



CASE STUDY NO. 7

The Pastoralist Survey Method (PSM) and its application in Mali and Ethiopia

Case Study Summary

The guidelines for conducting anthropometric nutrition assessments among sedentary populations are inappropriate for pastoralists. This is for two main reasons. First is the problem of establishing a representative sample in a low-density, scattered, mobile community where there is limited information on population size. Second, the conventional Weight for Height (W-H) measure for acute malnutrition suggests an artificially high prevalence among pastoralists in the Horn of Africa and the Sahel. This is because the characteristic body shape of these populations differs from the average on which the measure is based.

The Pastoralist Survey Method (PSM) comprises two phases. The qualitative phase draws on key informants to develop an understanding of identifiable groups of households moving together with their livestock (*troupes*), and of how they are socially or geographically organised (organising factors). The quantitative phase resembles a two-stage cluster design comparing information drawn from different sources and based on different methods to validate the qualitative data.

The PSM was piloted in Mali (2008) and in Ethiopia (2010) and represents a significant improvement in estimating under-nutrition where population data are not known in advance or a population is on the move.

ALNAP Innovations Case Studies showcase innovative solutions to the problems and opportunities faced in international humanitarian response. Each case study focuses on a specific innovation, and outlines the process through which the innovation was developed, from the initial recognition of a problem, through development to practical implementation and scale-up.

The Innovations Case Study series is designed to act as a key mechanism to improve dissemination and take up of innovations across the humanitarian sector.



Implementing agency
ACF France

Case Study authors
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Location of programme
Kidal district, Mali (2008) &
Shinile zone, Ethiopia (2010)

Time period
2007-2010

Estimated expenditure
€165,000

Estimated Beneficiaries
around 600 children under 5
measured during the 2 surveys



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Background Information and Rationale for Innovation

Most humanitarian agencies now recognise the need for accurate nutrition surveys. Action Contre La Faim (ACF) was one of the first NGOs to use the Standardized Monitoring Assessment of Relief Transitions (SMART) method for conducting emergency nutrition surveys in Ethiopia, and ACF Canada leads the international SMART technical working group on emergency nutrition assessment in the Global Nutrition Cluster.

There are two major challenges in conducting nutrition surveys among pastoralist populations. First, such populations are vulnerable to nutrition-related risks caused by factors such as drought, animal disease, market disruption and the closure of borders. Drought, for example, both raises the price of cereals and reduces pasture quality. The resulting deterioration in the condition of their livestock means that pastoralists are forced to sell them at a reduced price. Various agencies have identified nutritional problems among pastoralist populations, including seasonal vulnerability, food insecurity, health, and maternal and child-caring practices (Mayer 2007).

Second, without a suitable method to conduct nutrition assessments emergency response and development programmes may neglect pastoralist populations (Pavanello 2009).

Guidelines for anthropometric nutrition assessments have long existed for sedentary communities. But the conventional Weight for Height (W-H) measure of the existence and/or degree of under-nutrition is inappropriate for pastoralists in the Horn of Africa and the Sahel region, who tend to have longer legs and a shorter upper body than the average body shape on which the measure is based. Studies from Somalia and Ethiopia have shown that for pastoralist children who are over two years of age the W-H measure returns a higher prevalence of under-nutrition than does the mid-upper arm circumference (MUAC) measure, but the two measures show a similar prevalence in agrarian populations (Myatt, Duffield et al. 2009), probably because of this difference in typical body shape. A further difficulty is that of selecting a representative sample in an area with a low-density, mobile community where there are few reliable data on population size. In order to improve ACF's approach to determining the nutritional condition of nomadic pastoralist populations in the Horn of Africa and the Sahel we therefore needed either to adapt an existing sampling method or design a new one, and also to revise the anthropometric definition of under-nutrition.

This study focuses on nomadic or transhumant pastoralism¹ because these populations tend to be more difficult to sample than other forms of pastoralism. The method developed here could also be used for other communities that practise seasonal migration or are displaced from their usual place of residence for other reasons. In such circumstances, however, it may be difficult to obtain complete and reliable data for the first sampling stage and alternative methods may be required. Sedentary pastoralists or those with reliable population data can be surveyed using existing methods.

Although there are scientific data on pastoralism at the global level, little attention has been paid to the methodological dimensions of assessing under-nutrition or malnutrition among pastoralist populations. We therefore focused on developing appropriate survey methods and anthropometric measures for assessing under-nutrition among pastoralist communities in the Horn of Africa and the Sahel. Although we believe that the survey method could be adapted for other types of assessment, consideration of this potential lies beyond the scope of this exercise.

Description of the Innovation Process

Recognition

ACF has developed systems and survey methods to assess the nutritional condition of populations living in vulnerable regions and in critical situations. There are various survey tools available, including SMART, mentioned above. SMART has, however, been found unsuitable for surveys in pastoral areas because it requires a random sample based on population data by village or camp - data that are difficult to obtain when the population is mobile and scattered. In addition the typical body shape of pastoralists in the Horn of Africa and the Sahel raises issues about how best to measure under-nutrition.

ACF wanted to assess the possibility of adapting SMART or developing a new survey method for nomadic pastoralists, drawing on a combination of technical and scientific information and field studies. The agency commissioned a technical consultant (Anne-Marie Mayer) (AM) and a statistical design consultant (Mark Myatt) (MM).

¹ Nomadic pastoralism is a generalised food-producing strategy that relies mainly on the intensive management of herd animal, including their daily movement and seasonal migration. The entire household moves with these seasonal migrations. In the case of transhumance, members of the group move the herd seasonally from one area to another, often between higher and lower pastures. The rest of the group remains in the same location (Wikipedia definitions).

Invention and development

AM defined the criteria for the adapted or new method in conjunction with ACF nutritionists

Criteria for the new survey method

The approach will

- produce a general tool with options for particular situations encountered
- make use of local knowledge to identify kinship groups and their locations
- be validated by computer simulation and the criteria defined before field testing, then tested
- remove the bias against small communities in relation to methods for sedentary population (described above) and describe any other sources of bias
- be sufficiently straightforward for trained NGO staff to conduct
- specify the data-analysis system.

The sampling system should

- not require population data at the design stage
- not require knowledge of people's location at the design stage
- be efficient in order to optimise time spent on gathering information
- represent the entire survey area, even remote regions that are sparsely populated.

Attributes of precision for under-nutrition or wasting

- The method will use a standard (fixed) sample size and yield estimates whose level of precision is similar to that obtained by methods currently used for sedentary populations.

The measure used to determine wasting should

- predict mortality
- take account of the typical body shape of pastoralists in the region.

The consultants reviewed other survey methods, guidelines, definitions of nutritional status and other relevant literature. Since none of the existing methods satisfied all the agreed criteria (Box 1) it was decided to design a new one. Invited experts in the fields of pastoralist society and economy then reviewed the proposed method via an email discussion group that ran between August and November 2007. Members of the peer group supplied examples of realistic parameters for the computer simulation testing, which showed that the proposed method had real potential in terms of its precision and accuracy.

The draft design was circulated to the review group and the feedback was incorporated prior to field tests.

Description of the Pastoralist Survey Method

The Pastoralist Survey Method (PSM) is a general method that is designed to be adapted for the specific context and season. Several of its key features are described here and the case studies of its application in Mali and Ethiopia show how the method was adapted to those two contexts.

Definition of wasting

In view of the problems already identified with the more usual W-H measure of nutritional status, the PSM uses the MUAC definition. The nutrition survey is conducted with a sample of children measuring between 65cm and 110cm length/height as a proxy for under-fives, i.e. 6–59 months of age.

Survey design

It is critical to agree a clear definition of ‘pastoralist’ from the outset. During a crisis period settled communities may also be included if pastoralists are present among them at the time of the survey. These settled communities will, however, require different types of sampling plan, for which methods are already available (UNICEF and USAID 2005).

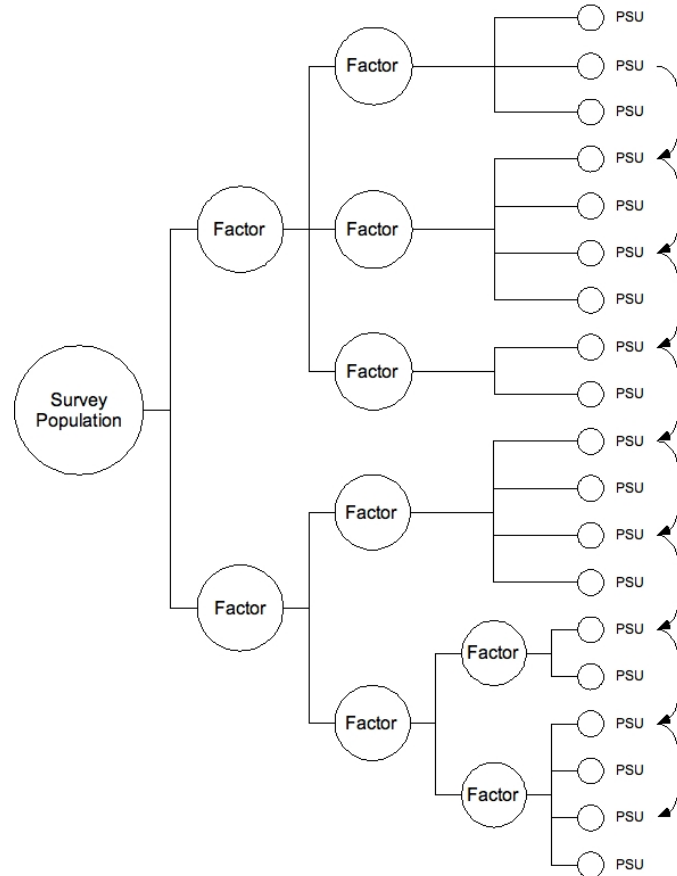
A sampling frame is developed by collecting population data from key informants. Pastoralists generally have a good and up-to-date understanding of environment, climate, market conditions and population movements because such information is essential to their survival in the often harsh arid or semi-arid conditions in which they live. In this way, the community itself provides the necessary information to compile a list of the potential primary sampling units (PSU). A PSU is the first level of sub-division of the population, which is based on selecting a part of the population for further sub-sampling. In this case the PSU comprise one or more identifiable groups of households moving together with their livestock, collectively known as *troupes*.

We defined the internal organisation of the *troupes* as the ‘social structure’ of the community. The Organising Factors (OF) need to be identified in order to compile the list of PSU. These factors define the *troupes* in a way that is locally meaningful and understood and might include ethnicity, kinship, traditional access to grazing territory, market access, livestock holdings, trading posts or the use of water points. The first part of the PSM aims to develop an understanding of OF and *troupes* on the basis of which to have enough information to establish the sampling frame.

Each assessment includes a qualitative and a quantitative phase. During the former, local information is used to establish the PSU sampling frame. This information is presented in the form of an organisational tree or organogram that represents the relationships between organising factors and *troupes* (see Figure 1). During the quantitative phase, which resembles a standard anthropometric nutrition survey, the selected communities are located and surveyed and the data analysed.

Figure 1 - Organisational tree (organogram)

This organisational tree sets out the social and geographical structure of the population. The structure also allows systematic sampling of the PSU that are formed of one or more *troupes*.



Qualitative phase

In the qualitative phase information is gathered from key informants and published documents and presented as an organisational tree. This involves defining the *troupes* and the relevant OF, which need to be locally meaningful and the information readily available, whether drawn from formal or informal sources. An OF has three important features. First, it must be easy to compile a complete list of OF during the qualitative phase. Second, we need to know the total number of *troupes* assigned to each OF, or at least the relative population sizes, in order to undertake representative sampling. Third, we need to be assured that during the full quantitative survey it will be possible to obtain detailed information on *troupes* associated with the OF. A small pilot study can verify this.

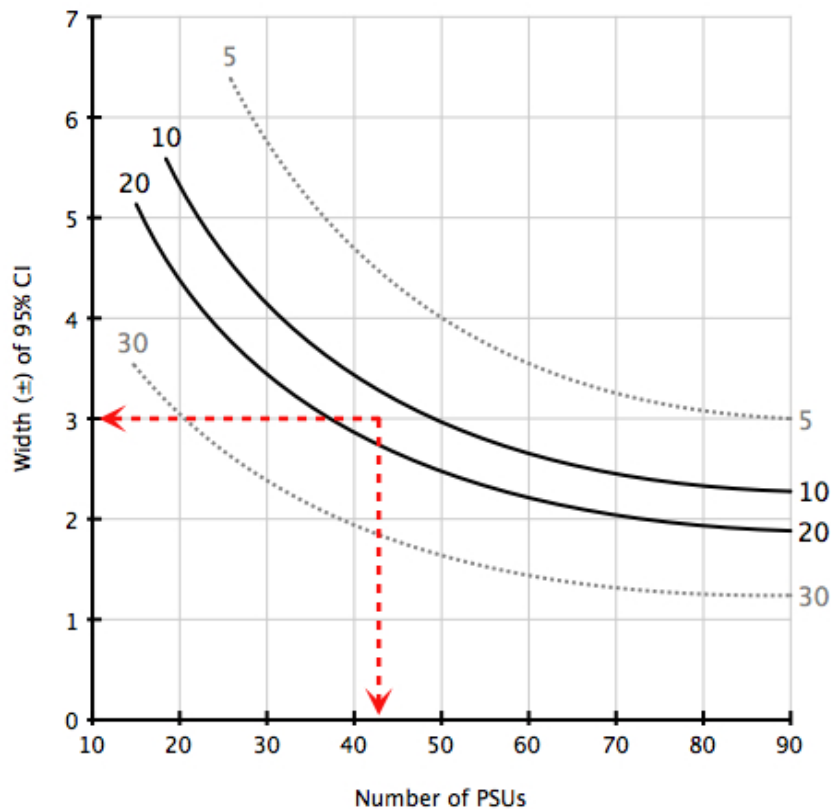
Open-ended discussions with the informants help to develop an understanding of the social structure. The organisational tree can be generated via specific qualitative methods such as 'pile sorts', 'proportional piling' and 'free listing', whereby community members are asked to identify, categorise and rank the importance of various factors. This information is then incorporated into a sampling frame so that each *troupe* in the survey area has an equal chance of being included, even if it is remote or mobile at the time of the survey. The qualitative phase needs to be repeated each time there is a survey because the social structure of pastoralist communities often changes according to seasonal or other factors. In Mali, the OF was identified as 'water point' and in Ethiopia, 'kebele centre', a small trading centre in the administrative kebele geographical area.

In preparation for the sampling it is necessary to draw on various sources and/or a small pilot study to estimate the average *troupe* size.

Sampling

The PSM uses a two-stage sampling design – the first selects the PSU and the second selects children within the PSU at the time of the field survey. The statistical design used in the PSM was pre-tested using a computer-simulated population of pastoralists, the data for which were provided by the peer reviewers. The simulation exercise produced nomograms, or two-dimensional diagrams designed to allow the approximate graphical computation of a function, in order to estimate the sample size. The nomogram indicates the required sample size, i.e. the target number of PSU, based on the estimated average size of the *troupe*, and the precision and estimated prevalence of under-nutrition (see Figure 2).

Figure 2 - Example of a nomogram for estimating the sample size



The nomogram was produced by computer-based simulation and makes it possible to estimate the sample size using the estimated prevalence of under-nutrition, the precision required and the average PSU size. In this example, the nomogram is for an estimated 10% prevalence of under-nutrition. The required sample size (the necessary number of PSU) is expressed on the x axis and the required precision on the y axis. Here the PSU size is 15 and the precision level is 3%. The arrow shows that a sample size of 42 *troupes* is needed with troupe size 15, prevalence 10%, and precision 3%. Allowing for a margin of error we calculate a sample size of 48 PSU.

A systematic sample of the target number of PSU can be selected by using the sampling frame generated in the qualitative phase. For the second stage, the PSM uses an exhaustive sample of children from each PSU. The *troupes* identified in field trials in Mali and Ethiopia were small enough to allow for this. The MUAC method also facilitates the collection of an exhaustive sample because it is quick and easy to use.

Quantitative phase

The quantitative phase must follow soon after the qualitative phase to avoid the information becoming out-dated. The final selection of PSU (comprising one or more *troupes*) is made on

the day of the field survey using a random or systematic sample of the *troupes* associated with each OF. Qualitative methods are used to enumerate and locate the *troupes* by OF.

The nutrition assessment is similar to other established survey methods. The MUAC definition of under-nutrition is better suited to pastoralists in the Horn of Africa and the Sahel, which both simplifies and improves the validity of the survey. Other variables can be included as necessary, such as vitamin A supplements or vaccination coverage, but the calculated sample size needs to reflect these variables. Computer-based simulation will produce valid sample size nomograms for any such additional parameters.

Data analysis and statistical design

A dedicated software system has been designed for the PSM. It uses a 'bootstrap' estimator to assign measures of accuracy to sample estimates in order to determine the prevalence of under-nutrition. The advantage of this method is that it can accommodate multi-stage samples that may be collected if there is more than one OF in the population being surveyed. Data are entered for each child using a continuous measurement of MUAC rather than a categorical variable such as 'not malnourished', 'moderate' or 'severe' wasting. This also makes it easier to validate the data.

Validation

Qualitative data are validated by comparing information collected from at least three different sources and by using at least three different methods. 'Sampling to redundancy' is also used, which means that information is collected from independent sources until the effort of obtaining more information outweighs the likelihood that it will make any significant difference to what is already known. At the end of the quantitative survey the initial qualitative data are validated against the field data.

Quantitative data are validated by statistical means by comparing the field-based estimates to those predicted by computer-based simulation. By using different simulated definitions of under-nutrition the method can be validated by comparing the level of precision of observed data with that predicted by the initial computer-based simulation. This is done by artificially changing the definitions of wasting to simulate its prevalence across a range of values.

Implementation

The PSM has been applied in two ACF-sponsored field trials. The first was in Mali in 2008 and the second in Ethiopia 2010 (see Boxes 2 and 3). Lessons from the Mali experience were used to refine the method and its implementation in the second trial. These lessons included aspects of the logistics, administration and support for the project and technical details of the

method. We produced more specific qualitative assessment tools and guidelines after the first test and also modified the computer software. Following the two trials we have proposed more detailed guidelines for validating the data. We have also produced a field guide, which is ready for further testing.

Mali case study

Method

In collaboration with ACF, the PSM was tested in the Kidal commune in eastern Mali from January to March 2008.

The qualitative methods included key informant interviews, focus and small group discussions, observation, published reports and tools designed to help the population identify and rank the

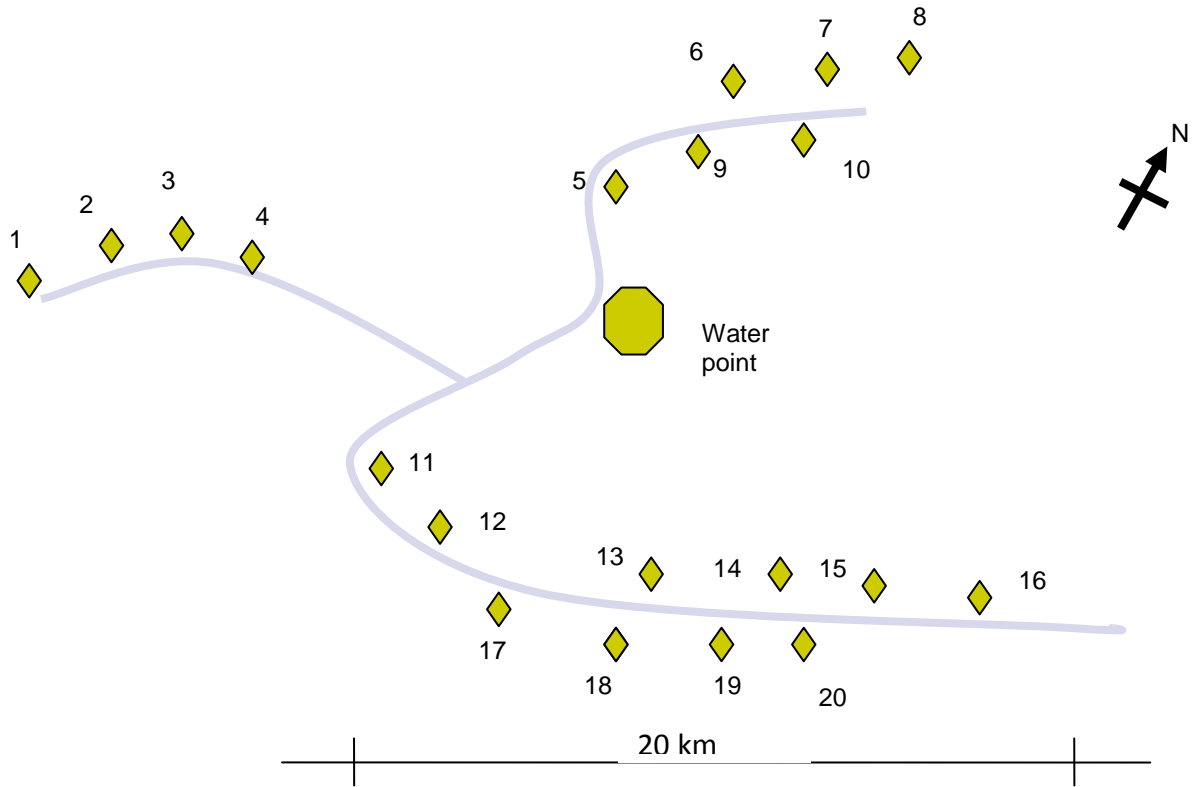
importance of particular factors, e.g. 'free listing', 'pile sorts'. Key informants included drivers, local leaders, NGO workers, medical personnel and pastoralist elders. Most of the key informants were men because they were responsible for trade and animal husbandry and therefore knew about the location and movement of the *troupes*. Apart from a female NGO worker, most of the professionals we interviewed were also men.

Results of the qualitative assessment

In the dry season, the rural population of Kidal and their livestock move in *campements* in search of pasture and stay within reach of water points. The *troupe* was therefore identified as a *campement* with an estimated average number of seven under-fives (children aged between 6 months and 59 months) at the time of the survey. Different key informants divided water points into 'small', 'medium' and 'large' groups using pile sorts as a means of categorising and ranking them. Each category was assigned a relative size with respect to the number of *troupes* using the water point at the time of the survey. This information generated an organisational tree of the *troupes* at each water point.

Two neighbouring *campements* were considered as one PSU. The sample size of was projected using a nomogram for 15% malnutrition at 3% precision for an estimated average PSU size of 15 children. This gave a target of 43 PSU of which a systematic sample could then be taken. The selected PSU were located at each water point, again with the help of key informants, by constructing a map of the *campements* in the surrounding area (see Figure 3).

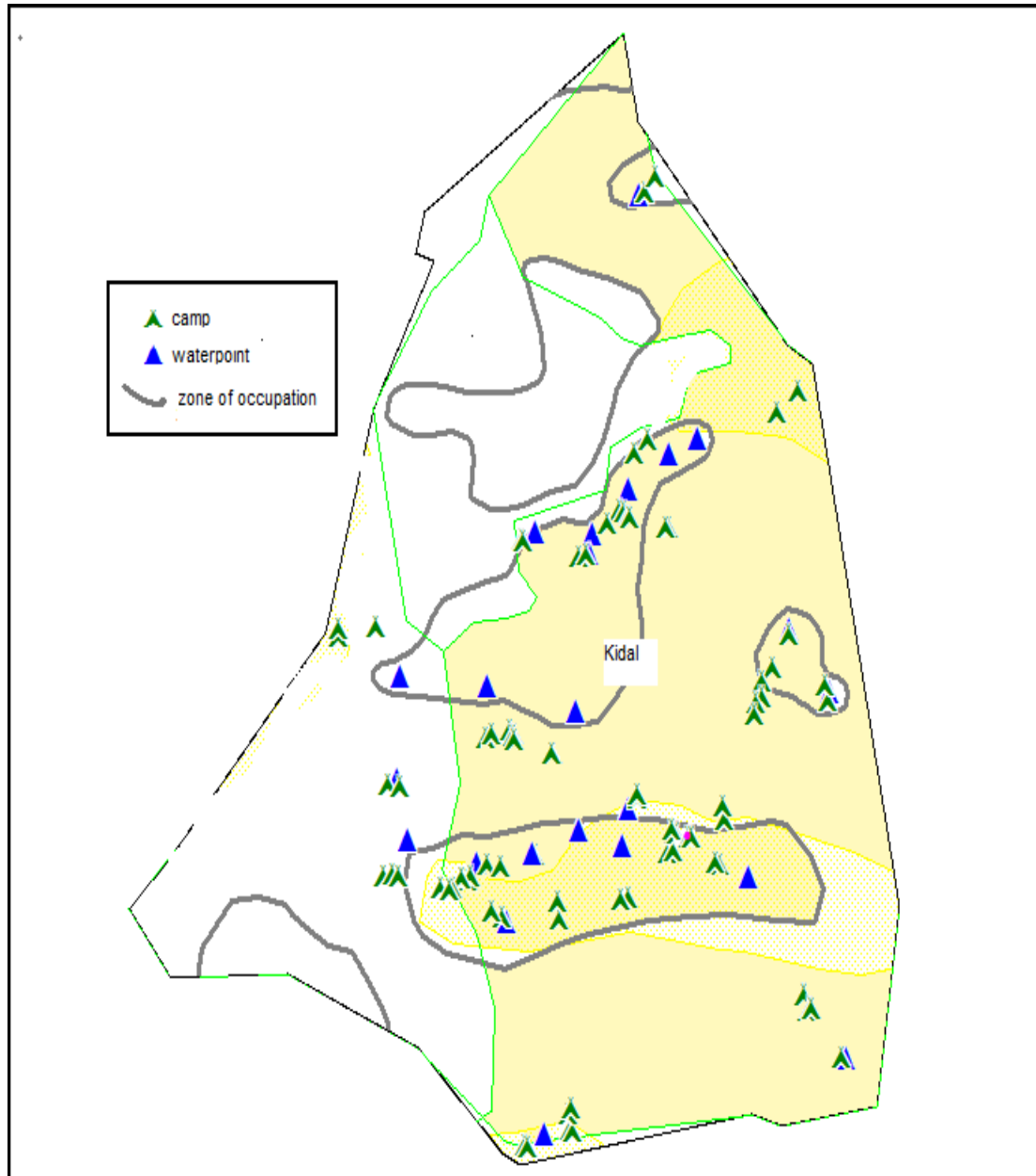
Figure 3 - A stylised map of a water-point showing the location of troupes and approximate distances



The numbered diamonds represent the relative position of the troupes. The field trial found that these data, collected from key informants at water-points were generally accurate.

Within each selected PSU children aged between six and 59 months were included in the assessment. The survey included 451 eligible children from 42 PSU, with an average of 5.4 each. A Global Positioning System (GPS) reading was taken from each *troupe* and water point, and the information was used to create a map (see Figure 4).

Figure 4 – Location of water points and troupes in Kidal Commune



The shaded area shows Kidal Commune, the administrative zone for the study. Most campements were staying within the 'occupation zones' at the time of the survey. These were identified by satellite imaging by the Bamako-based ACF team. Some water points and campements were sampled outside this administrative area, which is inevitable in a terrain where borders are not apparent on the ground.

Results of the quantitative assessment

The prevalence estimate and confidence interval (CI), i.e. the reliability of the estimate, were calculated using bootstrap techniques, which are computer-based methods for assigning measures of accuracy to a sample estimate. The prevalence of Global Acute Malnutrition (GAM), assessed as MUAC <125mm or oedema was 1.6% (0.2–4.3). Severe acute malnutrition was 0.43% (95% CI 0.01–1.12%) assessed as MUAC <110mm. There were no cases of bipedal pitting oedema, which is symptomatic of severe malnutrition or kwashiorkor.

Validation

Qualitative data were validated by comparing information collected from different sources and based on different methods. The data showed that:

- 1) *Troupes* were within daily reach of water points and in locations predicted by key informants, and their relative size corresponded well.
- 2) The mean number of eligible children found in each *troupe* was similar to the number predicted by key informants.

The precision of the prevalence estimate also showed a close match with the computer-based simulation. For example, at <135mm the prevalence of under-nutrition would be 9.9% (6.6–14.0), close to that predicted by the original computer simulations. The prevalence estimate also corresponded to the clustering of under-nutrition cases in just a few *campements*.

Ethiopia case study

The second field test was undertaken in Shinile *woreda* (an [administrative division](#) of [Ethiopia](#) managed by a local government) in the Somali Region of Ethiopia from February to March 2010 in collaboration with ACF and a Technical Implementing Group for Ethiopian Roll-out (TIGER).

The qualitative methods and use of key informants were similar to those in the Mali study. In addition, ‘proportional piling’ was used with pastoralist key informants in the town and in the study area in order to estimate relative population sizes.

Qualitative assessment

In the dry season, many pastoralists from the Shinile *woreda* migrate with their livestock, leaving families in small rural communities (*rer*) or in the settled population (*tullo*) (a sub-division of *kebele*, such as a village or a designated location) or in the *kebele* centre (a ward or

neighbourhood) where traders also gather. In this dry season (*jilaal*), for the purpose of sampling, the OF was defined as *kebele*, with *tullo* as a sub-organising factor. This OF had all the requisite features, i.e. it was possible to make a complete list and determine the relative size from a central location, and the OF allowed for the complete enumeration of the *troupes* during the full survey. Again, for sampling purposes, the *troupes* were defined as *rer* with an average of five eligible children. Children residing at the *kebele* centres were also included because they were from the wider pastoralist community although they were not strictly nomadic at the time of the survey. The *woreda* population data were used to determine relative size of the OF. Unfortunately, because the survey had to end earlier than planned we could not compare qualitative data with data collected from the field as thoroughly as we would have liked.

Two *rer* were combined to form one PSU to facilitate the fieldwork without losing statistical validity. Based on the nomogram, the number of PSU to form the sample size was 37 with 4% precision and the anticipated rate of Global Acute Malnutrition (GAM) by MUAC was 15%. Five PSU were added to allow for a margin of error. A systematic sample was drawn from the sampling frame based on the qualitative phase. The next stage of sampling was carried out at the *kebele* centre during fieldwork when key informants again provided information on the location and relative size of the population groups. Once specific locations had been identified, it was possible to find the targeted PSU. If the PSU was in a rural location, an exhaustive sample of eligible children from the combined *rer* was taken. If the PSU was in the *kebele* centre, 10 eligible children were sampled based on SMART method proximity sampling.

Quantitative method

Assessments included oedema, MUAC, vaccination, vitamin A supplementation and recall of morbidity. A key informant interview covered pasture condition, livestock, water sources, food availability, food aid and human health.

The survey had to be suspended before completion because unseasonal rainfall and flooding made the sites inaccessible. The target number of PSU was 42 from 17 *kebele* but we were able to survey only 18 PSU from seven *kebele*. Only 145 of the intended 420 children were surveyed. The average number of eligible children in each PSU was 8 (4 per *rer*). The fact that the survey ended prematurely compromised the accuracy of the quantitative results. The reported GAM by MUAC was 6.06% (1.83%–11.04%) by bootstrap estimator.

Validation

The OF of *kebele* and *tullo* enabled sampling of the population. The first stage of sampling was at the central location (Dire Dawa) then on reaching the *kebele* centre, then at the *tullo* and

lastly at the *rer* level. As the fieldwork ended prematurely, we were unable to validate the key informants' data on population size and location at each stage.

Diffusion

Following the Mali field trial the method was published in *Field Exchange* (Mayer, Myatt et al. 2009). AM and MM also presented the PSM at a conference in Addis Ababa organised by the Emergency Nutrition Coordination Unit. As part of the field test in Ethiopia there was a series of meetings of the 'Technical Implementing Group for Ethiopian Roll-out' (TIGER), which included many Ethiopian Institutes². AM presented the method at the 2 July 2010 Médecins Sans Frontières conference in London (MSF 2010).

Risks

The qualitative phase of the survey produces the sampling frame, which means that any inaccuracy in the population data will result in bias and errors in the estimated prevalence of under-nutrition or wasting. It is therefore important that the community trusts the agency conducting the survey to avoid the risk of the agency being given false information. In certain cases, such as 'survey fatigue' or expectations of interventions or population displacements communities may provide misleading information, whether wittingly or not.

Limited access to the survey sites, for example after heavy rain and flooding, can limit the survey, as happened in Ethiopia. Access can also be problematic when teams have to walk long distances and return to base every day for security reasons, another constraint in Ethiopia.

The MUAC measure is not universally accepted, which means there may be some official resistance to its use. In addition, because the switch from W-H to MUAC will reduce the estimated prevalence of under-nutrition or wasting, there may be a corresponding cut-back of nutrition programmes in pastoralist areas where artificially high estimates of under-nutrition have been the norm.

² TIGER comprised the Early Warning and Response Department (chair), the Emergency Nutrition Coordinating Unit (secretariat), Action Contre la Faim (secretariat), the Regional Health Bureau, Regional Disaster Preparedness and Prevention Bureau, Federal Ministry of Health /Ethiopian Health and Nutrition Research Institute, Save the Children US, Save the Children UK, Mercy Corps, the World Food Programme, and UNICEF as permanent members.

Partnerships and Collaborations

ACF is among the NGOs that initiated the use of SMART for emergency nutrition surveys in Ethiopia. ACF Canada is currently leading the International SMART technical working group on emergency nutrition assessment of the Global Nutrition Cluster. ACF was therefore well placed to initiate the design of a new nutrition assessment method for pastoralists.

The PSM was designed by MM and AM, and AM led the field trials in Mali and Ethiopia. The whole project was coordinated by ACF France. Myriam Ait Aissa, Cecile Salpeteur and Nuria Salse provided ACF technical support while Laura Madero was the project manager for the Ethiopian trial. ACF drew on expertise from a wide range of organisations and individuals as part of the peer-review group during the development phase. The Ethiopian field trial was facilitated by the TIGER member organisations. .

The method has also benefited from input from academics and members of NGOs and international organisations. Other collaborators are being sought to continue its piloting and development.

Lessons Learned and Evaluation Findings

The method is practical, valid and is simple to apply in a pastoralist context. Gathering and entering the quantitative data should present no difficulties for staff already familiar with cluster surveys. Experienced assistance may be needed during the early stages to advise on the choice of 'organising factor' and to train staff in qualitative methods.

The delay between the collection of qualitative and quantitative data needs to be as short as possible because seasonal changes and population movements affect the validity of the qualitative data.

The method could be used for any region where population data are not well known in advance and/or a population is on the move. The method of sampling can be also used for collecting information on many different variables in addition to under-nutrition.

Wider Sectoral Implications

The PSM was designed to assess under-nutrition in nomadic pastoralist populations but could also be adapted for use with other mobile groups such as displaced persons or refugees, provided that sufficient quality information is obtained on the social structure at the time of the survey. In addition to the nutritional application, the sampling method could also be used for other technical assessments, such as health surveys, food security, and veterinary health.

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Please Note: The views expressed in this case study are the authors', and do not necessarily reflect the views of ALNAP

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