

**Transforming Public Health Organizations
Into Learning Organizations:
The Case of Malaria Control in Odisha, India**

by

Jerald Hage
Center for Innovation
University of Maryland
College Park, Maryland
United States of America

Babu Ram Devkota

Hemant K. Das

Joseph Valadez
Liverpool School of Tropical Medicine
Liverpool, England
United Kingdom

Transforming Public Health Organisations into Learning Organisations: The Case of Malaria Control in Odisha, India

Introduction

Monitoring and evaluation (M&E) techniques identify where health care interventions need support. Resource poor settings generate obstacles to producing an effective response. Once it is known where programmes fail, organisations require problem solvers on the ground to produce actionable solutions to improve their health care interventions. This paper considers key challenges in how to increase learning from M&E results in public health organisations, diffuse this learning more rapidly throughout an organisation and produce local level responsiveness to the recommendations made. We present a method for assessing how much organisational learning is occurring and indicate how it can be increased in health care organisations. The paper explores the question through the example of Lot Quality Assurance Sampling (LQAS) for malaria control in two districts in Odisha, India.

Lot Quality Assurance Sampling (LQAS), originally described by Dodge and Romig in the 1920s [9] together with the work of Shewhart [29], grew to what is today called Statistical Quality Control. Their idea of sampling manufactured goods became even more critical in the subsequent war effort, where destructive testing of equipment made the concept of statistical sampling and inference essential [30]. During the 1980's LQAS made the transition to international public health sciences gaining popularity as an assessment tool in a wide range of settings (see [7] for an extensive survey of applications).

LQAS is a classification method and requires sampling a population in two stages: The first obtains random samples of households from a district in order to classify it as being in one of two classes: labelled as “acceptable” and “unacceptable”. The term “acceptable” in this study means that a high proportion of households have a trait of interest; conversely, “unacceptable” means that a low proportion have this trait. The second stage combines information from several districts so as to measure the prevalence of a particular indicator. This can be done either as a stratified sample, see [31, 32] for examples, or as a cluster sample [33]. The current study uses stratified random sampling.

LQAS can result in time and cost savings in comparison with more traditional survey methods (Lanata & Black 1991). The savings render LQAS particularly suited to low income contexts, providing public health care organisations with performance measures to benchmark their effectiveness in interventions designed to improve the health of the poor (Robertson and Valadez, 2006; Valadez, 1991; Valadez and Devkota, 2002).

The method as demonstrated here aims to improve how organisations respond to LQAS recommendations and critically, to problem solving regarding how to change individual,

community and institutional behaviours for improving delivery of, access to and use of health care. The specific method presented here identifies where learning is or is not occurring and suggests mechanisms for transforming a health care bureaucracy into a learning organisation. The Liverpool School of Tropical Medicine funded this pilot study with a grant from the Development Fund of International Development Fund of the United Kingdom.

The need for learning organisations

Findings generated by M&E data collection methods, analysis and reporting do not always identify the reasons why a particular intervention fails to reach its targets. Where reasons are known--for example, specific behaviour patterns running counter to successful programme implementation --officials in public health care organisations often face seemingly intractable problems, such as changing entrenched behaviour at the individual or collective level. Nor is this a problem only in low to middle income contexts. Public health concerns in higher income countries such as obesity, cigarette smoking, and hypertension are viewed as caused by the social determinants of health, defined as the social, cultural, political, economic and environmental factors which may impact on an individual or community's health (CSDH 2008; Marmot, 2004; Marmot and Fiel, 2008; Marmot et al., 2008; Pample et al., 2010). These determinants form a complex nexus and may manifest in a number of ways, including the distribution of power and income; accessibility of education and health care services; living and working conditions; socio-cultural norms, values, identities and forms of discrimination; and the policies and programmes affecting any of these factors (Braveman & Gruskin 2003: 254; Leon et al. 2001; CSDH 2008).

Given the need to address the social determinants of health, health care organisations in both developed and developing contexts must become learning organisations capable of developing appropriate solutions for local communities tailor-made to existing social norms, practices and preferences (Argote and Miron-Spektor, 2011; Cohen and Sproull, 1991; Crites, et al, 2009; Davies and Nutley, 2000; Dierkis et al, 2001; Kogut et al, 1996; Nonaka and Takeuchi, 1995; Senge, 1991). The need to improve the responsiveness of public health organisations to research findings reflects current concerns regarding 'avoidable waste' in the production of research evidence (Chalmers & Glasziou 2009). It is important that findings generated in M&E reports are transformed into tangible health improvements for the poor.

The first section of this paper introduces the specific health care organisation of the malaria control programme in two districts of Odisha, India. In this context, LQAS reports are perceived to change the typical downward communication patterns of public health organisations and to demand that health care officials become problem solvers. The learning organisation paradigm is discussed as an example of how this type of problem solving might be achieved. The second section focuses on the research design for assessing what problems have to be solve, whether or not individuals are attempting to solve them, our definition of learning, and at what levels in the decision-making, status hierarchy. The measurement of these characteristics was collected in seven distinct interview schedules, protocols for focus groups, and surveys from approximately 80 respondents, about equally divided between the two districts of Kandhamal

and Sundargarh. The specific problems to be solved and which individuals in the hierarchy are attempting to solve them or have suggestions about how they can be solved are reported in the third section. On the basis of this data, a series of recommendations are made as to how these potential solutions can be diffused throughout the organization, respecting the various cultural constraints, to convert the bureaucracy into a learning organization.

Case study setting: Odisha state, India

The specific example is the use of LQAS for malaria control in two district health care organizations in the state of Odisha, India. This state has 3% of the population but 23% of the malaria cases and 40% of the most deadly form of malaria, *P falciparum*, and as a consequence 17% of the total malaria deaths in India (World Health Organization, 2007), rates are which are higher than in Africa.

The Theoretical Framework

The organization of the malaria program along with its characteristic patterns of communication in the districts of Odisha is described in the first sub-section. In this context, one can place the LQAS system of performance measures and their impact on communication channels and learning. The quite different patterns of communication in learning organizations are discussed in the second section. These then become the keys for designing the transformation of a bureaucracy into a learning organization.

The Organization of the Malaria Control Program in the Districts of Odisha

Although India has been involved in the eradication of malaria since the 1950s, the program has gone through various transformations as it became apparent that DDT was no longer successful in controlling the disease (see Directorate of Health Services, Odisha, n.d.). The most important recent institutional change occurred with the creation of the National Vector Borne Disease Control Program (hereafter NVBDCP) This program added new diseases carried by insects (Filaria, Dengue, Kala Azar, and Japanese Encephalitis), new diagnostic tools (the rapid diagnostic technique), new preventive techniques (long lasting impregnated nets and new kinds of spray) and medicines for malaria, especially the highly effective artemisinin based combination therapy (ACT), which became available in 2008.

Starting in 2005, the World Bank began funding parts of this program and expanded it in 2008 (www.searo.who.int/en/Section10/Section21/Section1979_13869/htm). Perhaps more critically, the funding paid for malaria training within each health care district of: (1) the health volunteers in the villages, accredited social health activists (ASHA) who when they receive this qualification are called Fever Treatment Depot Holders (FTDs); (2) the Malaria Technical Supervisors (MTSs) who take the measures used in the LQAS reports; and (3) the coordinator of the National Vector Borne Disease Control Program (hereafter VBDC) at the district level.

The sheer size of even the Health and Family Welfare Department of a single state such as Odisha in India, leaving aside the entire health care delivery system, is hard to grasp for non-Indians without data. Table One reports the number of personnel of health care workers at various status levels along with the average size of the population unit being served only for malaria control--the new created NVBDCP--and only for the two districts involved in the case

study. The state of Odisha has 30 districts for a population of 41 million (census of 2001, see [Odisha/55.NVBDCP.pdf](#)). It should be noted however that not all 30 districts, which have 314 sub-districts or blocks and 51,790 villages and hamlets other than the urban areas, contain a high incidence of malaria.

Since this is a health care bureaucracy, one might assume that it is highly centralized with all decisions being made in New Delhi by the federal government but it is more complicated than that. Since the 1990s the federal government has been evolving gradually towards decentralization. Specifically, it has been attempting to provide more latitude in decision-making to the district and the sub-district levels. As part of the decentralization, some positions having enormous autonomy, specifically the Medical Officers in Charge (MOIC) at the sub-district (block) level. This has been true since the inception of the health care system. Another manifestation of decentralization is that disparate districts within the Government of Odisha have adopted distinct policies relative to the handling of malaria. Furthermore, on the margins, small amounts of funding can be moved from one category of health care or even malaria control to another. The tolerance of different policies allows districts to experiment and learn. But it is important to note that the Government of India specifies the level of training required for each position in the status hierarchy creating some issues for the districts that have high turnover and/or vacancies in their NVBDCP. Also, the bulk of the funds for health care and how they will be spent are still dictated by the federal level. At the same time, the sum of 10,000 rupees has been allocated to separate Gaon Kalyan Samiti (i.e. village welfare committee) in the villages. But as is typical when money is delegated downwards, the responsibilities are also delegated downwards, which exceed the amount of available money, creating tensions and in some cases reducing the effectiveness of the malaria program.

The centralization is also observable in the communication patterns, which are typical of public bureaucracies (Hage, 1974). Communication typically consists of instructions that emerge from the rational planning at the federal level, which are issued down the “chain of command” to the Governments of the States such as Odisha, and then on to the districts, sub-districts or centers, and finally the sub-centers, to continue with specific case of the Indian health care system. Leaving aside the problem of how these instructions are filtered by the various levels--the more the levels, the more the filtering--there is little upward communication about how general instructions have to be adapted to different conditions at the village level (dissimilarities in language and typography, the presence of tribes and insurgencies, and most importantly, the differential availability of resources, and unusual barriers to village acceptance).

The NVCDP in Odisha has been using LQAS under the supervision of the Liverpool School of Tropical Medicine in four districts of the state of Odisha in India to reduce malaria (NVBDCP, 2008) with support from the Development Fund for International Development of the United Kingdom (see Valadez and Devkota, 2011 for a description of the program and Pradhan, 2011 for the kinds of technical support provided). Its objective is to provide more technical support including enhanced training and capacity building to overcome the weak surveillance and low quality supervisory support noted in the state of Odisha (see [Odisha/55.NVBDCP.pdf](#)). Thus, it is a more intensive effort than is generally being implemented by the World Bank in the 13 high burden districts within the same state.

As LQAS gradually diffuses across both programmatic areas and countries, it is important that it be placed within a theoretical framework so that this important branch of

applied research can enrich a theoretical field and also be nourished by various developments in basic research on health organizations and health care delivery systems (Robertson, S. and Valadez, J., 2006; Valadez, J. and Devkota, B., 2002) such as the organizational learning paradigm. Essentially LQAS with small samples measures how much a particular performance is achieved, such as knowledge, e.g. does a mother know how to treat a child with diarrhea or do health care workers know how to prepare a slide with a blood sample, and behaviors, e.g. does the pregnant woman visit the health clinic for prenatal care or has the village been sprayed at the beginning of the malaria season. These concrete indicators reduce the margin of measurement error and also focus the attention of decision-makers on clear targets to be met. However, knowing that pregnant women are not visiting clinics or that villages are not using malaria nets presents a problem that then has to be resolved. How does one change these individual and collective behavior patterns? This is particularly important for overcoming the social determinants of health (Marmot, 2004; Marmot and Fiel, 2008; Marmot *et al.*, 2008; Pampel *et al.*, 2010), which has clearly become the number one problem in improving the health of many poor people.

LQAS reports change this typical downward pattern of communication in large health care organization to upwards. *In effect, in a large organization with many levels, LQAS “short-circuits” the communication channels by providing information feedback collected at the lowest level of the bureaucracy and the patient level and then communicates this information not only to the immediate supervisory level but more importantly to three and even four or more levels within the hierarchy of decision-making in the health care organization.* In this instance, primarily to the DMOs and CDMOs but also to the Health and Family Welfare Department of the Government of Odisha and even to the federal level of India. In addition, the content of the communication not only concentrates on the performances as measured by the concrete indicators, e.g. amount of spraying, the use of long-lasting impregnated nets, or the availability of various kinds of anti-malaria medicines such as artemisinin based combination therapy (ACT), but more and more on various problems whether it is the inadequacies in the supply chain, the lack of training of the supervisors, or the various resistances at the village level that may explain why these preventive interventions and treatments are not effective or even occurring. The presentation of problems establishes a new demand on government officials, namely that various levels of the hierarchy become problem solvers. This is not easy without training because it means a shift in the organizational paradigm of a bureaucracy from performing routines to changing these routines. In health care organizations, this also means a shift from treating illnesses to considering various kinds of public health interventions that can overcome resistances by either individuals or whole communities.

The development of solutions becomes even more complicated when the patients or communities are not homogenous, which is precisely the case in these two health districts of Odisha. The official language of this state is not Hindi but Odia, which has several dialects. At the village level, there are tribes that speak their own language, Kui, which does not have a script. Pockets of Christianity (and we might add different kinds) also exist, posing still new issues in delivery malaria services to them but also opportunities for intervention and problem-solving. A particular difficult obstacle that creates turnover in some districts is the existence of Maoist insurgencies in parts of the state of Odisha which partially explains the human resource

problems in Kandhamal (see footnote in Table One). Different solutions have to be developed for these distinctive populations.

The partial decentralization of the decision-making in health care in general and in malaria in particular, the large size of the health care bureaucracy even within the districts, and the disparate cultures and languages are all contextual issues that are important when generalizing this case study to other societies or even to other programs of health care within India. But the general implication remains the same, providing specific solutions for the disparate circumstances of various villages and health care district personnel.

The Learning Organization

A new paradigm in the study of organizations, learning organizations (Argote and Miron-Spektor, 2011; Brown and Duguid, 1998; Cohen and Sproull, 1991; Connor and Prahalad, 1996; Crites, *et al*, 2009; Davies and Nutley, 2000; Dierkis *et al*, 2001; Kogut *et al*, 1996; Nonaka and Takeuchi, 1995; Senge, 1991) offers the promise of being able to develop solutions for overcoming the social determinants of poverty and making health care bureaucracies more responsive to LQAS reports. One general theme in this perspective is the idea of accumulating experience and converting this into knowledge (Argote and Miron-Spektor, 2011). But to our knowledge, nowhere in this literature is the idea of locating the good problem solvers at various status levels of the organization and then diffusing both their solutions and their techniques of problem solving to other parts of the organization. Our case study indicates how this can be done. Our simple definition of learning is problem-solving. Problem solving groups, typically labeled quality work circles (Nonaka and Takeuchi, 1995), is one important technique for converting experience into knowledge in the business literature. However, an important point is that the group members are taught how to analyze and solve problems.

In contrast to this theme of training problem solvers in the business literature, the major theme in the health care literature emphasizes evidence based medicine (Crites, *et al*, 2009; Davies and Nutley, 2000) and the knowledge gaps that occur when particular health practitioners are unaware of best practices. But this is usually not the issue in developing countries relative to the use of various prevention techniques. The health officials know that nets and spraying are important. Instead, what they need is training in how to overcome the resistances of specific individuals and entire villages to the use of the appropriate preventive techniques. However, implied in this discussion of knowledge gaps in the health literature on the learning organizations is the larger issue of whether there are communication blocks, which prevent information from moving up and down the status hierarchy, and primarily the former. This is an endemic problem in health bureaucracies and the NVCDP is no exception. One key issue is how to identify where these particular communication blockages are located, and most importantly eliminate them so that there is upward communication.

Which leads to a curious omission in the organizational learning paradigm; there is little discussion of what are the communication patterns for a learning organization. In Hage's (1974) study of health and welfare organizations, he found that while bureaucracies only had downward communication patterns, the more innovative organizations and by implication those good at learning had both upward and horizontal communication and a larger total communication rate. The presence of horizontal communication--especially between different branches of the organization (whether sub-districts, districts or states--would appear to be the

more critical defining characteristic of a learning organization between it allows for solutions developed in one part of the organization to be shared with other sections. Beyond this, the upward flow of information about problems is another critical defining characteristic, which LQAS provides.

In summary, we hypothesize that a learning organization should be a considerable amount of problem solving whether by individuals or in groups, has horizontal communication, and also upward vertical communication. These then become standards by which to evaluate how far a health care bureaucracy has moved towards a learning organization.

The Methodology

An important objective of this pilot study was to develop a set of methodological tools-- design, instruments, and procedures--that could be easily applied to other situations, at minimum in the health care bureaucracies of developing countries. Specifically, the focus is on the creation of interview instruments, protocols for the focus groups, and survey questionnaires for each distinct level of decision-making and status in the bureaucratic hierarchy. The objective was to measure problems to be solved, who was attempting to solve them, and provide feedback on potential solutions for these problems. It is important to recognize that the blockages preventing a health care bureaucracy from becoming a learning organization exist in both the health care bureaucracy, in particular communications blockages, and in the villages, specifically resistances to health care programs. Both sets of problems have to be identified and solved.

Conducting a pilot study to test a new method requires complex research team with different specialties. Das is an Indian who could translate the cultures--national of India, specific to the state of Odisha and in particular, to the Health and Family Welfare Department or organizational culture (and the latter is frequently ignored by individuals who come from other countries) as well as speak the specific language of Odisha. Devkota is an expert in LQAS training and implementation with experiences in multiple countries and was responsible for collecting four rounds of data in Odisha while Das has assisted in two of these collections sponsored by the Liverpool School of Medicine. Finally, Hage is an expert in organizational communication (1974) and has worked in developing countries, and has investigated the problems of translating Western ideas into developing contexts (Hage and Finsterbush, 1987). It is important that research teams assessing the extent of organizational learning has a similar set of competencies.

The Research Design

The research design started with three assumptions. *First*, since LQAS was introduced in four districts, with one of these as a control district (Kandhamal), the initial goal was to visit all four districts. But since each district contains many sub-districts in which these techniques of malaria control are employed, e.g. 12 in Kandhamal and 15 in Sundargarh (see Table One), two sub-districts within each district, one scoring relatively high and one scoring relatively low in perceived organizational responsiveness to LQAS reports were chosen by Devkota and Das in

consultation with Dr. Pradhan, a member of the Family and Health Department of the state of Odisha and in overall charge of the malaria control program in that state. The advantages of contrasting Kandhamal and Sundargarh are suggested by the much higher malaria death rate in the former district as well as the differentials on some of the indicators as measured across time, e.g. the percent fever cases tested has reached almost 40% in Sundargarh in the percent of households properly sprayed in the last three months but actually declined somewhat in Kandhamal to less than 20% indicating some major problems in the skill level in this district (Pradhan, 2011). The latter district is where there is the Maoist insurgency, has large distances between villages, and a high turnover in health care personnel.

Second, since we are concerned with identifying blockages and problems at various levels of the decision-making and status hierarchy, we had to collect data at each of these levels. The number of respondents in various status categories involved in the study are indicated in Table Two. Within each district, we interviewed individuals in two sub-districts, that is the 2 MOiC, 2 Multi-Purpose Health Supervisors at the sector level (i.e. two sectors) and 4 Health Workers (both male and female, or the two assigned to the specific sub-sectors that were selected, and all the FTDs that work in all villages attached to one sub-center in each of the two blocks or sub-districts in the Kandhamal and Sundargarh districts. An extremely important source of data was a long series of interviews with the two co-authors who had been involved in the collection of LQAS data. They provided a considerable amount of background data that was essential.

Table Two
Total Number of Respondents by Hierarchy/Status Level and
By Type of Instrument Across the Two Districts

<i>Hierarchy Status Level</i>	<i>Type of Instrument</i>		
	Interviews	Focus Groups	Surveys
District Health Officer	2 (one each district)		
DMO, VBCD	4 (2 for each district)		
MTS		2 (one each district)	14
Medical Officer in Ch.	4 (1 for each sub-district)		
Primary Center Sector	4 (1 for each sub-district)		
Health Workers	8 (2 for each sub-sector)		
Fever Treat. Depot		4 (one each village)	39
Informants	Multiple with 2 people		

Third, since all of the workers at the bottom level of the hierarchy are women as well as one half of the Health Workers, we felt it was critical that a woman be involved in the interviews with the female Health Workers to reduce whatever biases are created by male interviewers.

Two of these assumptions had to be altered in the light of several constraints. The first constraint was time. The initial planning started in October, 2011 with the request that the two Americans of the research team would travel in the month of December to conduct the pilot study. But scheduling of the trip in this month meant that there would only three weeks at maximum in the field since two members of the research team were to leave on the 22nd of December. Under these circumstances, it was impossible to visit four districts in some 20 days. Furthermore, one of the districts, which would have been ideal, was 18 hours from the capital city of Bhubaneswar. The compromise was to visit two districts and within each one sub-district/sector that was relatively better and one that was relatively less good to try and highlight potential issues that were affecting the responsiveness of the health care officials to the LQAS reports as well as what might be different in terms of the reasons for village resistance.

Research Instruments

The time constraints also impacted on the decisions about the methods for collecting data. Given the large number of interviews especially at the top and bottom of the hierarchy in the Indian health care bureaucracy, the decision was made to shift from interviews to focus groups with two key groups, the MTSs and the FTDs. Since the latter group involved all females, a woman was asked to observe the non-verbal behavior of the women and to report what she thought was the meaning of silences and whether one or two women were dominating the conversation.

A final and non-trivial constraint was the problem of multiple languages. Odisha speaks Odia (which has several dialects itself) rather than Hindi. Ideally one would prefer to have all instruments double-translated into Odia and back into English to check whether or not mistranslations had occurred, but this was not possible given the time constraints. Therefore, the translations were made *in situ* by the focus group leader for the FTDs in each district, who was usually the VBDC. Copies of the instruments are available on request. In the case of other interviews, where we discovered language problems, a second person, usually a native speaker of Odia, translated the questions that either American interviewer asked into their native tongue.

As can be observed in Table Two, seven distinct instruments, protocols and surveys had to be developed to handle the different situations up and down the status hierarchy. It is important to recognize that in this study it is not the number of times a specific problem is mentioned nor the number of problem-solvers of a particular status category nor the consensus on proposed solutions to problems. Instead, we are testing whether this method does adequately locate problems, problem solvers, and solutions, which are then reported in section three. Our concern was with locating specific technical problems that appeared to reduce the responsiveness of key health care personnel to the reports from the LQAS system and specific cultural problems in the villages that made the use of various defenses against malaria less effective, i.e. what were the obstacles. Qualitative studies are better at locating these kinds of problems but of course they are not good in providing percentages about the frequency of specific technical issues or cultural obstacles.

Although the seven instruments (actually two were developed for the FTDs and two for the MTSs, the protocol for the focus groups and the background information for each

participant collected from a survey). Entry into the specific health care districts was facilitated by Dr. Pradhan, , who called various Chief Health Officers in the two districts that were selected for the pilot study and asked for their cooperation. A key asset was the extensive interpersonal network of two members of the research team, Devkota and Das, who knew many of the MTSs because they had worked with them in the field. But beyond this, both of them had developed a number of friendships, which obviously made a great deal of difference in obtaining cooperation in the focus groups and interviews within each district. Another help was the aid of the two VBDCs, Dinesh Praharaj in Kandhamal and Birat Pradhan in Sundargarh, who assisted in the coordination of all those who were to be interviewed either individually or in focus groups. This level of cooperation was critical in the success of the project. Given the practice of the Government of Odisha to provide inducements to secure compliance with various health care protocols, especially pre and post-natal care, inducements were used to help facilitate the formation of the focus groups. The FTDs who participated in the four focus groups were each paid 100 rupees.

The procedure employed in the focus groups for the women is that two of the men, the facilitator, the VBDC, and another native speaker of Odia, led the focus discussion while another person translated for Hage. The presence of two individuals to conduct the focus group is unusual but we found it compensated for the absence of a series of pilot studies to determine the best kind of wording for each question. In other words, the VBDC made the original translation and the second native speaker would amplify this and try another kind of wording. Another important procedure was the recording of the answers by two to three people as well as the use of a recorder to be sure that nothing was missed. In the final edition of the protocols and interview schedules that are available on request, we have used what we believe is the best wording for communicating. Finally, we employed what we thought were culturally sensitive procedures by having both the leader of the focus group discussion and one of the translators sit on the floor because the women were also sitting with their legs crossed. Equally important was the presence of a woman during the focus groups who facilitate the discussion.

Two unusual procedures were used in the process. Devkota who has a vast ground-level knowledge of the health care performances in Odisha would challenge some of the responses of various officials when they seemed not consistent with known data in the LQAS reports. This tactic occurred more in the second district and especially with the Health Workers because he felt that he was receiving pro-forma answers based on the desire to please and not on a knowledge bases on facts. In some cases, the official being interviewed would admit that he had overstated the level. In other instances, it became obvious that the official did not know, in the process identifying one major weak link in the health care hierarchy: Health Workers (see section three on communication blocks). This is, of course, consistent with the concerns of the State of Odisha about weak supervisory support.

Another unusual procedure used by Hage consisted in asking whenever a problem--whether organizational or at the village level--when identified, if a specific solution might resolve the issue. While it would appear difficult to duplicate this procedure in future studies, in fact, many of the suggestions revolved around requesting that individuals ask questions or suggesting more training of various kinds. In effect what this procedure accomplished was putting the interviewee into a problem-solving mode, which in turn provided a number of

insights about the obstacles and even solutions to these obstacles. It helped identify the natural problem solvers in the organization.

Research Findings

The findings are organized around the various issues discussed in the learning organizational perspective: (1) indicating who should receive problem solving training; (2) identifying who is problem solving, and (3) locating communication gaps. LQAS is a wonderful system for detecting when goals are not met in terms of some health care intervention. And individuals are carefully trained in how to sample and measure the concrete performance measures appropriate for a specific health care such as malaria control. But as we have noted above, because LQAS short-circuits the communication channels it presents upper level health officials with the need to problem solve and yet many of them do not have this kind of training. More fundamentally, many of them are trained to treat diseases and do not have a public health orientation, which is more concerned with how to handled patient resistances.

Furthermore, the problem is more complicated than this. The LQAS reports offer suggestions that are in effect problems that have to be solved at quite disparate levels. If we take a recent report in the state of Odisha, clearly some of the recommendations such as the improvement in the supply chain for malarials and prioritizing which districts receive the latest impregnated nets are best accomplished at the district if not higher levels in the health care hierarchy. But overcoming the resistance of villages to the use of nets and spraying is problem that has to be solved at quite a different level, namely at the level of the FTDs and MTSs. Beyond this, the recommendations for improving the supply chain essentially are demanding increased spending, which is unlikely to occur. The issue is how to problem solve about the scarcity of these kinds of materials, an issue that is addressed below and provides an example of how one can turn a liability into an asset.

Just as each level of the hierarchy is most adapt at solving certain problems that are preventing the malaria control program from reaching its targets, so too, our interviews found that each level there was at least one person who was on his/her own developing solutions or at minimum capable of doing so. At the level of MOiC, one of them had given a great deal of thought to the problem of village resistance to the malaria program and had a number of ideas including: Extend the discussion of health topics with the FTDs from one day to two because of the many topics at the ASHA sector meeting; involve the Gaon Kalyan Samiti (local village counsels) and local leaders in gaining acceptance of spraying; and add a lab facility for reading the blood slides to the sector level so that the results are obtained more quickly.

Since the MTSs present the LQAS reports, they are the perhaps the most important status level for not only identify a specific problem such as resistance to spraying but providing some potential solutions as well. The MTSs were interviewed in two focus groups, one for each district, and one of them had developed a number of ideas upon which they were acting:

- 15 days advanced warning for spraying was provided via the sub-district (block) administration;
- The poor performing villages were prioritized for a more focused intervention;
- Attempts were made to engage other organizations that dealt with the villages to increase acceptance of spraying;

- The FTDs and the Health Workers were monitored to improve their skill levels.

But contrary to what one might think, problem solving was also occurring at the lowest level of the status hierarchy: *a few of the FTDs are learning how to convince the villagers to do their mud plastering before spraying occurs*. What is especially interesting is that these women are poorly educated and some of them are among the untouchable class. Many officials in the bureaucracy questioned the wisdom of having them provide diagnostic tests and preparing blood slides because they did not have much education. Some of those who were interviewed commented on the low levels of education of the FTDs. While it is true and their skill levels should be increased, this is quite different from *their capacity to problem solve*. In other words, because of cultural biases that exist in India with its long caste history, the FTDs have been underrated by those officials. Other signs of the ability of the FTDs to problem solve is some of the villagers are observing that the FTDs can cure malaria better than either the quacks or the Bula Doctor.

Our third finding involves the communication gaps that existed in the health hierarchy. Some of the MOiCs are not receiving LQAS reports on malaria control in the meetings in which they are presented and for multiple reasons. They are extremely busy taking care of both in-patients and out-patients since they supervisor the hospitals in their sub-districts. Beyond this, they reported in their interviews they spend close to 50% of their time in filling out administrative reports. Furthermore, the MOiCs frequently do not attend meetings where these reports are made and therefore they are not engaged in solving problems At the level of the Health Workers who work directly with the FTDs, the latter complain they do not see them very often nor is there much teaching involved. Instead, many of the Health Workers simply count what supplies are available and then leave reflecting their understanding that it is a health care bureaucracy and not a learning organization. At the same time, it should be admitted that like the MOiCs, the Health Workers handle a number of health issues including supervising pregnancy tests, the dispensing of birth control pills and condoms, and perhaps most critically safe delivery.

In summary, while many have not been trained in problem solving a few individuals despite it being a health care bureaucracy have taken initiative and begun to solve some of the problems that can improve malaria control. At the same time, the communication gaps in the health hierarchy are interfering with the diffusion of knowledge about the extent of the problems as indicated by LQAS reports to say nothing about some of the solutions.

Recommendations for Increasing the Amount of Learning

The over-arching themes are how to improve the amount of organizational learning and diffuse this learning more rapidly throughout the health care organization so that there are both more organizational responsiveness and village acceptance and therefore reductions in malaria morbidity and mortality. In making recommendations, the enormous constraints of time and resources common in developing countries must be kept in mind. A further disaratum is that various liabilities such as the lack of resources be turned into assets that help create the learning organization. With these objectives in mind, the three sets of recommendations can be organized around mechanisms for making this particular health care bureaucracy a learning organization by increasing: (1) problem-solving; (2) horizontal communication; and (3) vertical

communication. Together they provide greater responsiveness to LQAS reports and help overcome village resistance to malaria control while increasing the total amount of communication in the organization.

The core of any learning organization is problem solving and therefore our first set of recommendations focuses on training health care officials in various ways to become problem solvers. Each time that LQAS is introduced, there should be not only in-service training about how to collect and analyze the data but in-service training of the existing health care personnel at all levels of the hierarchy in how to problem solve and with problems appropriate for that level. This kind of training should include role-playing in problem solving and contain a number of examples of concrete issues that have been discovered that affect organizational responsiveness and village acceptance as well as some of the solutions that have been tried with varying degrees of success. This capacity building is related directly to the objectives of the LQAS, solving problems so that the malaria control program is effective. Ideally, this training would be similar to that given to quality work circles and be conducted in a group context. Group problem solving is much easier than individual problem solving because individuals stimulate each other and discuss the pros and cons of any potential solution. Problem-solving can also be increased if the MTSs start to collect data on which individuals are in fact providing solutions. How might this be done? One kind of training would be in investigative reporting.

The second set of recommendations involves increasing horizontal communication via two mechanisms. Above, we observed that some individuals were solving or at least attempting to solve the problems in the malaria control program. The first mechanism is to transfer the accumulated experience of the existing problem solvers to their peers at the same level, first within the same district and then across districts, respecting the importance of status in a large health care organization. The identified problem solvers provide role models and also proof that anyone has the capacity to find solutions. Recognizing these individuals has the added advantage of providing some intrinsic rewards to them who are have low salaries.

The lack of space prevents us from giving many examples of what kinds of experience that can be transferred but four stand out:

1. Sharing the experience of FTDs who have been able to convince their villagers *not* to plaster with mud their walls after they have been sprayed but to do it before the festivals with other FTDs;
2. Transferring the tactics employed by MTSs in Sundargarh to the MTSs in the other three districts;
3. Extending the discussion of health topics with the FTDs from one day to two because of the many topics at the ASHA sector meeting;
4. When a death is caused by malaria occurs in a village, sending a rapid deployment team to spray the village.

Sharing knowledge at the same status level begins to create the horizontal communication channels that are the key component of a learning organization.

The second mechanism exploits the problem of scarce resources, turning it into an asset. We found that some sub-centers had shortages of particular malerials whereas others have a surplus. This presents a wonderful opportunity for sub-centers, centers, sub-districts and even districts to share scarce resources via the principle of borrowing. This would improve

the supply chain problems considerably although not solve them completely. Similarly, one of the Health Workers suggested that bicycles be provided to both Health Workers and to FTDs who have to cover large distances can be more easily implemented if these are shared across sub-centers and centers, which is particularly a problem in Kandhamal (see footnote 3 of Table One). Rather than provide each health worker and/or FTD with a bicycle, it would be better to provide one or two for each sub-center. The fixing of schedules and discussing how to share not only increases horizontal communication but builds social capital and a broader sense of the organization.

Increasing vertical communication to overcome the communication gaps in the health care hierarchy is an equally important step in creating a learning organization. But a major stumbling block is more attention to malaria can reduce attention to the many other health care problems being handled by the MOiCs and the Health Workers. In the former instance, the solution is for the MTSs to make special reports to the MOiCs when they have a few minutes free rather than at general meetings that they do not attend. Given the status differences between the permanent government officials and contractual staff such as the VBDC and the MTSs, we suggest that the latter contact the District Malaria Officer and ask permission to contact the Chief District Medical Officer (CDMO) to ask him for permission to establish a reporting channel with the Medical Officers in Charge of the Block, explaining that some of them have not received reports and are unaware of their activities in the sub-district.

The other weak link in the vertical chain of command is the Health Workers (male and female) attached to the Sub-Centers. Most do not visit their FTDs enough or teach them correct procedures when they do. We recommend that the Multi-Purpose Health Supervisor begin teaching the Health Workers in how to teach the FTDs. This would have to be authorized by the District Medical Officer and the Chief District Medical Officer. This would be one of those discussions that the MTSs would initiate with the MOiC. A variation on this recommendation would be for the MOiC to authorize the MTSs to do this as well. The objective is to change the role of the Health Worker from bureaucrat to teacher.

Quite a different approach is to target those FTDs and even blocks that are reported below par. For example, the FTDs in Sundargarh stated there were considerable differences between the skill levels of their two blocks. In this instance, it might be worth to consider assigning all the MTSs in the district and borrowing the MTSs from at least three other districts to do intensive training for one day with those individuals who need to have their skill levels increased. The objective would be to create enough small groups of FTDs so that a one-day concentration would be effective. The objective would also be to complete this training in all blocks below par in a specific day. Then, particularly if MTSs have been borrowed, the MTSs from Sundargarh would repay this donation of time by providing reciprocal training in other districts. In this way the Government of Odisha could increase its skill level in the four districts in a relatively short time period. Of course, this would be done outside the period when data collection for LQAS is occurring.

One cannot necessarily assume that MTSs know how to teach even though they have a college degree. Indeed, this very well may incapacitate them as regards teaching relatively uneducated women and in particular if they are in located in some of the enclaves involving tribal groups or Christian faiths. It might be wise to conduct some experiments in teaching FTDs

with various methods to determine what is most viable, recognizing that there may be cultural differences even in the same block.

The objective of these recommendations is to increase problem solving, create horizontal communications and resolve communication blockages. They are low cost and therefore can be implemented in health care bureaucracies in developing countries.

Conclusions

LQAS has proved adapt in identifying where health care interventions are failing. Now it is time to move to the next stage in its development and provide solutions to improve health care. Typically this means changing health care behaviors at either the individual or collective level. Theoretical guidance can be achieved by using the perspective of the learning organization. And methodological guidance can be obtained by using research team that the same set of skills and the various methods employed in this case study with appropriate adaptations. By having a cognitive map of the communication patterns in a learning organization--upward, horizontal, and high rates--and focusing on what are the problems and who is solving them, one has a clear picture of what to research and what recommendations to make.

Clearly this approach has to be tested in other health care interventions involving LQAS and in other developing countries. And while one might fault us with not actually implementing these recommendations, which is the decisions for the State of Odisha, our objective is to indicate how naturally they flow from the theory and the methods that we have employed. The idea is to provide a model that can be tested in many circumstances.

Table One
The Number of Health Officials in the Malaria Programme
of the Government of Odisha by District and Level

Bureaucratic Level	Kandhamal District		Sundargarth District	
	Number of Officials	Population of Unit	Number of Officials	Population of Unit
District Malaria Officer and staff ^a	1 DMO, 1 VBDC, 6 MTS	778,693	1 DMO, 1 VBDC, 9 MTS	2,001,471
Medical Office (CHC) in Charge ^b	12, one for each sub-district	On average, 100,000	17, one for each sub-district	On average, 100,000
Sector (Primary Health Centre) ^c	34	On average, 20000-25000	54	On average, 35,000- 40,000
Sub-center Health Workers ^d	188 Health Workers (Male) and 249 Health Workers (Female)	Two per 5,000 to 6,000	390 Health Workers (Male) and 212 Health Workers (Female)	Two per 5,000 to 6,000
FTD (volunteers)	1,234 for 4,000 villages	On average, 500 to 1,000 ^e	2,380 for 1,742 villages	On average 800 to 1,100

- a. Each MTS covers two blocks or sub-districts except for one person in Sundargarh.
- b. CHC stands for Community Health Centre, in Sundargarth only 15 blocks involve LQAS. because of the low incidence (Annual Parasite Incidence or API) of malaria in two sub-districts. Of the 96 physician positions in the hospitals and the primary health care centers, only 76 are filled in Kandhamal and of the 209 created for Sundargarh, only 156 are filled.
- c. Medical personnel include one physician, one pharmacist, and one Multi-Programme Health Supervisor per primary health care center.
- d. Considerable vacancies exist, in Kandhamal 45 Male & 34 Female positions are vacant, and in the case of Sundargarth, 37 males and 87 females.
- e. Given the typography of forests and mountains in this district, the villages are scattered and vary in size. This presents special transportation problems for the Fever Treatment Depot Holders (FTDs) who provide anti-malarials.