Child Survival
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Successes, Innovations, and Promising Practices from Projects Around the World

Photo courtesy of PLAN/Nepal

An FA supervisor interviews a mother in January 2000. PLAN/Nepal has developed a special set of instruments for LQAS monitoring. These LQAS tools contain a subset of questions from the project's baseline KPC survey.

Effective monitoring with efficient methods

PLAN/Nepal's Experience with LQAS in Project Monitoring

Abstract

In recent years, the PVO community has expressed a need for rapid, field-friendly approaches to monitoring child survival (CS) projects. Lot Quality Assurance Sampling (LQAS), which has its origins in industry as a quality-control technique, has been touted as one such method. This paper presents PLAN/Nepal's experience with LQAS as a promising practice for child survival monitoring and evaluation. It discusses details of PLAN's approach and highlights issues to consider in the replication of this technique by other projects.

LQAS has a number of advantages over cluster sampling. Because cluster sampling only yields overall coverage estimates, it hides differences in coverage between sub-divisions of a project's catchment area. While LQAS does not yield specific coverage estimates for sub-divisions, it does identify which sub-divisions have acceptable levels of coverage versus those that are performing below expectation. LQAS is also a more precise and efficient sampling design than cluster sampling. LQAS' relative ease of implementation and relevance to local program units lends itself to multiple applications through the project cycle, thereby providing useful information for both monitoring and evaluation

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LQAS: Key terms and Concepts

Common LQAS terms such as lot, production unit, and decision rule are unfamiliar concepts to many individuals in the child survival field. Understanding the meaning of these terms is the first step in understanding the LQAS methodology. Below is an overview of some of the most important terms and concepts.

In health applications of LQAS, lots tend to be catchment areas of health facilities, which may consist of several villages or communities. The production unit is usually the health worker or a team of health workers. PLAN/Nepal has designated the FA as the lot and each supervisor and his/her FCHVs and TBAs as the production unit.

Judgement regarding whether a lot is acceptable or below expectation is based on a decision rule, which is the maximum number of observations which can be classed as "unacceptable" if the whole lot is to remain acceptable. Decision rules are based upon thresholds that reflect: 1) the minimum standard that must be met in order for a lot to be "acceptable" (the upper threshold), and 2) the cut-point below which a lot is deemed to be "below expectation" (the lower threshold). A project's coverage targets may vary from year to year. As a result, decision rules should change to reflect these targets.

For example, an upper threshold of 80 percent and a lower threshold of 50 percent imply that lots with coverage at or above 80 percent are "acceptable," while lots with coverage at or below 50 percent are "below expectation." The corresponding decision rule for these

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List of Acronyms

ARI	Acute Respiratory Infection
CDD	Control of Diarrheal Disease
CS	Child Survival
CSTS	Child Survival Technical Support Project
DE	Design Effect
EPI	Expanded Program on Immunization
FA	Field Area
FCHV	Female Community Health Volunteer
KPC	Knowledge, Practices, and Coverage Survey
LQAS	Lot Quality Assurance Sampling
MCHW	Maternal and Child Health Worker
MOH	Ministry of Health
PVO	Private Voluntary Organization
TBA	Traditional Birth Attendant
VDC	Village Development Committee
VHW	Village Health Worker
WHO	World Health Organization

purposes. Finally, there are cost implications using the technique: LQAS studies are generally less expensive than cluster surveys.

LQAS monitoring activities were introduced during PLAN's midterm evaluation. PLAN/Nepal has now used the technique three times and it has proven itself to be a very useful management tool for project supervisors. This article reviews PLAN's experience with LQAS and provides six challenging lessons learned to projects that wish to follow PLAN's example and use LQAS in monitoring:

1) Identify small, manageable program units from which data are gathered.

2) Identify a concise set of monitoring indicators.

3) Pay attention to the rigor of the selection process.

4) Explore the use of LQAS to assess the technical capacity of workers.

5) Cultivate monitoring skills in workers at various levels.

6) Explore ways in which this project-oriented approach can be modified for community-based monitoring and decision-making.

Background

PLAN/Nepal's CS project is located in the southern Terai region of Nepal.[1] The overall goal of the project is to assist the Ministry of Health (MOH) in improving the health status of women and children. The CS project has four key technical interventions: control of diarrheal diseases (CDD), pneumonia case management (PCM), maternal and newborn care, and child spacing. The project also aims to strengthen the existing MOH system through improvements in: 1) supervision and training of health facility and community-level staff, 2) program monitoring, 3) drug supplies, and 4) community mobilization.

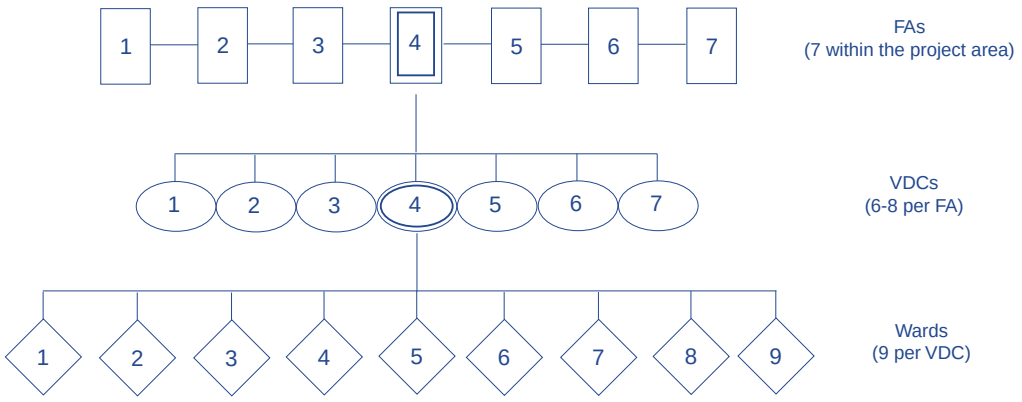
Staffing and Supervision in PLAN Nepal's CS Project

PLAN/Nepal's project covers two districts, Rautahat and Bara, which consist of seven

[1]PLAN is an international, humanitarian, child-focused development organization without religious, political, or governmental affiliation. Child sponsorship is the basic foundation of the organization. PLAN's vision is of a world in which all children realize their full potential in societies which respect people's rights and dignity.

Figure 1

The Relationship between Field Areas (FAs), Village Development Communities (VDCs), and Wards



field areas (FAs). Each FA includes 6–8 Village Development Committees (VDCs). VDCs are further divided into wards, with approximately nine wards per VDC. A total of 50 VDCs (450 wards) fall within the CS project's catchment area. Figure 1 depicts the relationship between FAs, VDCs, and wards. The illustration highlights one FA (#4) and breaks it into its smaller administrative units (VDCs and wards).

The Relationship between Field Areas (FAs), Village Development Communities (VDCs), and Wards

Each VDC has an MOH facility that is staffed by a Village Health Worker (VHW). The VHW supervises all Female Community Health Volunteers (FCHVs) and traditional birth attendants (TBAs) within his/her facility's catchment area.

In the past, lack of incentives, lack of transport, and poor management systems have resulted in less-than-optimal supervision at the community level. In an effort to improve supervision, PLAN/Nepal has assigned one supervisor per FA to assist the MOH with both training and supervision. Each FA supervisor is clinically trained (nurse, midwife, or health assistant) and has extensive management experience within the MOH's community-health system.

Project Monitoring and Evaluation

In 1997, PLAN/Nepal's CS project conducted a 30-cluster Knowledge, Practices, and Coverage (KPC) survey as part of its baseline assessment. This baseline survey assisted the CS project in targeting areas and planning interventions. PLAN intends to conduct a similar, large-scale KPC survey as part of its final evaluation, in order to assess whether the CS project has achieved its initial objectives.

Since baseline, the project has developed a series of tools to monitor progress at the facility, health worker, and beneficiary levels. Two facility-based tools are the Health Facility Checklist and the Village Health Worker (VHW)/Maternal and Child Health Worker (MCHW) Checklist. There is also a Female Community Health Volunteer (FCHV)/Traditional Birth Attendant (TBA) Checklist, which assesses community-based workers.

The Health Facility Checklist is a concise instrument that documents the following:

- staffing (positions, training)
- availability and use of materials (e.g., registers, reporting forms, health cards, and posters)

- service activities related to family planning and maternal and newborn care
- supervisory visits by MOH, PLAN, and other staff
- drug inventory

FA supervisors complete either a VHW/MCHW Checklist or a FCHV/TBA Checklist during each supervisory visit to a health facility or the community, respectively. These health-worker checklists cover topics similar to those in the facility checklist, in addition to workers' technical knowledge on key topic areas (e.g., clean delivery; pregnancy, delivery, and postpartum danger signs; maternal nutrition; breastfeeding).

These checklists provide valuable information on health facilities and health workers. However, they do not provide information on how these factors translate into results at the beneficiary level. In response to this need, PLAN/Nepal has employed Lot Quality Assurance Sampling (LQAS) for monitoring progress at the beneficiary level. The project has developed a special set of instruments for LQAS monitoring. These tools contain a subset of questions from the project's baseline KPC survey and are discussed in subsequent sections of this paper.

What is Lot Quality Assurance Sampling?

Lot Quality Assurance Sampling (LQAS) was initially designed in the 1920s to assess the quality of industrial commodities (Robertson et al., 1997). Over recent decades, the method has been adapted by health-system evaluators and is quickly being recognized as a viable means of assessing health-worker performance and intervention coverage. Multinational agencies and various institutions have been involved in health applications of LQAS. For example, WHO adapted the method to monitor immunization services, and it created a manual to assist health managers in using LQAS to assess both coverage and quality of immunization services[2] (WHO, 1996).

The hallmark of LQAS is the division of the target population into smaller, administratively meaningful units (lots) and the selection of small, random samples from each of those units. Data gleaned from these stratified random samples provide supervisors and program managers with a sufficient amount of information on which they can base management decisions. In addition to enabling managers to monitor sub-divisions within their project area, LQAS also offers the flexibility of aggregating data across sub-divisions to obtain a coverage estimate for the entire project area.

The hallmark of LQAS is the division of the target population into smaller, administratively meaningful units (lots) and the selection of small, random samples from each of these units.

LQAS has a number of advantages over cluster sampling. Five such advantages are presented below.

1) Cluster sampling, unlike LQAS, only yields overall coverage estimates. Because of this it hides differences in coverage between sub-divisions of a project's catchment area. While LQAS does not yield specific coverage estimates for sub-divisions, it does identify which sub-divisions have acceptable levels of coverage as well as those that are performing below expectation. In this regard, it is possible to target areas that require additional resources in order to achieve project objectives.

2) LQAS coverage estimates tend to be more precise than estimates obtained using cluster-sampling techniques. This greater precision is due to the fact that LQAS is rooted in principles of stratified sampling, which generally yields estimates with narrower confidence intervals than estimates derived from cluster samples of the same size. With LQAS,

[2] LQAS has traditionally been used for one of two purposes: 1) to provide area-specific information relative to the supervision of health workers or 2) to obtain a highly accurate measure of program-wide coverage (Valadez, 2000). The WHO manual focuses on the latter. While WHO's approach yields precise aggregate-level estimates, it introduces the risk that judgements pertaining to specific areas (lots) may be imprecise or inefficient (Valadez, 2000).

Photo courtesy of PLAN/Nepal

Community Health Officer Y. B. Thapa interviews a mother during the first LQAS assessment of June 1999. During the first assessment, supervisors collected data in two to three full days. Supervisors now conduct interviews as part of their routine visits over a 19-day span, with one LQAS observation per day.

every stratum (e.g., village, ward) is sampled. With cluster sampling, many strata may be omitted in the selection of clusters.

3) As alluded to above, LQAS is a more efficient sampling design than cluster sampling. In many countries, families or individuals with similar behavioral patterns tend to live in close proximity to one another. The selection of neighboring households within a given cluster, as is done with cluster sampling, introduces a bias that does not exist when individuals are selected randomly. This bias is reflected in a statistical measure known as the design effect (DE). DE equals 1.0 (no design effect) if the sample design is as efficient as a simple random sample. There is no design effect associated with LQAS. In contrast, cluster sampling is associated with increased sampling error and is therefore less efficient than simple random sampling. For cluster samples, DE is assumed to be equal to 2.0. There must be twice as many respondents in a cluster sample compared to a simple random sample in order to compensate for the increased sampling error associated with cluster sampling.

4) Surveys can be implemented at any time during a project. Traditionally, cluster surveys are implemented at the beginning of a project to gather information as part of a baseline assessment, then four years later at the end of a project to assess whether the project has achieved its initial objectives. While information gathered at the end of a project can be used for evaluation, it is too late to use for project monitoring. In theory, cluster surveys can be implemented as frequently as the project manager desires. From a monitoring perspective, however, the methodology can be impractical. It does not provide information on individual program units that can be used to manage projects more effectively and efficiently. In contrast, LQAS' relevance to local program units makes the methodology more practical for project monitoring. When used with a small questionnaire, LQAS is relatively easy to implement. It lends itself to multiple applications throughout the project cycle, providing useful information for both monitoring and evaluation purposes.

5) There is also evidence to suggest that studies using LQAS are less expensive than studies using cluster sampling (Robertson et al., 1997). For example, a cost analysis of PLAN/Nepal's LQAS assessment at midterm indicates that the total cost of the study was less than half that of the project's baseline cluster (KPC) survey. Many of the LQAS costs were already paid by the project (e.g., project employees were used as interviewers).

Taking this into consideration, the baseline cluster survey actually costs more than four times as much as the LQAS assessment.

LQAS as a Monitoring Tool

LQAS was introduced during the project's midterm evaluation as a mechanism for routine monitoring of community-based health worker performance. This monitoring strategy was included as part of the project's original design, appearing in the project proposal that PLAN/Nepal submitted to the PVO Child Survival Grants Program. Since its midterm evaluation in June 1997, the CS project has conducted two additional LQAS assessments. PLAN intends to conduct this monitoring exercise semi-annually through the remainder of the project.

LQAS provides FA supervisors with up-to-date information that is used in their supportive supervision of FCHVs and TBAs.

LQAS provides the FA supervisors with up-to-date information that is used in their supportive supervision of FCHVs and TBAs. Supervisors do not use LQAS to evaluate the technical skills of each health worker. Instead, they use LQAS to assess whether teams of FCHVs and TBAs are achieving coverage targets within the community. In areas where coverage is lower than expected, supervisors work with the teams to improve intervention coverage.

Methods

As was mentioned previously, PLAN/Nepal's lots are its seven Field Areas (FA), and its production units are the supervisor and FCHVs/TBAs within each FA. Although PLAN conducted a baseline KPC study during the first year of its CS project (and intends to conduct a subsequent survey for its final evaluation in 2001), it is using LQAS to select respondents and administer a subset of KPC questions for monitoring purposes. This section discusses sampling procedures and tools used by PLAN/Nepal.

Respondents

Certain types of information are best obtained from different individuals. For example, mothers of children age 12–23 months are better targets for questions pertaining to immunization coverage, whereas mothers of younger children may be more appropriate respondents for questions regarding pregnancy-related issues (since these mothers were pregnant in the recent past, thus minimizing recall problems). PLAN uses parallel sampling to collect information from various types of individuals in an efficient manner. The main principle behind parallel sampling is that one random element (in this instance, a household) serves as the basis for selecting different types of respondents. PLAN/Nepal targets three client populations in its LQAS monitoring exercise:

A sample size of 19 limits misclassification risks to less than 10 percent for every indicator.

1. women of reproductive age (15–49 years)
2. mothers of children age 0–11 months
3. mothers of children age 12–23 months

If separate tools are used for each group of respondents, the number of questions per questionnaire and thus, the length of interviews can be dramatically reduced.

Data Collection Tools

There are three different questionnaires for each of the three cohorts of interest. Questions contained in the LQAS questionnaires are simply a subset of the baseline KPC survey, and provide the same type of data as the baseline KPC survey. As seen below, the type of respondent determines the topics included in each of the three questionnaires. Those topics are as follows:

<u>For mothers of children age 0–11 months:</u>

- Breastfeeding/nutrition
- Control of diarrheal diseases (CDD)
- Pneumonia case management (PCM)
- Maternal and newborn care (antenatal,

delivery, and postnatal care)

For mothers of children age 12–23 months:

- Breastfeeding/nutrition
- Vitamin A supplementation
- CDD
- EPI

For women of reproductive age:

- Family planning

Sample Size

PLAN/Nepal decided that randomly selecting 19 wards per FA would enable the project to make informed decisions regarding each FA, while minimizing the risk of incorrectly classifying an FA as acceptable or below expectation for every indicator. Other sample sizes could have been chosen; however, the risk of misclassification increases as the sample size gets smaller, whereas little is gained in terms of the precision of estimates and the efficiency of the method when larger sample sizes are used. As discussed in the article "LQAS: Key Terms and Concepts," a sample size of 19 limits misclassification risks to less than 10 percent for every indicator. Since there are seven lots (corresponding to the seven FAs within the CS project area), there are approximately 133 women (19x7 lots) in each of the three cohorts of respondents.

A truly random sample is the crux of the LQAS methodology.

As discussed above, questions on diarrhea case management are asked of both mothers of 0–11 month olds and mothers of 12–23 month olds. These questions are duplicated in the two questionnaires to ensure that there is a sufficient number of sick children to accurately assess care-seeking practices. Assessing differences in diarrhea case management between lots may not always be of interest, however, nor may it be very feasible. If there are not enough sick children in each FA to make lot-specific assessments, the data can simply be aggregated across FAs for a project-wide assessment of the indicator.

Sample selection

Samples are selected using the following two-stage selection process.

Step one—sampling wards within each FA

The process for selecting wards is analogous to the process for selecting clusters when cluster sampling is used. Nineteen wards from each FA are randomly selected with probability proportional to size (the chance of a ward being selected is proportional to the size of its population). A sampling frame serves as a guide for selecting wards. A sampling frame is a listing of all possible "elements"—in this instance, wards—within a domain (FA). PLAN's listing includes the following information:

- all VDCs within the FA
- each ward and its population size
- a column that tallies the cumulative total population for that particular FA

A sampling fraction is then calculated by dividing the total population of the FA by 19 (the LQAS sample size in each lot). PLAN's Project Health Coordinator then selects a random number between one and the sampling fraction. The ward whose cumulative population includes that number is selected as the first LQAS ward. The staff identifies the second ward by adding the sampling fraction to the first randomly selected number. This process is repeated (adding the sampling fraction to the previous number) until 19 wards are selected. For example, if the total population within an FA is 1000, the sampling fraction (1000 divided by 19) is 53. If the Project Health Coordinator randomly chooses the number 13, the ward whose cumulative population includes the number 13 is selected. The second ward is identified by adding 53 (the sampling fraction) to 13 (the first randomly selected number). The second ward then, is

the one whose cumulative population includes the number 66. The third ward is chosen by adding 66 and 53, and so on.

Step two—sampling households within each selected ward

The above process identifies the 19 wards from each FA. While the Project Health Coordinator randomly selects the 19 wards in each lot, the FA supervisors are responsible for randomly choosing in which households the interviews are conducted. As stated previously, there are three sample populations: women of reproductive age, mothers of children age 0–11 months, and mothers of children age 12–23 months. In each ward, the supervisor conducts one interview for each of the three cohorts.

Over the past year, PLAN/Nepal has modified its methodology to improve the rigor of the household selection process. This was done in hopes of achieving a truly random sample, which is at the crux of the LQAS methodology. During the initial LQAS assessment, the method of household selection was left to the discretion of each supervisor. Supervisors were trained and given the option to either divide the selected ward into smaller and smaller units or employ a "spin the bottle" technique to identify households.

LQAS requires minimal training to implement. Local supervisors rather than specially trained interviewers may collect the data.

With subsequent applications of LQAS, however, all supervisors are expected to adhere to the following protocol when selecting households and respondents:

1. Go to the center of the selected ward and identify the four directions (quadrants)—north, south, east, and west. Determine in which direction to proceed using a random method (e.g., placing the directions on four slips of paper and blindly selecting one of the slips).

2. Proceed in the selected direction and go to the place that equally divides the quadrant's population in half (i.e., where 50 percent of the quadrant's population resides on one side and the other 50 percent reside on the other side). Randomly select in which of the two directions to proceed.

3. Repeat Step Two until a small and manageable set of houses remain, then proceed to Step Four.

4. Count all the households in that direction.

5. Use a random number table to select the first household in which an interview will be conducted.

6. In the selected household, determine if a woman of reproductive age (15–49 years old) resides in that household. If so, ask for consent and administer the Family Planning Questionnaire.

7. Next, determine whether there is a mother of a child under the age of 24 months. Based upon the age of the child (either 0–11 months or 12–23 months), administer the appropriate maternal questionnaire.

The same woman who serves as the respondent for the Family Planning Questionnaire may also serve as the respondent for one of the maternal questionnaires. Note, however, that there can only be a maximum of two interviews conducted within the same household: one with a woman of reproductive age and one with either a mother of a child age 0–11 months OR a mother of a child age 12–23 months. The rationale behind collecting information on only one child per household is to ensure that the diarrhea case management behaviors of a particular household are not overrepresented within the sample. Not adhering to this rule would introduce bias when assessing the treatment of sick children.

Training

LQAS requires minimal training to implement. Local supervisors rather than specially trained interviewers may collect the data. In June 1999, the Senior Monitoring and Evaluation Specialist from NGO Networks for Health trained all seven FA supervisors and one support staff per supervisor in LQAS and general research methods. The training was conducted over a three-day period. There has been no refresher training since the midterm evaluation, although the Project

Coordinator meets with the FAs prior to each LQAS field implementation.

Data collection

In addition to requiring a minimal amount of interviewer training, little time is spent conducting interviews. On average, PLAN's interviews with women of reproductive age last approximately five minutes. Interviews with mothers of children age 0–11 months and 12–23 months last approximately 15 minutes and 10 minutes, respectively.

During the first two LQAS assessments, supervisors completed data collection in two to three days. PLAN's initial data collection strategy took the FA supervisors away from their usual supervisory activities, however. FA supervisors normally visit communities four to five days per week in order to support FCHVs and TBAs. In an effort to integrate LQAS into the existing supervisory system, PLAN has changed its LQAS interview schedule. Now, FA supervisors conduct interviews over a 19-day span—one LQAS observation per day. Thus, supervisors conduct interviews as part of their routine visits to the wards. Supervisors have expressed a preference for this approach, which places fewer demands on their time and is believed to be more cost-effective and sustainable than the previous approach.

Data analysis

In addition to efficient data collection, data analysis for PLAN's LQAS exercise also required little time. In the case of PLAN/Nepal, hand tabulation of data could be completed within half-a-day. Data were also entered into a computer and analyzed by PLAN/Nepal's Project Health Coordinator and office personnel using EPI Info.

In determining whether FAs are adequately or inadequately covered, PLAN has chosen different decision rules for each of the indicators included in its LQAS assessment. The project used results from its baseline KPC survey to identify coverage benchmarks for each intervention. With time, a successful project is expected to get closer and closer to achieving it's coverage targets. In light of this fact, PLAN's coverage targets change from year to year. Consequently, the project has changed its LQAS decision rules to reflect annual targets. To ensure

Photo courtesy of PLAN/Nepal

PLAN's interviews with area mothers such as this one are relatively short. Interviews with women of reproductive age last approximately five minutes. Interviews with mothers of children age 0-11 months last an average of 15 minutes. Interviews with mothers of children 12-23 months are only 10 minutes.

comparability across FAs, all FA supervisors use the same decision rules (the maximum number of observations which can be classed as "unacceptable" if the whole lot is to remain acceptable) when examining the data.

Indicators

PLAN/Nepal has identified a set of monitoring and evaluation indicators for its CS project. Project monitoring does not require an extensive list of indicators; a concise set of exemplary measures is sufficient to assess the achievement of project benchmarks. The following are exemplary indicators that can be gleaned from PLAN/Nepal's LQAS data:

1. Percentage of children age 0–11 months whose births were assisted by skilled health personnel

2. Percentage of children age 12–23 months who are fully immunized before the first birthday

3. Percentage of children age 0–23 months with diarrhea in the last two weeks who received ORT

4. Percentage of children age 0–11 months with pneumonia during the last two weeks whose mothers sought treatment

5. Percentage of women age 15–49 years who are currently using a modern method of child spacing

"We can evaluate ourselves as part of our regular work."

—Yam Bahadur Thapa, Field Area Supervisor

Information sharing/dissemination of findings

Once the data are collected, the seven FA supervisors meet to discuss findings and develop strategies to improve coverage. Then each supervisor meets with his/her team of FCHVs and TBAs to share the results. As part of PLAN's system of supportive supervision, a number of monthly meetings are held with health workers. These meetings provide forums to discuss LQAS results and to develop action plans that address problems identified during the assessment. FA supervisors also meet with mothers' groups on a regular basis. At present, there is no mechanism for community feedback, although mothers' groups and micro-credit groups are being explored as possible conduits for information dissemination.

"It is a fast, easy way to let us know how we can support them [FCHVs and TBAs]."

—Saraswati Kharel, Field Area Supervisor

Discussion

PLAN/Nepal's FA supervisors have used LQAS three times and have found it to be a very useful management tool. In light of the CS project's success with LQAS, PLAN/Nepal is considering this activity for its other programs in education and micro-credit. Child survival project managers also wishing to adapt PLAN's experience may wish to consider the following:

Self-Assessment

At present, FA supervisors conduct interviews in the same wards where they supervise FCHVs and TBAs. While PLAN/Nepal has paid tremendous attention to quality control and does not see this as a conflict of interest, other projects should give this careful consideration. One alternative would be to have field supervisors collect information from a neighboring lot, rather than their own lot. There is evidence to suggest that that while self-assessment creates some bias, it is not substantial (Valadez, 2000). Even individuals who assess themselves ultimately improve their performance. Because supervisors need to perceive the LQAS monitoring as a constructive exercise implemented by them, for them, PLAN opted to have its supervisors collect data from their own FAs.

Indicators and Time Needed for the Assessment

PLAN's LQAS monitoring questionnaires are subsets of a larger KPC survey. The number of indicators will dictate the number of questions required in each questionnaire. This ultimately determines the amount of

time needed for both data collection and data analysis. A concise set of measures—one or two sentinel indicators for each technical intervention—is desired for ongoing project monitoring.

LESSON LEARNED

A concise set of measures—one or two sentinel indicators for each technical intervention—is desired for ongoing project monitoring.

During its first two LQAS assessments, PLAN completed data collection within 2–3 days. However, other projects will need to take various factors into account when estimating the amount of time and resources required for this exercise. Data collection may take longer in other contexts, where geography and/or settlement patterns within communities may affect the number of interviews that can be conducted within a day. Time of year (e.g., monsoon season) should also be taken into account. In addition, individuals who are not familiar with the communities in which they are collecting data may require additional time.

Capacity Development

To date, PLAN has placed emphasis on improving the rigor of its sampling strategy and the general quality of survey implementation. Challenges now lie in 1) engaging ground-level staff in this activity and 2) mobilizing the community to use the data.

LESSON LEARNED

The next step in the process is to develop the capacity of others (e.g., MOH senior managers, VHWs, and MCHWs) to conduct this monitoring activity as well.

CS project supervisors laud LQAS for its feasibility and relevance to project management. At present, LQAS data collection is solely the responsibility of the FA supervisors, and the capacity of the FA supervisors has grown tremendously in this area. The next step in the process is to develop the capacity of others (e.g., MOH senior managers, VHWs, and MCHWs) to conduct this monitoring activity as well. Other projects may want to explore means of developing the capacity of local partners/stakeholders and project personnel at various levels to use LQAS. At the present time, data utilization is limited to the supervisors. Although LQAS results are shared with FCHVs and TBAs, these parties are not active participants in PLAN's LQAS monitoring efforts. Given the high levels of illiteracy among FCHVs and TBAs, it is understandable that supervisors are best suited for data collection that centers around written instruments. Nevertheless, community volunteers could play essential roles in information gathering, information dissemination, and data utilization.

LESSON LEARNED

Community volunteers could play essential roles in information gathering, information dissemination, and data utilization.

PLAN/Nepal recognizes that community feedback is an area needing growth, and it is exploring innovative ways of engaging community members in project activities. FCHVs and TBAs are vital links to the community and may serve as agents for information dissemination and facilitators in community-based decisionmaking. The CS project has already designed a number of pictorial instruments that are used by FCHVs to monitor child morbidity within the community. It may be possible to adapt some of these tools to be used in conjunction with LQAS.

Using LQAS To Assess Health Worker Skills

LQAS has proven useful in tracking PLAN's achievement of coverage targets. Another area in which the methodology can be beneficial is in assessing the adequacy of services rendered. Project staff, health-facility staff, and community volunteers have received specialized and refresher training in each of the project's technical interventions. Nevertheless, the technical competence of

these workers has not been formally assessed. It may be worthwhile to explore the use of LQAS to assess the skills of health workers. In order to do so, health workers, and not wards, would be sampled. Supervisors would need to identify the essential factors/skills/behaviors that constitute acceptable technical quality on the part of the health worker.

LESSON LEARNED

It may be worthwhile to explore the use of LQAS to assess the skills of health workers.

An assessment of this nature serves two ends. First, it can identify the technical areas where particular health workers may need to improve. Second, it may identify problems that are common throughout a program area. A coverage-based application of LQAS will identify where problems exist. A worker-based application of LQAS may provide insight into whether those problems can be solved by increasing the technical capacity of the health workers.

Small Lots Provide Specific Information

PLAN/Nepal uses fairly large sub-divisions of its project area in the LQAS assessment. One FA contains seven VDCs, or 63 wards (see Figure 1). Based on its current sampling strategy, PLAN can determine whether or not an entire Field Area has acceptable levels of coverage. Even when an FA is deemed acceptable, however, there may be vast differences in coverage within the FA. Likewise, if an FA is deemed below expectation, it is unclear which wards—and which FCHVs and TBAs—require special attention.

LESSON LEARNED

Using smaller lots allows project managers to identify and provide a highly targeted response to areas of greatest need.

Another way of using LQAS would be to divide the Field Areas into much smaller units. Using smaller lots allows project managers to identify and provide a highly targeted response to areas of greatest need. In a project such as PLAN Nepal's, smaller local units (in this case, VDCs or wards) could function as the lot rather than the field areas (see Figure 1). This approach would require a project to train local VHWs—the appointed "supervisors" within the MOH system—in LQAS. Dividing the FA into much smaller units this way yields different levels of information. FA supervisors would be able to monitor performance of an FA as a whole, while VHWs monitor workers from wards that fall within his/her facility's catchment area.

"We can improve our work before it's too late. It costs nothing. It takes nothing…"

—Rajendra Prasad Sah, Field Area Supervisor

One of the most attractive features of LQAS is its ease of implementation and the small amount of data generated. As smaller and smaller lots are identified, however, time spent and data generated increase. Project managers should consider the additional time needed, the volume of information that could potentially be generated, and the utility of information on smaller units of analysis, so as not to lose these advantages of LQAS.

Lessons Learned

PLAN's use of LQAS has proven to be an effective and efficient means of tracking the achievement of coverage objectives. When considering a similar application of LQAS, other CS projects should consider the following challenging lessons learned gleaned from PLAN's experience with the technique:

- Use LQAS as part of supportive supervision to assess the technical capacity of workers.
- Identify small, manageable program units (lots).
- Develop a concise and manageable set of monitoring tools and indicators.

- Pay attention to process—random selection is crucial.

- Build the monitoring capacity of workers at all levels.

- Foster a community buy-in—explore ways in which this project-oriented approach can be modified for community-based monitoring and decisionmaking.

Within the context of child survival, *LQAS is simply a technique* used to select respondents and analyze data. It can be used in conjunction with a variety of tools, under a variety of circumstances. In this case study, LQAS has enabled a CS project to make routine assessments during the life of the project and modify project activities to achieve objectives. PLAN/Nepal's supervisors have become tremendous advocates of this cost-effective, efficient, and field-friendly method. It will be interesting to observe how PLAN and other PVOs further adapt this method to build capacity, strengthen partnerships, improve project efficiency, and ultimately translate these changes into favorable outcomes at the beneficiary level.❁

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LQAS: Key terms ...

continued from page 1

thresholds is 19:6, where 19 is the sample size and six is the maximum number of observations which can be classed as "unacceptable" if the whole lot is to remain acceptable. In other words, an entire lot is considered "good" or "acceptable" if a supervisor/manager observes at least 13 out of 19 randomly selected "elements" as acceptable.

To further illustrate this concept, suppose that a hypothetical CS project has a diarrhea intervention that involves community health workers educating mothers on the correct use of oral rehydration solution (ORS). A supervisor visits a particular village and asks 19 randomly selected mothers to explain how they would prepare ORS. If 13 or more mothers correctly describe the process, the supervisor will conclude that the village has "acceptable" (adequate) coverage of the intervention. If fewer than 13 mothers answered correctly (more than six answered incorrectly), this would imply that the village is inadequately covered with respect to the intervention. As a result, additional project resources—further training of community health workers or more intense IEC (information, education, and communication) activities aimed at mothers of young children, for example—may need to be directed towards that village.

The number of observations (sample size) within each lot and the decision rule are based upon what is statistically acceptable for the health manager or supervisor. Ideally, the sample size should be large enough that the manager has a high probability of identifying lots that are at or above the upper threshold and a high probability of identifying lots that are at or below the lower threshold. In the above example, the 19:6 decision rule takes into account a risk of misclassification that is below 10 percent. Project managers should identify the smallest possible sample size to keep the risk of misclassification below 10 percent for all indicators of interest. Samples of size 10–19 generally satisfy this criterion.

A sample size of 19 is often used because of the flexibility it provides. Sometimes a manager wishes to change an upper threshold after the data have been collected, for example, to come up with a stricter definition (higher threshold) of acceptable coverage. With a sample size of 19 the upper threshold can be changed for any variable and still have a fairly low risk of judging lots incorrectly. With a smaller sample size, a manager who changes thresholds after data collection increases his or her chances of making errors when assessing lots. To avoid making these errors, the only other option would be to collect additional data. This is very impractical in most cases. With a sample size of 19, a manager can change or set thresholds after fieldwork is done, and not have to worry about surveying additional households.

If you are interested in a more in-depth discussion of key LQAS terms and concepts, please consult the references listed at the end of the PLAN case study in this issue.❁

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Monitoring Community Health Workers' Performance through LQAS

During the period 1987 to 1990, the Ministry of Health of Costa Rica conducted a comprehensive assessment of the nation's primary health care system. Among the investigations carried out were some that focused on community health workers' techniques, using an observation checklist that was detailed enough to help supervisors rate the workers' performance (J.J. Valadez, L. Diprete Brown, W.V. Vargas, and D. Morley, unpublished material, 1995).[1,2]

In all cases, lot quality-assurance sampling was used to evaluate problems in community health workers' performance. This type of sampling requires samples ranging in number from 6 to 28 patients and can yield conclusions with sensitivity and specificity greater than 95%.[1] This report demonstrates how lot quality-assurance sampling, when used regularly for supervision of community health workers, can improve vaccination service by identifying specific errors and correcting them.

In brief, lot quality-assurance sampling uses binomials to determine whether a performance threshold has been reached or whether a minimal threshold has not been reached.[1,3] The decision rule selected for our study required observing each community health worker vaccinate six children in six different households during routine visits.[4] One error per given task was permitted. This 6:1 decision rule was 97% specific with 95% confidence for identifying adequate performers. Figure 1 shows that with multiple use of lot quality-assurance sampling over time, the sensitivity continues to increase for community health workers with varying levels of performance.

Three community health workers from health posts in each of Costa Rica's then-six health regions were randomly selected for the assessment (n = 18). At three 6-month intervals between 1988 and 1990, the community health workers' performance was monitored by their supervisors,[5] and remedial training was provided each time. Five categories of tasks were used for judging the vaccination quality over the three time points: (1) identification of children requiring vaccination; (2) preparation of the syringe and a sterile work area in the household; (3) education of mothers on the need to vaccinate children and the potential side effects of vaccination; (4) application of the vaccination and clean-up; and (5) maintenance of the cold chain.

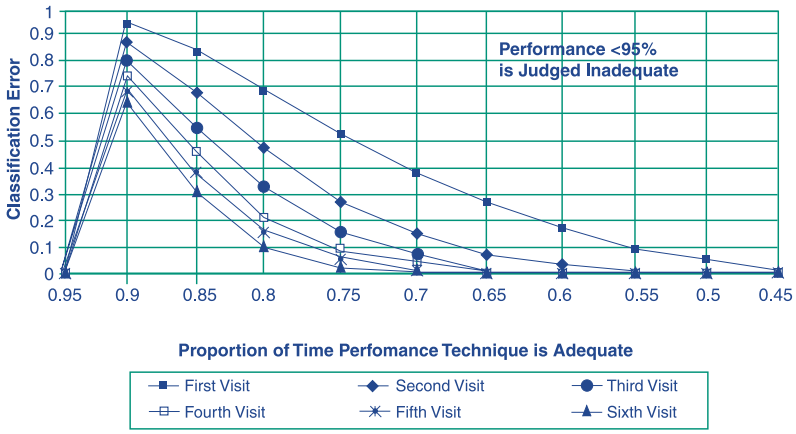

FIGURE — Decreasing classification error among community health workers' techniques with each additional supervisor visit.

The results are consistent across the three time points. The number of community health workers exhibiting substandard performance decreased markedly in 30 of the 38 activities. The 30 activities included 21 in

which the number of substandard community health workers decreased to 0, 5 in which the number decreased to 1, and 4 in which the number decreased by more than 80%. There were 2 categories of tasks in which no performance problems were recorded and 1 category in which community health workers did not improve. Performance in 3 categories improved by about 25% but declined slightly in 2 categories.

These results demonstrate that the technical quality of vaccination service improved over approximately 1 year after the introduction of a local supervisory system that used lot quality-assurance sampling.❁

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