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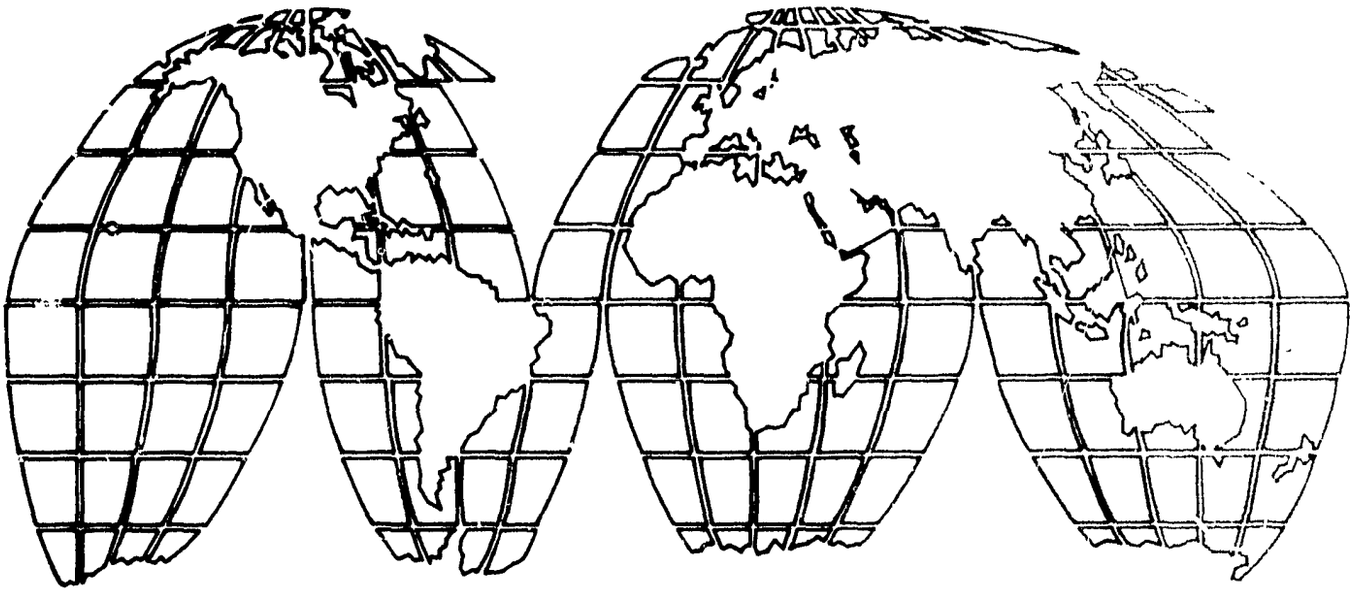
A.I.D. Program Design and Evaluation Methods

Manager's Guide to Data Collection



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MANAGER'S GUIDE TO DATA COLLECTION

Prepared for the Agency for International Development

by PRACTICAL CONCEPTS INCORPORATED

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PREFACE

The Manager's Guide to Data Collection becomes available at a critical time in the evolution of A.I.D.'s program evaluation system. The Administrator's decision to assign a high priority to socio-economic impact assessments, sectoral and cross-sectoral evaluations and other policy-oriented studies, is ultimately a challenge to our ability to measure directly the effects of development assistance on the social and economic well-being of the poor.

Managers are responsible for the design, management and evaluation of development assistance programs and projects, yet they usually do not have the capability themselves to collect the data critically needed to support those management functions. As managers turn to experts for data collection services, they are confronted with the classical problem of how effectively to use expertise without becoming its captive.

There are three parties concerned with data collection:

- -- the data collectors/enumerators who ideally should know the language and socio-cultural characteristics of the target group;
- -- the evaluation/census/survey research experts who design the study and specify the data collection procedures;
- -- program and project managers who need data as a basis for decisions on design and implementation issues and for evaluative judgments.

This Guide is intended to assist this last group to define and direct the efforts of the other two parties and to judge their products. It attempts to tell the manager what can and cannot be done adequately under certain conditions, at reasonable cost and within a reasonable time. It also tries to help the manager differentiate between credible and suspect data. Those who have an experienced knowledge of statistics and survey techniques will be thoroughly familiar with the concepts in this Guide.

The utility of this guide should increase with experience. To assist this, please give us suggestions for improving the contents and organization of the Guide.

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OBJECTIVES AND SCOPE OF THE GUIDE

The collection and analysis of data requires both time and resources. Well planned and managed studies can provide information on a timely, cost-effective basis. Poorly designed studies can consume both time and money without providing useful information. Guiding a data collection process for a specific program or project requires an understanding of what information is needed and what research methods are most appropriate for collecting and analyzing it.

The Manager's Guide to Data Collection has been developed with the project manager in mind. Its purpose is to provide AID and host government personnel with a basis for planning and monitoring studies that yield information in a timely manner and at reasonable cost. The "manager" for whom the Guide is intended may be an AID project manager or project design officer, a host country official in charge of a specific development project, or a contractor or grantee involved in the implementation of an AID-assisted project.

The Guide is concerned almost exclusively with project information. Our objective is to improve the manager's ability to undertake data gathering efforts in developing nations. Managers will not necessarily be involved in the day-to-day conduct of such studies. But they should be active participants in decisionmaking about:

- What should be studied.
- How it should be studied.
- How the findings should be analyzed.
- What uses are made of information.

Because this Guide is written for non-specialists, its treatment of data collection is quite basic. For some readers, it may be too elementary. Nonetheless, we prefer to err with simple explanation in favor of those untrained in empirical field studies. The Guide does not attempt to convert managers into mathematical statisticians or anthropologists. Rather, it tries to give managers some of the basic tools they need for controlling the process by which data are obtained.

The Guide is divided into three parts, each of which contains two chapters. Part One focuses on the manager's role in data collection efforts. Its chapters address the question of how to determine, very specifically, what information is needed to make decisions and how to go about managing a process that will provide you with this information.

Part Two is concerned with the strategic choices that must be made in designing a field data collection effort. The factors that affect the quality of information in these studies and the basic approaches used in carrying out field data collection are central topics.

Part Three addresses the specific techniques and procedures that can be used to gather information in the field study situation. Procedures for selecting the specific study units from which data will be collected are addressed along with tactical decisions about the best way to secure data from them.

This Guide exists, in part, because countless others have made the effort to document their knowledge and experiences in books and reports that deal with the various topics covered in the Guide. The bibliography that appears following Part Three provides a selected listing of reference material you may want to consult when a more detailed treatment of some topic would be useful.

PART ONE

MANAGERS AND INFORMATION

THE MANAGER'S ROLE

As designers and managers of development projects, we often need to acquire information that will help us to plan, monitor or evaluate our projects. This chapter reviews our role in data collection and analysis efforts that are undertaken to support project level decisionmaking. The mechanics of this role are considered in this and the following chapter. Four distinct aspects of the manager's role in such efforts are examined, including:

- The responsibility for identifying why information is needed, when it must be available, and what data must be gathered and analyzed to meet management's information needs.

- The responsibility for deciding on an appropriate level of investment in information gathering, including an assessment of the cost, money, time and quality of information trade-offs.

- The need to identify, on a tentative basis, the best general approach for securing the information that is needed, i.e., specification of the appropriate balance between reexamination of existing, readily accessible data and new field data collection.

- The responsibility for managing the process by which data is secured and analyzed to address management's information needs.

The first three of these are examined in this chapter. The following chapter addresses the task of managing data collection and analysis activities.

A. THE SPECIFICATION OF INFORMATION NEEDS

For AID designers and managers, information requirements are closely related to a predictable cycle of development assistance activities. This cycle begins with efforts to define problems and a project approach, and normally ends in an effort to evaluate our success in achieving project objectives.

Planning, monitoring and evaluation information are closely related. Sometimes we appear not to understand this, e.g., in our initial data collection effort we gather only design data and not the baseline information that will be needed for evaluation. When we ignore the interrelationships, we lose the opportunity to develop an efficient data collection and analysis plan that will serve us at all project stages. The key thing to remember is that we can anticipate many of our important decisions and institute a process that brings together the pertinent information on a timely basis.

At any stage in the project cycle there is a range of decisions that can be made, e.g., to fund a project, to terminate or expand efforts in a specific sector, to replicate a pilot effort on a national scale, etc. There also tend to be a set of actions that cannot be taken. For example, AID cannot decide for a host organization what projects will be given priority. Nor can AID managers decide for a farmer what he will plant next season. Being clear about what actions can and cannot be taken helps us focus on what information we really need for decision-making. Some of the questions and issues that might lead us to need specific types of information are suggested below:

- Is lack of transportation a constraint on development in this region?
- Which of two approaches for improving diet should we try in this project area?
- This project is not having its planned effects; should we modify our approach or terminate the project?
- What final actions must be taken before we turn this project over to the host government for long-term operation?
- This project worked well; shall we replicate it in another area?

Information that addresses these questions will not be available unless we collect and analyze relevant data.

Some project decisions can be identified in advance; others cannot. When the need for a decision arises quickly and unexpectedly we may find it necessary to proceed based on the information we currently have available. We do not have the luxury of slowly gathering together relevant information as is

the case when we know about an upcoming decision six twelve or eighteen months in advance. If we want to make informed decisions in either situation, we need to have good basic project information available at all times. In most projects, we will be able to make informed decisions in a "crisis" if we have been conscientious about securing the information required to make other decisions -- the ones we can anticipate.

When we identify one or several decisions we expect to make, we begin to specify the information we will need. In practice we tend to proceed by asking ourselves and others a series of questions, e.g., What will it cost? Who will benefit? Can labor-intensive approaches be used? Is it feasible? Is progress being made? The information we need is often a set of answers.

When we first formulate our questions, we often state them in very general terms. While this may seem adequate, it usually turns out that our questions are not answerable until we refine them and become specific about the concepts and terms we are using. For example, the question: Who are the poor? sounds reasonable until we try to define how we will answer it. At that point both "who" and "poor" may require further clarification. In one context an appropriate answer concerning "who" might involve classification by occupation. In another, we might need to answer the question in terms of age, ethnic group, caste, or any number of other possible classifications. "Poor" in one situation might mean "those earning less than $100 per year." In another context it might be that the term "poor" is a euphemism for malnourishment, the unemployed or for those who live outside the money economy. Figure 1-1 illustrates the different ways in which we use familiar terms.

WHO are the POOR?	
• Men/women	• Those above or below $100 income per year
• Older than 30/younger than 30	• Those with primary education/not having access to or taking advantage of primary education
• Those living within ten km. of the town hall/living beyond ten km. of the town hall	• Those within ten km. of a health clinic/beyond ten km.
• Migrants/residents	• Those having spendable cash/having only goods and services to barter
• Agricultural workers/ industrial workers	

Figure 1-1: Terms have different meanings in different contexts.

Our questions, once this type of refinement is made, become answerable in exactly the way we intend they be answered. If we fail to define our terms clearly, and we ask others to provide us with answers, the answers we receive may surprise us. They may not in fact answer the questions we thought we asked. Rather, they may respond to the meaning the data collector attached to our words. In most situations where we find ourselves dissatisfied with the results of a data collection and analysis effort, the problem can be traced to a failure to define completely the study questions and the type or form of answer we want.

Once our terms are adequately specified, our questions can be written at a level of detail that allows us to assess what will be required to secure answers. Questions can be answered at different levels of precision, depth, and with different potential for generalizing the answers to a larger population. Decisions concerning what constitutes an appropriate answer for a specific question are among the most important the manager makes in forming and directing a study. They are also the decisions that most directly influence a study's duration and cost.

A clear formulation of the questions, and types of answers we need helps narrow the scope and limit the cost and time required to complete a study. Such clarifications tell us whether the main concerns are economic, social or technical. They also help us understand whether the subject of study is people and their behavior or the objects and systems that result from this behavior.

One nearly foolproof way to ensure that our questions have been adequately clarified is to take a piece of paper and write out an answer to each question which, while fictitious, would be acceptable to us in terms of detail, format, etc. When we do this we may find ourselves drawing graphs, maps, tables with subdivisions that give us information on different subgroups of the population we want to examine, etc.

When we undertake this exercise we are, in effect, formulating an analysis plan -- a plan for turning many small pieces of data into information that will be meaningful for the decisionmaking process. In most cases the answer we need will be more than a simple "yes" or "no." On the other hand, it does not necessarily take a lot of data to answer our questions. Too often studies are approached with the idea that "first we will get the data, and then we'll consider how to process and analyze it." Thus, we often collect more data than we need, perhaps more than we will ever use. We may find that data collected in this way is not easily or cost-effectively processed and analyzed. Further, we may actually fail to collect some important and pertinent information if the analysis plan is not well conceived in advance of data collection.

While not all AID and host managers have a great deal of experience in specifying their information needs clearly, it is relatively easy to achieve a good working skill in this area. Too often data collection specialists are called in to define a study, or to design its details, when the preliminary thinking about information needs and uses has not been completed. Only when we know what we want from a study can specialists proceed efficiently. The best researchers know this and will not proceed until management information needs and uses have been fully defined.

B. INVESTING IN INFORMATION

Much unnecessary effort would be saved if we sought data only where its role in generating decisionmaking information was clearly understood. This orientation, coupled with an emphasis on cost-effectiveness and optimum information, could lead to more focused, useful studies. When we are considering gathering data we should always ask:

- What is the value of having this information and is it equal to or greater than the cost of getting the information?
- What is the value of the information compared to some other product or service we consider important, i.e., what are the opportunity costs of our resources?
- What value would be added if we spent more (say 25%) to improve the quality and representativeness of study data?

When we view data collection efforts in this light we tend to consider our options in terms of data quality, timeliness and cost more realistically. This perspective also helps us to identify the most efficient approaches for securing the information we need.

In many situations we can keep the costs of securing information down to a reasonable level by trying to ensure that:

- Where possible, existing information is used to answer our questions. There is no reason to duplicate the data collection efforts of others if they have been undertaken with care, are recent, etc.
- Extraneous objectives and questions are eliminated from plans we make for collecting new data.
- Those we seek to help us secure data are experienced, properly trained, familiar with the difficulties of overseas work, aware of our data requirements and our cost constraints.

Time, cost and data quality are interdependent in field studies. We need to be prepared to examine the trade-offs in an information gathering effort. A trade-off involves getting more of one thing by giving up part or all of something else. We understand that there are trade-offs when it comes to choosing among alternative project approaches. We have the same opportunity in most data collection efforts. Our trade-offs here tend to involve time, cost and quality.

Time and money are almost always to some degree interchangeable. When we must have the results of a study quickly, data collection and processing time can often be reduced by increasing the number of individuals who work on the study. Normally, however, there is some minimum amount of time required for data collection and analysis (or for the review and reanalysis of existing data). Increasing manpower will not help us reduce the time required below that minimum.

The time and cost vary with specific qualitative characteristics of the data we seek (as discussed in Chapter Three):

- Time and cost both go up as we increase the number of study questions. But when those questions cross-check each other, our confidence in the answers also goes up.

- Time and money must be spent if a study is to provide valid information at the right level of precision:

  -- Money and time spent on ensuring study validity can provide savings through high quality data and reduce our risk of having to redo portions of a study effort.

  -- Precision is expensive. When we want very precise answers our study costs may be high.

- Time and cost both go up as the size of the sample we need increases. Sample size requirements vary with both the number of population subgroups and other factors we try to characterize, and with the degree of sampling error we are willing to accept.

- Time and cost rise when a large number of individuals must be consulted in the early phases of a study concerning their needs for information. (A few users who do not know what they want can require just as much attention as a large number that do.)

Unfortunately, there is no mathematical formula for equating the cost of information with its value. Occasionally we respond by acting as if the least expensive option were automatically best. In reality it is sometimes better to forego data collection and analysis rather than take short-cuts. For example, spending an

inadequate period of time clarifying our questions, and the type of data we need, may appear to save money. In fact, our subsequent inability to utilize the results of a misguided study may suggest that failing to plan properly led us to waste money.

We should be extremely careful in evaluating apparent shortcuts, e.g., skipping the pretest of our instruments, informally selecting respondents rather than formally sampling our study population, providing fieldworkers with only minimal training, reducing the fieldworker to fieldwork supervisor ratio, etc. This is not to say that all short-cuts are to be avoided. Certainly some, such as precoding responses when we are able, save money. What is suggested is that we proceed carefully and understand fully the implications of the short-cuts we elect to take.

It would help us, as managers, if someone handed us a "price list" that told us what we should expect in terms of the time and resources required to gather information that is needed in development projects. Unfortunately, this cannot be done at present. While we can determine the total cost of past data collection efforts, and the contractual or grant period over which they were carried out, these data tell us very little. AID, like many other organizations, does not presently require researchers to report the type of detailed cost, time and methodological information that would be needed to create an illustrative "price list." More important, perhaps, is the fact that anecdotal information suggests these factors can vary by region of the world and sometimes for different parts of the same country.

C. DETERMINING WHETHER A FIELD DATA COLLECTION EFFORT IS REQUIRED

When we collect new information to support our decisionmaking process, we normally do so because we have already determined that the information presently available in our files or in host government offices is not adequate or reliable enough to meet our needs. We should not start field studies until after we have searched for answers to our management questions in the information already gathered for other purposes: in our own office, in the files of another country mission, or in Washington.

A systematic review of existing documentation should focus on the country and project in question and on other programs in other countries that may have "operational relevance." Project and research reports that document basic socioeconomic information on similar populations and development interventions generally, should be included. Within AID, the Office of Development Information (DS/DIU) exists to assist managers in undertaking such reviews. A systematic document review should also include examination of materials available locally.

Not all the information that is useful for planning programs is necessarily in project offices, files, or reports. Print sources, including newspapers, magazines, textbooks, newsletters, institutional records, client/patient files, legal statutes, inter-agency directories, conference minutes, speeches, production schedules and short stories, etc., may contain pertinent information. Graphic and other audio-visual sources of information such as computer tapes, maps, pictures, satellite photographs, hydrogeological topo sheets, origin-destination flow charts, tape recordings, movies, microfilm, drawings, and machine data cards may also contain useful data.

The examination of existing data can yield a great deal of information for project decisionmaking. However, we must take some precautions in using existing data. We must attempt to determine whether that information is reliable and accurate. This is particularly important when there appears to be only a single source for the data -- only one report or individual that attests to its quality. Official statistics are often of this type.

Two tests of single source data we can apply are those that consider the authenticity of the information and its degree of objectivity.

The first test addresses the question of reliability. It can be viewed as an assessment of data authenticity. Is there any independent verification, or means of verifying the data? Where independent verification of the authenticity of single source data has not been carried out, we should attempt to verify it ourselves. Naturally this should only be done when the integrity of the data is vital. Quantitative data coming from questionnaire surveys should always be checked very carefully to ensure that the information is dependable. There should always be an indication of what methodology was employed to secure it, including the personnel used, the representativeness of the sample, the manner in which the investigators were regarded by the people living in the area from which the sample was drawn, etc.

The second test for single source information addresses the question of accuracy; it is an assessment of the objectivity of data. Where official information is collected and disseminated, it is important to assess the underlying motivation. Why do respondents give answers to personal questions? Why are certain kinds of data collected and disseminated? Information should only be relied on when the motivation underlying the donation of information has been established. Only then can we interpret it correctly in relation to conscious or unconscious biases it may reflect.

In summary, we do not need to collect more data if the information we need for making decisions is already available. One of the most frequent errors we make is to ignore existing information, either because of an unwillingness to dig for it or because of our ignorance of the information gathering activities and capabilities of host country institutions, our own organizations and of other technical assistance agencies.

No new data collection effort should be undertaken until at least preliminary assessment of existing information resources has been made. Once we make an initial determination of the scope and quality of existing information, another issue arises. The amount of time and resources we might decide to spend on reanalyzing existing data must be weighed against the relative cost-effectiveness of getting the same or better information through new field work. It is not necessarily cheaper to locate and reexamine old information than to generate new information. In practice, virtually every project ends up using both types.

The uses of data, specific measurements to be taken, and the precision and representativeness of the answers are factors that affect the amount of time and other resources required to collect new information or to reanalyze existing information. In either case we are almost always in a better position to define what is needed than are the research specialists who carry out such efforts.

While we ourselves may never have collected or analyzed field data, we must be prepared to manage that process if we are to obtain information on a timely basis. The management of data collection efforts is the subject of Chapter Two.

MANAGING FIELD STUDIES AS PROJECTS

When we know that information is needed in order to make specific decisions and that field data collection (or the reexamination of existing data) will be required, a separate activity designed to provide information should be initiated. It is useful, from a managerial point of view, to consider such data collection efforts as "mini-projects" with their own objectives, schedules and budgets. This encourages us to articulate our needs clearly, and to specify the means we will use to secure the information. Too often data collection and analysis efforts are thought of only in terms of the methods that will be used. Occasionally this results in studies that do not actually produce the information they were intended to provide.

A. APPLYING MANAGEMENT TOOLS TO DATA COLLECTION EFFORTS

Each study we undertake should start with a clear definition of the results it is intended to produce. The selection of specific measures to be made, and the manner in which data will be collected should follow from, rather than precede a definition of study intent and expected results. AID's Logical Framework approach for clarifying a project design can also be applied to the design of a "mini-project" involving data collection. Figure 2-1 shows the rough levels of "mini-project" logic that might be appropriate for such studies. Note that the methodologies used for data collection are inputs for this type of project, much as are the strategies and methods we employ in development projects.

When we plan for data collection within a project context it should be apparent that managers must be involved in defining the Purpose and Outputs of such studies. A study team can respond to objectives, but it cannot invent them in the absence of direction.

Once the objectives of a data collection effort have been clarified and all of the activities involved have been identified,

Logic of a Study	
	Narrative Summary
Goal:	Development projects are increasingly effective in meeting their objectives. (STATE THE OBJECTIVES IN YOUR PROJECT.)
Purpose:	Decisions concerning program/project action (at the design, appraisal, implementation or evaluation stage) are made based on adequate objective information. (LIST THESE DECISIONS.)
Outputs:	• Specific information gaps filled by answers to study questions. (LIST THESE QUESTIONS.) • Information provided by empirical studies meets management's requirements concerning data validity, reliability, precision and representativeness. (DEFINE YOUR EXPECTATIONS.) • Answers to our questions presented in a useful form. (DESCRIBE THE FORM ANSWERS SHOULD TAKE.)
Inputs:	• Questions to be answered by the study. (LIST THEM.) • A technical approach, budget, schedule, etc., for answering the study questions (DOCUMENT THESE IN A "SCOPE OF WORK" FOR THE STUDY AND IN A WRITTEN STATEMENT OF THE "STUDY DESIGN".) • Implementation, including all resources used to carry out the study design (RECORD AND MONITOR THEM.) • Utilization plans and actions (RECORD AND MONITOR THEM.)

Figure 2-1: An Empirical Study, Like Other Projects, Responds to a Hierarchy of Objectives.

other management tools can be brought to bear on the project. The cost of activities can be examined to prepare a budget for the project. The sequence in which activities must occur can be reviewed to determine the minimum amount of time required to complete the data collection and analysis project, and a workable schedule can be developed. Gantt charts, bar charts or networks can be prepared that display the sequence of activities

through time. Milestones, such as the completion of draft data collection instruments, can be identified. The same tools can also be used to help us determine when reports should be prepared, reviewed, etc.

Along with these basic "mini-project" design products, we need to clarify some other issues as well. These include specifying the study questions, the population to be studied, whether a representative sample of the population is needed, what level of detail we are seeking in the answers to our study questions, etc. We can then start to identify who will be responsible for preparing a final study design and gathering and analyzing the data. We may choose to carry out the study ourselves, or to seek the assistance of others. We may also need to prepare a formal scope of work.

B. PREPARING A SCOPE OF WORK

A scope of work for an empirical study is not a study design. Rather, a scope of work is a statement of why a study is needed, what resources are required, when work is to be done, etc. It is a summary of the managerial aspects of the effort that should clearly outline our needs. A study design is a technical or analytical response to these needs. (Chapter Three focuses on the design of empirical studies.) To be useful, a scope of work should be limited to pertinent commentary, but should not skimp on explanation of our situation, our questions, or the planned uses for the information.

Information is more, not less useful or relevant when investigators know why we want information and what actions we can and cannot take. There are of course individuals who will tell us only what they think we want to hear. That fact, however, should not deter us from being honest in our statements of work. Rather it should encourage us to check the references and past reports of all investigators we consider.

A natural way to approach the preparation of a scope of work is in the order in which we develop our thoughts about our information requirements. (Interestingly enough, this is roughly the sequence of presentation used in the final version of many AID contracts):

1. Purpose of the study.
2. Study outputs or "deliverables."
3. Background.
4. Study approaches -- data collection and data analysis methods.
5. Special skills and other characteristics of the investigator(s).

6. Time frame and level of effort.

7. Reporting requirements.

When we have trouble writing a section of a scope of work we should probably not struggle with the words. Rather, we should go back and make sure we carefully thought through our needs.

1. Purpose of the Study

In this section of a scope of work, we share with potential investigators the reason for the study and the range of actions we can take when we have the information we seek.

Investigators cannot achieve our project objectives for us, nor can they make our decisions. They do make a contribution, and that contribution is most relevant when they know why we need information, e.g., when they know that AID needs information to determine what improvements to make in a moderately well designed project that has been operating for 18 months, and in which the only actions we can take relate to improvements in the project's training components. If they know we are constrained, they can direct their efforts toward the areas in which we need assistance. For instance, in the example above we would want the study to focus on the types of improvements in training that would be most likely to lead to other desirable results.

2. Study Outputs or "Deliverables"

In data collection efforts, our Outputs or "deliverables" are the answers to our questions. In this section of the scope of work we should identify the study questions. We need to state them as clearly as we can. (Consider including your "mini-project" Logical Framework [Figure 2-1] in this section).

When fieldwork begins, the details of a study demand our attention. Thus it is important for our basic contract or agreement to state clearly why we are doing the study, and what "deliverables" we expect.

3. Study Background

The statement of the study background should elaborate on the decisions that are to be made based on study information. It should also briefly discuss the project history as it relates to those decisions.

To the extent possible, the background statement should provide the reader with an understanding of the nature of the study we are considering, i.e., is the study being undertaken to discover the variables in a project situation, to develop hypotheses concerning known various types of studies, e.g., a baseline

study, an impact evaluation, a feasibility study, etc. However, we should not rely on these phrases to communicate the unique issues that must be addressed for our project or program. These terms, when used, should be supplemented by our own statement of why information, and hence an empirical study, is required.

4. The Study Approach

When we start a study approach section by stating that we want a "sample survey," we may stifle creativity. On the other hand, when we begin by stating our expectations concerning the quality, representativeness, level of detail and other characteristics of the answers we receive, we can encourage creativity, as well as provide the investigator with important information.

Once we have provided the potential investigators with our quality and other criteria, it is appropriate to share our ideas about the approaches that would satisfy these criteria. In fact, we should always share thoughts about approaches since it helps the specialist understand our problem and our context. The fact that we have stipulated criteria, rather than an approach, will encourage others to share their ideas about relevant alternatives with us. Sometimes these alternatives will be more cost-effective, and just as likely to provide high-quality information on a timely basis, as the ones we have identified.

In the scope of work we need to separate the discussion of the study tasks into two parts: data collection and data analysis. We should expect those who offer assistance to tell us how they would approach each task.

a. Data Collection

In this section of a scope of work we need to summarize all of the aspects of a data collection approach that are important to us and which we want the investigator to address in his or her presentation (proposal) to us. The discussion in this section should cover:

- The population or universe to be studied.
- Whether a representative sample is needed.
- The method of selecting members of the population.
- Whether interviews, tests, records or other techniques appear to be appropriate.
- Who will design the instruments.
- Who could administer them.

- How and when a pilot test would be conducted.
- Other relevant items.

Our coverage of these items will not necessarily be even. We may have more information to share about what population is to be studied than, for instance, what sampling approach seems appropriate. Whatever information we have we should share. Further, we should stipulate that, in a proposal to us, prospective bidders should give us their best ideas on each of the topic areas we have covered. It is even a good idea to ask them to use the same outline we have used so that it will be easy to compare our ideas to theirs and/or review several proposals at once.

b. Data Analysis

When we approach the description of data analysis in a scope of work, we should indicate who will be receiving the study report (the audience), our thoughts about the form in which we want our answers (e.g., charts, narrative, computer printout, photographs, etc.), illustrative types of analysis we consider relevant (e.g., tabulations, statistical tests, productivity ratios, cost/benefit ratios, etc.) and our constraints (e.g., there is/is not a computer available, there are/are not trained statisticians, or anthropologists, or political scientists available locally who can help gather and analyze data, etc.). We should focus on our needs and constraints, and then let specialists be creative about how they respond to these requirements.

From a managerial point of view the best rule in approaching the subject of data analysis is: "keep it simple." The purpose of analysis is to summarize and present study findings in a way that is meaningful to the audience for this information. As a rule, field data collection efforts are not the place to test novel or sophisticated analysis techniques. Generally they are not needed. Further, the more sophisticated the analyses, the more we require in the way of skilled personnel and resources to carry them out.

There are a number of problems that can complicate the task of data analysis. Analysis is planned with the expectation that we will collect all of the data we hope to collect. To be realistic, and save later difficulties, an analysis plan should also address itself to procedures that will be used if we find that some data must be thrown out. The implications of missing data for the statistical validity of large-scale surveys should be examined carefully in such plans.

5. Special Skills

Where special skills (including language) are required, it should be made clear in the scope of work. On the other hand

the manager should be careful about specifying what academic credentials are required. In any discipline there are individuals with good research skills and others whose experience and interests do not equip them for field data collection efforts. These do not automatically coincide with formal credentials and degrees held. The manager needs a good research team. He should specify what is to be done and be willing to consider a wide variety of individuals with different backgrounds and experiences in field data collection and analysis for the job. Only those skills which are clearly required by the job need be specified in the work statement. Specification beyond this point can sometimes eliminate exactly the people you would want on your team if you knew all your options.

6. Time Frame and Level of Effort

In the scope of work, we should state when the information from the study is needed for decisionmaking, e.g., by the end of the next budget cycle. Frequently this target is not shared. Thus, studies are sometimes designed that will not provide data until well after the decision they were intended to serve has been made.

In considering the possible costs of empirical studies, we should begin by asking ourselves how much the information is worth. The cost, or level of effort in a study should be consistent with its expected value. When the estimate of what it will take to conduct a given study is significantly beyond the value of the information to us, it should not be done at all.

7. Reporting Requirements

Ask for the reports you need and specify when you need them. If you state that one report at the end of the project is all you need, you are probably deceiving yourself. You may need monthly or quarterly reports (because you in turn must prepare reports on this schedule). On the other hand, episodic reporting may suffice. There are a number of checkpoints in a study that should be monitored. The use of reports as a monitoring device is one of your options. Having reports built in at these checkpoints is one sure way of remembering them. The checkpoints that may warrant reports in some form are:

- The development of a final work plan, which should include a final clarification of the study questions.

- The final version of the study's methodology -- the selection of a site or population, the sampling or selection approach, the intruments if any, and who will collect and analyze the data and how, etc.

- A preliminary report of raw findings or facts -- case study observations or the tallys, by question, from a survey -- without conclusions or recommendations.

- A report on preliminary conclusions and recommendations (how is the investigator combining study facts to form judgments and to derive ideas for your next actions?).

- A final report, (following an agreed upon outline).

The importance of having investigators separate findings (facts) from conclusions, and conclusions from recommendations is worth stressing. Many times we must present information to individuals who have not been as close to the study as we have. When we tell these people about a study's recommendations, or its conclusions, we may sound as if we are offering just another set of opinions.

A systematic field study is the collection of facts by a formal method. If we don't describe our method, and make a clear presentation of the findings, our audience must accept what we say on faith. When we do present our methods and facts clearly, and then show how they led to the conclusions and recommendations, we present a solid case. It is a case that can still be argued, but the arguments will be appropriate -- they will address our methods, or our use of study facts in drawing specific conclusions.

C. SELECTING A STUDY TEAM

When a study is to be carried out in the developing countries, we should consider carefully the alternative project teams we might use. The most critical factors to consider in this selection are the nature of the study and the types of technical skills that correspond to the study approach and methodology.

In addition, there are other considerations. The most important involves a choice between local researchers and U.S. based study teams. While there may appear to be immediate advantages in calling in investigators from overseas, there are long-term benefits to be realized if local people can be used, or perhaps trained. in the course of conducting a study. Ministries and local universities can often provide suggestions concerning the existence of, or potential for creating, local teams.

1. Sources of Assistance

When our needs for information suggest that a full scale field study is needed, we often seek assistance in carrying it out. In the developing countries and in the U.S. there are several

sources of assistance we should consider. For relatively small studies we might consider individual researchers. However, for most field studies a larger team will be needed. Social science facilities at universities and research institutes, the specialized offices in our own and other government agencies, and commercial firms can usually direct us to, or provide us with, researchers who can design and manage field studies.

Academic institutional capacity is always difficult to estimate and great care should be taken to study the situation before scarce resources are committed. Academic institutions may have well-known researchers on board, but often the day-to-day business and research is carried out by lower level people. Even when prestigious U.S. or local scientists are reportedly available, one should not assume that their reputations alone guarantee competence for the specific work you need done. Only the actual involvement of these top-flight researchers offers that promise and it may be difficult to ensure.

In the U.S. and the developing countries it is sometimes possible to secure assistance through agreements with governmental organizations. Often such organizations will have highly qualified staff and extensive experience in the types of studies we need to undertake. On the other hand, the staff of these organizations are often committed to large workloads and we may have to be willing to wait if we want their assistance.

There is a wide variation in the intellectual resources and capabilities of firms and nonprofit organizations. We need to recognize that many of the better research and consulting firms have collaborative relationships with university personnel and even formal relationships with academic institutions.

The one factor that should (although it doesn't always) distinguish nonacademic organizations from the academic is an emphasis on solving specifically the problem you have posed in the terms in which you posed it. An academic institution tends to succeed because of the number of its publications and the eminence of its individual professors. A successful consulting firm or nonprofit research organization depends upon a track record of having met its client's needs.

2. Making Arrangements for Expert Assistance

The most economical way of managing social science resources is to assume that the relationship between project staff and investigators is to be long-term and mutually beneficial. A first step, before any specific assignments are given, should be to ensure that the institutions or individuals who are being considered for assignments are given an opportunity to acquire some knowledge about your organizational procedures and practices. The object of these familiarization procedures is to

ensure that those who are being considered for assignments know what kinds of data are required, what kinds of judgments and opinions are needed, and when.

The final step in the precontracting process should be a meeting to discuss the nature of the assignment. Here we need to demonstrate that we have clear substantive areas in mind and a firm series of expectations.

The actual timing and nature of the work output should also be discussed at this time so that both parties are quite clear about what is required and when it is required. Of course it is not always possible to nail all items down at the precontract stage. Where field work, quantitative surveys, or other original studies are involved, it is well to allow six months or perhaps more for completion. Where the data are already available or the investigator is familiar with the area, then the time required should be significantly less.

A contract for research should be given only after soliciting a number of proposals. Academic and sometimes other government organizations are all too often given tasks in a haphazard manner that would never be followed in awarding an engineering contract. Except under exceptional circumstances, a competitive process is the most satisfactory way of awarding studies.

D. MONITORING AND USING DATA COLLECTION EFFORTS

Once the study team is selected, our emphasis should shift to monitoring. We should expect that the team will begin by consulting with us and with other individuals and agencies that have relevant experience and information. We should insist on periodic reviews of progress to prevent misunderstandings and deviations from our objectives. Experience has shown that such interaction improves not only study quality but also subsequent information use. Our monitoring function should include financial and scheduling controls. Devices such as networks and bar charts, various budgeting forms, etc., can be very useful.

Where possible, we should encourage our study team to circulate its output formats and draft reports early enough to permit revision based on our feedback. Ideally, the data will be so arranged as to provide easy-to-read answers to each of our study questions.

An important rule for monitoring is to regard complicated presentations of data with skepticism. Anyone who truly understands something can explain it to someone who doesn't. Insist on explanations of the content and approach used at each stage. This is not only a means of increasing your understanding; it is

also the best means of eliminating waste and irrelevance. It's not "butting in" to insist that key study decisions be justified and explained. As someone whose particular concern is with the value of the information produced, you bring an important perspective to bear.

If the report is useful, it will be read. A common mistake to be avoided is not producing enough copies of such reports. If the report is lengthy and complex it is a good idea to have the investigator(s) produce a summary for wider distribution. In certain cases it might be appropriate to produce several versions of such a summary, emphasizing the points of interest to different audiences.

The specific steps involved in planning for and administering empirical studies are complex. They require the attention of both the manager and the study team. These steps are summarized in Figure 2-2.

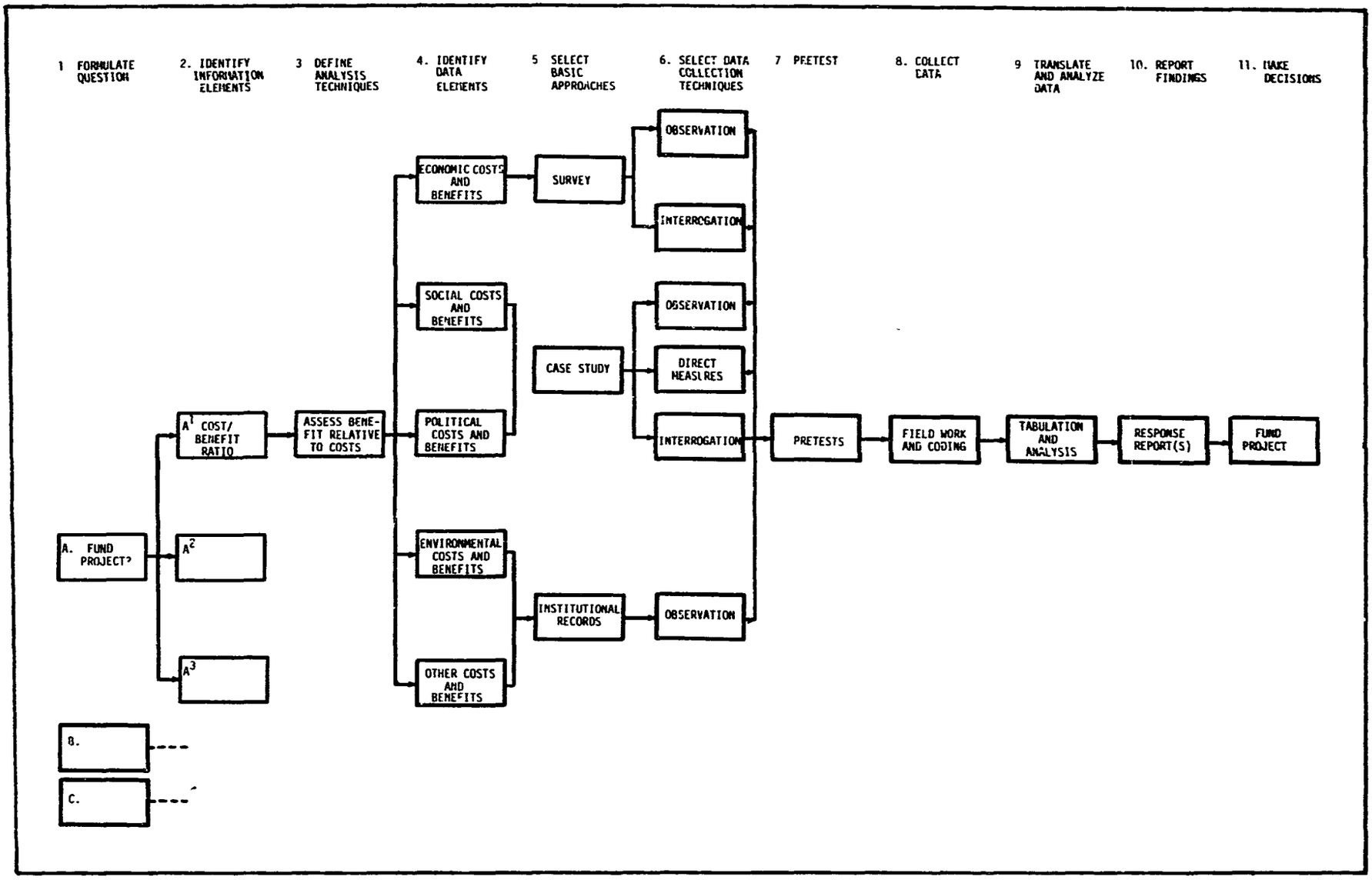

Figure 2-2: Logical Sequence of Steps/Choices in a Data Collection Effort.

PART TWO

PRINCIPLES AND APPROACHES

BASIC STUDY DESIGN CONSIDERATIONS

Part One of this Guide examined the process of securing information for decisionmaking from a managerial perspective. In Parts Two and Three, the focus of the Guide shifts and begins to consider the technical steps involved in deciding how management questions are to be answered.

This chapter addresses the basic study design issues we need to resolve. We cannot select specific approaches and techniques for our fieldwork until the essential characteristics of our inquiry have been set forth. The two basic study design issues that need to be considered early in the planning process are:

- The nature of our inquiry, including the types of answers we need and how we intend to use those answers.
- The quality we seek in study answers, including the ways in which quality is defineo and can be controlled.

When these basic research issues are discussed in the abstract their importance is sometimes ignored. Taken alone, they may sound academic. Yet whenever a professional researcher is faced with a question, this is where he begins.

As project designers and managers, we may not be well acquainted with the initial steps that are taken in formulating a study design. If we have a question that requires fieldwork, we develop a scope of work and solicit proposals from professionals. What we see in their proposals tends to be a description of the approach and specific procedures they, as professionals, recommend to us. The early steps in their analysis are not normally reported. In this chapter, it is to these "invisible" steps that we turn our attention. If we are to understand our data collection options, the process by which specific approaches are selected should not be a mystery.

A. THE NATURE OF OUR INQUIRY

The first step in moving from a management question or issue to an actionable plan for gathering and analyzing data is to define the nature of our inquiry. A professional researcher makes this determination based on what we tell him about our information needs.

As Chapter One suggested, it is the manager's task to formulate the questions that are to be answered through field studies. When we recognize that another person will examine our questions, in detail, as part of the process of selecting a study design, the need for clarity is apparent. The Chapter One recommendation to write out a plausible though fictitious answer to each of our questions is designed to help us, as well as the professionals we engage, make initial determinations concerning the nature of our inquiry and an appropriate study design.

1. The Uses of Information

Understanding our information needs can help us determine what type of study will be appropriate. The first step in specifying a study design is to decide why we need information. Answers to this question will tend to fall along a spectrum. At different stages of our projects we may need data to help us:

- Describe in a preliminary way the factors and relationships that appear to be important in a relatively unfamiliar situation.
- Describe in a precise way the status of a population or area on those dimensions that our exploratory work has suggested are important.
- Predict the changes that will result from alternative program or project interventions.
- Determine whether predicted changes or other changes occurred.
- Explain how and why specific changes came about.

As the above list suggests, the primary uses of information fall into three general categories: description, explanation and prediction. When we know which of these uses of information are important to us, it helps us decide what type of data, and therefore what type of study design, is needed.

All information is essentially descriptive. Explanation and prediction are ways of using certain types of descriptive information to enhance our ability to act on what we know.

However, a distinction among these three basic uses of information is necessary since studies that provide simple descriptive information do not necessarily provide us with a basis for explaining relationships or making predictions. When we want to explain or predict we often need to utilize study designs that differ from the ones we use if simple descriptions are all we require.

Descriptive information is not a single class of information. Some descriptive information is very general in nature, and often comes in the form of a series of qualitative statements. This is the type of information we need when we know very little about what factors are important in a situation or how those factors relate to each other. Microstudies that examine the totality of a situation, using case study or participant observation approaches, can often provide this type of general picture. Microstudies, which are discussed in Chapter Four, are useful for determining what problems are being faced by a target population, what project strategies would be possible given the local social structure, etc.

A second type of descriptive information we often need is that which characterizes, in a precise way, the attributes of a population, e.g., its income, caloric intake, etc. In order to make these descriptive statements, we may need to study all units of a population, or a representative sample. In Chapter Four the discussions of census procedures and sample surveys provide us with approaches to developing this type of descriptive information.

Whenever we consider gathering descriptive information, it is worthwhile to ask ourselves whether we will want this same information at some point in the future. In many projects, we estimate economic trends, progress in reducing the incidence of specific diseases, etc., using series of studies that provide comparable data for different points in time. If it is likely that we will need time series data we will need to select a study approach that can be replicated easily at a later time and perhaps by a different study team.

Explanatory information is the most difficult type to secure. When we want explanations we need to secure data that allows us to make strong statements about cause and effect. The type of statement we seek to make is of the form: A occurred because of B. The problem we face in any attempt we make to secure information that allows us to assert causation is that eliminating all other possible causes of A is difficult, even in pure science. In the social domain it is virtually impossible.

There is no such thing as information that predicts. Rather, we make predictions using either descriptive or explanatory information. Our predictions can be based on our ability to explain

why some event or change occurs (because of B) or on our knowledge about a temporal relationship, for example: D appears to follow C. When we have information about temporal sequence, we can make predictions even though we do not know whether D is caused by C, or whether both D and C are caused by some factor we have not identified. Much of the information we use to make predictions is descriptive data that has been shown to be highly correlated.

Being able to distinguish between information needs that require only descriptions and those that seek explanation is often critical. While most of our studies require only descriptive information, we should determine rather than assume we know what is needed in each new study.

As the preceding paragraphs suggest, all of the approaches to gathering data presented in Chapter Four of this Guide can be used to secure descriptive information. When we intend to use the information we gather to explain how and why change takes place, we also need to consider a number of additional study design factors. The remainder of this section reviews approaches that can be used to secure the data we need to explain relationships and to examine the degree to which project activity stimulated changes in a project situation.

2. Information That Examines Cause and Effect Relationships

When a question is raised that needs to be answered with an explanation, we should begin by determining whether we can use information we already have to deduce the answer. Deduction is a powerful tool that should not be ignored when we need explanations. While our "theories" about the development process tend to be weak and unverified, we do have information about some aspects of social and economic processes that has been validated in our own and other cultures. Thus, deduction should not be dismissed without an examination of what we do know.

A second approach to explanation is best described as diagnostic reconstruction. The work of a medical examiner illustrates this approach. The observed result he begins with is a death. By process of elimination he works backward eliminating some possible causes and thus identifying a very small range of plausible explanations. When this approach leads us to a single cause, in repeated instances, we may be able to make explanatory statements.

In some situations the only route to an explanation will be to develop and test an hypothesis concerning cause and effect. Our formal explanatory hypothesis must state both what will happen and why. (We often use the ideas generated by deduction, past experience and diagnostic reconstruction efforts to formulate

our testable hypotheses.) "Experiment" is the term typically used to describe a test of an hypothesis.

a. Types of Experiments

The approaches we use for testing hypotheses in the real world are borrowed from the scientific disciplines. The two problems we face in executing these tests are: (a) lack of control over the factors in the test environment and (b) lack of clarity in our notions about causation in the social domain. In studies of physical matter we have well developed expectations concerning the nature of cause and effect relationships, e.g., if object A hits object B under specified conditions, object B will move. Our grasp of how things change in human situations is much more tenuous.

The logic of a field experiment is like that of the physics or chemistry experiment in a laboratory. We take a situation (before), add a new ingredient (a development project) and observe (after) whether the change we predicted has occurred. Normally, we are also careful to observe and record any changes that occur, but which we did not predict. If the predicted change does not occur we reject our hypothesis. However, we cannot say that we proved our hypothesis when the predicted change does occur -- we can only say that it is strengthened. We can never be 100% certain that we know the cause of any effect, even when we know that the same effect is achieved in repeated tests.

When we conduct such experiments, we usually make every effort to ensure that there are no alternative explanations of the effect we observe. Thus it is normal to establish comparison situations called "controls," which are the same (before) but do not receive our experimental treatment (the addition of a new ingredient). In formal experiments we take special precautions to ensure that the experimental and control groups (of people, farms, etc.) are as much "the same" as possible before the treatment (e.g., project services) is provided, i.e., we use statistical techniques to assign randomly individual study units to the experimental and control groups. When we gather our post-experiment data (after), we secure it for both the experimental and control situations. If the effect we predicted is observed in only the experimental situation, our confidence is increased that other factors, including the passage of time, do not explain the change. Figure 3-1 shows the design for a controlled field experiment in its simplest form.

BASIC DESIGN OF A FIELD EXPERIMENT			
	Surveyed or Tested Before	Receive Program	Surveyed or Tested After
Program or "Experimental" Group	yes	yes	yes
Control Group	yes	no	yes

Figure 3-1: Simple Experimental Design with one Control Group.

As is apparent, the amount of control over a situation required in a true experiment is such that we can only in rare instances use this approach in the real world. Quasi-experiments and natural experiments are modifications of this form which, while they provide less powerful data, can be carried out in the environments in which we work.

In a quasi-experiment we have a reduced amount of control over the situation. This takes two forms. First, we cannot control all the factors (other ingredients) that are entering the situation. What we do is make the assumption that if some factor, other than our intervention (treatment), is having an effect, its effect will be the same on both our experimental and control groups. Secondly, we have less ability in a real situation than in a laboratory to ensure that our control groups and our experimental groups are alike (the same before). We do the best we can. This usually means we select, for example, cattle from the same stock raised in the same area. However, because we tend to work with natural or existing groups in quasi-experiments, the precautionary step of randomly assigning study units to our control and experimental situations is often omitted. This omission leaves us less certain that the groups we are studying are in fact "alike" before the program begins.

If we are trying for a relatively high degree of rigor in a quasi-experiment, we may use villages of the same size, income level, occupations, soil, religion and as many other conditions as we can think of. Sometimes we do not include control groups in these quasi-experiments. We simply depend on the before-and-after data on those who were exposed to a treatment, i.e., our project intervention. When we forego control groups it is

usually due to cost, or the difficulty of identifying a plausible control situation. Sometimes external reasons, e.g., the political or ethical difficulties involved in giving some, but not other, people a certain treatment, prevent adequate use of controls.

Three types of quasi-experimental designs are relatively common in our development projects: (1) those that use two groups and take before-and-after measures, (2) those that take "after only" measures on groups that did not receive assistance and (3) those that use one group and take before-and-after measures.

Studies that involve two groups, one of which is used for comparison purposes, are preferable to before-and-after studies of a single group when we want to determine the strength of a project's effects. When two similar groups are compared, even on an "after only" basis, we can make a fairly strong case for the proposition that the effects we have measured are attributable to project assistance. In studies of a single group it is more difficult to determine whether change occurred as the result of project efforts, or for some other reason.

Quasi-experiments that involve two groups, one which receives an experimental treatment (project services) and one which does not, can be used in a variety of development project situations. In projects that provide services within a specific geographical area, a "control" group can be identified somewhere outside of the area served by the project. Pilot projects often offer the opportunity to use this type of evaluation design. In some projects we may be able to selectively provide services to members of the target group in order to create a "control" group. This might be feasible in projects involving farm credit, training, etc. It would be less appropriate for health, family planning and nutrition projects where ethical considerations must take precedence over our evaluation plans. When it is appropriate and feasible to selectively provide services, some technique for avoiding bias, such as random selection, should be employed.

There are two types of situations where we normally use a single group to study the effect of an intervention. The first of these is the "natural experiment," a situation which we neither set up nor control, but which we know will occur. We may take advantage of that knowledge by making before-and-after measurements of the effect of the intervention. Land reform actions, changes in tax policy, etc. are examples of "natural experiments" from our point of view. The second type of "one group" situation in which we take before-and-after measures is the development project that, in effect, serves everyone. Projects that bring about fundamental changes in the way that government services are provided, or which cover a very large portion of the country, can sometimes only be assessed using "one group" measurement approaches.

b. Variables and Relationships

Two concepts are important to an understanding of most approaches for securing descriptive and explanatory information; they are critical for planning field experiments:

- The idea of a variable.
- Hypotheses about the relationships between variables.

(1) Variables

The basic criterion for determining what information is useful for program and project decisions is relevance. Facts can be secured on virtually any subject, and in any degree of detail. What the designer or manager normally seeks in a data collection effort is information on those aspects of a situation that can change. The term used to discuss these factors, whether physical or behavioral, is variable.

The three types of variables are discussed below: dependent, independent, and intervening. In addition, we are concerned with conditions that we do not expect to change or vary in ways that will affect our analysis. These conditions are called parameters.

(a) Dependent Variables

Dependent variables are the conditions that we hope to change, and whose changes we wish to be able to predict and explain. In development projects our dependent variables are often dimensions of the lives of the people those projects serve: their health status, their income levels, etc. We think of these conditions as being "caused" or "forced to change" by other factors (independent variables). For example, farmers' adoption of fertilizer is thought to be related to their contact with agricultural extension agents. Thus, we predict that as the frequency of agent visits to villages increases, the rate of fertilizer adoption will increase.

The purpose of our projects is to bring about change in the dependent variables we consider important. Empirical studies of development projects provide the basis for examining whether and how such changes occur -- for determining which independent variables have the greatest impact on the condition we are trying to affect.

(b) Independent Variables

Independent variables are the conditions we attempt to control in order to influence the status of the dependent variables. We need to identify and understand these factors in order to bring

about change in the dependent variables. We think of independent variables as "causing" changes in dependent variables. Our projects try to predict and test relationships between independent and dependent variables, e.g., as education increases, innovative behavior increases. Our projects are themselves independent variables. We hope our project interventions, the provision of credit, education, etc., will result in favorable outcomes.

(c) Intervening Variables

Intervening variables are also variables that can bring about change in the dependent variables, but unlike independent variables, are not controlled deliberately in a given project, e.g., the price of fertilizer might affect the crop choices farmers make, but it may not be a factor that an agricultural extension project can control.

Their importance in a situation, i.e., the way they cause changes in the dependent variable, is not always known in advance. Sometimes we only know something intervenes when its effect emerges in our data analysis. To the degree that we are able, we should identify the intervening variables in our project situation and monitor them to detect early any unanticipated effects.

(d) Parameters

The three types of variables described above have one thing in common: They are subject to change during the time period with which we are concerned. In every project there are some conditions that we do not expect to change significantly during the project period. Physical terrain, distances between villages, soil types, etc., the religions and languages of the people, the size of their villages, and so on, are all conditions which we do not expect to change over the life of a project. These conditions are called parameters in our studies. That is, they are "givens" or the "constants" that characterize the environment within which we operate.

Figure 3-2 provides examples of the above types of variables in programs and projects.

(2) Hypotheses About Relationships Between Variables

In a project or program we are acting on the expectation that our interventions, the things we are doing, will bring about a change in one or more dependent variables of interest. As introduced earlier, the general term that is used to describe this expectation is hypothesis.

	Examples of Project Variables
Dependent Variables	• Per capita income • Daily caloric intake • Population growth rate • Productivity of individual farms • Availability of protein foods at reasonable cost
Independent and Intervening Variables	• Number of loans to small farmers • Nurses per hospital • Number of family planning clinics • Time
Parameters	• Physical characteristics of the land • Religion of the people

Figure 3-2: Project Variables are the Factors We Consider Important in a Specific Situation.

An hypothesis states that a certain relationship is expected to exist between two or more variables. A statement of a relationship expresses our expectations about change in two or more variables. We speak about a change in the independent variable producing a change in the dependent variable: as credit increases, fertilizer use increases.

While most of us can easily list factors of interest (variables) that we wish to measure, once or many times, we all falter occasionally when we try to state our project hypotheses clearly. Sometimes we know our technical area, or the country in which we are working so well that when we try to explain the relationships of interest we convey too much information. While this may happen when we have a number of hypotheses in a single project, it sometimes happens because we are not used to reducing our thoughts to their simplest terms. Thus, we might first

write our hypothesis in a descriptive way. The following is an illustration:

> Farmers receiving interest free loans from the agricultural credit cooperative will invest in fertilizers and participate in the mushroom growing scheme. Farmers who do not receive loans from the cooperative will continue to plant maize, beans and cassava.

With practice we can simplify these thoughts. The use of symbols can help us get started. For example:

> Y, because of X translates in our situation as: Farmers will grow mushrooms when (because) affordable credit is extended.

The example above is an explanatory hypothesis. We can also formulate hypotheses of a predictive sort (If X, then Y), when we are not sure that X is the sole cause of Y. As noted earlier, our predictive hypotheses are often generated based on a knowledge of what factors in a situation are correlated (i.e., known to change together in predictable ways).

B. THE QUALITY OF INFORMATION

Information about variables and relationships is only of help if its quality is adequate to meet our needs. Information quality, in this sense, is ordinarily characterized in terms of several basic aspects, including:

- Validity -- does the information measure what it is intended to measure, and what is important for decision-making?
- Reliability -- to what degree does repeated use of a measurement procedure produce the same results?
- Precision -- with what degree of specification are relationships and conditions measured?
- Bias -- to what extent do human factors of an unplanned and/or non-random sort operate to distort information by intervening in the measurement process?
- Representativeness -- to what extent does our information characterize all of the units in a study population?

It is important to understand how each of these dimensions of information quality is affected by circumstances we can control.

1. Validity

The most elementary aspect of information quality is the extent to which it corresponds to what we thought we wanted to measure. Validity in its simplest meaning is the closeness of fit between an intellectual construct, say "family cohesion," and the things we measure empirically as indicators or proxys for that abstraction. If our measures do not "correspond" to the abstraction, then the entire chain of reasoning between analytic and empirical domains collapses.

In addition to the above textbook sense, we can add another aspect critical to development project management. This recognizes that information is valid for us only to the extent it helps us understand relevant problems and make sound project decisions. From this perspective, information must do more than merely provide adequate representations of abstract concepts. These concepts must be important to the project effort, and help to shape project decisions in a way that promotes the achievement of our objectives.

2. Reliability

Obviously, the quality of information is poor if the relationships and conditions it represents are subject to variation which it does not capture. Therefore, information is not reliable if similar measurement procedures would yield different results if applied again.

What we need is an adequate degree of confidence that our measurement results correctly represent empirical relationships. In general, we can gauge the degree of reliability of our information by the simple process of repeating the measurement under the same or similar conditions with the same or similar population.

3. Precision

This dimension of information quality concerns the degree of detail or refinement in the measurement of variables, relationships, or conditions. Because a given degree of precision is normally something you can "buy" with a given amount of resources, it is a good idea to be very sure how much you actually need. Then you are not likely to waste resources getting more. For example, if bridge design decisions require that you know only what the heaviest vehicles using the bridge will be, you do not need to have frequency counts by weight class to make your decision.

4. Bias

Biases degrade information quality by injecting human distortion into the data collection process. The result is always some

degree of error in the representation of empirical relationships. There are many sources of such effects, ranging from the influence of the basic study approach we adopt, to the particular nature and behavior of each individual field worker we employ.

Because biases are inherent in every study, dealing with their effects usually involves more than merely attempting to eliminate them. A concentrated effort to identify them, and correct for their effects is needed.

5. Representativeness

Information quality is also contingent upon the degree to which it measures or can be applied to the complete population or universe of the study. Usually, we depend upon some type of selection or sampling from this total population to provide units for observation. This raises the question of representativeness, or the extent to which our selected units truly characterize the entire population from which they were drawn.

As with precision, different degrees of representativeness can be achieved with different levels of investment. And in the same way, the degree we buy, for example with more sophisticated sampling techniques, or perhaps with an exhaustive census, should be determined by the amount required for our project management purposes (as discussed in Chapter Five).

In addition to these quality considerations, we need to consider the amount of information we collect from each population unit we intend to examine when we select an approach. In most situations the choice we face is between securing a lot of data about a few or a little data about many. To make this choice we must refer back to our reason for collecting data. If we are trying to learn enough about a population to develop testable hypotheses, or to specify what aspects of the project environment are likely to facilitate or hamper project efforts, we may find that an in-depth study is needed. If on the other hand we simply want to describe a population, or gather data that tests an hypothesis about project impact, an approach that secures a limited amount of data from a representative sample may be needed.

We need to recognize that when we consider study approaches we are not necessarily required to select on an either-or basis. Sometimes the most cost-effective studies involve combinations of efforts. For example:

- A case study could be conducted to determine the variables in a situation. It could be followed up by a survey that is designed to determine how a population is distributed on each of the variables identified in the case study, or

- When a survey, or census effort reveals a pattern of findings that cannot readily be understood or explained, a case study that considers this pattern in-depth may be an appropriate next step, or

- A survey of health indicators might be followed by the development of a recordkeeping system in local clinics and schools that would provide low-cost, long term, trend data on specific indicators.

When we fully understand the types of information we need, it becomes easier to determine what types of study approaches are appropriate. Thus, a one-time case study or survey might be adequate to tell us about the status of a variable at the point of project design. However, if we want to monitor change in that variable during project implementation as well, we will have to choose a data collection method that allows us to make the comparisons that interest us. When we want to be able to conduct an evaluation and say, at the end of a project, that our project effort appears to have caused a measurable change in the village, or among women, or farms, we must consider research designs and evaluation approaches that actually allow us to 'test' our hypotheses.

When we do select a study approach, or a combination of methods, the important thing to understand is what we have accepted in the way of limitations on the things we can say. The use of census, survey, micro-study, and other approaches are considered in greater detail in the following chapter.

FIELD DATA COLLECTION APPROACHES

In this chapter we briefly survey a number of approaches for gathering data in field situations. The approaches discussed are most useful when they are applied to the type of situation for which they were developed. The focus of our review of these strategies is on the types of questions they are best suited to answer and the level of effort and time required to use them. In selecting one, or a combination of approaches for carrying out a field study, the manager must bring to bear his knowledge of the major study questions and the main characteristics of the answers he seeks. Normally, the research design issues discussed in Chapter Three need to have been addressed and resolved in at least a preliminary way before an appropriate field data collection approach can be selected.

In this chapter the advantages and limitations of a census, surveys, microstudies, recordkeeping and other field study approaches are discussed.

A. A CENSUS

Most of us are familiar with the term census. Often we are aware of the fact that many countries undertake a census to enumerate and describe their entire population every ten years or so. In some of the developing countries this type of national census has never been attempted; in others AID is assisting the government in carrying out a national enumeration and data collection effort. A national census of a population is a major undertaking in any country. When such efforts are carried out it is normal to collect only a limited amount of information about each member of the population. Most of this data is descriptive. We learn where the population lives, its average age and income, how it is divided between majority and minority or tribal groups, and so on.

The idea of a national census is not frequently applied to non-human populations, though other approaches are taken to

enumerate and maintain data on the quality of a country's roads, grain stocks and the like. At a regional or project level, however, a census might be taken of either human or other populations on which we need comprehensive location and other simple descriptive data. Thus, for example we might in some project situations find that we need census data to tell us exactly how many and which individuals or cows have a certain disease, or how many and which fields were plagued by a particular variety of insect. These smaller size regional or project area censuses will be more manageable than their larger national counterparts, thus making a census a feasible approach.

There are three main reasons for considering a census approach or trying to use existing census data in making project decisions. First, an existing census is a ready source giving us accurate positional data about how dispersed or concentrated the population is and where the most severe pockets of hardship and want are located. This information is needed by both donor agencies and host governments to decide what basic programs should be undertaken and how these programs should be focused in terms of geographic area and target groups. The second basic reason for securing data on all units of a population is to identify exhaustively the incidence of some characteristic and to locate specific units, such as all cases of smallpox. Finally, we collect census information to provide us with an accurate representation of the population that can be used in selecting samples (representative units of the population) from whom additional data can be collected. Sample data are less costly than census data, but in many situations it is difficult to sample a population unless a census has already been completed.

Because a census is made infrequently, it is important to collect the type of population data that will later help us sample that population. Thus in a census we might want to secure data on the number of men and women who are married or unmarried, have or do not have a secondary school education, own land or do not, etc. These different characteristics can then be combined in various ways to form different categories to be sampled in subsequent studies. For example, depending on our reasons for wanting information, we may wish to overrepresent in a later study women who are single, literate and employed.

1. Characteristics of Census Information

A census gives us information on all units. Other data collection approaches collect information on only some of the units of a population. Census data are not estimates, they are actual counts.

Census information does not necessarily have greater validity than the information generated with other approaches. In a

census, as in other types of field studies, we can make mistakes in the way we try to measure the things that are important to us. We can err by not asking the right questions or by asking the right questions in a way that is meaningless to our study respondents. The fact that a census gathers data from all units of the population does not help us with such problems.

The reliability, or response consistency of census data is usually gauged by going back at a later time to a sample of the population already examined and repeating our data collection process. The degree of agreement between our census data and the subsequent examination of a sample is a measure of response consistency.

Census information has a number of other characteristics that are more a function of the size of the undertaking than of its nature. Because a census, particularly a national census, is an enormous operation, it is not uncommon to find that more resources are devoted to locating members of the population than to obtaining data from them. Even the U.S. Decennial Census collects only a small amount of information from all of the people in the country. Most of the information we think of as being "census data" is actually collected through sample surveys conducted by the U.S. Bureau of the Census.

Census information tends to be highly quantitative. Answers in a population census tend to be numbers of adults and children, male and female, and various categories of education, employment, languages, religions, age, marital status. Other information, if any, will be similarly structured. Information is self-reported: people are asked questions about themselves and they report on themselves. Census enumerators collect some data by observation, usually in agricultural censuses and on other physical populations.

Finally, census operations are highly visible in the community. Strangers coming to the village or into the neighborhood asking questions about all people is an extraordinary event. A census disrupts the routine. It's highly obtrusive.

2. The Limitations of a Census Approach

Human populations in developing countries are difficult to count. In the large cities and urban areas there are elusive "floating" populations of transients, homeless, underemployed, migrants, the old, etc. Some of these people share dwellings. Perhaps as many as three "families" may share the same quarters in a 24-hour period. Addresses are hard to locate, streets are unmarked, boundaries are obscure. The situation in the rural areas may not be better. Nonexistent or impassable roads, absence of transportation, nomadic populations, and unclear notions of village locations can make it difficult to carry out

a census or to develop population lists from which samples can be selected.

Moreover, our ability to count is severely limited when we seek data on units such as villages, leaders, households, heads of households, farmers, full-time workers, etc. None of these labels applies easily to human populations in developing countries. Even when we attempt to count the number of farms and describe them we face difficulties. The terminology and units we use do not always have meaning in the situations we want to describe.

A further weakness of the census approach is the high potential for human error in carrying out the data collection procedures. Census workers often receive low wages and work only part-time. They endure arduous conditions in the field, often in strange or even inhospitable areas. Errors of omission and commission can be of serious proportions. Thus, while census data, in theory, are precise, in fact they may be error-ridden. In addition to the human problems, a census tends to be very costly, requiring enormous investments in staffing, time and logistical operations, including: training, transportation, maintenance, supplies and equipment, data processing, etc.

For these and other reasons, census efforts typically provide limited data for project planning or evaluation -- they secure only a few quantative items that are as easy as possible to collect. No "open-ended" or unstructured questions are asked, nor are unstructured answers recorded. The limited nature of census information is largely a function of time and cost, but it also relates to the attempt normally made to reduce the fieldworkers' job to a manageable task and to cut down on clerical errors in collection and processing.

The key point to remember is that a census is ordinarily not an efficient strategy for securing data on people's social, informational, attitudinal or behavioral characteristics. A sample survey or microstudy will usually be a much more cost-effective strategy for securing these kinds of project information. The exception to this general rule occurs when a study population is so small that sampling it is inappropriate. When we study small populations it is usually feasible to use a census approach. It is necessary if we intend to characterize the whole population with our data.

B. SAMPLE SURVEYS

A sample survey characteristically draws information from a representative portion, or sample, of the population of interest. Sample surveys, when properly carried out, allow us to characterize whole populations with our data, as does a census. The difference is that our sample data provide an estimate

whereas census data are complete. Because sample surveys involve fewer units of the population we are studying, e.g., farmers, school children, credit transactions, etc., they tend to be less expensive. Further, we are normally able to collect more information from individual units in a sample survey than is the case when a census is undertaken. Even though we often gather more information in a sample survey, we tend to complete it more quickly because of the significant difference in the size of survey and census efforts.

1. General Attributes of Surveys

Because of their relatively low cost, sample surveys are a versatile tool for assessing needs and suggesting the most appropriate project interventions for assisting large populations. Over large areas, surveys can describe population characteristics, land tenure patterns, water resources, cropping patterns, diet and so on. In short, where the consequences of studying some rather than all units of a population are acceptable, a survey is an effective strategy for gathering data.

Surveys are conducted to serve a variety of project information needs. They can be used to characterize a target population -- population subgroups that are deficient nutritionally, in health status, etc. -- and identify the main constraints on improving the status of these people. Similarly, we can use survey approaches in project areas to examine the needs of the farms, livestock, and dwellings or the demand for the credit, health, training, population control and other services our projects can provide. What we learn about population subgroups from our surveys can help us to "customize" our delivery programs, making them fit better within the local culture, traditions, environment and economic structure.

Survey data can also be used to put to rest clichés and myths about populations. For example, the incidence of infanticide may be much lower than is suggested by popular myth, the press, or the Ministry of Health. The truth about hidden wealth, hostility toward strangers among the hill people, resistance to innovation in farming practice or medicine, etc., may be so distorted as to be absurd. Project decisions that are based on such stereotypes may have serious adverse consequences. Survey research and microstudies provide us appropriate ways to secure data that correct for this type of distortion.

Finally, surveys can be used to assess the strength of our project hypotheses in some situations. They can help us determine whether a project effect we notice in one area is also present in other areas (under different conditions and for different types of people). The survey is the only cost-effective way we have of securing the same data in many places at roughly the same time. We can also use survey data from different

points in time to monitor changes in specific characteristics of our study population. Several types of multiple-time surveys are worth noting.

2. Multiple-Time Surveys

Surveys that are undertaken at a single point in time can help us to understand the characteristics of a population. However, the picture such studies provide is a static one. In order to learn about changes in a population or to examine trends on specific indicators of interest, e.g., family income, nutritional studies, etc., data from multiple points in time is needed. Two main types of multiple-time surveys are used to secure data that allow us to examine changes in a population. These are: (a) multiple cross-sectional studies, which measure gross changes in population characteristics, and (b) longitudinal studies, which collect data on specific population units at several points in time.

a. Multiple Cross-Sectional Studies

Surveys of this type examine different but comparable, or equivalent, samples of the same population at two or more points in time. Before each cross-sectional survey is conducted, a representative sample of the population is selected for examination. Some units included in an initial survey may appear in subsequent survey samples, others will not. In multiple cross-sectional studies we are not attempting to follow up on particular population units to determine how these units changed. Rather we are assessing change in the aggregate using two or more equally representative samples of the population.

Thus, for example, a Ministry of Education might survey its secondary school teachers to learn about their attitudes and motivation. If data from an initial survey indicated that morale was low due to poor facilities and a lack of textbooks, the Ministry might undertake a program to improve the situation. After a one or two year improvement effort, a second cross-section of the secondary school teachers might be surveyed to determine whether there had been changes in the way teachers felt about their work situation. While such multiple cross-sectional studies would not tell the Ministry that the morale of specific teachers had changed, or that the improvement program was the direct cause of such change, it would give the Ministry information on whether, in aggregate, secondary school teacher attitude and motivation was improving.

Multiple cross-sectional surveys are relatively easy to conduct when an adequate sample frame exists, e.g., a reliable list of all secondary school teachers. When this type of study is undertaken the various surveys must be comparable if valid conclusions are to be drawn. Thus it is important to ensure that

the same sampling methods are used each time, and that the same procedures and approaches are used in interviewing, observing or otherwise measuring the characteristics of the population. Further, it is important to be aware that in situations where there is a great deal of migration, turn-over, etc., we may be studying two different populations, rather than one population at different points in time.

b. Longitudinal Studies

Longitudinal studies attempt to assess change in the characteristics of a population by repeatedly examining a specific set of population units. Thus, while other types of multiple-time surveys can show changes in the characteristics of various types (categories) of a population, longitudinal studies can identify specifically which units of a population changed and how much they changed. By pinpointing where change occurs, the longitudinal study improves our powers of generalization and causal imputation. With longitudinal data on a fixed set of population units we can describe over time the number of units that change, their rate of change, stages in the process of change, etc. We also tend to learn about patterns of migration and turn-over as we attempt to follow-up on a fixed set of units over a reasonably long period of time.

While longitudinal studies provide us with both quantitative and qualitative data of value, they tend to be expensive and difficult to carry out.

Two of the key difficulties with longitudinal studies are attrition and biases associated with repeated measurement of a fixed set of units.

Attrition is a basic issue in most longitudinal studies. In many situations a population will shift during the period of study, e.g., some units will "drop-out" by migrating, ceasing to participate in the program, etc. The cost of following up on these units can be high. On the other hand, it is dangerous simply to ignore the units that "drop-out" since there may be something special about them, e.g., the people who leave the study area are the ones who were best (or worst) served by the program. In addition, attrition can often reduce a study sample to an unacceptably small number of units. To counteract this we may have to "oversample" in the initial years of a longitudinal study, recognizing that while "oversampling" will tend to increase our study costs it may be the only way to secure data about a sufficient number of units.

Repeated measurement tends to be a problem when we are studying human populations. Thus, while we do not expect to introduce bias by remeasuring per hectare productivity at the end of each

crop season, we need to recognize that people tend to remember the questions we have asked them and the answers they have given us. In repeated interviews, our respondents memory of the last survey can result in: (a) simple repetition -- sample members may become frozen in their response for fear of appearing inconsistent; (b) some may become more expansive -- improving on original answers; and (c) some become more knowledgeable -- the study serves to stimulate some people to learn more about the program and even to take part in it.

These kinds of response problems are common to any longitudinal study or experiment in communities or laboratories. Special attention must be given to training researchers to cope with them. And, data analysis must include specific tests of re-interviewing biases.

3. Trend Studies Based on Multiple-Time Surveys

Trend studies are one of the ways we use multiple-time survey data. They are not a separate approach for gathering data. In trend studies we simply examine data to identify patterns in the degree to which variables appear to change in similar ways. These studies are an excellent approach for developing hypotheses. A good deal of economic and health research is of this type, e.g., studies that correlate cancer with heavy smoking. Data from longitudinal studies can be analyzed using correlation techniques to identify patterns in the data.

While trend studies may be helpful for exploratory purposes, we need to be very careful in drawing conclusions based on this type of analysis:

- Trends are just that -- we learn whether the value of a variable of interest is increasing or decreasing over time. But our data do not tell us what's causing these trends.

- Correlation is not causality -- when two variables appear to change in similar ways and in similar time frames, it may be that one variable is 'causing' change in the other, <u>or</u> change in both variables could be caused by change in a third variable (one we haven't thought about or identified), <u>or</u> the two variables can move together by chance.

We are best served by this type of study when we expect it to help us define new hypotheses that can be subjected to more rigorous tests later. We are ill served when we assume it can tell us conclusively what causes what in the real world.

4. Survey Cost Estimates

Since surveys have become a well-accepted and frequently used approach for gathering many types of data, a good deal of experience in their conduct has accumulated. We are thus able to make illustrative estimates of the costs that we will incur when these approaches are used. (Actual costs will of course vary depending on sample size, the number of times the survey protocol is to be used, etc.) Most surveys involve five major steps or phases. The International Statistical Programs Center at the Bureau of the Census estimates that costs tend to break down by phases as follows, for a one-time survey:

Survey Phase:	Percent of Total Survey Costs
1. Planning/negotiation	15%
2. Survey preparation	25%
3. Field implementation	25%
4. Data analysis	15%
5. Reporting/presenting results	20%
Total Costs	100%

Figure 4-1 provides further estimates within each of the phases. It divides each phase into activities and shows the approximate distribution of costs in a phase by activity.

5. The Limitations of Survey Approaches

Surveys can produce the same types of data we secure from a census. They can also produce a great deal more information, both quantitative and qualitative. Yet they suffer some of the same limitations as a census. Both approaches encounter difficulties in locating study populations. While survey team members may be better trained, this is not always the case. A sound program of training and supervision in both census and survey work helps to counter data distortion due to human error.

When survey staff are well trained and supervised, their data may be quite free from recording errors. On the other hand, survey staff with better educations, urban experience and higher socioeconomic circumstances may be more prone to make errors in reporting data. The greater social and psychological distance between these fieldworkers and their subjects can be a source of error since there may be subtle differences in the way these individuals understand either the survey questions or the answers provided by respondents.

There are many other pitfalls to guard against in a well-executed survey. Like the census, the survey tends to sweep into communities with a bunch of strangers asking a lot of

SURVEY STAGE	% OF TOTAL STUDY COST	BREAKDOWN OF STAGE INTO ACTIVITIES/ACTIVITY COSTS	
I. PLANNING STAGE	15%	ACTIVITY	% OF COST
		1. Develop Sample Plan	15
		2. Develop Research Instructive	35
		3. Prepare Trng. Materials	30
		4. Determine Data Processing Requirements	20
		TOTAL	100
II. SURVEY PREPARATION	15%	ACTIVITY	% OF COST
		1. Select Interviewers	5
		2. Select & Prepare Sites	15
		3. Establish Field Procedures	30
		4. Train Field Staff & Interviewers	35
		5. Develop & Test Data Processing Methods	15
		TOTAL	100
III. FIELD IMPLEMENTATION	25%	ACTIVITY	% OF COST
		1. Provide Coordination & Administration	20
		2. Undertake Sampling & Quality Control	20
		3. Interview & Maintain Data Collection Quality Control	50
		4. Complete Preliminary Data Processing	10
		TOTAL	100
IV. DATA ANALYSIS	15%	ACTIVITY	% OF COST
		1. Construct Model & Analysis Plan	45
		2. Define Measures	30
		3. Execute Measurement & Validation	25
		TOTAL	100
V. REPORTING	20%	ACTIVITY	% OF COST
		1. Write Report	70
		2. Present Findings	30
		TOTAL	100

Figure 4-1: Illustrative Allocation of Resources to Various Survey Stage/Activities

questions. Unless care is taken in study preparation, many of the questions may be embarrassing, threatening, or simply meaningless. Surveys should be preceded by thorough, culture-specific preparation, as discussed previously. Nevertheless, a serious obstacle to success can be conditions in the developing countries and the procedural difficulties these conditions present.

Thus we find that poor transportation connections and impassable roads make it difficult to reach the more remote villages. Low general levels of education make it difficult to match competent fieldworkers with respondents of the same language and cultural background in all areas. Distrust and fear of strangers make it difficult to convince people to be part of the study and to give reliable information. The lists we need to draw random samples or stratify the population are hard to develop. Foreign researchers and country nationals are often inexperienced and unfamiliar with the sociocultural conditions of the populations they are studying. Further, fieldworkers may be reluctant to endure the arduous conditions of privation and discomfort in rural areas.

Despite all these difficulties, the potential for the survey is great, simply because it can provide solid information in less time and for fewer resources. Moreover, we can improve managerial control over the population units studied (i.e., improve definitions and selection procedures). We also can improve our control over fieldworker training, motivation and supervision.

C. MICROSTUDIES

Microstudy is a term that covers field investigations undertaken on a small or unique scale. The basic reason for undertaking microstudies is to secure in-depth, detailed information on a smaller number of population units. Studies of this sort yield information that, in most cases, can only be used to characterize the units examined. The units in microstudies can be individuals or groups such as villages, religious sects, voluntary associations, etc. Any type of group can be examined using microstudy approaches as long as it is small enough to be manageable. Community studies and case studies are the two best known types of microstudies.

Community and case studies were the basis of much of our information about developing countries long before the survey came into vogue. Planners and managers of data collection efforts are now "rediscovering" the value of microstudies prior to and as a basis for planning surveys. The kind of intensive, below-the-surface detail revealed by the microstudy cannot easily be obtained through a survey.

1. Types of Microstudies

Community studies, which examine villages or neighborhoods, try to describe for one community the basic social, economic and political processes that uniquely distinguish it. Such studies focus on community traditions, beliefs, codes of conduct, class divisions, social institutions, occupational activities, male and female roles, means of social control, generational transmission, etc. The purpose of this research is to understand in relatively great depth the "whole" of a social organism, its parts and their interrelationships, in order to explain the how and why of unique patterns of thought, belief, and behavior in the community.

Community studies create minimal disruption of the natural setting. Often they take the form of an anthropological examination of a single community. The research is conducted using techniques that are unobtrusive, i.e., observation, informal interviewing, and personal diaries and other records.

Information generated through community studies can help us to determine whether our project is likely to be viewed positively by community residents and whether they are likely to become involved and use the goods and/or services it produces. Information of this sort is critical for planning decisions, particularly when a novel intervention is being considered. Community studies can also provide information about the ways in which community residents address specific problems, such as a limited water supply, lack of storage facilities, etc. When we know what members of the community are already doing, we may be able to support their initiative rather than introduce a new, and potentially competing, solution.

Case studies, like community studies, are intensive. We can develop a case study of an individual, an industry, a farm, a classroom or a wide variety of other situations. Case material can be developed either for a single point in time or it can be longitudinal and focused on an exmination of how, when and why the unit we are examining changes. Many case studies attempt to be before-during-and-after witnesses to the process of change. They can provide rich insight into the processes by which development projects, business and other case units operate, fail, succeed, etc.

Case studies generally do not collect information in as structured a way as is needed for rigorous comparisons. They do, however, allow us to gain insight about the process of change. For instance, we may study what is believed to be a "typical" example of an area or people of interest. This is one of the best ways to gain information concerning the variables in a situation both at the beginning of projects and following implementation. It is a relatively direct way of gaining this

type of information. Case studies, in which interviews are used and in which the questions are asked in a manner that allows the person being interviewed to respond freely, can be an effective way of identifying what people think are important factors (variables) in a situation.

Virtually any approach to learning about a situation which does not presume that we already know all the factors that are important can be used to gain information on variables, or to develop hypotheses about cause and effect. Case studies of unusual or extreme cases, e.g., remote populations, educated populations, etc., can be undertaken and compared with our "typical" case in order to clarify the types of relationships that might exist between the variables. Such studies can often be done early in the planning process, before our project design has fully crystalized.

Another important use of either type of microstudy is in conjunction with survey research, either to facilitate our sampling process or to strenghthen our ability to interpret survey data properly. A related use is to develop and refine the questions that will be used in surveys and to improve the measurement of concepts by learning how best to measure them in specific situations. For example, a microstudy might indicate that several measures of land holding and personal assets are necessary to assess wealth, that young married women are willing to talk privately with female interviewers about family planning practices, and so on.

Microstudies have a variety of other purposes. They are often used as a training ground for fieldworkers who are to be employed in long-term projects. They can be a training ground for foreign researchers as well, enabling them to better understand the nature of the populations they hope to study.

2. Microstudy Information

A microstudy usually focuses information on only a few units. Microstudy data describe only the units studied. This data cannot normally be used to estimate the characteristics of larger populations.

On the other hand, of the field approaches described here, the microstudy has perhaps the greatest capacity for producing highly valid information. Immersion in the group and unobtrusive, intimate observation help the researcher to understand which variables are important to measure and how to measure them properly. The microstudy can examine complex relationships over a period of time and at a level of detail not possible with a census or survey.

The reliability of microinformation tends to be unknown. Only rarely do we do follow up microstudies for the purpose of checking data reliability. This is because our purposes in undertaking microstudies typically do not require it. Instead, we convert the original insights into a more general hypothesis for later testing. This is not a check of reliability, but it is an efficient use of microstudy information.

Microstudies can collect a lot of information. Their emphasis is on getting information, not on the methods of collection. Compared with census and survey data, microstudies yield information that is more qualitative than quantitative. Such studies are typically carried out early in the research process, specifically because little is known about the study population.

Finally, microinformation is usually unstructured. It is gained through observation, informal (unstructured or semistructured) interviews, diaries and reconstruction of events and occurrences or from key informants speaking on behalf of the group. Interpretation of the data may be as personalized and impressionistic as the means of collection.

3. Limitations of Microstudies

Microstudies do not provide information that can be used to characterize a population. They provide in-depth information, but only for a few units (usually small intact groups). They may cost less than other types of studies; however, they tend to require significant investments of time and competent staff.

Immersion and participation in the study culture have obvious implications for the information collected. On the one hand, intimate familiarity with the people and conditions under study overcomes many problems associated with self-reporting. As community members come to accept and trust the presence of the researcher, they begin to give truthful and useful information. On the other hand, as the researcher becomes more deeply embedded in the structure and activities of the local culture, recorded observations can become less objective.

D. RECORDKEEPING AND OTHER DATA GENERATING APPROACHES

In the preceeding pages three well known approaches for gathering data have been examined. They are the main approaches used by most social science researchers. However, they are not the only strategies for generating the information we need to make project decisions. Too often we select an approach because it is popular and without examining whether other less well known or simpler approaches apply in our situation.

1. Recordkeeping

Most literate populations keep records, even when there is no audience for those records. Throughout time and across cultures people have kept diaries and journals that record much of the same data we seek in case and community studies. When a new stimulus is introduced in a community, individual records often note the change and its impact on the community. Similarly, the personnel who work on our projects tend to keep notes and journals that are not required as well as the formal records we do require. Recordkeeping approaches for generating data harness this impulse to secure information for project decisionmaking.

Recordkeeping approaches are those systems we establish for the purpose of gathering facts and commentary about subjects of interest. They differ from records maintained for other reasons, such as bank, hospital and business records. The existing records of these institutions can provide us with information, as was suggested in Chapter One. They exist independent of our project. Recordkeeping systems that we institute, as an approach to gathering data, do not pre-exist. Unless we bring these records into being they will not provide information for our decisionmaking process.

One of the simplest recordkeeping approaches is the formal journal. It is frequently used in studies of agricultural practice. Farm journals record detailed information about an individual farm. Normally this record is kept by the owner or primary farmer. When farm journals are kept in quite similar ways by a large, perhaps even representative number of farms in a project area, they can be a useful source of information. They will provide more detailed information than we could afford to "buy" using research teams. The standardization of such records should allow us to aggregate findings. If a probability sampling procedure was used to select participating farms we may be able to generalize our findings to all of the farms in the area.

Often members of the target group will participate in recordkeeping efforts, particularly if the information they record will help them as well as the researcher. The possibilities for this type of data recording are limitless, e.g., timebudgets, consumption behavior, frequency of contacts with specific types of individuals, use of latrine facilities, treatments given to livestock, etc. Needless to say, these procedures must be accompanied by initial instruction and periodic checking if acceptable levels of data quality are to be assured.

A second natural source of information is the required reports familiar to every project officer, contractor, and ministry staff member. These project documents are often developed in a <u>pro forma</u> manner. Alternatively they can be a "dumping ground",

for a variety of facts, feelings, observations and impressions. These existing documentary requirements can, with some effort, be transformed into a rich data source. Usually what is required is the introduction of a format that helps the report writer systematically, rather than randomly, bring forth data that range from hard evidence to the subjective. When a change in approach to everyday reporting is sought, we need to share with those who generate the reports our reason for adding structure to their process.

In some situations there will only be a single, perhaps weekly or quarterly report that could become a data source. In other situations there may be many reports which record facts about different parts of our project area or different subgroups. The field visit reports of sanitary inspectors, extension agents, village medical workers, etc., can potentially become useful resources. If examined, for a period of a year or more, they may provide us with the equivalent of case study or survey data, though not normally for representative samples of our population.

Finally, we should consider the other factual records we keep in projects. Often we simply forget to look at these data. Some of the records of a project, such as ledgers, inventories, etc., can be analyzed to supply us with needed information. It is often suprising to find, when we examine these data, that we have in fact created perfectly good data collection formats, procedures that are easy to use, and data that can be readily aggregated. When our project designs are experimental or quasi-experimental in nature, as discussed in Chapter Three, these project records are the equivalent of a scientist's laboratory notebook. They can help us understand the processes operating in our "experimental" and "control" situations. They also provide a documentary record for others who might wish to examine the applicability of our project approach for another area.

2. Informants and Group Process Approaches

Not all of the information we need for decisionmaking is objective, in the strictest sense. We often seek data on attitudes, beliefs, recollections, reactions, and the like. This data is technically subjective. i.e., we do not have direct access to it and must rely on the testimony of others. While subjective opinion should not be confused with objective facts, it need not be ignored. Sometimes the data we need for a specific decision will include another person's opinion, judgment, impression or idea. We can secure information on attitudes and opinions in many ways, including surveys, and case studies, informants or group process approaches.

a. Informants

An informant is any person or group from whom we secure data. Technically, everyone who gives us data is an informant. Generally, however, we restrict the use of this term, in the social sciences, to a limited number of data gathering strategies, including: securing data from experts or individuals who hold special positions in a community.

Expert informants are of many types. We select them from technical, cultural, language, religious, and other specialized domains. The data we seek from these individuals may be data about their area of expertise, about how the target population can be understood and helped or about how our planned intervention can be made to "fit" better in a poor community. We seek information from these individuals because they have special, sometimes unique, insights or experience.

The degree of expertise we seek varies. When we visit a strange place, anyone who lives there is an expert compared to us. In the early stages of an anthropological investigation we might accept the first volunteer as our "local expert." Later, however, after we ourselves develop familiarity with a situation or subject area, we tend to gravitate toward those who are truly expert in the dimension of interest.

It is often difficult to be specific about what we expect from an expert informant. We want him to illuminate a subject or situation for us, but it is his subject and he knows what is important. Thus, we tend to place the burden of defining what we need to know, in part, on our expert. When we gather information from an expert informant we acquire not only a set of facts or opinions, we also acquire his classification system, his way of ranking the importance of various community or technical factors, etc. In effect, we are accepting the informant's biases along with his data. This is not a problem in and of itself. However, we must not state as objective fact what was offered as opinion or judgment.

Sociometric informants are those we select because of their position in a community or because of a special relationship they have with something or someone that interests us. Informants in this category are usually members of the study population. Because of their position in the community, they are presumed to have special insights and an understanding of local situations, processes, power structures and problems. Sometimes we select a series of informants in order to gain data about several aspects of a problem or on several levels in a hierarchy or other social network. The data these individuals provide may not be particularly insightful and it is not likely to be analytical, i.e., organized in well reasoned categories. In seeking information from these informants we can accomplish

two things: we are likely to secure the data we seek and, further, we may be able to secure the cooperation of others in the community as a result of our relationships with these informants.

Most case studies and community studies incorporate informants into their data gathering approach. However, there is no reason why we should not develop informant relationships even when formal studies are not being conducted. As long as we accept the limitations of the data we secure from our informants, we can seek their opinions and access to their knowledge at any time.

As managers we tend to have a series of contacts which might be considered informants -- a counterpart in another organization, someone inside the government ministry with which we share project responsibilities, someone at our headquarters office. Once we understand the simplicity of the informant approach, we might consider extending our own informant networks, e.g., getting to know one of the residents in our project area, one of the extension agents who works with our target group, one of the provincial engineers who periodically assesses water levels, soil conditions, etc.

When we have well developed networks of informants, we tend to get a lot of information and often we learn things quickly which might otherwise take months to find out. Of course, we cannot accept informant data as a final answer to most questions. We can, however, use this type of information as a trigger that suggests when and where we should be seeking additional and perhaps more structured or representative data.

b. Group Process Approaches

We have all picked up information at one time or another simply by listening to the interactions of a group. Group process approaches for generating data capitalize on this fact. They are formal approaches for stimulating and directing discussions, or other forms of group interaction, so that data can be generated and captured. As in the case of informants, the data we generate using group process approaches ranges from objective fact to opinion. The problems of bias that exist with individual informants also exist with groups, particularly since we tend to use the same types of individuals in both instances.

Group processes take advantage of the natural or early interactions of some members of a group to stimulate quieter group members. These approaches attempt to generate new information through a process that involves all of the members of a group in a shared effort. For example, "brainstorming" is the term for a process that seeks to generate new ideas and alternative solutions to existing problems. The "Delphi Technique," another group process approach, is used to bring experts to a consensus.

There are only a few basic types of group process approaches, although these are given many different names. The point of all these approaches is that people in groups tend to stimulate each other and that stimulation is a potential facilitator for information transfer and the generation of new information. While we should probably not consider using group approaches as our only data collection strategy, these process approaches can have a great deal of value when we try to decide how a problem might be solved, try to interpret survey data or simply seek to gain access to the collective wisdom of a set of experts.

PART THREE

PROCEDURES AND TECHNIQUES

SELECTING UNITS TO STUDY

Development projects often serve relatively large populations. It is not unusual to find that an agricultural or health services project addresses the needs of several hundred farms or several thousand individuals. As managers, we occasionally need information that will help us reach conclusions about such a project population. Yet it is neither practical nor economical to collect data about each and every member, or unit, of a large population. Instead, as suggested in Chapter Four, we often gather information about some portion, a sample, of the population we wish to describe.

The process of selecting units of a population for study is called sampling. Sampling approaches cluster into two basic types. Probability sampling allows us to use the data we gather on a sample to characterize a whole population. Purposive sampling is useful when we need data about a special portion of a population, e.g., the "best" farmers, or when we simply want to get a rough idea of how a population is responding to our project efforts. When we understand how samples are drawn and how this affects our ability to make general statements, we are better able to evaluate information we already have and to make appropriate choices when we plan new data collection efforts.

There are four aspects of the sampling process that require our attention in most studies:

- Definition of the study population and clear identification of the units of that population.
- Selection of a sampling approach -- or combination of approaches.
- Where needed, construction of a sample frame -- a method of ordering population units so that our sampling approach can be applied.
- Application of the chosen sampling approach.

A. DEFINING POPULATIONS AND THEIR UNITS

In most development projects, we think of our target population as including some segment of the poverty community -- small farmers, the malnourished, poor urban dwellers, the marginally employed and the like.

In our discussions we often speak as if we knew with equal precision what we mean by each of these terms. The fact is that our terms are often ambiguous. It is not an easy task to locate individuals who are marginally employed, unless we first refine our definition and develop criteria that help us to identify members of that population. When we are planning to sample a population, we need to describe our study population and its units in a clear and unambiguous way. Even when our definitions are clear, it is often a good idea to secure the assistance of local informants when we try to find the units of the population we want to study.

One of the problems we face in deciding how to secure the information we want is identifying what population can supply the information. Populations are often socially defined. In our own culture it might be appropriate to study the employed population to determine income levels. In another culture it might be totally inappropriate to study individuals. It might, however, be perfectly correct to seek data on family income from the eldest male in an extended family. Further, social relationships and practices may determine how physical units, such as farms, are defined. We need to understand the social landscape in order to determine what populations are relevant to study and what approaches for selecting a sample and gathering data are feasible.

Most cultures in which we undertake development projects have already been examined by social scientists. Their reports can normally be found in local libraries or through the various donor organizations. These documents, together with the observations of people who have worked in the area, can provide us with the type of background information we need to define our study population and develop criteria for identifying population units. When background information of this sort is not available, it may be necessary to undertake a limited investigation of the social situation before trying to carry out a sample survey or case studies that depend on the selection of representative villages, families or farms.

B. SELECTING A SAMPLING APPROACH

The important fact for a manager to recognize is that the choice of a sampling approach depends largely on why we want data and what we hope to do with it. Both probability and purposive samples have a place in the data gathering plans for many

projects. For example, a probability sample of all households might be appropriate for establishing baseline data on nutritional status and for remeasuring the population's status on nutrition indicators after a project is implemented. A purposive sample, on the other hand, might be an appropriate way to gather data about early adopters of fertilizer. In the first case we could expect to characterize all households with our sample data; in the second, we could only expect to reach conclusions about the set of early adopters we actually interviewed. Both types of information would be resources for the decisionmakers in a project, but they would be different kinds of resources. The major differences between these two approaches are described below.

1. Probability Samples

Four methods of selecting probability samples are used with some frequency -- either singly or in combination -- in studies of human and nonhuman populations. They are: random sampling, sequential (or systematic) sampling, stratified sampling and cluster sampling. Each method makes different assumptions about our a priori knowledge of the population and about the mathematical chance that individual population units will be selected. In order to choose among these methods, the manager must consider the population he or she wants to study, why it is being studied and the requirements of each method concerning our knowledge about the population.

a. Random Sampling

A random sample gives each unit of a population an equal chance of being selected. Other probability sampling methods assign a known positive chance of selection to each unit, although the chances of selection using other sampling methods are not necessarily equal.

In order to select a random sample of a population, either directly (from among all families in the project area) or indirectly (through clusters such as census tracts), we need a list of each of the units from which we will draw a sample. Each unit must appear only once on the list and every unit must be included. The knowledge we require about the population to be sampled is minimal. We need only to be able to list all the units. In reality, the lists we need often do not exist or are out of date. Creating lists of the units to be sampled can be difficult and expensive. Thus, if we do not have a list of these units readily available, or cannot afford the time and money required to create a comprehensive list, other sampling methods should be considered.

When and if we have a satisfactory list of the units to be sampled, a random selection can be made. While any random

method would serve this purpose, e.g., placing all numbers in a hat and drawing them blindfolded, most social scientists use a table of random numbers in making their sample selections. These tables are found at the back of most statistics as well as many other social science texts. The tables contain random arrangements of numbers, e.g., 1 to 100 or 1 to 1,000. The researcher picks the first number on the table randomly, and then follows some systematic pattern, e.g., first taking all numbers to the right and then moving left, then right, on succeeding rows The numbers he selects by this method correspond to numbers given to the units on his list. The sample, then, is the set of units whose assigned numbers correspond to the numbers that have been randomly selected.

b. Sequential (or Systematic) Sampling

A sequential sample, like a random sample, depends on the existence of a list of the units to be sampled. For a sequential sample, the researcher selects the initial unit randomly. Subsequent selections are made by moving up, or down, the list and systematically selecting every nth unit.

Sequential sampling can save time since we proceed without numbering all units on the list and without consulting a table of random numbers or some other randomizing device (except in choosing the first unit).

When we know that the list we are using is randomly ordered -- that there are no groupings by family, or position or weight, etc., in the list, the results with the sequential sampling method will be equivalent to those produced with random sampling. However, when our list is known to be ordered, or when we are not sure whether it is ordered, a serious bias may be introduced if sequential sampling is used.

c. Stratified Sampling

In a stratified sample we first divide the population into subgroups, or strata. However. the simple fact that such divisions can be made is not an adequate reason to stratify. For example, since we know that human populations tend to divide into groups of men and women that are of almost equal size we would learn little from such a stratification. Further, we would probably increase the cost of the study by subsampling these groups. A random or systematic sample of the population would be less cumbersome and would yield the same proportions by sex group.

Sometimes we have a situation where a population can be divided into subgroups that are expected to differ in some dimension that is important to our study, e.g., occupation, income level, etc. We may find that by using strata we will be able to select a smaller total sample to secure our study data than would be

possible with other sampling approaches. However, even when stratification appears to be appropriate, we may find that it is not practical. That is, we might need a great deal of information we do not have about the population to make the actual division into subgroups.

When we decide to stratify and can do so with a reasonable level of effort, the normal procedure is then to use either a random or systematic sampling procedure to select units from each stratum.

d. Cluster Sampling

Cluster sampling, like stratified sampling, uses groups to facilitate the selection of an appropriate sample. However, the groupings used in cluster sampling differ in important ways.

First, in cluster sampling we are normally sampling units of one population in order to examine the members of a different population. The clusters are a way of grouping the population we will actually study. For instance, if we were interested in examining urban households we might use city blocks to group, or cluster, these households. By sampling blocks, and examining the households within sample blocks, we would realize economies of two types: (a) we would not have to enumerate all households in order to draw a sample and (b) we would minimize our travel costs by concentrating our study of households in a limited number of areas within the city.

Secondly, it is important for the units of our study population to be heterogeneous within any single cluster. Ideally, much of the variability in our study population will be present in each cluster. This internal heterogeneity is critical if we are trying to use cluster sampling to secure a representative sample of our study population at minimum cost. The less internal heterogeneity the clusters have, the more clusters we must select to achieve the same degree of representativeness. Clusters, then, are quite different from strata. In stratified sampling we want the groups to be homogeneous with regard to the stratifying criteria.

Cluster sampling has important advantages when we do not have, or cannot easily secure, lists of the members of the population we want to study. Area clusters which can be created in several ways allow us to avoid the task of enumerating an entire population. By sampling clusters first, we reduce the enumeration task to one of identifying only those study population units that fall within the clusters we have selected.

2. Purposive Samples

Purposive samples are those we select using judgmental criteria. If we deliberately pick units of a population to study, or

if we accept volunteers as a sample, we are employing purposive sampling approaches. The basic limitation we face with such samples is that we do not know whether, or to what degree, the sample is representative of the population from which it was drawn. There is no mathematical theory that stipulates the chance (equal or unequal) that our individual units have of being selected. Thus, we cannot use statistical inference to generalize our findings from a purposive sample to a larger population.

In the following paragraphs several types of purposive samples are discussed. As the reader will note, alternative labels are given to some of these procedures. The language of purposive sampling is not as formal, or agreed upon, as is the language of probability sampling. Thus the descriptions provide more guidance than do the labels.

Accidental or haphazard sampling describes those nonprobability samples that in effect choose themselves. Samples that include volunteers or chunk samples, e.g., the first ten people the researcher finds at the market, fall within this category. Generally we know very little about the units we have included in such samples and hence we know virtually nothing about how well they represent the populations from which they come.

Homogeneous purposive samples include a group of approaches that are used when we want to examine unusual units of a population. The units we try to sample using these approaches are usually atypical in one of two ways: (a) the units are extreme cases along some spectrum, e.g., those units that are extremely high or low in intelligence, productivity, income, etc., or (b) the units are rare events, cases that occur infrequently, e.g., the members of small minority populations, families with twins, etc. When we want to examine these types of population subgroups, purposive sampling is often quite appropriate. Probability samples might either miss these unusual units or represent them in such small numbers that we would have difficulty drawing conclusions about the subgroup. To increase the utility of the data we gather about such subgroups, we might purposively sample to find these unusual units and then use a probability sampling approach to select sample units we will actually examine.

Heterogeneous purposive samples describe approaches that attempt to achieve representativeness using judgmental rather than mathematical criteria. Quota samples are one example of this type of approach. In a quota sample a researcher uses information about the population to determine how different types of units are apportioned in that population. These proportions become his quotas. He then attempts to pick individual units that fit his descriptions and quotas, e.g.. 12% employed women, 88% employed men. Other approaches to selecting representative purposive samples include efforts to locate units with a

specific characteristic whenever they occur. As one example, an effort to represent "early adopters of innovation" might draw a sample that included progressive farmers, businessmen, teachers, etc.

A final type of purposive sample, which in practice may be coupled with one of the previously noted types, is the structural sample. Here units are selected because of a specific relationship they have to other units in a population. Samples of leaders and experts fall into this category, as do samples that are created by working through existing social networks, e.g., identifying one sample unit and then asking that individual to identify other individuals, usually according to some criteria. When farmers are asked to identify others who use the same techniques for farming, or when "experts" are asked to identify units that are typical of some population, a structural sampling approach is being employed.

As a data gathering technique, purposive sampling is particularly useful when we want data on unusual groups within a larger population. The data we gather with these methods can be used to draw conclusions about the units we have studied. However, we cannot use or accept data from a purposive sample to reach conclusions about a larger population. As managers, we need to be able to identify and avoid situations in which an attempt is being made to use purposive sample data as if it were representative, i.e., equivalent to probability sample data.

C. SAMPLE FRAMES

Sample frames are ways of organizing a study population so that the probability or purposive sampling approach we have selected can be applied. All types of probability samples, and a number of the purposive samples discussed above can only be applied when we are able to identify population units or clusters of units. Two types of frameworks are used with some regularity to organize study populations so that sampling procedures can be applied. These are: list frames and area frames.

A list frame is an enumeration of all of the units of the population we wish to sample, e.g., all of the farms in a province, all of the households that have electricity. For a list frame to be adequate it must be comprehensive and up-to-date. No unit may be listed more than once, and none can be left out. If a list frame is to have practical value, the units must be clearly demarcated, i.e., fieldworkers must be able to identify the units we have selected when they go to collect data.

For many of the populations we wish to examine, listings of units do not exist. In some areas there is no recent, high quality, census listing of families and perhaps no list at all

of who owns which hectares, or cattle, or of the patients who use the health clinic. Where lists do not exist we have two options: either create a list or use an alternative framework for ordering the population.

The most commonly used alternative framework is an area frame, a geographic arrangement of our populations, that can be used as the basis for sampling. Area frames can be developed in a number of ways, including dividing maps into sections, urban areas into blocks, etc. In most situations area frames are clusters of the population units we want to sample, and we apply the rules for cluster sampling in their development and use. Area frames, which are frequently used in studies of agricultural practices and productivity in the U.S., have proven extremely useful in the developing countries -- where existing lists are often inadequate and new lists are expensive to develop.

Area frames, like list frames, must cover the entire population of interest. All population units must fall into one and only one area segment and the boundaries of area segments must be recognizable on the ground, e.g., roads, large structures, etc. These make the type of boundaries that fieldworkers can find and use to tell, for example, which farms are in one or another area segment.

Once we have created a list, or used geographic segments to cluster population units, we can follow the procedures required to select the sample units we will actually examine.

D. APPLYING SAMPLING APPROACHES

Once we have selected our basic sampling approach(es) and constructed a sample frame, we have the basis for addressing several issues that can affect the quality of our sample and the data it yields. While these issues are normally considered critical for probability samples, they should not be ignored completely when purposive samples are to be used.

The two main factors that can affect the quality of sample data are: errors which stem from the fact that samples differ from each other and from the populations from which they are drawn, i.e., sampling error, and mistakes we make in carrying out our efforts to secure data from a sample, i.e., human or nonsampling errors. Either type of error can ruin our data. In taking steps to minimize error we need to take a balanced approach. There is no point in working very hard to reduce sampling error and then pay no attention to nonsampling errors -- our fieldworker mistakes can distort the data despite all the efforts we make to reduce our sampling error, and vice versa.

1. Sampling Error and Sample Size

There is no single right answer to the question of how large a sample should be. Our confidence about the degree to which a sample represents the population from which it was drawn is largely a function of its absolute size. In determining what size sample we need we must consider both the degree of confidence we want, i.e., how minimal a sampling error, and the level of detail we will need to analyze our data. The size of the population from which we will select sample units is of secondary importance in our decision.

While it may at first seem counter-intuitive, managers should be aware of the fact that we can achieve the same level of confidence with roughly similar sample sizes in situations where our study populations differ dramatically in size, e.g., with populations of 10,000 and 100,000. We can often reach a 90%+ level of confidence that the expected result (the result we would have gotten by taking a census) lies within a specifiable range with relatively small samples, i.e., 40 to 50 observations. We may, however, need to add a large number of observations to reach a 98% or 99% level of confidence in the accuracy of our sample data. Since we know that social science research tends to be plagued by nonsampling errors that distort the data, many social scientists are satisfied with a 90%+ level of confidence when it is coupled with a significant effort to control for human errors. This contrasts with the practice in such fields as engineering, where nonsampling errors are minimal, and the additional investment required to achieve a 98% or 99% confidence level is often made.

A second key factor to consider in determining the size of a sample is the type of analyses that are to be performed. We often need a minimum of 30-35 observations for each detailed data item of interest to us, especially if comparative tests of statistical difference are to be made between two subgroups of the total population.

2. Nonsampling Errors

Nonsampling errors are errors of measurement and human errors in judgment committed in the course of our data collection efforts, e.g., as we attempt to follow procedures, transcribe data, etc. Their effects can seriously distort the results of a well conceived study. Errors of this type are common to both probability and purposive sampling efforts.

The catalogue of potential nonsampling errors is too long to list here. Instead, we may summarize by saying they can cover a

wide range of problems, including such things as interviewing errors committed by not using the correct wording or leading the respondent, respondent errors caused by misunderstandings or memory failure, conceptual errors caused by poorly designed or ambiguous questions, or processing errors such as coding or keypunching mistakes. Suffice it to say that the best antidote is adequate pretesting of our instruments and all procedures coupled with a rigorous training program that gives fieldworkers practice with each procedure they must follow.

An additional safeguard against nonsampling errors is careful field supervision of a data collection effort. If there is a supervisor on hand, data collection teams will be less likely to guess when they are in doubt or attempt to find shortcuts in the procedures. A clearly written set of instructions for the fieldworkers is also a must.

DATA COLLECTION TECHNIQUES

A study approach is the overall fieldwork strategy for conducting a study. Methods or techniques for securing data from a study population are the specific tactics of that strategy. The approaches we use in field studies -- sample surveys, case studies and the like -- rely heavily on three basic techniques for acquiring data: direct measurement, observation and interrogation (usually interview) methods. Often a field study plan will employ more than one of these techniques. For example, in a study of the nutritional status of a target population we might conduct a sample survey in which we collect both interview data and direct measurements of height and weight from our sample.

In this chapter the basic techniques of gathering data from a study population are considered. Both direct measurement and observational methods can be used to secure data from human and other populations. Interrogation methods are, of course, relevant only for the study of human populations.

A. DIRECT MEASUREMENT METHODS

Direct measures tend to be physical measures. Normally we utilize some type of measurement device in collecting our data, e.g., thermometers, weight scales, surveying equipment and the like. Measurements of this sort are recorded in standard units that have been devised to isolate differences along some spectrum or dimension of interest. For the most part, the measurement systems and standard units we use with these techniques already exist, i.e., we use conventional ways of measuring distance, temperature, etc. When we do create our own categories and measurement scales it tends to increase the complexity and length of our studies. New measurement techniques generally need to be pretested to determine their validity and reliability.

Well calibrated direct measurement methods will usually provide highly accurate data. The procedures used in making these

measurements, whether simple or complex, tend to be standardized. Thus the fieldworker is not required to use judgment, in any great measure, in the data collection effort. In most situations, the data collected using direct measures of population characteristics are freer from bias due to fieldworker or study subject preconceptions than is the case when observational or interview methods are used. Data on the bacteriological properties of well water in a rural village should be the same whether collected by a stranger or village resident. The degree to which data collected by direct measurement are free from human error is primarily a function of how well we have trained those who will apply the measurement procedures.

When we use direct measures it is usually difficult to avoid having others know that we are collecting data. The equipment we use to test water quality, weigh children and make other direct measurements is obvious. Some of these devices may be unfamiliar to residents of the areas where we carry out our studies. Explanation of what the instrument does and does not do may be needed before we can begin to collect data. Regardless of whether these techniques are obtrusive or not, the data they yield tend to be consistent. The number of meters, degrees, cubic feet or kilometers that describe a specific study unit will be the same irrespective of what people know or think about the fact that we are collecting data.

There are a number of types of project-related data that are best collected using direct measures. Maps that display physical distances, medical measurements and environmental measures are often required by project decisionmakers. Further, direct measures sometimes give us a way to validate the data we collect using other techniques, e.g., whether people are undernourished, whether the rainfall and soil conditions in the project area are adequate to support specific forms of vegetation, etc.

Mapping efforts that determine the size of an area, the way it is divided, its resources, population concentrations and the like provide basic information for project decisionmaking. Such efforts can cover more than simple physical relationships. We can use direct measures to determine not only how far a barrio lies from the closest health center but also the travel time involved in reaching the center, given the condition of local roads and vehicles.

In the clinical setting we often use direct measurement techniques to detect pregnancy, identify the cause of a disease, determine blood counts, weight, height, etc. These measures, together with data on the incidence of specific diseases, help us determine the current health and nutritional status of a target population as well as plan appropriate interventions. Similarly, data on the quality of water, soil and the degree of rainfall, sun, etc., in an area are most efficiently gathered

using the direct measurement devices that have been created for this purpose.

The main drawbacks to using direct measurement in project data collection efforts are of two sorts. The complexity, cost and training requirements associated with a particular direct measurement technique may make its use inappropriate. Or, use of a direct measurement technique may not be acceptable for social or cultural reasons. In this later category, study planners need to consider whether the measurement techniques they might use are familiar and unlikely to produce fear or other negative reactions among the population in the study area.

B. OBSERVATIONAL METHODS

Observational methods rely on the ability of the observer to perceive facts, patterns and relationships. Observation, as a technique for collecting data, can be undertaken in either a participatory or a nonparticipatory manner. It can be used to collect either quantitative or qualitative data. What is more important, perhaps, is the fact that observation is an inadvertent part of virtually all our data collection efforts. When we collect direct measures of population characteristics, we still rely on an individual to use our measurement scales and observe what the instruments record about weight, acidity, and the like. When we interview we cannot help but notice the facial expressions of those with whom we talk and the physical surroundings in which our study is taking place. Since observation is always a part of our field studies, we should have a conscious plan for capturing this type of data and adding it to the other material we have collected.

Observation tends to be a reasonably unobtrusive method of collecting data. In contrast to interview methods and direct measurement techniques, we can usually make a series of observations without calling attention to the fact that we are collecting data. This feature of observational methods gives us an advantage in situations where we are concerned about reactive effects. These are distortions in the study data that can be introduced when study subjects are overly conscious of the fact that they are being studied, already familiar with the data collection instruments and procedures, etc.

Observational methods are also appropriate when we expect that memory, or our respondent's lack of skill in using measurement concepts, will distort the study data. For example, the question: How much rice does this family have? might better be answered by looking at the pile of rice in the shed than by asking individuals who do not know the metric system to respond in numbers of kilos. Aerial photography, another observational technique, can be used to count cattle, estimate the percentage

of land under cultivation, etc., when it is expected that interview data would give us misleading answers.

The most common forms of observation as a method of data collection are the classic participant-observer techniques used by anthropologists and a range of nonparticipatory methods used with some frequency in medical and educational settings.

1. Participant Observation

The participant-observer lives and works as a member of the social unit under study, attempting to achieve rapport and deep insight into the community process. While it is true that such outsiders can never entirely come to live, think and feel as the village farmer, if we are studying village farmers there is much to recommend living among them in order to come as close to that ideal as possible.

Participant observation is the way most anthropologists have collected their data since the pioneering work of Bronislaw Malinowski in the Trobriand Islands just after World War I. Anthropological fieldwork begins with a period of sustained immersion in the culture. The anthropologist "joins" the community for a period of months to years. The anthropologist learns the language, lives as a member of the community and records data from the perspective of a participant. Familiarity with the language, with seasonal activities and with the nature of community affairs makes it possible for him to secure intimate details about the local practices, motivations, and attitudes.

The anthropological fieldworker normally identifies and works with local informants who provide him with data. The researcher tries to select informants who are representative of the social milieu. Usually, anthropologists will try to have a number of informants of the same sex, similar socioeconomic status, similar age, etc. Ideally, one informant's reports can be checked against those of another.

The strength of this method lies in the fact that it can produce high quality, meaningful data. The anthropologist not only records observations, he also provides the background material that may explain these observations, e.g., material that helps us understand why production is low, or why certain people use the health clinic while others ignore it.

There are several major drawbacks to the selection of participant observation as a data collection method for project-related research. First, the initial investment of time in participant-observation studies is often quite high. However, these costs can usually be amortized over a fairly long period. The anthropologists who undertake these studies inevitably develop a

reservoir of experiences that can be tapped to answer questions about the field site well after the observation period has terminated. Secondly, the method depends on the skill and objectivity of individuals. Personal biases and individual limitations can easily affect the quality of the data. Further, there may be situations in which participant-observers of one sex or the other may have difficulty gaining access to some types of data, e.g., birth control practices. Such difficulties may arise just as easily for other reasons, e.g., a young data collector might not be able to gather much information about the decision process used by the village elders. The potential effects of personal biases and other aspects of the interaction between the participant observer and the study population need to be examined carefully. This should occur early in the study period, when corrective action can be taken.

2. Nonparticipant Observation

Nonparticipant observation subsumes a variety of techniques that, like participant observation, rely on the ability of an observer to notice and record patterns, relationships and the like. Unlike participant observation, techniques in this category do not require that the fieldworker merge himself with the subject of his study. Nonparticipant observation methods can be used to gather data from human and other populations.

The methods included in this category have some of the drawbacks noted for participant observation: they are susceptible to observer bias and the data they yield cannot always be verified in a cost-effective way. However, they do not necessarily involve an extended period of fieldwork, which gives them an advantage over participant observation when resources are a constraint.

We use nonparticipant methods whenever we observe populations of cattle, crops, textbooks, etc. When observation is used to examine these types of populations, we can often gather data on such characteristics as number, quality, utilization (of tools and other resources, such as irrigation water and fertilizer), "healthiness" and other attributes of interest. When we observe human populations in a nonparticipatory way, we tend to use one of three basic techniques: mass observation, institutional observation or clinical observation. Each of these methods is described briefly below:

- Mass Observation -- describes those situations where the observer watches and listens to individuals without becoming involved with them directly or taking part in their activities. Such observations might be made in markets, by the village well, at community meetings, etc. The objective of this type of observation is to

gain data on the individuals and their activities, including information on who participates, in what role, with which other individuals, etc.

- Institutional Observation -- describes observations made of individuals and groups in structured settings such as schools, clinics, government departments and other formal institutions. Again, the observer keeps interaction to a minimum and concentrates on watching and listening to the study subjects to gain data on their processes and relationships.

- Clinical Observation -- tends to include those observations we make of individuals and groups to determine how they are acting or reacting in response to a specific stimulus. The observations made by physicians and psychologists about individual behavior are often part of a process through which the source or type of illness is detected. Observations made under experimental conditions, e.g., through a mirror, also fall within this category. Clinical observations are not totally nonparticipatory, since the observer often has a relationship with the subjects he observes.

C. INTERROGATION METHODS

When we seek to learn about the attitudes or past experiences of individuals, we must often depend upon interrogation methods for collecting data. Asking questions, either through interviews or questionnaires has become common practice and something of an art form over the past several decades. It has become one of the main data collection techniques used in field research and it can be used to gather a wide variety of information.

One advantage of these methods is that they can often be used to gather data from a large population relatively quickly. When a census is conducted, interview techniques tend to be used for gathering data. Frequently we find that either interviews or questionnaires are the basic data collection mode in sample surveys. The asking of questions is also a basic technique for developing case study data.

Interviews and questionnaires are techniques with which many people are familiar. Thus, they tend to be accepted as appropriate methods by those who procure studies. This familiarity, however, may at times mislead us. Interrogation methods are not always appropriate and we need to ascertain whether their use will both secure the data we need and be acceptable in the study situation.

When we interrogate someone and ask him to tell us what we want to know, we are heavily dependent on his cooperation if we are

to obtain data for our study. The individual we interrogate must both understand what we are asking and be willing to give us the information we seek. We need to be fairly certain that this individual has no reason to give us false information. The people we question in our studies do not know us; often they come from cultures that dictate quite specifically the acceptable level and type of interactions with "strangers." When they do answer our questions, we need to test their answer against our sense of why they are talking to us at all, e.g., fear, desire to influence us, to be polite, etc.

A major weakness in many studies that use interviews and questionnaires is that they are frequently designed by people with no real understanding of the particular social context or the respondents. In a given community one must know what kinds of questions it is permissible to ask. Before designing an interview schedule or questionnaire we may need to know whether it is proper to ask, for example, what kind of education a man wants for his children. We need to know whether the people we question fear that giving honest answers will have negative consequences, e.g., cause their taxes to increase.

Any interrogation procedure relies on the testimony of respondents about themselves or about other facts with which they are familiar. Self-reporting is obtrusive. It probes areas that may make the subject uncomfortable. The data it yields can be influenced by other subjective factors as well: What the subject thinks of the fieldworker, what he thinks about being questioned, why he thinks he is being questioned and how he wants the researcher to view him.

The issue of data quality is further complicated by the need to achieve shared meanings between the data collection instrument and the person being examined through an interview or questionnaire. If the person being questioned does not understand the terms being used, or uses those terms in an entirely different way, or simply distrusts the measure, it will not apply. The validity of the data will be lost through evasion, misunderstanding or falsification.

The above two points underscore the fact that respondents must be able and willing to answer our questions. Our questions must take into account sociocultural as well as language differences. What this suggests is that the person who designs our interview schedule or questionnaire should know as much as possible about the social and economic background and status of the study subjects. Background information on what different tribal, age, sex and occupational groups will be involved is important for instrument design. Finally, this individual should be well acquainted with the language in which our questions will be asked and answered.

Expert advice is often needed when we contemplate using interviews or questionnaires. The experience and observations of these individuals can help us determine what types of questions can be asked and how they should be asked. It is also useful to know whether the type of instrument we are considering has been used before in the study area and with what success. Information on the respondents' familiarity with the techniques we are considering will help us to decide how much time fieldworkers need to spend in the area before beginning to collect data and what type of explanation should be provided about the interview or questionnaire purpose and procedure. Expert advice is also helpful in determining who should administer our study instrument. Yet even when the advice of experts is used, we, as managers, should require that the instruments be pretested before they are applied to the full study population.

A pretest is a small scale study carried out in advance of the main study. To the degree possible, the pretest conditions should approximate the full study conditions. A pretest is a "dress rehearsal" for the study instruments and procedures. The pretest should cover both the substantive and procedural aspects of the fieldwork, including the procedures for selecting sample units. The pretest period is the appropriate time to determine whether there are weaknesses in the wording of questions, in response categories, in the interview procedures for dealing with study subjects, in village preparation for the arrival of data collectors and in the logistics, budget estimates and other elements of the study plan.

The training of a field team should be separated from the pretest of the instruments. Sometimes we will pretest our instruments before we hire and train a field team. When this occurs we will need to create a practice situation that allows the field team to develop skills in using the instrument.

While advice from those familiar with the study situation will help, a number of other factors need to be considered in making staffing decisions when interviews and questionnaires are used. The claim is often made that studies which employ interviews and questionnaires can be carried out cheaply because relatively unskilled individuals can administer these instruments. Occasionally this is the case, but we cannot assume this adage will be true in our situation.

Different studies require different types of fieldworkers with different abilities. If local people are trained to administer our study instruments and their work proves unsatisfactory, it may be hard to dismiss them. When well educated fieldworkers are used we may find that there is resistance to spending long periods of time in what these individuals consider "backward" villages. In addition, the very fact of their education may create a social distance between them and the study subjects

which makes fieldwork difficult if not impossible. Thus, in each study we will need to consider various staffing options and weigh in our minds their advantages and disadvantages. If we find that we cannot reach a decision, because we simply do not know enough about what works best in our study environment, we should experiment with different types of fieldworkers and make our final decision after assessing the quality of data secured by alternative fieldwork candidates.

Once we know what type of fieldworkers we need, a profile and a job description should be prepared. These guidelines should be used in selecting the field team. While it may be difficult to recruit individuals who fit our profile, care needs to be taken to ensure that we do not deviate unintentionally from the criteria we have set, i.e., hiring people just because they are readily available may have unfavorable consequences.

The training we provide for fieldworkers must be geared to the successful achievement of our study objectives. Lectures are an inadequate method for preparing fieldworkers. What is needed is involvement and practice. The fieldworker needs to understand why we are asking certain questions. This can provide him with the information he needs to let the study director know, during a pretest period, that some questions are ambiguous or too difficult for the respondents. Practice also gives the fieldworker a chance to make and correct mistakes before the actual data collection period.

Field supervision is an extension of training and it is particularly important in studies where interviews are used and where some or all of the sampling procedures will be executed in the field. Supervisors need to be able to provide continuing in-service training as well as deal with problems of measurement and personalities. Data problems can sometimes be traced back to fieldworker confusion, dislocation or feelings of alienation in the study setting. Low morale can have a serious effect on data quality. The supervisor's role often turns out to be multi-dimensional, involving logistics, coaching, moral support and many other activities upon which the success of the effort depends.

As the preceding discussion suggests, two basic forms of interrogation are commonly used for gathering data within the framework of a sample survey, microstudy or other field data collection approach:

- Interview and other researcher-administered techniques.
- Respondent-administered techniques such as questionnaires and psychometric measurement techniques.

In the following paragraphs the various methods falling within each of these categories are briefly reviewed.

1. Researcher-Administered Techniques

Researcher-administered techniques include the range of ways we, as data collectors, orally question the subjects of our study to secure information. All the techniques in this category require the physical presence of the researcher. He is either with the respondent or he uses a telephone or some other device to establish contact and ask the study questions.

A variety of types of questions can be used in interviews. Open-ended interviews are those in which we ask only a few broad questions. In other interviews we may use a larger number of narrowly focused questions. The type of question used varies depending on what we are trying to learn. When we seek only confirmation concerning the presence or absence of specific resources, a history of past illnesses, etc., a set of narrow questions may be appropriate. However, when we know very little about the subject we are studying, broad, open-ended questions may provide better information. Occasionally, when a series of interviews will be conducted , we might begin with interviews that use broad questions and, over time, substitute more specific questions as we grow to understand the subject and context we are studying.

Below, we classify interviewing techniques by the degree of "structure" that each achieves for both questions and response categories. The two classes are nondirective and directive interviewing. We are mostly concerned with directive interviewing in development research.

a. Nondirective Interview Techniques

Nondirective and semidirective ways of interrogating study subjects are characterized by an absence of predetermined response categories. These methods allow the respondent to give us answers that may help us formulate, but will not help us reject hypotheses. Rather, they inform us about what is important to the respondent, what frame of reference he uses, what is true and not true given that frame of reference, etc. These methods, in effect, provide us with a window on the thinking of our study subjects. They are particularly useful when we know very little about a study population. The basic forms of nondirective interviews are:

- In-Depth Interviews -- which may be totally unstructured or focused on a particular range of topics. They can be used to gather information from individuals or from groups. The value of an in-depth interview lies in the fact that we have the freedom and time to pursue the

meaning of comments made by those we interview. Through successive questions that follow the line of conversation initiated by a respondent, we are able to uncover the assumptions, beliefs and cultural traits that underlie more superficial statements. In-depth interviews tend to be time consuming and must usually be carried out by trained professionals.

- Projective Tests -- which ask the respondent to react verbally to a stimulus as opposed to a specific question from the test administrator. While there are not many instances in which the cross-cultural validity of a psychological device such as the Rorschach (ink blot) test has been established, projective instruments are being used with some success in studies overseas. The tests used involve such problems as sentence completion, interpretation of ambiguous drawings, associating words with other words and ideas, interpreting the meaning of symbols and the significance of color, etc. These tests may be useful at the point where we are trying to understand a study population and develop hypotheses about how members of the population will vary their behavior in response to our project interventions. The use of projective tests requires skilled administration. Often, it also requires that respondents be able to use abstract reasoning.

Nondirective interviewing is more likely to be appropriate in microstudies than in other fieldwork approaches.

b. Directive Interview Techniques

In directive interviews, questioning follows the specific intentions of the researcher, not the conversational inclinations of the respondent. Response (answer) categories are sometimes unstructured and sometimes predetermined.

The advantage of directive interviewing is that all people are asked the same question in the same way, thus answers are comparable. When this type of interview is conducted as part of a census or in a sample survey, the fact that we can compare and classify answers allows us to make general statements about the population as a whole. We can identify what is a typical answer and we can isolate and examine those answers that are atypical.

When our questions are structured, but our answer categories are not predetermined, later efforts to classify answers may be required. One meaning of the term "content analysis" refers to the procedure we follow to make such a post-interview classification of responses. Although the use of open-ended questions -- those which do not have predetermined answer categories -- takes more time, it is often needed when we do not know enough

about a study population to predict the range of responses we might receive. One useful by-product of pretests can be the information we need to predefine categories of answers.

Face-to-face interviews and telephone interviews are the most commonly used procedures for conducting directive interviews:

- Face-to-face surveys -- Almost all surveys in developing countries involve face-to-face interviewing of groups or individuals. This technique requires direct contact with the respondents by the interviewer. In theory, this approach maximizes our control over the measurement process, since measurements are constant, preprinted on the page, and supposedly leave no alternative to the interviewer except to ask the question as written and in the sequence written. In reality, we know this is often wishful thinking. Interviewer biases, as indicated above, can be a crippling restriction on the quality of interview data.

- Telephone surveys -- As yet, there are very few populations for which the telephone survey is feasible. Of course, if desired, a survey of all households having telephones will produce a good sample of wealthy, highly educated, professional and influential people. For collecting data from any other types of respondents, telephone surveys in developing countries are obviously inappropriate.

2. Respondent-Administered Techniques

With a literate population, we can often accomplish our research objectives using self-administered questionnaires and tests. As in the case of interviews, these instruments can be either structured or unstructured. Two advantages are normally associated with such questionnaires. First, their use tends to reduce study costs, both because less labor and less highly skilled personnel are required to conduct the study. Secondly, where we are concerned about the introduction of interviewer and/or respondent bias in a study, self-administered instruments allow us to gain information without extensive contact between the researcher and his subject.

Because of low literacy rates, poorly defined populations and unreliable mail service, mail questionnaires are not often used in developing nations. However, mail questionnaires have been used with success in gathering data from easily defined urban and/or professional populations in these countries. A major disadvantage normally associated with mailed questionnaires is a low rate of response. Response rates on mailed questionnaires cannot always be closely predicted. To secure an adequate data

base with this approach a study team usually has to follow up on its mailing either with repeated mailings or in person.

Yet another limitation we should consider with all interrogation methods, but particularly with mailed questionnaires, is that the people who complete and return their questionnaires are somehow different from those who do not. Both groups are self-selected. In analyzing our findings from questionnaire studies with low response rates, we must be extremely careful about the conclusions we draw. Usually we need to seek out a sample of our nonrespondents and determine how they differ from respondents before we can accurately characterize the questionnaire data or the self-selected sample from which it came.

When self-administered questionnaires are used, we face all of the same issues of question development as we do for interviews. The problems associated with asking questions in a clear and understandable manner are, of course, intensified in written questionnaires, i.e., we do not have the opportunity to rephrase a question on a questionnaire if it is not immediately understood. In addition, when questionnaires are used, the issue of format becomes important. We must come to understand whether our written instructions for completing the questionnaire are clear and whether there is enough room to write out each of the requested answers before we mail the instrument. The concern with format in mail questionnaires is also an issue with other methods, but not to the same degree.

In self-administered questionnaires, as in some types of interviews, we can combine some elements of data processing with data collection by prespecifying and precoding the answers to the study questions. That is, the questionnaire format allows respondents to select an answer by making a check in a box. This technique is often used when rapid analysis is required.

In addition to the techniques discussed above, there is a category of paper and pencil methods for collecting data that requires the use of measurement concepts as well as the interrogation of respondents. In this category fall the written examinations given to determine whether some body of knowledge has been absorbed and the "forced-choice" and other exercises used to secure data on attitudes. The latter are often referred to as psychometric measures. With these paper and pencil exercises we use units of measurement: percentage points and points on nominal, ordinal and other scales to classify the performance or attitudes of a respondent. When we consider a number of respondents at once in our data analysis, the techniques we use are those which best aggregate and display the numerical values we have assigned to individuals.

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I. Data Requirements for Program and Project Analysis

   A. Analytical Approaches at the Program and Project Level

   B. Sectoral and Sub-Sectoral Analysis and Data Requirements

II. Data Requirements for Monitoring and Evaluation

III. Social Science Methodology and Statistics

IV. Data Collection Approaches and Techniques

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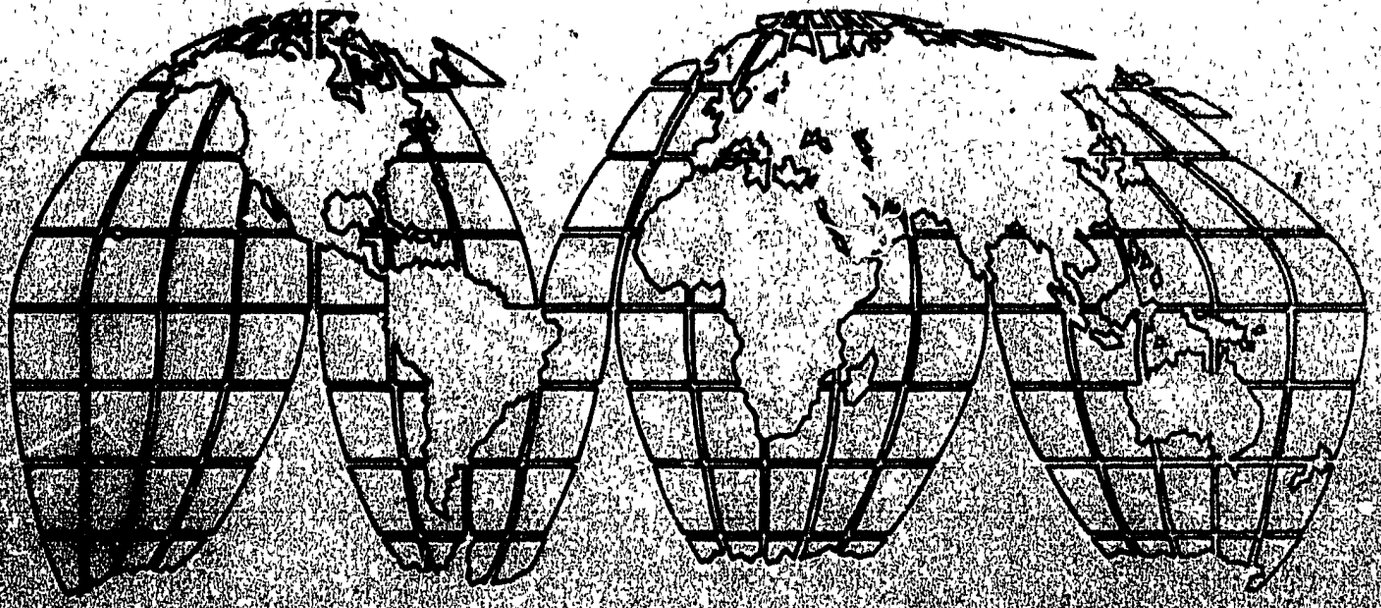
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