will get:

True Coverage	Number	Classified correctly	Error
Unsatisfactory	10 (10%)	**9 (90%)**	1 (10%)
Satisfactory	90 (90%)	81 (90%)	**9 (10%)**

In this case we would choose to intervene in 18 areas, 9 (50%) of which do not actually require intervention. The effect of the two errors is different if 50 (50%) of the 100 surveyed areas have unsatisfactory coverage:

True Coverage	Number	Classified correctly	Error
Unsatisfactory	50 (50%)	**45 (90%)**	5 (10%)
Satisfactory	50 (50%)	45 (90%)	**5 (10%)**

In this case we would choose to intervene in 50 areas, only 5 (10%) of which do not actually require intervention. LQAS can be viewed as a type of *screening test*:

10 / 100 surveys areas with unsatisfactory coverage

		Classified Coverage		
		Unsatisfactory	Satisfactory	
True Coverage	Unsatisfactory	9	1	10
	Satisfactory	9	81	90
		18	82	100

Sensitivity : 90%
Specificity : 90%
Negative predictive value : 99%
Positive predictive value : 50%

50 / 100 surveyed areas with unsatisfactory coverage

		Classified Coverage		
		Unsatisfactory	Satisfactory	
True Coverage	Unsatisfactory	45	5	50
	Satisfactory	5	45	50
		50	50	100

Sensitivity : 90%
Specificity : 90%
Negative predictive value : 90%
Positive predictive value : 90%

In this context, the ***positive predictive value*** is the measure of appropriate resource utilisation.

SQUEAC uses a *two-stage screening test model*:

Stage 1 : Identification of probable low coverage areas using routine program data and anecdotal data.

Stage 2 : Small area-surveys of areas identified in stage 1 analysed using the LQAS technique.

If we assume that the first stage screen has a sensitivity of 100% and a specificity of 80%, that there are 100 potential areas to survey and 10 of these areas have poor coverage (as in the example above), and we use an LQAS sampling plan with *upper* and *lower* errors of 10% we will get:

First Stage (routine and anecdotal data)

		Classified Coverage		
		Unsatisfactory	Satisfactory	
True Coverage	Unsatisfactory	10	0	10
	Satisfactory	18	72	90
		28	72	100

Second Stage (small-area survey / LQAS)

		Classified Coverage		
		Unsatisfactory	Satisfactory	
True Coverage	Unsatisfactory	9	1	10
	Satisfactory	2	16	18
		11	17	28

Positive predictive value : 82%

Figure 20 : Data from the small-area survey of the area shown in *Figure 18*

OTP Site : Mwene-Ndeke

Locality	Cases	Covered
Pene Mukenda	I	—
Kasangati	I	—
Mubonga	I	—
Kamangu	II	—
Muzee	I	I
Bwanaali	I	—
Mupuluzi	~~IIII~~	II

Data courtesy of Concern Worldwide

Table 2 : Results from six small-area surveys from the first SQUEAC use-study

OTP Site	True Coverage	Cases Found (n)	Covered Cases (c)	$d = \lfloor \frac{n}{2} \rfloor$	Is $c > d$?	Classified Coverage
Bezena Benara	> 50%	15	9	7	Yes	> 50%
Jore	> 50%	5	3	2	Yes	> 50%
Yebu	< 50%	16	6	8	No	< 50%
Funto	< 50%	21	7	10	No	< 50%
Demboya	> 50%	5	3	2	Yes	> 50%
Adilo	< 50%	9	2	4	No	< 50%

Data courtesy of World Vision

Table 3 : Summary of results from the second SQUEAC use-study

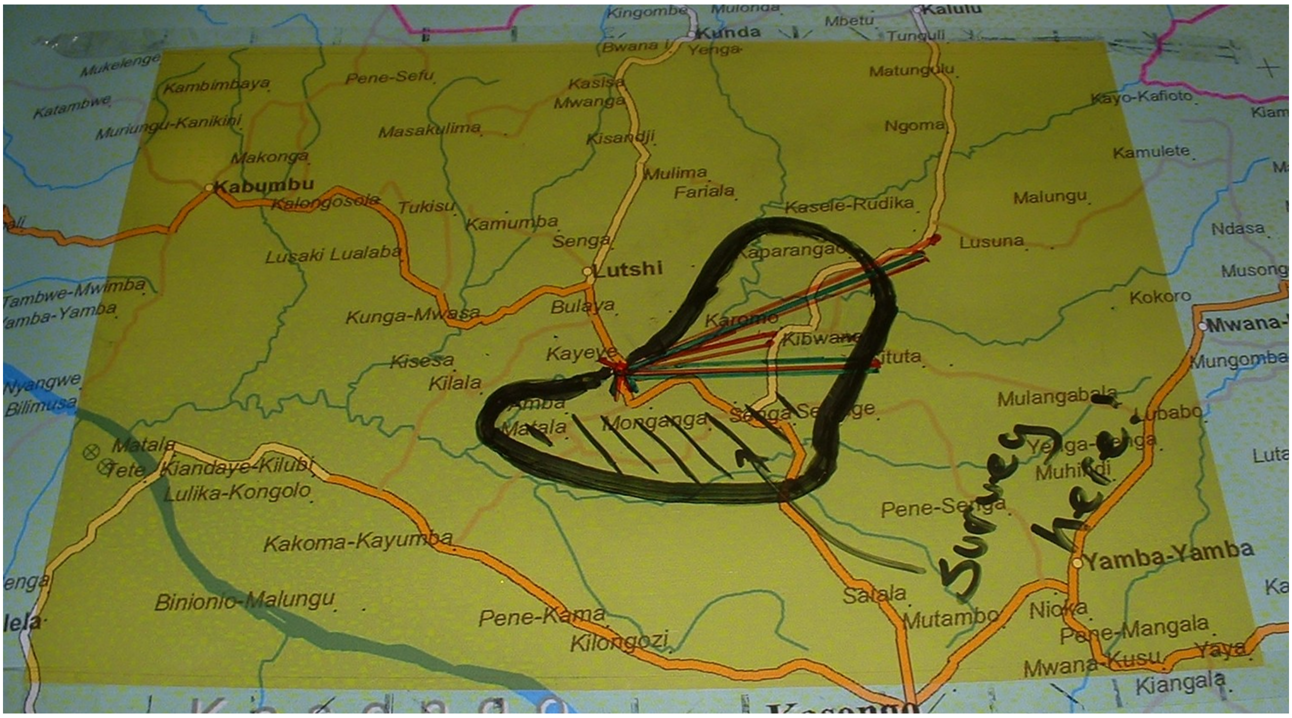
Type of data	Variables / Methods	Findings
Routine program data	**Admissions over time**	Data were available but presented in tabular rather than graphical format. When graphical formats were used, data were presented in formats that tended to obscure trends (e.g. as complicated bar charts showing multiple variables or as line charts showing multiple lines for the same variable for different periods). Spreadsheet data required some restructuring before it could be analysed.
	Standard indicators	Data were available but frequently presented in tabular rather than graphical format. When graphical formats were used, data were presented in formats that obscured trends resulting in a failure to detect increasing defaulting and in-program mortality rates. Spreadsheet data required some restructuring before it could be analysed.
	Mapping home villages	The data required to do this were being collected on beneficiary record cards but were not being collated and analysed. The program area was not sufficiently well mapped (i.e. a *complete* list of villages in program catchment areas and a map of their locations had **not** been made). This would have prevented analysis of the data even if it had been collated. A *complete* list of villages and a map of their locations were created and home location data collated. Once this was done, local staff had no difficulties mapping this data and using it to identifying areas of probable low coverage (*Figure 13*, *Figure 18*, *Figure 21*, and *Figure 22*).
	Outreach activities **Case-finding activities**	The program monitored outreach activities using simple workload returns. These listed the villages and localities visited by outreach and case-finding staff. The analysis of this data was hampered by the lack of a *complete* list of villages in the program catchment area and a map of their locations.
	Defaulting and DNA cases	The program collected and reported some follow-up data for defaulting and DNA cases. This concentrated on the collection of reasons for the non-attendance of defaulting cases. The major reasons for defaulting were distance to OTP sites and the problem of loss of labour to the household. It was not possible to map this data as locations were not recorded. There is no reason to believe that local staff would have had difficulties mapping this data if location data were available.
Anecdotal data	**Barriers**	A great deal of data were collected using informal discussion groups, semi-structured interviews, and formal focus groups from a variety of sources. Formal focus groups were used to investigate indications of religious discrimination that arose from informal group discussions. Initially, local staff found the collection and analysis of anecdotal data difficult. Observations of informal focus groups suggested that the use of local program staff may be problematic. In particular, it was found that informants tended to be muted in their criticism of program activities compared to when groups were run by staff not connected to the program and that program staff tended to "steer" discussions to match their own perceptions of the program and the informants. Local staff also found it difficult to challenge statements made by community leaders and other high status informants often attaching credibility to statements made by high status informants even when such statements could not be triangulated by other sources.
Small-area surveys	**Coverage** **Case-finding** **Reasons for non-attendance**	Local program staff had no problems identifying areas to survey, undertaking surveys, and analysing survey data using the LQAS technique.

Data courtesy of Concern Worldwide

Figure 21 : Local program staff mapping beneficiary home locations

Photograph courtesy of Concern Worldwide

Figure 22 : Area of probable low coverage identified by mapping of beneficiary home locations (coverage in the identified area was later found to be unsatisfactory)



Photograph courtesy of Concern Worldwide

Figure 23 : The clinical audit cycle

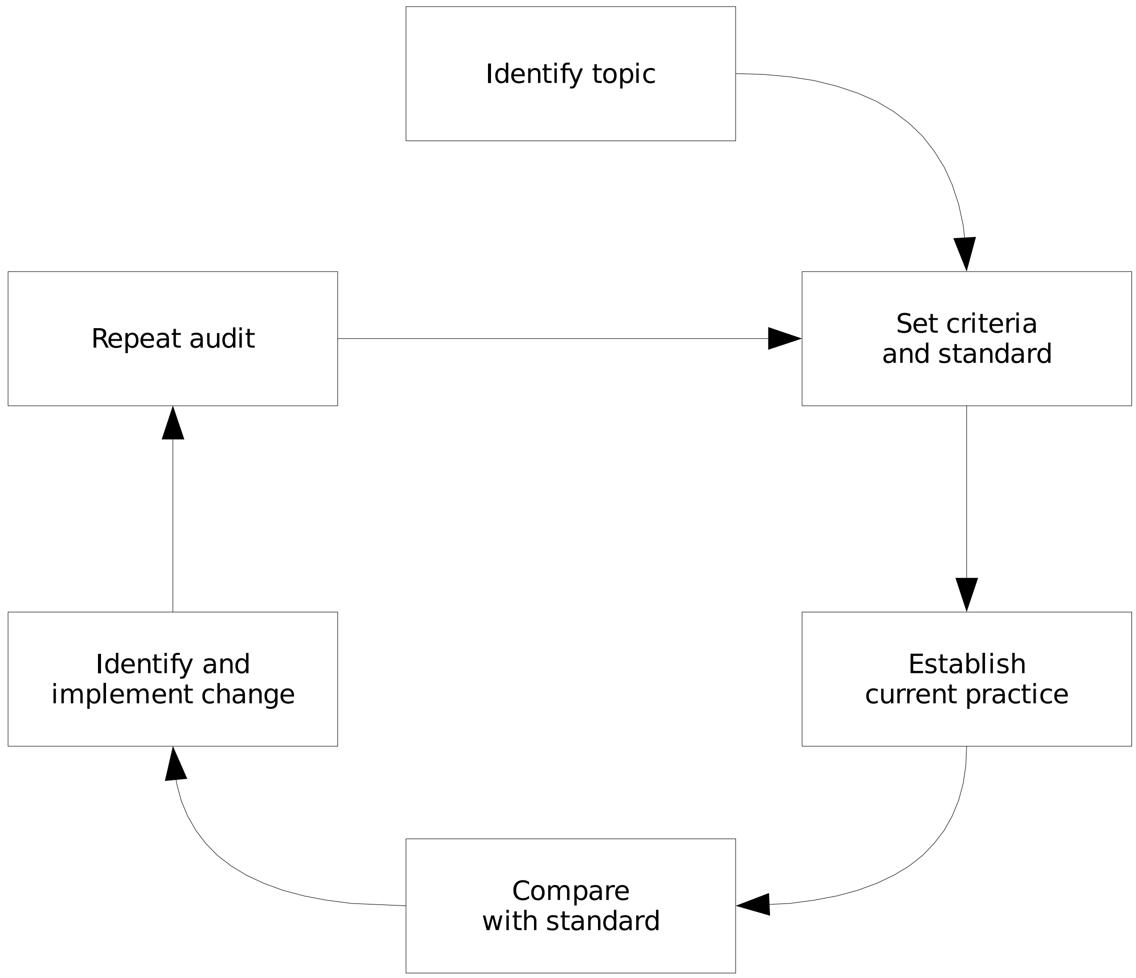


Figure 24 : Villages selected using the *quadrat* method

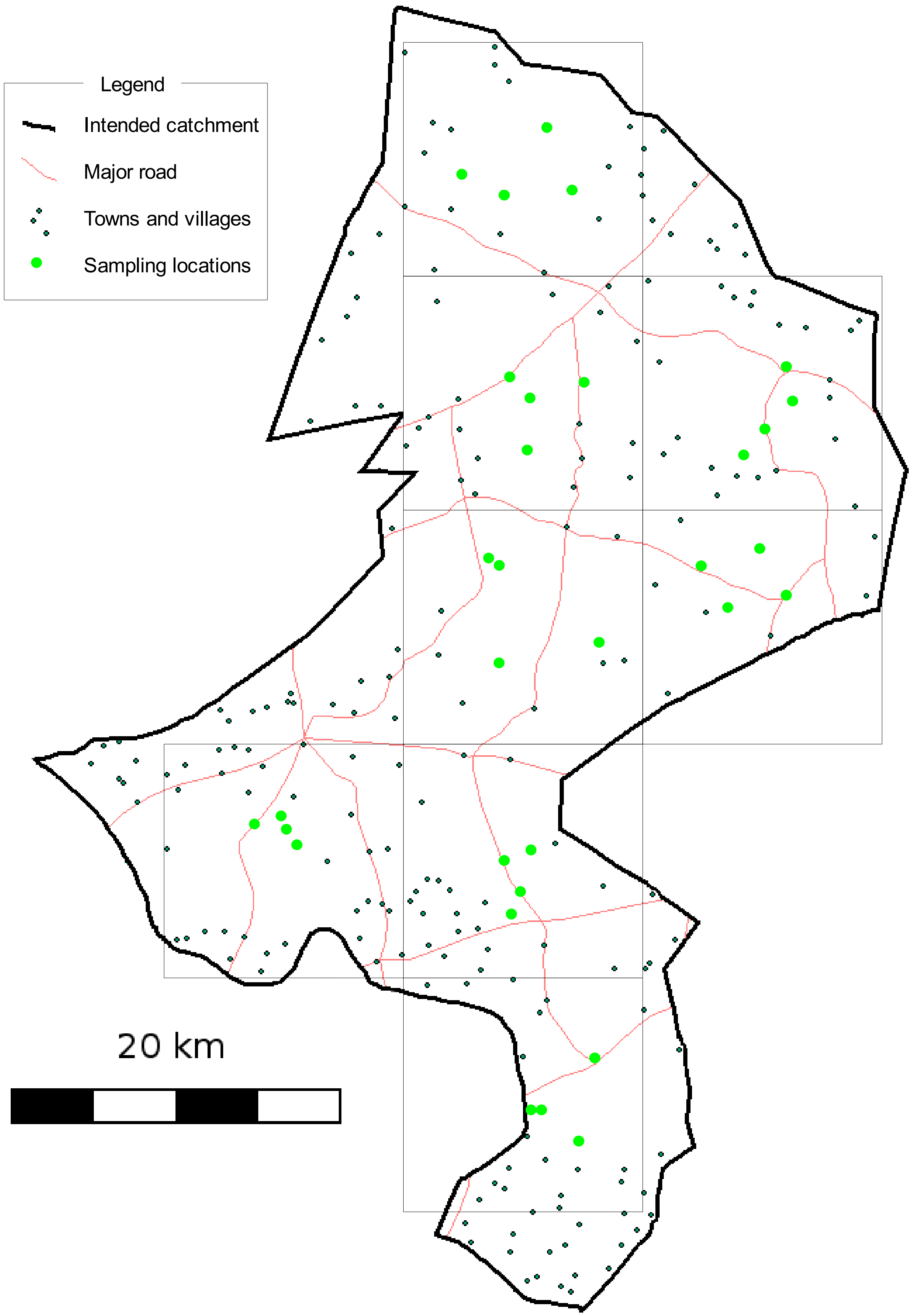


Figure 25 : Villages selected using stratified random sampling

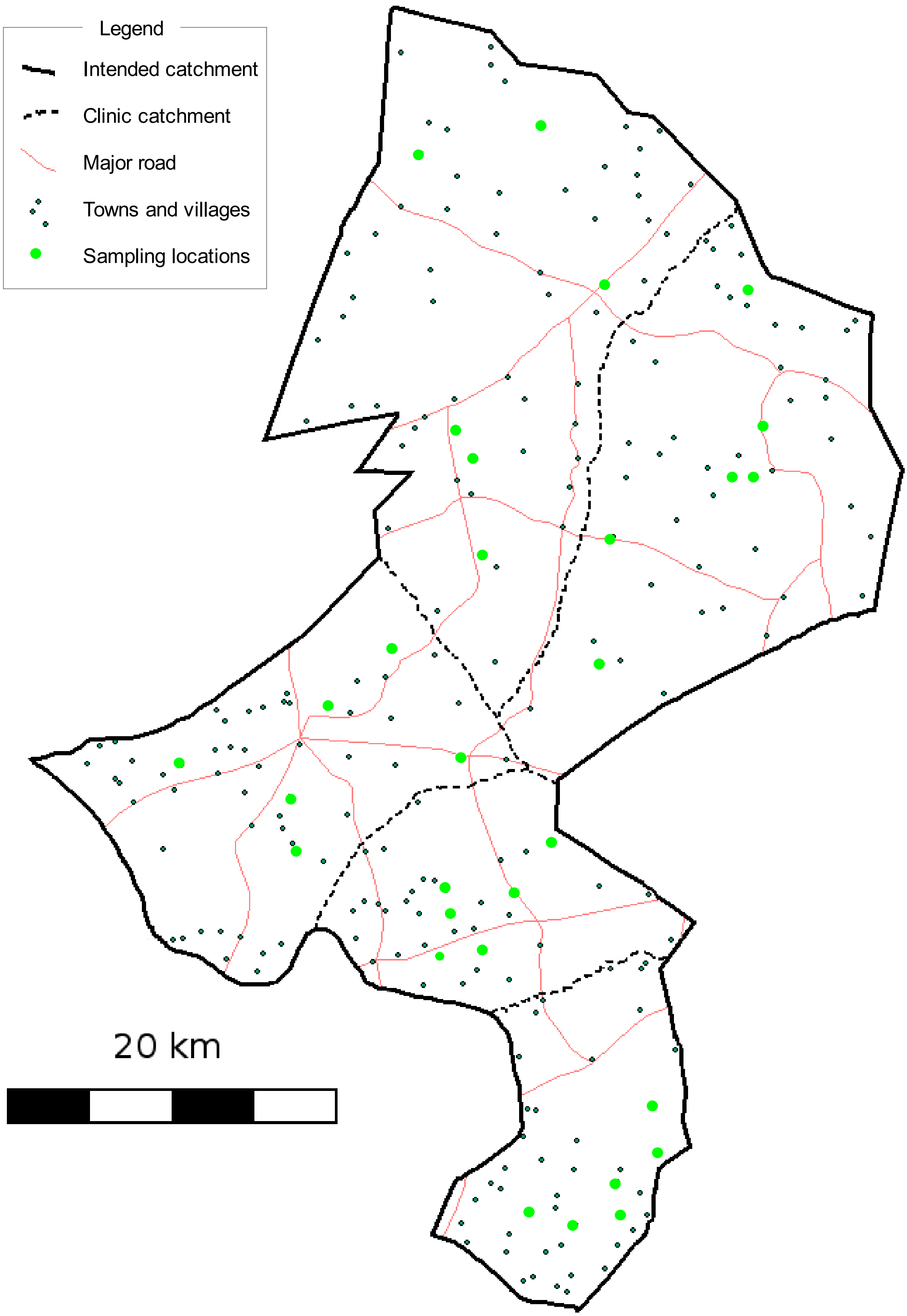


Figure 26 : An LQAS sampling plan calculator

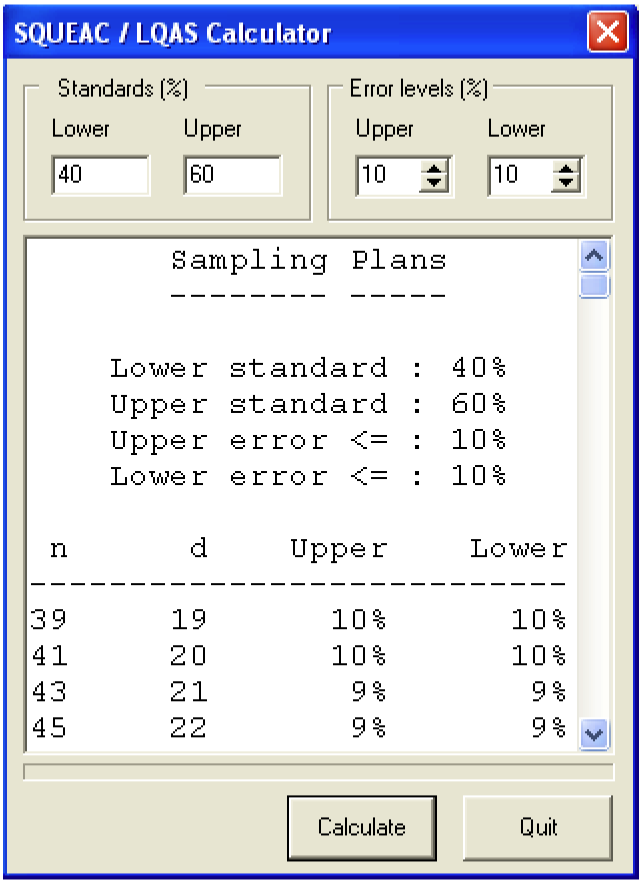


Table 4 : Typical behaviour of a two-class LQAS sampling plan

	True coverage in the sampled population				
Classified coverage	Very low	Low	Moderate	High	Very High
Low	Always	Often	Sometimes	Seldom	Never
High	Never	Seldom	Sometimes	Often	Always

Figure 27 : Operating characteristic curves for three LQAS sampling plans

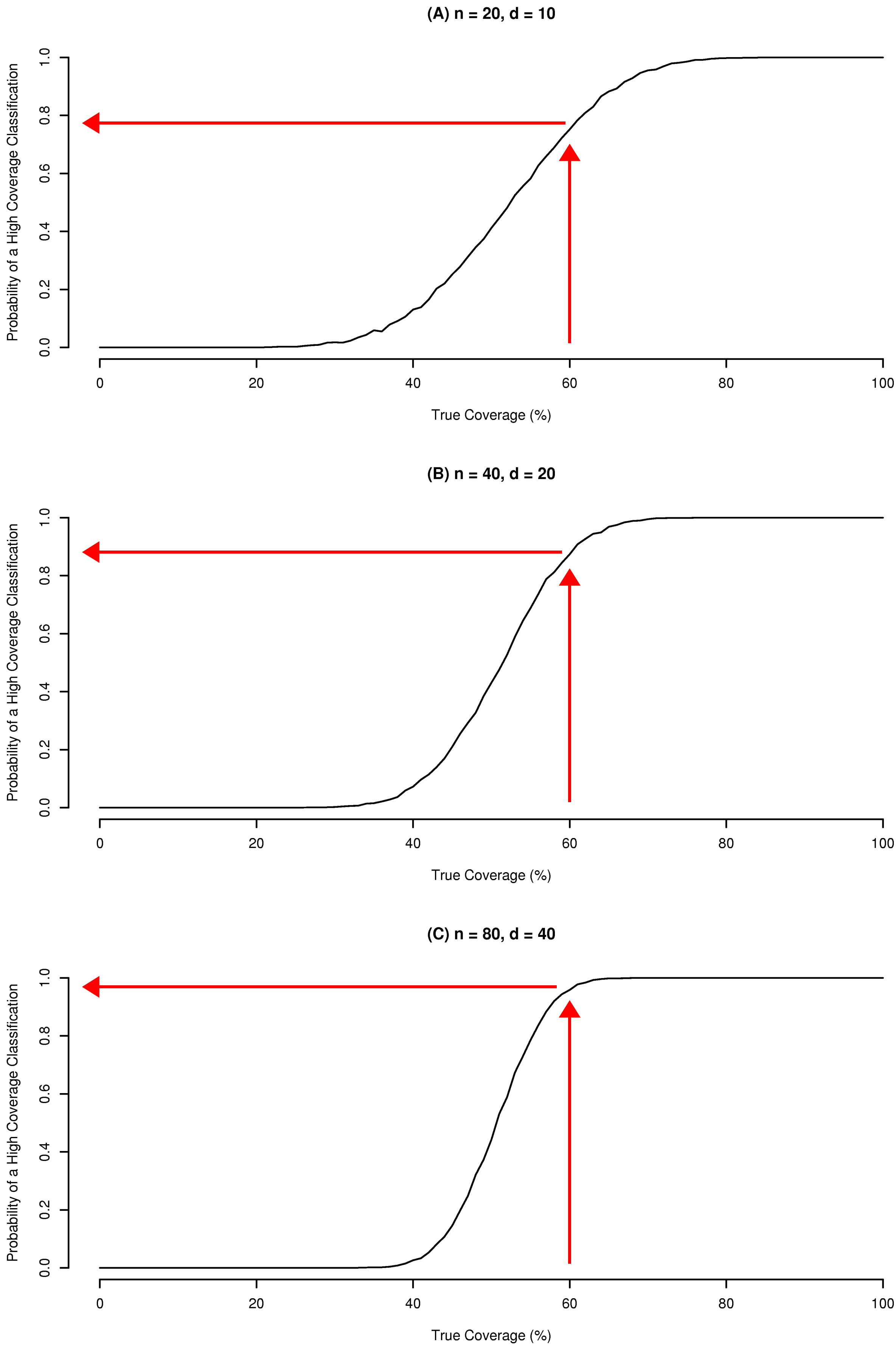


Table 5 : Typical behaviour of a three-class LQAS sampling plan

	True coverage in the sampled population				
Classified coverage	Very low	Low	Moderate	High	Very High
Low	Always	Often	Sometimes	Seldom	Never
Moderate	Never	Seldom	Most often	Seldom	Never
High	Never	Seldom	Sometimes	Often	Always

Figure 27 : Probability of classification plots for three three-class LQAS sampling plans