

PA-RAW-068  
ISN = 296470

02

FUTURE USAID SPONSORED  
OPERATIONS AND BICMEDICAL  
RESEARCH IN INDIA

REPORT TO  
USAID/NEW DELHI

DUFF GILLESPIE

FEBRUARY, 1982  
NEW DELHI

First Draft

## TABLE OF CONTENTS

(The "Conclusion" of This Paper Also Serves As An Executive Summary)

	<u>Page</u>
I. INTRODUCTION	1
II. BACKGROUND	3
1. Integrated Rural Health & Population Project (IRHP)	3
2. Social Marketing PID	4
3. Private Voluntary Organizations (PVOs)	5
4. Research Organizations	5
5. Ministry of Health & Family Welfare (MOHFW)	6
6. Conclusion	6
III. OPERATIONS RESEARCH, GENERIC DESCRIPTION	8
1. Input-Output Model	9
2. Methodologies	11
IV. OPERATIONS RESEARCH UNDER IRHP	18
1. Research Needs	18
2. Types of Operations Research	22
3. Organizational Considerations	36
V. POTENTIAL ROLES OF U.S. ORGANIZATIONS	39
1. Rationale for U.S. Technical Assistance	39
2. Organization of U.S. Technical Assistance	40
3. Types of Technical Assistance	44
VI. FUNDING CONSIDERATION	49
1. National Budget for U.S. Organization	49
2. Funding Sources	50
3. Funding Mechanism	52
VII. NATIONAL BIOMEDICAL AND OPERATIONS RESEARCH PROGRAM	53
1. Fertility Regulation and Service Delivery Technology	53
2. Technological Transfer	55
3. Specific Project Activities	55
VIII. CONCLUSIONS	58

## I. INTRODUCTION

USAID/New Delhi requested me to assist the Mission in developing operations research activities in the area of family planning and health and, to a lesser extent, biomedical research on fertility regulation technology. The Mission has several on-going or planned bilateral projects which provide funds for operations research activities. Here, operations research is defined as research which is designed to make delivery systems more effective or more cost-effective. The research concentrates on the examination and manipulation of program-specific variables (e.g., training, resource allocation, supervision, logistics, etc.) rather than population-specific variables (e.g., income, education, religion, age-of-marriage, etc.). A more detailed discussion of the characteristics of operations research will be presented later.

Specifically, the Mission has asked me to:

1. develop an operations research component in the Integrated Rural Health Project;
2. write a draft section for the operations research and biomedical research portions of the Social Marketing Project paper; and
3. develop a plan for the utilization of centrally-funded operations research and biomedical research organization.

In this paper, all of the above tasks are addressed although it has been *impossible to fully compartmentalize* the three tasks relating to operations research. Because there are a number of factors over which

USAID or AID/W have limited control over, but which will influence the direction of future research activities, a number of options are presented. In every case, the preferable option is noted. In considering topics over which USAID and/or AID/W have a more control, the discussion is of a more definitive nature.

## II. BACKGROUND

This section briefly describes existing and planned activities which relate to potential operations research actions. The purpose here is to set in broad terms the stage on which any central organizations must work; it is not to provide a comprehensive review of the activities. This section covers the following:

1. Integrated Rural Health Project (IRHP)
2. Social Marketing PID
3. Private Voluntary Organizations (PVO's)
4. Research Organizations
5. Ministry of Health & Family Welfare (MOHFW)
6. Conclusion

### 1. Integrated Rural Health & Population Project (IRHP)

The Government of India (GOI) has a detailed formulation for providing primary health services on a national scale. This basic strategy is well developed. However, the tactics for effecting the plan are still in a state of flux. The IRHP is designed to assist the GOI in finding the most cost-effective way to implement its health program. Basically, this project enables the GOI to test its health strategy in 13 districts located in 5 states with an aggregated population of approximately 13.5 million. One feature of this project is its provision for testing different and innovative ways of providing health services. Over the IRHP five year life, \$2,438,000 has been budgeted for the development, implementation, and assessment of actions to improve the basic health delivery system.

In addition, the IRHP has \$581,000 for "monitoring and evaluation". Thus, there is a maximum of slightly over \$3 million for testing and evaluating ways to better deliver health services.

Conceptually, there seems to be wide agreement that the IRHP should be used as a vehicle for developing more cost-effective ways of providing health services. However, presently there are no mechanisms for generating appropriate protocols or for contracting with groups to carry-out the protocols. Under the IRHP, the \$2.4 million for innovative activities have already been budgeted to the respective states. There is very limited experience among the states in conducting operations research or contracting with non-government organizations. As a result, there is concern that the funds designated for operations research will not be utilized for that purpose unless steps are taken to insure their utilization. Without such research, the optimal benefits from the IRHP will be more difficult to realize.

## 2. Social Marketing PID

USAID's appreciation of the potential of operations research to improve delivery systems is also reflected in its PID "Social Marketing/ Communications (FP)" which budgeted \$600 for operations research. Additionally, the PID provides \$400 for biomedical research on fertility regulation technology. Specifics concerning how and on what these funds will be utilized for have not yet been formulated. A more detailed description of these activities will be presented in the Project Paper. It is anticipated that centrally-funded projects will play a role in this project, primarily as technical resources for their Indian counterparts.

While the IRHP is ongoing, the Social Marketing Project is still in an early stage of development. It will probably be from 12 to 16 months before this project is initiated.

### 3. Private Voluntary Organizations (PVOs)

There are scores of private voluntary organizations (PVOs) active in family planning and health. A number of these have innovative projects. In general, these projects are not well documented and there are minimal efforts to transfer lessons from these efforts to other programs. While this paper does not concentrate on PVO programs, combined they represent an important factor in the population and health field. Because PVOs are currently involved with new approaches in delivering services and probably have more flexibility to test different approaches than the government, this paper will discuss ways in which central projects might relate to these organizations. It is also important to note that USAID has established a rupee grant fund of roughly \$20 million which will, among other things, be used to support PVOs and other private organizations.

### 4. Research Organizations

State governments have limited research capability. They also have little experience in contracting with private research organizations. At the national level, the government has a much greater research capacity both within its regular staff and in special units, such as the National Institute of Health and Family Welfare (NIHFV) and the Indian Council of Medical Research (ICMR).

As with PVOs, there are scores of private research and management organizations throughout India. Some of these have international reputations. These private organizations will be the most likely bodies to actually carry-out operations research activities.

5. Ministry of Health and Family Welfare (MOHFW)

The MOHFW is the governmental locus for all health and family planning activities. Its participation in and support of any contemplated operations research activities is crucial not only because its clearance is required for initiating such research, but also because it will be the primary user of the research results. While the immediate user of research findings from the IRHP will be respective state governments, the ultimate objective of this project is not simply to improve delivery systems in 13 districts, but to improve health services on a national scale.

Of immediate interest for potential operations research efforts is the recently established "Headquarters Organization for Management of Externally Aided Area Projects". With UNFPA support, this unit was established within the MOHFW to coordinate, plan, monitor, and facilitate the various actions falling under the MOHFW Area Projects, of which USAID's IRHP is only one of 5 sub-projects. The total governmental units covered by these subprojects are 48 districts in 12 states which together constitute a population of 108 million. (The other donors participating in this program are: UNFPA, the World Bank, ODA, and DANIDA.) The management headquarters has the specific mandate to be actively involved with innovative activities such as operations research.

6. Conclusion

The main point of this section is, to highlight the magnitude and variety of organizations that could be involved in any operations research effort is very considerable, indeed. For instance, if only one research effort were to be implemented under the IRHP, a minimum of 6 distinct organizations would be involved, i.e., U.S. Research

Group, USAID, MOHW, State Government, District Government, and Indian Research Organization. Of course, these various organizations have units which may entail additional interactions. Therefore, in considering the development of a coordinated operations research in family planning and health in India, it is important not only to remember the considerable technical complexities inherent in such research, but also the equally important and complex bureaucratic and organizational relationships which can impede or enhance the research effort, depending on how they are handled.

### III. OPERATIONS RESEARCH, GENERIC DESCRIPTION

Operations research has a brief but varied history. This type of research (and its nomenclature) was introduced during World War II to alleviate major logistical problems. Since then, operations research techniques have been applied to a wide range of fields. The characteristics of operations research vary from one subject matter to another. As a result, what is termed operations in health may be unrecognizable as such by an industrial engineer. The problems addressed by the research dictate the methodologies employed and, thus, the characteristics of the research. Still, there are several common elements in operations research, no matter if the field of inquiry is transportation, industrial management, or family planning. First, operations research focuses on systems. Second, it is designed to identify or avoid problems in the system. Third, the success of the research is measured by the absence or presence of positive changes in the system. More than most forms of research, operations research is a practical tool used to avoid, resolve, or alleviate problems.

1. Input-Output Model

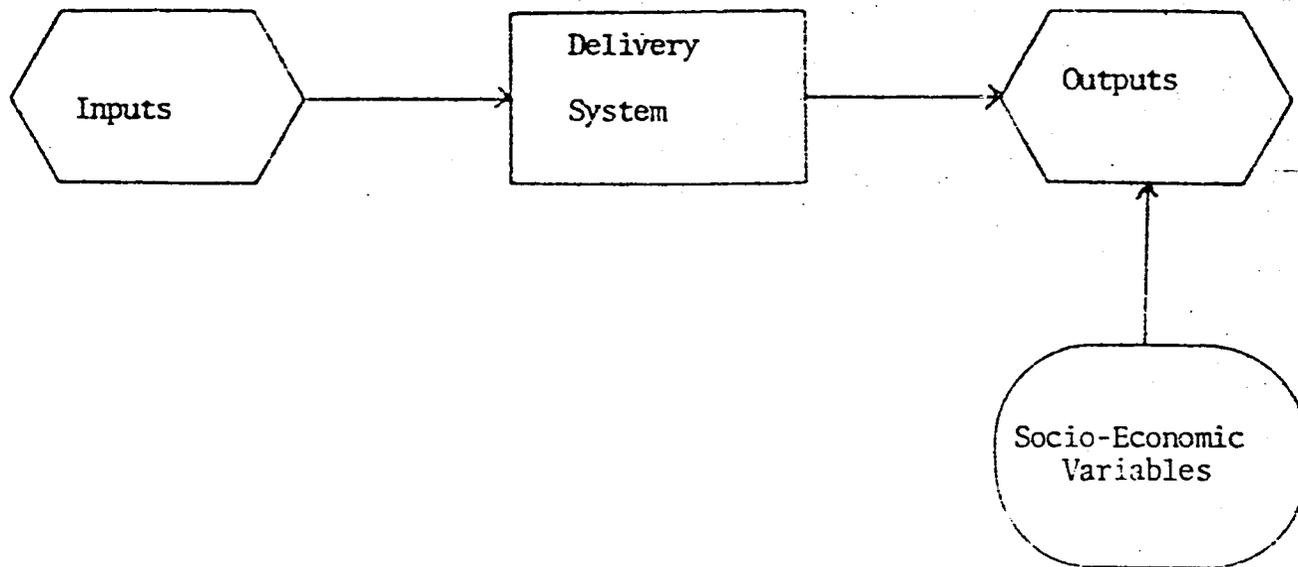
There are numerous ways to conceptualize health delivery systems. If one is examining the operations of the system, a useful analytical approach is an input-output model. Schematically, this model is represented in Figure I.

In operations research, the analytical foci are: inputs, the delivery system, and outputs of the system. Inputs include such things as funds, drugs, and personnel. The delivery system encompasses things such as the logistics, training, and staff-client interaction. There are various levels of outputs. While the ultimate output of a health system are positive changes in the population's mortality, morbidity, and/or fertility rates, there are many intermediate outputs that can be examined to gauge the system's performance. Examples of such intermediate variables are contraceptive prevalence, immunization coverage, and health utilization. The basic objective of operations research is to increase outputs, i.e., health behavior and health status, while at the same time keeping inputs at levels within the wherewithal of the society. Another way of stating the objective is the improvement of the system's cost-effectiveness. Cost-effectiveness is simply the ratio measurement of inputs required to achieve outputs.

Viewing the health delivery system as an input-output dynamic, there are four desirable objectives which operations research can be used as a helpful tool to attain. These are listed below:

<u>INPUTS</u>	<u>OUTPUTS</u>
1. Decrease	1. Maintain
2. Decrease	2. Increase
3. Maintain	3. Increase
4. Increase	4. Increase

FIGURE - I  
HEALTH INTERVENTION



While there are circumstances where each of the above objective can be considered desirable, their desirability is situation specific. For instance, the first alternative, a decrease in inputs and a maintenance of outputs, will definitely improve the cost-effectiveness of the delivery system. In this case, let us assume that the delivery system we are concerned with is a MCH program and the outcome we are examining is infant mortality. In a country such as Sweden, with an infant mortality rate of around 14, an appropriate objective might be maintaining this level of mortality, but doing so at a lower cost. Yet, even though alternative "1" would have a positive outcome, it may be considered inappropriate in many developing countries to maintain high infant mortality rates, say around 100, even though this level is being maintained at a lower cost.

At the other extreme, alternative 4, an increase in inputs and outputs, may actually cause the cost-per-infant-death-averted ratio to increase dramatically, say on the magnitude of \$100 to \$250 per-death averted. This remarkable increase does not necessarily mean that the program is less cost-effective because the outputs have increased. If the society has a goal of reducing infant mortality and alternative "4" has accomplished it, the examination of the cost-effectiveness ratio in isolation tells you very little. If, for example, infant mortality has been reduced by 50 percent, the fact may simply be that such a reduction requires significant resources. It is important to remember that a cost-effective system does not necessarily mean an inexpensive system. Operations research is a tool which like any tool can be misused and, of course, it can mislead. Operations research should serve the service delivery system and its objectives rather than have objectives external

to the system's.

An examination of delivery system specific variables is not the only way to identify steps to improve a population's health status. The most obvious alternative is the population's socio-economic setting, as shown in Figure I. While this approach is outside the scope of this document, the ability to change socio-economic variables is much more difficult and expensive than changing the delivery system variables. Moreover, while socio-economic conditions obviously influence health status and behavior, the relationships are indirect and not well understood. The improvement of socio-economic status is a worthy goal by itself. For changing health status, the immediate priority is improving the health delivery system.

## 2. Methodologies

There are several broad methodological approaches employed in operations research. For this paper, three categories will be considered; problem identification, system modification, and alternative systems.

- a. **Problem Identification:** Operations research techniques are often used to identify or define a problem. This can be done on a continuous basis or as a special research effort. An example of the first would be an on-going cost analysis of the delivery system which would allow program administrators to keep track of expenditures by functional categories and make possible simple cost-effectiveness calculations, e.g., cost-per-patient-visit.

This type of assessment usually falls under the title program management. However, since it is the exception to find programs that have and use such data on a regular basis, many operations research efforts in the developing world have evolved into management/monitoring systems.

Special operations research efforts are called for to identify and define a programmatic problem. Let us assume that the cost-per-patient-visit has increased, but the reason for this increase is not evident from the existing data. In such cases a discrete study of the system could be initiated to determine the nature of the problem.

- b. System Modification: Closer akin to classical operations research occurs when specific modifications are made in the delivery system in an effort to improve its cost-effectiveness. Such modifications can include the entire delivery system or components of the delivery system, e.g., training of field workers.
- c. Alternative Systems: The most useful and difficult methodology entails the development and testing of different delivery systems. Here again, the systems may differ markedly or may be different in terms of a few components.

Obviously, the above categories are not exhaustive, nor are they mutually exclusive. Before one tests different alternative delivery systems, there is usually a problem identification stage. In the following sections more detailed discussions of methodologies will be presented.

Here, it is timely to explicitly discuss the crucial element of reference points, a concept implicit in the earlier discussion.

Data generated by operations research have limited utility unless there are points against which these data can be compared. If a policy maker has cost-effectiveness figures for his program for a 12-month period, there is not really much he can do with the information. He does not know if this is high or low, bad or good. Generally speaking, the more varied and numerous the reference points one has, the better able one is to take actions to improve the program.

Below are four different types of research designs which illustrate various ways one can establish reference points. These designs are not unique to operations research but are widely used to address operations research issues.

- a. Before-After: Before-After comparisons are the most common and simple research design. Graphically, this design is represented as:

$O_1 \quad O_2$

With this design, measurements are taken at two points in time,  $O_1$  and  $O_2$ . There is no attempt to test an intervention between the two points of time. Rather, one is simply measuring change over time that is occurring in an on-going system.

- b. Before-Intervention-After: This design is slightly more powerful and sophisticated than the previous one. Here, a special intervention,  $X$ , takes place between the two data collection points,  $O_1$  and  $O_2$ , as shown below.

$O_1 \quad X \quad O_2$

The characteristics of the intervention are usually based on data collected at  $O_1$  and represent an attempt to improve the system or component of the system being examined. One drawback to this basic design is that the intervention chosen may be ill-conceived and not have any impact. This limitation can be alleviated by the addition of more than one intervention. Thus....

$O_1 \quad X_a \quad O_2$

$O_1 \quad X_b \quad O_2$

While theoretically one could test numerous types of interventions, it is usually not practical to examine more than 3 or, at most, 4.

Before-Intervention-After With Control: The most serious limitation to the " $O_1 \times O_2$ " design is that one cannot always state that changes observed between  $O_1$  and  $O_2$  are due to  $X$ . Although many researchers believe this limitation is enough to discredit the " $O_1 \times O_2$ " design, this is not always the case. For instance, in a closed delivery system it is safe to say that any observed changes are due to the intervention. If the government is the only provider of immunization services in a particular population, then any increase in immunization coverage of the at-risk-population must be due to the government's intervention. The problem occurs if the change being measured can be caused by forces outside the delivery system. This can be a specific type of utilization behavior when services can be from a variety of different sources, e.g., family planning from private sources

when one is assessing a government intervention. Another problem occurs when the index of change is something that can be influenced by population specific variables that can change significantly over a short period of time. For instance, nutritional status can be positively or adversely affected by crop productivity which may very well mask the impact or non-impact of a government nutrition education program.

Another instance when the use of a control group may not be necessary is when the changes between  $O_1$  and  $O_2$  are so large that there is no other reasonable explanation for the change. If contraceptive prevalence increased by 80 percent over a 12 month period after the introduction of a special program, most persons would attribute the reasons for this change to the intervention, even though they could not "prove" this to be the cause. The problem, of course, is that no one can predict if the intervention will have such a dramatic effect. Persons would be much less certain about the influence of the intervention for, say, a 30 percent increase; even though such an increase is programmatically significant, it could be caused by factors external to the intervention. One way to alleviate this analytical problem is to introduce a control group, as illustrated below.

$O_1$	X	$O_2$
$O_1$		$O_2$

By having a research design that includes a control population changes in the treatment population due to non-experimental variables should be identified in the control population. There are sufficient instances where changes due to non-experimental variables have been observed in both treatment and control populations to make the inclusion of a control group a wise move. A control group is especially useful if the study is of a fairly long duration, on the order of two to four years. The longer the period of observation, the greater the probability that non-experimental variables will affect the behavior of the treatment population.

While the use of a control population increases ones analytical power, the design is not always possible because of the lack of research resources and/or the inability to find a control population that matches the treatment population. Concerning the matching of the control and treatment population, this methodological problem can be resolved if the total study population (treatment and control) are large. In this situation, the analytical plan can call for the matching of treatment and control individuals.

d. Before-Intervention-After With Control Crossover: The most sophisticated research design is outlined below.

0 <sub>1</sub>	X	0 <sub>2</sub>	X	0 <sub>3</sub>
0 <sub>1</sub>		0 <sub>2</sub>	X	0 <sub>3</sub>

With this design, there is little doubt of the casual significance if comparable results are obtained in the initial treatment population and the control/treatment population. If more than one intervention is being tested, the design would look like this.

0<sub>1</sub> X<sub>a</sub> 0<sub>2</sub> X<sub>a</sub> or b 0<sub>3</sub>

0<sub>1</sub> X<sub>b</sub> 0<sub>2</sub> X<sub>a</sub> or b 0<sub>3</sub>

0<sub>1</sub> 0<sub>2</sub> X<sub>a</sub> or b 0<sub>3</sub>

Crossover designs are difficult to implement in the field and or quite rare in the developed and developing world. They require a great deal of organization and a longer period of observation than is often feasible.

They, nevertheless, should be considered when the interventions being tested are anticipated to have a statistically small impact or where the relationship between the intervention and the desired change is theoretically a subtle one.

As with all types of research, the design chosen for any operations research effort should reflect the problems being addressed, the research resources available, and the feasibility of successfully implementing the research design. Perhaps the two most common problems in research are asking questions that the chosen design cannot possibly address or having a overly sophisticated design that is not properly implemented. In both instances, the final results are inconclusive and of limited value to program administrators and policy makers. The challenge, then, is finding meaningful questions that can be answered with reasonable research designs.

#### IV. OPERATIONS RESEARCH UNDER IRHP

The IRHP presents a very good opportunity to conduct a wide variety of operations research. Under this program, the GOI will implement its Model Health Plan in selected districts in 12 states. Here, only that part of the Area Project which USAID is participating in will be discussed. Below are the states and their estimated population.

<u>State (No. of Districts)</u>	<u>Population in 000's</u>
Himachal Pradesh (3)	1,500
Punjab (3)	3,400
Haryana (3)	1,900
Gujarat (2)	3,100
<u>Maharashtra (2)</u>	<u>3,600</u>
	13,500

Details of the Model Plan and, specifically, the IRHP are in documents available at USAID and will not be covered here. This paper will concentrate on those elements of the IRHP that: present operations research needs, examples of operations research special studies that could be carried-out, and the organizational requirements for an effort of this magnitude.

##### 1. Research Needs

The evaluation plan for the IRHP is the same as for other parts of the Area Project. The GOI understandably wished to have a unified evaluation strategy for overall project. As a result, there is limited flexibility to alter the evaluation protocol. Basically, the evaluation plan is : O<sub>1</sub> X O<sub>2</sub>. A baseline survey will be conducted prior to the actual introduction of services. Then, there will an end-of-project survey (or after survey) that will measure the impact of the

Model Plan intervention. The sample size of these surveys will be 13,000, 1,000 per participating district. It is difficult to predict how long it will take to attain full service coverage in the project districts. As a result, it is difficult to predict the length of time the treatment population will be exposed to the Model Plan services. Most likely, the exposure-to-treatment time between  $O_1$  and  $O_2$  will be from 1 to 2-1/2 years, unless the project is extended beyond 1985.

The evaluation strategy is a reasonable one and will provide policy makers a great deal of information. Undoubtedly there will be some useful areas and socio-cultural comparisons between different states. Lastly, there will most likely be different types of implementations between the various states. Although such variation is not called for, it is unlikely that the Model Plan will be carried-out in a uniform fashion. In general, then, the evaluation plan will produce a broad assessment of the Model Plan service system and will also enable one to make a number of opportunistic comparisons. The overall evaluation plan, nevertheless, has a number of inherent weaknesses. The IRIP project recognized this and provided approximately \$2.4 million to conduct special, innovative studies.

The limitations in the basic evaluation plan can be placed under four categories; lack of planned variation, limited problem identification and resolution capability, lack of control population and timeframe. Some of these limitations will be alleviated by other evaluation and managerial components of the IRIP, which will be discussed later. Still, these are major limitations that will require special efforts to correct.

- a. **Planned Variation:** The Model Plan is based on a great deal of experience and certainly appears to be an appropriate health strategy for India. It is difficult, if not impossible, to a priori know the best way to implement the plan. Through operations research, a number of different service delivery tactics can be tested and compared.
- b. **Problem Identification and Resolution:** The IRIP has a number of evaluation and managerial tools. Perhaps the most important of these is the Management Information System (MIS). The MIS will undoubtedly identify many problems that will have obvious corrective actions. However, there will be other problems that will be identified where the character of the problem is less certain and/or the required corrective action not obvious. An operations research capability will enable one to deal with these problems in a more intensive and systematic manner.
- c. **Control Group:** As noted earlier, the basic evaluation plan will allow one to make inter-district and inter-state comparisons. Although such comparisons will be of interest, there will be major analytical problems with comparing 48 districts or, for that matter, 12 states when there will undoubtedly be great differences between the characteristics of the various populations, the inputs and, implementation of the inputs. This is not to say that such comparisons cannot be made, but it is likely that an understanding of differentials between districts and states will take some time to analyze sufficiently to allow the presentation of actionable decisions.

In other words, while gross differences in performance may be a relatively easy task to compute, explaining these differences is a much harder level of analysis. In addition, there are many desired outcomes which are outside the closed system of Model Plan service delivery system. Considering the investment being made into this project and its importance to the formulation of the details of a national Model Plan, it is highly desirable to have control groups, at least for selected interventions.

- d. Timeframe: The baseline and after surveys are quite large and the interview schedules they will use are complex. It is unlikely that the baseline survey will be analyzed in time to have much influence on the service delivery program. (To counteract this, the IRHP has needs assessment surveys for training, management, and communications which will be used to structure the details of the delivery system. There has also been a less formal logistical assessment.) Concerning the after survey, this will not be completed in time to have any influence on the IRHP. In short, the evaluation plan does not allow one to take corrective action until after the end of the project.

The above considerations essentially reinforce and make more explicit the rationales in the IRHP Project Paper for the provision of funds for operations research activities. In the following section, a more detailed discussion of the types of operations research activities that seem appropriate is presented.

## 2. Types of Operations Research

It would be presumptuous at this juncture to suggest detailed research protocols for the IRHP project. Specific research designs will require individuals who are very knowledgeable of the IRHP and, of course, India. In addition, any operations research project should actively involve the potential users of the results in order to insure that their needs are represented in the design. The examples below, then are notional. They are presented under the same headings developed under the previous section, "Research Needs".

- a. **Planned Variation:** A systematic testing of different approaches to health care can be a powerful mechanism for the optimal use of resources. Under the IRHP, it is not suggested that variations should be made in the basic Model Plan. This would be too complex and expensive undertaking. Moreover, there is nothing to suggest that such a drastic alteration is warranted. Rather, components of the system can be examined, modified, and tested. These modifications can include both elements of the delivery system and ways in which the system delivers services.
  - i. **Delivery System:** Delivery systems can analytically be compartmentalized into interdependent categories, e.g., logistics, supervision, training, etc. In most countries, some components are more problematic than others and, thus, more suitable for operations research. One area that almost all health care delivery systems experience difficulty with is service statistics.

Although the ways in which service statistics are a problem vary, some of the common problems are: information collected is not programmatically useful, data are not collected by health personnel, data are not processed in a usable form, an inordinate time is required to process the statistics, and the managerial system is not structured to allow the statistics to be used for managerial purposes. Such problems mean that a potentially powerful tool for directing the program is not used and valuable resources are being employed in an unproductive activity.

India is known for having superior service statistics, especially in family planning. As a result this may not be a high priority problem area. If service statistics are anticipated to be problematic under the INIP, an alternative service statistic system could be developed and tested among a discrete group of personnel in a test area. The modified and standard system could differ in the following ways.

- amount of data collected
- types of forms used
- frequency of collection
- information collected

The two systems could be compared in terms of:

- time required to collect data
- internal consistency of data
- time required for processing data
- cost of operating system
- programmatic actions based on system

Another area that is frequently problematic is training, especially the training of community workers with limited educational background. In an integrated health program, there is a wide range of information and skills that the health workers are expected to master. What often happens is that the workers have difficulty in internalizing and retaining this broad spectrum of subjects.

The Model Plan has established the basic components of the training program. There is flexibility concerning how the training might be carried-out. For instance, one training program might present the entire course to a group of trainees with periodic in-service refresher courses. Another program might present a core course which would be followed by periodic specialized training on distinct service components. The two approaches could be contrasted in terms of:

- competency before and immediately after training
- competency some length of time after training
- staff productivity
- cost-effectiveness

Obviously, one could think of scores of potential variations that might be suitable for examination. The two suggested above are illustrative of how one might decide what research topics to examine.

- b. Problem Identification and Resolution: Most problems confronting program administrators can be resolved if the problem is identified with sufficient detail without relatively complex

operations research actions. The key point is that administrators must be given sufficient information about the problem. Under the IRHP it is anticipated that the bulk of the research effort will be problem identification activities. Below are three examples of the type of activities that fall under this category. Their most significant difference from the "planned variation" studies is that they typically have very simple protocols since they lack any experimental intervention. Indeed, the first example does not even entail a research protocol.

- i. Information System: Under the IRHP, it may be desirable to establish a number of extraordinary, on-going data collection systems somewhat more sophisticated than is necessary under a national effort. The IRHP can be viewed as a demonstration project, albeit an extremely large one. It is difficult to anticipate all the problems that will be confronted. Moreover, decision makers will want to examine this effort much more closely than the regular program in order to determine what lessons there are for the national program. The data which it is now planned to collect should be examined to see if they are adequate. Likewise, plans for the reduction and presentation of these data should also be reviewed to determine if they enhance optimal, timely exploitation. An example of work in this area would be cost accounting.

All systems have a cost accounting system. Often, however, the allocation of costs is done at a level of generalization that prevents assigning a cost to a particular input and, ultimately, an output. If one wants to calculate the cost-effectiveness of a particular category of staff, the types of cost data required include such things as training, salary, supplies, and transportation for this category of worker. Such information is essential to assigning a cost to the worker's productivity. This type of analysis is very useful in identifying components of the program that are in need of corrective action.

- ii. System Studies: Often administrators know that some part of the system is not operating satisfactorily, but do not know the nature of the problem. In other instances, the performance of the system may not be known. In such situations, quick, simple studies can be used to generate the requisite information. For example, a nutritional educational program may be designed to change the dietary practices of the treatment population. A small, simple survey could be conducted to determine if the population has actually changed their habits.
- iii. User Perspective Studies: While the emphasis in operations research is on system specific variables, one cannot and should not neglect the users and potential users of the system. In operations research,

particular emphasis should be directed at the interface between the user and the system. Frequently, the performance of the delivery system is inadequate not because of the services being provided nor because there is a lack of demand for services, but because the manner in which the services are provided are incompatible with the life-styles of the community. A classical example of an inappropriate delivery system is when the hours of clinic services conflicts with the community's work hours. Villagers sometimes misunderstand or mistrust services being offered.

In one study, for instance, it was found that villagers associated oral rehydration salts with family planning, believing the salts would sterilize their children. This information was ascertained through a mini-survey and the misconception was corrected. As a result, the use of ORS increased markedly. User perspective research can be used to both assess and plan the delivery system.

Problem identification research can have immediate positive impact on the delivery system. If it is used as a management tool, and not as a "research" project, it should be exceedingly useful and popular with administrators.

- c. Control Groups: Earlier, it was stated that the inclusion of control groups would constitute a valuable addition to the IRHP. It was noted however, that designs calling for

control groups can be difficult and time consuming. Still, the use of control groups have more positive than negative attributes, although practical consideration will limit their utilization. There seems to be three ways control groups can be incorporated into the IRHP.

- i. Within District Surveys: Total service coverage in a district will require time. Blocks not initially covered could serve as a control population. If time allowed, the design could include a crossover, i.e.,

$O_1$	X	$O_2$	X	$O_3$
$O_1$		$O_2$		$O_3$

- ii. Between District Surveys: Control populations could be identified in districts outside participating districts. Before-after comparisons could be made between the districts. It may be difficult to find a suitable control population outside IRHP districts. Additionally, this alternative could result in logistical and administrative problems.
- iii. Comparisons of Service Statistics: The service statistic of IRHP and non-IRHP populations could be compared on an on-going basis. While this exercise may be useful, it has obvious limitations and is inferior to the other options.

Because of the difficulty associated with the use of control populations, care should be taken to employ them only in situations that obviously would benefit by their inclusion. It seems unlikely that a control population would be required for

every district or, for that matter, every state.

- d. **Timeframe:** There are two considerations to take into account when discussing the timeframe of the IRHP project. First, there is the length of the project, i.e., the research time available to conduct a particular project. Second, there is the time required to get usable results to policy makers and program administrators. These two points are discussed in detail below. They are given emphasis because world-wide research experience suggests that they are one of the main reasons research is not widely used by program administrators and policy makers. It is very important that operations research results are generated in time to influence the direction not only the Area Project, but also the national model program. It is not unusual to have results from major research efforts not available for consideration until one, two, three, four years after the project is completed. One cannot expect decisionmakers to hold abeyance actions until the results are available, especially since it is not unknown to have frequent changes of decisionmakers. Below are ways in which the problems associated with timeframe can be avoided or alleviated.

- i. **Research Topics:** Although it seems elementary, a common mistake in research projects is to select a topic or issue that cannot be adequately addressed in the time available to conduct the study. In selecting research topics, one should first start

with the date on which the report is to be presented to its users, then work back in time to determine how much time is available for the actual research. In going through this process, there will be numerous and interesting research topics that must be eliminated simply because there is not sufficient time to examine the topic.

An example of a research topic that cannot be addressed in a short period of time is a program's impact on fertility rates. If a two, and perhaps a three year, study were conducted to measure the impact of the delivery system on fertility, it would not be atypical to have the study population actually exposed to the intervention for only one year. The rest of the period would be taken-up with such things study design, training, data collection, analysis, and report writing. Obviously, for biological considerations, it would be impossible for the service intervention to have a measurable impact on fertility in one year. As a result, some other outcome variable would have to be used, e.g., contraceptive prevalence. Indeed, in this example, fertility data should not even be collected.

- ii. Research Methodology: As with research topics, it is critical that research methodologies be employed only if they can be carried-out within the time available. It is unlikely, for example, if the following design

could be implemented under the IRIP project unless it was initiated the near future.

0<sub>1</sub> X 0<sub>2</sub> X 0<sub>3</sub>

0<sub>1</sub> 0<sub>2</sub> 0<sub>3</sub>

Here again, it is important not only to take into consideration fieldwork time, but also the ancillary activities that must take place before and after the fieldwork. Crossover studies are very difficult to successfully execute and, therefore, invariably take longer to do.

In general, research methodologies should be kept as simple as possible. It is particularly important to restrict the number of experimental variables. Ideally, the number of variables should be kept to one. While it is tempting to address a number of variables in one study because it seems more efficient, the addition of more than one variable confounds one's ability to isolate the cause of any measurable change. At a minimum, rather prolonged and difficult analyses are called for to unravel the cause of the change. More likely, it will be impossible to determine the reasons for the change. It is preferable to have a series of small, narrowly focused studies than large, complex studies.

iii. Data Collection: Data collection involves the amount and type of data to be collected and the manner in which it is to be collected. It is well known that there is

a tendency to collect more data than are actually required to test a particular hypothesis. This seems like an universal characteristic of all research efforts. Adding "a few more questions" to a research instrument is often seen as a no-cost addition or a small, marginal cost. A 40 item interview may take only 30 minutes. Adding 10 more items may mean only 5 more minutes. However, these 10 items are often tangential to the major thrust of the interview and can cause confusion and fatigue among interviewers and interviewees. More importantly, the addition of questions has a ripple effect, requiring more resources for such things as coding, processing, and analysis. Such additional costs would be acceptable if they contributed to the objective of the research, but such a contribution is the exception, not the rule. It does not make sense to collect data that is not germane to the issue being addressed by the research.

Interview schedules and other data collection instruments should be kept short and simple. For the proposed operations research activities, questions should be restricted to only areas of behavior or conditions that the delivery system is designed to influence. In addition, the focus should always be on those aspects of behavior or conditions on which one can take action.

In addition to keeping the research instruments to a minimal level, care should also be taken to keep the sample size to a minimum. If the special study utilizes service statistics, a sample of forms should be used when feasible. In situations requiring surveys, "mini-surveys" should be employed.

Mini-surveys have been used successfully in a number of studies. They are based on the assumption that large sample sizes are not required when the research issue is narrowly defined and where the dependent variable is not a statistically rare event. Such surveys are inappropriate for a cause-of-death mortality study. They are satisfactory when the dependent variable is something like contraceptive prevalence or health utilization. Unlike most surveys, the mini-survey is much less concerned with establishing multi-correlations or casual relationships, which require larger sample sizes. They are primarily designed to detect change between two points in time for a specific type of behavior or condition. Thus, if one was examining contraceptive prevalence in the following study, the amount of data and the sample size would not have to be very large to determine if there was the desired change.

0 <sub>1</sub>	X	0 <sub>2</sub>
0 <sub>1</sub>		0 <sub>2</sub>

In this instance, one is not so concerned about the dynamics of contraceptive behavior, but with the change in contraceptive behavior caused by X.

Mini-surveys have also been used to monitor interventions. Let us assume that a population has just received an innovative educational/training campaign on diarrheal disease among infants and children. This program involved, among other things, training all mothers with children under five years of age in oral rehydration therapy (ORT). It would be a fairly simple task to conduct a mini-survey to determine what mothers learned and how they were using this knowledge. Gross deficiencies in the ORT program could be quickly identified and corrective action taken before the innovative approach was expanded to other populations.

- d. Data Processing: One of the reasons for concern about the amount of data collected is the burden large amounts of data place on the data processing component of a research project. This phase of a research project is where very prolonged delays are often experienced. Restricting the amount and complexity of the data personnel must deal with is one way to avoid undue delays. Equally important is the timely establishment of data processing capability and plan. At an early stage, staff should be recruited and trained, data processing procedures

developed, schedules established, and access to requisite equipment established.

- e. Data Analysis and Presentation: Data analysis can impede the timely completion of a research effort. If the earlier suggestions are followed, the number of analytical problems should be diminished. The research designs and the data collected establish analytical boundaries and, as a result, discourage undirected, shotgun approaches to the analysis of the data. Still, analytical plans should be established early with a clear emphasis on programmatic issues.

The presentation of the data is crucial in operations research. Since operations research is designed to serve the needs of decision makers, the documentation of the results should reflect their needs and desires. Findings should be presented in a format that clearly highlights the options flowing from the analysis. Additionally, the primary documentation should be short with a minimal of technical details. The primary document can be supported with back-up documents.

Establishing and maintaining a realistic research schedule is extremely important. In the IRMP it is anticipated that there will be a series of operations research activities. If any phase of the research falls behind schedule, the delay will soon spread to other parts of the process and to other operations research activities, e.g., delays in data processing for one project almost invariable means that delays will be experienced in subsequent efforts.

### 3. Organizational Considerations

An organizational framework must exist to take advantage of Indian research opportunities. Presently, this framework does not exist. Under the Area Program's Management Headquarters, the MOHFW is establishing a unit which will relate to innovative activities, including operations research. In addition, each state MDH is supposed to designate a staff member who will oversee such activities. At this time, it is uncertain if these designations have taken place. Having such staff at the central and state level is necessary for coordinating and facilitating operations research activities. There does not appear to be any vigorous attempt to constitute the organizational structures required to design, execute, and analyze research efforts.

It is not in this paper's purview to outline what organizations should be involved in an Indian research effort. A number of general observations can be made concerning factors that may be useful in organizing the research effort, however.

- a. Type of Organization: Obviously the organizations selected to carry-out the operations research should have experience in research, preferably, operations research. In addition, the ideal organization should have, or have the potential to have, a self-contained research operation. If the organizations have to sub-contract for services, such as technical staff, the administrative aspects of the research process will become cumbersome. Organizations should have the requisite range of technical personnel or the ability to hire such personnel. In addition, they should have the necessary data processing facilities or ready access to

such facilities. Lastly, they should be in close physical proximity to the study districts, ideally in the same state.

- b. **Number of Organizations:** The number of research organizations should be kept to a minimum, certainly no more than one per state. With many organizations it will be extremely difficult to coordinate their efforts. A burden will be placed on government personnel who must disburse funds to and relate in various ways with these organizations. Most importantly, operations research necessitates the researchers establishing a close collaborative relationship with service personnel. Care must be taken in the relationship that the researchers do not impede the ability of the service personnel to provide services. With multi-organizations involved, the danger that the research effort might disrupt services increases markedly.

Considerations should also be given to having a prestigious research group, preferably in New Delhi, serve as a technical resource for organizations located in the states. One difficulty with this suggestion is that the funds for innovative activities have already been budgeted to the states.

- c. **Communication:** In the initial stage of this effort, it is important to establish: the boundaries of operations research, expertise in the various research organizations, and communication networks between the various states and, for that matter, researchers in other parts of India and the world. At an early stage, a workshop should be held with key individuals from each participating state. This workshop could also include

persons who have participated in innovative programs in India and elsewhere. The purpose of the workshop would be to review the area of operations research in health and family planning and to develop initial research protocols. This meeting would also insure that unwarranted duplication of effort did not occur among the states. Although some studies may be suitable for replication in more than one state, for other studies this would be unnecessary.

These workshops could be repeated on a periodic basis, perhaps having a rotating site among the states. Initially, they could be organized by the centre research group mentioned earlier. An indirect and subtle benefit of these workshops is their potential to positively affect the pace of the research. If the workshops are presented as milestones, the respective researchers may strive to have material ready for presentation to their peers.

The quality of research is directly related to the quality of the researchers. There is a great deal of work that needs to be accomplished in establishing what groups will conduct the operations research, how they will relate to each other and the rest of the IRHP project, and what funding mechanisms will be employed to support these organizations. Indeed, at this time these organizational concerns should have the highest priority.

## V. POTENTIAL ROLES OF U.S. ORGANIZATIONS

The discussion of possible roles for U.S. organizations must be very tentative for a number of reasons. First, any activity involving a U.S. research organization that entails work in India must be approved by the GOI. The GOI's approval has not been explicitly asked for at this juncture. Second, while there are a number of existing AID/W supported projects that could relate to the proposed research activities in India, they lack sufficient funds to undertake a significant level of effort. Third, the tasks that any U.S. organization would be asked to do cannot be described in detail at this point. Of particular importance is the degree of Indian technical skills that can be focused on operations research. Lastly, there is a critical time element. The IRHP is an on-going project and a U.S. organization would have to become involved very soon in order to play an effective role. This section contains many options, reflecting the many unknowns.

### 1. Rationale for U.S. Technical Assistance

India has numerous research organizations and has well documented expertise in population research. A legitimate question, then, "Is outside technical assistance necessary?" There are at least two reasons for believing that the Indian family planning effort could benefit from outside technical assistance.

- a. Operations Research In Family Planning: Although India is well known for population research, it is less known for operations research in family planning. (Operations research is established in other fields, however.) In the area of operations research on community-based

distribution projects, a field especially relevant to the IRHP program, the experience is very limited. Worldwide, however, there is considerable experience in this area. For instance, the Research Division, Office of Population has supported 36 such projects in 22 countries. There are several U.S. organizations who have actively participated in such projects and could assist Indian counterparts in learning from these experiences.

- b. Catalyst: Presently, there are no well formulated plans for utilizing the funds budgeted for innovative activities under IRHP. A U.S. organization could have a catalytic effect on Indian organizations in terms of developing an operations research strategy and program.

It should be noted that the type of technical assistance envisioned under this project does not entail U.S. organizations playing an active role in the actual research, as is the case in some other countries. Obviously, India has a strong capability to mount successful and sophisticated research. Rather, the technical assistance role would be a resource to facilitate the development of a potentially large operations research program.

## 2. Organization of U.S. Technical Assistance

The number of U.S. organizations who are involved with the IRHP should be kept to a minimum. It is strongly recommended that only ~~one~~ American organization be involved with the project. The reasons for this recommendation are outlined below.

- a. Rapport: It is important that the U.S. organization

establishes a good working relationship with its Indian counterparts. The fewer individuals involved in this process, the more likely such relationships will evolve and mature over time.

- b. Administration and Coordination: With more than one organization, the amount of work the Mission and the GOI would have to devote to administrative, logistical, and coordinative activities would increase.
- c. Expertise: Having the technical assistance concentrated in one organization would result in a critical mass of expertise much sooner than with multi-organizations.

The American organization should have an established record in operations research requiring very little, if any, supplementation of professional staff. In short, the organization should be able to begin effective work with minimal start-up time.

The amount of effort the U.S. organization could expend in the IRHP could be considerable. There are a number of factors that delimit the level of effort. To what extent these factors will affect technical assistance is not known, but they will directly impact on the organization and level of the technical assistance. Briefly, these factors are:

- Position of GOI
- Availability of funds for U.S. organization
- Amount of innovative IRHP funds devoted to operations research
- Level of effort by Indian organizations
- USAID staff time devoted to operations research

Except for the funds available for U.S. organizations, which is dis-

cussed in the next chapter, and USAID staff time, there is little more that can be said about the other potential constraints. It is too early to determine what their final disposition will be. An initiative by USAID to arrange for U.S. technical assistance will obviously force the issues, making it possible to better estimate the magnitude and nature of U.S. technical assistance.

Although it is difficult to predict the characteristics of the U.S. organization, some broad types can be outlined. Two key factors will influence the final make-up of the organization. First, the presence or absence of a resident facilitator. Second, the level of support USAID staff can allocate to this effort. These two factors are critical since a large on-going, in-country U.S. presence is not feasible or appropriate. Therefore, most of the actual technical assistance will be provided through periodic, short-term visits by professional staff. The effectiveness of this form of technical assistance and the frequency of trips will be influenced by staff support in the country.

- a. Without Resident Facilitator: The resident facilitator would be a mid-level professional with good managerial and administrator skills. As his/her title suggests, the principal role of this person would be to facilitate and coordinate the technical assistance activities. Additionally, he/she would follow-up on actions resulting from the technical assistance visits with particular emphasis on adherence to implementation schedules.

Without a resident facilitator, it is unlikely that a U.S. organization could mount a major technical assistance

effort unless this role could be assumed by staff in an Indian organization or by USAID. The probability of having an Indian organization be the functional equivalent of the resident facilitator is not known. This is certainly a viable alternative and, indeed, has several advantages. First, an Indian will obviously know the country and its organizations far better than an American resident. Second, if he/she is located with a well known Indian organization, he/she could more quickly establish working relationships with other organizations. Third, an Indian facilitator would help maintain a low American profile. Lastly, even if his/her salary had to be paid, the amount of funds involved would be substantially lower than that of an American resident. This alternative should be explored.

- b. Without Resident Facilitator With USAID Staff: If the IRNP operations research effort does become a reality, USAID will have to assign some staff time to the activity. If there is no resident advisor, Indian or American, substantial staff time would have to be assigned to the activity if it is to be on a major scale, at least a half-of-person year annually. Presently, the IPN Division's staffing pattern does not allow this option. Having a USAID staff person being the functional equivalent of the resident advisor means that he/she would have to spend considerable time in the field.
- c. With Resident Facilitator: With a resident facilitator, there would undoubtedly be a major operations research effort under

the IRHP. Among other things, the resident facilitator would indicate that the GOI was intent on launching a major effort in this area. Additionally, it is hard to imagine technical assistance to a multi-site, multi-organization operations research effort being possible without a resident facilitator. If there is a resident facilitator, the amount of USAID staff time required for this effort would be substantially reduced, roughly 2 person months per year.

Of the above three options, the most desirable one is having a resident facilitator, either American or Indian. The second most desirable option is having someone in the Mission attempt to fulfill the role of a resident advisor. In order for this alternative to work, the individual would have to be given a clear mandate to work exclusively on this effort for extended periods of time and be allowed to travel extensively. A potential problem is that this individual may be viewed as more of a monitor than a facilitator by Indian researchers and, in fact, such a position may lead to some awkward situations. With no increase in USAID staff time devoted to the proposed effort and no resident advisor, it is impossible to think in terms of broad technical assistance. Rather, the technical assistance would have to focus on a few projects in one and, perhaps, two states.

### 3. Types of Technical Assistance:

Although it is hoped that a U.S. organization will have a catalytic effect on the innovative activities of IRHP, technical assistance is largely a reactive activity. The technicians react to problems they observe and/or to requests for assistance. Most likely,

the technical assistance activities will cover the entire spectrum of operations research, which was described in earlier chapters. The intensity of assistance will vary from subject to subject and from region to region.

Even though the specific details of technical assistance cannot be stated now, a broad, simplified description of the major actions and tasks can be outlined. These would be more or less the same irrespective of the level of effort, with the exception of a resident facilitator which may or may not exist. Graphically, the technical assistance process is shown in Figure 2 and is described below.

- a. Selection of U.S. Organization: A U.S. organization needs to be identified very soon. There are a number of candidates of which the Population Council seems most appropriate. It is an experienced, prestigious organization. The Council has a regional office in Bangkok that will facilitate communications and travel. The Council has an existing project with AID/W (Operations Research, Asia) which gives the mandate to carry out the activities described in this paper.

Even if the proposed operations research activities under the IRIP do not become a major program, it is likely that the Council could undertake technical assistance on much smaller scale, say one project in one district.

- a<sub>1</sub> Review of Material: After selection, the U.S. organization should be given all relevant material to review. This

step is usually left out of technical assistance activities resulting in much in-country time being spent of reading material.

- b. Site Visit: The initial site-visit would be to establish contacts with Indian organizations, visit INHP staff and project districts, consult with GOI and Mission personnel, examine the feasibility of a resident facilitator, and formulate a general feasibility statement on operations research. These tasks may necessitate more than one individual and more than one trip.
- b<sub>1</sub>. Resident Facilitator: If GOI approval is given, an American or Indian resident facilitator should be established as soon as possible.
- c. Participating Indian Organizations: The organizational framework for the operations research activities must be established at the central, state, and district level.
- d. Workshop: This meeting would bring all the principal actors together, plus a few outside experts. The major function of this meeting would be to organize the research effort.
- d<sub>1</sub>. Workplans: This would be the major product of the workshop and would contain the strategy for the research activities.
- e. Multi-site Visits: Following the workplans, numerous visits would be required to develop the details of the various research efforts.
- e<sub>1</sub>. Indian Site-Visits: It would be ideal if selected Indian researchers could visit existing operations research projects.
- e<sub>2</sub>. Research Protocols: Individual research protocols would be

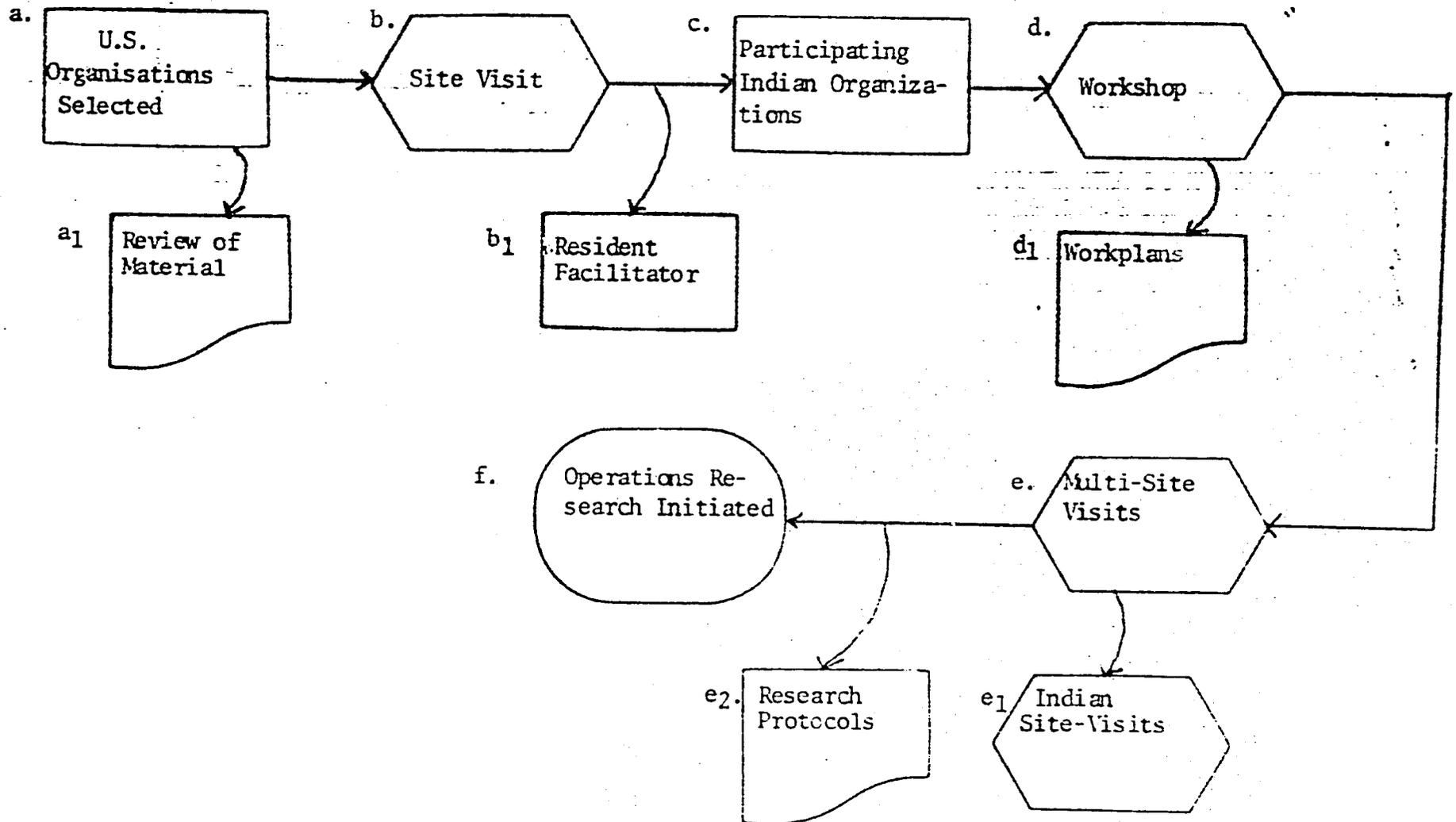
developed for the various research settings. These would not be all the protocols but only those for initial studies. This first round of protocols should obviously focus on studies requiring the longest timeframe.

- f. Operations Research Initiated: The actual research studies will be initiated in a staggered fashion. During this initiation stage, and later, it is anticipated that there will be multi-site visits by U.S. organization personnel.

A persistent concern in this paper is the limited time available for operations research under the IHIP. There are approximately 4 years remaining in this project. Optimistically, it will take a year to initiate the operations research study after a U.S. organization is identified. This means that there is a maximum of three years for research activities. It is important, then, that a suitable U.S. organization be identified as soon as possible and that preliminary site-visits to India be conducted before the funding arrangements are finalized. Additionally, it is suggested that the Mission consider a no-cost extension of the IHIP. Although it may seem premature to consider such an extension this early in the project, it will be difficult to design research protocols when the terminal date of the project is uncertain. Moreover, the IHIP appears to be roughly one year behind schedule anyway.

FIGURE - 2

Indian Phase of Operations Research Technical Assistance, IRHP



VI. FUNDING CONSIDERATIONS

Among the unknowns confronting the operations research portion of the IRIP, is the amount of funds that would be required to carry-out the activity, the source of funds, and the funding mechanism. This chapter offers a number of alternatives.

1. Notional Budget For U.S. Organisation

Based on the experience of similar efforts, below is a budget for the U.S. organization component of the operations research activity.

U.S. Organization

IRIP OPERATIONS RESEARCH

BUDGET  
(in US \$000)

YEAR	1	2	3	Total
1. Social Scientist FTE *	45	49	54	148
2. P.H. Physician	57	57	57	171
3. Social Scientist, FTE	35	39	43	117
4. Resident Facilitator	90	100	110	300
5. Sec. Clerical(2, one New Delhi, one Bangkok)	12	13	14	39
6. Travel	50	55	60	165
7. Communication	3	4	5	12
8. Consultants	20	25	30	75
Subtotal	312	342	373	1,027
Overhead 65%	203	222	242	667
Total	515	564	615	1,694

\*FTE = Full-time equivalent

The budget assumes several things. First, that there will be a major research effort. Second, that there will be an American resident advisor. And, third, that the Population Council will be the U.S. organization and that it will operate out of Bangkok. The budget is for three years under the assumption that the development work prior to the initiation of the project could be covered with existing central funds already obligated.

## 2. Funding Sources

There are no lack of potential funding sources. Unfortunately, there is a lack of assured funding sources. The various potential sources are discussed later. Before that, the impact of finding no source of funds for a U.S. organization should be examined.

As noted earlier, there are several on-going U.S. organizations that can now provide technical assistance to India. These are: Columbia University, Johns Hopkins University, the International Fertility Research Program, and the Population Council. All of these projects are administered by the Office of Population, S&T. In addition, the Office of Health, S&T has recently initiated a contract with the University Research Center for operations research in health. It is anticipated that Columbia University will provide technical assistance to a limited number of PVOs in India. This will be on a small scale and will be the subject of a future memorandum to USAID. Of the remaining organizations, the most logical choice is the Population Council for reasons noted in the last chapter. However, the Council has not been approached concerning this activity, nor has it been discussed with GOI officials. The point here is that there a number of organizations that could be called upon to provide assistance if the Council were unwilling or unable to undertake the activities.

What level of activities can be envisioned without further funding under these projects? The answer is very little. The level of central funds available is quite limited. Nevertheless, it is likely that the Council could provide assistance to at least one, discrete operations research study within its current contract.

Five potential sources of funds have been identified. These different sources could be drawn upon to fund all or fewer years of the U.S. organization activities, i.e., more than one funding source could be used.

- a. Obligated IRHP Funds: The Mission could request the GOI to deobligate a portion of its funds for this activity. This would be a delicate and complex procedure and is likely to be looked at unfavorably by the GOI.
- b. From Non-obligated IRHP Funds: The Mission is scheduled to obligate approximately \$7 million to the IRHP in FY 1983. Although this might be too late to fund the first year of the U.S. Organisation's activities, it should be considered as a possible source for subsequent years.
- c. Social Marketing Project: This project is scheduled to be initiated during FY 1983 and is therefore an unlikely source for the first year of activities. Also, as is shown in the next chapter, the amount of funds for operations research in the present budget is too small to use for IRHP related activities. Unless the budget is increased or there is a reallocation within the present budget, this is not a potential source of funds.
- d. FY 82 Fallout: If fallout funds can be utilized, this would be the preferable funding source.
- e. Asia Bureau FY 83 and 84: If funds can be obtained elsewhere for FY 82, subsequent years could be programmed by the Asia Bureau.

3. Funding Mechanism

The easiest funding mechanism would be to use an existing project, Operations Research # 0632. When a source of funds is identified, it would be transferred to the Operations Research project account. The Office of Population projects noted earlier all fall under this one project. This mechanism has been used numerous times before.

VII. NATIONAL BIOMEDICAL AND OPERATIONS RESEARCH PROGRAM

The proposed Social Marketing Project has \$1 million in its budget for biomedical and operations research for the five years of the project. This chapter will examine how these funds might best be utilized.

1. Fertility Regulation and Service Delivery Technology

Among the developing world, India has the strongest biomedical capability, by far. It is equally strong in the social sciences. In addition, it is estimated that the GOI will budget approximately \$15 million for biomedical and operations research over the five years of the social marketing program. There is, therefore, potential for mounting a major research effort in these areas.

Fertility regulation can be viewed on a continuum. Products are developed, tested, and then provided to users. Under this project, it is suggested that Mission's funds be utilized primarily for the testing and delivery aspects of fertility regulation technology. Although India has a strong biomedical research capability, it does not compare with the U.S. or Western Europe in the area of fertility regulation technology. AID should concentrate its limited resources for the development of a new and major modification of existing methods in leading facilities. Product development research is an extremely expensive, high risk venture. Large amounts of funds are spent which never result in an acceptable product. Moreover, most fertility regulation technologies must go through a rigorous FDA screening before it can be used in the United States or provided by A.I.D. Typically,

FDA will accept safety and effectiveness data only from U.S. institutions and, occasionally, European. By concentrating its funds in U.S. institutions, AID lowers the high risk nature of product development research by focusing on the best research facilities and by working closely with FDA to insure that its complex requirements are adhered to during the various research phases.

It is not being suggested that there never will be situations where India research organizations have developed uniquely exciting leads for a new or improved technology. However, there are existing funding mechanisms for supporting such efforts, in addition to the GOI. AID/W has a two centrally funded projects that can, and do, support Indian organizations in applied research on fertility regulation. The first is the Program for Applied Research in Fertility Regulation (PARFR) and the second is the International Committee on Contraceptive Research (ICCR). In addition, India has access to funds under WHO's program in fertility research. The actions proposed later should result in greater access to these funds.

There are areas in fertility regulation research that should be done in India. These are concerned with the safety, acceptability, use-effectiveness, and delivery of new or modified technologies. With these types of research, socio-cultural and physiological factors become critical. It is difficult to say what method of fertility regulation is appropriate for India without testing such methods. India's family planning program is now basically a two method system, sterilization and the condom. One possible reason for this is the lack of a major effort on applied research and service delivery research, or operations research. Therefore, it is proposed that Mission

funds be used to assist the GOI in the following areas of research.

- a. Safety Research
- b. Use-effectiveness Research
- c. Acceptability Research
- d. Delivery System Research

2. Technological Transfer

The U.S. has a great deal of experience in the proposed areas of research. This project is designed to develop ways to encourage the exchange of research techniques and knowledge between U.S. and Indian researchers. The logical lead Indian agency in this effort is the Indian Council of Medical Research (ICMR). The ICMR is not only concerned with fertility regulation research, but also how best to provide technologies to users.

3. Specific Project Activities

The specific ways in which technological transfer would be effected are indicated in the budget.

NATIONAL APPLIED BIOMEDICAL AND OPERATIONS RESEARCH

BUDGET (In U.S. \$000)

<u>Years</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Total</u>
a. Workshops	3	3	3	5	6	20
b. In-Country Trg.	5	10	15	15	-	45
c. Special Studies	-	100	200	150	-	450
d. International						
Travel						
Indian	35	40	55	55	25	210
American	30	35	45	45	25	180
e. Publications	1	1	2	2	4	10
f. Training						
Long Term	(60)	(90)	(90)	(90)	(90)	(420)
Short Term	(45)	(55)	(65)	(65)	(65)	(295)
g. U.S. Trainer						
Salaries	15	20	25	25	-	85
<b>TOTAL</b>	<b>89</b>	<b>209</b>	<b>345</b>	<b>297</b>	<b>60</b>	<b>1,000</b>
	<b>(194)</b>	<b>(354)</b>	<b>(500)</b>	<b>(452)</b>	<b>(215)</b>	<b>(1,715)</b>

- a. Workshops: These meetings will consist of small working groups to review existing research literature and to develop new research protocols.
- b. In-Country Training: This training will consist of small courses or seminars conducted by U.S. experts on selected subjects such as epidemiology and operations research.
- c. Special Studies: These funds will be used as seed money to encourage studies in high priority areas. It is assumed that more research funds will be available from the COI.
- d. International Travel: It is important that there is an easy exchange between U.S. and Indian researchers.
- e. Publications: Under this category, a newsletter could be developed. Also, publications of particular importance could be purchased and distributed.
- f. Training: This item would be supported under the Mission's new project "General Development Training".
- g. U.S. Trainer Salaries: These salaries are for the researchers who will conduct the in-country training courses.

The major problem with the above program is that it will be difficult to administer. While it was suggested that the lead Indian organization be the ICMR, there are many activities that the ICMR will have difficulty in carrying out. Who, for instance, will identify and arrange for U.S. experts to give in-country training? Mission personnel will not have the time or knowledge to undertake such tasks. Therefore, it is also proposed that there be an ICMR counterpart in the United States. Below is a budget for this activity.

U.S. ORGANIZATION ADMINISTRATION OF  
 NATIONAL APPLIED BIOMEDICAL AND OPERATIONS RESEARCH  
 BUDGET (IN U.S. \$000)

Year	1	2	3	4	5	TOTAL
1. Salaries						
Professional	5	5	5	5	4	24
Support	3	5	5	5	4	22
2. Communication	2	3	3	4	4	16
Subtotal	10	13	13	14	12	62
3. On Campus						
Overhead 65%	6.5	4.5	4.5	9.1	7.8	32.4
4. Trainer Salaries	15	20	25	25	-	85
5. Off Campus						
Overhead 35%	5.25	7	8.75	8.75	-	29.75
<b>Total</b>	<b>36.75</b>	<b>44.5</b>	<b>51.25</b>	<b>56.85</b>	<b>19.8</b>	<b>209.15</b>

This budget assumes that the U.S. organization will be already active in this field (e.g., PARFR, ICCR, IFRP, etc.) and that efficiencies can be realized by taking advantage of their existing organization and network of contacts. The source of these funds is not known and would require reallocating funds in the earlier budget or adding funds to the proposed Social Marketing project.

The funds for technological transfer will involve the use of U.S. dollars. These dollars should be administered by USAID rather than being obligated to the GOI. Otherwise, gaining access to these project funds may be difficult and time consuming.

## VII. CONCLUSIONS

USAID has earmarked approximately \$2.4 million for innovative activities under its existing project, Integrated Rural Health and Population Project (IRHP). In its Social Marketing PID, the Mission has a budget item of \$1 million for biomedical and operations research. The Social Marketing Project is scheduled to start during FY 83. This paper discusses ways these funds may be utilized. The emphasis is on the IRHP project since operations research activities must be initiated very soon in order to have sufficient time to carry-out the studies and to influence the direction of the service delivery system. USAID should explore a no-cost extension of the IRHP. The IRHP is designed to test the GOI's Model Health Plan in 13 districts located in 5 states. The aggregate treatment population is approximately 14 million.

In considering the various forms of OR, an input-output analytical model is believed to be the most appropriate for testing the impact of service intervention. Modifications of the basic Model Health Plan can be tested using this type of research design. The use of control groups should be seriously considered for select research issues. It is anticipated that most of the operations research activities will be concerned with problem identification and resolution. This type of research does not necessitate an experimental design and can be based on cross-sectional data derived from program statistics and/or small surveys. Special emphasis should be given to insuring the IRHP has a proper cost accounting system and to user-perspective studies which focus on the interface between the delivery system and its clients.

Operations research should emphasize simple research design with carefully selected, limited scope data collection. Instead of a few large, complex studies, it is recommended that there be a series of small, simple studies which are concerned with a limited number of dependent variables. Research issues should be concerned with system specific variables that are actionable. It is very important that there be a rapid turnaround time for these studies in order that they can play a role in the direction of the Model Health Plan.

The number and type of Indian research organizations that might implement the operations research activities is reviewed. For administrative reasons, the number of organizations should be kept to a minimum, no more than one per state. The option of having an Indian organization located in New Delhi should be examined. This group could serve as a technical resource and facilitate and coordinate the various research activities. By concentrating the research activities to a few organizations, a critical mass of expertise is more likely to develop. Also, it will be easier for a limited number of organizations to establish rapport with service personnel and to minimize the potential of the research disrupting the service delivery system. Lastly, by concentrating the research in a few organizations, economies of scale should be realized.

It is believed that a U.S. organization could assist the COI in this area by bringing to bear considerable operations research experience, especially in terms of community-based distribution system. Having the participation of an U.S. organization may have a catalytic effect on the IRHP's innovative activities. It is envisioned that the U.S. organization could serve primarily as a technical resource. Technical assistance

would occur primarily through a series of site-visits. Ideally, the U.S. organization would have a resident facilitator. An Indian resident facilitator may be preferable to an American. The resident facilitator would require GOI approval, as would the overall technical assistance effort. The GOI should be contacted on this matter at an early date. Without a resident facilitator, a major operations research effort would be difficult, if not impossible.

There are a number of U.S. organizations that are active in operations research which have existing contracts with AID/W. Of these, the Population Council seems to be the leading candidate since it has a regional office in Bangkok and has the specific mandate to provide technical assistance to India and other Asian countries. However, the present contract has insufficient funds to mount a major initiative in India. There are sufficient resources to provide technical assistance for one, perhaps two, discrete studies.

There are several potential sources of funds to support a U.S. organization. The most immediate possibility is a FY 82 fallout. This will be explored in the immediate future. Central funds are insufficient for use on this activity. The suggested funding mechanism is through an existing Office of Population project, Operations Research 0632. Funds could be transferred to this project and, in turn, to an existing contract. This mechanism has been used often.

Concerning medical and operations research on a national scale, it is recommended that these activities be concentrated in the following research areas: safety, use-effectiveness, and acceptability of fertility

regulation technologies; and, service delivery system studies. The most appropriate use of funds from the Social Marketing project is for technological transfer. The transfer would be effected through a series of workshops, in-country training courses, international travel of Indian and American researchers, and long and short term training. The last item would be supported through the Mission's new project, "General Development Training."

An effective technological transfer requires a great deal of staff work by knowledgeable professionals. The logical lead agency in India is the Indian Council of Medical Research (ICMR). It is suggested that the ICMR should have an American counterpart since it is unlikely that USAID will have the ability to implement this program. It is estimated that around \$210,000 would be required by a U.S. organization to facilitate a meaningful technological transfer. The source of these funds is not known. There are several U.S. organizations that would be suitable for this activity.

In reviewing this paper, USAID should keep in mind the implications of the proposed actions on its staffing pattern. Even if there is a resident facilitator and a U.S. organization to assist in the technological transfer, additional USAID staff time would be required to monitor these efforts.