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A REVIEW OF THE
MANAGEMENT COMPONENT OF THE
USAID/INDIA
INTEGRATED RURAL HEALTH
AND POPULATION PROJECT

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ACKNOWLEDGMENTS

Because the clearance procedures of the Government of India (GOI) were not fully completed during the period of consultation, it was not possible to make field visits or to hold formal discussions with officials of the central government. This was not the serious disadvantage it might have been, given the preliminary and organizational arrangements of the consultation. It meant, however, that the time could be productive only because of the extensive documentation and interpretation of the documentation provided by the USAID/India staff.

As project manager of the Integrated Rural Health and Population (IRHP) Project, John Rogosch was extremely helpful. Madan Singh and Saramma Thomas were equally cooperative and informative. As chief of the division of Health, Population, and Nutrition (HPN), John LeSar provided useful insights and freely gave of his time. Although there was less need to interact directly with Gary Merritt and Mary Ann Anderson, these two persons nevertheless were most helpful.

ABBREVIATIONS

FCMR	Fertility and Child Mortality Reduction
FP	Family Planning
GOI	Government of India
HPN	Health, Population, and Nutrition
IRHP	Integrated Rural Health and Population
MBO	Management by Objectives
MIS	Management Information System
MNA	Management Needs Assessment
PHC	Primary Health Care
USAID	United States Agency for International Development

I. INTRODUCTION

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The Government of India (GOI) has endorsed the concept of primary health care (PHC) and is actively implementing a Model Plan that provides health, nutrition, and family planning (FP) services from the village level upwards. Forty-six districts in 12 states have been designated for intensified efforts with assistance from international agencies. Twelve of these districts in five states (Gujarat, Haryana, Himachal Pradesh, Maharashtra, and Punjab) are being assisted by USAID/India in the Integrated Rural Health and Population (IRHP) Project.

Twelve priority problems have been targeted, with services aimed at fertility and child mortality reduction (FCMR). In addition to providing additional physical infrastructure, the IRHP is dedicated to improving training, communications, and management support. Of these supporting activities, management has received the least concrete attention to date, although the conceptual framework for action has been clearly defined in a paper by USAID/India staff members John W. LeSar and Madan Singh.

The project design calls for a management needs assessment (MNA) organized around one or more workshops. The need for an effective information system is already well-recognized and is anticipated to be one of the central themes of the workshops. Within this context, the purpose of the current consultation was defined. The stated purpose is:

"... to develop Management Information System improvement guidelines for the Integrated Rural Health and Population Project in India as part of the preparation for the forthcoming management needs assessment workshop."

Because a Management Information System (MIS) is simply a tool of management, albeit an important one, its value is contingent upon the presence of appropriately trained managers functioning within a fundamentally sound system of management. The consultation strategy, therefore, has been to work from the broad base of management needs assessment and to fit the MIS within that context, thereby avoiding the temptation to treat the MIS as an end in itself. One must guard against the risk of preparing a report that is yet another abstract recitation of management principles and platitudes. In particular, it is necessary to move beyond the LeSar-Singh guidelines and the views expressed subsequently, notably in Fabricant's consultation report of December 1981.

The earlier documents are fully compatible with this writer's thinking, and are a useful point of departure for the remarks and recommendations that follow. The author's comments are intended to clarify and further delineate recommended steps toward management improvement in primary health care. The principal product is a relatively long-term plan of action, and not a detailed set of prescriptions for successful implementation.

II. PRINCIPAL FACTORS IN MANAGEMENT

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The Focus of Management

The subject of management can easily be considered so broadly as to be all-encompassing. It is necessary to begin, therefore, with a clear focus in mind. For the purposes of IRHP, the appropriate focus initially is field supervision, the most fundamental level of management in primary health care. A comprehensive management system must be built on a base of effective field supervision.

The LeSar-Singh paper identifies six aspects of management needs assessment that further focus attention on areas relevant to current reporting purposes:

- The level of need for FCMR services in relation to existing patterns of utilization.
- Supply and equipment needs and current distribution networks.
- Management information systems.
- Personnel planning and management.
- The state of existing knowledge and skills for the management of services and service units, and for the recording and reporting of information.
- Synthesis of current management problems and projection of future demands.

It is helpful to organize the discussion around five key management functions that derive from the topics listed above. The setting of objectives is the first function of management. Planning and scheduling then follow. Implementation of a work plan--the third function--requires the monitoring of performance in relation to objectives and the plan for achieving them. Because performance is accomplished by people, performance monitoring should give priority to personnel development and continuing education, the fourth management function. Physical resources, notably supplies, must be called upon in the application of knowledge and skills. Supplies management, therefore, constitutes a fifth function of interest.

The setting of objectives, combined with planning to meet those objectives, requires that certain well-defined procedures be followed that lead to the establishment of performance targets that become the basis for the performance monitoring and personnel support functions of management. The procedures and targets are diagrammed in Figure 1

in the appendix, "Guidelines for a Management Information System in Primary Health Care," and are described in that document; in addition, the consequent implications for MIS are outlined.

Structure and Emphasis

One of the most common weaknesses of management is its principal orientation towards means rather than ends. The emphasis is on prescribed administrative procedures, but scant attention is given to the end results. Figure 1 in the appendix is intended to show the ultimate importance of performance measures, but it also indicates that in the absence of detailed, structured, and disciplined planning, performance targets are virtually meaningless. Structure, in short, is not the end of management, but it is certainly one of its fundamental features, especially in relation to field supervision of primary health care.

It was once assumed that medical training was necessary for the diagnosis and treatment of illness. This is no longer an accepted idea, but implementation of a successful primary health care project does require competency-based training of the providers of care; use of standing orders in the provision of care; and clear delineation of the primary provider's capabilities, in addition to a functioning referral system.

A corresponding organization of the management of primary health care has not been devised but is essential. Supervisors cannot be expected to be fully qualified accountants, personnel managers, etc. Yet, they must be prepared to undertake specific management activities through competency-based training, the use of simple manuals of supervisory procedures, and provision for problem referral (i.e., management support of supervision).

It has been argued that management is a problem-solving endeavor that must deal with unique circumstances as they arise; therefore, it cannot be routinized. This is an overstatement, analagous to the contention that each patient is different and must be seen by a physician. In fact, supervisory procedures are necessarily highly structured, although the need for flexibility and adaptability within the structure is, admittedly, essential.

The presence of structure, outlined in Figure 1, sets the tone for discussions and recommendations in the following chapters, which concern issues in management needs assessment, management training, and management information systems.

III. ISSUES IN MANAGEMENT NEEDS ASSESSMENT

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The management framework developed in Chapter II suggests consideration of management needs under the six headings listed in Exhibit III-1. Each of the topics probably merits inclusion in an initial workshop, although the format might be modified. The participants at the workshop would first clarify each issue, discussing the points raised under the headings in the exhibit, as well as other features considered to be significant. Clarification of issues would permit priority-setting and recommendations for action.

The workshop itself might reach closure on an issue. It is more likely, however, that it would pave the way for a task group to undertake detailed analysis and develop necessary answers or procedures. Perhaps an operations research approach would be recommended to examine alternative courses of action systematically.

To illustrate, consider the question of staff utilization. The workshop group would be expected to endorse the principle of community outreach to provide certain priority services. The group would examine current staffing norms in light of this endorsement. However, the detailed task of calculating service needs, setting productivity targets, establishing outreach procedures, and determining work loads, and the balance of time appropriate for clinical and community activities, would probably be left to a follow-up task group. That group would, perhaps, gather data through a special task analysis and might design an experimental study to investigate, for example, the viability of employing male-female pairs in community outreach.

Those charged with management responsibilities must understand its many dimensions and issues and contribute to their solution. The workshop is a useful forum for education and communication. The detailed analysis and formulation of procedure in relation to various management activities are accomplished more efficiently, however, by small, task-oriented working groups. A minimum of existing data will need to be compiled for the workshop. Systematic data gathering could be a major function of a task force.

Exhibit III-1

ISSUES IN MANAGEMENT NEEDS ASSESSMENT

I. Appraisal of Community Needs

- Is understanding of major health problems and their magnitude adequate?
- What means of risk assessment should be employed?
- What are the community profiles of need for, access to, and utilization of priority services?
- What concrete, realistic service objectives should be set?

II. Staff Utilization

- What provider-initiated outreach services should be stressed, in addition to those demanded by clients?
- What are the consequent time requirements for outreach services?
- What procedures are appropriate to ensure a proper balance between clinical services and outreach services?
- Are current staffing standards adequate?

III. Supplies Management

- Can a limited list of drugs be agreed upon?
- What bottlenecks in the supply chain can be identified and removed?
- Can decision rules for replenishment be streamlined and made more effective?

IV. Performance Monitoring

- What specific criteria are to be used in judging performance?
- How can these criteria be incorporated most usefully into a Management Information System?
- What is the appropriate frequency and content of supervision?

V. Personnel Development

- How can management time be used most effectively through selective supervision?
- Through what procedures can group continuing education needs best be identified and met?

VI. Mechanisms for Improving Management Knowledge and Skills

- What subjects of training need to be provided to which categories of participants, utilizing which learning techniques?
- To what extent and in what ways can manuals of supervisory procedures be usefully employed?

IV. MANAGEMENT TRAINING

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The sixth issue in the list of topics for a workshop, management training, deserves highest priority and merits special commentary and recommendations in this report.

Because the subject of management is so broad, nebulous, and poorly understood, orientation courses lasting one or two weeks need to be offered at all levels. Indeed, such courses already are under way. These courses are like hoop skirts; they cover everything but touch upon nothing. Therefore, it must be recognized that the participants cannot be considered trained general managers upon completion of the courses. Such an assumption would be absurd, but it is often made in management improvement programs that provide nothing more than brief orientation training.

It is essential that the orientation be followed by a well-packaged series of courses on specific topics targeted at district, health center, and subcenter field supervisors. Each course should be sharply focused in time (also one or two weeks) and topic. The training should be competency-based, using specially developed or adapted training modules and practical applications. The training also should be based on a manual of supervisory procedures, which can serve as a field handbook on the various topics of supervision.

It is envisioned that each supervisor will attend several courses over a period of time, learning and applying topics one by one. The preparation of course materials and manuals will be a significant undertaking, comparable to the preparation of teaching materials and standing orders for primary health care providers. The program will also require that serious attention be given not only to the supervision of workers, but to the management of supervisors as well.

Management training should proceed in concert with the management needs assessment and the development of an MIS. Undoubtedly, one of the first subjects of training will be the use of the MIS. Other topics for early consideration will emerge from the priorities identified in the needs assessment.

V. MANAGEMENT INFORMATION SYSTEMS

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MIS guidelines are presented in an accompanying document prepared as a background paper for the management needs assessment workshop. This chapter, therefore, contains only the highlights of certain significant points.

First, it is worth noting that a number of recordkeeping innovations already introduced into patient management, especially in Punjab, can provide useful information for program supervision. Dr. Saramma Thomas has drafted additional MIS components that look promising. Beyond this, the role of the users, that is, the supervisors themselves, in designing information systems for field supervision deserves emphasis. Statisticians can provide technical assistance, but supervisors need to exercise the initiative in recognizing and specifying their information needs. Thus, management training in the value and use of information must closely parallel development of the MIS.

Another point of emphasis is the possible value of sampling within the MIS. Much of the management information under consideration at this time is obtained as summary tallies from service records. Service registers should be organized to facilitate the calculation of daily, weekly, and monthly totals, so that the maximum amount of management information can be obtained. Some data, especially qualitative data, are not easily obtained by complete enumeration, however, and sampling procedures should be considered in these cases. Sampling can be as accurate as complete enumeration, and where data gathering becomes burdensome, sampling can be considerably more accurate, as well as less costly, than enumeration. For example, a complete count of child weighings should be obtained readily from service records; however, a determination of the proportion of severely malnourished children receiving food supplementation and nutrition education is likely to be an important management indicator most appropriately measured by periodic sampling.

Underlying the entire Management Information System are the principles of Management by Objectives and Management by Exception. If clear-cut, quantitative objectives are not set, MIS loses much of its value. Given realistic aims, the MIS should highlight significant departures; otherwise, the system will become overburdened with massive data gathering, and most of the information will remain unused. Practical procedures for exception-reporting are described further in the guidelines attached as an appendix to this report.

To the extent that MIS succeeds in highlighting exceptions, it is at risk of simply becoming an efficient inspection system. In addition to exercising the principle of Management by Exception, it is necessary to give concrete meaning to the notion of supportive supervision. Exceptional circumstances identified in the monitoring of performance are not a basis for assigning credit and blame. Rather, they are a basis for ascertaining needs for selective supervision and group continuing education. It is essential, therefore, that MIS be introduced in concert with management training on the one hand and solid commitment to staff development on the other hand.

VI. SUMMARY AND FUTURE PLAN OF ACTION

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Management improvement is a monumental undertaking that can only proceed a step at a time. Yet, there are many interrelated aspects that must be tackled simultaneously. A Management Information System cannot be introduced separately from well-defined management procedures and trained managers who understand and are committed to the purpose and value of MIS. How can management improvements be introduced in a coordinated, practicable way?

Plans are under way for a management needs assessment workshop. It is hoped that commentary on the subject in this report will lend a necessary structure to the workshop.

Management orientation courses are also under way and should be continued.

It is recommended that the next major effort focus on MIS in four respects. First, the examination of MIS needs should be an important component of the MNA workshop, as suggested in Exhibit III-1. The guidelines included in the appendix to this report could serve as a background document on the information required for the assessment.

Second, a few key management indicators should be selected for introduction into a performance monitoring and field supervision routine. Some of the indicators will be simple tallies of clinic activity obtained from existing patient management records. In addition, selected indicators of preventive activity (e.g., antenatal or well-child care) should be adopted, as should procedures for scheduling outreach and determining productivity targets.

Third, specific training modules should be developed and courses conducted around MIS, performance monitoring, and field supervision. Parallel organization of the second and third steps will allow supervisors to gain sufficient understanding of MIS to participate in the development of indicators and procedures and to apply them effectively.

Fourth, work should begin on a supervisory manual incorporating the points covered in Steps 2 and 3 above.

The MNA workshop should identify additional management improvement activities deserving high-priority attention. Care must be taken not to move forward on too many fronts at once, which would excessively dilute efforts and render them ineffective. At the same time, fragmentation of effort must be avoided. Individual management activities should be paced and sequenced within a clearly-defined strategy. The MNA workshop should provide the basis for a general strategy.

Appendix

GUIDELINES FOR A
MANAGEMENT INFORMATION SYSTEM
IN PRIMARY HEALTH CARE

Appendix

GUIDELINES FOR A MANAGEMENT INFORMATION SYSTEM IN PRIMARY HEALTH CARE

William A. Reinke

Huge volumes of data are generated while delivering basic health services in India. Each health center is called upon to prepare and forward literally hundreds of separate reports annually. However, the information contained in these documents is focused neither on the 12 priority problem areas that have been identified nor on management needs. To the extent that it does happen to be potentially useful for current management purposes, the presentation of so many data in essentially undigested form renders the current information system virtually unused and useless.

The job of pruning, reorganizing, and augmenting the current information base to convert it into a viable Management Information System (MIS) is overwhelming. To tackle the job at once is to guarantee failure. Moreover, to tackle any part of the job without the support and, indeed, the direction of managers themselves is futile. Apparently logical, sensible information systems have repeatedly produced disappointing results because they were conceived and designed by statisticians, not the management users of the systems. The MIS has been considered an end in itself, not a tool to support improved management decisionmaking.

It follows that a major commitment to management training must accompany MIS development. A good MIS can be a powerful management tool, but it can never be more than a tool. Like any tool, it must be placed in the hands of a competent operator if it is to be effective.

The MIS Focus

The management of information is a mammoth task that easily can become unwieldy. The MIS focus, therefore, needs to be sharpened in two respects. One, a distinction must be made between client management and program management. On the one hand, maintenance of a Road to Health weight chart on an individual child is an important service which, however, is not a concern of an MIS as defined here. On the other hand, use of Road to Health findings to define the high-risk population in need of nutrition services, coupled with indicators of weight gain over time in that population, is a central concern of the MIS.

Two, the point of primary service contact needs to be identified. The interest here centers on the interface between the community and the primary health care (PHC) provider. The principal purpose of the MIS, therefore, is to support effective field supervision. The aggregation

and use of information for broader management purposes at district and state levels are subsequent, though admittedly important, considerations. A garden can never become a garden if the individual plants within it are not nurtured and cared for.

One further remark is necessary to set the stage for a technical consideration of the operational features of the MIS. As a tool of field supervision, the MIS must foster improved performance, not simply inspect underachievement. This means that it must be based on the principle of information feedback and worker self-control and self-fulfillment. Peter Drucker, a guru on management, if not information systems, may have overstated the point, but his words are worth repeating.

She [the worker] must always be judged by her productive performance. And the only way to make sure of this is by having her fill out no forms, make no reports, except those she needs herself to achieve performance.*

Management Functions Served by MIS

If MIS is a tool of effective management, it must be developed within the framework of management functions. Therefore, it is necessary to begin with a presentation of those functions. Management is the planning, organizing, and overseeing of work in pursuit of defined objectives. Its first function is, therefore, the setting of objectives. Planning and scheduling of activities represent the second function. The mere scheduling of activities guarantees neither that they will be undertaken nor that those initiated will achieve the intended results. Implementation of a work plan, therefore, introduces the third function of management: performance monitoring. The simple recording of performance is not sufficient; the aim is continual improvement. Because performance depends primarily on people, the fourth function of management is personnel development, achieved most notably through inservice training. Personnel must then be given whatever supplies, equipment, transport, and other support they need to apply the knowledge and skills they have acquired. The management of supplies in particular is a fifth and significant function of management.

Underlying these management functions are two key principles of management that are critical to the successful development and use of MIS. The first is the principle of Management by Objectives (MBO). Because teamwork is necessary in any organized effort, it is important that all team members understand and strive to achieve a uniform set of clearly

* Peter Drucker, People and Performance, New York, Harper and Row, Publishers, 1977, p. 70.

defined goals. These targets then become the basis for performance monitoring and the subsequent adaptations that will have to be made to keep the project "on target."

Management is a complex and comprehensive endeavor, and management skills are scarce. It is essential, therefore, that management skills be applied where they are needed; that is, where unanticipated difficulties have arisen and adaptations are needed. For example, weekly supervisory visits may be unnecessary for workers who routinely perform well, whereas they may be entirely inadequate for those experiencing difficulty in their work. This leads to a second principle: Management by Exception. A critical feature of any good MIS is its ability to highlight the exceptions while discounting routine cases. In communications terminology, the MIS should produce strong signals and filter out most of the noise.

The Information Base for Management

The principal tasks in the programming of primary health care are diagrammed in Figure 1. These tasks of objective-setting, planning, and scheduling are informative, for they each require or generate information that, taken together, forms the skeletal framework of the Management Information System.

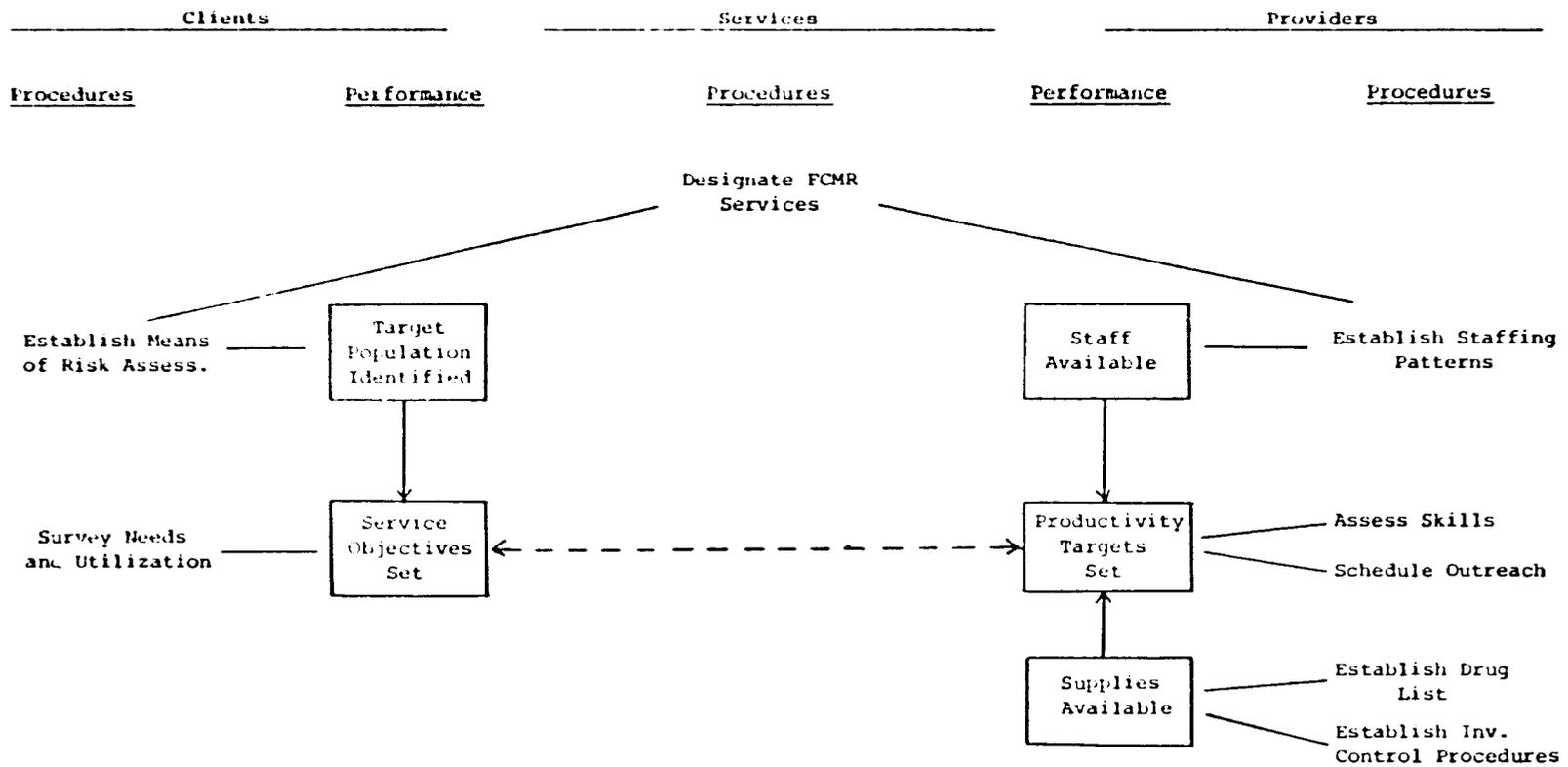
Figure 1 depicts three distinct entities in the planning process: the community of clients with needs to be served; the service providers with requisite skills and support (e.g., medicines); and the organized service through which providers and clients interface. In each of these three spheres, certain management procedures must be followed. Accomplishment of the procedures yields specific interrelated performance indicators (within the boxes in Figure 1) that form the heart of the Management Information System.

To illustrate, it has been necessary to follow procedures to designate particular services to be provided aimed at fertility and child mortality reduction (FCMR). Because malnutrition is recognized as one of the 12 priority problem areas, it seems reasonable to designate food supplementation of malnourished preschool children as one of the services to be provided.

This leads to the need (client side of the diagram) to define those potentially at risk and to develop procedures for assessing risk. Perhaps, for example, children under the age of three are considered at special risk and actual risk (malnutrition) is to be measured in terms of attained weight-for-age in relation to a defined standard.

This requires (provider side of the diagram) the availability of staff with scales and weighing skills, in addition to defined procedures for periodically reaching and weighing the target population.

Figure 1
PLANNING AND SCHEDULING ACTIVITIES



Many other examples could be given. The point is that an effective MIS presupposes a tremendous amount of detailed planning. Once the planning has been completed, specification of the requisite information base for implementation and monitoring is straightforward and nearly self-evident. Without adequate planning, however, the MIS is a farce. If scales for weighing children are not provided, for example, information on the population at risk and rates of malnutrition are meaningless. Again, MIS is not a panacea for sound management, it is simply a tool that must be used with other techniques of good management.

Essential as management procedures are, they alone are not sufficient. The linkage in Figure 1 between procedures and performance targets and indicators cannot be overemphasized. The single most important cause of ineffective management is orientation toward procedures rather than results. Workers and supervisors repeatedly complete tasks without ever questioning the value of what is accomplished.

Foremost among the performance indicators in Figure 1 are those associated with service coverage, which is expressed in two ways: relative to the community's need and relative to staff capability. A goal of 500 antenatal visits per month, for example, is of limited value in itself. It becomes meaningful when it is translated into the proportion of pregnant women receiving antenatal care, on the one hand, and the expected number of contacts per worker per month on the other hand.

Figure 1 should convey two important features of MIS. One, the various indicators are closely interrelated and must be mutually compatible. The intent to provide 80 percent coverage of antenatal care, for example, must be associated with a feasible work load. Moreover, the productivity targets related to specified levels of population coverage must be based on realistic projections of staff and supply availability. Five hundred antenatal visits per month may reasonably translate, for example, into 50 visits per female worker, assuming that there are 10 workers. Is it likely that this many positions can be filled?

Two, indicators reflecting absolute volumes of activity are seldom adequate. Rather, for comparative purposes in performance monitoring, indicators such as "visits per 1,000 target population" or "contacts per worker-month" are generally more meaningful. The stress on performance rates attaches importance to the collection of compatible data for both numerators and denominators, in addition to careful analysis and interpretation of the findings. Most current information systems devote substantial effort to data collection and compilation, but very little time to genuine analysis. A sound MIS, on the contrary, is economical in data gathering but makes the most of the limited information obtained.

Analytical Framework for Performance Monitoring

The value of information analysis is illustrated in Figure 2, in which performance indicators are arrayed along two dimensions. The columns represent the various categories of activity being monitored (e.g., the 12 service priority areas). Each row presents the performance record of a particular worker across activity categories. Thus, the tabulation can be viewed as a compact supervisory report that summarizes the performance of all workers for whom a given supervisor is responsible.

Suppose, for purposes of illustration, that all indicators are stated as "percent of target achieved." Totally satisfactory performance would be represented by scores of 100 in every cell in Figure 2. Such uniformity is unlikely to occur in practice. A competent worker who achieves 100 percent of target on the average is bound to fall somewhat short on occasion and to exceed the target at other times.

Recalling the principle of Management by Exception, the key in interpreting a chart of performance such as Figure 2 is to isolate systematic departures from the target over and above those that inevitably occur by chance. In particular, suppose that experience shows that competent workers normally attain performance scores ranging from 80 to 120. A single score of 90 should trigger no special action, but a worker who scores 75 in some activity category should be considered exceptional; that is, in need of special supervisory attention. In addition, a worker who consistently scores below 100 in all categories might be singled out for attention, even if he is above 80 in each or most of the individual indicators.

More generally, four patterns of exceptional circumstances can be discerned within a performance chart:

1. An individual worker might exhibit problems in carrying out a specific activity (low score in one cell of the chart).
2. The performance of an individual worker might be generally inferior (low scores across an entire row).
3. Workers in general might exhibit difficulties in meeting targets in a specific service category (e.g., immunizations) (low scores throughout a given column).
4. Workers in general might show poor performance across all or most service categories (low scores throughout the chart).

Figure 2

PERFORMANCE MONITORING SCHEMA

Worker	Performance Indicator				Worker Avg.
	1	2	3	4	
A					
B					
C					
D					
E					
Perf. Ind. Avg.					Overall Avg.

Analytical procedures must be devised to identify the type of exception that exists, for the decisions and actions associated with each are qualitatively different. The first and second types above suggest, for example, the need for selective supervision; that is, intensified supervisory contact to provide individualized in service training. In contrast, the third type suggests two different possibilities. Perhaps unrealistic targets have been set, in which case they, as well as the goals for levels of service coverage in the community, need to be revised. If targets are realistic, perhaps group continuing education is needed to balance the emphasis among the services offered. Finally, the fourth pattern of malperformance indicates a need for fundamental management changes.

Statistical techniques exist to formulate decision rules to signal the presence of any of the above patterns. Suppose, for example, that five workers' performance on 10 indicators is being monitored. Suppose, further, that each indicator has been established, as described earlier, on the basis of a standard of 100 and a normal range of 80-120. Then, the following statistical decision rules would be appropriate, paralleling the four exception categories:

1. Investigate any individual score that is less than 80.
2. Any worker achieving an average performance score of less than 94 is a candidate for selective supervision.
3. If the average score in any service category is less than 92, that category deserves a special group training effort.
4. If the overall average score is less than 97, general supervisory competence should be questioned.

Realistically, individual performance indicators may display more heterogeneity than is assumed, and decision rules will be expressed somewhat differently as a result. Furthermore, more complex methods than are cited here will be used to report performance, validate the reports, compute indicator levels, aggregate these over time for individual workers, and conduct the necessary comparative analyses. This is not to discount the value or the feasibility of these efforts, however. It simply underscores the importance of statistically sound approaches.

As indicated earlier, the manager, and not the statistician, must be the principal designer of the MIS, specifying the decision points, the options available, and the critical indicators on which decisions are to be based. The statistician can be most helpful as a technical adviser in applying the decision rules, ensuring that management attention is directed systematically and reliably to exceptional circumstances worthy of the manager's time.

Information for Supply Management

It has been shown how the management functions of objective-setting, planning, and scheduling produce the data base for MIS. The way that an MIS can be used in performance monitoring to further personnel development through selective supervision and continuing education also has been outlined. The one management function that has not been addressed directly in this discussion is supply management.

The supply management function is a complex mix of activities. It involves, for example, the preparation of drug lists, warehousing, the organization of a distribution network, protection of the cold chain, and coping with import restrictions and the availability of foreign exchange. Important and troublesome as they are, most of these considerations have little to do with MIS and are not discussed here.

Assuming that satisfactory supply distribution procedures have been devised, a practical management concern remains: the ordering and maintenance of stocks. Historically, this is probably the most thoroughly studied topic of management. Simple, yet powerful, quantitative methods of inventory control have been designed. For some reason, however, they have not been used as much in the health sector as in private industry. They belong in every MIS, however.

Two features of the supply management component of MIS deserve particular mention. The first concerns the difficult task of tracking the possibly changing average demand for a particular commodity. Granted that demand varies week by week and month by month, it is difficult to discern whether this variability occurs in relation to an average that remains constant, progressively increases or decreases, or follows a seasonal pattern. It is most probable that seasonal patterns as well as secular trends account for variability, and the problem is to quantify the relative force of each effect. Such quantification is vital, if inventory levels are to be kept consonant with demand levels.

In the course of widespread operations research, the technique of exponential smoothing has been developed as an especially attractive way to account for the dynamics of demand. Exponential smoothing is essentially a sophisticated, though easily applied, technique to calculate a moving average. This approach, or something comparable to it, should be built into supply management MIS procedures.

However clearly defined average demand is, variability is a factor that needs to be considered in setting restocking frequencies and quantities at safe levels. Again, this issue has been investigated exhaustively, and so-called s, S decision rules for stock replenishment have been devised. The rules state simply: Reorder only if current stock has fallen below s ; if so, order an amount that will bring the stock level up to S .

Numerical values of s and S are determined for individual commodities on the basis of average demand, variability, value, and perishability of the commodity, tolerable risk of stock-out, and lead time between placement and receipt of order. Thus, the procedures are adaptable to varied circumstances; yet, the circumstances are incorporated into mathematical formulas that are easily applied.

To illustrate, consider two commodities with values of s and S , determined to be:

<u>Commodity</u>	<u>s</u>	<u>S</u>	<u>End-Month Stock</u>
A	40	150	80
B	100	300	90

Furthermore, assume that supply levels are reviewed at the end of each month. Because the current stock of A exceeds 40, there is no need to replenish. The risk of a stock-out is negligible, and reordering will only tie up working capital unnecessarily. On the contrary, because the supply of item B has fallen below the "trigger" point of 100, an order for 210 is required to bring the supply to 300.

The MIS involves detailed data gathering and analysis, as indicated in the above discussion of inventory control procedures, but it is worth reiterating that numerical indicators themselves are of no value. They must be part of a sound management system in which properly trained managers and supervisors follow well-defined management procedures and use the MIS as a tool in effective decisionmaking. These guidelines should be viewed in that broader context.