Nutrition Intervention in
Developing Countries

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Study VII
INTEGRATED NUTRITION AND PRIMARY HEALTH CARE PROGRAMS

Prepared by the Harvard Institute for International Development

Prepared for
Office of Nutrition
Development Support Bureau
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Development

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Study VII
INTEGRATED NUTRITION AND PRIMARY HEALTH CARE PROGRAMS

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FOREWORD

How do nutrition projects begin? How are specific interventions selected? Who makes the decisions and what is the rationale behind them?

Since such decisions relate to health or food policies of countries and have important implications for budgets, personnel and other resource allocations, it would be prudent that they be made only after careful study and analysis. Regrettably, this is not usually the case. More often than not, the choice is a subjective one.

Some interventions are undertaken because they seem "obvious." Since many others are doing it, it seems like the right thing to do, and there is unquestioned faith that it works. An approach may be fashionable at a given time period. A particular activity may be promoted by an external agency. There may be very attractive offers, such as free food or technical assistance, or a start-up grant.

To the degree that costs are considered, there is usually concern only with what funds are needed to cover immediate and direct costs. The indirect or hidden costs, which may be much greater, are overlooked. Project staff time may be charged to other budgets. The implications for an increased demand on energy or scarce materials may not be considered. There is a tendency to forget overhead costs such as those for the use of buildings or for heating, cooling, and lighting.

Social costs are even more often ignored. Some projects accelerate a change away from traditional practices such as breast-feeding or using natural foods or cultivating home gardens. A project may encourage a welfare mentality, reduce incentives to work, or create lasting demands for convenience foods where packaging and processing may forever raise the price of a food. Obsessed with political needs, decision makers may not be concerned with long-term consequences, such as the problem of terminating a popular service when it is no longer needed.

Too often these kinds of questions are not addressed, resulting in only marginal effectiveness for many projects. An apparently "good project" (that is, one which is scientifically sound, well organized, etc.), will bring disappointing results if it is aimed at a problem it is not designed to deal with. This in turn can lead to a dilemma of whether to continue a project while lacking confidence in it or to terminate it and admit failure. More often, projects go on and on without bringing results but without any objective evaluation or analysis.

Avoiding these problems requires accurate identification of problems, insightful analysis of causation, and a good understanding of interventions in terms of how they work, what they cost, what they achieve, what other consequences they bring, and what preconditions should be present before a particular intervention is selected.

To help deal with the question of intervention selection, the U.S. Agency for International Development commissioned Harvard University to prepare a series of Special Studies dealing with supplementary feeding, nutrition education, formulated foods, food fortification, consumer price subsidies, agricultural production, and integrated programs. Together the separate pieces comprise a manual intended to provide guidance on selecting from alternative approaches to reach the preschool child. We hope this effort contributes to improving the process of intervention selection, and thereby, to more effective prevention of malnutrition.

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PREFACE

This study on integrated nutrition and health care programs is the last of a series of studies examining the major types of nutrition programs operating in developing countries. There has been a growing recognition of the interrelatedness of the nutrition, health, sanitation, and population factors and the desirability of addressing the corresponding basic needs in a coordinated manner. The previous studies explored in detail the nature of "direct" nutrition interventions; a planner should have a thorough understanding of these individual approaches before trying to integrate them with other "indirect" nutrition interventions. This study examines salient considerations in taking such an integrated approach.

The purpose of this series is to provide guidance to planners in developing countries and international development agencies on the nature and design of these major types of nutrition interventions. The lack of knowledge about intervention design, costs, and effectiveness, was cited by the National Academy of Sciences in its 1976 World Food and Nutrition Study as a major impediment to efforts to reduce the malnutrition problem. Our work, which was carried out for the Office of Nutrition of the U.S. Agency for International Development, is an attempt to help close that knowledge gap.

We have tried to make a partial assessment of the "state of the art" of nutrition interventions through a review of published and unpublished literature, a mail survey of 200 nutrition projects in 64 developing countries, interviews with professionals from many disciplines and institutions involved in nutrition programming, and direct field analyses of selected nutrition programs. From these multiple sources and voluminous data, we have attempted to present a representative picture of each nutrition intervention. A commonly cited difficulty for planners, especially in developing countries, is ascertaining what is going on elsewhere and obtaining factual information on the many facets of designing a nutrition program. We have attempted to alleviate that problem by providing fairly complete, although not exhaustive, documentation and supporting references. Such attention to detail is needed when one is actually going through the intervention design process. However, not all readers will need to immerse themselves in this detail. To facilitate their use of the studies, we have preceded each subsection with a set of Key Questions that are addressed therein. At the end of each subsection we have presented a short Summary of the major points observed. Both the Questions and Summary sections are blocked off to facilitate the reader's scanning the document and identifying those parts which are of most interest to them.

Despite our efforts for completeness and our intense desire to provide useful guidance, the relative paucity of reliable evaluative data on nutrition programs and the limitations of this work leave us far short of the ideal. It has not been possible to verify the quality of the data or research designs presented in most of the literature we reviewed. Our

analyses and suggestions should be viewed as tentative, subject to further verification. It is hoped that these documents will facilitate such future evaluative efforts and that this study and the others in the series will at least provide a firmer foundation upon which others can build.

This study has benefited from the collaboration of many individuals. Carl Taylor reviewed the manuscript and provided many invaluable suggestions. The case studies in Ghana and Lesotho would not have been possible without the collaboration of the excellent staff of Synectics, Inc.; we are especially grateful to the President, Jim Altman, and Sally Munger and Nancy Pielemeier. The generous sharing of their data and field efforts is a tribute to their concern and cooperative spirit. We are also very appreciative of the valuable assistance of the various ministries and clinic personnel in Ghana and Lesotho. We also thank James Kocher of the Ford Foundation in India and the many health personnel involved in the programs described in Chapter 5; their cooperation in sharing their program experience represents an invaluable contribution to the international nutrition community.

The document was enhanced by the administrative assistance of Sara Hazel, Melanie Mahin, and many other members of the HIID staff. The financial and technical support of the AID Office of Nutrition was also essential, as was the original vision of Dr. Martin Forman whose guidance and support was critical to the realization of this study.

On behalf of my colleagues and co-authors, I express our deep appreciation for the efforts of all the individuals and institutions who gave so generously to this undertaking. It is our fervent hope that this collective effort will assist others in more effectively addressing the pressing problems of global malnutrition.

James E. Austin
Project Director
Cambridge, Massachusetts

CHAPTER ONE*

OVERVIEW

I. INTRODUCTION

The concept of delivering a combination of nutrition services, such as supplementary feeding and nutrition education, is well established, as is the concept of integrating health, nutrition, and/or family planning and of assigning these tasks to a variety of workers. The existence of supportive linkages between these activities, in theory and practice, and of important economies resulting from sharing resources provide a compelling rationale for their integration. Political priorities and limits on resources, particularly administrative and organizational resources, have hindered integration. Although attempts to provide integrated programs on a large-scale are only now beginning in a few countries and there is great concern about the difficulties and complexities of the integrated approach, this in no way implies that such efforts are inherently infeasible or unsuccessful. A number of relatively small-scale rural integrated nutritional health care programs, have reduced infant mortality rates by 50% in a few years, reduced the incidence of malnutrition, and greatly increased family planning acceptance rates, thereby suggesting that programs can have great impact and should encouraged (Gwatkin, Wilcox, Wray 1979). The organizational and economic advantages achieved by integration also recommend this approach.

II. PURPOSE AND ORGANIZATION

This study describes the main "linkages" underlying the concept of integration and discusses some important design considerations. We hope that this work will serve as a guide to planners in assessing and designing integrated interventions and that it will clarify and somewhat simplify the undertaking.

The remainder of this chapter defines integrated interventions and examines their rationale. Chapter Two discusses design considerations, and Chapter Three examines intervention evaluation. Chapter Four presents a case study which analyses the relative effectiveness of the various components and the cost of similar integrated preschool clinic programs in Ghana and Lesotho. A second case study is provided in Chapter Five which examines the organizational and administrative aspects of a group of village-level, integrated projects in the Indian State of Maharashtra. The case studies illustrate the complexity of implementing and evaluating integrated programs.

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*The first three chapters were prepared by David Pyle, Thomas Belding, Marion Zeitlin, Joe Wray, Richard Cash, and James Austin.

III. THE ROLE OF INTEGRATED INTERVENTIONS

A. KEY QUESTIONS

- What are desirable components of an integrated program?
- What is the rationale for integrated programs?
- How are limited resources to be shared?

B. Definition

For the purposes of this study, an integrated intervention is defined as an initiative that employs some combination of direct nutrition interventions[1] with health, family planning services, water supply, and sanitation activities [all of which WHO (1978) has grouped under the general term primary health care]. An integrated intervention focuses on two or more related goals and services in nutrition, health, and/or family planning. Integration can occur in various forms and degrees, but it must entail the intentional fusion or coordination of goods or services for a common target group. The integrated services may be provided by one or by separate organizations.

The term integrated has a more limited meaning in this volume than in its normal usage in integrated rural or community development programs. In rural devleopment terminology the term generally encompasses a broader range of economic and social service and community organization activities. Within such projects, however, the health-nutrition-related initiatives may still be considered as an internally cohesive unit. Our use of the term integrated should be considered to refer to this internal cluster of initiatives within the broader context of community development.

C. Rationale

Recent development efforts have emphasized the need to satisfy "basic needs" for all people in developing countries (ILO 1977; Sewell 1977; UNICEF 1977).

Five needs have been identified as basic: 1) adequate food and nutrition, 2) uncontaminated and accessible drinking water and adequate environmental sanitation, 3) basic health care, 4) adequate shelter, and 5) basic education (ul Haq 1977). More specifically, basic health care needs relate to the most common causes of the high levels of morbidity and mortality: gastroenteritis, respiratory diseases, and parasitic infestation, interacting with poor nutrition. In addition, high fertility and associated poor maternal health are important problems, clearly related to basic needs.

The increasing use of the Physical Quality of Life Index (PQLI) as a desirable indicator of development reflects an awareness of basic needs. The PQLI is based on levels of infant mortality, life expectancy, and literacy.[2] Programs discussed in this monograph that focus on the needs of infants and children have a potentially great effect on infant and child mortality. Deaths among the under-five age group normally comprise from 30% to 50%, in some cases as much as 75% to 80%, of all deaths in a developing country (Dag Hammarskjold Foundation 1975; Kocher and Cash 1977). Clearly, reducing this human loss must be a basic goal of any integrated program.

The argument for an integrated program, as opposed to categorical or vertical programs, arises from its potential for dealing more effectively with the high levels of morbidity, mortality, and fertility that are well recognized as the by-products of a mélange of undesirable conditions. The rationale for this approach emphasizes both the biological and social interrelatedness of health, nutrition, water/sanitation, and family planning and the organizational requirements. Unipurpose or vertical programs have been effective in dealing with such matters as smallpox vaccinations and malaria control. The objectives of such programs are clear. Few skills are required and these are simple to learn and carry out. However, in attempts to improve nutritional status, simple direct interventions have not always been effective. As a result, integrated schemes have been tried and have demonstrated that they offer a potentially more effective and efficient way to address problems of basic service delivery than do a series of categorical programs. They should be seen as central to a development strategy oriented toward meeting basic needs. Provision of primary nutrition and health care and related services is a means of promoting the well-being of rural people; their health status influences their ability to produce. Investment in low-cost, effective primary care may be considered an investment in national agricultural self-sufficieny, and the cornerstone upon which development can be built.

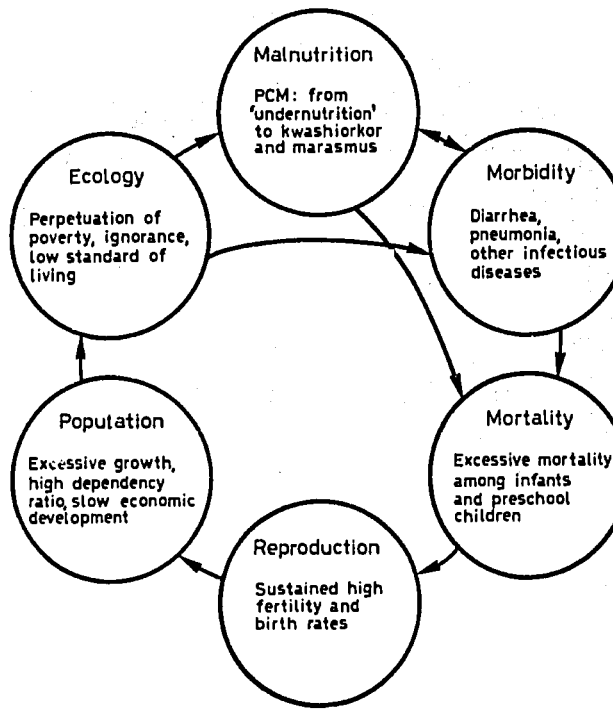
1. Biosocial Rationale for Integration

Health, nutritional status, and fertility are not independent variables or outcomes but rather the expressions of multiple interrelated social and biological causes. This statement, however, should not be interpreted as suggesting that in grouping issues one should ignore their individual significance. Alan Berg's The Nutrition Factor (1973) illustrates the point that nutritional issues are distinct from health issues. Both single and multifactorial concerns should determine program structure and function. Below a brief summary of the linkages between nutrition and health, family planning and water/sanitation is provided; a more complete discussion of sociobiological linkages underlying the integrated approach is provided in Appendix A. The material presented in the Appendix makes the interrelationships between the four elements of the integrated package abundantly clear and emphasizes the point that the chances for significant and long-term impact on the nutritional status of children are decreased as elements of the package are excluded. Figure 1 by Joe Wray presents one view of these sociobiological linkages.

FIGURE 1

THE MALNUTRITION-POPULATION EXPLOSION CYCLE:
A MODIFICATION OF McDERMOTT'S
"BASIC DEMOGRAPHIC-DISEASE PATTERN IN OVERLY TRADITIONAL SOCIETIES"

Will Better Nutrition Decrease Fertility?



The relationship between infection and nutrition as they relate to health care has been investigated in two widely quoted studies - one at the Institute for Nutrition of Central America and Panama (INCAP) in Guatemala, from 1959 to 1964 (Scrimshaw, Taylor, and Gordon 1967); the other at Narangwal in India, from 1967 to 1973 (Kielmann 1977; Parker et al. 1979; and Taylor et al. 1978). These studies and others reveal the adverse effect on health status caused by the interaction of nutrition and infection and suggest that addressing both needs is desirable and potentially synergistic.

The quantity and quality of water, its proper use, and hygiene appear to play important roles in determining the levels of infection and parasitic infestation that commonly affect the preschool child in developing countries and thereby influence their nutritional status. Diseases transmitted by human feces are probably the most widespread diseases in developing countries and a primary cause of death - particularly the infectious diarrheal diseases but also poliomyelitis and typhoid. Water-related diseases have been cited as the most common cause of mortality in the under-five age group and most prevalent in the zero to three age group (Zijl 1966; White, Bradley, and White 1972). Improved water supply and sanitation facilities have been shown to reduce diarrheal diseases (Schliessman 1959; Zijl 1966), which in turn permits nutritional improvement.

The provision of water-supply or related services outside the context of an integrated effort may limit their effectiveness (Stanley 1977). According to McGarry (1977):.

> If we are to speak of the importance of water supply, proper excreta disposal and hygiene, improvements to health and the need to implement such activities in the rural areas of developing countries, they must be viewed together as components of a "sanitation package." If each component is left to be implemented separately, the potential health benefits are seriously constrained if not totally lost.

Social and biological linkages also exist among nutrition, health, and fertility. Nutrition and health status appear to be important elements of the socioeconomic changes that influence motivation to limit family size. Though there is disagreement about the relative importance of either motivational factors or the availability and acceptability of the means of birth control (Knodel and Piampiti 1977), it seems indisputable that a close linkage gives weight to the proposition that delivery of family planning services should be accompanied by activities in health and nutrition. Widely recognized special cases such as Sri Lanka and Kerala, India, further indicate the importance of social programs for reductions in mortality and fertility rates in the absence of significant changes in per capita income. Notably, other factors such as age at marriage, immigration, emigration, and peer pressure have an important influence on rates of population growth (see, for example, Fernando 1976); and except for large increases in income, it is difficult to identify the most important factors. However, in countries where incomes are low, the availability of nutrition and health services seems a very important prerequisite for a lower birth rate.

Conversely, fertility affects nutrition and health status. Mortality rates among infants and children tend to increase with their mothers' parity. Children born after the third child may have considerably higher mortality rates than their older siblings (Wyon and Gordon 1971). Nutritional status of infants in developing countries frequently decreases with higher birth order and shorter birth intervals.

"Maternal and child health services are considered the basis for effective family planning efforts" (Rosa 1967). Similarly, a "family health" program instead of one focused primarily on family planning has been recommended (Omran 1971; Cassazza 1973). The United Nations Fund for Population Activities recognizes these linkages and has integrated projects in maternal health services, health education, and health manpower in at least one agreement with a government of a developing country (Fernando 1976).

2. Organizational Rationale for Integration

People and organizations generally choose to confront complex problems by breaking them into categorical components that are then addressed with categorical solutions. Such has been the case with most development assistance efforts - health, nutrition, fertility, and related topics being no exception. Despite the simplicity of the categorical or vertical program, there is a strong rationale for using multifaceted and inherently more complex and administratively more challenging approaches.

First, all objectives discussed herein require a degree of behavioral change. Relating and combining the delivery of services may facilitate attainment of this behavioral change, as adoption of one innovation in a package of services may imply the subsequent and continued adoption of others (Johnston 1977). Second, the target groups are usually the same in all cases: children under three years and pregnant and lactating women, primarily in the lowest socioeconomic groups. Delivering multiple services simultaneously may provide economies both for beneficiaries and for the delivery system. Integration of services can reduce the overlap that results when services are provided separately. Third, the same families are multiply disadvantaged. Need for one service usually implies need for the rest of the package.

Savings can also result from the use of integrated services, multipurpose workers, or teams. Under such conditions, it may be economically and managerially feasible to deliver services to a larger segment of the population than with separate programs. By combining services that were managed separately, an integrated program may permit economizing on scarce management resources as well as such things as facilities. Using multipurpose workers or a team may also increase the credibility of the program when associated with the introduction of a comprehensive package of services. However, the administrative demands of multiactivity programs may strain management capabilities and must be considered when implementing such an integrated scheme.

Thus, the basic rationale for integration lies in the biosocial linkages and organizational benefits that, if used to best advantage, should lead to increased effectiveness and greater efficiency, particularly under conditions of limited financial and personal resources.

A growing body of opinion in support of an integrated approach has arisen in the development field recently (FAO 1976; Johnston 1977; Mata 1977). Dr. Halfdan Mahler, Director-General of the World Health Organization, has stated (1976) that health care:

> should include the provision of potable water and an acceptable standard of waste disposal; the care of mother before, during, and after childbirth; family planning; infant and early childhood care; nutritional guidance to ensure the best use of available food; immunization against the major infectious diseases; prevention and control of locally endemic disease; elementary curative care of all age groups for disease and injury; and unsophisticated health propaganda aimed at promoting interest in health, awareness of potential benefits of essential health care, knowledge of whom to approach in order to benefit from it, and active involvement in the progressive improvement of this care.

Many uncertainties exist, however, indicating that integration offers no guarantee of these benefits. Many issues are unsettled, and we make no pretense of concreteness of position where hard evidence does not exist or is not generally accepted. What we hope to do in the subsequent chapters is to indicate linkages that are well supported in theory or fact and to suggest design considerations for an integrated approach.

Although the following chapters' discussion is presented largely from the nutrition perspective, this does not imply the preeminence of nutrition over concerns for health, water/sanitation, fertility, or related areas in integrated programs. Rather, it is done to indicate what linkages exist between these other areas and nutrition and how these linkages may be used for the joint benefit of all interventions. Priorities should reflect local needs.

D. SUMMARY:

THE ROLE OF INTEGRATED INTERVENTIONS

Integrated interventions described in this monograph address nutrition, health, water/sanitation, and fertility. Although integration may take many forms, it involves the intentional delivery of composite services.

Two general rationales exist for integrated programs. First are the biosocial linkages among nutritional status, infection, inadequate water supplies, unsanitary environment,

and fertility; addressing these simultaneously holds potential for achieving a synergistic effect on the target group's well-being. Second are the efficiencies that can be achieved through coordinated and shared organizational facilities, personnel, and services.

CHAPTER ONE FOOTNOTES

[1]Direct nutrition interventions include supplementary feeding, nutrition education, formulated foods, fortification, consumer subsidies, and agricultural productivity (see Studies I-VI in this series).

[2]PQLI is a composite index of a country's average life expectancy, infant mortality rate, and literacy rate (Sewell 1977). It thus gives an indication of the effectiveness of social services in a country and is expressed on a scale from 0 to 100. One can quickly see that because a country has a high annual per capita income (e.g., Saudi Arabia, with $4,480), it does not mean that the basic needs of its population have been met (PQLI of Saudi Arabia = 29). In contrast, India has only one thirtieth the per capita income (less than $150), while it has a higher PQLI (41). Sri Lanka, with a PQLI of 82 despite a per capita income of less than $150, is considered a social development "success," i.e., a package of social services has been provided which has allowed the population to enjoy some of the health and education benefits of the more developed countries (McLaughlin 1979).

CHAPTER TWO

INTERVENTION DESIGN

I. INTRODUCTION

The integrated program generally develops out of pre-existing programs, ideally consuming fewer resources than the previously independent elements while improving impacts. It is the result of reorganization and reorientation of ongoing activities. The more crucial aspects of its design and implementation apply to these processes.

To the extent that community-level programs are determined by government priorities, this approach must be initiated at the central government level. To the extent that local needs and resources determine program structure, development of the integrated approach can begin at the ground level. The union of local and national efforts is probably necessary for long-term success.

Our discussion will focus first on organizational issues. Most governments have or could readily obtain sufficient information on existing nutrition, health, water/sanitation, and family planning needs and resources within their countries to be able to make tentative decisions on whether or not an integrated approach should be considered. Our previous discussion of rationale, as well as Appendix A on biosocial linkages, may also be of assistance in this regard. Intervention design should result from careful assessment of the target group's needs, must be tailored to fit the cultural context, and should draw on community resources. Thus, in addition to organizational factors, we will discuss needs assessment, resource assessment, objective formation, personnel, services, facilities, supplies, and timing.

II. ORGANIZATION

A. KEY QUESTIONS

- To what extent and how should integrated programs be decentralized?
- What organizational structures are desirable at the national, regional, and community levels?

The organizational and management aspects of the integrated intervention have been given little attention by planners. Most of the integrated schemes that have been included in the HIID (Austin et al. 1978) and APHA (Karlin 1976) surveys are relatively small in scale (rarely covering over 100,000 population) and easier to manage. In these cases, policies are set by the local organization whose dedicated staff carries them out, thereby avoiding bureaucratic problems. At present, several countries such as India (Community Health Workers Program) and Colombia (Promotora Program) are attempting to implement integrated programs on a large scale; however, these schemes are in the formative stages and it is too soon to evaluate their impact.

A key organizational question is whether integrated programs can be developed on a national or regional level. Such programs require in many respects the same administrative structure as community development or integrated agricultural development efforts. Organizational and managerial problems have often limited the effectiveness of these schemes (Owens and Shaw 1972). The integrated health-nutrition model could suffer from the same problems. It would be most unfortunate for the approach to be disparaged because of poor or defective implementation rather than any inherent weakness in the concept itself.

In recent years, studies in rural development have emphasized the need for decentralization (Chambers 1974; Lele 1975). The typical top-down, vertically oriented hierarchical approach characterized by a large bureaucratic structure has been found to be unsatisfactory for the delivery of social services in the rural areas. With this in mind, we will consider organizational and managerial issues in terms of the roles and responsibilities of the central or national government, the regional level and the community.

B. National Level

Choice of an appropriate administrative body at the level of the national government depends largely on pre-existing conditions. Nonetheless, a changed strategy generally requires adjustments in organizational structure. It appears highly desirable that there exist or be created an entity within the central government bureaucracy that will have ultimate authority and responsibility for overseeing the development of integrated programs. However, simply forming an interministerial coordinating committee has generally proven to be insufficient. The organizational unit should not be subordinate to other parts of the bureaucracy that may have traditional jurisdiction over particular elements of the new integrated package. This unit should be at a higher level than its constituent elements, where it would be in a position to review their activities and make recommendations and/or decisions regarding priorities and implementation consistent with an integrated delivery. The unit must have strong leadership and leverage, both political and financial.

It would be unlikely for traditional categorically oriented individual ministries or departments of equal stature to relinquish their primary commitment to their respective special interests in favor of an integrated approach without such external incentives. With adequate leadership, however, consensus may occasionally be achieved among separate participating departments that an integrated approach is in their mutual best interest.

One suggestion is that limited reorganization of participating ministries/departments take place, resulting in the formation of a coordinating/controlling unit. Members of each contributing ministry/department could be selected to serve in this unit. These members should be chosen on the basis of experience and commitment to the integrated approach. Once selected, their primary obligation should be to the coordinating/controlling unit, retaining little or no active role in their former department.

In several instances interagency coordinating bodies have been established with representatives from the various institutions that must implement the program. In Colombia, the interinstitutional planning and coordination of the national integrated Food and Nutrition Program was under the direction of the National Planning Department.

Because it is already responsible, in most cases, for nutrition and family planning matters and because health is the most commonly cited justification for investing in rural water supplies (Saunders and Warford 1976), the Ministry of Health may be best suited to be the primary administrator of the integrated program. Other potential advantages of using it are established staff networks, staff recruitment and training programs, and political relationships (Johnston and Meyer 1977). However, the low priority usually given to health and the ministry's typically low level of effectiveness and predominantly curative/medical attitude are disadvantages that must be seriously weighed. Furthermore, the Ministry of Health could not deal with the agricultural dimension of integrated nutrition efforts. Nonetheless, broadening of the Ministry of Health to include water engineers and agronomists can do a great deal to change its image from a doctor-only institution. Of course, the Ministry of Health should not and usually cannot take over the roles of the Ministries of Agriculture or Water Resources. The point is, however, that it must learn to coordinate with other ministries that have common interests. One essential element if the integrated approach is to operate effectively is that health be viewed in its broader context and not just as medicine.

The principal role of the ministry at the national level is policy making. China provides us with a vivid example of what an efficient, effective central office might look like. The ministry in Peking is reported to have less than 200 people (Wray 1975). Policy decisions are relayed to and implemented at the local level according to local resources and capabilities. Effective decentralization, however, is not easy to achieve. Migdal (1977) has pointed out that to accomplish it, there must be a strong, capable, well-motivated government at the center. Lack of effective institutions in many developing countries could restrict their

ability to carry out such a policy successfully. As Huntington (1968) states, it is not the form of government but the "degree of government" that matters. It is difficult to delegate authority if little exists in the first place.

Groups which might participate in the integrated program could be as divergent as the military (for transport and supplies), the Ministries of Planning and Agriculture, and regional or local community development organizations. If medical colleges or nutrition institutes exist, they may also be included so that their research efforts can be directed to support the integrated program. Voluntary agencies with integrated programs of their own may be invited to participate in an advisory committee as a reality check as well as to add field experience.

Within the Ministry of Health itself, there exists an equally important need for collaboration and joint effort. Various categorical programs in the ministry - malaria control, family planning, smallpox eradication, and tuberculosis control - usually operate independently. To avoid overlap and wasteage of scarce resources (human, material, and financial), their efforts must be combined as much as possible. The provision of water can also present problems because government agencies frequently have overlapping responsibilities and specific tasks are well defined.

Whatever coordinating mechanism is used, to be effective it must have strong presidential support and budgetary power in order to elicit effectively the integration and coordination of other government entities.

C. Regional Level

Although less directly related to either the policy-making responsibilities or the delivery of services to the target group, the intermediate level is vitally important to the success of an integrated program. It is here that the top-down (policy) and the bottom-up (feedback) flows meet and must be managed (Korten 1977a). It is at this level that the institutional weakness that has been blamed for the failure of rural water supplies (Sanders and Warford 1976) and health services delivery can be remedied.

The Philippines integrated nutrition effort provides an interesting example of how the regional level might be utilized. The policy to improve the nutritional status of children has received strong support from the highest level of the government in Manila. Through the regional and provincial levels, the mayors have been made responsible for accomplishing this in the area under their jurisdiction. Having been provided with some tools and suggestions on procedures, the mayor is given a large degree of freedom on how the local program is designed and supported. Government facilities and personnel controlled by the mayors can be used as they see fit or as required to bring about nutritional impact. Vertical links with the central government are thereby "horizontalized," that is, sectoral or ministerial boundaries are broken down and efforts are combined (FAO 1977). This should be made a part of or complementary to other important development activities.

An important role of the intermediate level is to support and monitor the community-level efforts. Without this, the community worker is isolated and unable to perform his/her duties effectively. It is at the middle level that technical expertise and supplies must be available. One potential problem is the shortage of qualified management personnel to staff this level, which would be expected to grow as the central level decreases. In response to this problem India, in a new village-level integrated program, has transformed vertical program workers (e.g., sanitary inspectors, smallpox vaccinators, malaria workers) into multipurpose workers. These health workers are retrained and then assigned a number of community health workers to supervise on a regular schedule. Among potential problems are reluctance of the respective departments to relinquish control of their personnel as well as different training backgrounds and salary levels among the various workers. Training, promotion through the ranks, and shifts of some personnel from central to intermediate levels are possible means of making more qualified individuals available to fill these roles. How available personnel are managed may be more important than what formal training they have (Chambers 1974).

Doctors at primary health centers have been found to be notoriously bad managers (Antia undated). Considering their training and interests, one can easily understand why this is so. A greater role for administrators, community organizers, and social workers seem to be called for. How the intermediate-level worker interacts with the village-level ("contact") worker is also extremely vital to the success of an integrated scheme. The "team" approach is to be encouraged, and the idea that the health worker is to guide and educate his low-level colleague instead of disciplining him or her is to be stressed.

Delegation of responsibility and authority to this level greatly reduces the "distance" (both cultural and physical) that inhibits central government planning and administration. It also decreases dependence on the already overburdened national level and more evenly distributes responsibility.

Experience shows that large programs have to spend more time serving the population and do not have the opportunity to concern themselves with the quality of service they provide (Karlin 1976). What appears necessary is for the government to coordinate relatively small decentralized operations that are allowed to continue functioning as semi-independent entities.

Governments in developing countries often must profess and attempt to deliver a high standard of medical care. However, usually the bulk of money is expended on facilities and specialized equipment that achieve a very limited impact. If the same amount were spent on providing adequate services on priority problems to the entire population, greater results might be demonstrated. No one could criticize this as "second class" care, as at present the bulk of the people are not receiving any health care from the government.

D. Community Level

WHO defines community participation in primary health care as:

> The process by which individuals and families assume responsibility for their own health and welfare and for those of the community, and develop the capacity to contribute to their and the community's development (WHO 1978).

The WHO report goes on to say:

> They therefore need to realize that they are not obliged to accept conventional solutions that are unsuitable but can improvise and innovate to find solutions that are suitable. They have to acquire the capacity to appraise a situation, weigh the various possibilities and estimate what their own contribution can be. While the community must be willing to learn, the health system is responsible for explaining and advising and for providing clear information about the favorable and adverse consequences of the interventions being proposed, as well as their relative costs.

Under the integrated approach, the community takes a much more active part. It is no longer the passive participant in the development process or the unappreciative recipient of inappropriate assistance frequently misunderstood or unexplained. Cohen and Uphoff (1977) have written on the role of community participation in rural development. Their ideas can constructively be applied to the integrated approach discussed here. The community, in fact, is so important to the success of the integrated approach that the traditional order of discussion with the national level preceding the community level might well be reversed.

Community groups, particularly one like a health committee, can be very helpful in reinforcing the connection between the components of the integrated package and ensuring that the services of the scheme are provided and maintained. The Indian case study demonstrates the importance of such community participation. In the initial phase, this group could help identify the needs, resources, and attitudes of the villagers to permit the most suitable program to be designed. Moreover, they can mobilize the community to assist in the construction or financing of facilities required by the program, e.g., clinic, water storage tank, well, community garden. The committee could also be responsible for enforcing payment of any fees charged to cover operating expenses. Experience in areas as different as China and the South Indian state of Kerala suggests that programs are more successful when the people themselves are involved in building and running the system, with responsibilities specifically allotted to particular people and groups (Ward 1977).

Another key vehicle for community participation is village-level workers. Past efforts to deliver integrated services through village workers have typically been well funded, small in scale and run by voluntary agencies. They are staffed with dedicated, conscientious workers under good

management. The schemes work as a segment of a decentralized program, having an action/results orientation with the flexibility to respond to local needs and conditions (Field 1976).

Korten (1977b) makes a useful distinction between the traditional procedure-oriented approach to social service delivery and the results-oriented approach. They may be distinguished as follows:

	Results-Oriented	Procedure-Oriented
Targets/Feedback	Outcomes	Activities
Supervision	Supportive	Disciplinary
Training	Problem-Solving	Routine
Organization	Team	Specialists

The success of an integrated program depends heavily on the health team's having a results orientation. In regard to success, the community-level workers are especially important.

It is generally agreed that village-level workers should not be regular government employees, subject to bureaucratic regulations (Joseph 1977). The responsibility for hiring and firing should lie at least in part with the community. The community health workers in Peru, for instance, are elected by the villagers and their jobs renewed annually based on satisfactory job performance (Harrison 1977). Systems of selection and accountability never are totally free of bias. However, being outside the government means village workers are more accountable to the community as well as the government, which increases the responsiveness of both the workers and the clientele.

In most cases, the community will not take an interest unless specific efforts are taken to make people aware of their roles and responsibilities. This is most effectively done by someone with a community organization or development background who is familiar with such things as community structure and dynamics, communications theory, etc. Such areas must be approached scientifically and are not something in which a doctor or health staff person is or should be expected to be qualified without prior training. For this reason health field workers of all levels from the doctor to the IW can greatly benefit from training seminars or workshops in methods for motivating community action.

Success has also been achieved by forming affinity groups like mothers' clubs. Such local organizations give the women a chance to learn and reinforce favorable behavior patterns (diet, child care, hygiene, family planning) while also serving social and economic functions. It may replace meeting at the village well or at the river to wash clothes as the most important opportunity for social interaction for the village women. Peer pressure can be exerted on reluctant mothers to improve practices that affect their children's growth and development. Several studies have pointed out the potential economic contribution of women's groups; their income gives them status within the family and a degree of independence which can greatly improve their position (Development Alternatives 1974; Parker and Taylor 1977; and Korten and Young 1977).

The more groups and people involved with the program (e.g., health committee, women's club, school teacher, government health service), the greater the chances are that the program will benefit from multiple sources of support. If one group or sector falters, there is another one to step in so that the scheme is never left without a strong backing. On the other hand, conflicts and rivalries between groups might arise. Nonetheless, in general, the greater the community's involvement and participation, the more chances the program has of succeeding (UNICEF-WHO 1977). Furthermore, the community must work together if the synergies of the integrated approach are to be realized. It does little good if only 10% or even 50% of the villages build and use latrines or if only part of the garbage is buried. The village must ensure that those most in need (the vulnerable sectors and the lowest 20% economically) receive priority treatment. Efforts must be extended to the most underprivileged since, because of social traditions, economic conditions, and lack of knowledge, they are the least likely to participate in such a program without extra encouragement or incentive.

Local support can also have positive financial implications. The smaller programs (such as Jamkhed) have been successful in eliciting support from the villagers in the form of fees, labor, all or part of the village worker's salary, and the provision of supplementary food, drugs, or equipment. Not only does such involvement increase the interest and commitment of the villagers to the program, but it can also reduce the burden on the national budget, thereby permitting broader coverage.

If successful, the program should serve as a catalyst, an agent of change. The local population becomes more self-sufficient and self-reliant, while at the same time recognizing what demands it can reasonably make upon the government. Although still heavily reliant/dependent on information, guidance, instructions, and support from above, they should have a greater ability to guide their destinies in the direction they feel most appropriate. It is difficult for the governmental authorities, with their long tradition of paternalistic outlook, to adjust their behavior so as to support such community efforts.

E. SUMMARY:

ORGANIZATION

Implementing an integrated strategy generally requires adjustments in organizational structures at the national, regional, and community levels. At the national level it is desirable to create an entity that has ultimate authority and responsibility for overseeing the development and operation of the integrated program. This entity must be more than an interministerial coordinating committee. It must have presidential political support, strong leadership, and budgetary authority in order to exercise adequate leverage over the other bureaucracies charged with program

implementation. Ministries of Health appear to be logical candidates to be the lead implementing organization. However, the low priority generally given to health, the dominance of curative attitudes, and the frequently weak administrative capacities are disadvantages.

The regional-level structure is important because it is the institutional linking point between the national policies and the local operations. A dependable supply of technical services and supplies is needed at this level to support and monitor the community-level workers. Greater effectiveness and efficiency appear possible when considerable freedom and responsibility is given to regional officials for shaping and carrying out the programs in their areas.

At the community level the key organizational theme is "participation." Community groups, such as health committees, can identify needs, mobilize resources, and operate services. Involving multiple groups broadens support. The social service delivery system should be results-oriented rather than procedure-oriented. Village-level workers from the community are a central part of the organizational structure at the local level.

III. NEEDS, RESOURCES, AND OBJECTIVES

A. KEY QUESTIONS

- How can one ascertain diagnosed and felt needs?
- What local resources can be mobilized to support integrated programs?
- What program objectives should be set?

B. Needs Assessment

Need for services exists at the local level. All programs, whether centralized or decentralized, should have as an integral part of their organization communication links and an information-gathering system that will insure that programs are designed on the basis of recognized need. Specific requirements for meeting basic needs may vary throughout the country and will change over time. Thus, there should be open interaction between the local and national levels and between program recipients and program administrators. Further, needs assessment is critical for the formation of goals used for planning purposes. The more accurate the information on needs is, the more reliably objectives can be set and progress toward objectives be measured.

Two primary types of need will be considered: diagnosed needs and felt needs. These should both be assessed and used jointly in program development.

1. Diagnosed Need

The first step in designing an integrated program is to gather basic demographic and epidemiological data on the magnitude and distribution of needs in the intervention area. Indeed, the ultimate target group may not be clearly identified before such information is gathered. A census of the population may serve part of this function. However, national census statistics may not be reliable for localities; and where resources are available, it is recommended that at least sample surveys be conducted. Censuses may be conducted by a village-level worker assigned to each group of one hundred to two hundred families. This can give the worker a chance to meet and talk informally with each family in his/her area. It is suggested that the worker draw a rough map of the zone with each house numbered and located. During the initial visit, the worker must note the number of people in the family and their ages, giving particular attention to those members in the vulnerable category.

It is not too much of an exaggeration to use the term "keystone of the integrated program" when referring to the weight chart. The chart, which is described in great detail in the two studies, Nutrition Education and Supplementary Feeding, provides a means to assess needs, and serves other functions such as monitoring, education, and evaluation. The chart is widely used and is discussed in a number of publications (e.g., Wray 1970; USAID 1971; Morley 1973). WHO (1978) has reviewed worldwide experience and provided a standardized format (see Appendix C). Because of the importance of growth charts to the integrated intervention design and operation, we will discuss briefly their use and function.

A standard weight chart contains the following information:

- identification and registration
- birth date and weight
- chronological age
- weight measurements
- history of sibling health
- immunization record
- infant feeding guideline
- child spacing practices

While Appendix C demonstrates only one chart, WHO recommends that two be used: the one shown in the appendix should be retained by the mother so that she can follow the development of her child; another should be kept by the village- or intermediate-level health worker. The only difference between the two charts is that the latter is broken down to show the four levels of malnutrition (normal, first, second, and third degree). The standards used can be international ones (e.g., Harvard, NCHW) or locally derived ones. The former is recommended since research has shown that if children receive proper nutrient intake, their development

is the same or as close to that of children in the developed world. Some charts include a graph for recording height for age, but we feel that the extra time and expense for equipment makes this less important. Height for age is a more relevant indicator of development for children over three and since primary concern must be focused on the under-three group, we recommend concentrating efforts on collecting weights.

Several factors in the use of weight charts must be considered. First, people complain that low-level health workers have trouble maintaining them. WHO (1978) did not find this to be the case provided good training as well as constant supervision are available. Although it certainly is not easy for mothers to grasp the meaning of the charts, experience shows (e.g., Gopaldas et al. 1975) that with intensive educational efforts they do come to understand the significance of upward and downward sloping curves. Another danger is that often the exercise becomes more important than the information it contains. The weight taking and recording become an end in themselves. The weight charts are of little or no value unless they are interpreted regularly and are used to identify those requiring special attention.

It is possible for a program to rectify this problem by having one person take the weights and record them on the chart while a second person is counseling those found deficient in proper nutrition habits. Although this division of labor may be required in a clinic situation where large numbers are handled, if an IW is responsible for a limited number of families s/he should be able to do both functions. But proper supervision must be maintained to ensure that the vital screening function is not lost.

The growth charts also provide an easy and efficient means of built-in evaluation. Each month, for instance, the number of cases in each degree of malnutrition can be recorded, enabling the program director to see what impact the intervention is having. Finally, the problem of lost cards has been found to be in the vicinity of 5% (WHO 1978), more in the home cards. While the loss problem is not great, it is another reason that the maintenance of two cards is recommended.

It is by means of the weight chart that the village worker monitors the growth and development of the children from birth through the most vulnerable age, even up to the age of five. Periodic weighings charted in the graph indicate how the child is progressing compared to the norm and what, if any, additional assistance is required. Monthly weighing is considered preferable so that sudden setbacks can be noted and remedial action begun as soon as possible. The weighing schedule, however, can be varied by age and by nutritional status. Infants and young children from birth to three years should be given priority and weighed every month; and if children over three years are included, every three months is sufficient. From a nutritional point of view, however, it is equally appropriate to use nutritional status as a determining factor: all children with third-degree malnutrition (Gomez) and below might be weighed every week; second degree, every two weeks; first degree, every month; and normal, every two months. This permits the workers to concentrate their time on those in greatest danger, while allowing them to maintain surveillance over all the children in the community.

Assuming a worker covers 200 families of approximately 2,000 people, s/he will have as many as 120 children under three years of age. The worker will be busy, but the load will be manageable if s/he is able to identify those who are "at risk" and pay particular attention to them. As many as 13 "at risk" factors have been identified; the most important ones are low birth weight, lack of weight gain, multiple birth, high parity, breast-feeding failure, serious infection, or childhood disease (Morley, Bicknell, and Woodland 1968; Cutting 1971; Ghosh, Mohan, and Talib 1977; Shah et al. 1976). According to Shah (1976), 85% of the under-sixes that died in a project area showed one or more of the following "at risk" indicators:

- weighs 65% of the Harvard Standard or less
- fails to gain weight for three successive months
- loses weight for two successive months
- weights less than 2.5 kg at birth
- has illness such as measles or acute gastroenteritis.

Although the "at-risk" group represented only 2.1% of the total population, it accounted for 21.5% of the total deaths.

Those not "at risk" need only be weighed every month or two and be given the normal preventive (e.g., immunization) routine. In most places during most of the year, less than 50 children will require special attention, more intensive education for the mother, supplementary foods, medicine, and possibly even a visit to or by the nurse or, if serious enough, the doctor. During the hot season (low nutrient intake and high infection rate) and during drought, the number requiring concentrated effort might rise and the worker-provided services may have to be limited temporarily to the more pressing services such as supplementary feeding, oral rehydration, and vitamin A distribution; and some of the education duties may have to be delayed until the situation is stabilized. The intimate relationship between the worker and the target group enables him/her to adjust the service mix as circumstances warrant.

"At-risk" factors for pregnant women have also been delineated. Proper action before birth can reduce fetal wasteage and low birth weight infants, who are much more likely to suffer from severe malnutrition and to be among that group that never reaches its fifth birthday. Some of the factors alerting the village worker that a pregnant woman requires special attention are (Shah 1976):

- weights of 38 kg or less before pregnancy, or weight of 42 kg or less at 34th week of pregnancy
- severe palor
- weight of previous child less than 2 kg at birth

- swollen legs
- age of 35 years or more at time of pregnancy
- history of abortion or stillbirth
- current pregnancy with fifth or later child.

A mother's health card has been devised by Shah (1975) that records the mother's pregnancy history, menstrual cycle, attitudes toward family planning, weight during pregnancy, and postnatal observations. This card provides a relatively easy way to integrate services for expectant mothers.

The children's weight charts have proven to have an educational value. Project Poshak, as mentioned, found that virtually all the mothers understood the significance of the curves (Gopaldas et al. 1975). After being taught how to weigh the child and record the weight on the graph, mothers can, it is maintained, keep the chart themselves as long as scales are available (Rohde, Ismail, Sutrinso 1975). Market scales could be used for this purpose if no others are available. This enables mothers to monitor the growth of their own children.

Mothers can also be trained to use an even easier method - the tricolored arm-circumference strip. They took the strip home, after being instructed how to use it, and discovered a large portion of their children were in the red (malnourished) and needed help (Feferbaum 1978). This method has the advantage that it is virtually age-independent during the most vulnerable period of a child's development (12-36 months), as there is little change (from 16.0 cms. to 16.2 cms.) in the standard arm circumference (Shah 1974). The ability of illiterate village workers to use and maintain longitudinal records on growth charts utilizing the tricolored strip was successfully tested in Upper Volta (Study III, Formulated Foods). This could eliminate two difficulties commonly experienced with the weight charts: accurate determination of age and the availability of accurate scales. Circumference charts, however, remain less accurate and responsive than weight charts for recording positive growth achievement. Combined with the fact that the circumference charts are less useful as an educational tool, they should be used only when weighing scales can't be used because of unavailability or illiteracy. The tricolored tape method has also been used in India to identify undernourished pregnant women. Arm circumference below 21 cm. indicates severely malnourished; 21 to 23.5, moderately; and over 23.5, mildly undernourished (Tibrewala and Shah 1972).

It is important that the colors on all types of growth charts and circumference tapes correspond to the clientele's color symbolism. For example, in India red is not understood as danger but rather indicates healthy red blood, while yellow-orange represents jaundice, hence an unhealthy state (Gopaldas et al. 1975). In much of subSaharan Africa, however, red represents danger and white stands for good health. Proper development on a circumference chart is indicated by the measurement's falling regularly in the best color rather than by an upward curve. Because neither concept is innately understood by the mother and must be learned,

there is little difference, although color symbolism might be easier for minimally educated women (worker and target group) to grasp. Use of color, however, increases printing costs. To avoid such costs, different gradations of grey shading may be used instead of colors, as illustrated in Study II, Nutrition Education. Whichever method is utilized, the village worker will have an easier time changing the mother's behavior pattern once the mother is aware of the problem. It is often found that if the mother retains a copy of the chart, the educational impact is increased and the loss rate is negligible (Gopaldas et al. 1975).

Aggregated information on the status of the individual community members can be posed to increase community awareness and hopefully the spirit of the community in the program. Moreover, a list of the children identified as "at risk" can be provided to the village headman so that he might be aware of those in the village requiring special attention.

Because the workers are in constant contact with each home in the area at least once a month, they may be able, if literate, to keep vital statistics (births, deaths, and in/out migration). These figures can be useful not only to the program (to calculate birth rates, IMRs, etc.) but also to the national governments as a way to update their census data.

2. Felt Need

The integrated program relies heavily on community support and involvement for its success. A recommended entry point for the program is through working with community leaders and possibly the community itself to assess existing nutrition, health, water/sanitation, and family planning needs. Community perceptions of what are important problems may not be the same as those of external program design and implementation staff. It has been found that preschool malnutrition is generally not recognized as a community problem. Further, criteria for diagnosing needs just discussed reflect value judgments that, while important, may not coincide with local priorities. Thus, an externally initiated program must begin by investigating and addressing local felt needs as well as educating local people to the rationale for diagnosed need. Education may be called necessary. Finding a commonly recognized need may be a useful starting point for gaining acceptance.

Assessment of the felt needs is thus a process requiring that program staff be sensitive to local cultural issues. Sensitivity not only to the nutritional preferences of social groups, but also to their favored methods of interpersonal interaction, orientation toward the delivery of health and medical care, cultural awareness of the causes of ill-health and malnutrition, as well as the reasons for large family size or high parity of women, may all condition the effectiveness of any intervention. For instance, in a new water supply, taste may be more important than convenience or disease contamination, factors normally given priority by the "experts." Poor design resulting from a lack of awareness of, or an inability to coincide with, people's felt needs has been identified as the

most important factor leading to the high number of failures in rural water systems (Pacey 1977). To lessen the changes of such errors, designers should make a concerted effort to reduce the cultural and physical distance between themselves and those to be served. This issue will be considered further below, under "personnel."

A basic conflict arises in the fact that the preventive/promotive aspects of the intervention are given a high priority by the program designers while the highest priority of the villagers and village-level workers is almost always curative medicine. The planners are, therefore, put in a bind of either having to provide what the people want or what they "should have." Several programs have solved this apparent dilemma by having the IWs provide curative services first and once a base has been established, introduce the preventive and promotive aspects. The concept of prevention is not easy for all to grasp and only through constant educational efforts and demonstrations will an appreciation be gained.

C. Resource Assessment

Amid conditions that usually include severely limited central government resources, it becomes imperative that local programs encourage innovation in mobilizing and using local resources. An integrated program requires limited physical resources of its own and is best designed from a perspective which assumes that few such resources will be available.

An assessment of local resources will give consideration to all aspects of community structure and life that have potential relevance to the tasks at hand. This begins with a consideration of local people, their abilities and financial resources. Who are the influential and knowledgeable people who may be able to make useful suggestions for winning community support, for influencing community motivation, and for indicating village members with particular skills that may be of use? If it will be necessary to have manpower for construction of a primary water system or pit latrines, or to transport supplies, does it exist locally and if not can it be recruited from a neighboring area? The varied categories of workers to implement the integrated program are a key resource to be selected from the community. They will be discussed later.

Some of the most successful programs, as in Jamkhed, India (Arole and Arole 1975), and in Yako, Upper Volta (see case study in Study III, Formulated Foods), for example, have used the principle of matching funds to elicit proof of commitment of community resources before external inputs are provided. These inputs have been limited to necessary items, such as cement for wells, that are not available locally.

Traditional health practitioners should be considered as well. The vast majority of health aid dispensed in rural areas of developing countries historically came from traditional healers. Most babies are born with the assistance of traditional birth attendants. These people must not be alienated by the integrated effort but should be incorporated into it as much as possible. Conversely, because of their extensive

clientele, they can lend support and credibility to the scheme if they are included at least in a peripheral way. A large portion of their remedies either work or are harmless and should be encouraged. Only those that have negative repercussions (e.g., cutting the umbilical cord with a rusty knife and putting cow dung on the stump) need be discouraged (Morley 1973).

What financial or physical resources does a community have that could be put to use obtaining supplies? Could local people be called upon to pay in part or whole for services? The few facilities required for storage of supplies or delivery of services are probably available locally. Programs may not require independent facilities of their own. Health services best provided indoors could perhaps be provided in a local school or other public building. Perhaps it would be possible to have school classes conducted outdoors one morning a week so that the school could be used as a clinic. Building a specific facility for health, nutrition, and family planning services in the integrated program may not be cost effective. Very few services may require a local facility. Cases requiring more specialized care should in general be referred to regional health centers rather than use scarce local resources for the construction of generally unnecessary facilities. The village may be required to provide facilities. In Upper Volta, for example, villages must construct a health building before the primary care worker receives training.

An advantage of integrated as opposed to categorical approaches is that they are more widely relevant to the community's overall needs and therefore can serve as a basis for organization and play a primary role in community development. General support and participation by the community are very desirable objectives for program development staff, leading to an ultimate goal of self-reliance for all resources except those which cannot be provided locally, e.g., vaccines. This approach is recommended as a means by which a community-based program of potentially vital importance to community well-being can decrease dependence on outside sources of support. Government support may be very limited because of budget constraints and is ultimately tied to political priorities, which change over time and may not include community programs. Further, development from the ground up will have a greater chance of producing programs designed in a fashion consistent with the local culture and thus acceptable to the community.

What resources are needed and available at the regional and national levels? For the most part this question is moot, as the integrated approach is based not on the development of new services, but on the integration of existing services. While varying greatly in levels of effectiveness and in accessibility, there is almost universally some facility (e.g., health center) responsible for the health of a village. Family planning services are somewhat less common, especially in areas of the world (e.g., Middle East) where there is cultural/traditional reticence to controlling procreation. Environmental sanitation and water supply are available but are most often the responsibility of a ministry other than health. The separation of the technical aspects (e.g., design, drilling, construction) should be maintained while the health staff should assume more responsibility for such aspects as education, monitoring of

facilities, proper usage and storage of water, clorination, and possibly even spraying. Coordination between the health-related sanitation efforts and the technical operations of other ministries are most important at the national, regional and local levels if significant results are to be achieved.

Obviously when one or more of the services is not available, a resource search will be an important first step. Otherwise, planners and administrators should be considering ways of taking advantage of organizational linkages previously mentioned. This would involve an assessment of resources previously used for categorical programs and means for combining them to reduce overlap and exploit economics of scale. These conditions will largely depend on country and region-specific circumstances. In brief, the planner should be concerned not with how much more an integrated program will cost but with how much may be saved by exploiting its potential organizational linkages and tapping community resources.

Obviously a basic discussion such as this can only superficially consider these issues. Of critical importance is that the integrated approach be perceived as ultimately requiring fewer physical resources of its own than a group of categorical programs or achieving greater impact with the same resources. Success will be more dependent upon using an innovative approach, an open eye in searching for existing or unexploited resources and putting them to use in an integrated fashion. It may well be, however, that some desirable components for an integrated program have been neglected in existing activities and will have to be added, requiring additional resources.

D. Choice of Objectives

Assessment of needs and resources at both community and national levels should be tied into a process of formulating objectives. The process should be conducted in such a way as to present realistic program objectives that take into consideration existing conditions of needs and resources and provide measures of achievement for use in program evaluation. Ultimate goals may include the elimination of malnutrition, reduction of infant mortality to the standards of the developed world, and reduction of crude birth rates to acceptable levels. Intermediate objectives should be quite different from these. Short-term objectives should relate to operating and outcome measures discussed in the intervention evaluation section (Chapter Three); they should be realistic and measurable. In the integrated approach, an immediate objective could be the attainment of community support/government-political support. Specific to communities are goals such as reduction of the incidence of immunizable diseases following vaccination, reduction of cases of enteric infection following improvements in hygiene and sanitation, and reduction in the prevalence of severe malnutrition. The attainment of realistic short-term goals can serve as inspiration necessary for long-term achievement of ultimate goals. Related to this is prioritization of needs in relation to existing resources. Priorities must be established according to which factors are most responsible for the mortality and morbidity among the under-fives and according to the community's felt needs.

Morley (1973) has delineated criteria for building priorities in which the nutrition-related problems of a community are weighed according to their prevalence (frequency), seriousness (destructiveness), community concern (knowledge, attitudes, sense of urgency) and manageability. These four criteria have been disaggregated and extended by Joseph and Scheyer (1978) into eight factors: prevalence, impact on morbidity and mortality, technical feasibility of control, technical feasibility of program maintenance, probability of long-term success, cost of control and maintenance, economic development benefits, and community awareness and acceptance. Such an analysis is of tremendous value when trying to determine what the ingredients of an integrated program should be and how to derive the maximum effect from the limited resources available.

The integrated approach also allows for prioritizing among the target group. By screening out the most "at-risk" children and women, costly leakages in food and medicines and underutilized facilities and personnel are reduced to a minimum.

It should be pointed out that the priorities of a program can and should change as programs progress. This may result in cost reductions as some of the most common deficiencies (e.g., immunization backlog, number of malnourished children) are rectified.

E. SUMMARY:

NEEDS, RESOURCES, AND OBJECTIVES

Assessing community needs is an essential step in formulating appropriate policies and designing effective interventions. One should assess both diagnosed and felt needs. Diagnosed needs require the gathering of demographic and epidemiological data on the magnitude and distribution of needs in the intervention area. Village-level workers can be instrumental in the data collection process. Growth charts are a key data source in both ascertaining and monitoring nutritional status. They also can motivate mothers and serve as a focal point for the integrated program. Various nutritional risk factors for children and pregnant women have been identified and can be used to identify needy groups.

Community perceptions of the most important problems may differ from external perceptions. Assessing felt needs is essential to identifying those service areas around which the community can be most readily mobilized to ensure ongoing involvement and support.

The scarcity of national funds and the goal of community participation means that one should determine what local human, infrastructural, and economic resources are available to the integrated program. The more effective programs

appear to involve significant local contribution in cash or kind. Existing national and regional resources must be juxtaposed with the local resources to determine what additional inputs might be needed and whether existing resources could be used more economically.

The needs and resource assessments provide the basis for formulating program objectives. Long-term goals as well as short-term objectives should be set at the national, regional, and community levels. These should be realistic, measurable, and prioritized and have operational meaning to decision makers and beneficiaries.

IV. PERSONNEL

A. KEY QUESTIONS

- What personnel should be selected for the integrated programs? How should they be selected and by whom?
- What should their responsibilities be?
- How many staff should be engaged?
- What are the personnel needs at the intermediate level?
- How should the personnel be trained?

There are five main intervention design aspects surrounding the personnel dimension: selection, responsibilities, coverage, intermediate-level support, and training.

B. Selection

There seems little need to emphasize the benefits of using village-level workers as opposed to health professionals to provide the primary health care components of the integrated program It is well recognized that in developed as well as developing countries, M.D.'s are in general neither cost-effective for the delivery of primary services nor interested in remaining in rural service (Fendall 1975, Taylor et al. 1976). Some have expressed concern that primary care workers are not able to provide high quality care and may misuse medicines and cause other problems (Majekodunmi 1966). Such concerns seem moot, given the favorable experience of many developing countries with such workers, most notably China. From a comparative study on physician versus nonphysician delivery of primary care, results indicated that infant mortality could be halved and preschool mortality quartered by utilizing the nonphysician approach. An additional benefit is the reduced cost of nonphysician care, even if highly supervised, as compared to program costs using physicians' services

(PAHO 1973). Favorable results achieved by nonphysicians appear to occur in part because more lay workers can be afforded for the same cost and coverage is improved, but also because the lay workers have better communication with their communities and higher levels of commitment and accountability to the local power structure.

The generic term primary care workers (PCWs) includes a wide range of personnel such as feldsher, dai (midwife) community or village health worker, promatora, nurse practitioner, medex, medical assistant, physician assistant, clinical officer, health extension officer, health auxilliary, and others who perform primary services. The characteristics of primary care workers or workers enlisted to participate in integrated programs should vary by location. What is important is that personnel presently in use or in training be adapted to serve in an integrated context. This can be accomplished by adapting their orientation to the integrated approach. This may mean training them to perform a wider variety of functions or developing a closer coordination between the services they provide and the provision of other elements of the composite package by other categories of village-level workers. For the sake of convenience, we use the designation integrated worker (IW) to refer to all categories of village workers participating in the integrated program. This is done not to suggest a change in nomenclature but to emphasize an expanded role for primary human services personnel. As the conceptual analogue to "appropriate technology," the IW concept may be referred to as "appropriate personnel." It may apply not only to lowest-level personnel but also to technicians who could be trained to provide simple maintenance on water systems and sanitation facilities at the local level.

The IW not only has potential for providing essential outreach services but also may be more acceptable as a member of the community. This is generally referred to as "homophyly," defined by Rogers (1973) as the "degree to which a source-receiver pair is united in certain attitudes, life beliefs, education, social status, etc." This is thought to improve communications and thereby facilitate behavior change.

Repetto (1977) found in his study in Indonesia that homophyly alone is not sufficient to assure success. Variations in field-worker performance was explained more in terms of personality differences, with a high degree of extroversion and high affiliative need being personality factors that might be associated with good performance.

The objective of the integrated approach is to provide a basic level of nutrition/health-related services to the entire community rather than only sophisticated services to a few members of the community. Consequently the focus is on efficient population coverage. The services rendered are appropriate yet technologically simple; the personnel receive only the training required to correct the most common and important causes of high mortality and morbidity among the vulnerable groups in the developing world. This is not to imply that the services are ineffective or the personnel incapable. Rather the point is that the program is designed to have maximum impact in the most cost-efficient way. A hundred IWs serving their own communities with such services as surveillance, oral rehydration, and education can accomplish considerably more than one highly trained and

highly paid doctor stationed at a clinic serving those same 100 villages. Only after the first level of health and nutrition-related problems have been addressed can the more advanced technologies and personnel needs be considered.

How the IW is recruited is a fundamental concern. There is agreement that these workers should be functionally literate if possible so that they can maintain simple records and read simple instructions. It is also possible to use illiterate workers if some changes are made in the program. In some instances, the less-educated workers are found to work harder and to be more effective in what they do (Companiganj Health Project 1975). There is also a question of which sex is preferable for what tasks. Older women generally are preferred for midwifery. Middle-aged women with children may be preferable for nutrition and some or all health services. It may be advantageous to choose a younger woman when literacy among the older cohort is low. In a number of developing societies, women are very restricted in their activities. On the other hand, men operate most effectively with other men in the village, especially in regard to water systems and the like, but there may be cultural constraints to their discussing family planning with women (although they can be effective with men). They also are not appropriate for dealing with mothers on matters of pregnancy or infant/child care, which as we have seen are priorities in the integrated package. Men are also more employable and during peak employment seasons (e.g., harvest, planting) they are likely to leave the job, which can seriously interrupt a scheme (Ahmed 1977; Shah 1977). A possible solution is a man-and-woman team, each specializing in areas which are most appropriate. Or, as in Upper Volta, a man for primary care, a younger woman for nutrition services, and an older woman as midwife may work together. India plans to have a community health worker and a trained midwife for every 1,000 population by 1983.

Two important qualities for an IW are motivation and acceptability. They should be selected by a local group to ensure that there is mutual respect and cooperation. Efforts should be made to minimize patronage and to assure that the entire community is served regardless of religion, caste, ethnic origin, or economic status. It has been suggested that in order to reduce political problems the worker need not come from the immediate community in which s/he serves; in any case, the IW should, where possible, be from a village in the same area. Credibility is related to, but not synonymous with, acceptability. Because of the intimate relationship between IWs and the community, they must practice what they teach or their credibility will be destroyed. It is difficult, for instance, to convince anyone to limit the size of her family if the IW is pregnant with her sixth child!

Other people in the village can be recruited to assist the IW in delivering integrated services. The school teacher could help the local worker keep records. Even the IWs' children may lend a hand in this effort. It has also been suggested that mothers whose children are healthy, sometimes referred to as "positive deviants," be identified and asked to share their experiences and child-rearing practices with the rest of the community (Rohde 1977). Moreover, as discussed in the organization section, a local health committee comprised of village influentials should be formed to assist the IW in his/her work and facilitate local support.

C. Responsibilities

1. Outreach

Possibly the most important responsibility of the IW is to provide the outreach from the static clinic facility (e.g., health center) into the village. Experience has shown that people rarely use centers more than a few miles from their residence, even for curative purposes. Considering the priority of preventive and promotive aspects in the integrated approach, the outreach principle is vital to the success of the intervention.

The higher level facility is important for support, supervision and referral purposes, but can accomplish little unless an outreach program delivers services into the community. The accesibility and continuity of services as well as the increased trust and confidence inspired by the IW make impact possible. The vital link between the clinic and the user community assures greater utilization of services which are notoriously underutilized. If it is working properly, the clinic will be used more for the treatment of complicated illnesses - those which cannot be treated at the village-level by the IW or intermediate-level worker. The health service clientele should no longer be the few more privileged or more aware villagers but the entire community which has been brought under the umbrella of protection as a result of the outreach capacity of the IW. Experience has also demonstrated that a health-nutrition surveillance system, particularly of the vulnerable groups, allows for the identification and early detection of those "at risk" or most in need of service, thus increasing the cost-effectiveness of the intervention.

2. Needs Assessment

As mentioned, priority needs determine what services would be included in particular programs. Assessment of local needs may be a primary activity of the IW. It would be difficult if not impossible for a health, sanitation, or family planning worker at the district level to have the intimate contact with the village necessary to plan long-term and significant changes.

3. Liaison

As mentioned, integrated program development should include close communication links between the community and the regional and national levels. Local needs and activities must be effectively understood by regional and national offices for planning and coordination purposes; national priorities and the availability of federal resources must be made known to the regional and local levels. An IW may be selected from each area to serve as a liaison to the coordination/control unit, with the regional office possibly serving as intermediary. Regardless of the form this communication link eventually takes, it is imperative that one function allocated to the IW be interaction with the other parts of the system. Central planning ministries may have no better source of information concerning local needs and activities.

4. Education

Reviewing the problems of nutrition, health, water/sanitation, and family planning, we notice that education can play a major role in bringing about long-term behavioral changes. Education is an important element in this transition. The matter of nutrition education is covered extensively in Study II of this series. Educational endeavors are supported by program efforts (supplementary food, medicines, better quantity and quality of water, contraceptive availability) that will directly or indirectly improve the target group's nutrition and health status. Without an educational component, their impacts may be decreased. Combining the naturally interrelated topics into one educational effort delivered by a person from the community has obvious advantages. The IW is a trusted member of the community who is intimately familiar with the perceptions, beliefs, sensitivities and practices of the target population. Wor ers are able to communicate on an equal basis with the villagers while providing continuity, reinforcement, and follow-up on a day-to-day basis, elements often lacking in typical service delivery systems.

5. Health, Nutrition, Water/Sanitation, and Family Planning

Village workers may carry out several important functions. In health and nutrition, their principal responsibility is to maintain a surveillance of the vulnerable groups. Any illness or deficiency should be treated as soon as it becomes clinically apparent, and preventive care should be given to those at risk. Any problem beyond the IW's capabilities should, where feasible, be referred to the next higher level of assistance.

To facilitate the IW's task diagnostic flowcharts have been developed. In Tanzania flowcharts based on 60 commonly observed symptoms and signs seen in outpatient situations are used. Intermediate-level health workers, trained in the use of this method, are able to achieve well over 90% accuracy in diagnosing more than 200 common illnesses in a matter of minutes (Essex 1976). WHO has developed the technique further (for Guinea-Bissau and Sudan) where it has been adapted to fit the needs of individual countries (WHO Chronicle 1978a). A simpler variation specifically for low-level health workers concentrates on the most serious problems of maternal care and family planning (history of pregnancy, prenatal examination, prenatal treatment, labor and delivery, early and later post-partum, family planning) and under fives (diarrhea, mild and severe dehydration, cough, fever, nutrition, immunization) (Management Sciences for Health 1974).

IWs also have a valuable role to play in the water/sanitation field. The most common reason rural water systems fail to function is that no one maintains them properly. It is claimed that at any time, 60% of the 150,000 boreholes in India are inoperable because of pump breakdowns (New Internationalist 1975). In Afghanistan an estimated 80% of newly installed handpumps are out of commission within a year (Solter 1979). An appropriately designated village worker should play a role in performing or procuring preventive maintenance of such facilities. On a simple handpump, for instance, the hinge pins and sliding parts need regular greasing. In Malawi "barefoot engineers" have been given a three-week technical course on how to carry out such work (Jackson and PRP Team 1979). Another example of low-level maintenance personnel is found in Tamil Nadu state of Southern India where a network of trained "caretakers" cover 55,000 settlements.

Open wells also require attention. First, the head area of a well requires daily cleaning. The task of well chlorination could also be carried out regularly by a local worker, throughout the year or during the season of maximum infection. Regarding sanitation, this IW could promote the construction and usage of latrines as well as monitor their maintenance. Promoting the collection and proper disposal of garbage and animal feces could also be part of this worker's educational efforts to reduce nutritionally debilitating infections. The creation of community compost piles might be encouraged. Clearly, the person assigned to these tasks should not also be in charge of all primary health care or developing a weaning food; the worker quickly loses his/her effectiveness if overloaded.

In family planning, an IW could serve as the principal motivator and contraceptive supplier. The presence of a worker in the village and continual support and reinforcement may help to increase acceptance and reduce the contraceptive dropout rate. Family planning responsibilities should add little to the work of the village midwife, for example, as the fertile mothers (approximately 20% of the population) are in most cases the same persons the workers would contact regarding pregnancy, lactation, and child-care concerns.

6. Vital Statistics

There is a well-recognized lack of accurate data for such basic information as births, deaths, and migration. Being in regular contact with each home in the village, the IW is in an excellent position to collect accurate vital statistics. The intermediate level should use this data to compute such things as infant mortality and crude birth rates. Such information is extremely important at the national level to identify areas of special need and to plan or adjust interventions.

D. Coverage

The ratio of the lowest level of integrated service delivery personnel to target population should depend on a number of factors such as terrain, existing communications/ transportation, population density and responsibilities, worker capability, and support services. It is therefore impossible to state categorically what the ratio should be. In existing programs the ratio varies from one to approximately 500 up to one to nearly 5,000. Very generally, it is recommended that, conditions permitting, the ratio should be about one worker of each major category such as primary health care, nutrition, midwifery, and family planning, for example, per 1,000 people or 200 families (Pahlavi 1976). Some feel that a village worker cannot cover more than 100 families efficiently (Berggren 1977). The appropriateness of the workload should be monitored periodically to ensure that the IWs are not overextended. Part-time volunteer workers may cover only their immediate neighborhoods, whereas full-time workers can

What appears to be required is an exercise whereby each program is able to determine the IW-population ratio at which the efficiency of the IWs decreases. This will necessarily vary from program to program, even within programs and, possibly, between workers. To our knowledge no research efforts have addressed this question. It is an important area in which more specific research is needed and recommendations and guidelines should be formulated.

In several countries like China (Sidel 1973), the Philippines (Solon 1973), and Thailand (Lampang Project 1975), there are smaller neighbor units of 10 to 20 families under people referred to as group leaders, unit leaders, and health communicators, respectively. These can often be volunteers who provide few services but serve as an intimate link between the health personnel and the community.

E. Intermediate-Level Support

There are likely to be several people at the intermediate level who have specific responsibilities that correspond to separate components of the integrated package. Each person provides technical back-up for the corresponding IW as well as support in the form of supplies, instruction, and encouragement. The community worker, who has a relatively low level of expertise, will depend a great deal on the advice and professional knowledge of the next higher echelon, be it in water systems, sanitation problems, or medical matters. To be effective, therefore, higher-level technicians should have managerial and administrative skills to ensure that village workers are functioning properly and effectively. Moreover, the representatives of the various components must work together at this level so that the integrated effort is efficient and effective. The "team" approach is required. Such coordinated support systems have not been well developed because they require a degree of interorganizational and intraorganizational integration not present in the traditional vertically structured programs.

High-level professionals such as physicians may play various professional and administrative roles in rural areas and are usually at least nominally in charge. However, doctors have been identified in some instances as a major barrier to effective village-level integrated programming (Antia 1977; Rohde 1977). Reorientation of the professional staff in such cases is a necessary objective. The IW can at times be effective in gradually changing the system from the bottom up by making the doctors more aware of problems in the villages.

F. Training

Without proper training, the village workers will be unable to carry out their responsibilities effectively. Similarly, doctors, intermediate health level personnel and administrators must be trained to train, supervise and administer the IW team. Before even the design and objectives of the training program can be drawn up, however, the role of the

village worker must be defined. The curriculum of the training program will naturally vary according to the most urgent needs, capabilities, and resources of the scheme. Nonetheless, several factors apply to most training programs.

The instruction should put primary emphasis on the practical aspects, with only a minimal amount of theory. WHO (1974 and 1979) has published useful manuals on the training of village health workers that include many of the components discussed in this chapter. Village workers like everyone else, are able to learn and retain much better if the lessons are conducted in a real-world environment. On-the-job training after a few days of general instruction has been found most successful. Others have used a task-by-task approach whereby the IWs are taught one simple task to begin with; once they have mastered it, another task is given to them until they are able to carry out all the duties required. The work should, as much as possible, be routinized or systematized to reduce the need for personal judgments on the part of the IW and to standardize performance.

The material taught in the training course should be action-oriented and highly directive. Rohde (1977) gives several examples. The IW should be told to instruct the mother to eat an extra handful of rice a day when she is pregnant. This will cover the additional calorie requirement. Rohde estimates that such a simple lesson, if followed, could reduce the prevalence of LBW by 50% and neonatal mortality by about 30%, with an even greater reduction in infant malnutrition. Another example, this one to accelerate the recovery of pre-infection weight in children, is to have the IW tell the mother to feed a child what he has missed when he was sick, i.e., double the normal calorie intake for a period roughly equal to the duration of illness. The messages are direct and easy to comprehend for the IW and the mothers, and the actions suggested are affordable.

The length of training varies from a few weeks to three or four months. A short period of intensive training followed by periodic retraining and refresher sessions is practical and effective. Learning, and thus training, in an integrated program as described here is a continuous process that never ends.

An appropriate place to begin the training is with what has been referred to as the demystification of medical technology (Mahler 1976). The village workers must be able to distinguish signs and symptoms to which they must react and must know in detail the steps they must take in each situation. It is essential that they know precisely what the limits of their capabilities are and how they fit into the referral system. Overtraining in any particular skill, be it health, water systems, or family planning, can throw the integrated program out of balance. It can also make the worker eligible for a position outside the community, promoting out-migration and resulting in a high turnover of community workers.

An important aspect of the training is how to interact with the target group and the community leaders. Because the success of the IWs depends on their contact with the families of the community, interpersonal

relationships may be more important than technical skills. Without the ability to approach and effectively communicate with the families, their knowledge will do them little good. By selecting the IWs from the community or having the community choose the IWs, one can enhance such rapport.

Several reasons favor the training of the IWs in or close to the area where they will be working. Because the programs are designed to deal with local problems, the village workers should be trained in the same environment in which they will be working. Training in a large capital city not only may be disruptive but may also lead to future ambitions to migrate to the city. It is also expensive. Finally, the IW often is unable or reluctant to leave home for any length of time, which would disrupt family life (Barrion 1975).

The intermediate as well as high echelons must also undergo training for the integrated program. As mentioned, a reorientation is required. Workers must learn their new roles and their responsibilities to the program, the community, and the new category of workers below them. In many cases this will be difficult given their background and prior training; it may even require efforts at changing basic value systems. It would be helpful if all the workers involved in the integrated scheme would attend some sessions jointly to learn how their jobs relate to one another and to emphasize the "team" concept of organization.

Finally, there must be careful evaluation of the training program so that changes can be made and the workers on all levels may be made more effective. Periodic meetings for all staff members to discuss common problems and their resolutions can be helpful to the workers and generate an esprit de corps. The meeting can be conducted at villages with particularly successful programs to give other workers a chance to see how and why some IWs are especially effective. This can produce a friendly and practical feeling of competition and cooperation among the workers.

G. SUMMARY:

PERSONNEL

The five main intervention design issues involving personnel concern selection, responsibilities, coverage, intermediate levels, and training.

Village-level integrated workers (IW) play a critical role in integrated programs. The IW should be selected from the local community to enhance rapport and used to provide basic, multiple services in the integrated package. The use of this level of personnel is necessary to avoid the costliness of professional medical personnel and to enable broader

health care coverage. Generally the IW should be literate. The sex and age of the worker will vary depending on the particular cultural setting and the nature of the integrated tasks. A combined male and female team is sometimes most appropriate.

The responsibilities of the IW will vary depending on local conditions, but likely tasks would include needs assessment, liaison, education, and direct health, nutrition, water/sanitation, and family planning services. Where the problem exceeds the IW's capabilities, it should be referred to the next higher level of assistance.

The ratio of IWs to clients will depend on factors such as terrain, transportation facilities, population density, and worker capabilities. A ratio of around one IW per 200 families has proven effective in several instances. Some countries have used smaller neighborhood units of 10 to 20 families working with volunteer group leaders who provide a few services and also act as the link to other health care providers.

The IW needs technical and supervisory support at the intermediate level for both training and referral as well as for the provision of necessary supplies. These technical and administrative support staff are often specialists in one of the components in the integrated package. Their effective functioning requires considerable inter- and intraorganizational coordination. Doctors and others may require special reorientation training to enable them to operate optimally within the integrated program structure.

Proper training of the IW is also essential to program effectiveness. Such training should emphasize practical aspects and can be best done on the job. Different skills can be taught sequentially, with mastery over one a prerequisite to adding the next. Tasks should be simplified and standardized. The duration of initial training varies from a few weeks to a few months, but periodic refresher courses are important to ensure IW capability and motivation.

V. SERVICE MIX

A. KEY QUESTIONS

- What are the key health service components that are most desirable for an integrated nutrition program?
- The key water and sanitation components?
- The family planning components?

Before an integrated scheme can be designed the options open to the program designer must be delineated. Depending on local health, nutrition, and family planning needs and available financial, physical, and personnel resources, a desirable mix of core services would be chosen from a list of potential candidates. We discuss here possible services for the health, water/sanitation, and family planning components of an integrated approach. The nature of direct nutrition interventions (supplementary feeding, nutrition education, formulated foods, fortification, consumer subsidies, and agriculture) are analyzed in the other studies in this series.

Services are discussed in terms of implementation considerations and potential impact on the nutritional status of the vulnerable sector. It should be noted that not all possible design problems involving the respective components are discussed; instead we have limited ourselves to the most frequent and/or those with the most serious impact on the vulnerable. For some readers the discussion of the component that is their specialty will be superficial. However, a common barrier to effective integration is a failure on the part of different specialists to understand the areas of other specialists. This section aims to provide a basic understanding of the mix of services in order to enhance communication and integration.

B. Health

A number of interventions available under what is normally thought of as health services can significantly improve the nutritional status of the under-three child. The approaches discussed here include rehydration, antiparasite measures, infection treatment, immunization, maternal services, education, and first aid.

The lowest-level health workers cannot and should not be expected to take care of more than basic prevention and promotional health matters. While it is essential for these people to know their limits, they should be able to make a rough diagnosis of the problem and, in any event, be able either to direct the ill person to a higher level of medical help or to

direct a doctor or nurse to the ill person. Health workers, especially in an integrated scheme such as described in this monograph must be able to refer people they are incapable of assisting to a higher level of expertise. Without this support, the IWs are isolated and unable to provide all the services that may be required. The referrals may or may not be for any of the following services if the illness is sufficiently serious or the IW's skills are too limited.

1. Rehydration

Because diarrhea is generally considered to be one of the most serious and common health/nutrition problems facing the vulnerable under-three age group, a rehydration component should be a basic requirement for all integrated programs. The recommended method of preventing and treating dehydration is oral rehydration therapy. By using glucose-electrolyte solution, it is possible to replace fecal losses of water and electrolytes and rapidly return the individual to a normal state of hydration.

Physical signs of dehydration usually occur after losses exceeding 5% of body weight. Up to this point, thirst may be the only manifestation. The ill child, however, frequently does not show signs of thirst. Symptoms and signs of dehydration develop rapidly over the 5% level-loss of elasticity of the skin, sunken eyes, severe thirst, dark yellow urine. As dehydration approaches 10% of body weight, the child is likely to go into shock and be close to death.

Health education may be required to teach mothers how to recognize diarrhea. Breast-fed children may normally continue to have more than three stools a day into the second year of life. Diarrhea may have to be defined by odor or watery quality. The treatment of diarrhea should begin as soon as frequent or loose stools are noticed and should not be delayed until dehydration becomes clinically apparent. Early action prevents symptoms such as vomiting, anorexia, and lethargy, that increase with increased dehydration and interfere with continued feeding. The treatment may be carried out at the community or even home level if started early in the diarrheal episode, while the two important homeostatic mechanisms of thirst and renal functions are still intact. If diarrhea is allowed to persist, the child may require intravenous rehydration, which must be done at a higher-level health facility under medical supervision.

The primary function of the therapy is not to terminate the diarrhea but to replace fluids and electrolytes. Oral rehydration can prevent severe dehydration and help maintain appetite (Hirschhorn et al. 1977). Fasting is not an appropriate way to reduce diarrhea. In fact, food should not be withheld. The only food that a child may not be able to take in large quantities is full-strength animal milk. Diluted or half-strength milk followed by a glucose-electrolyte treatment is recommended. Mother's milk, however, should always be continued during diarrhea. If diarrhea worsens, other protein foods such as egg, fish, or meat can be substituted for animal milk. Yogurt or soured milk is more digestible than fresh milk and is an excellent source of protein during diarrhea. Staple foods should be continued throughout the diarrheal episode.

The treatment itself is very simple. Packets of premixed glucose-electrolyte solution are sometimes available that need only to be mixed with the correct amount of uncontaminated water. But experience has found that low-level village health workers and even mothers can be taught to prepare the solution from four relatively easy-to-find ingredients and to administer it to children suffering from diarrhea (Rohde 1977). The ingredients and the proportions are as follows:

- one liter of water
- 20 gm glucose. 40 gm (8-10 level teaspoons) of table sugar (sucrose) may be substituted (twice the amount), but it is not as effective as glucose, especially in the more severe cases.
- 3.5 gms (1 tsp.) of table sale (sodium chloride)
- 2.5 gms baking soda (3/4 teaspoon)
- 1.5 gms potassium chloride (1/4 teaspoon).

Citrus fruits are a good source of potassium, and the juice can be added as a substitute if potassium chloride is not available. If the latter two ingredients are not available, one teaspoon of salt and four of table sugar can be added to 1/2 liter of water and produce a feasible rehydration mixture for mild diarrhea (Cameron and Hofvander 1971). Naik and Shah (1976) mention that a package of glucose-electrolyte solution in India is only 1.5 times the cost of preparing a half-strength sucrose-saline solution. A guideline that may be followed is that if the government decides to package an oral rehydration solution, glucose should be utilized because of its effectiveness and lower cost when bought in bulk. However, if local formulation (by IWs or mothers) is chosen to decrease logistical problems and improve response time to early treatment of diarrhea, then sucrose may be utilized. For a review of oral therapy see Cash (1979). WHO has developed guidelines for oral rehydration and is constantly updating them and therefore should be consulted (WHO 1976).

For small children, it is recommended that the solution be given in small quantities at first with a spoon or small cup. Small sips should be given every five to ten minutes to begin with, especially if the child is vomiting. In children able to drink, rehydration should take place as rapidly as possible. Gradually the solution can be reduced to hourly doses, but it should not be stopped until loose stools disappear. Thirst can be a general guide to how much and how often the child should be given the oral solution.

Medicines that decrease intestinal motility, like Lomotil, reduce the volume of the stool in some conditions and do not cure the underlying infection, and therefore their use does not affect mortality rates. In fact, they can increase the severity of certain types of enteric infections, e.g., shigellosis (DuPont and Hornick 1973). The use of these drugs may detract from the need for rehydration. However, they may reduce the child's pain and suffering.

The child with diarrhea frequently refuses food. However, feeding should be continued during the illness and increased after the episode because it takes days, even weeks, to recuperate from diarrheal attacks (Pierce and Hirschhorn 1977).

Rehydration is not only possible but facilitated in the community-based integrated approach. The nutrition and/or primary care worker is able to identify those requiring rehydration, begin treatment promptly, serve as a supply center for the solution ingredients, and educate the mother on why this is important, the need to continue feeding, and what hygiene/sanitation improvements could lessen the diarrheal infections.

2. Curative Treatment of Infection

Because of the interrelationship between nutrition and infection, attention must be given to how an integrated program should handle such problems. The purpose of discussing specific drugs and procedures in this and the following sections is not to produce an abbreviated treatment manual for the IW, but rather to provide simplified reference materials for those planners of integrated programs who are not medical doctors by background. Nor do we wish to educate specialists in their specialties but we want to attempt to provide sufficient background information concerning each component of the integrated intervention to allow nonspecialists to think intelligently about the whole package of components together and to critically review proposals for integrated programs.

In Java, paraprofessionals have been trained in mother-child health (MCH), nutrition, and the treatment of the common infectious diseases. Over 90% of all disease complaints are handled with only 10 medicines (Hendrata 1976; Suyadi, Sadjimin, and Rohde 1977). Again, using the principle of prioritization, a program designer is able to select from the 200 essential drugs listed by WHO (1977). A list of medicines that counteract the effects of the most prevalent and debilitating illnesses affecting the vulnerable and that can be utilized at the village level might resemble the following:

Diarrhea - packets of glucose electrolyte solution
or
baking soda and potassium chloride (to add to local sugar and salt)

Fever/Pain - aspirin

Infections - sulfanomides
penicillin/ampicillin

Worm Infestation - piperazine (round, pin, thread) - liquid form often easier especially for preschoolers.
thabendazole (hook)

Vitamin/Mineral Deficiencies - iron
folic acid
vitamin A
iodine

Malaria - pyremethamin (for pregnant women and preschoolers)
chloroquine (for fever)

Eye Infection - antibiotic eye ointment (tetracycline)

Skin Infection - 1% gentian violet (also for umbilical cord and stump)

Cough - cough medicines do little good but people expect them, therefore necessary to maintain credibility

The medicines should be locked up and out of reach of children; labeled with directions and date of expiration; and kept in a clean, dry, cool storage place (Werner 1977).

There are also some nondrug supplies and equipment that help the local worker carry out an integrated program:

Nutrition - weight/health charts in polyethylene envelope
scale

Contraceptive Kit - samples of pills, IUD, diaphragm, condom to demonstrate to villagers

First Aid - bandages
petroleum jelly
soap

Fever - thermometer

Immunization - cold boxes
dermojets

Delivery Kit - sterile razor blades
sterile tie for umbilical cord
gauze
tincture of iodine

Anemia - hemoglobinometer or recognition card

This list of medicines and supplies is neither inclusive nor exclusive. The needs of a particular location at a specific time must be determined on a case-by-case approach. Doctors often quite unnecessarily try to restrict the distribution of certain medicines by paraprofessionals. However, medicines that have wide safety margins of error and that will have a dramatic effect on the health/nutritional status of the vulnerables

should be made more widely available in rural areas. Because the number of doctors and even nurses is so limited, integrated programs should make use of low-level paraprofessionals who with the proper training, supervision, and experience can effectively use such medicines (Gish 1975).

In Upper Volta, illiterate primary care workers dispense chloroquine phosphate for malaria, aspirin for headache and fever, and zinc sulphate for eye infections and use alcohol and sterile bandages to dress wounds. The pills are kept in different colored boxes and dispensed according to pictorial instructions that depict the purpose of each medicine and the amounts to be given to individuals of different ages. Records of the amounts of supplies dispensed also are kept pictorially.

Although excessive usage of medicines is not advocated, several of the drugs listed can be very effective against the common and more serious infections that often cause nutrition depletion in children. The least sophisticated form of "pain-killer" is aspirin, which can be used for simple low-grade fevers and inflammations. The next level of sophistication is sulfonamides, which are effective against some bacterial infections. They can cause allergic reactions, but they are effective against many urinary, ear, skin and, most importantly, respiratory infections. They must be administered along with generous amounts of fluids.

Antibiotics like penicillin can be given to preschoolers. If there is no improvement in the child's condition in a day or two, a doctor should be consulted. Penicillin can result in an allergic reaction (in the form of a rash). The most convenient way of administering penicillin is in pill form. The pill should be given an hour before meals to enable the body to make better use of the medicine. Pills may not be as effective as injections, however. Success of the pills depends on their being taken correctly. Because penicillin is one of the safest drugs, it is possible that with proper training and experience, an IW can administer the drug.

Ampicillin is a broad-spectrum variety of penicillin that can kill many more kinds of bacteria than other penicillins. It is also safer to use, especially for babies and small children. However, because it is expensive and can cause diarrhea, ampicillin should not be used when regular penicillin will suffice.

Tetracycline is a widely used broad-spectrum antibiotic that can combat a variety of infections and is relatively safe. Village health workers can be taught to administer the drug appropriately in selected cases.

Integrated programs (e.g., Narangwal) have demonstrated that IWs can be responsible for the distribution of medicines to control infections. The local worker has the advantage that s/he is in constant contact with all the families and can start treatment quickly while making sure that the sick child received the proper amount of food, either through supplementary rations or a better diet provided by the child's mother.

Of prime importance in treating infection is insuring that the child receives the proper food, both in quantity and quality, during and after an infection, be it a common respiratory ailment, measles, whooping cough, or pneumonia. A sufficient diet is the only way that the body can compensate for the drain of nutrients during the catabolic and anabolic phases of an infection. For example, breast feeding, which is often stopped at the onset of measles, should be continued throughout the period of illness. Supplementary food during this period of increased need is recommended. The intake of fluids must also be maintained or increased when the child is fighting an infection, especially if it is accompanied by a fever or diarrhea.

3. Immunization

Because of the negative nutritional impact of some of the common diseases which can be prevented by immunization (e.g., TB, whooping cough, measles), immunization is an important part of an integrated program.

It has been estimated that five million deaths occur each year because of the six common childhood diseases for which immunizations exist. In addition to the fatalities, a larger number of children are disabled by brain damage, paralysis, stunted growth, chronic lung illness, deafness, or blindness. Only approximately 10% of those born each year in developing countries are protected through immunization (Morley 1977).

It has been estimated that diseases preventable by more extensive immunization are responsible for up to 10% or more of the small-child mortality in most developing countries (McCord 1977). Percentages of deaths under five from diseases (some of which can be immunized against) derived from studies in Nigeria, India, Bangladesh, and Guatemala are shown in Table 1.

The effects of measles and whooping cough on nutritiional status are discussed in Appendix A. Other childhood infections include diphtheria and tuberculosis. Tuberculosis can have a particularly serious effect on children because it affects the bones and can cause hunchbacks and brain damage. The findings on the effectiveness of BCG against tuberculosis are contradictory. Polio causes paralysis and the resulting large number of withered limbs seen in the developing countries, infantile or neonatal tetanus is one of the most common causes of infant mortality.

Smallpox has essentially been eliminated and, for economic and health reasons that will be discussed later, WHO recommends that smallpox vaccinations no longer be given except in those few regions where final surveillance activities are being carried out.

The recommended schedule attempts to group the immunizations to make the effort as simple and cost-effective as possible. Proper scheduling can help decrease the high dropout rate that commonly occurs after the first round of immunization. Cockburn (1977) suggests the following schedule:

1st Visit (at 3 months) - BCG
1st DPT
1st Polio

TABLE 1

Deaths Under Five by Disease
(Percentage of Total Deaths)

	Imesia, Nigeria 1957	Narangwal India 1971-73*	Companiganj, Bangladesh 1975**	Guatamala 1956-57
Diarrheal Disease	12	39	27	18
Pneumonia	12	19	7	19
Malnutrition	12	5	31	20
Malaria	8	0	0	0
Diphtheria, Whooping Cough and Tetanus	8	2	4	7
Smallpox	5	0	0	0
Measles	8	1	2	?
Tuberculosis	5	0	1	?
Other, including Neonatal Deaths	30	34	29	37

Children aged 8 days to 3 years.
1975 was a famine year.

Source: McCord 1977.

2nd Visit (at 7 months) - 2nd DPT
2nd Polio
(Smallpox-if given)

3rd Visit (at 9-12 months) - 3rd DPT
Measles
3rd Polio

This schedule can be decreased to two visits by combining measles in the second visit and dropping the other two (PAHO 1970; Edsal 1977).

The time interval between injections can make a difference in their effectiveness. One study, for instance, showed that if two doses of tetanus toxoid were given three to eight months apart, the effectiveness after four to five years was double that when the two doses are given less than three months apart. If the second dose was more than eight months after the first, effectiveness was 10 times greater than in the control group (Newell et al. 1971). Live vaccines like BCG, oral polio, and measles have a long life but must be kept cool. This presents a tremendous delivery problem, especially in the rural areas of the tropics.

Some immunizations may have a negative effect on the nutritional status of a vaccinated child if they are given too early. BCG and polio immunizations should not be given until the age of six months unless a specific infectious illness poses a threat to health or if coverage at a later date would be difficult to achieve. The threat of the illness is obviously a greater danger than temporary inflamation or loss of appetite caused by the vaccination. To counteract the stress of the vaccination, mothers should be encouraged to offer extra food to the vaccinees in the days immediately following innoculations (Rohde 1977).

Malnourished children may not have the same immunological response as the well nourished (Krishman et al. 1974, Gross et al. 1975, Edelman 1977, Neumann et al. 1975). Skin tests subsequent to BCG immunization have been reported to have produced depressed or falsely negative skin tests for tuberculosis (Jayalakshimi and Gopalan 1958). Harlan and Brown (1965) also report that the reaction to the standard skin test dose of tuberculin antigen was significantly less in children with growth failure.

The effectiveness of polio vaccinations may also be [illegible]ited by malnutrition. In one study, 10 of 17 severely malnourished ch[illegible] failed to produce antibodies after receiving oral polio vacc[illegible] is hypothesized that this failure was due to intestinal abnormalitier [illegible]used by PCM (Katz, Brown, and Plotkin 1966). Chandra (1976) showed that a group of fetally growth-retarded children had lower levels of antibodies than normal children receiving polio vaccine.

However, immune mechanisms inhibited by severe malnutrition can be quickly restored with supplementary feeding. CMI competence is restored long before catch-up growth is achieved - only two weeks are required (Walker et al. 1975). The diet need only consist of the staple grain with a protein density of two grams per 100 calories. Because severe malnutrition often coincides with certain seasons of the year, efforts should be made to schedule immunizations when the children are most healthy.

Immunization fits well into the integrated approach. The village workers are able to identify those children requiring immunizations. Even if not able to immunize them themselves, they can organize the community so that immunization can be carried out most efficiently and effectively. If required, moreover, the worker could provide supplemantary rations for the children receiving immunizations who are severly malnourished. The latter should not be excluded from the immunization, as they will receive some of the benefits from the vaccine.

4. Antiparasite Measures

Next to diarrhea, intestinal parasites are probably the most common affliction in the preschool age group in the developing world. Anthelmintic drugs are available for the eradication of intestinal parasites (especially roundworm and hookworm). The effect of intestinal parasitism on the nutritional status of children, however, is unclear. Certainly, a heavy infestation with a parasite, such as ascaris can be harmful (it can cause intestinal obstruction, malabsorbtion, etc.); however, most children have moderate or mild intestinal parasitism. A single dose of the anthelmintic piperazine will usually get rid of roundworm. Because the medicine is inexpensive and nontoxic, it can be used generally and widely in areas of intense roundworm infestation. Piperazine comes as either tablet or a liquid (recommended for the under-three age group). The more recently developed "broad-spectrum" anthelmintics are effective against roundworm infestation and also lower hookworm and other intestinal parasites. Drugs like levamisole tetramisole and pyrantil pamoate have relatively low incidences of side effects and are suitable for mass treatment programs, although they are more expensive than piperazine (Latham and Basta 1977). Shah, Junnarkar, and Khare (1975) point out that mass deworming would be most effective in both the short form and the long term in an integrated context.

In a study in Kenya by Stephenson and co-workers (1978) in which one group of 12- to 72-month-old children was treated for ascaris and another group was not, the treated group showed a significantly higher percent of expected weight gain and highly significant increases of skinfold as compared to the controls during the 14 weeks of treatment. Multiple regression analysis identified deworming as the variable that significantly explained the skinfold changes. However, deficiencies exist in this study and similar ones, thereby necessitating further studies to determine the true effect of deworming on the nutritional status of the child.

The treatment of hookworm by itself is generally more difficult. Tetrachlorethylene (TCE) is the cheapest drug but has adverse side effects such as stomach pains and headaches and cannot be given either to pregnant women or malnourished preschoolers. Bephemerin has similar restrictions. A newer medicine, mebandazol, works against mixed infections as it is effective against the pin, whip, and roundworms in addition to hookworms. However, with heavy infection it may cause some intestinal pain and diarrhea. Moreover, mebandazole should not be given to pregnant women and children under two (Werner 1977).

A third parasite that affects nutritional status, particularly of women, is malaria. Chloroquine can be used for the treatment, suppression, or prevention of malaria. Dosages vary according to the function it is serving. Four tablets (600 mg of chloroquine) are given daily for three days

to treat acute malaria, while two tablets each week is sufficient for suppression. No adverse effects have been noted in either the mother or the fetus when pregnant women use the drug (Morley, Woodland, and Cuthbertson 1964). It is also safe for children under theee. Experts recommend providing prophylactic dosages to pregnant women in malaria-infected regions.

In all these cases, the health interventions serve only as short-term measures. Reinfection is highly probably unless accompanies by more basic sanitation/hygiene measures to eliminate the underlying causes of the infections. Before this is accomplished, however, the community worker can be in charge of distributing anthelmintics and antimalarials to those who could benefit from them.

5. Maternal/Infant Services

There is an old Confucian saying that when a child is born, it is already nine months old. We cannot afford to wait until a child is born to worry about its nutritional status.

Improper nutrition and a high incidence of infection can have serious effects upon the unborn child. Infections can be transmitted to the fetus (Rosenberg, Solomons, and Levin 1976). The result is a low birth weight child. Of the estimated 22 million live-born LBW (2500 grams) born each year, 21 million are in the developing countries and roughly 16 million of these are small-for-date, full-term (not premature) babies (WHO Chronicle 1979). Starting out undernourished as an LBW child greatly decreases an infant's chances of surviving the first year. Guatemala data indicates that half of the infants weighing less than 2.1 kilograms at birth died in the first year of life, while all those over 2.9 kilograms survived (Mata, Urrutia, and Garcia 1972). It has been pointed out that when the child is born in a malnourished state, interventions are not only more costly but less certain of success (Rosenberg, Solomons, and Levin 1976).

Recent studies in Colombia (Mora et al. 1979) and Guatemala (Habicht et al. 1973) have shown that caloric supplementation of maternal diets during pregnancy can increase birth weights and that this can have an impact on infant mortality. In fact, Taylor et al. (1978) report that the single most cost-effective measure to reduce infant mortality in Narangwal was maternal supplementation.

Mothers who have been identified as potentially having a pregnancy of high risk may include those in a state of poor health, with a history of obstetric catastrophes, showing poor fetal growth (judged by weight gain furing pregnancy and/or increase in size of the uterus), having the fetus in an abnormal position in womb, suffering hemorrhage or edema. Special attention must be focused on these women to ensure the child will be born in a healthy condition.

Diet is of great importance for the pregnant woman. The nausea and vomiting associated with early pregnancy may worsen a woman's nutritional condition. The anemia experienced by most women in developing countries is exacerbated in the LDCs. Iron and folic acid supplements are recommended for every pregnant woman. Efforts should also be made to increase the mother's diet (either on her own or by supplementary feeding) to satisfy the added nutritional requirements during pregnancy.

All expectant mothers should receive tetanus toxoid immunization to protect the newborn child against tetanus (Berggren 1974). In many parts of the developing world neonatal tetanus is the leading cause of infant mortality. In regions of endemic malaria, pregnant women should receive antimalarials to prevent infection and the resulting premature or low birth weight infant (Morley 1973). The mother's normal immunity to malaria apparently diminishes in her first or early pregnancies (not so much in higher parity). A study in Africa showed that babies of mothers on antimalaria medicine were 157 gm heavier than those of mothers not receiving it (Morley, Woodland, and Cuthbertson 1964).

The delivery itself in the vast majority of cases is conducted by a traditional birth attendant or midwife. She should be supervised or trained how to deliver the baby in a hygienic manner, how to care for the umbilical cord, how to prevent infection, and how to recognize and deal with common difficulties arising in delivery, referring them elsewhere when necessary.

Some recommend that at birth the infant's eyes should be treated with silver nitrate to protect against gonorrhea and possible blindness. However, this is suggested only if a significant venereal disease problem exists in the program area. This and the other birth-related activities are best carried out in an integrated program. The control of infection, education, and nutrition services for pregnant women require an intimate association with the community and are more effective if delivered simultaneously.

6. Health Education

As demonstrated in Nutrition Education (Study II of this series), changing people's behavioral patterns may be extremely difficult. Feeding the child during an infection or giving it fluids during a diarrheal attack may contradict long-held customs and beliefs. Direct person-to-person encounters have been demonstrated as most effective in changing health practices involving high risk. Villagers may often have had little or no contact with modern health services and accept illness as something over which they have no control. Therefore, it may be desirable to discuss how illnesses occur and that they are preventable and treatable. The subject of health education is too broad to be covered here. Other works, such as Greene (1977), should be consulted for practical points in health education in MCH services.

Because breast-feeding is so important to the development of the infant, special emphasis must be placed on the correct method, breast care, diet during lactation, and weaning. Fortunately, the vase majority of mothers in traditional cultures breast-feed successfully with minimal complications. The mother should be aware of the value of high-protein colostrum, the yellow transparent fluid exuded during the first few days after birth. Misunderstanding concerning colostrum is common in many parts of the world. She should be encouraged to start breast-feeding immediately for nutritional, immunological, and psychological reasons. Proper care of the

breast is important to prevent infection which can deprive the child of its best source of uncontaminated and nutritious sustenance. Moreover, the mother must understand that breast milk is the best food for the first 4 to six months, and that supplementary foods should be started by 4 to six months. It may also help if she realizes that her volume of milk decreases as the child's nutritional needs increase, so that by 18 to 23 months she has only 50% of the volume she had at 6 months. If she realizes that every child should double its weight by the age of six months and should never lose weight, she should become more conscious of any failure in development due to infection or nutritional deficiency. WHO expert committees (WHO 1971-78) consistently support simple messages: breast-feed, increase maternal food intake during pregnancy and lactation; begin supplements at 4 to 6 months. They also endorse community learning.

There are a number of simple things that the mother could do herself such as rehydration. As Rohde stresses, efforts should be made to improve the capacity of the mother to handle her own situation (Rohde, Esmail, and Sutrinso 1975; Rohde 1977). It is desirable to point out the importance of immunization and how poor sanitation and hygiene practices cause illness and negatively affect the growth of child.

As such basic changes are required in well-established behavioral patterns, it is essential that the instruction be provided on a person-to-person basis by someone (e.g., an IW) who comes from the same community, understands its lifestyle and problems, can communicate on an equal basis with the mother and is available on a continuous basis. This effort can be effectively reinforced by mass media (radio, posters, drama), which give the message of the IW importance and status.

It makes sense that if an educational effort for any one of the four components discussed here is to be offered, all these areas be included in one program. Each component, as we shall see, has an educational element, each at least partially overlapping and often complementing another component. The educational effort combined with the services increases acceptability as well as meaning and, as a consequence, participation.

7. First Aid

An integrated program of nutrition, health, sanitation, and family planning, particularly if operating at the village level, should also include basic first aid. This will enable the IW to establish or maintain credibility as a health worker as well as allow stabilization of a person's condition until a higher level of medical assistance is available. The community, moreover, demands that someone associated with health provide such services.

The basic first aid measures should include how to treat and lower high fevers; how to care for someone in shock; how to give mouth-to-mouth resuscitation; how to control bleeding of a wound; how to clean and bandage wounds: how to set fractures: and how to treat burns and bites.

C. Water/Sanitation

This section will deal with how the quantity and quality of the community's water can be improved, along with ways to reduce infection by water-based and water-related disease by means of proper waste disposal, drainage, spraying, and water storage and ways to improve hygiene through educational efforts.

1. Water Supply

It has been found that both the quantity and the quality of water are important in improving a community's health (and therefore nutritional status) (White, Bradley, and White 1972). Therefore, the objective of this component of an integrated program should be to provide an adequate and reliable supply of water that is easily accessible to each and every member of the community. Special efforts should be made to ensure adequate water is available during the season when diarrheal rates rise and the child is typically in the worst nutritional condition. Having to revert to the traditional contaminated water source is likely to reinstate the cycle of infection and depressed nutritional status.

Priority must be given to those communities with no readily accessible or dependable supply. Once all areas have some form of water supply, the priority should be the provision of a ground water supply. The greater the number of distribution points, the lower the chance of epidemics and the greater the accessibility to users, thereby encouraging greater (more frequent and in greater quantity) usage. Simple wells, handpumps, or standposts, inexpensive and easily maintained, are preferred. In a hilly area with springs and streams, they can be tapped fairly inexpensively by means of a gravity flow system. Whatever the form, the designers should take future needs into consideration so that the system can be cheaply upgraded as required.

On a large scale, percolation dams can be an effective means of collecting water, especially in areas like India which experience heavy seasonal rains. By constructing a small dam or bund on permeable soil, water is trapped and percolates into the subsoil where it is stored and protected from evaporation losses. Wells are then dug to tap the stored water supply (Pacey 1977). The construction of percolation tanks is well-suited to labor-intensive methods, which can provide employment during nonagricultural periods. Projects of this nature are at times in the form of food-for-work schemes - i.e., local or imported food (usually donated by an international development agency) is used as full or partial payment to the workers.

Catchment tanks are another means of conserving water. Tanks can be excavated in areas with hard surfaces (clay soil, rock) where the runoff is considerable. Smaller versions can be constructed on an individual basis to catch rain water from hard, impermeable roofs. Precautions must be taken to guard against contamination by dust and bird droppings on roofs.

The water supply must also be acceptable to the community. It is, of course, pointless to install an expensive water system the people will not use or maintain on account of such things as unpleasant or unfamiliar taste or color. Some sources may have high iron or magnesium content that will discourage use by villagers who are not used to the taste. It may also discolor the laundry and food. Excessive amounts of fluoride can cause teeth to turn black. Such attributes can lead the community to reject the new water supply in favor of the contaminated river or pond. A "reasonably safe" water that is tasteless, colorless, and odorless is obviously preferable to "absolutely safe" water that may never be used.

The program designers must ensure that the new water supply serves all functions in the community. If the source is used only for potable water and if the other activities such as bathing and laundry continue to be carried out at the traditional contaminated water source, the water-based and water-related diseases will continue to plague the community. For this reason, laundry and bathing facilities should be provided along with the new water system, although there may be situations in which safe drinking water should be a first priority.

Because an integrated program is likely to be carried out by personnel connected directly or indirectly with the health ministry whose responsibilities do not include the drilling of wells or construction of dams or tanks, it is extremely important that integrated program workers be aware of the need for a safe water supply and be able to coordinate with those who can provide these services. The workers should know about problems involved so that they can educate the people on proper usage and serve as motivators for community efforts to improve water supplies.

2. Water Treatment/Protection

The heavy contamination with human and animal fecal matter responsible for the high incidence of diarrhea can be lessened if not completely eliminated. There is disagreement on exactly what standard should be applied. WHO has said that a village water supply should not contain more than 10 coliforms or 1 E. coli per 100 ml. Pacey (1977) says this is far too stringent for tropical climates and means that most of the existing water supplies in developing countries would be condemned. It is suggested, instead, that "fecal coliforms" reflecting fecal pollution provide a more accurate idea of pollution (White, Bradley, and White 1972).

The most frequently suggested method of purifying water is boiling. It is, however, neither practical nor feasible to expect villagers to always do so considering their time constraints, the availability/cost of fuel, and their lack of understanding of why it is necessary. There are, however, other ways to reduce contamination. One way is to seal the top of the well and add a pump. This prevents pollution by contaminated buckets or rope and from dust and rubbish. Where the soil is highly permeable, a concrete apron extending two meters on all sides, plus a wall around the opening and a well lining of concrete (often precast) rings, will provide protection for the water supply.

Chlorination of the water supply, especially well water, is a noncapital-intensive way of improving the quality of the water. It kills both fecal and nonfecal coliforms in the water supply. The IW can be, and in many programs is, responsible for chlorinating the village well(s) on a regular basis (usually every two weeks). Once the amount of TCL required has been calculated, simple measurements can be established (e.g., in India it is in terms of match boxes which are always available in the village and easily understood). This can be calculated for the IW if necessary. Cost of TCL can be a limiting factor but this can be reduced by chlorinating only once a month in nondanger periods.

Another alternative is storage, which over a 48-hour period allows settlement and can reduce E. coli bacteria. If left for two weeks, the bacteria can be decreased by 50%, but this requires large storage tanks or ponds. However, algae growth and evaporation are drawbacks. Covering the storage tank can reduce evaporation as well as prevent the collection of dust, insect breeding, and inborn pollution.

Where turbidity suggests the probability of contamination by parasite cysts and ova, filtration is recommended. Filtration through sand can remove suspended matter, cysts, ova, and 99% of the bacteria. A slow sand filter capable of treating 750 liters per day can be created inexpensively out of an oil drum with 3 cm (1 inch) of pea-size gravel at the bottom with 70 cm (28 inches) of clear sand (0.1 to 0.6 mm grade) above it. The filter must periodically be cleaned and checked and the rate of water flow checked. A small-scale rapid sand filter can be employed where insufficient sand is available. Sand or crushed rock of 3-4 mm grade in layers about 25 cm (10 inches) deep can be used. In this model water is introduced from below the sand level and flows upward. The output can be 3,000 liters of pure water per day (Pacey 1977).

Because contamination can become more concentrated during the dry season, it may be necessary, as mentioned, to employ chlorination or filtration efforts only for the month or two when water supplies are limited. In some regions, it may be required during the wet season if there is high sedimentation or slope wash, increasing the possibility of fecal contamination.

To prevent a common source of pollution, animals must be controlled, possibly by fencing the tank and pumping water for the livestock to troughs. Another possibility is to dig protected holes on the shore a few feet from the waterline to obtain cleaner water.

3. Waste Disposal

The high rate of weanling diarrhea and the infection and infestations caused by poor sanitary conditions can in some instances be more important in explaining malnutrition than the diet itself (James 1972). There are a number of ways to improve the situation.

Because of cost constraints, it is generally not realistic to think in terms of anything more than pit latrines, which are generally satisfactory for low-density areas unless the soil happens to be excessively permeable or there is a high water table. The latrines should be constructed well away (minimum 20 meters) from houses and water sources. They must also be maintained regularly. They can be constructed cheaply in an hour or two and on a self-help basis by merely digging a 1-2 meter hole and covering it with a wood or concrete slab with a lid over the hole to decrease fly contamination. Alternatively, the dirt or sand from the excavation can be left next to the hole, and users taught to throw a handful over the excreta to prevent fly contact. This simple latrine can be used for four to six months. After a year a fruit seedling can be planted on the spot (WHO Chronicle 1979). If properly used and maintained, it can significantly improve the community's health and nutritional status in a number of ways, including the reduction of roundworm and hookworm infection, while lowering the fecal contamination of water sources.

Latrines tend to be underused when first constructed. People must learn to prefer their use, and their advantages to the community must be understood before results can be expected. Therefore, as we shall point out, this major behavioral change requires significant educational efforts.

Flies are one of the principal means of disease transmission (especially trachoma and shigella) and can directly affect the food they come in contact with. Studies have demonstrated that fly control can significantly reduce the amount of infection, disease, and death in a community. The rate of infectin in one study went from 3.2% to 0.8%, while there was no change in the control village (Watt and Lindsay 1948). In another study, a village with latrines that excluded flies from contact with human excrement was contrasted to one where the latrines did not. Although thenumber of flies did not decrease, the prevalence of shigella infections declined by 50% (McCable and Haines 1957). Latrines can have a negative effect unless the flies are prevented from contact.

In addition to eradicating flies or limiting their contact with exrement, a third method of control is screens or nets to prevent the flies from having contact with food supplies. These can decrease the spread of water-related disease, especially those carried by mosquitos.

It is also important to control pollution from disease-carrying animals. In cultures where animals are kept in the same house as the family, efforts should be made to instruct the people on why this is harmful and to construct shelters or corrals outside and away from the house.

Finally, garbage must be disposed of by burning in incinerators or burying. If buried, the decomposed garbage, along with the contents of the compost pile, can be used as fertilizer on small kitchen gardens.

4. Drainage and Spraying

To decrease the water-related diseases like onchocerciasis (river blindness) and the nutritionally debilitating mosquito-carried diseases, especially malaria, efforts must be made to control the breeding of the insects. The larvae of the black fly that spreads onchocerciasis, which infests 20-40 million people, breeds in fast-flowing rivers and must be killed by insecticides. Regional spraying by aircraft has been attempted, as local control does little good (Tomiche 1976).

Malaria has recently made a resurgence because of the DDT-resistant anopheles mosquito. Control of potential breeding spots may prove a more effective intervention. Efforts should start with small water bodies like storage tanks. Places where water can collect, like around a standpost, must be provided proper drainage. Other potential breeding areas like swamps should also be drained. In addition to the health benefit, there could be employment opportunities in a labor-intensive, food-for-work project, plus more land for cultivation. The IW can help to mobilize the community to assist in and cooperate with spraying and drainage efforts.

Once a new water supply is activated, the old pond or well is usually allowed to remain as insurance against failure of the new source or because no one bothers to drain it or fill it in. These may continue to be breeding places for mosquitoes or transmission sites for schistosomiasis long after they have ceased serving a useful purpose. They should, therefore, be prime candidates for drainage or careful management.

Waste water from household uses also can accumulate to breed mosquitoes and otherwise contaminate open drainage ditches and low areas of yards during the rainy season. The filthy water is easily tracked into the house by children and animals. This problem can be avoided by constructing soakpits near cooking and washing areas. A soakpit is a pit filled at the bottom by large stones, then by increasingly smaller stones, until the top is a layer of gravel into which the waste water is channeled. Waste water can also be directed into small kitchen gardens beside the house thereby helping to augment the family's diet. These methods can be taught by the IW.

5. Hygiene Education

An adequate quantity of uncontaminated water is a necessary but not sufficient condition for good health. Even those with water tapped into their homes often continue to experience sanitation-related infections if their low standard of personal hygiene is not changed. Dr. Feachem found in his Lesotho study that a water system in isolation is practically useless unless accompanied by education of the community in matters of hygiene and the proper use of water. For instance, those with access to improved water did not use any more than others; therefore, their hygiene did not improve and the transmission of water-washed diseases continued, and no improvement in health status occurred (Stanley 1977).

According to White, Bradley, and White (1972), people are not bound by traditional views of water quality and source and will change. People's decisions on what water to use and how much is based on many different factors - views of cleanliness, practicality, and interpersonal consequences. Their choice is a discering one and not blind conformity to customary practices of their cultural group. Consequently, a change in the choice of water sources is not a matter of breaking habit or custom as often stated, but rather involves cultivating new perceptions of health, convenience, and cost.

A study in Guatemala observed that rural people there had an almost complete indifference to fecal matter, which contrasted sharply with the strong negative attitude observed in western cultures. They also failed to report milk episodes of diarrhea because they did not consider such events as abnormal (Schneider, Shiffman, and Faigenblum 1977). There is quite obviously a perception problem; and using pictures of feces, parasites, or germs will not be effective in getting across the importance of proper hygiene and sanitation. For other rural groups, however, as the "Dinka" in the Sudan, excretion is a sufficiently sensitive topic that questionnaires investigating hygiene practices must be carefully designed in order to avoid offending sensibilities (Zeitlin 1978).

Hygiene is something people must learn and requires changing behavior patterns. Most efforts in the water-sanitation field have concentrated on the physical aspects such as pumps, wells, tanks, and latrines, and little attention has been given to the behavioral aspects. Where a new water system is contemplated, the educational efforts on the benefits and proper uses of water should begin in the planning stage in order to stimulate village interests and continue through the implementation phase to ensure that full benefits are derived from it. Because behavioral change within a social group is a multistage process, sufficient time must be allowed before significant results are expected. In a St. Lucia program, for instance, it took three years to increase water consumption rates from 15 to 50 lcd (Unrav 1974). It is also possible to achieve meaningful improvements even without upgrading the water supplies by simple, low-cost educational efforts to change personal hygiene habits.

Throughout Africa and much of Asia, the use of the left hand for eating is not permissible. Although this custom is rich in associations and beliefs, the main reason given is that the left hand is used for washing after defecation. The custom acknowledges the fact that the left hand does remain contaminated by direct contact with feces, which cannot be thoroughly washed off without using soap. The custom does not prevent general contamination of foods during preparation. Although such issues are sensitive, links of direct contamination should be investigated because these may differ by cultural and social class. Inherently good practices, such as washing hands before the meal, may also be carried out in an imperfect manner that requires change. An example of this was observed in the Sudan when those sharing a meal eaten with the hands from common dishes poured water from a cup onto their hands to wash before eating, saved this washing water in a metal tray, and sloshed their hands back in the same water to wash the food off their fingers after the meal.

Health, nutrition, and hygiene are so closely interrelated that they should be addressed simultaneously. According to Saunders and Warford (1976), the high prevalence rates of diarrhea in children under two is caused not so much by unsafe water as by mothers who do not practice good personal hygiene.

During the vulnerable weaning period, the food chain is of principal concern. The mother's contaminated hands during meal preparation and feeding are common means of transferring infection. Many mothers in the developing world dangerously delay the introduction of supplementary foods because they associate them with increased diarrhea. They must learn that it is not the food but the unhygienic preparation of it that causes the problems. The use of soap to clean hands and the cooking and eating utensils would improve the situation greatly. Where the custom is eating from a common dish, the spread of infection can be reduced by feeding the sick person separately. Food should never be allowed to sit around in the incubator-like climate of the tropics that permits bacteria to multiply. If it must be kept, it should be boiled thoroughly at regular intervals. Health education efforts in Colombia were successful in getting mothers to understand that it was "not the food that caused diarrhea but food improperly prepared" (Wray 1977).

Other precautions may include ensuring that buckets and household containers in which the water is transported are properly cleaned, that children stop defecating indiscriminantly in the vicinity of the house, and that traditional water supplies are not used once newer, safer facilities are available.

6. Water Storage

Even if the water is uncontaminated when reaching the house, it is often infested in the home itself. In a Guatemalan study, in a community with a piped, intradomiciliary water supply system, only 2%-4% of the samples obtained from the faucets proved to be contaminated; yet 36%-44% of the samples from the domestic storage containers were polluted. The same phenomenon was observed in water drawn from wells. In another village, 48%-53% of the samples drawn from wells were contaminated with coliforms, while the percentage of contaminated samples from household containers was 66%-88% (Schneider, Shiffman, and Faigenblum 1977).

Contamination can occur in a variety of ways. First, the collecting vessel itself can be unsanitary. Second, the storage jar or container is rarely washed out. Flies and insects (e.g., the yellow fever-carrying mosquitos) breed in the storage containers around the house, which increases the chance of water-related infections. The danger is increased if people collect water from the roofs of their houses. This can be prevented by surrounding the inlet pipes with mosquito netting.

Disease-carrying flies and insects have access to the stroage vessels and can contaminate the water, as can livestock residing in the house. In addition, unclean hands contaminate the rim of the jar or the dipper or cup used to extract the water. This dipper may be rested on a

dirty surface and returned to the jar. The use of unglazed pots cools the water by evaporation during storage but compounds the problem by maintaining a dense microbial vegetation. With water in as such short supply as it usually is in developing countries, there is little opportunity for people to clean or even rise out the storage containers. The problem can be alleviated by increasing the quantity of water and educational efforts on proper storage practices.

7. Kitchen Gardens

Another linkage exists between water systems used for irrigation and those used for potable water supplies and for irrigation of kitchen gardens. The suggestion is simple: where irrigation systems exist, would it be possible to, at little extra expense, use them as a source of potable water and/or water for irrigation of home gardens? If a nonpotable supply were being used for irrigation, this proposal would be reasonable for irrigation of kitchen gardens only. Resources should be used, where feasible, for the development of potable water supplies.

As mentioned, a family's waste water can be used in a small garden (perhaps 3 X 3 meters) where sufficient land is available. The IW whose responsibility it is to improve both the environmental sanitation and nutritional intake of the community is the proper person to promote a kitchen garden which serves both purposes.

D. Family Planning

1. Natural Methods

The linkages between birth intervals, parity and nutrition are covered in some depth in Appendix A. Below is a brief review of methods of birth control which the IW should become familiar with. Delaying the age at marriage and increasing the length of time between births are fundamental means of reducing the rate of population growth and limiting family size (Coale 1973). These changes are more likely to result from societal trends than the efforts of individual health workers, though the IW is in an excellent position to reinforce these messages when used as part of large-scale, government-coordinated campaigns.

The connection between breast-feeding and the delay of ovulation is well-documented. Recent hormonal investigations have clearly shown that prolonged lactation results in an increased secretion of prolactin produced by the sucking at the breast. This inhibits ovulation as well as decreases urine secretion, so that body fluids can be used for the synthesis of milk (Jelliffe 1972). Once the sucking ceases, the production of prolactin is decreased and along with it the period of postpartum amenorrhea. Lactation can increase amenorrhea from about 2.5 months in a nonlactating mother to a year or more, depending on amount of sucking and other factors (Jelliffe and Jelliffe 1978).

Some cultures delay the resumption of sexual relations until after lactation stops for fear the semen may contaminate or sour the milk (Singarimbun and Manning 1976). This taboo appears to work well only in polygamous systems, which break down with urbanization. Without sexual abstinence, lactation cannot be relied upon as a foolproof method of birth control, and other means should be employed three or four months after delivery. Another natural means is the rhythm method in which the couple abstains from intercourse during the woman's fertile days each month; however, its effectiveness is limited because of the ever-present uncertainty about the timing of the fertility period.

2. Pills and Injectables

If used properly, the pill is probably the most effective means of birth spacing. The principal disadvantage in isolated rural areas is the irregularity of supply and consumption. This is rectified by appointing someone in the village like the IW to be responsible for a community-based distribution (CBD) program on a monthly or even trimonthly basis. In Indonesia, for example, village mothers distribute pills through a system of family planning acceptors' clubs. The mother using the pill, however, must acquire the habit of taking the pill each and every day. For this reason, a packet of 28 pills (either including 7 placebos or using different hormones) is recommended. Local reinforcements or reminders, especially in the initial phase, are often helpful. There is some margin to allow for error: if the woman misses 1-5 pills in a month, the chance of failure increases from less than 1% to 2.6%; if she misses 6-19 times, it is 42.1% (Peel and Potts 1970).

Several side effects of birth control pills can affect a woman's nutritional status. Nausea (reportedly as high as 25% in new users) and bleeding can occur but usually go away in 2 or 3 months. The mothers must be alerted to this possibility to avoid excessive dropout rates. Many also suffer from folate deficiency due to disturbance in folate metabolism or interference with absorption (Edelman 1976). High-dosage pills should not be used because they cause reduced quantities of breast milk. Low-dosage pills may have no negative side effects on the milk or on the child. Pills using progestagen alone without estrogen are best because they do not diminish and may even increase milk volume (Jelliffe and Jelliffe 1978). On the positive side, hemoglobin levels may rise due to decreased menstrual loss (Peel and Potts 1970).

There are women who should not use the pill: women with any history of blood clotting or phlebitis (steady or deep pain in one leg or hop); stroke history; during hepatitis or for one year after any liver disease; with any cancer; or with migraine, urinary infection, heart disease, or heavy flow during the menstrual period. A doctor or trained person, therefore, must do the initial prescribing to ensure that the woman is not already pregnant and that the most effective, safest, most convenient, and least expensive means is chosen for each women. The safety of the pill is not really a factor in the LDCs since, on the average, pregnancy and childbirth are 50 times more dangerous than taking the pill (Werner 1977).

A recently developed method of contraception is the periodic injection of Depoprovera. The side effects are similar to the pill. A study in Bangladesh found that the continuation rate after the first year was 56% (60% if those who changed to six monthly injectibles were included). This compares favorably with the continuation rate for oral contraceptives in Bangladesh, which is 40% after six months. At least half the women experienced troublesome menstrual side effects, but of greatest concern were the number of women (147 out of 1,020) who reported a decrease in lactation (Parveen, Chowdhury, and Chowdhury 1977). This obviously could have a serious nutritional impact on those children still being breast-fed. The latter problem suggests that further research is required before large-scale implementation of Depoprovera.

3. Intrauterine Devices

The IUD is one of the best known and most widely used contraceptive devices. If inserted properly by a trained midwife, health worker, or doctor, it can be the simplest and most economical means of birth control for a large portion of the fertile women in the developing world. There are, however, a number of potential problems.

One problem is the expulsion rate, which is high. The IUD may also cause pain and discomfort. There is often very heavy bleeding after insertion, which decreases with use. This, of course, can increase the anemia that is already a serious problem for the vast majority of women in developing countries. For this reason, an oral iron supplement should be given if heavy bleeding is experienced. The IUD requires careful follow-up to ensure that it remains properly in place and does not cause excessive problems for the women. If this method turns out to be inadvisable or inappropriate for an individual, an alternate method must be recommended. The failure of the IUD in India is largely blamed on the lack of follow-up. However, any women with any history of internal pelvic infection should not use the IUD (Peel and Potts 1970). Recently, a lower rate of complications has been found with the copper "T".

4. Diaphragms, Foam and Condoms

Another form of contraceptive used by the woman is the diaphragm, which is not frequently espoused by family workers but which can be an effective and inexpensive means of contraception. The initial fitting can be done by a health worker or midwife and requires a minimal amount of maintenance along with yearly replacement. Spermicidal jelly, which may also be inexpensive, must be used with the diaphragm. Spermicidal foams or tablets, used alone, are less reliabile than other forms of contraception but are relatively easy to use and are an added safety measure when used in addition to condoms.

A male contraceptive is the condom, usually included in every family planning program. Success is usually equated with the number distributed, although actual usage is often unknown. Most often, delivery is through commercial channels able to attain wide coverage or through public clinics. (CBD) programs using village-level workers also distribute condoms, in addition to pills and foam.

5. Sterilization

Sterilization is gaining acceptance in the developing as well as the developed world. Whereas the methods previously mentioned can be considered for either child spacing or limiting uses, sterilization is in almost all cases irreversible and therefore employed only when the couple is firmly committed to having no more children. There are also potential political repercussions, as demonstrated in the 1977 Indian elections (Weiner 1977).

The male operation (vasectomy) is quite simple and carried out on an outpatient basis. There are, however, a number of barriers which must be overcome universally before the operation is widely accepted. The fear that sterilization equals castration and that sexual pleasure will decline after the operation must be quelled. The most successful way to do this is to have members of the community who have had a vasectomy tell others how easy and painless the operation was and how it was not changed their sexual drives or satisfaction.

It will take a long time, however, before men are fully convinced that sterilization is a viable alternative. Women, on the other hand, are much more likely to undergo a sterilization operation (tubectomy) because they must not only bear the children with all the attendant problems, but must also care for the children once they are born. The operation has become increasingly less complicated, quick, and cheap to carry out. Precautions, however, must be taken to decrease the chance of infection after the operation through proper follow-up. Moreover, husbands who often have social or traditional misgivings must be convinced to allow their wives, who are frequently willing, to undergo the operation.

6. Abortion

While abortion raises moral and political issues which must be addressed prior to policy decisions, more attention must be paid to this form of family planning. Of the 108 countries covered in Teitze's (1979) report, only 15 do not permit abortion under any circumstances; 11 of these are classified as developing countries (Bolivia, Burma, Colombia, Dominican Republic, Egypt, Haiti, Indonesia, Jamaica, Panama, Philippines, Zaire). Most of the other developing countries put restrictions on abortions, permitting them only for medical, eugenic (fetal), juridical (rape, incest, etc.), or social reasons.

Distressingly little data are available on abortion rates in developing countries. In China, it is estimated that there are 100 abortions per every 1,000 women between 15 and 44 years old and an abortion ratio of 90/1,000 live births. In Seoul, Korea, the rates given are 235/1,000 women and 3,300/1,000 live births. In urban Malaysia the rates went from 106/1,000 live births in 1970 to 331/1,000 in 1973, while in rural Malaysia from 25 to 76/1,000 live births.

The principal problem is illegal abortions. Laws are restrictive. Abortions are nonprofessional because of improper implementation of policy and because of lack of equipment and trained staff. While little research is available on the subject, anyone connected with public health in the developing world knows it is a very serious problem. In India, for example, in 1977 only 278,000 abortions were officially reported (equals a rate of 2.2/1,000 women or ratio of 11/1,000 live births). On the other hand, the International Planned Parenthood Federation estimated that 6.4 million illegal abortions were carried in 1970 in India. With the unsanitary conditions and poor medical facilities, the mortality rate "may reach or exceed 100/100,000 illegal abortions" (Teitze 1979).

To answer the felt need that obviously exists, alternative methods must be made available, especially in rural areas, to prevent conception. Simple abortion procedures like menstrual regulation (carried out two weeks after a missed period before pregnancy can be reliably confirmed) or suction curettage should also be made more available where policy permits. Every effort should be made to have abortions carried out as early as possible since the risk of maternal mortality increases from 1/100,000 abortions before 8 weeks, to 3 before 12 weeks, to 8 before 15 weeks, to 15 before 20 weeks, to 25 over 21 weeks. Improper abortion is a leading factor in the high maternal mortality rates found in developing countries.

7. Education

Family planning programs cannot be effectively carried out without an educational effort which, as in the cases of health and water programs, is best done on an interpersonal basis. The person closest to the potential clients must understand their perceptions and motivations before the most practical method of contraception is determined. Once convinced, someone, often a village-level paraprofessional, must ensure that the user understands the proper way to use the chosen method and what potential side effects exist.

8. Infertility

Women who cannot have children (often described as "barren") are looked upon very negatively in many developing societies. Often simple remedial steps can be taken that will enable a couple to bear children. This greatly increases the community's respect and confidence in the programs as a whole.

Infertility can be caused by several factors. First, weakness or nutritional deficiency as a result of anemia, poor nutrition, and lack of iodine may decrease the chances of becoming pregnant or cause a miscarriage or stillbirth. Second, chronic infection, especially pelvic inflammatory diseases like gonorrhea, can cause sterility. Treatment may help if the disease has not progressed too far. Prevention and early treatment can lower the incidence of infertility. Finally, men with low sperm counts can be helped through advice to wait longer between intercourse and concentrate on fertile days.

E. SUMMARY:

SERVICE MIX

The key set of health services that appear most effective is enhancing the nutritional status of children under three includes: surveillance, rehydration, antiparasite measures, infection treatment, immunization, maternal services, health education, first aid, and referral.

The key set of actions relating to water and sanitation includes: increased water supply, water treatment, waste disposal, drainage and spraying, hygiene education, water storage, and kitchen gardens.

The key set of techniques in the family planning component includes: natural methods, pills, IUDs, diaphragms and condoms, sterilization, abortion, injections, educstion, and infertility treatment.

The reader is referred to the respective health, water and sanitation, and family planning sections for a more detailed discussion of specific design considerations for each of the just-mentioned services.

VI. FACILITIES, SUPPLIES, AND EQUIPMENT

A. KEY QUESIONS

- How can facilities be shared or coordinated in the integrated program?
- How can supplies and equipment be shared or coordinated?

When the appropriate mix of services has been determined, the task of integration can focus on how to share or coordinate facilities, supplies, and equipment.

B. Facilities

The focal point of an integrated scheme is usually the health program. In some cases the program has been run from a health center. For example, supplementary feeding is sometimes distributed at health or MCH centers where health and family planning services as well as an

integrated education program are available, e.g., Project Poshak (Gopaldas et al. 1975) and Ghana/ Lesotho case study (Chapter 4). Although health centers serve important functions in integrated programs, the long-term impact of schemes that rely exclusively on clinics is questionable because of a number of problems, two of the most important being accessibility and acceptability.

For instance, in Narangwal, 75% of the patients came from a radius of less than 4.6 km. Patients requiring curative treatment may be expected to be referred to a central location from outlying areas. Preventive health care and health-related campaigns, such as immunizations or parasite control, for example, are ineffective unless the majority of households are contacted directly. It is not possible to achieve this outreach in rural areas while operating from a centrally located facility. Health centers have sometimes been cited for primarily cultural reasons as being unable to respond to the community's felt needs in the field of health (Banerji 1973). At Narangwal, 62% of the people contacted unqualified, indigenous medical practitioners (IMPs), neighbors, or family members for perceived health needs, while another 19% contacted private allopathic or registered IMPs (Kielmann 1977). Similarly, in an area of Bangladesh, 75% of those ill within one year went to non-Western medical practitioners (Skoda, Mendis, and Chia 1977).

For these reasons, centrally located facilities should not be the main basis for program activities within the community. Rather, decentralized and relatively simple facilities are more appropriate in order to achieve greater coverage. Makeshift clinics may be set up outdoors in a regular local spot such as under a tree. Fixed facilities serving a broader area are needed for specialized referral purposes. When thrown open for general program use, however, they can, in certain instances, have a negative impact by encouraging community workers to work there rather than carrying out their outreach activities (Pyle 1977). Similar problems are experienced in water system programs, which require an intimate knowledge of the community as well as proper utilization and maintenance to have a significant impact. When the presence of a fixed facility or capital equipment is identified with the intervention, the developer is all too often more concerned with the "numbers game" (the number of centers built, pumps installed, wells dug) than the effectiveness of the program activities.

The facilities required for an integrated program need not be sophisticated or expensive. They should be located close to the intended clientele. In the village, any structure designated by the community (the meeting house, the school in off hours, the IW's house) can serve as the center of the local integrated programs, a place where the doctor or intermediate health personnel who regularly visit the village can carry out their work. The IW, in fact, does not require a structure as such since his/her work is most effectively carried out in the homes of the villagers which the IW regularly and routinely visits in the course of his/her surveillance work. It is this feature which permits the early detection and treatment of simple illnesses and deficiencies. As in

Jamkhed, India, or Yako, Upper Volta, the community may be required to construct or furnish a building as evidence of commitment to the program. It is advisable that a specific location by clearly association with the program so that people know where to go for assistance.

Logistic support facilities (e.g., warehouses and vehicles) can be combined to increase efficiency, simplify administration, and reduce costs. Storage warehouses, for example, can be used for supplies for all the involved components - the food for the supplementary feeding; the medicines and health supplies; the water system parts, insecticides, chlorine; and the family planning contraceptives. In this way, reporting requisitioning, supervision, transportation, and the like can be streamlined. The same can be accomplished in terms of vehicles - if programs done together, fewer vehicles might be needed.

On particular facility that may be required in the early phase of an integrated program or during an emergency (especially war or famine) when there is a high incidence of severe malnutrition is a regional rehabilitation unit. But this probably would be short term, and all other components of the program should be carried out in the village itself.

C. Supplies and Equipment

The influence of the developed world and the urban bias often leads to inappropriate services being provided to rural communities (Navarro 1974). Highly technical solutions are provided where the problems call, at least initially, for simple interventions. Several countries, notably China (Horn 1969; Sidel 1973; Wray 1975), have demonstrated that significant improvement sin health, nutrition, sanitation, and family planning can be made by applying on a priority basis what was already known, without resorting to high technology. More flexible and unorthodox routes to simple yet effective solutions must be encouraged.

Technology should be selected on the basis of effectiveness, practicality, safety, and cost. The best technologies are often developed not by specialists but in the field. The proper "technology fit" between care and disease pattern is most important, i.e., appropriate technology. For example, an inexpensive heat-stable measles vaccine is very desirable for work in the tropics (Woodruff 1975) but is not available. In the absence of such an innovation, WHO has developed an inexpensive and reliable "cold box" that enables health personnel to maintain the "cold chain" to the point of vaccine delivery (Cockburn 1977). In order to carry out such work, however, the technicians must be intimately familiar with the needs of the field workers and keep in mind the feasibility and practicality of their interventions. Creativity is also vital to the success of the integrated approach. As seen in the first case study, inability to keep vaccines cold has resulted in low levels of immunization in the target population.

Several simple techniques have been found useful in enabling the low-level health workers in their jobs. As described elsewhere in this volume, one technique is arm circumference measurement and recording by a color-coded system. A simple system for detecting degrees of marasmus,

also used in Upper Volta (see Study IV, Formulated Foods) relies on visual appearance of the buttocks and face. Marasmus grade one (M_1) is defined as: buttocks soft, child very thin. M_2 is buttocks hanging like an empty sack, face still normal. M_3 is buttocks like an empty sack, face looks like an old person. Another technique is the use of an anemia recognition card. Detection of anemia is done by comparing the color of tongue, lower lip and nails with the card. Tests found the system to be 98.5% effective in severely anemic cases (less than 6 g/dl) and 75.3% for those with moderate cases (6-9 g/dl). The method is simpler, less expensive, and more acceptable than the normal hemoglobinometer and is well suited for use by IWs as a screening device (Ghosh, Mohan, and Talib 1978). The "sticky eyes" characteristic of clinical vitamin A deficiency can be recognized by the IW, who can also ask questions about night blindness.

The same principle can be applied to water/sanitation systems. The initial system need not be highly sophisticated; the most elaborate systems are not the most cost effective (Thomas 1975). Designs using local materials and suitable for construction of unskilled village labor (e.g., block work and masonry as substitutes for concrete) are recommended. Adequate supplies of spare parts for water equipment must be available locally to allow for timely repairs. They can be shipped as well as stored along with the other supplies (food, medicines, contraceptives) and stored on a decentralized basis.

To make these operations feasible, however, the equipment should be standardized as much as possible to save engineering costs and reduce maintenance and repair problems. This is not meant to take away the flexibility of the system or reduce the options of the water system designers. Rather, it can reduce the inefficiency that might exist in a program. The standard design should be able to be modified as required in light of field experience and tailored to local conditions.

The point is illustrated by taps and standposts. Because of heavy use, the tap is often the weak link that leads to high rates of wastage to a complete shut-down of the system. Simple crank-operated water paddles as used in Nigeria and Cameroon may be more appropriate, as they can be made locally and require only a low level of skill to maintain and repair (Pacey 1977). In contrast, diesel pumps may be inappropriate because of their capital cost and difficult maintenance and repair; also, the recurring cost of fuel is exorbitant in many LDCs that suffer from acute petroleum (and foreign exchange) shortages.

Logistics should be considered. As the emphasis is on the less sophisticated materials, it may be possible to manufacture some of them in-country and conserve foreign exchange. This is a particular problem with water supply system equipment and materials. WHO (1973) estimated that the foreign exchange costs for materials may average 35% (varying from 15%-50%) of the total costs.

Basic drugs must be as plentiful and inexpensive as possible. International donor agencies can occasionally help supply drugs, but a dependency relationship should not be allowed to develop. It may be possible to produce many basic drugs indigenously. Packaging should

roughly correspond to the consumption rates of different drugs with each standard box sufficient for a set period (e.g., one year) for a set population (e.g., the number covered by a health worker most likely to dispense that particular medicine). Many programs successfully require villagers to pay for the drugs they need, thus establishing the effective demand that supports normal market channels. In Gorom-gorom, Upper Volta, price of the drugs also includes a mark-up to cover the IW's salary, if the community does not choose to recompense him or her in time or services.

Supplies are of no use unless available to the clientele and the credibility of a scheme can be ruined by the lack or interruption of supplies. This problem is accentuated in an integrated program and becomes more difficult as a larger portion of the community is covered. Moreover, the total system could be damaged by failure to deliver a single component of the package. In developing countries, transportation of supplies is frequently a problem. All available means of transportation such as military vehicles, commercial vans, public transportation buses, and even private vehicles making regular journeys to the same destination should be considered. This could possibly be coordinated centrally.

Commercial market channels, however, may be most reliable. One reason noted for the high patronage of quack doctors and pharmacists in rural Pakistan, for example, was that these outlets had medicines for sale, including sophisticated antibiotics for which they did not know the proper uses. Government health clinics, which theoretically supplied free drugs, rarely had any in stock. Similarly, while government or international agency vehicles may remain out of repair for some time, some commercial vehicles consistently ply the most remote dirt roads.

The supplies can often be purchased in larger volumes or through a centralized procurement office to realize savings. Some equipment, e.g., first aid kits and educational materials, could be produced more inexpensively through the simplification and standardization facilitated by integration.

Nutrition supplies, such as weight charts, can be printed in bulk and provided to individual villages through the same channels of supply as the simple drugs. Integrated programs are encouraged to utilize local foods where available for any supplementary feeding schemes. However, if stocks are not locally available, the transportation of the food can be combined with the delivery of health, family planning and sanitation supplies. Coordination on this level can greatly reduce the cost of logistical support.

D. SUMMARY:

FACILITIES, SUPPLIES, AND EQUIPMENT

Health clinics serve an important function as a referral center in integrated programs, but decentralized and relatively simple facilities located close to the target groups are more appropriate for achieving greater coverage. Logistical support facilities - warehouses and vehicles - of categorical programs can often be combined to increase efficiency, simplify administration, and reduce costs. Supplies and equipment, especially if simplified and standardized in the integrated program, can be produced or procured more cheaply.

VII. TIMING

A. KEY QUESTIONS

- How fast should an integrated program be mounted?
- What factors affect timing?

It is very unlikely that the integrated approach described in this chapter with its dependence on behavioral and structural change can be implemented and produce impressive results within a year or two. The implementation process itself should be gradual and phased so as not to overload the system and force it to collapse. It is neither advisable nor possible to rush the process if a successful program with long-term impact is to be produced. Nonetheless, short-run results should be as good as would have been achieved by the individual, nonintegrated program, and significant improvement in nutrition might be looked for within six months.

The most important thing is to establish a strong foundation upon which sound integrated programming can take place in the future. For instance, the establishment of an effective health/water committee in a community may not sound like a major accomplishment. However, in that it permits the effective operation of a health operation as well as construction and maintenance of a water system, it is a spectacular achievement. Once the first plateau of community involvement has been attained, things can begin to move more rapidly.

Villagers must also have time to adjust to a new program. If a paraprofessional village worker is initiated in a village, it is unreasonable to expect that people will accept him or her as a health practitioner in a short period of time. This person must demonstrate competence and instill trust and that will take time.

All too often, it is easier and less time consuming to play the "numbers game," i.e., to construct a health center, provide equipment, and feed "x" beneficiaries. People-centered activities such as community organizing, changing behavior patterns, and conveying the importance of regular maintenance all take considerable time (Bradley 1977). Because these require patience and a more thorough understanding of the local situation as well as the human element, development organizations often shy away from undertaking them. The political time frame often is not consistent with the development time frame.

In addition, the institutions and people (both local and external) involved in designing integrated programs usually want results in the shortest period of time possible (Schneider, Shiffman, and Faigenblum 1977). Administrators charged with the delivery of social services have a fixed term in which to deal with a set of problems. It is natural that these people want to demonstrate their competence and leave behind a measurable improvement. More meaningful results might be achieved by assigning a local social service administrator for longer periods.

Some programs are judged failures by governments before they are given a fair chance to prove themselves. Comparing the performance of two integrated schemes in India at one- and five-month intervals demonstrates this point clearly (Table 2), which shows food intake increasing over time. It is expected that even greater improvements would be seen after a year or two. Voluntary agencies with independent programs have the advantage that time is not so much a limiting factor. They are able to test different approaches, learn from their mistakes, and adjust their programs accordingly to achieve maximum impact.

Development, be it in the field of health, nutrition, water, family planning, or agriculture, is very trend conscious. Everyone is looking for "the" answer. Unfortunately, it is found all too often. The developing countries are often encouraged to follow one path and then, before the results are in, are told another approach is better. There must be more indigenously developed programs that fit the specific needs and circumstances of the country and are implemented, adapted, and given an opportunity to demonstrate their full potential.

Finally, program designers must be aware of the well-known but largely undocumented budgetary factor which affects the timing of the program (Caiden and Wildavsky 1974). A huge amount of money is allocated and must be spent each year on programs like the integrated one discussed here. If the funds are not spent, they are lost, and the funding agency is in danger of having its allocation reduced accordingly in the following year(s). Therefore, it is sometimes considered imperative

Table 2

Average Daily Intake of Poshak by the Experimental Group of Children at the Initial and Final Stages of Intervention

Age (in months)	Intake after One Month of Feeding (in gm)	Intake after Five Months of Feeding (in gm)
6-11	11	moved to older age group
12-23	13	39
24-36	24	53
36-48	29	50

Source: Gopaldas et al. 1975.

to spend the money, then worry about the impact it will have. In some cases, the long-term interest of the community is not given priority. There is merit in starting simply and slowly in trying to achieve the goal of providing integrated services for their vulnerable sectors.

B. SUMMARY:

TIMING

The implementation process for mounting the integrated program generally should be gradual in order not to exceed the institutional and personnel capabilities. Establishing adequate community involvement and commitment is critical to initial efforts. Political and bureaucratic pressures are often intense to show short-term results rather than progress toward establishing the foundation needed to ensure long-run viability. Judgments on program performance should be reserved until one or two years of experience are completed.

CHAPTER THREE

INTERVENTION EVALUATION

I. INTRODUCTION

A. KEY QUESTIONS

What are the costs of integrated programs?

- How effective are they relative to the resources deployed?

Evaluation of costs and effectiveness is necessary for comparison of program results with original objectives. As has been mentioned (Chapter Two, Part III), the evaluation process should be ongoing and provide feedback to program planners and supervisory personnel. Particularly in the complex intervention discussed herein, characteristics of program design, particularly organizational design, may have important repercussions for cost and effectiveness. Once programs are initiated, their continuation along a given path should be the result of a conscious decision by planners and supervisors based on evidence of effective progress toward preselected objectives. Lack of progress should be a warning flag that some element of program design is not working as expected and that changes should be made. It is crucial herein that evaluation not be perceived as an all-or-nothing process. It should be used primarily for making planning/administrative/operational decisions at intermediate stages of program development, not simply as a process occurring after a program is fully developed that results in a decision to proceed with the integrated approach or give it up.

Outside experts are often useful at the initial stages of program development to assist in designing how an evaluation function can be built in, giving particular reference only to that information which is explicitly needed. The purpose of evaluation is not to generate reams of data but to produce only that information needed to make operational decisions. The important thing is that evaluation not be neglected because of perceptions that there is inability to collect data on all measures of cost or outcome. Even partial evaluation is generally better than no evaluation. It is up to program planners and supervisory personnel to select measures that can be realistically used and to see to it that they are used as effectively as possible. Information on baseline target group characteristics, principal costs, and growth charts may be sufficient in many circumstances.

As this science of evaluation has not been well developed for primary care services, much responsibility rests on the creativity of the individual planner/administrator to devise useful schemes to fit local needs. Evaluation data should be useful for designing program improvements at both the planning and the operational levels, and should help those working in jobs in different parts of the integrated system to do their jobs most effectively. It should neither be used nor perceived as a threatening procedure.

We will now discuss costs and effectiveness of integrated programs, respectively. It is important to note that data on both elements are scarce because of the general lack of systematic evaluations of integrated nutrition programs. Thus, the generalizability of conclusions is tenuous. Nonetheless, the methodology is broadly applicable and will guide analysts carrying out integrated program evaluations in the future.

II. COSTS

The paucity of cost data is illustrated by the fact that only 29% of the 201 international nutrition projects (most of which had integrated components) surveyed by Harvard Institute for International Development (HIID) (Austin et al. 1978) collected cost data, as did only 2% of programs surveyed by American Public Health Association (APHA) (Karlin 1976).

A. Component Costs

The cost of an integrated program is the sum of the costs of each of the separate components, calculated to reflect the savings that can be achieved by combining separate facilities and services. The cost components in integrated programs correspond to the resource categories mentioned in the previous chapter, i.e., personnel, facilities, administration, transportation, storage, and supplies and equipment. Start-up costs should be considered as well. Specific cost levels will vary among projects and countries according to different component mixes and factor prices. We will not review the costs of the individual components, we will make some observations about certain cost elements in the health, water, and sanitation components.

1. Health

Under the health component, the cost effectiveness of immunizations is one of the few areas studied in any detail and provides some interesting information. The cost effectiveness of different immunizations can be calculated by taking the incidence of the disease, its mortality rate, the cost of the vaccine, and the number of contacts required to get full protection. In this way, despite the high cost of the vaccine, measles vaccine comes out on top (Dag Hammarskjold Foundation 1975) (Table 3).

TABLE 3

Cost Per Death Prevented in Child-Death and Immunization Campaigns Against Five Diseases in a Population with 500,000 Annual Newborns.

Type of Vaccine	Probability of Contracting the Disease	Case Fatality	Expected Number of Deaths	Number of Immunizing Contacts Per Child	Fixed Cost of Campaign (Million US$)	Variable Cost of Campaign (Million US$)	Total Cost of Campaign (Million US$)	Total Cost Per Death Prevented (US$)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Smallpox	0.005	0.1	250	1	1.0	0.025	1.025	4,100
DPT	0.1	0.05	2,500	2	2.0	0.25	2.25	900
TB	0.015	0.04	300	1	1.0	0.025	1.025	3,415
Polio	1.0	0.0005	250	3	3.0	0.375	3.375	13,500
Measles	1.0	0.16	80,000	1	1.0	0.25	1.25	16

Source: Dag Hammarskjold Foundation 1975.

The principal variable affecting the cost of vaccinations is the number of contacts per child. Because the delivery system is the most important consideration, it is possible that an integrated program employing IWs would permit increased efficiency, reducing the number of separate visits required by the community's children. Different combinations of vaccinations can result in considerably different costs (Dag Hammarskjold Foundation 1975) (Table 4).

It is estimated that it would cost between $1.50 and $3 for the vaccines to protect a child. It is possible that the community would be willing to share part of the cost. For example, in the Kottar program, the parents of children receiving the oral polio vaccine pay an additional few cents (Kottar 1977). Other vaccines such as anticholera (Cvjetanovic 1971) and antityphoid (Cvjetanovic, Grab and Uemura 1971) are found cost ineffective compared to long-term improvements in sanitation. However, during epidemics or emergencies, short-term interventions providing cholera and typhoid immunications would be recommended.

In an integrated program with village workers, the cost of health/nutrition interventions such as the distribution of antimalarial pills to pregnant women, massive vitamin A dosages, and oral rehydration for children would be little more than the cost of the medicines themselves as the delivery system would already be in place. An annual supply of chloroquine for such purposes, for instance, would be only $0.50 (White, Bradley, and White 1972). The cost of transport plus part of the infrastructural overhead would have to be calculated, but the increment would be marginal. Costing procedures are clearly demonstrated in the case study on Ghana/Lesotho (Chapter 4).

2. Water Supply

The cost of water supply systems depends on a number of factors including geological and hydrological conditions and population density. Saunders and Warford (1976) give the typical costs for a village of 1,000 as ranging from $0.50 to $3 per capita for wells fitted with handpumps. Cost will vary depending on the type of well required, with drilled wells being the most expensive alternative. Motorized pumps and rudimentary distribution systems with public hydrants both increase the per capita costs to $7-$10. It is recommended, therefore, that new water systems be restricted to one central point with distribution points added as resources permit and if the community is willing and able to bear more of the costs. For example, by providing the labor (digging trenches, laying pipe, constructing concrete aprons and soakage pits), some 150,000 villagers in Malawi acquired piped water for less than $13 per capita (Jackson and PRP Team 1979).

TABLE 4

Cost Per Death Prevented with Different Combinations of Vaccines

Number of Immunizing Contacts Per Child	Number of Vaccines	Type of Vaccine	Expected Number of Deaths	Fixed Costs (million US$)	Variable Costs (million US$)	Total Costs (million US$)	Total Cost Per Death Prevented (US$)
1	1	Measles	80,000	1.0	0.250	1.250	16
2	1	DPT(1) DPT(2)	2,500	2.0	0.250	2.250	900
2	2	TB Measles	80,300	2.0	0.275	2.275	28
3	1	Polio(1) Polio(2) Polio(3)	250	3.0	0.375	3.375	13.500
3	2	DPT(1) DPT(2) Measles	82,500	3.0	0.500	3.500	42
3	3	TB Smallpox Measles	80,550	3.0	0.300	3.300	41
3	4	TB/DPT(1) Smallpox/DPT(2) Measles	83,050	3.0	0.550	3.550	43
3	5	TB/DPT(1)/Polio(1) Smallpox/DPT(2)/Polio(2) Measles/Polio(3)	83,300	3.0	0.925	3.925	47

Source: Dag Hammarskjold Foundation 1975.

3. Sanitation Facilities

Sanitation facility cost will vary again by village size and density as well as soil and drainage conditions, cultural patterns, and level of development (Wagner and Lancix 1958). Latrines are the least-cost solution to disposing of human wastes in uncongested areas. Of these, pit latrines are the least expensive, although in certain soils, borehole latrines may be quicker, cheaper, and equally effective. Neither have to be cleaned but are merely sealed with earth when nearly full and the shelter moved to a new site. Vault latrines are more expensive and permanent; they must be moved every one to 10 years depending on original size and amount of use. The cost ranges from under $10 per unit for a pit or borehole (where labor and shelter are provided by households so the only cash expense is the slab) to $200 if a concrete slab is used, and a reasonably sound shelter is installed. Leaking pits (for water-flushed toilets) are possible in areas with sand and gravel soils and no wells in the vicinity.

B. Costs to Individuals

While the cost of the individual components themselves are considered in great detail by program designers, the costs to the consumer in utilizing the various components is usually given little if any attention. Even though the cost of the service itself is free, the extent to which a person will utilize it is determined by factors such as location, cost and availability of transportation, and time (travel, queuing, and service). These must be taken into consideration when designing a program. The costs are of particular importance when service is aimed at the loqest socioeconomic groups and when concerned largely with the delivery of preventive services whose significance the population little realizes.

The cost to ther ecipient of services provided in or close to the village is many times cheaper than at a fixed health facility, either a health center or hospital. One analysis comparing hospital to domiciliary treatment of malnutrition clearly demonstrates the savings to the parent as well as to the institution, usually the government (Table 5). In addition to the financial costs, the psychological costs must be considered; treatment by clinic staffs is often degrading and completely without feeling for the villagers. This contrasts with the cultural affinity between the IW from the same village or region as the recipient.

There are also costs to be considered in procuring water, depending on whether the family hauls their own or buys from a standpipe or from a carrier at the door. The latter two are much more expensive and rarely seen in the rural areas of developing countries. The time women spend hauling water could in many cases be spent more productively (and perhaps profitably), especially during the peak agricultural seasons when labor is in demand.

Table 5

COST TO PARENT AND HOSPITAL FOR TREATMENT AT HOME VS. TREATMENT AT HOSPITAL

		Domiciliary MCH	Hospital
I.	Cost to Parent:		
	Additional Food	$1.77	--
	Loss of Wages	1.16	$4.90
	Transport	.53	1.87
	Own maintenance	---	11.43
	Total	$3.46	$18.20
II.	Cost to Institution	$1.32	$48.97

Source: Shah. Udani, and Aphale 1971.

The integrated program defined in this chapter would be considered a social service and would generally be thought to be a government responsibility. The costs borne by the patients in health services in developing countries are small, if anything. As a result, the burden of support for all the facilities, supplies, equipment, and personnel rests with the government. Most developing countries are unable to support a satisfactory health service. This is partially explained by the maldistribution of the health budget (two thirds or more typically spent on hospital services serving mostly urban centers). Another 10%-15% is spent for administration, training, and preventive programs. Only 10%-20% is expended on health centers and subcenters (Dag Hammarskjold Foundation 1975; Gish 1975; Lipton 1977).

Resource allocation priorities must be adjusted so that low-income grpups are serviced, but it would also seem that the rural population can and should be expected to pay at least a modest amount for the services included in types of integrated programs described here. As mentioned, the population relies to a large extent on local indigenous practitioners who charge for their services. Although developing countries rarely allocate over $3 per capita for health (it is usually closer to $1), the individual's private expenditures may come close to $4 per capita. Although there is little research on this point, a study in India found people spending $3.86 per year per person (Parker and Taylor in McCord 1977). There is, of course, no guarantee that all or even the majority of the amount spent on non-Western medicine will be used for the newly provided services. However, if only 25% were spent on the village-level integrated services, it would equal or even surpass present government annual allocations per capita.

Several integrated health schemes have found that people will pay for health services if they have confidence in them. Two programs in India, Jamkhed (Arole and Arole 1975) and Kottar (1977), are examples. In these schemes people pay fees that cover the cost of personnel, nutrition/health education, and health services. In Kottar, the family pays approximately $0.20 per month and receives fortnightly check-ups and education sessions given by paramedical personnel.

The same point can be made about water systems - more of the burden should be borne locally. Not only does this relieve the government of some of the financial burden but, according to Saunders and Warford (1976), there is evidence that villagers tend to value their water systems more highly, make better use of them, and operate and maintain them more efficiently when they have contributed resources (in the form of labor, materials, or money) to help defray construction costs and are paying users' fees to cover at least operation and maintenance expenses. The chances of the community contributing in this manner depends on two things: their comprehension of the need and value of such a system and having someone in the village responsible for overseeing the effort. This could be greatly enhanced by the existence of an integrated program and a village worker to coordinate and organize it.

It has been suggested that a government should provide water systems that will guarantee 20 liters per capita per day with only a moderate level of contamination, asking no more than labor during construction in return (White, Bradley, and White 1972). For anything more elaborate, such as multiple distribution points or in-house connections, the community should and is apparently willing to bear the cost. Saunders and Warford (1976) have recommended that a community should pay 3%-20% (average 10%) of the initial construction costs.

There is little argument that villagers should cover the operating and maintenance costs plus possibly a portion of the depreciation. The fee should be set at between 3%-5% of income (Saunders and Warford 1976). Such a fee could have a negative impact in forcing the poorest and most vulnerable members of the village to reduce the amount of water utilized or revert to the use of contaminated source. The problems, however, could be minimized by allowing these families to pay by working on the maintenance of the ater system (proper drainage, keeping well area clean). Being self-reliant, a village need not rely on government subsidies that may or may not be forthcoming on a regular basis.

It is unfortunate that for political reasons the capacity and even willingness of the community to assist in the funding of low-cost nutrition/health-related activities is discouraged. Politicians are reluctant to suggest that their constituents contribute to the support of such services; they fear that such a policy would cost them votes. Experience has shown in relatively small nongovernmental projects, however, that in addition to the obvious economic benefits there are strong psychological benefits to be gained by the recipients themselves. The beneficiaries gain an increased sense of participation and involvement. They feel that they have a greater say in the operation of the scheme, a vital factor if such community-level programs are to function effectively.

C. Cost Indicators

To evaluate programs, one could use costs per service recipient. However, it may be more helpful to calculate the cost of reducing the incidence of severe malnutrition for one child or the cost of each percentage point decrease in the infant and child mortality rates. While these figures can be compared across programs, it is still difficult to arrive at any accurate cost-effectiveness comparisons because of differing socioeconomic, climate, agricultural, and cultural conditions.

It is very important that the program designers understand the need to disaggregate the costs of delivery of the integrated program into component costs. It is only in this way that the complementarities or the savings derived from coordinating operations (i.e., the joint use of personnel and facilities) can be demonstrated. An example of the approach is in the Narangwal study. They estimated that the cost of delivering the nutrition supplement and infection control services were $16.70 and $8.35 per beneficiary, respectively. By combining the two, a 20% savings was achieved ($20 per beneficiary). An additional savings

of 16% was reported when the family planning and women's services were added to the combined program for the children instead of delivered separately (Parker and Taylor 1977).

III. COST EFFECTIVENESS

A variety of measures should be used in comparing program performance. Outcome measures are the tools for assessing progress toward operational goals (e.g., target group coverage) and outcome (e.g., changes in nutritional status). As a general comment, it must be emphasized that programs should be assessed only in relation to their respective objectives. The work by Popkin et al. (1978), for example, demonstrated how inappropriate it is to compare an integrated approach including a vitamin A component to a vitamin A fortification of monosodium glutamate (MSG) effort (see Study V, Fortification, Austin et al. 1979). What is described as a public health and horticulture intervention relies on the provision of preventive and primary health services while encouraging the production of carotene-rich crops in family plots. The latter is expected to take considerable time to produce results, although once it does, they may have a much broader effect and be a more meaningful form of change than the fortified MSG intervention. These "externalities" are difficult to consider. The MSG fortification produces a reasonably quick and impressive impact on xerophthalmia but no additional effects on the population and their general quality of life. The MSG scheme, therefore, would be the choice if looking for a simple, short-run effective intervention not concerned directly with bringing about other changes in the society. The objectives of the two interventions differ greatly; little is gained by comparing their effectiveness.

A brief discussion of suggested effectiveness measures follows.

A. Operating Indicators

From an intervention-design viewpoint, outcome indicators are insufficient. They tell the designer what happened but not why. It is the why answer that is essential to improving program performances. Consequently, there are some additional indicators that reveal how well certain components of the intervention's delivery system have been functioning. They represent program points subject to manipulation through adjusted program design.

1. Coverage

The percentage of the target group actually being reached by the intervention may reveal problems in outreach communications (i.e., participant awareness), location of service center, logistics, or some other participation barrier.

2. Cost per Target Group Recipient

This indicator adds a cost dimension to the coverage measure. This cost will be higher to the extent that the program is delivering services to nontarget-group members. The difference between the Cost per Recipient (this can range from entire population to a specific age or socioeconomic group) and Cost per Target Group Recipient (might be only those below 65% of standard or all pregnant mothers) is the cost of "excess coverage." If this is high, the manager should explore means of targeting the program more specifically. The administrative cost of achieving better targeting should be compared to the savings from reduced excess coverage to determine cost-effectiveness. Because the integrated intervention really requires someone like an IW to be effective, it allows, at virtually no additional administrative cost, the program to be targeted as precisely as the program directors desire.

3. Dropout Rate

The program manager should be particularly concerned about the attrition in participation. A high rate might reveal low-felt needs, ineffective educational efforts, poor initial screening, or participation barriers mentioned in the coverage section.

4. Leakages

The extent of substitution, diversion, pilferage, or storage losses are important to document because they represent potential cost savings and impact-increasing areas. Various interventions, particularly nutrition education, require modification in the outcome and operating indicators. These will be indicated in the individual intervention discussions. The design and selection of alternative interventions of course must not be based solely on outcome and operating indicators, but must also weigh administrative feasibility and political acceptability factors.

B. Outcome Indicators

These deal with changes in nutritional and health status. These changes when related to costs produce cost-effectiveness measures. Three such indicators are suggested.

1. Cost per Closing of Nutrient Gap

This indicator first assumes that the interventions are attempting to close all or a high percentage of the identified nutrient deficit in the target group either by providing food plus nutrition education or education alone. It is an attempt to verify that the desired nutrient levels are actually consumed. Without such an intake increase or alternately, without a health intervention that improves nutrient utilization, no physiological improvement is possible. The indicator also serves to highlight the seriousness of leakages of program-donated food to nontarget groups or because of substitution effects. The indicators require that the

dietary intake of recipients be known before and after the intervention started. Although current methodologies for assessing intake are not highly accurate, they appear to be at least as reliable as measures of income, for example; and work currently is being done to improve intake assessment methods. Change in intake reveals on the average what percent of the target group actually had their gap closed. In summary, the indicator can relate cost to the percentage reduction in the average gap; for example, $20 per year to reduce the target group's average calorie gap by half (say, a 40% deficit to a 20% deficit).

2. Cost Per Change in Degree of Malnutrition

This indicator shifts from nutrient intake to actual physicological change. However, if anthropometric measures failed to reveal changes, one might seek explanations from the failure of the delivery system to increase sufficiently target group intake. The Harvard anthropometric standards, the United States National Center for Health Statistics (NCHS) (United States Department of Health, Education, and Welfare 1976), or local standards can be used to reveal the cost per child moving from severe to less severe degrees of malnutrition or of case of malnutrition averted. Pregnancy weight gains are also relevant measures, as are birth weights. One cautionary note is in order here. It may be more difficult and expensive to move a child from third- to second-degree malnutrition than from second to first; weights might be given accordingly.

3. Cost Per Change in Mortality and Morbidity Rates

Separate indicators for the infant mortality rate and the 12-36 month mortality rate would be useful. However, to get statistically significant numbers would likely require an exceptionally large sample. Statistics are sometimes difficult to obtain reliably because of a lack of records and imprecise recall. The use of events calendars may be helpful in increasing accuracy. Morbidity rates could also be a denominator, but the reliability of such data is generally low; survey analysis is being conducted because even weak measures are highly correlated to nutritional status outcome. For simpler forms of evaluation, however, the effort to collect this information should not be made. Another option is the use of costs per death averted. However, widely accepted methodologies for calculating these figures are not available.

One interpretation question about the indicators is needed. By reducing costs to a per-unit measure, they do not clearly reveal the benefit of an intervention's being able to reach more people. For example, a nutrition rehabilitation center might be able to service 100 children per year, while a take-home feeding program might cover 1,000. Another example would be that one program had a higher dropout rate than another yet showed greater nutritional improvement in the remaining participants. Such coverage differences should be considered in comparing interventions.

It may not be feasible to use all these measures to assess progress toward objectives. Particularly due to the fact that morbidity, nutritional status, and mortality will be influenced by factors beyond the control of the system, it will be difficult to hold the program responsible for such changes. Nonetheless, they represent the ultimate bottom line.

A simple evaluation system can be established around the weight charts, which can provide timely information on the number in each grade of malnutrition. This can be compared to the baseline or previous periods to determine if the prevalence and severity of malnutrition has decreased and by how much. The master weight chart makes it easy for the village worker to keep track each month of such things as how many children progress, regress, or stay the same. This chart, devised by Capone (1977) is shown as Figure 2. Weights of all children are entered onto the chart at the same time as they are entered onto the children's individual charts. Percentage of children immunized against various diseases, and the numbers with diarrhea or serious disease can also be recorded. Moreover, the IW should be able to provide information on the number of contraceptive users each month. Progress can be measured by comparing the figures with the previous month, a year ago, or the baseline (when program initiated). When workers have these data readily available, evaluation of the scheme is greatly facilitated. A simple summary for giving only the accessible and useful information can be given to the IW supervisors so that the effectiveness of the workers and the program at large can be measured. Problem areas can be identified in this manner and special attention directed at them (an "at-risk" management system). The important principle here is that each worker is responsible for a definite area or population and is held accountable for what happens.

As as been recognized from the Narangwal experience (Parker et al. 1979), program evaluation may depend on the effectiveness measures used. Using the measure of deaths averted, the most cost-effective intervention was found to be supplementation of mothers' diets. Next in order were provision of health care services to children less than one year old, to children one to three years of age, and provision of nutrition care to children greater than one year of age, respectively. In general, the study found that use of morbidity as the effectiveness criteria ranked health interventions higher, while use of measures of growth and development, e.g., height and weight for age, found nutrition care to be effective.

Despite the limitations mentioned, a look at outcome indicators demonstrates that the integrated approach in general can have impressive results. The infant mortality rate (IMR) (0-1 year olds) and child mortality (1-3 years old) are usually listed separately since they indicate different problems. Figures from four integrated programs are given in Table 6.

A frequently noted phenomenon is that mortality rates and the prevalence of severe malnutrition cases drops, but there is little or no reduction in the incidence (the number of new cases) of malnutrition. This may be explained, at least in part, by the fact that the children who

GROWTH SURVEILLANCE CHART

CENTRE ______________ No.

NAME ______________ FATHER'S NAME ______________ MOTHER'S NAME ______________

DATE OF BIRTH - KNOWN ______________ PLACE OF RESIDENCE ______________ GROUP ______________

ESTIMATED ______________ DATE OF ENROLMENT ______________ SEX ______________

PERCENT OF STANDARD GROWTH

100	100
95	95
90	90
85	85
80	80
75	75
70	70
65	65
60	60
BELOW 60	BELOW 60

DATE

WEIGHT (lbs. or kg.)

ILLNESS

AGE IN MONTHS

TO ENTER THE PERCENT, CALCULATE FROM THE MASTER CHART, FILL THE CORRECT SQUARE AND CONNECT THE DOTS AS SHOWN.

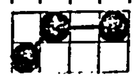


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TABLE 6
MORTALITY RATES IN FOUR INTEGRATED MCH-NUTRITION PROGRAMS

	Population Receiving Services		Population in Same Area without Services	
	Infant Mortality Rate	1-4 Mortality Rate	Infant Mortality Rate	1-4 Mortality Rate
Imesi (Nigeria)	57.3	18.0	91.4	51.2
Guatemala	55.4	5.9	84.7 *	22.0 *
Narangwal (India)	95.9	10.1 **	126.5	16.3 **
Jamkhed (India)	39		90	
Hanover (Jamaica)	10.6	5.6	47.0	14.5
Kavar (Iran)	64.3	n.a.	127.7	n.a.

* From official statistics, which are probably low estimates.

** Age 1-3 mortality rate

Source: McCord 1977; Gwatkin, Wilcox, Wray, 1979.

previously would have died are now surviving and increasing the number of malnourished. In Narangwal, for example, the 1-3 mortality rate was reduced by 37.5% in the experimental population and the percentage of malnourished children was reduced by 30%, but the proportion of severely malnourished remained constant (Kielmann and Uberoi 1972). The same thing was observed in Jamaica in the Hanover project in which the infant mortality rate in the population of 65,000 was reduced from 47 to 10.6 (a 77% reduction) and the prevalence of malnutrition cut in half over a two-year period without a significant drop in the incidence of malnutrition (Alderman, Wise, and Ferguson 1977). The Yako program in Upper Volta, however, apparently has reduced cases of severe malnutrition to about 1 in 5,000 preschoolers. The incidence of second-degree malnutrition in 6-24 month old infants in three Yako villages (62 infants) was only 12%, with no cases below 65% of weight for age (Zeitlin 1978).

Attempts at identifying which components in an integrated program contribute most to the mortality and morbidity reductions is extremely difficult. An effort in this direction has been made in the Ghana/Lesotho case study (Chapter 4). Although it is not feasible to review the potential impact of the individual components, it is worthwhile to briefly summarize information on the impact of the water supply, as there is perhaps more conflicting evidence on this component. Based on their work in East Africa, White, Bradley, and White (1972) have "guestimated" the rates of reduction in water-associated diseases that might be expected with the introduction and proper use of improved water supplies. The authors admit that the figures given in Table 7 are very rough estimates but say that this is better than assuming the conditions would either disappear, remain unchanged, or all respond similarly by improving water supplies.

The authors go on to discuss the complexity of the subject and the difficulty of determining cause-and-effect relationships. An improvement in nutrition or health status could result from a number of possible factors including decreased contamination in the water, increased usage, improved personal hygiene, change in livestock-rearing practices, and construction and use of sanitary facilities. Over and above these, the initial level of health of the population, economic and income levels, cultural habits, educational level, and general physical environment all have their effects. These factors must be considered, therefore, when judging the effectiveness of integrated programs. Two villages, even if located next to each other and receiving the same service inputs, may and probably will experience different results.

Because many of the relationships between program inputs and impact are indirect, it is extremely difficult to spend a great deal of time to ascertain the relative contribution of the individual components, especially in an operational setting. Nonetheless, it is important for establishing the component mix and sequence. Some interesting work done on this matter indicates that the integrated approach can produce increased impact.

Table 7

Relation Between Water Supplies and Infectious Diseases and Estimated Reduction Resulting from Water Improvement

	Group	Commonness	Severity	Chronocity	Quantity Effect	Quality Effect	% Reduced by Water Improvement
Cholera	Borne	**	***			###	90
Typhoid	Borne	*	***			###	80
Leptospirosis	Borne	*	**			##	80
Bacillary dysentery	Borne/ Washed	**	***		##	##	50
Amebic dysentery	Borne/ Washed	*	**	**	##	##	50
Paratyphoid	Borne	*	**		#	#	40
Infectious hepatitis	Borne	**	**	*		#	10?
Enteroviruses (some)	Borne	**			#	#	10?
"Gastroenteritis"	Borne/ Washed	***	***		##	##	50
Skin sepsis	Borne/ Washed	***	*	*	##		50
Skin ulcer (chronic)	Washed	***	*	**	##		40
Trachoma	Washed	***	**	**	###		60
Eye inflammation	Washed	***	*	*	##		70
Scabies	Washed	**	*	*	##		80
Yaws	Washed	*	**	*	#		70
Leprosy	Washed	**	**	**	#		50
Louseborne typhus	Washed	*	***		#		40
Ascariasis	Washed	**	**	*	##		40
Urinary schistosomiasis	Based	**	**	**		##	80
Guinea worm	Based	**	**	**		##	100
Yellow fever	Related	*	***				10?
Onchocerciasis	Related	**	**	**			20?
Malaria	Related	***	**	*			10?
Gambian sleeping sickness	Related	*	***	**			80

*Weakly related. **Moderately related. ***Highly related.
#Improved quantity or quality of water somewhat decreases incidence. ##Moderately decreases incidence.
###Greatly decreases incidence.

Note: Indications of commonness refer to East Africa, except for cholera and guinea worm. Both of these important infections happen to be rare in East Africa, and a global frequency is given in parentheses.

An experiment in Nigeria involving 12-36 month olds divided them into five groups, each receiving a different service(s) (Edozien 1970). As Table 8 illustrates, the anthropometric growth was better in the groups that received food supplements (columns 2 and 4) than in the group that received only infection control (column 3). However, the mortality rate in group 2, which did not receive that infection control, was four times higher than the groups (3 and 4) that were immunized and given anti-malarials. The group receiving the integrated package was closest to the optimal group (children of university staff) in both growth and mortality rates.

Similar findings were reported in the Narangwal study. The result of integrating the medical care and nutrition components were found not be be synergistic (greater than the two components taken separately) or even additive. The term "synergism" has generally been used too loosely when applied to integrated programs. Nonetheless, by integrating the medical care and nutrition activities, the program was able to achieve the same growth and development increment attained when nutrition was provided separately as well as the reduction in morbidity and mortality rates as attained when medical care was made available by itself. The improved results were accomplished with only slightly more expenditures of time and money (Kielmann et al. 1977). Combining hygiene and sanitation aspects and family planning awareness and services adds several other aspects that could further improve the vulnerables' nutritional status and reduce sickness and death at little extra or marginal increases in cost, as the delivery mechanism would already be in place.

Several other significant findings on the biological effects of integrated programs should be noted. Narangwal found that the provision of iron and folic acid tablets plus supplementary food to pregnant women dramatically reduced perinatal (stillbirths and first week of life) mortality. The rate went from 57/1,000 still and live births to 31/1,000 vs. 45/1,000 for medical care without supplementation (Kielmann et al. 1977). The concern expressed that supplements to pregnant women will result in an increase in the number of caesarian sections is unfounded if recipients are determined according to the "at-risk" factors.

After discovering that almost 67% of all deaths between 8 days and 3 years were caused by diarrhea/dehydration (44%) and by lower respiratory tract infections (22%), the community workers were provided oral rehydration solution and penicillin. Over the next 17 months, there was a 50% decrease in the mortalit rates (Kielmann et al. 1977).

As mentioned, nutritional status must be considered when discussing mortality rates. Kielmann and coworkers (1977) found that between 1 and 36 months of age for every 10% drop in nutritional status (below 80% of the standard), the mortality rate approximately doubled (Table 9).

Drake and Fajardo (1976), in analyzing the Promotora program at Candelaria (Colombia), found that the age of the child upon entering the program and the duration of the family in the program greatly affected the impact of the scheme. The earlier the child was brought under the protection of the integrated package of services, the greater the effect of the program on the child's nutritional status.

TABLE 8

GROWTH AND MORTALITY ACCORDING TO INTERVENTION MIX

	1	2	3	4	5
	Control	Milk Supplement	Malaria Prophylaxis + Immunization	Combined 2 + 3	Optimal
Increase in height cm/12 mo.	6.1	7.8	6.5	8.1	8.5
Increase in weight kg/12 mo.	1.2	1.9	1.3	1.9	2.2
Mortality: No. deaths in 12 mo.	12	11	4	3	1
Developed kwashiorkor	5	0	0	0	0

Source: Edozien 1970.

TABLE 9

Annual Mortality Rates by Nutritional Status and Age Groups

Age Group (months)	Nutritional Status (as % of Harvard weight median)			
	60	60-69	70-79	80+
1-5.9	176	114	89	16
6-11.9	206	61	26	8
12-35.9	33	22	4	5
1-35.9*	87	43	21	7

* Assuming 16% of children 1-5.9 months of age, 18% 6-11.9, and 66% 12-36.

Source: Kielmann et al. 1977.

Clearly the more a population or target group approaches normalcy, the less the program impact will be noted. This means that a program serving a population with a high rate of severe malnutrition can achieve what appears to be a great impact.

A type of measure of cost effectiveness involves the delivery system, the cost of reaching the target group and delivering the services. The cost per recipient target group recipient, service delivered, and nutrient deficit or health problem(s) reduced can all be maximized by the ability of the integrated approach based on community workers to target the intervention to the individual in need and to the specific problems existing in the community. The surveillance technique, utilizing the IW and weight charts, as described in Chapter 2, permits optimal efficiency in directing the program to malnourished or nutritionally at-risk groups so that the most impact is achieved for the least cost.

This leads into another measure, operating effectiveness. This intermediate measure of effectiveness is concerned with program dimensions such as coverage, services, permanency, personnel, and leakages. Once again the integrated approach receives high marks. When one compares the performance of village-based integrates schemes to site-specific clinics, the difference is apparent. Over 80% of the reasons given by mothers for not attending under-five clinics in Zambia involved not knowing the child was ill or the clinic was too far away (Stephens 1975). There are many other reasons for not providing proper care for the child, and these are removed once the services are made accessible and the status of the child is monitored on a continuing basis. This contact with the vulnerable population, especially those most "at risk," on an ongoing basis is, therefore, the most important aspect leading to improved impact in the integrated approach. It enabled, for instance, the Narangwal project to reduce the number going without treatment from 60% to 20% (Kielmann et al. 1977). Mortality and morbidity are reduced by the prevention, early detection, and rudimentary treatment of infectious diseases by the IW and the higher-level referral staff. The integrated approach at Narangwal reduced the mean duration of diarrhea (by 2 days), lower respiratory tract illness (1-1.5 days), fever (1 day), cough (3 days) and skin infection (1.5 days). Overall, the mean duration of illness was 6.3 days in the medical care and nutrition program, versus 7.1 in medical care alone, 8 in nutrition alone, and 8.3 in the control. Similarly, it was principally by means of the surveillance/screening methodology carried out by low-level community workers that such programs as Hanover, Kasa, Jamkhed, and Candelaria, to name only a few, achieved their impressive results.

Among the most interesting and potentially important impacts of integrated programs including a family planning component is the dramatic increase in birth control users. Several examples demonstrate this very clearly. In the Kasa Integrated Mother-Child-Health-Nutrition Project, the number of sterilizations went from 45 in the fiscal year 1974-75 (before the scheme was initiated) to 750 the following year (Shah 1977). No such increase was reported in neighboring areas that did not have the

community-based integrated program. The Jamkhed Comprehensive Health Program reported the percentage of eligible couples practicing family planning went from 2.5% in 1971 to 50.5% in 1976 in the project area. In nonproject areas only 10% of the eligible couples were listed as active contraceptive users in 1976. In the Kavar Project in Iran, the percentage of contraceptive users went from 7% to 24% in 15 months (Pahlavi University 1976). Moreover, Companiganj experienced an almost 65% increase in acceptors in the first half of 1975 compared to the entire previous year. Significantly, the number of sterilizations rose by 35% (Companiganj Health Project 1975). Finally, the use of birth control in the Candalaria Promotora Program went from 18.7% of the families in 1968 to 43.6% in 1974 (Drake and Fajardo 1976).

The principal explanation for their success in this highly sensitive and often difficult area is the provision of a package of services and the continuity, trust, and rapport established between the IW and the villagers. Although this success may tempt governments to turn an integrated program into a family planning effort, they must realize that it is precisely because it is not primarily a family planning program that such impact was attained. Family planning must be a part of an integrated program, not the reverse where other services are attached to what is basically a family planning scheme and identified as such. As stated in the National Academy of Sciences (1975): "Family planning programs are often more likely to be accepted if they show concern for the health and well being of mothers and children and do not simply aim at limiting family size." For this reason, many of the integrated schemes are referred to as "family welfare" or "family development" programs (e.g., Project Compassion in the Philippines) and avoid using the term family planning (Johnston 1977). An exception to this rule, however, can be found in Indonesia where the highly effective family planning infrastructure is being utilized to deliver nutrition services.

While the advantages of the integrated approach are many, there are many potential barriers to its effective implementation. Realistic planning must scrutinize these problem areas, which include such matters as replicatability, personnel overload, receptivity, imbalance, and a variety of political considerations. Almost exclusively the examples of integrated programs referred to in this chapter have been relatively small demonstration projects intensively managed to insure effective implementation. The ability of a government to implement this new strategy on a large scale is only now being tested. The bureaucracy, as discussed, must repond and adjust to new demands to make it work.

There must be the political will on the part of the national government before serious efforts can be made to implement such a strategy. The constituents who stand to benefit the most, the children below three years of age and women in the child-bearing age, usually from the lowest socioeconomic strata of the society, have virtually no voice in the policy determination process. Moreover, government decisions are frequently based on considerations other than simply cost effectiveness (Pyle 1976). However, once the government decides that the preschool

mortality and morbidity rates must be lowered, the integrated approach with nutrition, health, water/sanitation and family planning components operating at the community level is the most reasonable one to adopt. The needs of the community and the quantity and quality of services feasible for the funds available must then be determined.

In replicating or expanding the integrated approach, several tendencies must be resisted. First, no given IW must be overburdened with responsibilities. It is inviting to assign many priority tasks to a single community worker who has become the link or contact point in the village. Too many responsibilities can cause the program to collapse under the weight. It is essential that the IW be supported by well-trained supervisory personnel who can insure the functioning of the referral system and the supply distribution system, as well as provide the IW with additional training. Creation of additional categories of IWs may be required. Sanitation and water supply, for example, may be assigned to different workers.

Another tendency to be resisted is to emphasize curative medical aspects for the community, thereby losing sight of its most important long-term objectives. While curative care is the bias of the doctors and usually is the highest felt need of the villagers, the promotive and preventive measures must be stressed. The IW will also concentrate on the curative services unless they understand clearly the need for the latter and proper supervision is provided to support their preventive/promotive efforts. Health often serves as the focal point of an integrated effort and can easily come to dominate it. It is neither possible nor desirable to attempt to answer all health problems at the community level. This would only perpetuate the situation as it exists now in most developing countries - provision of services to the few who need them least.

The integrated approach could also be handicapped by being associated with an unpopular component such as family planning. The planners must be aware of public sentiments and adjust the program accordingly. For example, it might be advantageous for the family planning aspect to become a part of the program only after rapport with the community has been established and the rest of the program is functioning effectively. In other words, the family planning aspect is allowed to grow naturally out of the other components. Neither it nor any other component in the integrated approach must be allowed to dominate the program. Undue priority to the curative or supplemental feeding aspects, either because they are politically popular or because of their relative ease of delivery, must be avoided. For maximum effectiveness, the package of services must be delivered as a whole, with each component complementing and supporting the others.

In summary, more is known about the nutrition and health problems affecting the preschool population in the developing world and about very practical means of solving them than we have been able to effectively implement and deliver on a large scale. The integrated approach, utilizing a community worker, provides a way to address four basic problems

(nutrition, primary health care, water/sanitation and fertility matters) for only a marginal increment in cost. The improved performance of each component enables the package to have a significant impact on the most vulnerable target group. It can be a cost-effective means of attaining both short-term and long-term improvements in the community's quality of life even before substantial economic development is realized.

C. SUMMARY:

COSTS AND EFFECTIVENESS

Although cost and effectiveness data for integrated programs are incomplete and scarce, the data that exist provide evidence that savings are possible by combining service delivery. The use of IWs also lowers delivery system costs. For the health component the cost of vaccines to protect a child against the major immunizable diseases is estimated at about $2.00 per child. The cost of water systems depends on multiple factors including geological and hydrological conditions and population density. For villages of 1,000 a per capita cost of $1.75 has been estimated for wells fitted with handpumps.

A sanitation facility's cost will vary by village size and density, soil drainage conditions, and cultural patterns. For human waste disposal pit latrines costing $10 per unit appear least expensive.

Program costing should also consider those costs incurred by the client to use the services, e.g., travel time and charges, loss of wages. These can be sizable and can significantly influence participation rates. People will and do, however, pay for nutrition health care, water, and family planning services, if they deem them worthwhile. Such beneficiary payments are probably essential to the long-term financial viability of integrated programs.

To measure program effectiveness one can first examine the following operating indicators: coverage, cost per target group recipient, dropout rate, and leakages. These indicators reveal program points subject to improvement by adjusting the program's design. One can also examine certain outcome indicators to ascertain changes in nutritional and health status and by relating them to program costs produce the following cost-effectiveness measures: cost per change in degree of malnutrition, and cost per change in mortality or morbidity rates.

The evaluation of integrated program effectiveness is complicated because different components appear to have differential effects. Therefore, different indicators can give rise to different performance judgments. Despite these methodological limitations, integrated programs appear to produce impressive reductions in mortality rates of infants and preschoolers. The exact nature of the synergism among program components is not clear from field data, except perhaps for family planning. When this component is included in the integrated package the number of users appears to jump significantly.

Despite the potential benefits of integration, many barriers also exist. These include replicatability, personnel overload, component imbalances, instituional resistance, and many political factors. These implementation hindrances require careful scrutiny and planning during the intervention design phase as well as in interpreting the results of the program evaluations.

CHAPTER FOUR

CASE STUDY OF THE COST AND EFFECTIVENESS OF PRESCHOOL CLINICS IN GHANA AND LESOTHO

I. PURPOSE

The goals of this case study are: 1) to illustrate an integrated approach to nutrition and health programming for preschool-age populations; 2) to explore the relative effectiveness of the integrated components in combination in averting weaning-age malnutrition; 3) to analyze the costs for such a program; and 4) to determine the cost-effectiveness of the intervention in preventing malnutrition in the target population. We have selected for the study two preschool programs, one in Ghana, the other in Lesotho, which have much in common with one another.

It should be pointed out that both programs reviewed in the case study are clinic-based. The focus of the case study is on the effectiveness of a mix of services and the costs involved. A second case study is presented in Chapter Five; it anlyzes the organizational and management aspects of community-level projects in the Indian State of Maharashtra.

II. DESCRIPTION OF THE PRESCHOOL CLINIC PROGRAMS

This case study is based on data from 19 preschool clinics studied from March 1977 to June 1978, gathered by Synectics Corporation, Lesotho's and Ghana's Ministries of Health, and the Harvard Institute for International Development (HIID).

The main clinic services are:

- general health/curative care
- preventive health (immunizations)
- nutrition education (including cooking demonstration)
- food distribution
- family planning
- clinic gardens
- health and hygiene education.

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*The primary author of the Ghana material in the case study is Marian Zeitlin and of the Lesotho material, Jonathan Fisher. Nancy Pielemeir of Synthetics, Inc. directed the field data collection of nutritional and health status impact. Richard Brooks and Richard Morrow collected the cost data on the Ghana case study. David Pyle, Tom Belding and Jim Austin provided editorial assistance.

III. COUNTRY SETTING

A. Ghana

The West African country of Ghana is partly tropical, partly savannah and, in the north, arid semi-desert. Ghana's population is heterogeneous with a number of tribes speaking different languages. About 70% of its 10.5 million population reside in the rural areas. In 1977 the annual growth rate of the population was given as 2.6% with an IMR of 160 per 1000 live births. Illiteracy rates ranged from 50% in the urban areas to 90% in the most isolated rural areas. The country's economy suffered from hyperinflation, and both per capita GNP (estimated at $580 in 1976) and real income had declined over the previous decade.

Like most of sub-Saharan Africa, Ghana was plagued with particularly severe strains of malaria, in addition to the usual range of tropical and communicable diseases. According to estimates of the Catholic Relief Services (CRS), only about 6% of the preschool population were reached by health services. These services were provided through a network of government and mission facilities, with 47% of the doctors and a fourth of the hospital beds located in and around the capital city of Accra and thus serving only about 10% of the population. In 1977 there were 111 hospitals, 59 health centers, 78 health posts, and 68 clinics operating throughout the country. United States Title II foods were distributed by CRS to about 130,000 preschoolers.

1. Nutritional Conditions

The staple crops in the forest zones of Southern and Central Ghana are tubers and plantains while sorghum and millets provide most of the calories in the Northern savannah country. The population in the latter region experiences caloric undernutrition due to insufficient supply before harvest. In the South the protein supply is limited because the tsetse fly makes it impossible to raise cattle. Vitamin A deficiency is also a problem in the North which lacks red palm oil and green vegetables available in the South.

The word kwashiorkor comes from Ghana and the Ga language (Williams 1963). Poor traditional weaning practices restricted the infant to maize and other cereal gruel and to starchy tubers when taken from the breast at about 18 months of age. Nutrition education concerning the cause of kwashiorkor over the past two decades, however, has improved the situation. Rank cases of the disease are now only rarely seen by health personnel (Abadio 1977).

A nutritional survey reported by Davey (1963) concluded that the rural population was less well-nourished than the urban, that pregnant women were more poorly nourished than nonpregnant, that 40-50% of children in the 1 to 5 age group were underweight and had diets deficient

in both protein and calories, and that school children suffered from less severe protein and calorie deficits. By contrast, 40% of the "market mammies," or female traders, in the capital city of Accra were overweight.

A study of 1706 preschool children attending the clinics was conducted by the CRS in 1973-74 (Jacob and Gordon 1975). Approximately one third of all children who were under two years at first clinic visit were found to be malnourished when first weighed. Older children aged 2 to 4 years at first visit were better-nourished. Less than one fourth fell below 80% of the Harvard Standard (Stuart and Stephenson 1959), which was used as the cutoff point for determining malnutrition.

B. Lesotho

Lesotho is mountainous with a harsh winter climate, minimal arable land and little vetegation. It is completely surrounded by the Republic of South Africa. The country's population of 1.2 million is homogeneous and is concentrated in the Western lowlands but scattered in thinly settlements in the eastern mountainous region. The population of Lesotho is growing at an annual rate of 2.2%. The IMR is given as 106 per 1000 births while the 1-4 year old mortality is 115 per 1000. The literacy rate is about 50%, partly due to the large number of mission schools.

The country's economy is highly dependent on South Africa for employment; (60% of the male labor force and 6% of the female labor work force in South Africa) (van der Weil 1977). The average per capita income in 1977 was tentatively estimated at $170 (McGlaughlin 1979).

Major health problems are communicable diseases - gastroenteritis, tuberculosis, veneral disease, and measles. Typhoid and typhus epidemics occur periodically. These diseases are largely related to poverty, limited access to clean water, poor hygienic standards, and inadequate preventative health services and health education.

Health services are provided in 9 government and 8 mission hospitals, and through 60 mission and 25 government health clinics. Ante-and post-natal services are provided at all health facilities and approximately 30% of all deliveries are supervised in hospitals, health centers, or in the home. For the 1976/77 fiscal year, only 8% of the Recurrent Health Budget was for public health services; most of the budget went for hospital-based curative care.

1 Nutritional Conditions

The major food crops in Lesotho are maize and sorghum. Protein, in the form of beef, poultry and milk, is generally available to most of the population. Vegetables and fruits are widely grown, especially in the lowlands.

Direct farm consumption (self-sufficiency) in food production in Lesotho has been approximately 50% (Anderson 1978); 10% of total consumption comes from foreign aid (donated) and the remaining 40% is imported from South Africa.

The labor migration to South Africa has contributed to falling farm productivity and dropping output for maize over the past 20 years (from 214 metric tons in 1950 to 121 in 1960 to 67 - 1970 - a 68.6% reduction). Yields of the major crops have also dropped anywhere from 20 to 60% in the same time period (Table 10).

TABLE 10

YIELDS OF MAJOR CROPS IN LESOTHO 1950-1970

Crop Yield (200-pound bag per acre)	1950	1960	1970	% Decrease 1950-70
Maize	5.3	3.7	2.3	56.6
Sorghum	5.4	3.8	3.1	42.6
Wheat	4.5	3.8	2.4	46.7
Peas	4.5	3.3	1.8	60.0
Beans	1.5	1.6	1.0	33.3

Source: Government of Lesotho, Agricultural census reports, 1950-70, Lesotho.

The 1976 Lesotho National Nutrition Survey conducted by the UCLA Nutrition Assessment Unit found that 22.7% of the children 6-60 months of age had stunted growth and were under 90% of height for age of the NAS Standard. Twenty-two percent of the children surveyed were under 80% of NAS Standard of weight for age (Zerfas and Shoor 1976); the highest prevalence of chronic PCM was in the mountain areas. This rate may even increase during the pre-harvest months, January to April. Moreover, 25% of the children were found to be anemic.

Up to the age of five months, the children were found to be generally well nourished and adequately protected by breast-feeding. The prevalence of breast-fed children by age was: 90% at 12 months, 70% at 18 months and 50% at 22 months. The weaning diet, however, was reported to be low in protein sources and probably provided insufficient calories in the 6- to 24-month period. According to the UCLA study, 26% of the 6-24 month children had had no protein-rich food (excluding milk) during the previous three days. The diet for those between two and five years consisted of mostly of maize, supplemented with wheat or sorghum; 86% of this age group received protein from these cereals and from legumes (peas or beans) (Zerfas and Shoor 1976).

C. Study Sites

In Ghana nine cities were selected in such a manner as to give a variety in geographical setting and nutritional education activities as well as a high level of local involvement with the project. Table 11 provides a summary of Ghanaian clinic characteristics, including location, administering organization, types of services, distinguishing features, program coverage, and supplement food distributed. It should be noted that the clinics are listed in order of highest to lowest average nutritional status of the target children at last weighing.

The preschool Nutritional Program in Lesotho began in 1966 with four MCH clinics covering 8,000 children. Three years later the program expanded to 16 centers serving over 25,000 children. By 1977, 52 clinics were in operation, covering over 50,000 preschool children. The scheme was initiated by CRS and has been administered by them as a fairly autonomous component of the Ministry of Health's MCH clinic program.

The program is run so that mothers bring their preschoolers on foot from the villages in the morning. They travel as far as 10 miles. In well organized clinics a village or group of villages are assigned specific days of the month to come to the clinic, thereby staggering the crowds. First, the mothers in groups of about 30 attend a 10-15 minutes health/nutrition talk on any one of a range of topics (e.g. preparation of weaning foods; recognition of severe malnutrition, importance of breast-feeding, child spacing, family planning, proper hygiene). This is often accompanied by a cooking demonstration and visual aids. The children are then weighed by an aide and weights recorded on a growth chart. The child's record is checked by a nurse to evaluate its development and then is given a quick checkup. Any required immunization is given at this time if vaccines are available (a common problem). For the services, the mother pays a fixed fee of about 30¢. Finally, the mother picks up her rations of CRS and WFP donated foods. The ration set by CRS/Lesotho is to equal one-third of the child's recommended protein intake and to provide 500 calories per child per day (Capone 1978). According to CRS, the supplementary food is to serve as an education tool for the mother, an income supplement to the whole family as well as a corrective element of the preschooler's diet. Moreover, the food is to serve as a strong incentive for the mother's to bring their preschoolers to the clinic.

Table 12 provides a summary of the Lesotho clinic service characteristics. The clinics are listed regionally and not according to any ranking of effectiveness. Finally, Table 13 provides a comparison between the program coverage in Ghana and Lesotho and shows that the two programs are very similar.

IV. METHODOLOGY

The Synectics Corporation of Allison Park, Pennsylvania, undertook under AID Contract #AID/ta-c-1231 to study the use of the child's growth chart as an educational tool in Ghana and in Lesotho. For this purpose, data from nearly 2,000 mother-child pairs in each country were

Table 11--SUMMARY OF GHANAIAN CLINIC CHARACTERISTICS

DATA CATEGORY	Highest to Lowest Nutritional Status Outcome										Total Ghana Sample All Clinics
	Fijai	Adidome	Kotobabi	Akim Oda	Berekum	Damango	Kumasi	Navrongo	Assin Foso		
TYPES OF SERVICES											
General Health/Curative		x	x		x						3
Preventive/Immunizations	x	x	x	x	x		x	x	x		8
Recuperative/Rehabilitation Center		x			x		x				3
Nutrition Education	x	x	x	x	x	x	x	x	x		9
Child Spacing/Family Planning	x	x	x		x		x	x	x		7
Cooking Demonstration	x	x	x	x	x	x	x	x	x		9
Hygiene Education	x	x	x	x	x	x	x	x	x		9
Supplementary Food Distribution	x	x	x	x	x	x	x	x	x		9
Clinic Gardens and Food Production							x				1
Community Development	x				x		x		x		4
Home Visiting					x	x	x	x			4

Table 11 (continued)

DATA CATEGORY	Highest to Lowest Nutritional Status Outcome										Total Ghana Sample All Clinics
	Fijai	Adidome	Kotobabi	Akim Oda	Berekum	Damango	Kumasi	Navrongo	Assin Foso		(S.d.)
PROGRAM COVERAGE											
Number of Preschoolers (Recipients)/ Year (based on 75% attendance rate)	871	1615	717	1360	4148	857	4259	4021	680		2059 (1593)
Number of Preschool Recipient Visits/ Year	7839	14527	6457	12238	37330	7716	38323	36186	6122		18526 (14333)
Number of Preschoolers in Catchment Area	1600	18000	32000	8500	11200	2000	30000	6000	2100		12378 (11799)
Number of Clinic Staff (Full-Time Equivalents)	4.0	8.0	1.5	6.5	8.5	2.5	5.0	9.0	1.0		5.1 (3)
Staff/Recipient Visit/Month	1:163	1:151	1:358	1:157	1:366	1:257	1:639	1:335	1:510		1:326 (168)
% of Catchment Area Coverage	54%	9%	2%	16%	37%	43%	14%	67%	32%		30% (22)
Supplementary Food (in pounds March 1977 - February 1978)											
Milk	8900	1150	13200	11025	14150	6350	24500	43600	9250		
WSB	32300	2800	19450	25575	69550	17700	89550	89350	11750		
Sorghum	33700	4700	23200	14900	71350	24900	75700	117750	13550		
Cooking oil	9456	1520	7784	8776	13976	9744	93376	24872	3360		
Total	84356	10170	63634	60276	169026	58694	283126	275572	39910		116085 (102059)

Table 11 (continued)

DATA CATEGORY	Highest to Lowest Nutritional Status Outcome										Total Ghana Sample All Clinics
	Fijai	Adidome	Kotobabi	Akim Oda	Berekum	Dimango	Kumasi	Navrongo	Asain Foso		
PROGRAM COVERAGE (cont.)											
Supplementary Food: Pounds/ Recipient Visit											
Milk	1.14	0.08	2.04	0.90	0.38	0.82	0.64	1.20	1.51		
WSB	4.12	0.19	3.01	2.09	1.86	2.29	2.34	2.47	1.92		
Sorghum	4.30	0.32	3.59	1.22	1.01	3.23	1.98	3.25	2.21		
Oil	1.21	0.10	1.21	0.72	0.37	1.26	2.44	0.69	0.88		
Total	10.76	0.70	9.86	4.93	4.53	7.61	7.39	7.62	6.52		6.27

Table 12

SUMMARY OF LESOTHO CLINIC CHARACTERISTICS

DATA CATEGORY	Urban			Lowland				Mountain				Total Lesotho Sample All Clinics
	Queen Elizabeth Maseru	Teyste-yaneng	Leribe	Teakholo	St. Paul Berha-Butho	Moloko	St. Rose Peka	Qutsing	St. James Mokhot-long	St. James Mantsonyane	#Clinics Applicable	
TYPES OF SERVICES PROVIDED												
General Health/Curative	x			x	x		x	x				5
Preventive Health	x	x	x	x	x	x	x	x	x	x		10
Child Recuperative										x		1
Nutrition Education	x	x	x	x	x	x	x	x	x	x		10
Child Spacing/Family Planning	x		x	x	x			x		x		6
Sewing and Crafts				x								1
Cooking Demonstration	x	x	x	x	x	x	x		x	x		9
Hygiene Education	x	x	x	x	x	x	x	x	x	x		10
Food Distribution		x	x	x	x	x	x	x	x	x		9
Clinic Gardens				x	x		x		x			4
Community Development				x	x				x			3

Table 12 (continued)

DATA CATEGORY	Urban			Lowland				Mountain				Total Lesotho Sample All Clinics
	Queen Elizabeth Maseru	Teyateyaneng	Leribe	Teebaloo	St. Paul Butha-Buthe	Mohales	St. Rose Peka	Qachas	St. James Mokhotlong	St. James Mantsonyane	#Clinics Applicable	
PROGRAM COVERAGE (cont.)												(S.d.)
Supplementary Food (July, 1976 - June, 1977) (Pounds)												
Powdered Milk		77750	25500	27150	114700	20750	30650	54800	36500	19600		45267 (32086)
Corn Soya Milk	No	80600	26350	34050	79700	21750	31400	46600	30800	35300		42950 (22151)
Bulgur Wheat	Food	85850	27250	39850	102100	21600	34300	60850	46650	45850		51589 (26918)
Cooking Oil		24902	8501	19080	39778	12382	17371	42134	20605	21160		22879 (11348)
Food Totals		269102	87601	92980	336278	76482	113721	204384	134555	121910		129798 (94404)
Supplementary Food: Pounds/ Recipient Visit												
Milk		3.20	3.52	1.76	4.60	3.26	2.60	2.09	2.85	3.47		
CSM	No	3.31	3.63	2.21	3.21	3.42	2.66	1.78	2.41	6.25		
Bulgur	Food	3.53	3.76	2.59	4.11	3.40	2.91	2.23	3.65	8.12		
Oil		1.02	1.17	1.24	1.60	1.95	1.47	1.61	1.61	3.75		
Total		11.06	12.08	7.00	13.52	12.03	9.64	7.71	10.52	21.59		8.29

Table 12 (continued)

DATA CATEGORY	Urban			Lowland				Mountain				Total Lesotho Sample All Clinics
	Queen Elizabeth Maseru	Teyateyaneng	Leribe	Tsakholo	St. Paul Butha-Buthe	Mokokoane	St. Rose Peka	Qutsing	St. James Mokhotlong	St. James Mantsonyane	# Clinics Applicable	(S.d.)
PROGRAM COVERAGE												
Number of Preschoolers Served by Clinic/Year (based on 75% attendance rate)	704	2704	805	1711	2761	706	1310	2914	1421	628		1566 (918)
Number of Recipient Visits/Year	6336	24333	7249	15400	24851	6358	11788	26223	12786	5649		14097 (8264)
Number of Preschoolers in Clinic Catchment Area	6000	3000	5000	5400	6000	2100	4000	5700	1600	2600		4140 (1699)
Number of Clinic Staff/FTE (Full-Time Equivalent)	2	5	3	4	7	2.5	5	5	4	2.5		4 (1.5)
Staff:Recipient Visit Ratio	1:264	1:405	1:200	1:321	1:296	1:212	1:196	1:546	1:266	1:188		1:289 (113)
% of Catchment Area Coverage	12%	90%	16%	32%	46%	34%	33%	51%	89%	24%		43% (27)
Nutrition Education (person days)												
Direct Contact	208	150	200	200	250	50	104	150	200	100		174 (52)
Mass Media				(pamphlets)				(cookbook & pamphlets)	(health booklets)			

Table 13
PRESCHOOL CLINIC PROGRAM COMPARISON

DATA CATEGORY	Total Ghana Sample All Clinics	Total Lesotho Sample All Clinics
	N	N
TYPES OF SERVICES		
General Health/Curative	3	5
Preventive/Immunizations	8	10
Recuperative/Rehabilitation Center	3	1
Nutrition Education	9	10
Child Spacing/Family Planning	7	6
Cooking Demonstration	9	9
Hygiene Education	9	10
Supplementary Food Distribution	9	9
Clinic Gardens and Food Production	1	4
Community Development	4	3
Home Visiting	4	
PROGRAM COVERAGE	Mean (Sd)	Mean (Sd)
Number of Preschoolers (Recipients)/ Year (based on 75% attendance rate)	2059 (1593)	1566 (918)
Number of Preschool Recipient Visits/ Year	16526 (14333)	14097 (8264)
Number of Preschoolers in Catchment Area	12378 (11799)	4140 (1699)
Number of Clinic Staff (Full-Time Equivalents)	5.1 (3)	4 (1.5)
Staff/Recipient Visit/Month	1:326 (168)	1:289 (113)
% of Catchment Area Coverage	30% (22)	43% (27)
Supplementary Food: Pounds/ Recipient Visit	6.27	8.29

gathered in the clinics over three rounds spanning a 12-month period. The basic study design, sampling techniques, type of data gathered, method of collection and the measurement period are described in Appendix B.

HIID researchers collected cost data in the study clinics in both Ghana and Lesotho in order to calculate the cost effectiveness of the respective programs, and also analyzed a subsample of the Ghana data collected by Synectics.

A. Ghana Effectiveness Study

The HIID study team analyzed a subsample of individual children from the Ghana clinics, consisting of all of those who fell between the ages of 6 and 24 months over a six-month period during the year-long study and for whom data has been collected consecutively for six months or more. The age limits were set in order to select the subset of children for whom average nutritional status was lowest (Jacob and Gordon 1975) and thus the subset within which the effects of programming components and socioeconomic variables would be most readily measurable. Financial constraints on analysis also made it necessary to reduce the toal sample size. For Ghana as a whole, 265 infants met the selection criteria.

The more than 500 variables used in the Synectics study were reviewed to determine whether they were hypothetical correlates of nutritional status or of the programming components under consideration in the first three chapters of this volume. Variables lacking theoretical importance or sensitivity in either case were not included in the HIID study.

Twenty-four hour dietary recall should have been a sensitive indicator of nutritional status but as loosely scored by food group rather than by quantity of nutrients. A look at mean values of nutritional status of infants ranging between 9 and 18 months in age grouped according to 24-hour recall categories of "extremely poor," "poor," "adequate," "good," and "excellent" diets showed no difference in nutritional status by diet category. Experience in a Phillippines study (See Nutrition Education, Study II in this series) had found that food group scoring did not predict nutritional outcomes but that quantitive scoring of the same recall data was highly correlated with nutritional status.

Variables that were both good theoretical correlates and had good theoretical sensitivity were kept and entered into the analysis. Significance levels in multiple regression analysis were used to determine actual best predictors. Variables excluded by regression analysis were retained for discussion only if they were significantly correlated by simple correlation coefficients with major outcomes or components.

Variables used to determine the factors affecting nutritional outcome of the children included the following:

- Index child: sex, age, birth weight, initial weight and age at clinic enrollment, length and regularity of program attendance, birth interval, birth order, number of immunizations, previous 6 month morbidity, age of weaning from the breast.

- Mother: age, weight, height, education, occupation, marital status, amount of food collected, number of nutrition education classes attended, and knowledge of three nutrition education variables, time required to travel to clinic.

- Family: family size, number of preschoolers, occupation of father.

- Household socioeconomic: urban/rural location, home ownership, appliances, house size, structure, land ownership, water supply, sewage system.

- Clinic characteristics: staff-to-patient ratio.

A list explaining the construction of the variables used is provided in Appendix B (Table 31).

Change in weight for age from first to final recording was calculated for each chiled and averaged by the clinic but did not prove a useful variable for analysis, in part because of the small size of the sample. Time series analysis using the sequential weighings also was considered but discarded because of missing data. Those children that attended regularly were judged sufficiently atypical that conclusions based primarily on their subsample would not be generalized.

B. Ghana and Lesotho Cost Study

A standardized costing questionnaire (see Appendix D) was developed at HIID and was used to arrive at program costs in both the Ghana and Lesotho preschool programs. The questionnaire was designed to be as comprehensive as possible to encompass all costs involving the construction and operation of the preschool clinics. The cost questionnaire lists types of services provided by each clinic, the program coverage (quantities of supplementary foods, target population, number of recipient visits, etc.), effectiveness of delivery, and labor (staff) services (including time allocation to different clinic tasks and staff training).

All annual program costs were grouped either as fixed costs or variable costs. The fixed cost category included labor (salaries) and capital equipment depreciation (replacement cost/expected life), meaning the entire physical plant, i.e., buildings, machinery and equipment, and vehicles.

Annual variable costs included costs for supplementary foods (the costs to USAID and U.N. World Food Programme, transport and storage by CRS), vaccines, and miscellaneous. Each cost figure was divided by the number of preschool attenders to obtain the cost per recipient visit and per recipient. All costs are in U.S. dollars, figures at the official exchange rates ($1 = 1.15 cedis in Ghana and 0.86 Rand in Lesotho).

In Ghana HIID and Ministry of Health personnel collected cost data in June 1978 from nine clinics included in the effectiveness study with Synectics. The figures given for quantities of donated Title II supplementary food were for March 1977 to February 1978. In Lesotho the cost data were gathered in October and November 1977. The annual food figures were given for the period July 1976 to June 1977.

Each clinic was visited and questionnaires filled in with the help of the nurse in charge or manager. Data on costs of supplementary foods were obtained from CRS records. Capital equipment costs were based on estimates made by the researchers since records rarely existed for the buidling costs. Since the building was shared, the annual depreciations used were estimates based on annual rental fees. The costs of vaccines were obtained from WHO and UNICEF in Geneva.

Labor (clinic personnel salaries) costs are based on percent of staff time spent working in the preschool clinics. Numbers of staff per clinic are figured as full-time equivalents FTE). Salaries for labor costs are gross figures before taxes. The social opportunity of labor was not calculated.

Numbers of regular clinic recipients (attenders) were based on estimates by clinic staffs and HIID personnel that 75% of recipient visits were by regular attenders (coming 9 out of 12 visits per year). The clinic catchment area population figures were found in Lesotho's 1976 Census Report and a wide range of error could be involved. The percent of catchment area coverage figures given in Table 12 are consequently only estimates. CRS/Lesotho estimates that nationwide the coverage of preschoolers is between 25% and 32%.

Cost-effectiveness outcome figures could not be calculated for the Ghanaian clinics because of the lack of baseline data concerning the nutritional status of nonclinic attenders. Hence, it was impossible to estimate the numer of cases of malnutrition averted by the Ghana preschool program. However, the HIID analysis of the Ghana program shows that the clinics were, in fact, effective in improving nutritional status. This study analyzes the relative cost effectiveness of the Ghana service components, which in turn was not attempted in the Lesotho case. The two country studies thus complement each other. The relative cost effectiveness of the Ghana service components is discussed in Section V below.

For the Lesotho case study, cost effectiveness is defined quite specifically. Effectiveness is rated by the measurable change in nutritional status of preschoolers within the target population. The anthropometric meaurement used was weight for age as a percent of a reference standard. The time frame was one year. The control group consisted of 1,370 nonclinic attenders and the experimental group had 1,412 clinic attenders.

Although no nonclinic control group could be foudn in Ghana, it was possible in Lesotho to use the UCLA Nutrition Assessment Unit's survey conducted for the Lesotho government in October and November 1976. To improve comparability, HIID/Synectics Round II, gathered in October-November 1977, was used to ensure similar seasonal food availability. An accurate baseline figure (control group) was obtained by excluding the 25% of the UCLA sample who attended clinics. This permitted the effectiveness of the clinic intervention to be compared with the nutritional status of a baseline nonclinic population. The two sample populations were very close in age, sex composition and family socioeconomic and demographic status. Moreover, both studies divided the countries into geographic regions.

Any preschoolers sampled who weighed less than 80% of standard weight for age were considered to be malnourished. For the purpose of effectiveness measurement, each child whose percent for weight for age rose above 80% after the one-year period was one case of malnutrition averted. The percent improvement in nutritional status was based on the difference between:

Nonclinic UCLA % Malnourished
\- Synectics % Malnourished
% Improvement in Nutritional Status

The number of cases of malnutrition averted was given as a range between the percent improvement in nutritional status per clinic and per regional mean multiplied by the number of clinic recipients (attenders).

The cost per case of malnutrition averted was figured as cost per recipient divided by the change (percent improvement) in nutritional status. This figure is also given as a range between the clinic mean improvement value and the regional mean.

The data for both the Lesotho and Ghana studies had some limitations. The food consumption data from the Synectics Growth Chart Study was not detailed enough quantitatively to base a cost-effectiveness ratio on cost of closing the nutrient gap. Moreover, other outcome indicators such as mortality and morbidity rates in the study population were not reliable due to missing data.

There are also problems caused by the official exchange rate for the Ghanaian currency. While it is realized that the official cedi figure is extremely overvalued, the supplementary food costs given are in dollars and represent the largest single clinic cost items proportionately.

Fixing a shadow price for each clinic cost component was beyond the scope of the researchers. The cedi was devalued in October 1978, to U.S. $1 = cedis 2.75, which still did not make the cedi a negotiable currency outside of Ghana.

IV. FINDINGS

A. Effect on Nutritional Outcome

1. General Summary

Factors significantly associated with the nutritional status of the Ghanaian program recipients are presented in the summary tables (see Appendix B, Table 32). Most variables measuring components of the integrated program were found to be significant determinants of nutritional outcome (weight for age) at final weighing in the total population.

The most interesting finding was that variables affected by clinic program participation including water supply and sewage system (not intervened by the clinic programs but capable of improvement through intervention) were more important determinants of nutritional status than socioeconomic variables. When program components, biological, and socioeconomic variables were entered simultaneously into stepwise regression procedures, the stepwise programs consistently selected the program component and biological variables as most important. This occurred despite the fact that the socioeconomic variables were highly correlated to nutritional outcome by simple nonparametric correlation coefficients. Sewage system and water supply, of course, also are socioeconomic indicators.

Regression Analysis

The independent variables used in the regression analysis are listed in capital letters in Table 31 of Appendix B which defines the variables used in the analysis.

Variables were first tested to identify determinants of weight for age at first clinic visit of infants enrolling by four months of age (Table 32). None of the measured clinic-related or program component variables (with the exception of birth interval, which may be affected by family planning services prior to the birth of the child) yet had a chance to affect the growth of the infant. Antenatal care might have proven significant but was not measured.

The stepwise multiple regression program found more than 10 variables measuring socioeconomic status, including mother's education, father's education, housing structure, electrical appliances, rural versus urban location, and land ownership to be nonsignificant when considered together with program component variables. Sewage system and clean water supply, however, were found to be determinants of weight for age even before most infants started to receive supplements in addition to breast

milk. Mother's height, which is a measure of past nutritional adequacy, was highly correlated to most variables in the study. Birth weight was found to increase with birth order. Higher weight for age at first visit with increasing birth order may have reflected higher birth weight. Older mothers, however, had infants that were less well-nourished when the positive effects of increasing birth order are controlled.

When analyzing the effects of variables that can be affected by intervention or program components variables only on nutritional outcome of the total sample at the final weighing of the study period (Table 33), we find that teaching use of protein supplements would raise weight for age by about 5%; full participation, by 3.5%; reducing staff-to-patient ratio from 1/300 to 1/200, by 3%; teaching oral rehydration during diarrhea, by 2.5%; reducing severe illness during each period, by 2.4%; lengthened birth interval, by 2.4%; each improvement in water supply, by 2.3%; each additional immunization, by 1.2%. Sewage system was not statistically significant. Age at first clinic visit showed a somewhat spurious positive relationship which reflected the fact that healthy, well-nourished infants were not enrolled in the clinic as early as infants with problems. An infant that scored high on all variables was predicted to have a weight for age of about 99%. High payoff items appeared to be nutrition education concerning protein supplements and oral rehydration and other variables related to the prevention and treatment of infection.

Regressions were then rerun retaining both statistically significant clinic and nonclinic variables (Table 35). It is of theoretical interest and to the credit of the clinics that socioeconomic variables proved of secondary importance to program component variables and to biological variables such as height, weight, and birth order. Since clinic attendance was not limited to families of low socioeconomic class, high income and education might be expected to be the major determinant of nutritional state. But they were not. Mother's formal education and her score on the nutrition education questions were highly correlated. The regressions tell us, however, that it was not her educational level, but whether she mastered the nutrition education information, that determined the nutritional status of her infant. All variables remaining in the equations, with the exception of mother's height and to a lesser degree her weight, were capable of being affected by varying components of the integrated intervention, and were relatively independent of socioeconomic status.

Summary Tables 34 and 36 present the same regressions as tables 33 and 35 using only those infants who belonged to the dominant Akan ethnic group, who numbered 157 out of the total sample of 265. The interested reader will note that most results in the tables for Akans are similar to those for the total sample. Variables that can be influenced by clinic programs explain about 20% of total variance in nutritional outcome in both instances. As would be expected, however, the nonclinic variables explain more variance in the homogeneous sample,

probably because they have more consistent effects in a culturally monogeneous group. Thus clinic and nonclinic variables together explain 42% of total variance in the Akan group versus 25% of variance in the total sample. The relationship between nutritional status and birth order noted for younger infants in Table 32 still existed among the Akans at the end of the study but this relationship did not hold for the total sample.

3. Effects on Nutritional Outcome of Children Grouped by Initial Nutritional Status

Nutrition interventions naturally have a larger impact on malnourished than on well-nourished children because the well-nourished cannot be expected to improve. Also, by a natural process of regression to the mean, children who start below average in nutritional status are most likely to improve, whereas those children starting out above the average are likely to decline slightly over time. This was confirmed in the Ghanaian sample (see Table 37).

The factors that prevent a well-nourished child from deteriorating may also be different from those that cure the malnourished. To explore these factors, one subset of well-nourished and two subsets of malnourished children were examined separately.

The well-nourished were defined as the sample of 77 infants above 90% of weight for age at first clinic visit. A regression of all other factors on nutritional outcome found, not surprisingly, a total of only four significant variables which explained less than 8% of variation in nutritional status. The four factors were teaching use of protein supplements, child morbidity, mother's height, and her weight at first clinic visit. The first two of these are clinic component variables and they explained only 3.5% of the variance in outcome at last weighing. Clinic service may, therefore, make much less difference to the initially well-nourished child, and the strategy of enrolling plump and healthy children later than scrawny ones is rational.

The first group defined as malnourished were the 58 infants below 85% of weight for age at first clinic visit. For this group six variables explained 21% of the variance. These were teaching use of protein supplements, child morbidity, good source of water, birth interval, mother's height and age at first clinic visit, with program variables explaining about 12%. The second group defined as malnourished were the 101 children who fell below 80% of weight for age at some point in the course of the study. For this group seven significant variables explained 14% of the variance. These were child morbidity, good water source, birth interval, clinic attendance, age and weight for age at first clinic visit, and mother's education, with clinic variables explaining about 7%. These findings imply that the program has greatest impact on infants who are initially malnourished, despite some tendency for malnourished infants to improve in status over time (regression toward the mean) even without treatment.

4. Simple Correlations with Nutritional Outcome

While regression analysis reveals underlying factors by controlling for interrelationships, simple correlations present reality as we encounter it. In the following description of infants with high outcome weight for infants with high outcome weight for age. Spearman's correlation coefficients are inserted in parentheses following each statement both in this section and in following profiles. These descriptions present only statistically significant relationships of which fewer than 10% have significance levels between 0.05 and 0.1. The nonparametric Spearman's procedures are more conservative than the Pearson correlations and give generally lower r values.

Children with higher outcome weight for age had mothers that were taller (0.28), heavier (0.28), better educated (0.12), and more frequently urban (0.12). They were from families of higher socioeconomic status in terms of father's occupation (0.18), housing structure (0.17), electrical appliances (0.11), water supply (0.21), and sewage facilities (0.17). They were less likely to have been seriously ill during the preceding six months (0.17) and came from families that had fewer preschool deaths (0.09). Their weight at first clinic visit was higher than average (0.38), and their proportionate participation in clinic activities (0.16). They attended clinics with lower staff-to-patient ratio (0.23); their mothers were more likely to believe in giving protein supplements (0.22); and the infants were more likely to have been female (0.11).

5. Individual Clinic Effects on Nutritional Status

As shown in Tables 11 and 14, clinics different significantly in program characteristics and in clientele. In addition to mother's education, water supply, and sewage system, quality of housing structure also differed significantly by clinic neighborhood. Individual clinics were entered as dummy variables into stepwise regression programs mentioned earlier, but were not retained because their effects on nutritional status outcomes were not significant after controlling for other variables. As noted in Table 14, both initial and outcome nutritional status differed significantly by clinic, but change in nutritional status from initial to final visit did not. Larger sample size, however, probably would have permitted instructive analysis of components and outcome by clinic.

6. Effects of Program Attendance

The varying program components can only affect those children who consistently attend the clinics. Participation in clinic activities was scored in two separate variables, length of participation and intensity or proportion of participation. Proportion of participation has a straightforward positive correlation with outcome weight for age.

Length of participation, however, is not correlated significantly with outcome weight for age unless age at the time of measurement and age at time of entry into the program are controlled. The apparent reason for this is that children who are doing well tend to be registered at the clinic at an older age than infants who are doing poorly, as previously

Table 14

Descriptive and Nutritional Characteristics of the Ghanaian Sample by Clinic

(Highest to Lowest Nutritional Status Outcome, Ordered Left to Right by Mean Weight/Age and Last Clinic Visit)

Data Category	Fijai	Addidzae	Kotobabi	Akim Oda	Berekum	Damongo	Kumasi	Navrongo	Asain Tono	Fi.. level	Total Ghana Sample All Clinics
Sample Size	19	21	20	8	25	30	50	28	49		250
Ethnic Composition											
% Akim (from Synectics)	70.95%	0.53%	24.75%	98.40%	91.95%	3.11%	99.45%	2.06%	79.35%		59%
Other predominant groups	Mixed North-ern	Ewe	Ewe, Ga	--	North-ern	Gonja, North-ern	--	Grushie, Kassem	North-ern, Ewe		
Mean age of mother	26(6)[1]	24(6)	27(6)	22(2)	28(8)	33(8)	24(6)	26(9)	27(7)	.007	26(7)
Mean education of mother	2.7 (1.8)	3.2 (1.7)	3.0 (1.8)	4.0 (1.3)	2.4 (1.7)	1.8 (1.5)	3.0 (1.7)	1.9 (1.3)	2.6 (1.7)	.004	
% fathers with modern sector or professional occupations	74%	29%	63%	50%	61%	39%	53%	52%	53%	NS	52%
Water Supply score	2.0 (0)	0.6 (0.9)	2.0 (0)	0.3 (0.5)	1.6 (0.7)	2.0 (0)	0.3 (0.5)	1.5 (0.6)	0.4 (0.5)	.000	1.1 (0.5)
Sewage system score	1.6 (0.6)	1.6 (0.5)	1.7 (0.7)	1.8 (0.5)	1.5 (0.5)	1.3 (0.8)	0.9 (0.3)	0.7 (0.8)	1.0 (0.7)	.000	1.3 (0.7)
Mean birth order	3.2 (2.6)	1.9 (1.5)	2.9 (1.8)	1.5 (0.8)	3.9 (3.4)	5.6 (3.5)	2.8 (2.1)	3.2 (2.3)	3.3 (2.3)	NA	3.5 (2.5)
% giving protein foods to infants	63%	81%	70%	62%	67%	81%	86%	54%	64%	.09	72%
% giving liquids for diarrhea	21%	57%	40%	25%	41%	35%	76%	14%	88%	.000	52%
% read weight chart	58	62	70	50	67	68	85	74	94	.0079	74
% know child's weight	50	52	47	100	75	31	89	63	98	.0000	73
WEIGHTK score Knowledge of child's weight and growth chart	1.14	1.14	1.21	1.60	1.42	1.00	1.73	1.38	1.91	.0000	1.51
Mean age at entry (mo.)[2]	4(3)	4(4)	4(3)	5(3)	5(4)	4(5)	4(2)	4(3)	4(5)	NS	4(4)
Mean wt/age at entry	100	100	94	96	89	97	89	87	87	.02	92
Mean wt/age at last study visit	92	91	91	91	87	86	83	82	82	.0009	86
Mean age at last clinic visit (mo.)	20	20	17	19	16	19	19	17	19	.0001	18
Mean length participation last visit	16	16	14	14	11	15	15	13	15	.02	14
Mean ill-ness score	0.7	1.0	1.2	1.4	1.2	1.1	1.3	0.4	0.9	.0002	1.0
Mean immunization score	1.7	3.9	4.4	0.6	3.4	0.4	3.4	1.9	3.4	.0000	2.7

[1] S.D. in parentheses.

[2] Forty-eight percent had entered by 2 months, 61% by 3 months.

mentioned. Thus, a child who has not been registered at the clinic until eight months because he is healthy and who then attends for a shorter total period of time has a probability of being better nourished at the end of that short eriod than the child who has been registered at one month because of a condition that negatively affects nutritional status outcome. Nutritional status also is nonsignificantly negatively correlated with age of outcome measurement. That is, there is a slight decline in weight for age over the weaning period despite the clinic intervention.

When the effects of age at outcome measurement, weight for age at first clinic visit, and age at first clinic visit all are partialled out, however, the outcome weight for age is highly correlated with length of clinic participation.

7. The Family Planning Component

All but two of the clinics offered family planning services. Because of the large number of variables affecting nutritional status and the fact that individual utilization of family planning services was not known, the investigators attempted to relate only the presence or absence of family planning services to birth interval as a first step and to use birth interval rather than family planning services as the program component variable for regression analysis of nutritional outcome.

Birth interval in the first instance was measured by whether the child below the age of 29 months had a younger sibling. Younger sibling only was looked at in order to insure that the mother would have been a program recipient during the period when family planning was applicable. Discriminant function analysis distinguishing between families with and without a younger sibling revealed three significant variables: the presence or absence of family planning services ($p < .01$), the number of preschool child deaths ($p < .002$), and whether the program child had been weaned from the breast by the first interview period ($p < .006$).

Family planning appeared to have an important impact on birth interval, even in a culture not known to value small family size. No other reason for short birth intervals in nonservice clinics could be identified. The fact that the death of a child is likely to motivate replacement of the child has been noted in other studies (Preston 1975). The fact that complete weaning from the breast was associated with shorter birth interval was unrelated to age of the program child because average age of program children was 15 months in both groups. It is well known that early weaning causes earlier resumption of fertility after childbirth. Part of the effect picked up by the relation noted, though, would be operating in the opposite direction. That is, a mother who became pregnant while breast-feeding would have stopped breast-feeding and would therefore have weaned the child.

The birth interval variable was defined for the regression analysis to include the intervals both before and after the birth of the child in the program. This variable was significantly related to nutritional status in all regressions except the one looking only at infants of high initial status. Therefore, it is reasonable to conclude that an individual measure of family planning acceptance would have been positively correlated to nutritional status outcome.

8. Rehabilitation Centers

As indicated in Table 11, four of the clinics had rehabilitation centers. These centers would be expected to have a positive impact on nutritional status in this area, because the clinic programs were most effective in helping children malnourished at time of enrollment. However, this impact was not measurable from the study data because the sampling procedure did not distinguish between children who were admitted for rehabilitation and those enrolled in the regular clinic program. The presence of a rehabilitation center was associated with higher levels of illness, possibly because of the health problems accompanying severe malnutrition.

9. Curative Health

Only three of the clinics claimed to have curative health facilities. This figure may be deceptive because other clinics apparently referred sick children to nearby treatment centers. An attempt to relate the curative health component to other variables yielded no significant results.

10. The Effects of Food Distribution

The foods distributed by the clinics were sorghum flour, WSB, nonfat dry milk, and oil. The food variable used in the analysis reflected foods received by the mother the month preceding each of the three six monthly interviews. Since most food distribution occurred on a regular basis to the same enrolled participants, the variable was a surrogate for foods the family regularly received. It did not measure whether any of the food was in fact given to the child.

According to CRS policy, the food was used primarily to motivate attendance at nutrition education sessions. The mother was place under no obligation to feed the foods to the child, so long as she agreed to feed other supplements with equivalent nutritional value. Inexpensive protein sources such as peanuts could be substituted for milk if the mother preferred to sell the high-valued donated milk powder. The oil was considered almost entirely as a drawing card for attendance and was not really intended for the child (Capone verbal communication 1978).

For this reason, oil and sorghum flour, which were not targeted specifically to the child, were each given a score of 1 (for each time the mother said she had received the food), WSB was given a score of 1.5 because it was targeted but of lower protein quality and lower acceptability than milk, and milk was given a score of 2. The food variable was the sum of these scores over the three rounds.

Although the food variable was entered in all regression analyses, the highest significance level attained ($F = 1.08$) was far below statistical significance.

B. Descriptive Profiles from the Ghana Program

Simple correlations provide descriptive profiles of programming characteristics of the integrated nutrition intervention and of biological and social factors that influence nutritional outcome.[1] The reader is invited to look for the human elements, such as the personal motivations of the program participants, and to engage in speculative interpretation. Any conclusions or speculations should be held tentatively, however, because some of the traits described may belong to distinct groups that are not differentiated from each other by the simple correlation process (the additional information that would have been gained by conducting factor analysis with respect to each variable was not judged to be worth the length of the procedure). The reader should also be aware that the picture painted is derived from a limited survey instrument and a limited sample and thus should not be expected to provide more than a partial glimpse of reality. Spearman's correlation coefficients appear in brackets. Spearman's coefficients are measures of association that can be used with both correlation coefficients calculated for the same pairs of variables. Almost all are significant at the .05 level or below.

1. Proportion of Participation

Mothers who attended clinic most regularly each month had a shorter travel time to reach the clinic (0.1), had had more preschool child deaths in the family (0.15), had more children aged 1 to 5 years (0.6), and were more likely to live in rented houses (0.16), and not to own land (0.19) although they were not more likely to be urban. They were significantly more likely to wean their children from the breast before the end of the first year (0.18), to introduce liquids early to the child (0.14), and to give the children protein supplements (0.08). These mothers collected more food (0.11), and attended clinics with higher total annual costs (0.36), probably because more foods were distributed by these clinics.

These correlations suggest the following interpretation. Mothers attended clinic regularly if they could get there easily, as denoted by shorter travel time, and if they were more highly motivated. This motivation apparently came from three sources. First was fear of losing the child because one or more previous infants had died. Second was the presence of more preschoolers in the family demanding more health care. Third was the availability of free food commodities. Earlier than normal weaning may have resulted from frequent clinic attendance and would also have made the child vulnerable to episodes of illness that required more frequent attendance. To avoid undue length, interpretations of this nature will be left to the reader in most of the following profiles.

2. Staff-to-Patient Ratio

Clinics with higher staff-to-patient ratio were more likely to be urban (0.55) and to give out more food (0.37) but fewer immunizations (0.33). Their clients lived closer to the clinic (shorter travel time) (0.45), in better quality housing (0.21), piped water supply (0.56), and good sewage systems (0.45). Many of these factors are correlates of urban

living. Mothers enrolled in these clinics had better than average attendance records (0.15) but had participated in fewer than average nutrition education classes (0.39) and scored low on all nutrition education measures (need for oral rehydration (0.41), reading the growth chart (0.26), identifying own child's weight on the chart (0.22)), with the exception of the need for protein-rich weaning supplements, which they knew (0.20). These mothers had experienced lower child mortality (0.15). Their children were less likely to have been severely ill during the preceding six months (0.22), more likely to have high weights at first clinic visit (0.12) and more likely to have high outcome weight for age (0.23). As suggested by this profile, clinic staff may monitor child health and development without much teaching, possibly by providing more curative devices.

3. Morbidity

Children who were severely ill during the six months prior to interview had lower weight for age at first clinic visit (0.11) and lower weight for age at final weighing (0.17). They came from families that had experienced more child deaths (0.16), that had more preschoolers in the family (0.15), and that were of larger total family size (0.18). Mothers of these children had attended a larger total number of nutrition education classes (0.37) and were more likely to know that children with diarrhea should be given liquids (0.12). A regression study of causes of illness found the most significant factor to be early weaning from the breast (F = 2.76), followed by short birth interval (F = 1.8) and high birth order (F = 1.64).

4. Preschooler Mortality

Families that had experienced more preschool deaths were more likely, as previously noted, to be regular in clinic attendance (0.15), to be urban (0.16), and to have weaned the child early from the breast (0.14). They were less likely to have educated mothers (0.21) or mothers that could read the growth chart (0.15). These families also were less likely to live in high-quality housing (0.11) or to have fathers with a higher occupational category (0.16).

5. Immunizations

The immunization variable totaled only those immunizations (DPT + BCG) considered to have an immediate relationship with nutritional status. This relationship is complicated because immunization has a threshold effect. After a certain percentage of children have been immunized, the diseases should be virtually eradicated. Because the Ghana clinic system covers a small proportion of children, probably only smallpox had been eliminated through immunization at the time of the study.

6. Food Collection

Conversely, the food appeared to go to lower income families with large numbers of preschoolers (0.15). The mothers were older (0.19), were less educated (0.9), lived in poorer quality housing (0.11), weighed marginally less (0.36) and experienced more children dying (0.13). They had high rates of participation (0.11), but children had received relatively fewer immunizations (0.12). Furthermore, the mothers had not attended significantly more nutrition education classes and did not rate high in nutritional knowledge. Thus, there is a question whether the food was serving the function of motivating nutrition education as tended by CRS policy.

7. Nutrition Education

In determining the impact of nutrition education efforts, the number of classes attended was compared to four measures of nutritional knowledge. Two variables measured the mother's knowledge of her child's weight chart: (1) whether the mother could consistently read the meaning of dots as shown on two weight charts; (2) whether she could correctly identify the weight of her own child on her chart. Two more variables measured the dietary knowledge of the mother: (1) whether the mother recognized the importance of giving protein supplements to the infant; (2) whether she specified the need for giving liquids in case of diarrhea.

Taller (0.19), heavier (0.19), rural (0.37), younger (0.21) mothers with husbands in higher occupational categories (0.21) and who owned more land (0.22) were more likely to attend nutrition education classes. These mothers had shorter travel time to reach the clinic (0.43). They had fewer children (0.24) of higher birth weight (0.32) who had had more immunizations (0.17). These mothers were less likely to be economically active (0.19), but were marginally more likely to have weaned the child from the breast at the time of the first interview (0.15). They did not score higher than average on any of the measures of nutritional knowledge. This profile suggests a picture of economically better off rural women who lived near the clinic and for whom nutrition education classes functioned as social occasions.

The four variables measuring nutritional knowledge were highly intercorrelated. Mothers that scored high on these measures had the following characteristics (significance levels are not given because they vary slightly from measure to measure). These mothers were younger, taller, better educated, had better jobs, fewer children, and fewer child deaths, were married to husbands with better jobs, and lived in higher-quality housing with more electrical appliances but with a worse water supply. These mothers were less likely to have collected food and more likely to have had their children immunized.

The analysis suggests that much of the nutrition information is best taught in one-to-one sessions with the mother at the time that her own infant is weighed and when she can see the weight dot entered on the chart. Similarly, dietary advice may be best absorbed when related directly to one's own infant. It is probable that women of an educational level similar to that of the health worker managing the well baby session get a better quality of explanation and a more sympathetic hearing from the worker, precisely because they are socially and culturally similar (Rogers and Shoemaker 1971). These women could then be expected to discuss this information and transmit it to their friends.

Ability to read the weight chart is highly related to educational level. However, many more women could interpret the weight chart than had higher levels of education. Two-thirds of the women were able to interpret test weight charts correctly on two successive trials and also to identify the weight of their own child on two successive weighings while only 53% of the total had had more than two years of schooling.

8. Water Supply

Water supply is an important and desirable component in the integrated mix. Good water supply appeared to be primarily urban (0.36). Women who had a good water supply weighed more (0.17) but were not taller. They were older (0.14), and lived closer to the clinic (0.12), had husbands of higher occupational level (0.11) and lived in smaller family units with fewer rooms (0.35) that were more likely to be rented (0.15). They had a better sewage system (0.28) and marginally more electrical appliances (0.08). Their infants had significantly higher outcome weight for age (0.21), although the mothers scored significantly below average on all measures of nutritional knowledge. Their infants had higher weights at first clinic visit (0.12), but had had significantly fewer immunizations (0.25), although mothers had collected significantly more food (0.24).

The picture here may be one of families of at least moderately high socioeconomic class, probably by reason of the father's occupational position rather than the mother's education or initiative. In some urban areas of West Africa, by contrast, educated and upwardly mobile young couples tend to settle in newly built housing in underdeveloped suburbs, where water supply and other facilities are not yet well established, and for this reason are cheaper than similar accommodations in a better area of town.

9. Sewage System

Although this variable also was not under clinic control, it is of interest in designing integrated strategies. Women with adequate sewage facilities as would be expected, were urban (0.36), well educated (0.18), and had high occupational status themselves (0.24), as well as being married to husbands of similarly high status (0.22). They lived in high quality (0.19), small unit (0.08), rented (0.28) housing with little land (0.25). They had more electrical appliances (0.21) and a good water supply

(0.28). These women scored above average on knowledge of giving protein supplements to the infant (0.16) but not significantly high on understanding the growth chart. Their infants weighed more at first clinic visit (0.21) and had higher outcome weight for age (0.17). The mothers had collected more food (0.09), although they had attended fewer nutrition education classes (0.22) and had fewer preschoolers (0.12).

10. Mother's Height

This variable generally is agreed to represent the long-term effects of nutrition from one generation to another, although some genetic factors may in fact enter. Taller mothers naturally are heavier (0.42).

They are also better educated (0.15), had better jobs (0.09), and had husbands with better jobs (0.18). They lived in housing that was of superior construction (0.15), had more rooms (0.1), and had marginally more electrical appliances (0.09). They had marginally more children (0.1) and a better diet (0.19). They had attended more nutrition education classes (0.20) and had better clinic participation generally both in terms of length (0.13) and proportion (0.15) of attendance at monthly check-ups. The children had had more immunizations (0.19), and the mothers were more aware of the need to give liquids during episodes of diarrheal infection (0.16) and better able to read the growth chart (0.12). Their infants had higher birth weights (0.24), higher weight for age at first clinic visit (0.22), and higher outcome weight for age (0.28). This single variable representing past nutritional status appears to be most consistently correlated with the majority of variables that are expected in turn to be associated with nutritional status of the new generation.

11. Mother's Education

More highly educated mothers were taller (0.15), younger (0.41), had better jobs (0.23), husbands with better jobs (0.27), houses with more rooms (0.09), more electrical appliances (0.27), and a better sewage system (0.18). They had fewer children (0.18), fewer preschoolers (0.2), and had experienced fewer child deaths (0.21). Their infants had more immunizations (0.22), although the mothers had collected less food (0.09). These mothers scored high on all nutrition education measures. Their children had high outcome weight for age (0.12), although their birth weights had been on the low side (0.09).

12. Father's Occupation

Women whose husbands had modern-sector or professional occupations were taller (0.18), better educated (0.27), had better jobs (0.35), were more likely to be urban (0.1), to have fewer children (0.13), and to live in fewer rooms (0.10), of better-quality housing structure (0.24), with more electrical appliances (0.27), better-quality water supply (0.11), and sewage system (0.22). They owned less land (0.16). Mothers scored high on understanding of the growth chart (0.2), their own child's weight chart (0.11), and knowledge of the need to give protein supplements (0.19), although their clinic attendance was marginally reduced (0.09). Their infants had higher weights on a first clinic visit (0.14), and higher outcome weight for age (0.18).

13. Housing Structure

Stone or brick housing was predominantly urban (0.25) and had fewer rooms (0.13) and better sewage facilities (0.19). This housing was occupied by younger mothers (0.1) with fewer children (0.16) and husbands of higher occupation category (0.24). These mothers had good clinic attendance (0.16), although they collected less food (0.11) and did not score highly on any of the nutrition education variables. The mothers' diets were of good quality (0.16) and their infants had good nutritional status at first clinic visit (0.09) and high outcome weight for age (0.17).

C. Cost and Cost Effectiveness

1. Ghana and Lesotho Cost Data Study

Costs were figures by clinic components per year per recipient visit and per recipient as outlined above in the section on costing methodology. Cost figures were assumed to be as accurate as possible, considering field constraints of minimal record keeping in some cases.

The itemized costs of the nine preschool projects in Ghana and 10 clinics in Lesotho are given in Appendix B (see Tables 37 and 38, respectively). Because percentages of totals by category and by fixed and variable cost totals were calculated for both programs, comparisons between the two country programs are possible.

The program costs are divided into fixed and variable costs. In both cases the latter comprised a very high percentage of the total annual program costs (93% in Lesotho; 76% in Ghana). The cost of the food input make sup 98% of the variable costs in the Lesotho program and 91% in the Ghanaian scheme. The remainder of the variable cost category is made up of services (cost of growth charts, transportation of food to outstations) as well as the cost of immunization. Immunization coverage is low for most sampled clinics due to either inadequate supply or no refrigerator in operation. In neither country do immunizations account for more than 1% of the variable costs.

The smaller fixed costs category is dominated by labor costs which makes up 89% of the Ghanaian fixed costs and 83% of the Lesotho fixed costs. In addition to salaries, capital equipment (buildings, clinic equipment, vehicles) account for 8% and 14% of the annual fixed costs, respectively. The remainder of fixed costs was spent on such things as utilities maintenance and supplies, and amounts to only 3% of both program's fixed costs.

If the costs of the supplementary food and the money spent on the transportation of that food are removed, total annual costs of the program are reduced by 92% in Lesotho and 75% in Ghana. Of this greatly reduced amount, each program would be able to cover a significant proportion of program costs with what might otherwise be considered insignificant annual income from clinic fees. Lesotho would be able to

cover 68.7% of their nonsupplementary food costs, while Ghana would be able to cover a smaller, yet not insignificant percentage (18.5%) of the local costs.

The costs per recipient visit and cost per recipient give the reader a better sens eof real clinic cost differences, without distortion by the size of the clinic, i.e., the number of recipients. The information is summarized in Appendix B (Tables 39 and 40 for Ghana; Tables 41 and 42 for Lesotho). In Ghana, total annual costs per recipient visit were lowest at the Adidome center ($1.37) which distributes a small quantity of food (0.61 pounds/recipient/visit) and highest at Kotobabi ($3.70) which distributed a very large ratio of food (8.3 pounds). The mean cost for all Ghanaian clinics was just under $2.50. Without food, however, the annual cost dropped dramatically to an average of $0.78 per recipient visit.

The total annual costs per recipient ranged form a low of $12.33 at Adidome to a high of $33.30 at Kotobabi. The mean cost was $22.32. The in-country costs to Ghana would have been closer to the costs/recipient without supplementary food costs. Excluding food costs, the range was from $3.15 at Assin Foso to $10.62 at Adidome. The mean cost per recipient (without food costs) was $7.02, less than one third of the costs with food costs.

The same basic phenomenon was seen in Lesotho. The annual cost per recipient visit at a clinic distributing food went from $2.85 (Tsakholo) to a high of $7.10 (St. James/Montsonyane). As expected, the former distributed the smallest ration (7 pounds) of the nine clinics providing supplementary food and the latter gave out the largest (21.6 pounds). Both the quantity of food and cost per recipient visit were increased by a factor of three. The mean cost per recipient visit in Lesotho was $3.93 with the cost of supplementary food included. The cost dropped to $0.34 without the food (ranging from a low of $0.15 to $0.85 with well over half, usually closer to 70%, of this cost going to labor).

Total annual costs per recipient ranged from a low of $6.21 at Queen Elizabeth/Maseru, to a high of $63.90 at St. James/Montsonyane. The mean was $35.37, a high figure considering the small health budget in Lesotho. Annual costs per recipient excluding the cost of supplementary food give a more accurate idea of in-country costs. The costs of supplementary foods are paid by USAID, the United Nations World Food Programme and CRS. Thus, annual cost/recipient without food costs range from $1.35 at St. Paul/Butha-Buthe, to $7.65 at St. James/Montsonyane. The mean cost was $3.06, or only 8.7% of the mean cost including food costs.

By looking at the percentage of total costs per recipient by cost category, one is able to appreciate again where most of the money is being spent (see Appendix B, Table 43 for Ghana and Table 44 for Lesotho). In Ghana, the key findings are the costs of supplementary foods (67%) and labor (25%) If Adidome clinic (which gives very little

food) is excluded from the sample here, the mean supplementary food costs rises to 73% of the total costs. Labor costs range from a low of 12% at Assin Foso to a high of 70% at Adidome. In Lesotho, the percent of total costs held by supplementary foods has a mean of 82%. However, if Queen Elizabeth II clinic is not included, the mean is 91%, since that clinic gives no food. Labor costs are again the second largest share with a mean of 14.2%; this category ranges from 3% at St. Paul's to 87% at Queen Elizabeth II. The latter figure is due to the high ($5.40) labor cost per recipient relative to the lack of food costs. Government clinic nurses are generally better paid than their counterparts at mission clinics. It appears that Queen Elizabeth II and St. James/Montsonyane are overstaffed relative to their preschool attendance rates.

2. Cost Effectiveness

a. Lesotho

The derivation of the cost-effectiveness ratios was delineated in the Methodology Section. The data from one center (St. Rose in Peka) was not included because the percentage of malnourished in the Synectics sample was considered unrealistically high based on the experience of the local workers. Table 15 summarizes the cost-effectiveness findings - the UCLA nonclinic group had 27.8% malnourished compared to 16.9% in the Synectics clinic group. Although the superior nutritional status cannot be attributed to the integrated intervention alone, it is important to note the 10.9 percentage point different between the baseline population and the clinic population, i.e., the number of malnourished preschoolers was reduced by 39.2%. All regions showed at least a 32% reduction in the number of malnourished children; the urban clinics showed the most improvement with 54.3% reduction.

Taking the number of regular clinic attenders and the difference between the percentage that would have been malnourished under baseline conditions and the percentage of malnourished clinic attenders, it is possible to calculate the number of cases of malnutrition that had been averted. In this case, it is estimated that there was an average of some 166 fewer cases of malnutrition per center because of the integrated preschool intervention. The next step in the analysis was to calculate the cost of each case of malnutrition averted. This was done by dividing the total costs per center by the number of cases of malnutrition averted in that center. It is noteworthy that nutritional status at Queen Elizabeth II improved on a par with the other two urban clinics despite the fact that this clinic did not give out supplementary foods. Because of the much lower total annual costs per recipient, the Queen Elizabeth II cost/case of malnutrition averted was only one sixth of the total sample mean ($52 versus $325). St. Paul's and St. James/Montsonyane were the most expensive per case of malnutrition averted, both in the $500 to $600 range. Without food costs St. Paul's became the cheapest clinic at $17-$18, while St. James/Montsonyane remained the highest - between $57-$81. The mean cost without food per case of malnutrition averted was $28, less than one tenth the mean cost with food per case averted.

Table 15--LESOTHO COST EFFECTIVENESS

DATA CATEGORY	URBAN CLINICS				LOWLAND CLINICS					MOUNTAIN CLINICS				Total Lesotho Sample All Clinics
	Queen Elizabeth Maseru	Teyate-yaneng	Leribe	Total Clinics	Teskholo	St. Paul Butha-Buthe	Mofokeng	St. Rose Peka*	Total Clinics	Qachas	St. James Mokhotlong	St. James Mantsonyane	Total Clinics	
Synectics Sample Size	94	151	176	461	185	135	119		439	163	154	195	512	1412
UCLA Sample Size				283					902				508	1693
UCLA % Malnourished				17.3					19.5				29.6	22.2
Nonclinic UCLA % Malnourished				22.3					24.6				36.6	27.8
Synectics % Malnourished	10.7	11.0	9.1	10.2	17.3	17.0	15.2		16.6	14.7	26.6	27.2	22.8	16.5
% Improvement in Nutritional Status	11.6	11.3	13.2	12.1	7.3	7.6	9.4		8.0	21.9	10.0	9.4	13.8	11.3
% of Cases of Malnutrition Averted				54.3					32.5				36.6	41.1
# Clinic Attenders (Recip.)	704	2704	805		1711	2761	706			2914	1421	628		1595
# Cases Malnutrition Averted (Range)	82-85	306-327	97-106		125-137	210-221	56-66			318-390	142-190	59-84		166
$ Cost/Case Malnutrition Averted (Range)	51-53	303-324	316-345		321-351	591-622	442-520			128-209	264-354	477-680		325
$ Cost/Case Malnutrition Averted Without Supplementary Foods (Range)	51-53	20-22	32-35		43-47	17-18	42-50			15-30	22-29	57-81		28

* Not included due to unreliable Synectics data.

External food aid reduces the government's fiscal burden and, hence, its cash costs per child. If without the feeding program the food aid would not be available to the country in the form of any other aid, the food represents no real cost to the country because it is not using any of its resources. The opportunity cost of the food in a social cost benefit analysis would be zero. However, if the country were to use its own agricultural production to supply the supplementary food, then the value of those resources would have to be counted.

If the food costs are removed (a hypothetical situation), the three cheapest clinics per case of malnutrition averted were all ones with the greatest number of clinic attenders. These were Teyateyaneng, St. Paul's and Quthing. Conversely, the three most expensive sites (without food) had the smallest number of clinic attenders. These clinics were Queen Elizabeth II, Mofokas, and St. James/Montsonyane. Thus, the case demonstrates the fact that economies of scale (i.e., the volume of clinic attenders) is a critical element in preventing malnutrition at the loqest cost to the government of Lesotho. Moreover, if externally supplied (and paid) food costs are included, the one clinic without supplementary food became the most cost effective by a large margin.

b. Ghana

A study of the costs of the integrated components related to relative effectiveness in the Ghanaian program support the basic finding of the Lesotho cost-effectiveness study. The study provides very little evidence for the effectiveness of the food component, the major cost item (67% of total costs and 91% of variable costs). None of the relationships tested between food distribution and nutritional status showed even low levels of significance.

Food collection was positively associated with attendance. However, the fourth largest clinic in terms of numbers of recipient visits, Adidome, gave out a negligible amount of food, but ranked second in outcome nutritional status. Food collection was not positively associated with attendence at nutrition education group lectures; neither these lectures nor amounts of food collected were correlated with improved levels of nutritional knowledge, as measured by the study.

In contrast, the money spent on preventive health measures like vaccines proved highly cost effective. Vaccines amounted to 0.25 of total costs per recipient. Total number of DPT plus BCG plus measles vaccinations were found to be a highly significant predictor of nutritional status in the sample as a whole.

Although the variables measuring morbidity and curative health care were too weak for careful analysis - the efforts at early detection and treatment of illness were not documented - the strongly significant relationship between illness and nutritional status indicates that preventive and curative health care are indispensable components of the intervention.

Nutrition education appears from the regression results to have high payoff in nutritional status outcome. The recall variable measuring attendance at group lessons, however, was not associated with learning of the nutrition education messages or with improved nutritional status. A possible reason for this finding may be that learning of the weight chart and dietary advice both occurred most effectively during the individual weighing sessions where the mother saw the weight chart procedure modeled using her own child and received dietary advice suited to her child's age and condition. Relevance of the weighing procedures and dietary advice to the personal circumstances of the mother-child pair is easier to achieve in a one-to-one than in a group setting. Education during the individual weighing need not be excessively time consuming, since the worker can and should talk to the mother while she is actually weighing and examining the child. The findings of the present study suggest that it might be cost effective either to improve the quality of the roup lessons or to budget relatively less time for group education and more time for the individual counseling session. Nutrition counseling on such things as diet and infant feeding are done in this manner in industrialized countries.

As shown earlier, presence of family planning services was significantly linked by the analysis to higher nutritional status outcome. Contraceptives were not costed by the study. The labor costs, however, do include family planning education. Birth interval was such an important determinant of nutritional status outcome in all regressions involving initially malnourished infants that family planning would be expected to be an indispensable and cost-effective component of the service package.

Both staff-to-patient ratio and labor costs per recipient visit[2] were highly correlated to nutritional status outcome. Early detection and treatment of incipient malnutrition and of illness, nutrition education, and family planning counseling all depend on the quantity and quality of staff interaction with the mother. While labor accounted for 25% of total costs, and would have been the major share (76%) if food were excluded, the relationships between labor costs per recipient and nutritional outcome are extremely variable.

Basically, the costs of labor per recipient depend more on level of worker used than on staff-to-patient ratio. Sixty-three percent of labor costs were for nurses and nutritionists and 27% for clinic aides. Two medical doctors may cost more than 200 village volunteers. Thus, conclusions concerning cost effectiveness in this regard depend more on the logic of low-cost health service delivery than on the findings of that particular study.

While these factors were not subject to intervention by the preschool program, water supply and sanitation were shown to be effective points of intervention for improving nutritional status outcome. An important finding of the study is that these two variables were significant determinants of nutritional outcome when many other factors, including rural/urban location, quality of housing, size of housing unit, land ownership, father's occupation, and mother's education were not found

significant by multiple regression analysis. The benefits of improved water supply and sanitation extend far beyond incremental improvement in infant nutritional status. Therefore, only a marginal component of the costs of these interventions should be attributed to nutritional improvement of the preschooler. This figure should be low enough to result in a favorable cost-effectiveness score.

c. Comparative Cost Analysis

A comparison of the Ghanaian and Lesotho preschool clinic cost analysis is given in Table 16 for the key cost categories. The percent of total costs per recipient and total costs per recipient are given by category. First, looking at the variable cost category, Lesotho clinics spent twice as much money ($32.31 versus $15.48) per recipient on supplementary foods. The food ration per recipient visit was 32% larger for Lesotho than Ghana (8.29 lbs. versus 6.27 lbs.). As a percent of total costs, Ghana had the smaller share taken by supplementary food costs (67%) versus 82% for Lesotho).

The costs of immunizations per recipient were very low in Lesotho ($0.09) and Ghana ($0.05). The costs for immunizations were only a fraction of 1% of total cost/ recipient. In both countries the vaccines are provided free to the Ministries of Health by UNICEF and WHO, so cost is not impeding the improvement of immunization coverage. The greatest problems are supply to the clinics and storage without breaking the "cold chain." Many vaccines are wasted because of improper refrigeration or no refrigeration at all.

In the fixed costs category, capital equipment costs/recipient were very similar for Lesotho and Ghana (.39 and .36) and only 1% to 2% of total costs. Labor costs were more than twice as high for Ghana clinics ($4.77 versus $2.16) as for Lesotho's costs per recipient. Labor represented 25% of Ghana's total costs compared to 14% for Lesotho. The high labor costs in Ghana result in proportionally higher total fixed costs per recipient ($5.31 versus $2.61 for Lesotho).

Total annual costs/recipient were 55% higher in Lesotho ($35.37 versus $22.77) due to the higher foods costs per recipient. However, Lesotho's clinic costs/recipient excluding supplementary foods were less than half of Ghana's ($3.06 versus $7.02). The costs/recipient without supplementary foods were 8% of the total in Lesotho versus 33% in Ghana. Because this is the cost that the respective governments would absorb, this is the most important figure. It is important to stress that the different costs of living and exchange rates in the two countries makes it extremely difficult to compare these two costs. For example, the labor costs are higher in Ghana, in part, because the wages are higher. For this reason, it is helpful to convert the annual cost per recipient without supplementary food into a percentage of per capita GNP. This makes the costs very close (between 1%-2%) and puts the intervention well within the economic resources of developing countries.

Table 16

Comparative Cost Analysis

Data Category	Percent of Total Cost/Recipient: Total Lesotho Sample All Clinics	Percent of Total Cost/Recipient: Total Chana Sample All Clinics	Cost/Recipient: Total Lesotho Sample All Clinics	Cost/Recipient: Total Ghana Sample All Clinics
Variable Costs/Recipient				
Nutrition				
Supplementary Foods	82%	67%	32.31	15.48
Other Nutrition Costs	1.4	5	.45	1.53
Prevention (immunization)	.5	.2	.09	.05
Total Variable Costs/Recipient	84%	72%	32.85	17.06
Fixed Costs/Recipient				
Capital Equipment	1.3%	2%	.39	.36
Labor	14.2	25	2.16	4.77
Other Fixed Costs	.5	.6	.072	.18
Total Fixed Costs/Recipient	16%	28%	2.62	5.31
Total Annual Costs/Recipient	100%	100%	35.47	22.37
Annual Costs/Recipient without Supplementary Food	18%	33%	3.06	7.02
Percent of Per Capita GNP	-	-	1.8%	1.2%

V. POLICY IMPLICATIONS

There are several policy implications which can be drawn from this case study. They concern the role of supplementary foods, the need to increase population coverage and the quality of nutrition education.

a. Reassessment of Donated Foods

The key conclusion that one can make from the case study findings is that providing supplementary foods to all preschool clinic attenders is not generally very effective and is a very expensive process relative to all other components of the program. To evaluate food aid fairly, it needs to be assessed on other grounds besides the cost-effectiveness analysis presented in this case study. Food aid provides an integral part of U.S. foreign aid at present. The pros and cons of the Food for Peace Program from a U.S. perspective are beyond the scope of this case study.

The major question raised in both country studies is that of non-discriminatory feeding. CRS advocates the supplying of supplementary food attendance. According to CRS monthly clinic reports, there is a clear correlation between clinic monthly attendance and the availability of food supplements. The clinics that secure a constant supply of powdered milk and/or cooking oil usually have the most consistent attendance figures. By making the food supplement the principal incentive for clinic attendance, it appears that the long-range viability of the clinics would be in jeopardy if the supply of these foods were to end. In addition, the case study raises several other concerns. First, in Ghana some clinics offered an incentive of about 10 pounds of free food at every clinic visit to motivate the mother to bring her child for well-baby checkups. The Adidome clinic, however, offered less than one pound of food per recipient visit and had nearly 100% regularity of clinic attendance in contrast to 67% for the Fijai clinic which offered 10.76 pounds per visit. More important, donated foods were not shown by the HIID institutional assessment study to be effective either in improving nutritional status of the child or in increasing nutritional knowledge of the mother. Other programs such as Yako (Upper Volta) and Hanover (Jamaica) have reported impressive nutritional impact with the use of little or no outside food supplements.

The integrated programs in both countries were found to have had positive impact on the children's nutritional status. The primary problem is that the programs reach only a very small proportion of all preschoolers in their respective countries (6% in Ghana and an estimated 25%-33% in Lesotho). If the Ghanaian government decided to expand the integrated preschool program as recently formulated to reach the remaining 94% of children currently lacking the services, they would require 16 times the amount of donated foods currently entering Ghana in order to reach all preschoolers. This would severely strain local administrative and logistical capabilties. There is also serious doubt if U.S. or U.N. agencies would be able to provide such considerable amounts. The desirability of such a massive transfer and the resulting dependency is questionable.

Another danger is that expanding the integrated preschool intervention will be delayed due to the limited or nonavailability of more supplementary food. This is one reason why the potential of targeting the food more specifically to those requiring the supplement is raised. A second reason for targeting is that the Ghana analysis shows that the package of clinic services as a whole was at least three times more effective in improving nutritional status of infants who were less well nourished at time of enrollment than children who were well nourished when they entered the clinic program, and that the program accomplished comparatively little for the initially well nourished group.

A third reason concerns mortality and morbidity risk rather than nutritional status. Although mortality was not measured by this study other research (Kielmann and McCord 1978) indicates that infants of weight for age below 80% of standard experience mortality rates between birth and three years that are from 4 to 20 times higher than those with weight for age about 80%. Peak difference in mortality between the well nourished and malnourished was found to occur in the 6- to 12-month period when supplementary foods and clinic health services should prove critical in preventing deaths of at-risk children. The fact that Ghanaian mothers who had experienced more preschool deaths were more regular in clinic attendance suggests that they understood this function of the clinics.

CRS policy in Africa has previously been reluctant to target the supplementary food because food acts as one incentive to attendance. In addition, after programs have started operations on a basis that gives food to all who attend, it is awkward from a public relations point of view to disqualify food recipients who may have been providing moral and logistic support for the program. However, CRS in the Cameroons has now taken the first steps towards targeting to the malnourished in a manner designed to gain community acceptance. This will be described below. Evidence does indicate that food distribution is one method (but not the only effective method) of motivating attendance. Such evidence also supports a strategy of targeting, because those who need most to be motivated to attend regularly are the mothers of the malnourished. Their children benefit much more from the program than the well nourished, and they also are most likely to need the food as an income supplement.

As is frequently true in subSaharan Africa, malnourished children constitute from 20% to 30% of the preschool population. Under these conditions, the preschool health program that targeted food distribution to these children only could expand population coverage by three to five times using the same quantities of donated foods, providing that personnel, training, and facilities were available for such expansion. Even with existing staff and facilities, however, much larger numbers could be reached if well-nourished children attended clinic less frequently than once a month and only the malnourished remained in monthly attendance after the first 6 to 12 months of life. Not only population coverage but overall cost effectiveness would be greatly enhanced by such a strategy.

A CRS representative in a rural area of the Cameroons currently is exploring targeting in the following manner. Community development workers have been made available to assist the CRS clinic program, which already distributes food to all clinic attenders. The method of outreach used to recruit families currently enrolled in preschool services was to announce the program through the churches and by word of mouth of village and other local leaders. Although these methods have succeeded in enrolling a significant number of preschoolers, the program now is concerned that not all the families of malnourished children in the community have been identified and informed of the existence of services. To detect these families, the community development workers have been scheduled to visit all homes and measure all preschoolers using an arm circumference strip (Shakir and Morley 1974). These workers will inform 11 mothers of children who fall into the red zone (less than 12.5 cm) that their children are in danger and should be brought to the clinic to receive food and health care.

The theoretical basis for using a simplified arm circumference strip or bangle or a thigh circumference tape which has slightly less measurement error and is equally accurate for boys and girls (Zeitlin et al. in press) is well founded. Chen and coworkers (1978) in Bangladesh found that arm circumference for age was the best of all predictors of mortality risk of 0 to 24 month old children during the subsequent two years. Weight for age, height for age, and weight for heigh were the other measures tested in their large prospective study. Fortunately, the simplified circumference strips and bangles are age-biased in a manner that corresponds to the decline in mortality risk with increasing age. To give an example, a 6-month-old child whose measurement fell in the red, below 12.5 cm on the arm circumference strip, would be moderately malnourished. A three year old with an arm of the same size would be severely malnourished. But the risk that these two children would die during the coming year would be about the same because three year olds have better immunity than younger infants. For this reason Chen concurs that these simplified indicators are theoretically the best anthropometric screening measures available (regardless of level of technology) for identifying high-risk children. Fortunately, they are simple enough to be used by nonliterate village volunteer workers.

b. Community Workers

Even with targeting, the Ghana and Lesotho preschool programs would require many more outstations in order to provide adequate population coverage. A comprehensive study of the clinic at Danfa, in rural Ghana, found that 75% of preschool children came from within 2 km of the clinic and that coverage beyond this distance was poor (Sai, Wurapa, Quartey-Papafio 1972). Many countries have developed village outstations that provide primary health care and nutrition surveillance at little or no extra cost to the government by training and supervising community workers who are selected and paid or supported by their villages (see case study, Formulated Foods, Study IV.

A subsidiary study conducted by Synectics in Ghana at the time of the present survey entitled An Exploratory Look at Layworker Use of the Growth Chart (Pielemeier and Jones 1978) demonstrated that village-level workers could in fact effectively use the growth chart to provide nutrition surveillance, nutrition education, and referral to health facilities. Since the nutrition education component per se appeared to have a high impact on nutritional status, there is little doubt that these workers could improve nutritional conditions in their communities. Because of their cultural similarity to the groups they would educate, the quality of communication provided also might be expected to be higher than that provided by outsiders, if adequate feedback and supervision could be arranged.

Proof of potential effectiveness of layworker programs in the West African context can be seen by the existence of an extensive village-level worker program in Upper Volta, directly to the North of Ghana, in an area having literacy rates of less than 3%. This program in the Yako District (see case study in Study IV, Formulated Foods) employs a ratio of 800 village volunteers to 20 nurses and a single medical doctor to provide health coverage to a population of 100,000 without the use of donated foods. According to detection surveys by vaccination teams, incidence of third-degree malnutrition in the program area was reduced to less than 0.4% in 1977 (nationally the rate was estimated to be from 3%-15%).

The most important priority, therefore, appears to be to extend the benefits of the present Ghana preschool program to the remainder of the population by use of layworkers recompensed by their communities. Such a policy would be in keeping with a longstanding self-help tradition in Ghana, which has resulted in the construction and staffing of large numbers of rural primary schools.

Lesotho is already moving in this direction. Village Health Workers are now beginning to be trained to provide basic health care at the village level. This type of outreach could greatly increase preschool nutrition coverage. In fact, the VHWs are being considered for clinic satellite status, weighing and screening the preschoolers in the villages and also teaching growth surveillance with the growth charts, along with nutrition and health education.

At Tsakholo the MCH program had extensive outreach into the surrounding villages. Community leaders were involved in the clinic and the concept of VHW grew out of this interchange of ideas. In the future there are plans by the Ministry of Health to have each MCH clinic training a cadre of VHWs to serve in peripheral villages. The VHWs would act as community liaisons, doing screening and referral, helping to improve environmental conditions of water and sanitation.

Five other growing VHW programs were functioning in Lesotho by late 1977. Early in 1979, a large AID-funded Rural Health Project began and was slated to train about 1,000 VHWs. Basic factors, such as isolation of the clinics in the mountainous country, present administrative and logistical problems which will take time to overcome but a beginning has been made.

c. Quality of Nutrition Education Activities

In view of the significant impact of nutrition education on nutritional status, and the fact that the opportunity for such education arises in each contact of the health worker with the mother, factors affecting the quality of the educational exchange between the mother and the health worker should receive additional attention. It may be that more time should be allotted for individual nutrition counseling, but that such longer sessions would not be needed each and every month after the earliest months of life. Group sessions might also be improved in quality. Research involving small-scale, in-depth observations of field workers, and pretesting of different counseling methods and schedules could probably increase the effectiveness of educational efforts. A move toward the use of more village-level workers could improve the amount of person-to-person contact and allow for the continuity and reinforcement which is so frequently lacking in the clinic-based, group sessions.

CHAPTER FOUR FOOTNOTES

[1]These profiles should be interpreted cautiously because of the probability that spuriously high correlations will occur among some variables when groups of variables are considered together. The variables that appear in the profiles, however, were selected from large matrices in part because their correlations with other variables and with each other were consistent and confirmed loosely held hypotheses of the investigator. The probability that theoretically consistent clusters of correlations will be spurious is very low, although the interpretive emphasis given to the cluster could be affected by spurious significance levels of one or more variables within the cluster.

[2]The variable "labor cost per recipient visit" was not used in regression analysis because of multicolinearity problems when "staff-to-patient ratio" (the more basic variable) was included.

CHAPTER FIVE

CASE STUDY OF ADMINISTRATION AND ORGANIZATION OF VILLAGE-LEVEL INTEGRATED PROJECTS IN MAHARASHTRA (INDIA)*

I. PURPOSE

This case study analyzes the integrated programming experience of seven pilot/demonstration projects in the West Indian State of Maharashtra. The focus of this study is on the programmatic (principally managerial and operational) aspects of community-level integrated projects. Questions addressed include: how is the program organized; how does the program interact with the community; how are personnel selected, trained and supervised; what are the costs and effectiveness. Based on the Maharashtra experience, some suggestions are given which project designers and implementors might consider when attempting to formulate or initiate a project of this nature. For another example of a community-based, integrated nutrition and primary health care program, see the case study of the Yako Project in Upper Volta in Study IV, Formulated Foods.

II. SETTING AND BACKGROUND

Maharashtra ranks third in India, both in area and population (estimated at 55,000,000 in 1975). Although the state is dominated by the metropolis of Bombay, over 70% of its population resides in the rural area and faces the same problems as peasants face elsewhere in the subcontinent. Subsistenace farmers and landless laborers make up a high percentage of the rural population. The vast majority of farmers must depend on the erratic monsoon to grow their staple crops of sorghum and millet. Within the last decade sugar and cotton have become large commercial crops in the irrigated areas of the state.

Accurate data on the nutritional/health status of the state's population are generally lacking. Infant mortality in most of the state's rural areas is estimated at between 100 and 150 per 1,000 live births. The same helmenthic and gastrointestinal infections that plague the preschool population in most of the developing world also have a serious negative impact on the vulnerable groups in Maharashtra.

To alleviate some of these problems, seven projects have been independently initiated since the early 1970s. All of the projects are similar in nature. Not only did all of them deliver a package of health, nutrition and family planning services, but they also had the common feature of relying extensively on outreach to deliver their services and on utilizing village-level workers to carry out some of the major project responsibilities in their own communities.

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*This case study is based on a paper prepared by David E. Pyle for the Ford Foundation, New Delhi 1979.

In the past decade, a number of such schemes have been implemented all over India; however, Maharashtra, for a combination of reasons, has had more than its share of these projects. Of the seven projects located in Maharashtra five were jointly run by the Government of Maharashtra (GOM) and voluntary agencies (the five project sites were Miraj, Mandwa/Uran, Kasa, Wadu/Loni, and Pachod). One was totally under the control of a voluntary organization (Jamkhed), and one was completely GOM-run (Padgha). Table 17 summarizes some of the projects' features. In the jointly run projects, the Department of Health agreed to turn over to the voluntary agencies for a specified period (usually ranging from two to four years) the control of local health facilities, personnel and financial resources at the Primary Health Unit in Mandwa and Wadu/Loni or Primary Health Center (in Miraj, Kasa, Uran and Pachod) level. Mandwa is exceptional in that it is an ongoing project. As will be demonstrated, several of the projects have achieved rather remarkable results. Such successes encourage a closer study of the projects to determine what can be learned from the Maharashtra experience and to suggest points which project designers and implementors might consider when attempting to initiate projects of this nature elsewhere.

It should be pointed out that three of the projects - those in Wadu/Loni, Uran, and Pachod - were started too recently to provide any reliable results at this time. The Padgha project has no data, and the Kasa project has concentrated its efforts on nutritional status. Three of the seven projects - the Padgha, Miraj, and Kasa projects - are no longer functioning. Once the agreement with the GOM came to an end and the voluntary agency was no longer involved, the local health operation reverted to the status quo ante. However, certain residual effects such as increased health awareness among the population, changed attitudes, and a certain amount of behavioral change do appear to have continued.

When explaining the success so often achieved in small-scale voluntary agency-managed projects, people usually cite three reasons. The dedication of the project managers is considered most important, and is commonly referred to as the "missionary zeal" factor. The generous funding the project receives, often from abroad, is ranked next. People consider the final essential element to be the intensive management which characterizes the projects, permitting close supervision and control.

While no one can deny the importance of these factors, it is necessary to break them down into more specific elements and investigate additional characteristics which account for the apparent success of many of these schemes. In other words a system, or at least a systematic way, by which projects of this nature can be analyzed is possible. The first part of this case study, therefore, concerns important program design characteristics found in the Maharashtra projects. This section is followed by suggestions regarding which factors are particularly important to consider when attempting to establish an integrated health, nutrition, family planning project utilizing a village-level integrated program worker (IW).

Table 17

Project Characteristics

	(1) JAMKHED	(2) KASA	(3) MIRAJ	(4) MANDRA	(5) PACHOD	(6) PADGHA	(7) WADU
Project Name	Comprehensive Rural Health Project	Integrated Mother-Child Health Nutrition Project	Integrated Health Services Project	Rural Health Research Project	Comprehensive Health & Development Project	Comprehensive Health Care Delivery Project	Pilot Project of Comprehensive Rural Health
Director	R. & M. Arole	P.M. Shah	E.R. Ram	N.H. Antia	A. Dyalchand	B.K. Bhadkamkar	B.J. Covaji
Administrating Organization	CRHP, Jamkhed (Ahmednagar Dist.)	Institute of Child Health, Grant Med. College, Bombay	Miraj Medical Centre (Sangli Dist.)	Foundation for Research in Rural Health, Grant Med. College, Bombay)	Mission Hospital, Pachod (Aurangabad Dist.)	District Health Officer (Thane Dist.)	KEM Hospital, Pune
Years	1970-	1974-1977	1973-1977	1973-	1977-	1976-1977	1977-
Coverage	100,000	56,364	230,329	32,000	79,000 (27,000 at at present)	104,000	60,860
No. of Villages	60	60	38	30	72 (22 at present)	144	19
Funding Agencies	Marathi Mission, CASA, CRHP	CARE, GOI, GOM	World Council of Churches, GOM,	Oxfam, Folkert Fdn., Christian Aid, FRCH, GOM	Terre des Oxfam, GOM	GOM	KEM, Z.P., GOM
VHW	VHW (since 1973)	Part-Time Social Worker	Village Health Aide	VHW	Dai	Community Health Worker	Community Health Worker
Number (% Female)	60 (100%)	28 (38%)	40 (100%)	19 (100%)	25 (100%)	132 (80%)	39 (50%)
Priorities	1-Simple Symptomatic Care 2-MCH 3-F.P. 4-Leprosy/T.B.	Nutrition-MCH Immunization F.P. Primary Health Care	MCH Primary Health F.P. Leprosy/T.B.	Primary Health Care MCH Leprosy/T.B.	MCH Prev. of Blindness F.P. Leprosy/T.B.	Primary Med. Care F.P. MCH Com. Diseases	MCH F.P. Env. Sanitation Leprosy/T.B.
Initial Training Period	1 Week	2 Weeks	1 Week	10 Days	1 Week	2 Weeks	3 Weeks
VHW/Population	1/1500	1/2000	Variable	1/1500	1/1000	1 Male & 1 Female/1600	1 Male & 1 Female/1500
Annual Cost/Capita	Rs. 8/75	Rs. 7/10	Rs. 3/70	Rs. 4/50	Rs. 6/15	N.A.	Rs. 9/50

A. Intervention Design Considerations

It is interesting to note that despite virtual lack of contact with one another these projects have independently developed many similarities in approach and modus operandi. The important factors that will be discussed in this section are divided into five categories: management, personnel, materials, cost, and effectiveness.

1. Management

The aspects that are included under management are results-orientation, "prioritization," sequential programming, information feedback, community organization and involvement, and decentralization. In some cases the discussion consists of general observations made about the projects as a group, while in others there will be references to specific project examples.

a. Results Orientation

When the voluntary agency projects are compared with government programs, it is evident that the agency projects are more concerned with results than with the procedures which dominate official operations. The results orientation is present in varying degrees in all the Maharashtra projects. This orientation is of paramount importance in the achievement of meaningful impact. The results orientation is distinguished from the procedures orientation discussed in Chapter 1 of this study.

The results approach clearly defines the objectives of the project and specifies goals and targets (e.g., a certain percentage decrease in infant mortality or severe malnutrition, coverage of a specified percentage of eligible couples). The project designers and implementors discuss the objectives of the program openly and freely with the staff so that all have feelings of personal involvement and commitment to attaining the goals. The yearly targets are set taking local conditions and resources into consideration. It is understood that progress will be slow. The workers understand that there is nothing wrong with revising their targets as new breakthroughs or barriers arise. However, objectives are usually time bound so that periodic assessment of progress can be gauged.

b. "Prioritization"

The specter of bureaucracy raised by this word may send a chill up the spine, but prioritization is a very important principle. It is generally practiced in the seven Maharashtra projects. A project determines priorities among the services needed by the entire community and targets specific groups to receive services so that the impact and effectiveness of the program will not be diluted and the IW will not become overburdened. At the same time, the IW's capabilities and time must be utilized optimally. Once the priority needs of the community have been satisfactorily met, expansion of the project's objectives and the IW's responsibilities can be considered.

The projects do not attempt to deliver a full range of services addressing all potential medical problems in the villages. Nor do they provide the best or most sophisticated care available. Rather than projects concentrate their efforts in a relatively few services which are appropriate and effective. This ability to determine and respond to priority needs enables the projects to maximize their cost effectiveness.

While in the long range the needs, particularly in terms of socioeconomic development, of the entire community must be addressed, the Maharashtra projects concentrate their efforts in the nutrition-health field in the under-five age group. Despite the fact that preschoolers comprise only about 16% of the population, the age group accounts for 40% to 50% of all mortality in India. Within this group, special attention was given to those children between the ages of one and three since they are most vulnerable because of the malnutrition and increased susceptibility to disease which often occurs during weaning. Because of the influence of pregnancy, of weaning and childcare practices and of family planning on the health and nutritional status of the child, married women of child-bearing age were included in the priority target group. It was hypothesized that through the proper care and education of pregnant and lactating women the high infant mortality rates could be lowered. Together the under-fives and child-bearing-age women comprise approximately 40% of the population. However, if preschoolers and prenant women in the community receive special attention, the IW is able to concentrate her efforts on only 20% of the population at any one time. While simple curative treatment is provided to the community at large, the bulk of the IW's time is devoted to providing MCH services, especially nutrition (undernutrition plus vitamin A deficiency and iron deficiency anemia), ante- and post-natal care (ANC and PNC), and education in proper childcare practices and immunization.

The principle of prioritization goes beyond selecting the target group and services. The IW can focus her efforts on an even more select group who require her services most. As they are in constant contact with people in the target group and keep up continuous surveillance of the population, the IWs can concentrate their attention on those most in need or at risk. The Kasa Project most clearly illustrates the importance of this aspect of prioritization. The project lists the following as the most important at-risk factors for the <u>under-fives</u>:

- weight less than 1.5 kg at birth;
- weight less than 65% of Harvard Standard;
- no weight gain for three consecutive months;
- loss of weight for two successive months;
- illness such as measles or gastroenteritis.

Of all the children in the target group who died in the project area, 84% showed one or more of these at-risk factors. Thus, while the at-risk group represented only 2.1% of the total population, it accounted for 21.5% of the total deaths.

The same principle can be applied to ANC cases as well. The at-risk factors for pregnant women (again from the Kasa Project) are:

- weight less than 38 kg before pregnancy or less than 42 kg in the 34th week of pregnancy;
- severe pallor (anemia);
- previous child weighing less than 2 kg at birth;
- swollen legs;
- over 35 years of age;
- history of abortion or stillbirth;
- fifth pregnancy or more.

The IW and intermediate-level paramedicals provide these women with special treatment. The Wadu/Loni Project has a slightly longer list of at-risk factors which includes, and in some cases subdivides, items on the Kasa list. It seems preferable to keep the list as short and simple as possible to facilitate the IW's work.

The cornerstone of the screening procedure is the commonly used Morley weight chart. All but two of the Maharashtra projects maintain such cards for each child under five. This enables the IW to identify those children requiring extra attention. As a result of such selectivity the Kasa Project was able to reduce the number of those receiving supplementary rations to only 23% of the under-five population. In addition, the weight chart provides an excellent longitudinal record of a child's development (nutritional status as well as morbidity), serves as an educational tool demonstrating to the mother improvement or decline in the child's growth, gives the immunization history, and lists the family members which can serve as a family planning reminder to the IW. The Kasa Project also utilized a card for the mother which includes a history of previous pregnancies, menstrual cycles, weight during pregnancy and important ante- and post-natal observations.

c. Sequential Introduction of Components

Although all the services complement each other and should be delivered as a package, all the projects studied emphasize some aspects and deemphasize others in their initial stages. Health, particularly the curative aspect, is a much greater felt need in the community than nutrition, which, in turn, is greater than family planning. The Maharashtra projects, therefore, commonly waited until they had established confidence and trust in the population through the provision of the other services before introducing family planning. Kasa also delayed [illegible] several months the initiation of its immunization program, which can [illegible] use resistance. This phased approach reduces the chances of overloading the IWs as they begin their work and eliminates the possibility that the project will be regarded by the community as only interested in family planning. This is of particular concern since the excesses of "the Emergency" (period from mid-1975 to early 1977 when the Indian government allegedly carried out many forced sterilizations. See Schlesinger (1977).)

Because the priorities of the projects require regular and close contact with the women, rapport is usually established while the IW's concentrate their efforts on ensuring the survival of the existing children. The subject of controlling fertility is introduced in a rational way at an appropriate time (e.g., after a birth, or a year after the last birth when the likelihood of conception increases, or after two or three children have reached a "safe" age). The existence of an IW also permits the utilization of alternative means of birth spacing (pills condom, or IUD). The IW maintains a depot of contraceptives and she serves as a constant reminder. She also follows-up on any complications. The success of an IW in recruiting family planning acceptors has been one of their most outstanding, yet least recognized, accomplishments.

Jamkhed and Mandwa included hospital facilities in their early stages in order to respond to the community's felt need. It helped solve the problem of what entry point to use to gain access to the village end, more importantly, the influential villagers. It is problematic for an outsider to gain acceptance in a village. A doctor, however, is generally considered a legitimate outsider and as a result commands respect in the village.

Alternative entry points which can be developed iwth the health package approach can be gained through broad-based, equity-oriented schemes. Jamkhed, for example, focused on developing water resources and increasing agricultural production, both high priorities within the community. They have also utilized donated imported commodities for food-for-work development schemes. Pachod is combining its comprehensive health measures with a dairy development scheme for landless members of the community.

The general pattern for the introduction of integrated components in the seven projects is to introduce curative health schemes first; and then, nutrition, preventive health, and family planning schemes; and finally environmental sanitation schemes. Because of the amount of behavioral change required and its very low felt need, the directors at Jamkhed felt confident to introduce the environmental sanitation component only after the IWs had been functioning in the villages for five years. The introduction of each aspect is accompanied or preceded by educational/promotive efforts so that the villagers understand the reason for the particular action and will participate willingly.

1. Information System

One of the outstanding features of the relatively small-scale, voluntary agency-managed projects in Maharashtra is the degree of flexibility they exercise. While having a clear set of objectives in front of them, the directors are not committed exclusively to any one approach or methodology; they are able to learn from experience and adjust their projects accordingly as they progress. There is a lot of trial and error before a formula that fits the local conditions and allows the project to achieve its stated objectives is arrived at and adopted.

To make mid-course corrections and improvements, the project administrators need to know exactly what the status of the work in the villages is at all times. This is possible only if a good system of feedback exists. For the feedback to mean anything, a baseline survey or census of the project population is always the first order of business in these projects. Without such basic information, the project director has no idea of the amount and nature of the work which the staff has accomplished and still must do. By comparing the periodic feedback data with the baseline, the managers know exactly what the project has and has not achieved. Moreover, when the project area is divided into zones of specific responsibility as has been done in the Maharashtra projects, weaknesses can easily be identified and followed up. This amounts to a built-in evaluation system.

Provided the right kind of information is collected, the more limited the data, the clearer the picture of project status the program director has. Data collection in most of the projects was carried out efficiently and economically. Probably the simplest yet most effective information systems were seen in Jamkhed and Kasa. At the former, the IWs (80% of whom are illiterate) maintain records of output-related information. They can tell at any time, for example, what percentage of children under five have received their three doses of diphtheria-pertussis-tetanus inoculation (DPT), the percentage of eligible couples covered by some form of family planning, or the percentage of ANC cases covered. Data as percentages make it easy for both the workers and supervisors to see at a glance what has been accomplished and what remains to be done. The temptation to provide input numbers (i.e., play the "numbers game") has been avoided in all but one project. Such numbers as houses visited, inoculations given, or minor ailments treated are meaningless by themselves.

With the Kasa project's system the managers could tell how many children at any moment were in the different stages of malnutrition and how many had improved, stayed the same or regressed in the previous reporting period. At the end of every month each IW reviewed the weight charts and submitted a report giving the number of children in each grade of malnutrition. The information not only permitted the project directors to follow the impact of the intervention but also allowed the IWs and intermediate supervisors to appreciate how well they were doing, thereby improving job satisfaction and motivation.

e. Local Involvement

The majority of the voluntary agency-managed projects in Maharashtra charged a nominal fee for the drugs or services rendered to the villagers. The fee not only defrays the cost of operations (see Cost Section) but just as important, gives the community a sense of participation and involvement in the project. Having paid something for the services, the recipients tend to appreciate the project more. Jamkhed charges 5-10 paise (approximately 1¢)* for the medicines they distribute; Miraj, a flat fee of 25 paise (about 3¢) for any one type of medicine given for three days; Mandwa, 55 paise (about 7¢) for any medicine.

*U.S.$1 equals 8 rupees; 100 paise equals 1 rupee.

There are other forms of community involvement found in both government and agency-managed projects. For example, Mandwa has the gram panchayats (elected village council) pay 60% of the IW's monthly honorarium out of their budget. According to the Panchayat Act covering local council appropriations 10% of the gram panchayat's budget is to be allowed for health. While it might be allotted on paper, it is rarely if ever spent on health-related matters. Project directors, however, have encouraged them to spend the money on such things as chlorine for well disinfection.

Jamkhed makes some very specific demands on the community. The project will not enter a village unless specifically requested to do so. The villagers must agree to provide certain things such as a building for the weekly clinic, food for, and preparation of, the daily supplementary ration for the preschoolers, and an access road if none exists to permit mobile team visits. If the village does not live up to the agreement, the project withdraws its services. This has happened in several cases. At the same time, the Jamkhed people suggest that the IWs should not be paid directly by the gram panchayat which would put them under obligation to the sarpanch (village head man) for favored treatment to the influential sector at the cost of the really needy ones. None of the Maharashtra projects have tried the idea of the IW's collecting a small amount each month from each family she covers. If the community understands the program and values it, and the IW has official sanction to do so, this approach might be workable.

The same emphasis on self-help and self-sufficiency characterizes the Wadu Project. A particular village expressed interest in a community latrine and gobar (animal excrement) gas plant. Funds were to be loaned to them for this purpose on the condition that the village find and pay for two people to clean and maintain the facility. The community said that they were unable to find anyone to do the job. No funds are being released until this condition is met. The project feels that it is essential for the success of the program that the community live up to its commitment. Creating a feeling of dependency or of getting something for nothing is being avoided at all costs.

f. Community Organization

The Maharashtra project can be divided into two general groups. The first type delivers services to the community with a minimal level of community involvement or organization. The Padgha, Kasa and Miraj projects are of this nature. They are effective as long as the projects last, but once voluntary agency association ends or government support is withdrawn, little or nothing survives of the project.

The other type of project puts more stress on developing some community organization to actively participate in the scheme. Wadu has to some degree been able to initiate the formation or revitalization of local organizations like bhajani mandals (religious single groups), youth mandals, mahila mandals (women's groups) and involve them in their preventive and promotive activities. At least one of these groups usually exists in every Indian village. Jamkhed has utilized the local Young

Farmers' Clubs to help organize and conduct mass health (especially immunization) programs and nutrition programs (cooking and distribution of food). The project is presently working through these clubs to institute environmental sanitation improvements and general development in the villages. Among other things they identified fallow land and brought it under cultivation for the feeding programs; they planted over 10,000 trees in 1976 and watered them through the summer. Such organizations enable the community to take advantage of many government schemes which otherwise go unutilized for lack of an implementing body in the village.

There really exists a continuum that can be represented as follows:

Total Dependency ———————————— Total Self-Reliance

In the first instance (total dependency) there is no community organization or involvement. The villagers receive the services in a passive manner. Everything is done for them. This is more typical of a normal government program. At the other end of the spectrum, the village does everything for itself and has no need of outside assistance. It is self-sufficient and self-supporting. Rarely do programs fall at either extreme, and the Maharashtra projects come somewhere in between: the first three (Padgha, Kasa, Miraj) are more to the left side, while the rest are somewhat to the right. There, of course, must be a partnership or mix since no community, at least to being with, can completely support an integrated program as described here. A study of the projects, however, demonstrates the importance of undertaking efforts to increase self-reliance and decrease dependence in a community so that long-term changes can be realized. The more a village is able to organize itself and become self-reliant, the greater the possibility that the integrated health program will be institutionalized and continue even if the project ceases to operate.

All the Maharashtra projects worked with the gram panchayats. None attempted to by-pass or radically challenge the established social, political or economic structure. This does not mean, however, that there are no socioeconomic changes taking place as a result of the projects. For instance, changes in the status of women, and their increased participation in community affairs has been reported in the Jamkhed Project. The high sociopolitical forces in the villages do not usually take much interest in the integrated health projects or affect their operations either positively or negatively. The projects' health-related activities are not perceived as a threat or challenge to the existing structure. Nor is it seen by the leaders as beneficial to themselves, since they are already receiving adequate medical care from private or public practitioners. More support from the leaders of the community can be expected where there is less of a gap separating the upper and lower segments of a village.

The projects, if successful, can become a threat to the leaders and their interests. For example, one Sarpanch in the Jamkhed project area requested the project directors to urge one particularly effective IW not to run in the gram panchayat elections for fear (a well justified one) that she would win and unseat him. All projects have instructed their workers not to become involved in politics. Conflicts have not been a problem up to this time. In a similar program in Bangladesh, however, one IW was brutally murdered because he was considered a threat to the local power structure. The danger increases as the project becomes more successful in raising the consciousness of the community, exposing social injustice, informing the villagers of their rights and organizing them for development. Project directors, therefore, must be cognizant of the socio-political ramifications of their schemes.

The Mandwa Project has activated health committees in each village to promote and help supervise the program activities. Every gram panchayat is by statute to have a health committee, but rarely if ever do they exist except on paper. Mandwa's efforts have proven unsuccessful. Because of the lack of effectiveness in the elected bodies and the need for alternative sources of project support within the community, nonpolitical organizations have been utilized. The more sources of support (both moral and financial) that exist, the better the chances of survival and long-term impact both while the project exists as well as when and if the project ever has to cease operations. If one source waivers. another is there to offer assistance.

Other benefits of community organizations are both peer pressure for accepting such ideas as family planning and sanitation and also quick dissemination of new ideas and concepts. Women's groups are particularly important for political and educational reasons. The groups increase the status of women and provide an educational forum. It takes a great deal of work and time to make a community organization an effective instrument of development, but the potential of such groups has encouraged the projects to undertake such efforts. People working together in a cooperative effort is probably the greatest achievement any project can hope for, and integrated health interventions provide an unusual opportunity for this work to begin.

g. Decentralization

Despite the fact that the Maharashtra projects are small in scale, the principle decentralization is utilized in several of them. It is best exemplified in Jamkhed. In expanding the project in recent years from 40,000 to 100,000 they have kept the operations largely separate. Beyond this, they have what is described as a cellular organization. This means that under the central facility, a subcenter serves as a virtually self-sufficient unit with four to five IWs functioning under its control. Advantages include the ability to identify, localize, and isolate failure so that if it is not remedied, the subcenter can be abandoned without affecting any other part of the project. It is also a convenient means by which to phase a program's build-up.

2. Personnel

The IW is the primary service delivery agent in each of the Maharashtra projects. Because IWs serve as the contact persons with the population, their role deserves special attention. Of particular importance are IW selection, training, supervision and coverage. The role of social scientists and government personnel is also discussed.

a. Selection

Because of the project priorities, women IWs were generally preferred. The Kasa Project, however, had to recruit approximately 60% males for the position due to the unavailability of middle-aged female candidates who met the minimum educational qualifications (the literacy rate among women is less than 5% in the area) and who were willing to serve in the particularly isolated areas. There was a much higher turnover rate among the male workers. Males have much greater job mobility, and as soon as a better job opportunity presents itself, they leave the project. For instance, Kasa experienced a high rate of male IW dropout during the harvest season when the demand for labor increased.*

Wadu utilizes a pair of IWs - one male and one female - for each 1,500 people. The women handle the MCH and family planning matters among the female population, while their male colleagues organize the youth, concentrate on improving environmental sanitation and promote family planning among the males of the village. Men have been found to be of little value in the MCH work because their interest is low and they are unable to interact effectively with the women of the community due to cultural/traditional restraints.

The criteria for selection vary from project to project, but some general observations can be made. A middle-aged or older woman who has had children but who is free of heavy responsibilities at home is preferred. She has been found to be more respected and selecting her produces minimal turnover. Different projects required different levels of education. Of Jamkhed's 60 IWs, 80% are illiterate. Two of the Mandwa IWs are also illiterate and their children maintain their records. The lack of schooling, in and of itself, does not preclude effective performance. In fact, two other projects (Kasa and Wadu) found that IWs with less education often performed better. It was universally agreed that the important criteria for an effective IW is the human qualities - sensitivity to other people's needs, a desire to do social service for the community, and patience to gently promote health knowledge. Other important traints include industriousness, trustworthiness, eagerness to learn, and willingness to change both herself and others, forwardness or aggressiveness, an ability to get along with and organize people. Anyone who wants the position merely for the money was found not to be a good worker.

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*In the words of the Jamkhed director, "The women in the remote villages are less corrupt, morally more upright and more responsible than the male counterpart. With sufficient encouragement and training, these women prove to be dependable and responsible workers."

Experience has shown that almost every community has a person who assists others (for example, at times of illness, during marriages). They are readily identified by the villagers. In some cases it may be the village birth attendant (dai). Almost all the projects utilize the dais in some way. At present, Pachod is relying on them exclusively. Miraj trained 173 out of the 186 identified dais in its area; 20 of these were selected as IWs in villages with no subcenters. Kasa, Jamkhed and Wadu also trained and integrated the services of the dais into their programs.

The method of IW selection varies somewhat in the subject projects, but in general there is close cooperation between the project directors and the established community leaders. Before the leaders nominated anyone, great efforts were made to explain in detail the objectives of the project, what was expected of the IW and what type of person is most effective in the job. The more the leaders know of the project, the less likely they will be to appoint someone for political or selfish reasons.

It is recommended that before final selection is made, the project directors conduct interviews with the prospective candidates and their families. All must clearly understand what will be expected of the IW. At times families, especially of female IWs, disapprove once the IW starts work. This can lead to increased family tensions and high turnover rates. In one of the projects, misunderstanding resulting from the wife's work as an IW led to her murder by her untrusting husband.

b. Training

The Maharashtra projects found a short orientation course of one to three weeks more satisfactory. The training is conducted close to the IW villages, does not require the IW to be away from home for extended periods, and is heavily biased toward practical field training. The training is geared to deal with each project's priorities and the duties of an IW. In addition to an introduction to the project's objectives and organization, such subjects as social injustice (including caste and economics), the status of women, community dynamics and organization, leadership patterns and decision-making in the village, and motivation are included. The IWs are seen as change agents and guided in the development of a broad range of skills.

Once orientation is concluded, the IW acquires skills at an individual rate in under-five care, nutrition immunization, treatment of minor ailments, ANC, delivery, family planning, T.B., leprosy, sanitation and hygiene. As soon as one skill is mastered, another is taught. Ongoing training is done mostly in the field. This method avoids the problem of exposing the IW to too much material at one time. The phased approach enables the IW to absorb more. Along with the practical, gradual training, reeducation and reorientation is constantly provided.

The most successful programs demonstrate that the learning is a two-way process. The Jamkhed directors stress that the two half-days a week that the IWs spend in discussions is the most important ingredient of their program. According to them, these sessions account for the success of the scheme. The lessons revolve around case situations

experienced by the IWs during the previous week. From the discussion the supervisors and project managers learn about the problems and perceptions at the village level. Alternative ways of dealing with the issues raised come from all levels, IWs to administrators. A similar approach and atmosphere is exhibited in dai training meetings at Pachod. The other projects generally meet at least once a month to trade experiences and for retraining.

c. Supervision

In order to emphasize the team orientation, the voluntary agency-managed projects prefer to use the terms "support" and "guidance" instead of "supervision" which conveys a superior-subordinate relationship and disciplinary action. Between the village- and intermediate-level workes some 80% to 90% (according to Jamkhed) of all village illnesses can be effectively handled. But there must be close cooperation and coordination if this is to be done. The IW knows the community best, its needs and how best to approach it. Anything to be done in the village, therefore, must be done through the IW. The IW is relied upon to identify those people needing immunization, suffering from severe malnutrition or undiagnosed illnesses, demonstrating any ANC at-risk factors, or showing signs of T.B. or leprosy. The IW's ability to detect illnesses early and the fact that she is always present in the village to provide services in emergencies and follow-up allows the intermediate-level worker to operate at higher levels of efficiency and effectiveness when s/he visits the village. On the other hand, the technical support given by the supervisory level is essential for the credibility and legitimacy of the IW within the community. Experience shows that the more support and encouragement given the IW, the more confident and effective the IW will be. Of course, both the IW and supervisor must be aware of and not exceed their limits of competence; any case they cannot treat is referred to the doctor at the central health facility.

The regularly scheduled (usually weekly) visits of the intermediate-level worker to the IW are most effective when the IW is treated as a respected member of the health team. This boasts the image of the IW in the eyes of the villagers. The supervisor must be willing to accept the IW as the central figure in the health operation without whom little can be accomplished. The supervisor's visit to the village is most effective if it has been planned ahead of time. What the agenda will be is usually discussed at the joint meetings. In this way the IW can do the necessary groundwork in the village, such as guiding the preparation of the required audio-visual aids, and conducting preliminary educational campaigns, etc.

The indispensibility of the IW is clearly demonstrated by the Jamkhed Project which originally stationed auxiliary nurse midwives in the villages. They were able to reach only 16% of the ANC cases and deliver only 1% of the babies. Teams visited weekly and by themselves covered 31% of the ANC cases but were not able to make a single delivery. With the introduction of IWs in addition to the weekly visits, 90% of the ANC cases were covered and 60% of the deliveries attended.

d. Coverage

The population covered by one IW varies from project to project, from approximately 800 per worker at Padgha to 2,000 at Kasa. Usually the worker was assigned to cover one natural village or a gram panchayat which might include several villages. The number of people one person can effectively cover depends on a number of factors such as existing communications, density of population, and number of hours that the IW is expected to work. The IWs in the projects were to work from three to five hours each day. At Kasa, where the villages were very spread out, the IWs found that it was virtually a full-time job if they were to complete all the work assigned to them. Under normal conditions, a figure of about 1,000 people or 200 families per IW seems feasible in the Maharashtra context. Supervisor seem able to give effective support to four or five IWs.

e. Social Scientists

It is interesting that all the Maharashtra projects with the exception of the GOM effort at Padgha determined independently that it was necessary to involve a social scientist intimately in the operation of the respective schemes. The staff of Miraj and Pachod include a demographer; Kasa and Mandwa/Uran have a manager with a rural sociology background; Wadu/Loni has a Project Support Communications Officer whose responsibilities include working with the communities to determine their needs and then organizing and gaining the maximum cooperation. Finally, Jamkhed depends heavily on social workers who are part of the health team that regularly visits the villages. It is their job to work with the Young Farmers' Clubs and organize community activities. The importance given to the social scientists emphasizes the need to understand the community and to learn how to work within its universe in order to make the integrated approach successful.

f. Government Personnel

When the voluntary agency projects which were cooperating and working with GOM health staff were visited, it was observed that a high percentage of the government personnel benefited from, and enjoyed the opportunity of working with, a nongovernmental organization. Talking to government servants at Loni, Kasa, Mandwa and Miraj, it was clear that most of these workers had an increased feeling of efficacy and self-worth. With proper supervision, timely and appropriate drugs, supply of simple equipment, good management and organization, they were able to accomplish something. After years of frustration, they now receive some job satisfaction. Most were willing and able to work hard given the additional inputs. They do not fit the normal image of a government health center staff.

Materials

The equipment required by an integrated health, nutrition, and population program utilizing an IW are minimal - less than 10 simple and inexpensive medicines at the village level to cure the most common ailments, vaccines, a stock of alternative contraceptive devices, some audio-visual aids and a dai's delivery kit.

The IW in the voluntary agency-managed schemes commonly carry such drugs as aspirin, piperazine (for deworming), vitamin A, vitamin B complex and iron/folic acid (for anemia), benzyl benzoate (for scabies), chloroquine (for malaria), and sulphadiazine (for upper respiratory infection). While the IW may carry an oral rehydration mixture to begin with, the preference at Kasa, Jamkhed, and Miraj was to instruct the mothers how to prepare it at home so that they could treat childhood diarrheas themselves. TCL (bleaching powder) is provided in all the projects for regular disinfection of the village well(s). One of the drugs, sulphadiazine, is a scheduled drug, but three of the projects have found its effectiveness outweighs any supposed danger. The simple precaution of advising the recipient to consume an increased amount of water precludes any adverse effects. One project director has even had an IW give streptomycin injections with no adverse repercussions. In fact, people said they no longer got infections in their arms as they did when they got shots at the health center. The point is not that IWs should give injections; rather, it is that a basically uneducated person with a little training can do more than is usually thought possible. Generally, the projects have kept medicines to an absolute minimum, providing only those that are essential for the IW's work or necessary for her/him to gain the confidence of the community by responding to their felt need for curative services. The projects are very careful to ensure that the IW does not become merely a pill dispenser or take the place of a doctor in the case of serious illness.

In addition to the normal immunization schedules of smallpox, DPT and the antitubercullin Bacillus Calumet Guerin inoculation (BCG), three projects (Jamkhed, Wadu, and Miraj) also provided polio immunizations. According to information from Jamkhed, this measure protected the children in the project area against a severe outbreak of polio which occurred in the surrounding blocks (the lowest level administrative unit covering approximately 100,000 people) last summer.

The IW should also have in her kit the common contraceptive devices so that she can demonstrate them to the villagers. This dispels some of their misconceptions. By means of educational efforts and close community contact, the use of birth spacing methods have been increased. At Jamkhed in 1975, for example, there were 564 voluntary tubectomies and 658 oral contraceptive users. Stocks of pills and condoms are kept with the IWs. Alternative methods to the terminal operation, therefore, have great appeal if they are consistently and conveniently made available.

Audio-visual aids are helpful for teaching the villagers about the more abstract subjects like sanitation, hygiene, and nutrition. Very effective aids are produced locally at Jamkhed where the IWs instruct the local artist what to present and how. Although untrained in the techniques of communications, the IWs seem to have an innate appreciation of the finer points.

As mentioned earlier, the traditional dais have been trained and provided with simple kits. Kasa, Miraj, Jamkhed, Wadu and Pachod have all given their dais such things as sterilized razor blades, cord ties, tincture of iodine and a few pieces of cotton, costing less than one rupee.

Each time she delivers a baby, the dai is paid a small sum (usually Rs.2 or Rs. 3) and her delivery kit is replenished. It is a good idea that, as at Pachod, the used materials be collected for recycling purposes and also to prevent the unsterile equipment from being used again by someone in the village, possibly for another delivery.

4. Cost

The cost calculations on the voluntary agency-managed projects leave much to be desired. They are only rough approximations of real costs. Inputs such as donated foo and labor are not costed. Consequently it is difficult to get a good estimate of the annual cost per capita. The best that can be done is to take the gross expenditure figure and divide it by the number of the population served. As seen in Table 17, on this basis the annual costs per capita range from Rs.3.70 at Miraj to Rs.9.50 at Wadu. Because of the vastly different sizes of the target populations (e.g., there were over 200,000 people in the Miraj area but only 30,000 at Wadu and Loni) and differences in services rendered, comparisons between projects are not terribly revealing. Economies of scale apparently is a factor since the largest project had the cheapest per capita cost and the smallest was the most expensive in per capita terms. The projects do seem to demonstrate, however, that is is possible to deliver a package of health, nutrition and population services for somewhere in the vicinity of Rs.8 ($1.00) per capital a year.

The projects demonstrate several interesting cost features that should be noted. First, it is possible for a project to defray its costs by charging for some of its services. For example, Jamkhed had an income of Rs.470,000 last year. This amount is recovered mainly from the 30-bed hospital the project operates. Since this facility caters to the felt needs of the higher income groups from both inside and outside the project area for more sophisticated curative services, the project managers can charge more for these services and use the income to subsidize the cost of the outreach (IW) operations. It allows the net cost of the program to be reduced to Rs.4 per capita. Miraj recovered Rs.20,000 from the community payment for medicines; this amount was ploughed back into the project to buy more medicines. These monies were more than doubled the amount allocated for medicines at the government centers.

A second important lost feature is that certain screening and cost-efficient techniques work interactively. On the one hand, selectivity makes the resources go further. Kasa reduced the number of preschoolers being fed to only 23%, thereby reducing the percentage of the budget spent on food to less than 22%. In many cases, the food provision consumes a major proportion of the budget. This savings permits more to be spent on other services. On the other hand, costing can be used as a screening device or, rather, a way to encourage use of the referral system. Mandwa plans to institute differential charges depending on where the patient enters the referral pattern; the minimum Rs.1 if the patient goes first to the IW; Rs.3 if he first contacts the intermediate-level ANM; and Rs.10 for coming directly to the hospital. This reduces the load at the central facility while, as in the case of Jamkhed, defrays the cost of the village operations.

Finally, some cost patterns decrease with a project's growth. As a project progresses, it covers the backlogs existing at the initial stage and costs decrease accordingly. At Jamkhed, for instance, they had to do 7,075 immunizations in 1971 and only 3,604 in 1975. Moreover, as the project begins to make an impact, its costs for inputs like food and medicines decrease. If hygiene and sanitation efforts succeed, for example, the budgetary provision for benzyl benzoate, piperazine and TCL can be reduced.

5. Effectiveness

The impact data available on the Maharashtra projects is little better than their cost data. Several of the projects (Wadu/Loni, Pachod, and Uran) have started too recently to have had any meaningful impact at this point. No significant results in this type of program can be expected in less than two to four years. Especially where behavioral change is required, results will take time, and voluntary agencies are usually willing and able to devote the necessary time to get results. No impact data could be found on the Padgha Project; only input figures exist (e.g., number of houses visited, blood smears collected, minor ailments treated, ANC referred, and wells chlorinated. As Table 18 shows, only Jamkhed and Miraj have complete impact data. It should be mentioned that the validity of these figures is unknown. They are presented here merely to give some idea of the projects' impact as the projects themselves have reported.

Probably the best overall indicator of impact is the infant mortality rate (IMR). This rate gives some idea of the effectiveness of such things as antenatal and postnatal care, proper delivery procedures, good childcare education, practices and supervision, immunization protection, general improved health and nutritional status of the mother, better environmental sanitation and the provision of MCH services. Miraj, with a lower IMR to begin with, reduced infant mortality in its project area in a three-year period by 65.8%, while Jamkhed experienced a drop of almost 60% over a five-year span. The other outstanding success in these projects is in family planning where over 50% of the eligible couples in Jamkhed and an almost unbelievable 90% in Miraj accepted some means of voluntary birth control. It demonstrates what can be accomplished with community-based programs.

Nutritional status is also a good indicator of the general health of the preschoolers because of the close interrelationship between infection and nutrition. Jamkhed reduced the number of severely malnourished from 30% to 8% in five years. Kasa reports that after six months under the program 37.8% and after one year, 55.7%, of the severely malnourished children improved their weight by 10% or more over expected growth. The project also reports having recruited a large number of sterilization cases - the figure increased from 45 cases in 1974 and 1975 (before the project was initiated) to 750 operations in 1975 and 76 to 1,668 in 1976 and 1977. The effect of the emergency is suspected but not confirmed since no figures from surrounding health centers are available. Moreover, the numbers are not terribly revealing because there is no indication of what percentage of the eligible couples it represents and, as such, it is difficult to gauge the significance of the numbera.

Table 18

PROJECT IMPACT

Project Name	JAMKHED Base-line 1971	JAMKHED Con-trol 1976	JAMKHED Project Area 1976	MIRAJ 1974 (Jan.)	MIRAJ 1977 (Jan.)
Infant Mortality Rate (per 1000 live births)	97	90	39	67.6	23.1
Percentage of Under Fives Immunized	less than 1%	15%	84% (1978= 98%)	Small pox-85% DPT-2% Polio-1.5% BCG - 6%	99.7% 85% 83% 55%
Percentage of Eligible Couples Practising F.P.	2.5%	10%	50.5%	30.6%	89.1%*
Crude Birth Rate (per 1000 population)	40	37	23	26.3	21.4
Percentage of ANC cases Covered	less than 0.5%	2%	78% (1978= 96%)	N.A.	97%

Percentage of eligible couples (three of more children) sterilized.

B. Suggestions

If there is anything that one learns from studying the Maharashtra projects, it is that there is no one way to carry out an integrated, community-level health scheme. There is not, cannot, and should not be one formula to apply in multiple locations. It is up to each project designer/administrator to investigate and study the needs of the proposed project area. Taking into consideration the existing problems, the desires of the people and the resources available, the project leaders must develop a program that will give maximum impact for the funds at their disposal. The fact that a formula cannot be provided does not mean, however, that lessons cannot be drawn from the Maharashtra experience. It is possible to arrive at some conclusions as to what a project of this nature should include and how services should be delivered. What follows is a brief normative outline of some general yet important points which might be taken into consideration when designing a village-level health, nutrition and population project utilizing local low-level workers.

Much of a project's eventual success depends on what is done in its initial stage - the foundation which is laid. Sufficient time must be allowed to establish good relations with the community and learn what are the best mix of services, the best entry point(s) and the best approach. If sufficient funds and qualified people are available, equity-oriented socioeconomic development programs are highly advantageous to the introduction of an integrated health effort. But these are not essential to the success of the integrated intervention. It is recommended that the more tangible services (e.g., curative health, immunization, TCL disinfection, feeding of preschoolers, and ANC care) be introduced first. Once the community has grasped the objective of the project, educational efforts on the more abstract concepts such as hygiene, environmental sanitation and nutrition and those aspects requiring behavioral change should begin slowly and should gradually become the primary focus of the project. Progress in these fields will take the longest time to achieve but will mean the most for long-term results. As circumstances permit and as the occasions present themselves, the ideas of birth spacing and limitation should be introduced on a person-to-person basis. With the passage of time and the organization of the community, this subject can appropriately be discussed at a broader level.

The initial overtures to the community must be through the established infrastructure, the gram panchayat, if it is a functioning body. No project can afford to alienate the village leaders if it is a functioning body. No project can afford to alienate the village leaders if it wants to operate in the village. At the same time, the project should not give the village leaders the impression that it is there merely to offer services to the community. The village must agree to certain conditions and fulfill certain responsibilities. Once the agreement is made, the project must not be reluctant to withdraw its services if the villagers do not live up to the conditions. Any weakness on the part of the managers in this regard will be taken advantage of. The village leaders and the villagers themselves have become used to the idea of "development from the top" in which they are the passive recipient

of program benefits. When behavioral change is required in order to have significant and long-term impact, this approach is not appropriate. Certain things like drugs, immunization, supplementary feeding and even chlorination of the wells can be done in the traditional manner and have some effect if managed well. But once the services are stopped, the situation reverts to what it was before the services were started. What is required, therefore, is active participation and involvement of the community itself. There must be a partnership between the service deliverers and the recipients; they must work together to achieve the desired ends.

However, such cooperative work is easier said than done. Much depends on the intentions of the project designers. Three different types of projects can be identified: demonstration, pilot and research. The most flexible type is the demonstration project which serves the purpose of showing the merits of a selected system, i.e., given certain inputs, something can be accomplished. A pilot project, on the other hand, tests a particular approach on a small scale to determine its chances for success if implemented on an expanded basis. Finally, a research project is a careful investigation aimed at identifying or testing new theories. The three types of projects serve different functions and must be distinguished one from another. If the director is interested in trying to prove his approach can produce certain results within a specified time, the project may give a lower priority to the long-term interests of the community. Certain vested interests develop. The pilot and research types particularly have this tendency. Certain controls - e.g., allocation of supplementary foods and full complements of staff - must be enforced for the sake of the study and as a result the emphasis on community involvement and organization is compromised. Therefore, before a project starts, all must clearly understand which type of project it is and what its goals are.

How do the project's ends become the community's ends and vice versa? A close relationship must be established with the community. One way of doing this is through the IW. The selection, therefore, becomes all important. The more the villagers understand about the scheme, the better their choice will be.

One of the points which must be stressed to the villager, it seems, is that the IW is a village member who will continue to reside there to serve health-related needs. The concept is a new one for villagers and is apparently difficult for them to grasp at first. It is important that this basic idea be repeated until it is understood by all for this is where the concept of self-help beings.

While training of the IW has been discussed, the reorientation and training of the middle-level staff and especially the doctors has not received enough attention. Their training and experience are procedure/specialist oriented, and how to work as a member of a team is usually not familiar or comfortable for them. The intermediate-level supervisor can spell out the differences between an effective and ineffective IW, and he cannot be allowed to be overshadowed by the IWs.

The IWs are just as dependent on the supervisor as the latter is on the IW. The doctors are few in number but have been identified as causing the most problems in a project of this nature. Thorough reorientation is normally required to make the doctor an effective member of the integrated team.

The supplementary food component, while appealing at first glance, must be used with considerable care. A number of foreign organizations donate commodities to voluntary agency projects. The project director must be conscious of the lost educational value as well as the danger of dependency if the imported food is utilized exclusively. First, local commodities which can be easily identified and purchased in the market or grown in a kitchen garden have a much greater meaning to the mothers. They can prepare the same dishes for their children at home.

The second point is that community concern and understanding of undernutrition are heightened if the supplementary foods are provided by the community themselves. Food for the supplementary feeding component can be produced on land specially set aside or small amounts can be given by members of the community who are in a position to do so. Unless a child is suffering from extremely severe malnutrition, the supplement need not emphasize animal proteins. The local staple grain plus a little pulse (legume) and jaggery (unrefined sugar) is satisfactory, appetizing, and serves as a good example of what should be in the normal diet.

Because of the limited amount of resources available in such programs, the supplementary feeding should be restricted to only those most requiring it, i.e., the at-risk children who are under three years old. The feeding, at least in the beginning, should be supervised. Once people come to understand and appreciate the purpose of the supplementary ration and the fact that it is a supplement, not a substitute, it may be possible to try feeding on a take-home basis. However, the temptation to share the ration with other siblings is usually too great to overcome.

Another nutritional intervention which is of considerable importance is the reduction in the rate of severe anemia among the women. As many as 50% of the women in the child-bearing age suffer from serious anemia. Simple methods of determining hemoglobin levels are available (e.g., hemoglobinometer); one method should be adopted so that the project can identify women requiring special attention.

The community should share the financial burden of the program (e.g., paying a small amount for medicines, sharing the cost of the IW's honorarium, and donating food, land or labor for the supplementary feeding program). If the IW receives Rs.100 a month and covers 200 families, each one need pay only 50 paise each month to meet the cost. It could be collected as a community health tax (Rs.6 a year), but the disadvantage with this arrangement is that people do not alwasy connect the payment with the services rendered, or, as mentioned, it can lead to misuse of the IW by the Sarpanch. The principle of direct payment is important in that it increases accountability from below. People feel the scheme is more "theirs" and take a greater interest in the program's activities.

Accountability from the top is also required. The IW must be asked to provide statistics each month on numbers of birth and deaths, percentage fully immunized, percentage of eligible couples using contraceptives, and number in third-degree malnutrition. If the project territory is divided into zones of specific responsibility, IWs and supervisors can be held responsible for their performances. If objectives are not achieved, immediate inquiries into the problems being faced can be undertaken. This might be referred to as "at-risk" management - i.e., being able to concentrate efforts on those workers most in need of assistance.

The family planning component is rather straightforward once trust is established. The IW can be successful with the women but may require assistance from a male to convince husbands who are often reluctant to let their wives undergo a tubectomy. Potential male helpers are the head of the Youth or Young Farmer's Clubs or an influential male who has already had a vasectomy or whose wife has had a tubectomy. Community organizations should be used to create peer pressure to become contraceptors. The IW should stress the fact that the services she provides ensure that the family's living chldren will reach maturity and that the danger of child mortality has been greatly reduced. This can reduce the "time-lag" phenomenon between the reduction in infant mortality and lower fertility. Even if the family does not accept a permanent method, one of the birth-spacing alternatives can be encouraged, especially since the IW is there to provide continuous stocks and follow-up as required.

For the IW to be successful, she must have a positive self-image. This is encouraged and nurtured by the integrated health team. At the same time, she must attempt to improve the feeling of self-worth among community members. By impressing upon the parents their important role in the development of their children and the dependence of the children on them for the first several years, the IW can make them better parents. Individual members of the community should also be made to view themselves as contributors to the welfare of the village. The voluntary agency schemes demonstrate that the normal apathy in the village can be broken if some direction and education on the value of joint action is provided.

Institutionalized self-reliant development which includes improvements in health, nutrition and population control is realized only if the community organizes itself. In most cases the present panchayati raj (democratic decentralization) structure has not proven capable of fulfilling this function. The dominance of the gram panchayats by politics and by the social and economic elites offers little room for hope in the near future. Therefore, local organizations should be formed or activated/strengthened. Women's groups, led by capable IWs, can do a great deal to improve the status of women within the community and even give them some economic independence (e.g., through cottage industries). The IW should be an ex-officio member of the gram panchayat, attend meetings and be a spokeswoman for village health matters and women's rights in general.

The temptation to come up with a formula and apply it to every project is always present. Project designers, however, must remember that all villages are not the same. Each will respond in its own way to an integrated health, nutrition and family planning scheme. Consequently, each community must be treated individually. A village, like an individual, has its own unique personality, desires, needs, resources and capabilities. It is here that a social scientist is of service to a project. The flexibility of voluntary agencies allow them to respond to these differences and enables them to be particularly effective.

APPENDIX A

BIOSOCIAL LINKAGES

I. HEALTH

The priority target group is infants and children under three years old and pregnant and lactating mothers (see Study I). Specific aspects of health that most commonly affect the nutritional status of this vulnerable group must be focused upon. Any integrated program intended to improve the chances of survival for the community's youngest members must consider the impact of such health problems as diarrheal disorders, parasites, nutritional deficiencies, infections, communicable diseases, and antenatal and postnatal conditions, all of which are discussed in this appendix.

A. Diarrheal Diseases

Diarrhea is the most prevalent illness of nutritional importance among the young child population (Puffer and Serrano 1973). It is one of the commonest causes of the high under-five mortality rates in developing countries. It has been estimated that in 1975 there were 500 million episodes of diarrhea in the under-five age group in Asia, Africa and Latin America. This resulted in somewhere between 5 and 18 million deaths. The situation in developing countries today is comparable to the industrialized countries at the end of the last century (WHO Chronicle 1978b). Studies in Egypt, Iran, and Venezuela estimate that the monthly incidence of diarrhea among preschool children varies between 40% and 50% (Zijl 1966). The Narangwal study in India calculated that 7.4% of the children under three years of age showed symptoms of "abnormal frequency of stools" (Kielmann and Uberoi 1972). This figure corresponds closely to the 7% figure arrived at in a Guatemalan study (Mata, Urrutia, and Gordon 1967). Cholera in Bangladesh has been described as a "strikingly pediatric disease which overwhelmingly infects small children " (Briscoe 1977); this is clearly demonstrated in Table 19. Attention was drawn by Gordon, Chitkara, and Wyon (1963) to the "weanling diarrhea" (frequent diarrhea at the weaning age). The peak incidence of diarrhea occurs between six months and two years of age. Prior to weaning, a child's exposure to diarrheal infection is restricted by primary consumption of breast milk. However, weaning brings with it the potential for a dramatic increase in the incidence of enteric infections. Children under two have been reported to be ill with diarrhea 10% to 14% of the time (Martorell et al. 1975).

Evidence indicates that the prevalence of diarrhea may be higher among the malnourished population. Studies in Colombia, South Africa, and Guatemala found reported prevalence of diarrhea in the previous week for the children in the most malnourished condition was nearly double that of the normal children (Table 20).

Table 19

Cholera Attack Rate in Bangladesh by Age Group

Age Group	Average Attack Rate Cases/ 1,000 Year (3 seasons data)	% of Total Population	% of Total Cholera Cases	% of Total Cholera Carriers
0-4	10.0	19.5	48.17	87.3
5-9	6.2	17.2	26.34	11.8
10-14	2.9	10.1	7.24	0.2
15-29	2.9	21.4	15.33	0.5
30-49	0.6	19.7	2.92	0.1
50+	0.0	12.1	0.00	0.0

Source: Derived from Gangarosa and Mosley 1974. By Briscoe 1977.

Table 20

Reported Prevalence of Acute Diarrheal Disease in Preschool Children by Nutritional Classification (Candalaria, Colombia, 1963)

Nutritional Classification	Percentage Reported Diarrhea During Past Week
Normal +	37.2
Normal -	40.4
First degree (Gomez)	40.3
Second degree (Gomez)	56.7
Third degree (Gomez)	66.7

Source: Wray 1977.

In South Africa gastroenteritis in both the summer and the winter seasons was more common among the more malnourished children (Table 21). The same phenomenon was demonstrated by a field experiment in Guatemala, where malnourished children had higher diarrheal attack rates (Table 22). The similarity in attack rates for second- and third-degree malnutrition shown in Table 22 may well occur because of statistical reasons, as the third-degree sample size was small. The third-degree malnourished in this case may also have been more susceptible either to severe diarrhea or to being classified as having it.

Using the probability of diarrhea attack rates given the Scrimshaw, Taylor, and Gordon work (i.e., normal = 1 case/child/year; mild = 1.6; moderate = 2.5; severe = 2.7), Rhode estimates that 35% (Table 23) of all cases of childhood diarrhea are associated with malnutrition.

Diarrheal curation bas been reported to be inversely related to the child's nutritional status at the onset of infection (Palmer et al. 1976), being prolonged in the more malnourished. This prolongation may reflect a delay in the turnover of intestinal mucus that is necessary to eliminate the fixed toxin.

Just as nutritional status of a child can affect the frequency and duration of diarrheal attacks, the contrary is also true, i.e., diarrheal diseases can also have serious negative effects on a child's nutritional status, for a number of reasons. First, diarrhea affects intestinal physiology. For instance, viruses replicate in the intestinal mucosa, causing mucosal damage that leads to water loss and electrolyte secretion, especially during the healing phase (Pierce and Hirschhorn 1977). The water content of the body at birth is 75% decreasing to 59% by age one. The high water content of the body, coupled with the still immature functioning of the kidney, makes the young child very sensitive to dehydration, the most dangerous aspect of weanling diarrhea (Dag Hammarskjold Foundation 1975).

Malabsorption of nutrients is another serious problem. Heavy and persistent contamination and severe malnutrition are related to gastrointestinal alterations that may compromise nutrient absorption. Severe protein-calorie malnutrition can lead to a thinning out of the intestinal wall and mucosal lining. Chronic diarrhea, multiple nutritional deficiencies, and malabsorption of fat, xylose, and vitamin B_{12} is associated with severel histologic findings in cases of "tropical sprue" (Mathan and Baker 1975). This condition appears primarily in adults but has histologic similarities to the milder, generally asymptomatic "tropical enteropathy," which is characterized by malabsorption of xylose and has been identified most often in children. Definitive studies in these areas remain to be done. Neither of these two conditions appears to be directly related to severe malnutrition and diarrhea in infants and small children, but they raise the possibility of widespread but as yet undefined malabsorptive conditions in this group. Important structural and physiological changes associated with malnutrition have been associated also with malabsorption of nitrogen, fat, calories, vitamin B_{12}, and other

Table 21

Gastroenteritis in Relation to Weight for Age*

	Percentages of Expected Weight		
	< 65%	65%-80%	> 80%
Summer:			
Total Patients	191	622	553
Diarrhea Patients	113 (59%)	235 (38%)	88 (16%)
Winter:			
Total Patients	134	387	626
Diarrhea Patients	38 (28%)	28 (7%)	33 (5%)

*This study did not indicate age distributions within weight for age categories.

Source: Wittmann et al. 1967.

Table 22

Diarrhea Attack Rates
(in cases/year/100 children, 0-4 years)

	Normal	First Degree	Second Degree	Third Degree
Number of Children	25	74	71	9
All Diarrhea	99	164	253	275
Severe Diarrhea	22	62	73	108

Source: Scrimshaw, Taylor and Gordon 1968.

Table 23

Estimated Number of Cases of Childhood Diarrhea Associated with Malnutrition in World

	Normal	Mild	Malnourished Moderate	Malnourished Severe
Established Number of Children in Developed World (5 years old (in millions))	200	200	90	10
Attack Rate (cases/child/year)	1	1.6	2.5	2.7
Total Cases Childhood Diarrhea (in millions)	200	320	225	27
Number of Cases if Attack Rate was that of Normally Nourished Group (in millions)	200	200	90	10
Cases Attributed to Malnutrition (in millions)	0	120	135	17

Source: Rohde 1977.

nutrients (Viteri and Schneider 1974). Further progressive changes in gastrointestinal ecology due to malnutrition and diarrheal disorders might result in greater susceptibility to malabsorption and chronic non-specific diarrheas (Schneider, Shiffman, and Faigenblum 1977). Bacterial overgrowth and loss of bile through passive diffusion may be partly responsible for this by reducing defense mechanisms in the gut (Viteri and Schneider 1974).

The capacity to absorb nitrogen, calories, and fat from the regular diet is seriously reduced in diarrhea. Beisel (1972) has shown that there is two to three times the normal amount of nitrogen in the diarrheal stool. In the INCAP study, such malabsorption was equal to the fecal loss of as much as 210 calories (13% of RDS for a three year old) and 175 mb nitrogen (83%) per day per preschooler (Schneider, Shiffman, and Faigenblum 1977). The consequence of diarrhea can be that a marginal case of nutritional deficiency is turned into a severe case.

In addition, the child with diarrhea has a reduced food intake, which results in part from an accompanying anorexia that reduces the child's appetite and from the widespread custom of reducing the quantity and quality of food given to the child suffering from diarrhea. This reduction can be seen as a reasonable, rational decision on the part of the mother because the frequency and quantity of diarrheal stool may decrease when food is withheld and increase when supplementary food is given, depending on the types of food given. The mother is also familiar with the mortality rate among the young from diarrhea.

Nonetheless, the practice is inappropriate; its nutritional consequences are very harmful. The end result is retarded growth and development of the child and a high mortality rate among the 0-3 age group. If only 1% of all under-five diarrheal cases die, it is easy to understand (especially in view of Table 23) why diarrhea is the major cause of death in the vulnerable sector in developing countries. This view is consistent with Puffer and Serrano's findings in Latin America (1973) and is demonstrated by a Guatemalan study (Table 24).

B. Infections

It has been long recognized anecdotally that malnourished children are highly susceptible to infection. The synergistic relationship between common and normally nonlethal infections and nutritional deficiencies have been considered one of the world's greatest causes of death (Taylor 1967). Despite this recognition, consistent scientific evidence has not clearly demonstrated the relationship and its physiological basis.

The influence of malnutrition on cell-mediated immunity, humoral immunity, phagocyte and complement function has been recently reviewed by Suskind (1977). With the risk of oversimplifying a complex and equivocal situation, evidence in regards to cellular and humoral immunity has been summarized as follows:

Table 24

Number of Attacks and Days of Illness per Year in Six Guatemalan Children with Greatest Weight Gain and Six with Least Gain, by Disease

Disease	Children with Greatest Weight Gain		Children with Least Weight Gain		Difference in Days Ill	
	No. of Attacks	Total Days Ill	No. of Attacks	Total Days Ill	X^2	Probability
Diarrheal disease	12	100	11	170	19.3	< 0.00
Upper respiratory disease and conjunctivitis	24	155	23	209	8.7	<0.01
Bronchitis and brocho-pneumonia	1	7	2	24	6.7	<0.01
Stomatitis and thrush	3	20	6	39	5.5	<0.02
Associated illnesses*	11	107	15	202	31.4	<0.001
Total	51	389	57	644	82.6	<0.001

*Two or more of the following illnesses: diarrhea, upper respiratory disease, conjunctivitis, thrush, and cellulitis.

Source: Mata, Urrutia, and Garcia 1972.

- Depressed cell-mediated immunity function develops in persons severely depleted of proteins after weaning. Bacteria usually controlled by intact cellular immune mechanisms in healthy persons produce unusually severe infections in the malnourished. Protein-calorie depleted patients cannot be easily sensitized to antigens and cannot readily recall prior sensitization, as measured by delayed cutaneous hypersensitivity (Edelman 1977).

- Complex interacting biological processes make it extremely difficult to dissect out the effect of individual nutrient deficiencies on isolated parameters of immunocompetence. Chandra (1977) provides an excellent review of the field. The changes shown in Table 25 have been noted in response to protein-calorie malnutrition.

- Animal studies have shown reduced antibody response in deficiencies of protein, calories, vitamins B_1, B_6, B_{12}, A, C, and D, pantothenic acid, folate, and biotin. Suppression of the immune response has been found in first- and second-generation offspring of deprived female animals.

Although malnourished children appear to be sick over a longer period because of respiratory and other infections, evidence suggests they do not have a higher incidence (Mata, Urrutia, and Garcia 1972, Table 24 herein; Wray and Aguirre 1969).

The impact of infection on the nutritional status of a child is particularly significant because illness is the norm rather than the exception among the young preschool population of the developing countries. The number of illnesses per child annually range from a reported 205 in Guatemalan villages (Scrimshaw, Taylor, and Gordon 1967) to 22 per child aged 6-11 months in South India (Kamath et al. 1968). A more recent study in Guatemala shows that in addition to the approximately 10% of the time an under-two child has diarrhea, it has fever 5% and respiratory illness 35% of the time (Mortorell et al. 1975). This means that for as much as half the year the child may suffer from some form of infection.

Depressed defenses against infection associated with decreased maternal nutritional status may result in not only an increased incidence of infection in the mother but also an increased transmission of infection to the fetus (Rosenberg, Solomon, and Levin 1976). Further, synergistic interactions between nutrition and infection in the mother may result in reduced weight gains during pregnancy and diminished fetal nutrition and development (Rosenberg, Solomon, and Levin 1976).

The most serious form of nutritional impact of severe infections is the catabolic process in which there is nutrient wastage through overutilization, sequestration, and diversion. The destruction of body tissue and the excretion of the products of this destruction in the patient's

Table 25

Humoral Immune Response to Protein-Calorie Malnutrition

Serum globulin	i
Albumin	d
B-lymphocytes	nc
Serum immunoglobulins	i or nc
Serum antibodies formation in response to:	
Tetanus	a
Diphtheria toxoids	a
Polio virus	a
Measles	a
Yellow fever faccine	n
Killed influenza-A (Hong Kong)	n
Flagellin	n
Tobacco mosaic virus	n
Avian red cells	n
Salmonella	v
Secretory IgA	d

Key:

i = increase
d = decrease
nc = no change
a = adequate
n = inadequate
v = varies

Source: Compiled from Chandra 1977.

sweat, feces, and urine occur mostly during the fever connected with the infection. The extent of catabolic losses depends on the duration and the severity (measured by elevation of body temperature) of the infection. For each centrigrade degree rise in body temperature, the metabolic rate increases some 13%; there is a 7.2% increase for every Fahrenheit degree (Pollack 1968; Pollack and Sheldon 1970). These increased requirements are met by depleting fat stores (if any) and by the breakdown of tissue protein (muscle) to meet increased energy needs (Beisel 1975). This process frequently results in a negative nitrogen balance, i.e., the body is losing more nitrogen than it is ingesting. Such a loss is particularly serious for a child already suffering from malnutrition; the existing negative nitrogen balance is made worse. There is evidence that a malnourished child's loss from an infection may be somewhat less than that experienced by a well-nourished child with the same infection, however.

The original work on the interrelationship between infection and nutrition by Scrimshaw, Taylor, and Gordon (1968) dealt mostly with bacterial and helminthic diseases. It is imperative that one consider the nutritional impact of some of the more common and dangerous viral infections of the preschool child. The most serious in terms of numbers of children affected and negative nutritional effects is measles, which attacks younger children in the developing countries between five months and three years, compared to late preschool or early school age in developing countries. The median age has been reported at 17 months in Nigeria versus almost 52 months in England (Morley 1973).

Although the incidence of measles is no greater in the developing countries, it results in a more severe rash, often followed by skin peeling as the superficial layer dies. The rash also affects internal organs such as the lungs and intestines, which may lead to pneumonia and diarrhea. It can also affect eyesight by causing the disappearance of the tiny cells that lubricate the surface of the eye. The result is corneal lesions. When combined with a vitamin A deficiency, measles' effect on eyesight is most severe. More than half the blindness in children in some developing countries is due to the attack of measles in children already deficient in vitamin A (Morley 1977). Overall, measles produces a mortality rate among malnourished children in subSaharan Africa that is 400 times greater than in the West (Morley 1977). For an example, in Mali, 78 deaths were reported out of 213 cases, giving a mortality rate of 38% (Morley 1973).

A Nigerian study clearly shows the relationship between measles and nutrition (Hendrickse 1967). Characteristically, the peak in the incidence of measles was in the second year of life, with the most serious morbidity occurring in the age group between two and three years old. All nine children who died of measles in this case were in the poorly nourished category; eight were below the 10th percentile for British children, with five of these below the 3rd percentile. This confirmed the fact that the severity of measles depends to a large extent on the nutritional state of the child at the time of illness. Puffer and Serrano (1973) found ill health after the infection had subsided. The child is weak and susceptible to other infections. Table 26 demonstrates that some children take over three months to regain weight lost during measles.

Table 26

Weeks Taken to Regain Former Weight after Measles

	0-4 Weeks	5-8 Weeks	9-12 Weeks	>12 Weeks
Number of Children	77	70	16	29
Percentage of all children	40%	36.5%	8.3%	15.1%

Source: Morley 1973.

Whooping cough (pertussis) is another important source of morbidity and mortality among childhood infectious diseases in the developing world. One third of all deaths from whooping cough take place in those who contract the disease under the age of five months. Although its severity does not seem to be related to the victim's nutritional status as in the case of measles, whooping cough can help bring about weight loss (although less than measles) and thus be one factor contributing to malnutrition (Table 27). Much of the weight loss may occur as the result of vomiting. Although these children do not have as much weight to regain, the recovery of lost weight takes as long as in the case of measles (Table 28).

Protein-calorie and certain vitamin deficiencies were found in one study to increase the severity of tuberculosis by reducing resistance to the disease (Scrimshaw, Taylor, and Gordon 1968). Such a reduction can lead to the rapid spread of tuberculosis lesions in malnourished children, which is also a factor in determining a child's nutritional status. Kwashiorkor at times can resist treatment, even proper dietary rehabilitation, because of the influence of undetected tuberculosis (Morley 1973).

A major cause of nutrition loss during all types of infection is decreased food intake. For such common illnesses as respiratory infections, there is little direct relationship between the child's nutritional status and the illness. However, when the marginal food intake is reduced for even as little as a few days, the child may have considerable difficulty in making up for the missed food in succeeding days and even weeks. Nasal congestion in a small child often prevents or reduces breat-feeding and hence can lead to reduced growth and even marasmus. In addition, a kwashiorkor child who lies listlessly for hours is highly susceptible to branch pneumonia, which can be fatal (Morley 1973). One reason that pneumonia is one of the most common causes of death in the first year of life may be that parents often do not realize these dangers. What becomes a simple cold in an adult may become bronchitis in a toddler and pneumonia in an infant.

In measles, the diet is often restricted, with the child receiving mostly nonnutritious starchy foods. The disease is often used as a reason to stop breast-feeding, which exacerbates nutritional problems. Sores in the mouth, which frequently accompany severe measles found in developing countries, reduce the child's desire to eat. Similarly, in a study in Guatemala on whooping cough, there was a 9% reduction from normal consumption during the first month, a 7% reduction from normal in the second, and a 9% increase over normal in the third month when the child is recovering (Mata 1978).

From one study of malnourished children in Jamaica, growth rates during the recovery period were fifteen times as fast as those of normal children of the same age. When the expected (50th percentile) weight for height was reached, food intake fell and growth rates slowed to levels comparable with those of adequately nourished children (Ashworth and Waterlow 1969). Rohde (1977) points out that weight gains in the recovery

Table 27

Extent of Weight Loss Due to Whopping Cough

	No Loss	Percentage Lost of Previous Weight 5%	5%	10%	15%
Number of Children	114	67	43	7	1
Percentage of all Children	49%	29%	18%	3%	1%

Source: Morley 1973.

Table 28

Weeks Taken to Regain Former Weight after Whopping Cough

	0-4 wk	5-8 wk.	9-12 wk	12 wk
Number of Children	50	37	14	17
Percentage of all Children	43%	31%	12%	14%

Source: Morley 1973.

stage depend on doubling the normal calorie requirement (at least 150 calories per kilogram are consumed per day). Even at this rate, he calculates, it takes between one and two days for each day ill to accomplish full nutritional recovery. However, often the child is already weakened by malnutrition and will not survive the infection. For those that do survive, more must be known about what happens to the food the sick child does not consume; is it or a portion of it saved until the illness abates and then given to him in addition to his normal diet? Do other family members consume it, therefore increasing their intake? Or is the family's total intake reduced by the amount the sick child does not consume?

C. Parasites

As with the case of infection and nutrition, conclusive evidence on the interaction of parasites with host nutrition is not available. However, existing evidence indicates that parasitic infections affect the nutritional well-being of their carriers. Two principal types of parasites will be considered in this section, intestinal (hookworm and roundworm) and blood (malaria) parasites.

The most prevalent intestinal parasitic infection in most areas of the developing world is roundworm (ascaris). It has its greatest frequency in moist tropical climates where prevalence often exceeds 50% of the population. The precise effect of roundworms on the nutrition of the host is unclear. Roundworms may cause malnutrition by ingesting and metabolizing nutrient eaten by the host. A study by Venkatachalam and Patwardham (1953) found that a mean fecal nitrogen loss of 1.3 gm/day occurred in children with ascariasis, which reduced to 0.7 gm/day when the ascariasis was treated. Increased amounts of nitrogen in the stools of children infected with roundworms were also noted by Scrimshaw, Taylor, and Gordon (1968). Tripathy and co-workers (1971) found that a substantial malabsorption of fat, carbohydrates, and proteins in patients infected with roundworms improved with treatment. Roundworms may also be a factor in malnutrition by causing a malabsorption of nutrients through disruption of normal intestinal processes.

Of primary concern with hookworm (uncinaria) are the effects on the nutritional status of pregnant and lactating women. Even mild infestation may interfere with the digestion and absorption of protein. Research suggests that the adverse effects of helminthic diseases like hookworm on a person's nitrogen balance is roughly proportion al to the parasite load (Taylor and de Sweemer 1973). One study shows that persons with heavy hookworm infection have an average absorption of 62.5% compared to 73.3% in worm-free subjects on the same diet (Scrimshaw, Taylor, and Gordon 1968). Even though these are only rough estimates, they give us some idea of the potential nutritional cost of parasite infestation to a pregnant or lactating woman who is particularly vulnerable to nutritional deficiencies that can, in turn, have a negative impact on the young child.

More important, however, is the negative effect of hookworm infestation on a woman's iron supply. A very high percentage of women in developing countries suffer from anemia, and the situation is exacerbated by pregnancy. Anemia, in fact, reportedly accounts for 20% of the maternal deaths during childbirth (WHO 1976a).

Another common form of parasite infection in the developing world is malaria. In recent years, malaria has again become a major health problem. It is estimated that the number of autochthonous malaria cases more than doubled between 1972 and 1976 (3.2 million to 7.5 million, excluding Africa) (WHO Chronicle 1978a). This disease also is particularly serious in pregnant women, where it is often accentuated by a concurrent folate deficiency. The disease is a major cause of low birth weight. Fetal growth retardation takes place during the end of pregnancy when physical and mental development is most rapid.

Studies in Nigeria found that babies of mothers with malaria were anywhere from 89 to 312 grams (mean = 263 grams lighter than those of noninfected mothers (Jelliffe 1967). The weight reduction is attributed to the malaria parasite's need for glucose, riboflavin, calcium, folic acid, biotin and oxygen for their own metabolism. They, in effect, are competing with the fetus for nourishment.

Morley (1973) points out that children, particularly those between six months and five years, are the chief sufferers of malaria. However, the relationship between malaria and nutrition is very different from other infections mentioned previously. For the first three months of life, the child has a remarkable degree of immunity to all forms of malaria due to its mother's antibodies. But thereafter the infection rate rises rapidly. A Nigerian study found over 80% of the unprotected child had malaria by the age of two (Hendricks 1967). Interestingly, the severely malnourished child is apparently less susceptible to malarial infection, at least with the P. falciparium variety. Since the malnourished child may not have sufficient nutrition for them, thereby literally starving them to death. There is also evidence that children on a milk diet have less incidence of falciparium malaria (Maegraith 1967). This may explain why breast-fed babies rarely get malaria. The parasites are overt once the milk diet is suspended. P. malariae is found more often in malnourished children but develops later with a peak at five years of age. Other nutritional relationships with malaria involve anorexia and fever, with similar effects as in the case of infections.

D. Deficiencies

It is difficult to make a distinction between the common nutritional deficiencies and health problems. There are several nutritional deficiencies to which the young preschool child in developing countries is particularly prone that constitute serious health problems. While avitaminosis A is of greatest concern, deficiencies in vitamin D, iron, folate, and iodine also deserve mention.

Vitamin A deficiency is associated with progressive visual deterioration, and in young children (but not in adults) it has been considered a major cause of blindness in low-income countries (Berg 1973). For every blind child, many others suffer mild or moderate visual impairment. Gopalan (1967) suggests that 8% of all Indian children are afflicted by night blindness and more severe ocular manifestations of vitamin a deficiency. WHO (1976a) reports that 25% of the survivors of keratomalacia remain totally blind, 50%-60% are partially blind, and 15%-25% escape with unimpaired sight.

Vitamin A deficiency problems are most serious in rice-dependent developing countries in Asia because rice is more severely deficient in B-carotene than other staple cereals. In Africa, Latin America, and the Middle East it can be intermittently extensive. Dry areas like the Sahelian region of West and Central Africa are particularly prone to eye problems associated with vitamin A deficiency. It is also highly sensitive to changing social and economic conditions. Eye deterioration progresses from conjunctival zerosis and the appearance of Bitot's spots to corneal ulceration and keratomalacia.[1]

Young preschool children have been found to be most susceptible to vitamin A deficiency. The peak incidence in Jordan has been reported to occur between the ages of 30 and 40 months (Kamel 1974). In Indonesia this peak occurs 12 to 18 months after the peak prevalence of PCM alone, which would make it close to the age in Jordan. The median age in Indonesia for the mildest form of eye deterioation is reported as 3.6 years, while corneal zerosis and ulcerations (a most serious stage) came at 2.3 years (Oomen 1976). This confirms that the younger the child the more serious the effects.

There is a close connection between PCM and xerophthalmia. Vitamin A is stored in the liver and must be transported in the blood by Retinol Binding Protein (RBP). For this reason children with kwashiorkor cannot adequately utilize their own vitamin A stores. This is not a problem in the case of marasmus. The Indonesian study showed children with the moderate vitamin A-associated eye problem had a median weight of 73% of standard, while most of those with serious problems had a median weight of only 60% (Oomen 1974). Moreover, Jordanian children with severe PCM had a much higher fatality rate if they had xerophthalmia concurrently. The fatality rate among those that were malnourished as well as having xerophthalmia was 60% compared with only 15% in those children with equally severe PCM but no eye lesions (McLaren 1964).

Vitamin A absorption is also impaired when the child is suffering from severe malnutrition, either kwashiorkor or marasmus. The inadequate protein intake has an adverse effect on the efficiency of intestinal absorption of the vitamin A as well as its metabolism. Protein deficiency markedly depresses the intestinal conversion of B-carotene (vegetable form in which most of vitamin A is consumed in LDCs) to retinol (the active or usable form of the vitamin) derivatives (WHO 1967).

Infectious diseases, especially those of the gastrointestinal and respiratory tracts, must be taken into consideration when discussion xerophthalmia. Oomen (1974) reports that a child suffering from a serious case of xerophthalmia attributed to vitamin A deficiency is rarely seen without an accompanying case of diarrhea, dysentery, respiratory disease (including infantile tuberculosis), or one of the contagious diseases of childhood like measles, chickenpox, mumps, or whooping cough. According to the researcher, these infections in many cases seem to trigger the eye condition. A relationship between xerophthalmia and roundworm infections has also been reported (Sivakumar and Reddy 1975).

Vitamin A deficiency increases the susceptibility to infection by altering the immune system. Vitamin A has been called the anti-infective vitamin because of the high incidence of respiratory ailments associated with its deficiency. Mucous secretions of the trachea and bronchi are reduced and produce good harbors for micro-organisms that would not normally penetrate a healthy epithelial layer (Guthrie et al. 1974). This has not been demonstrated in humans, however. The exact causal linkage between vitamin A deficiency and infection is not clear, but a direct relationship is unmistakable.

It has been noted as well that there is a striking periodicity to the incidence of xerophthalmia. Health personnel sometimes refer to a "xerophthalmia season," which usually corresponds to the dry season when fruits and vegetables containing carotene are scarcest and infectious diseases, especially diarrheal diseases, are most common (Oomen 1974; WHO 1976a). The semistarvation diets that characteristically accompany intestinal and respiratory infections increase the chances of vitamin A deficiency.

Despite the fact that sufficient exposure to sunlight can prevent vitamin D deficiency, the condition is a problem in some cultures where the custom is to wrap up the children to protect them against the sun's high temperatures or respiratory disease. Cases of rickets can be found in areas that have a maximum amount of sunshine.

References to anemia in conjunction with hookworm infestation and malaria have already been made. However, the importance of iron and folic acid during pregnancy require that a brief mention be made of them outside the context of specific infections.

Both iron and folate are required for the production of blood. Folate deficiency in pregnancy has been associated with a variety of obstetric conditions such as spontaneous abortions, stillbirths, fetal malformation, neonatal death, low birth weight, prematurity, toxemia, and postpartum hemorrhaging (WHO 1972).

Iron plays a role in the transport of oxygen and in the conversion of B-carotene to retinol (active vitamin A). It is also an anti-infective agent necessary for the growth of micro-organisms to destroy invading infectious organisms (Guthrie et al. 1974).

Iron sufficiency is determined by the total amount in the diet and by the amount absorbed. Absorption of iron from vegetable sources averages around 3% (ranging from 1% in rice to 3% in maize, 5% in wheat, and 6% in soybean, while the average for animal foods is approximately 7%. Iron deficiency is most common, therefore, in countries where meat is lacking in the diet. It is estimated, for instance, that in India 15%-20% of the women are anemic at the onset of pregnancy, and the incidence increases to 60%-70% in the last trimester (ICMR Bulletin 1975). Moreover, where wheat is the staple food, phytates in the grain inhibit absorption (WHO 1972). Finally, the common practice of pregnant women eating earth ("geophagia") depresses iron absorption and may be a more common cause of iron deficiency in some countries than previously realized (Moore 1968). There is, however, a compensating factor whereby the body's capacity to absorb increases with the need for iron (absorbtion increasing to as much as 60% of dietary iron compared to the normal 10%) (Guthrie 1975).

A high incidence of iodine deficiency remains in many developing countries, as evidenced by the incidence of goiter. The incidence of goiter is about six times higher in females than in males. Susceptibility is especially high in adolescent girls and pregnant women (Guthrie 1975). A serious deficiency can cause neonatal death or mental retardation, deafness, or cretinism.

II. WATER/SANITATION

Barbara Ward (1977) has referred to water as the "key to health." Other have suggested that the most effective way to bring about an improvement in the nutritional status of the population is through the provision of potable water in sufficient amounts. Water quantity, quality, and proper usage are intimately related to health and nutritional status. Decreasing the incidence of intestinal infection and parasite load can reduce the loss of valuable nutrients.

For purposes of reviewing the relationship between water, infection, and nutritional status, it is worthwhile to follow the well-known and often quoted four-category classification outlined by White, Bradley, and White (1972). We will discuss individually the water-washed, water-borne, water-based, and water-related infections, considering problems associated with waste disposal. In general, these categories comprise all the ways the infections discussed in the preceding section can be transmitted to the vulnerable child or mother. They must receive attention if a long-term impact on health-nutrition problems is to be achieved.

A. Water-Washed

An insufficient supply of water can result in intestinal disorder (bacillary or amebic dysentery, infective hepatitis, gastroenteritis) and skin and eye infections (skin ulcers, scabies, yaws, trachoma, conjunctivitis) because people are unable to wash themselves and their food, utensils, or clothes as required.

A number of studies have demonstrated clearly that the quantity of water available alone definitely influences the incidence of diarrhea (Ziji 1966). Important aspects of the quantity question are the amount of water required and accessibility. Before we get to these points, we should consider how many people in the developing countries do not have access to proper water supplies.

According to a WHO survey conducted at the beginning of the decade, only 14% of the rural and 68% of the urban population of the developing countries had "reasonable access" to safe water; areas most poorly supplied were Southeast Asia (only 9% had access in the rural areas) and Africa (11%) (WHO 1973). Even in the region with the most advanced water resources, Latin America and the Caribbean, 37% of the population lacked adequate and safe water supplies in 1975.

1. Amount

The minimum quantity of water required for a person to survive is estimated at between 1.8 and 3 liters per day (White, Bradley, and White 1972). This covers only the replacement of water lost through respiration, perspiration, urine, and feces. Of course, the warmer the climate and the more vigorous the work, the greater the need for replacement fluids.

The 1970 WHO report found that half the countries surveyed reported use of 40 liters per capita per day (lcd) or less for all purposes - drinking, cooking, washing, etc. (WHO 1973). As a rough guide, Saunders and Warford (1976) suggest that 20 lcd might be adequate. Efforts must be made, however, to assure proper distribution so that every person has at least the minimum required.

Gordon et al. (1964) contends that "water for hygiene used in adequate amounts and readily accessible has more significance for this age group (less than two years old) than the provision of potable supplies." He maintains that general diarrheas are usually transmitted by person-to-person contact (e.g., contamination of the baby's food by the mother's unclean hands). Therefore, the quantity of water and how it is used may be more important than the quality of the water. If properly used, the more water that is available, the more one is able to dilute existing infection and reduce its potency, perhaps to a level insufficient to cause a reaction in the human.

As may be suspected, during the dry season when water becomes increasingly scarce, unhygienic practices deteriorate further and the incidence of diarrheal diseases increases. This coincides with the lean-nutrition months in many areas (often referred to as the preharvest hunger period). The resulting combined effect is a heavy toll on the weanling cohort.

The effect of limited water supplies is not restricted to intestinal diseases. One of the worst consequences can be eye infections and even blindness due to trachoma. As is the case with vitamin A and measles, this disease particularly affects children. There are an estimated 400-500 million people in the world (120 million in India alone) affected by trachoma; two million of these are blind (Tarrizo 1974). The disease is endemic in most of North Africa, the Middle East, wide areas of Asia, West and East Africa, and to a lesser degree Latin America. Areas of Burma have a trachoma incidence of 60%-80%. Simple eye irritation from dust and glare can turn into infections because of a lack of proper washing. The eyes become milky and the pupils lose their luster.

2. Accessibility

An accessible water supply benefits a community in several ways. First, the closer the water source is to the user's residence, the more water will be used. The impact upon the water-washed infections is clear. Evidence shows that common diarrheal infection rates with organisms such as shigella are significantly higher among populations to whom water is available but "far from the house" (Schleissman 1959). In addition, according to Saunders and Warford (1976), the probability of skin disease is inversely related to the distance the family must go to acquire water.

Another factor is possible contamination of water during transit. The further one must transport water, the greater the opportunity for the water to become contaminated by dirt, flies, and other vectors.

The most significant impact of accessible water is on the individual transporting the water, most often the mother. Calories expended in hauling the water can be a considerable drain in the mother's nutritional resources. A study in East Africa (White, Bradley, and White 1972) computed the number of calories used per hour of walking to the water and transporting it home. Factors considered are distance or time required to transport, the volume of water carried and the terrain or gradients (more calories used going uphill, less downhill). The distance and load may vary according to seasons.

It was found that the average time spent in the rural areas to obtain water was 46 minutes, with the maximum approaching 4.5 hours. It has been calculated that an average woman expends 81 calories per hour when sitting or standing. When carrying 20 kilograms of water over flat terrain, the calorie need increases to 211 per hour. The mean calorie expenditure was 240 calories (equal to almost 70 grams of the staple grain) to as much as 1,930 calories (over half a kilogram of the staple). On the average, the energy expenditure of carrying water equaled 13% of the total calorie intake for daylight hours. However, in some rural settlements, over 25% of the person's daily energy requirements was used in obtaining water. It could go as high as 80% to 90% in very arid locations. These figures may be somewhat exaggerated, however, as it is safe to assume that the mother would be involved in some form of work requiring more than sitting or standing if she were not occupied with hauling water.

The opportunity cost to the water hauler should also be considered. The time spent carrying the water and in some cases waiting in line at the tap or well could be used more productively. This may vary by season, but is of particular concern during planting, cultivation, and harvest times when labor is most in demand. The unavailability of the women's labor and the use of water-carrying animals could preclude better utilization of existing land and agriculture-related capital.

In a Ghanaian study, women said that if they were provided with a convenient potable water supply system, they would have an extra 12 hours per week and that they would devote 57% of the freed time directly to productive work and 35% to household jobs (Dalton and Parker 1973). The latter is most important when considering the nutritional and health status of the young preschool children who depend so much on the mother's attention. More time to prepare food and feed the weanling could make a difference in the physical and mental development of the child. It might reduce the amount of time the less-informed mother-substitute (e.g., older brother or sister) has to care for the child, thereby freeing that person to be productive (e.g., attend school, work in the fields).

B. Water-Borne

Water-borne infections are spread through water supplies polluted with fecal matter and are, therefore, related to the quality of the water. Water can be the passive agent of transmission of such infections as typhoid, cholera, bacillary and amebic dysentery, infective hepatitis, and gastroenteritis. Because of the very negative impact of intestinal infections and diarrhea on the vulnerable child's growth and development, as discussed in the previous section, it is reasonable to consider making improvements in the quality of the water supply if the health and nutritional status of the population is to be raised on a long-term basis. Such a measure would plug several of the holes in the "leaking nutritional bucket" that Mitra (1975) refers to and would enable the young preschoolers to receive full benefits from the nutrients they ingest.

In East Africa, surface water (especially from rivers) has been identified as the most polluted source, followed by unprotected springs, streams, protected springs, dug wells, and finally, the most uncontaminated bore holes (Bradley and Emerson 1968). Ponds and pools vary in their contamination depending on their size and the extent to which livestock use them. Wells are polluted in various ways: seepage of animal and/or human waste through permeable soil; debris falling in; contamination of bucket and rope lowered from the surface. During the dry season, water levels decrease, increasing the concentration of pollutants. This helps explain the common hot-season diarrhea syndrome.

The speed and extent of the spread of water-borne infections can be determined by the number of people using one source. If the entire village population draws its water from a singel source, be it a stream, pool, well, or whatever, it will not take long for water-borne infection to spread throughout the community. On the other hand, with a large number of distribution points dispersed equitably around the village, the chance of widespread epidemics is reduced.

C. Water-Based

The water-based category includes infections such as schistosomiasis and guinea-worm, which are passed from person to person by snails living in the water sources. The infectious agents depend on aquatic organisms to complete their life cycle. They enter the person's system either by penetrating the skin (schistosomiasis) or by being ingested (guinea-worm).

Although infections in this category do not generally have great impact on the small child, they can negatively influence the health and nutritional status of the mother. As women are most commonly responsible for hauling water, they are exposed most frequently to the water-based infection and therefore often have higher infection rates. Such infection can greatly exacerbate the nutritional and health disabilities a mother may already be suffering.

D. Water-Related

The diseases included in the water-related category are spread by means of insects that breed in water sources (rivers, swamps, pools, even domestic water containers). The most common diseases are sleeping sickness (tsetse fly), onchocerciasis ("river blindness" spread by the black fly), and yellow fever, malaria, filariasis, and dengue fever (all spread by the mosquito). Any of these diseases can adversely affect a person's nutritional status, especially malaria which was discussed in the section on parasites (Part I).

E. Waste Disposal

The consensus of experts is that it makes little sense to invest in costly water systems if excreta disposal methods lack sanitation measures. It is difficult to make a significant and lasting impact on reducing water-washed, water-borne or water-based infections if fecal matter continues to contaminate water supplies and food, allowing the chain of transmission to remain unbroken.

In general, sanitation problems in the developing countries have received even less attention than those of water supply. In 1970 only 25% of the population surveyed by WHO had access to adequate pit privies or sewage collection and disposal facilities. In rural areas 8% had such facilities, with the lowest rate being in rural Asia (3%) (WHO 1973).

Water-borne diseases like cholera can be significantly reduced by improved and protected excreta disposal. In the Philippines, a study found that by itself the provision of sanitary facilities for human waste disposal could reduce the incidence of cholera by as much as 68%. This compares favorably with the installation of a safe water supply, which resulted in a 73% decrease. Only an incremental improvement was attained with both toilets and water supplies, which reduced the incidence by 76% (Azurin and Alvero 1974).

Proper sanitation can reduce water-based diseases like schistosomiasis in two ways. First, a latrine can provide a safe means of disposing of feces and urine, thereby breaking the life cycle of the infectious organism by not allowing it to reach the water. In addition, sanitary facilities can eliminate one reason for people to go near snail-infested waters, eliminating the occasion of infection.

The life cycle of intestinal parasites such as the roundworm and hookworm can be broken by latrines as well. The proper disposal of human excrement precludes the reinfection of people and lowers the parasite load that frequently burdens the already precarious nutrition-health status of the vulnerable.

Waste disposal problems include garbage and general village or domiciliary cleanliness. Unburied garbage and livestock kept in or near the house can be the cause of infection, as are animals that use or graze near the water sources. A study in India has suggested that the frequency of acute diarrhea among young children is inversely related to the distance between their homes and the compost pile that receives animal dung, household refuse, and fresh human excreta (Karla 1965).

Flies are also carriers of infections. They have a role in the transmission of shigella, although unable to carry enough salmonella to infect man (Watt and Lindsay 1948). Flies can infect food directly whereas most infections are spread by means of water or the human hand. The acute diarrheal diseases caused by flies can, as we have seen, have a serious negative impact on the health and nutritional status of the vulnerable.

III. FAMILY PLANNING

Family size, age of the mother at pregnancy, parity and the interval between children can have significant impact on the other three components of the integrated package. At the same time, the impact of nutrition on family planning efforts must also be considered. An excellent review of the interrelationships between nutrition and fertility and the benefits of integration can be found in NAS (1975).

A. Family Size

Each additional child means that the available food, water, space, and mother's time must be shared one more way. Among the lower socioeconomic groups especially, the quantities of these commodities are already in short, inelastic supply.

A high correlation between large family size and malnutrition has been noted (RAO and Gopalan 1969; Wray 1971). A Colombian study demonstrated that as the number of living children increases, the amount spent per person on food declines and the proportion of malnourished preschool children increases (Wray and Aguirre 1969).

A study by Mudkhedkar and Shah (1975) found that 15.6% of families with up to three children consumed less than 80% of their protein reference intake compared to 50% of the families with more than three children. As would be expected, there was also a close relationship found in the study between family size and nutritional status in rural areas. In families with one to three children, 46.9% had weights for age below 70% of the standard; with four to six, 52.3%; with seven and more, 62.5%. Moreover, 23.3% of single children suffered from anemia as opposed to 54.5% of children in three-child families. Under-five mortality was also considerably higher when there were more than three children per family (Table 29).

Table 29

Mortality Rate in Children by Mother's Parity

	Neonatal	Infant	Preschool
Up to 3 children	2	8	-
More than 3 children	8	14	2

Source: Mudkhedkar and Shah 1975.

A subsistence farmer with a fixed amount of land can do little but divide the available food among the family members, whether they are two or ten. An increase in the family size is not matched by an increase in productivity. Berg (1973) estimates that the availability of protein per child in families with one or two children would be 22% higher (or 13 grams per capita) than in those with four or five siblings. In most cases the additional amount would be enough to meet existing protein deficits.

Parity or birth order is an equally important factor. In India, it has been estimated that 61% of the youngsters with three or more older siblings (comprising 34% of the child population) suffer from malnutrition (Rao and Gopalan 1969). Wray (1971) reports that in a Colombian study, 58% of the malnourished children come from families with three or more children, while 42% are from families with three or less. The Khanna study demonstrated the increase in both infant and second-year mortality with an increase in parity over one (Table 30).

Not only mortality but physical growth is related to family size. Smaller size of children in larger families is a common phenomenon. First-borns with numerous siblings do not achieve the height and weight of first-borns who remain "only" children. The appearance of each additional child to a family has been hypothesized to act as a check on the growth of all preceding children (Morley 1973). Additionally, in countries in which severe malnutrition is endemic, the mother becomes weaker with each successive child. She gains less weight or experiences a gradual loss of weight over successive pregnancies (Vankatachalam 1962).

Table 30

Mortality of Children in Punjab Village by Parity of Mothers (1955-1958)

	Parity of Mother							Total/
	1	2	3	4	5	6	7-12	Average
Number of Births	230	209	210	197	165	136	326	1473
IMR	172	117	145	124	172	164	206	161
Second-year mortality (deaths/ 1,000 population)	76	16	24	92	96	77	95	68

Source: Wyon and Gordon 1971.

Maternal prepregnancy weight and weight gain during pregnancy in turn influence birth weight of neonates. Late-born children, however, begin at a disadvantage, having lower birth weights (Morley, Bicknell, and Woodland 1968). Breast-feeding is progressively reduced because of a depleted milk supply, resulting in the last or later children having an increased chance of suffering from malnutrition or dying of infection caused by contaminated or improperly prepared foods or bottles used to supplement or replace an inadequate supply of breast milk. Jelliffe (1966) refers to this as the "maternal depletion syndrome."

Of great concern to the nutritional well-being of the mother is anemia. As has been mentioned, anemia is a major cause of illness and death during pregnancy. It becomes increasingly severe with each succeeding birth. In South India, a survey found that 17.5% of women in their first to third pregnancies had hemoglobin readings less than 10 gm as opposed to 27% of those in their fourth or more pregnancy. The corresponding proportions for those with less than 8 gm were 3.2% and 8.5%, respectively (Rao and Gopalan 1969).

The nutritional effects of large families are felt for generations. In addition to the physical effects, there is evidence that children of high parity (sixth child or over) have significantly lower intelligence than children from families with fewer children. This is attributed to limited mother-child interaction that affects both the psychological and intellectual development of the child as well as to inferior nutritional intake of the child.

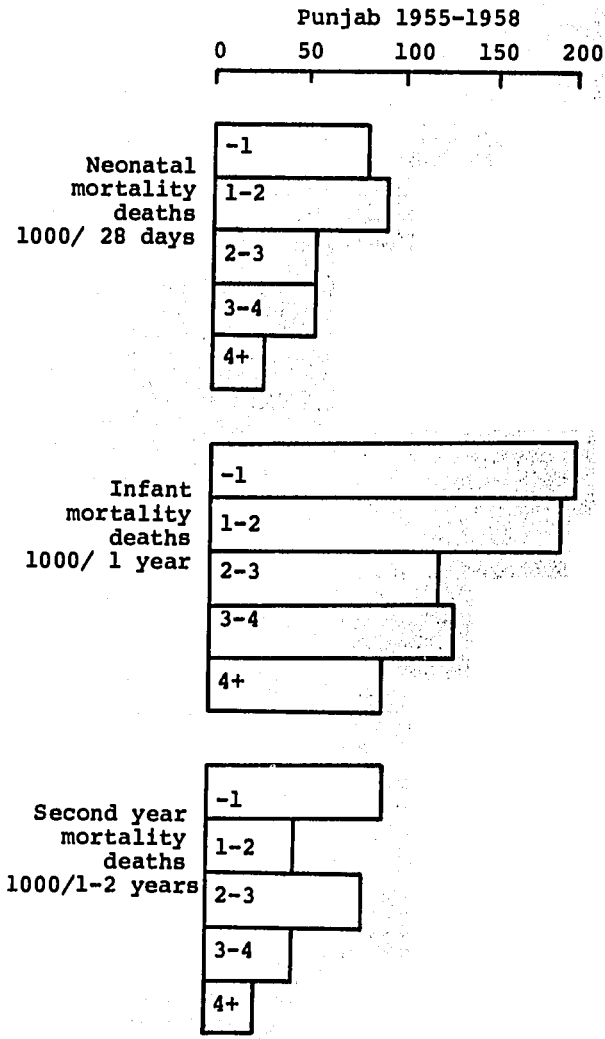
Another long-term effect is in the small parcel of land that is inherited by each of the siblings. The individual plot is often too small to provide sustenance, meaning either another generation of nutritionally deprived children or migration to the city.

Family size is also related to the rate of infection experienced in a household. The more congested the living quarters, the greater the chance for the spread of infection. Further, in areas without readily accessible water, each additional family member means that there will be a smaller amount per capita for the family. This, as discussed in the section on water-based infections, increases the risk of diarrheal diseases. The amount of water used by a family is rather inelastic. Rather than hauling enough water so that each member of the household has a sufficient amount, the family fits its needs to the amount of water transported from the water shource. The quantity is limited by the capacity of the containers and the haulers and by the daily work routines.

B. Birth Spacing

When the interval between births is short, there can be serious effects on the nutrition and health status of not only the new arrival but also its next-older sibling. Mortality rates for those born within less than two years after the last living child are considerably higher than those with longer intervals (Figure 3).

Figure 3
Mortality Rates According to Birth Intervals in Years
(Punjab, 1955-1958)



Source: Wray 1971.

The incidence of malnutrition and morbidity also increases as the birth interval decreases. The West African word "kwashiorkor" is interpreted as the "disease of the deposed baby when the next one is born" (Williams 1963). In other words, one child must be weaned early in order to make room for the new infant. Considering the extreme importance of breast-feeding for proper development of children, this can have a significant impact. A Colombian study shows that when birth intervals exceed three years, there is a fairly marked decline in the incidence of malnutrition (Wray and Aguirre 1969). Low birth intervals have also been associated with low birth weight (LBW) and lower intelligence (Morley 1973).

Not only is breast-feeding limited to the "deposed" child but the mother's care is generally more directed to the smaller child. Morley calculates that an African mother gives approximately one sixth of her "mothering time" to each of her children under five and the rest to the newborn child. With a birth interval of 17.25 months as in Latin America, the mother may have up to four children under five and consequently have little time, especially for the child who is in the midst of the most critical growth and infection period from 12 to 30 months (Morley 1973).

C. Maternal and Child Nutritional Status

Having discussed the impat of family size and spacing in nutrition, we must also consider the effect of nutritional status of the children and the community on family size. Intuitively one would think that improving the nutritional status of the mothers and children would increase population pressures and therefore be counter to the widely held objective of limiting population growth.

It has been noted that the average age of menarche is delayed among malnourished women (Frisch 1975). In India the onset of menarche in women from high-income families was found to occur at 13.2 years, compared to 14.6 years in lower-income families (Gopalan and Naider 1972). Menopause occurs earlier in malnourished women (Wyon and Gordon 1971; Berggren, Murthy, and Williams 1974). The combined effect of malnutrition is to decrease the child-bearing age by as much as five years. Further, maternal nutritional history, closely related to family size, is an important determinant of prepregnancy weight (Frisch 1975), which in turn influences birth weights of infants, as discussed previously.

It is well known that the high birth rates in developing countries are often the result of the desire for a surviving male heir. Considering the sex ratio and the high under-five mortality rates, a computer simulation estimated that a couple in India must bear 6.3 children to have a good chance of one son being alive to provide for his father when he reaches 65 years of age. This corresponds very closely to the actual Indian birth rate per couple of 6.5 (May and Heer 1968).

Improving the nutrition and health status of the under-five group by means of an integrated program can decrease the mortality rate and, according to the "child survival hypothesis" (Taylor, Newman and Narinda 1975; Wray 1971), will reduce the parents' need and/or desire for a large number of children.

This basic argument has been extended in what can be referred to as the holistic development approach to achieve reduced fertility (Kocher 1973; Rich 1973; Repetto 1974). Sri Lanka and the South Indian state of Kerala are used as examples of how equitable development policies, including accessible and appropriate health and nutrition programs, can result in lower birth rates despite low per capita incomes (Gwatkin 1978; Ratcliffe 1978).

APPENDIX A FOOTNOTE

[1]Early stages of eye deterioration associated with avitaminosis A are characterized by conjunctival zerosis-dryness, loss of transparency, thickening, wrinkling, and pigmentation and by the deterioration of dark adaptation. Conjunctival zerosis is often accompanied by the formation of Bitot's spots on the conjunctiva - small patches with silvery-gray hue and a foamy surface raised above the general level of conjunctiva (McLaren 1962). Conjunctival zerosis and Bitot's spots do not necessarily indicate avitaminosis A, however. In later stages of eye deterioration caused by avitaminosis A, corneal ulceration with zerosis occurs and finally keratomalacia, a very rapid softening of the cornea leading to deformation or destruction of the eyeball. In young infants the eye deterioration progresses very rapidly, and zerosis of the cornea may occur before the conjunctiva is affected (McLaren 1962).

APPENDIX B

STUDY DESIGN

The basic design used in the study represents a case study-like approach, as opposed to experimentation or quasi-experimentation. No hypotheses were set forth. No control groups were used. No attempt was made to "engineer" ways in which the growth chart was used or how and what nutrition education was carried out. Rather, the main thrust of the study was to evaluate the impact of the growth chart usage as it occurred naturally. Examples of constraints which underly this choice of design include: any engineering of the manner in which the growth chart is used would be too costly and disruptive of program activities; monitoring to insure compliance with special instructions for use of the growth chart would not be feasible with resources available to the study; the very nature of the preschool clinic setting precludes random assignment of treatment among participants, etc. It was, of course, recognized from the outset that the choice of a case study-like design implies that distinctions among different growth chart uses cannot be as clear and efficient for evaluation purposes as they might have been if engineering of usage and random assignment of cases were feasible.

SAMPLE SIZE AND SELECTION PROCESSES

The basic design prescribed up to ten program elements (clinics, centers, etc.) in each of the two countries, for a total of twenty program elements; and, up to 200 mother/child combinations at each of the twenty sites, for a total of up to 4,000 mother/child combinations. Selection of the program elements to be included in the study was made jointly by the in-country teams and the Synectics project staff, from a comprehensive and annotated roster of available program elements.

- provision of health services for preschool children, especially those under high nutritional risk;
- potential for finding variability in growth chart usage;
- reasonable prospects for nutrition/health education for the mothers;
- a participant population equal to or greater than 200 mother/child combinations;
- inclusion of the full age range from birth to 60 months of age;
- field conditions which would permit reasonable access for purposes of selection and training of workers and for periodic monitoring of field data collection activities;

- availability of competent part-time personnel for recording of data;
- judged stability of the program element in terms of staffing and participant population;
- willingness and interest of sponsoring agencies to permit the program element to participate in the study.

In addition, the selection of program elements sought to provide reasonable representation of the variety of sponsor types and of the geographic and cultural differences within the countries.

An attempt was made to somewhat randomize the selection of the mothers to be included in the study. Tools and instructions were provided the field workers. For example, if there were 400 participants on the roster, the sample could include every other mother as they arrived at the clinic, and numbers could be assigned for follow-up identification. Implementation of this method of selection could not be monitored by the study team. Limited observation of the process and of conditions under which the interviewers worked lead us to conclude that the planned selection procedures were not followed in any consistent fashion. The crush of activities and the numbers of persons involved on clinic days are simply too great and the program personnel resources too few. We suspect that the selection process frequently amounted to taking the next person in line when an interviewer completed an interview and could begin another (Pielemeier 1978).

TABLE 31

DEFINITION OF VARIABLES IN ANALYSIS*

AGE	
a. AGECV1	age in months at first clinic visit
b. SELAGE	age in months at which final weight (SELWT) was taken
BIRTHINT	0 = sibling younger than index child and/or 3+ siblings between 1 to 5 years, 1 = no sibling younger than index child and only 1 or 2 children between 1 to 5
BIRTHORD	birth order
Breast-feeding yesterday	1 = complete 2 = partial 3 = not at all
Family Size	
a. Children	No.
b. Children < 1 year	No.
c. Children 1-5 years	No.
d. Adults	No.
FOOD	total of food received where sorghum flour or oil = 1, WSB = 1.5, and milk powder = 2
Housing	
a. Home ownership	1 = owned 2 = owned by family or triba 3 = rented 4 = tenant farmer
b. Electrical appliances and cooking facilities	1 = none 2 = electricity 3 = separate kitchen 4 = 2 + 3 5 = working radio (+ previous) 6 = refrigerator (+ any previous) 7 = 5 + 6

* Variables printed in regression analysis are in CAPS.

TABLE 31 (continued)

Housing (cont.)	
c. Flooring	1 = mud 2 = cement, wood
d. Roof structure	1 = mud, thatch 2 = metal (CI) 3 = tile, shingle, tar paper, cement
e. Wall structure	1 = mud 2 = brick or wood 3 = stone or cement
IMMUN	= total number of immunizations of DPT + BCG
Land ownership	1 = none 2 = small garden 3 = large garden 4 = small farm 5 = large farm
Morbidity-mortality	
a. Children died	No.
b. ILLNESS	0 = child has not been severely ill during any preceding six-month period, 1 = child has been severely ill during one six-month period prior to interview, 2 = child has been severely ill during two six-month periods prior to interview, 3 = child has been severely ill during three six-month periods prior to interview
Mother	
a. MOMAGE	years
b. Mother's education	1 = none 2 = 2+ literacy in local language 3 = 3-5 years 4 = 6-8 years 5 = 3+ years
c. MOMHT	Cm.
d. MOMWT	.1 Kg.
e. Mother's diet	1 = very poor-poor 2 = adequate 3 = good 4 = excellent
f. Mother's marital status	0 = married 1 = all other

TABLE 31 (continued)

Nutrition Education Indicators	
a. DLIQ (If your child had diarrhea, are there any special foods or liquids you would recommend or avoid?)	0 = does not recommend fluids 1 = mentions fluids
b. PROTSUP (Are there any foods you think are especially good for helping a very young child (toddler) grow?)	0 = did not mention protein 1 = mentioned at least one high quality protein source
Occupation (father's and mother's separately - same code)	1 = unemployed 2 = farm 3 = traditional crafts + food processing 4 = 2 + 3 5 = seamstress 6 = 2 + 5 7 = 3 + 5 8 = clerical 9 = 2 + 8 10 = 3 + 8 11 = professional + any combination (collapsed to: 0 = traditional sector 1 = modern sector)
Participation	
a. Length of participation	= longest possible length of participation from date of first clinic visit to the end of data collection = VAR 542 - VAR501 + 12
b. PROPPART	= proportion of participation = # of attendances during the data collection period based on recording of age at each clinic visit/12

TABLE 31 (continued)

SEWAGE	1 = indiscriminate disposal 2 = pit latrine 3 = waterseal or indoor plumbing
SEX	0 = F 1 = M
STAFFTOP	= patient to staff ratio (staff to patient ratio in Tables 14 and 15, reversed in subsequent tables)
Travel time to clinic	Minutes
Urbanization	0 = rural homesteads + village 1 = urban + suburban
WATER	1 = river 2 = well 3 = pump or piped water
Weight	
a. Birth weight	0.1 Kg.
b. WTAGECV1	= weight for age at first clinic visit (when the child/infant was first brought to clinic first month of data collection; using Harvard standards for males and females, ages 0 - 29 months). Uses variables 497, 501 and 502.
c. SELWT	% weight for age (NCHS standards) at last weighing
Weight Chart	
a. CHWTK	= knowledge of own child's weight 1 = correctly identified own child's weight both now and last month 0 = incorrect on one or both readings
b. GRCHK	= growth chart knowledge, at round 1 (because of reduction in sample size, subsequent rounds were not included) 1 = correctly read both growth charts 0 = incorrect reading of one or both charts
c. WEIGHTK	= CHWTK + GRCHK

TABLE 32

DETERMINANTS OF WEIGHT FOR AGE AT FIRST CLINIC VISIT
FOR INFANTS ENROLLING BY AGE FOUR MONTHS

Multiple R	0.43	Analysis of Variance	DF	Sum of Squares	Mean Square	F
R Square	0.18	Regression	6.	6136.36	1022.73	4.83
Adjusted R Square	0.15	Residual	128.	27129.26	211.95	
Standard Error	14.56					

Summary Table

Variable	Multiple R	R Square	RSQ Change	Simple R	B	Beta	Std. Error B	F	Sig.
SEWAGE	0.29	0.08	0.084	0.29	5.91	0.26	1.90	9.66	0.000
BIRTHINT	0.36	0.13	0.043	-0.20	-8.12	-0.25	2.85	8.09	0.000
MOMHT	0.39	0.15	0.021	0.13	0.17	0.15	0.09	3.50	0.005
WATER	0.41	0.16	0.016	0.20	2.72	0.15	1.50	3.28	0.005
MOMAGE	0.41	0.17	0.004	0.06	-0.40	-0.21	0.24	2.80	0.025
BIRTHORD	0.43	0.18	0.015	0.13	0.40	0.18	0.26	2.42	0.05
Constant					68.42				

TABLE 33

DETERMINANTS OF OUTCOME WEIGHT FOR AGE OF ALL INFANTS CONSIDERING CLINIC VARIABLES ONLY

Multiple R	0.48	Analysis of Variance	DF	Sum of Squares	Mean Square	F
R Square	0.23	Regression	10.	6718.75	671.88	6.19
Adjusted R Square	0.19	Residual	208.	22588.06	108.60	
Standard Error	10.42					

Summary Table

Variable	Multiple R	R Square	RSQ Change	Simple R	B	Beta	Std. Error B	F	Sig.
STAFFTOP	0.24	0.06	0.056	0.24	1797.55	0.22	659.56	7.43	0.000
PROTSUP	0.32	0.10	0.048	0.21	5.17	0.20	1.58	10.74	0.000
IMMUN	0.37	0.14	0.036	0.10	1.16	0.19	0.40	8.22	0.000
ILLNESS	0.40	0.16	0.025	-0.17	-2.43	-0.17	0.91	7.10	0.000
WATER	0.43	0.19	0.023	0.23	2.28	0.17	0.91	6.25	0.000
BIRTHINT	0.45	0.20	0.013	0.15	2.38	0.10	1.46	2.65	0.01
DLIQ	0.46	0.21	0.011	0.01	2.55	0.11	1.57	2.66	0.01
AGECV1	0.47	0.22	0.009	0.06	0.33	0.11	0.19	3.12	0.005
PROPPART	0.47	0.22	0.006	0.16	0.035	0.08	0.03	1.63	0.1
SEWAGE	0.48	0.23	0.005	0.18	1.25	0.07	1.11	1.25	NS
Constant					65.36				

TABLE 34

DETERMINANTS OF OUTCOME WEIGHT FOR AGE OF AKAN INFANTS CONSIDERING CLINIC VARIABLES ONLY

Multiple R	0.54	Analysis of Variance	DF	Sum of Squares	Mean Square	F
R Square	0.29	Regression	11.	4806.87	436.99	4.14
Adjusted R Square	0.22	Residual	109.	11506.75	105.57	
Standard Error	10.27					

	Multiple R	R Square	RSQ Change	Simple R	B	Beta	Std. Error B	F	Sig.
WATER	0.28	0.08	0.077	0.28	2.46	0.18	1.30	3.60	0.001
PROTSUP	0.35	0.12	0.042	0.19	6.63	0.25	2.15	9.48	0.000
BIRTHINT	0.40	0.16	0.043	0.20	4.05	0.17	1.96	4.26	0.000
ILLNESS	0.44	0.20	0.033	-0.20	-2.87	-0.20	1.18	5.90	0.000
STAFFTOP	0.47	0.22	0.021	0.25	2076.02	0.27	829.84	6.26	0.000
DLIQ	0.49	0.24	0.019	-0.02	3.34	0.14	2.20	2.31	0.025
AGECV1	0.50	0.25	0.019	0.14	0.56	0.17	0.28	4.13	0.000
WEIGHTK	0.52	0.27	0.014	0.07	2.42	0.13	1.73	1.96	0.05
DEMUN	0.53	0.28	0.010	-0.03	0.69	0.11	0.58	1.40	NS
SEWAGE	0.54	0.29	0.009	0.24	2.25	0.12	1.69	1.76	0.1
FOOD	0.54	0.29	0.007	0.07	-0.13	-0.09	0.12	1.08	NS
Constant					61.72				

TABLE 35

DETERMINANTS OF OUTCOME WEIGHT FOR AGE OF ALL INFANTS
USING BOTH CLINIC AND NONCLINIC VARIABLES

Multiple R	0.54	Analysis of Variance	DF	Sum of Squares	Mean Square	F
R Square	0.30	Regression	10.	7085.24	708.52	7.07
Adjusted R Square	0.25	Residual	168.	16844.18	100.26	
Standard Error	10.01					

Summary Table

Variable	Multiple R	R Square	RSQ Change	Simple R	B	Beta	Std. Error B	F	Sig.
PROTSUP	0.21	0.04	0.042	0.21	4.51	0.18	1.69	7.10	0.000
DLIQ	0.21	0.04	0.000	0.01	2.47	0.11	1.68	2.15	0.025
BIRTHINT	0.25	0.06	0.022	0.15	3.94	0.17	1.55	6.46	0.000
ILLNESS	0.30	0.09	0.024	-0.17	-1.78	-0.12	0.96	3.43	0.001
STAFFTOP	0.39	0.15	0.065	-0.23	-.0088	-0.12	0.01	1.98	0.05
WATER	0.41	0.17	0.015	0.23	1.55	0.12	1.04	2.23	0.025
WTAGECV1	0.50	0.25	0.079	0.33	0.21	0.27	0.05	15.95	0.000
MOMHT	0.51	0.26	0.016	0.20	.075	0.10	0.05	2.07	0.05
MOMWT	0.54	0.29	0.026	0.25	.021	0.17	0.01	6.17	0.000
AGECV1	0.54	0.30	0.008	0.06	0.28	0.09	0.20	1.97	0.05
Constant				40.44					

DETERMINANTS OF OUTCOME WEIGHT FOR AGE OF AKAN INFANTS USING BOTH CLINIC AND NONCLINIC VARIABLES

Multiple	0.70	Analysis of Variance	DF	Sum of Squares	Mean Square	F
R Square	0.49	Regression	12.	7066.16	588.85	7.48
Adjusted R Square	0.42	Residual	95.	7480.15	78.74	
Standard Error	8.87					

Variable Summary Table

	Multiple R	R Square	RSQ Change	Simple R	B	Beta	Std. Error B	F	Sig.
PROTSUP	0.19	0.04	0.037	0.19	5.08	0.19	2.01	6.38	0.000
WEIGHTK	0.20	0.04	0.003	0.07	2.46	0.13	1.57	2.45	0.01
BIRTHINT	0.29	0.08	0.043	0.20	4.74	0.20	1.85	6.59	0.000
ILLNESS	0.35	0.13	0.042	-0.20	-2.52	-0.18	1.10	5.29	0.000
STAFFTOP	0.44	0.19	0.069	-0.24	-.016	-0.22	0.01	6.39	0.000
SEWAGE	0.46	0.21	0.017	0.24	2.59	0.14	1.54	2.84	0.005
WTAGECV1	0.56	0.32	0.103	0.40	0.21	0.26	0.07	20.59	0.000
MOMHT	0.60	0.36	0.044	0.26	0.25	0.17	0.12	3.98	0.001
MOMWT	0.62	0.38	0.023	0.26	-.033	0.22	0.01	6.96	0.000
MOMAGE	0.62	0.38	0.000	0.01	-0.96	-0.54	0.28	11.30	0.000
BIRTHORD	0.67	0.45	0.065	0.08	2.86	0.59	0.79	12.93	0.000
AGECV1	0.70	0.49	0.038	0.14	0.68	0.20	0.26	6.99	0.000
Constant									

TABLE 37

CROSSTABULATIONS OF CHILDREN OF DIFFERENT NUTRITIONAL STATUS AT FIRST CLINIC VISIT BY WHETHER THEY IMPROVED (CHANGE = 1) OR DETERIORATED (CHANGE = 0) OVER TIME, ENTIRE GHANAIAN SAMPLE*

CHANGE	FIRSTWT 0	1	2	ROW TOTAL
0	13	59	59	131
	9.9	45.0	45.0	66.8
	30.2	64.8	95.2	
	6.6	30.1	30.1	
1	30	32	3	65
	46.2	49.2	4.6	33.2
	69.8	35.2	4.8	
	15.3	16.3	1.5	
COLUMN TOTAL	43	91	62	196
	21.9	46.4	31.6	100.0

RAW CHI SQUARE = 48.59865 WITH 2 DEGREES OF FREEDOM.
CRAMER'S V = 0.49795
CONTINGENCY COEFFICIENT = 0.44574

NUMBER OF MISSING OBSERVATIONS = 68 SIGNIFICANCE = 0.0000

Firstwt: 0 = < 80% wt/age at first clinic visit
1 = 80-100% " " " " "
2 = > 100% " " " " "

CHANGE	FSTWT 0	1	ROW TOTAL
0	41	90	131
	31.3	68.7	66.8
	44.1	87.4	
	20.9	45.9	
1	52	13	65
	80.0	20.0	33.2
	55.9	12.6	
	26.5	6.6	
COLUMN TOTAL	93	103	196
	47.4	52.6	100.0

CORRECTED CHI SQUARE = 39.39549 WITH 1 DEGREE OF FREEDOM.
PHI = 0.45918
CONTINGENCY COEFFICIENT = 0.41729

NUMBER OF MISSING OBSERVATIONS = 68 SIGNIFICANCE = 0.0000

Fstwt: 0 = < 90% wt/age at first clinic visit
1 = ≥ 90% " " " " "

* Sample size is reduced by missing values for weight for age at first clinic visit.

ITEMIZED COSTS* OF THE GHANA PRESCHOOL CLINICS

Data Category	Highest to Lowest Nutritional Status Outcome									% of Total by Category & (% of Fixed Cost Total)	Total Ghana Sample all Clinics (S.d.)
	Fijai	Adidome	Koto-babi	Akim Oda	Berekum	Damon-go	Kumasi	Navron-go	Assin Foso		
ANNUAL FIXED COSTS BY CATEGORY											
CAPITAL EQUIPMENT COSTS (REPLACEMENT COSTS / EXPECTED LIFE)											
Buildings (based on rental rates & usage)	72	170	70	140	250	80	250	200	79	18%	146 (75)
Clinic Equipment	30	65	33	45	94	34	414	517	45	17%	142 (86)
Vehicles	—	1820	—	860	860	—	860	430	—	65%	537 (625)
Total Capital Equipment Costs	102	2055	103	1045	1204	114	1524	1147	124	100% (8%)	824 (736)
LABOR COSTS (SALARIES) (FULL-TIME EQUIVALENT)											
Nurses	1585	3310	2416	1980	10542	4328	7654	11926	955	51%	4966 (4078)
Nutritionists (Nutrition Technical Officers)	696	835	418	715	222	458	6409	472	306	12%	1170 (1974)
Family Planning Workers	1095	365	0	0	0	0	0	0	146	2%	178 (365)
Aides	1051	8571	523	5356	4387	391	164	2732	228	27%	2600 (2949)
Other (Drivers, Cleaners)	0	9C3	0	456	1947	1008	1710	1414	135	9%	841 (742)
Cost Adjustment	1063	0	10	0	- 3	-576	-154	- 27	0		
Total Labor Costs	5490	13984	3367	8507	17095	5609	15783	16517	1770	100% (89%)	9757 (6159)

*All costs in U.S. dollars.

TABLE 38 (continued)

DATA CATEGORY	Highest to Lowest Nutritional Status Outcome									% of Total by Category	Total Ghana Sample All Clinics
	Fijai	Adidome	Kotobabi	Akim Oda	Berekum	Damongo	Kumasi	Navrongo	Assin Foso		
ANNUAL FIXED COSTS BY CATEGORY (cont.)										(% of Fixed Cost Total)	(6.d.)
OTHER FIXED COSTS											
Office Supplies	191	146	—	283	830	13	—	—	—	51%	
Fuel (Kerosene, Coal, & Wood)	3	42	10	43	237	—	—	25	—	12%	
Recurrent Maintenance	—	—	—	—	680	—	379	—	—	37%	
Total Other Fixed Costs	194	188	10	326	1747	13	379	25	—	100% (3%)	360 (578)
TOTAL FIXED COSTS	4723	16227	3470	9878	20049	6312	17840	17716	1894	(100%)	10941 (7100)
ANNUAL VARIABLE COSTS BY SERVICE CATEGORY										(% of Variable Cost Total)	
NUTRITION COSTS											
Supplementary Foods											
Powdered Milk	6341	819	8834	7856	10082	4310	17457	31066	4553	33%	10146 (8956)
Wheat Soya Blend	5865	508	3214	4644	12628	3096	16259	16223	2133	23%	7174 (6135)
Sorghum	4999	697	3376	2210	10585	3076	11230	17468	1810	19%	6162 (5635)
Cooking Oil	3806	122	3114	3533	5626	2566	11177	10012	2158	25%	4680 (11454)
Other	210	0	133	242	213	252	94	188	197	<1%	170 (88)
Total Food Costs	21221	2146	18671	18485	39134	13303	56217	74957	10851	100% (91%)	28332 (28312)

TABLE 38 (continued)

DATA CATEGORY	Highest to Lowest Nutritional Status Outcome									% of Total by Category &	Total Ghana Sample All Clinics
	Fijai	Adidome	Kotobabi	Akim Oda	Berekum	Damongo	Kumasi	Navrongo	Assin Foso	(% of Variable Cost Total)	(S.d)
ANNUAL VARIABLE COSTS BY SERVICE CATEGORY (cont.)											
Other Nutrition Costs											
Growth Charts	29	—	22	57	139	25	105	47	12	2%	48 (46)
Food Transport	43	171	735	690	4215	2243	3530	12850	219	87%	2744 (4114)
Travel to Outstations (Petrol, Oil)	88	803	2	393	404	—	931	216	50	11%	321 (334)
Total Other Nutrition Costs	160	974	759	1140	4758	2268	4566	13113	281	100% (9%)	3113 (4203)
Total Nutrition Costs	21381	3120	19430	19625	43892	15571	60783	88070	11132	(99%)	31445 (31669)
PREVENTION COSTS (IMMUNIZATIONS)											
BCG	2	6	—	—	25	—	18	63	1		
DPT	3	18	—	16	64	—	14	11	1		
Polio	17	7	—	—	42	—	28	15	1		
Smallpox	5	—	—	5	46	—	10	32	2		
Measles	3	32	—	5	333	—	43	40	11		
Total Prevention Costs	30	63	—	26	510	—	113	161	16	(<1%)	102
TOTAL ANNUAL VARIABLE COSTS (NUTRITION AND PREVENTION)	21411	3183	19430	19651	44402	15571	60896	88231	11148	(100%)	31547 (31732)

TABLE 38 (continued)

DATA CATEGORY	Highest to Lowest Nutritional Status Outcome									% of Total by Category	Total Ghana Sample All Clinics
	Fijai	Adidome	Kotobabi	Akim Oda	Berekum	Damongo	Kumasi	Navrongo	Assin Foso		
											(S.d.)
COST TOTALS											
Total Annual Variable Costs	21411	3183	19430	19651	44402	15571	60896	88231	11948	76%	31547
Total Annual Fixed Costs	4723	16227	3470	9878	20049	6312	17840	17716	1894	24%	10941
Total Annual Costs (Variable and Fixed)	26134	19410	22900	29529	64451	21883	78736	105947	13842	100%	46047
Annual Costs Without Supplementary Foods (Food and Food Transport)	4913	17164	4229	11039	25317	8580	22519	30990	2141	25%	11459
TOTAL CLINIC INCOME											
Annual Income from Clinic Fees	1223	—	599	1269	5812	926	3329	3147	646		2119

TABLE 38 (Continued)
ITEMIZED COSTS* OF THE LESOTHO PRESCHOOL CLINICS

DATA CATEGORY	Urban			Lowland				Mountain			% of Total by Category	Total Lesotho Sample All Clinics
	Queen Elizabeth Masoeu	Teyate-yaneng	Leribe	Teekhele	St. Paul Butha-Buthe	Mafeteng	St. Rose Peka	Qachas	St. James Mokhotlong	St. James Mantsonyane		
ANNUAL FIXED COSTS BY CATEGORY											6 (% of Fixed Cost Total)	
CAPITAL EQUIPMENT COSTS (REPLACEMENT COST) EXPECTED LIFE												
Buildings	144	278	230	231	269	71	322	173	263	230	33%	210
Clinic Equipment	75	111	125	380	86	15	60	15	50	318	22%	124
Vehicles	0	0	0	0	0	0	0	2600	0	0	45%	—
Total Capital Equipment Costs	219	389	355	611	355	86	382	2788	313	548	100% (14%)	605
LABOR COSTS (SALARIES) (FULL-TIME EQUIVALENT)												
Nurses	2343	2691	1463	2056	1932	1373	1028	2629	1656	1424	55%	1860
Aides	1059	1035	828	1104	1105	552	249	1449	386	834	26%	860
MOH Support Staff	400	50	50	400	50	50	50	200	50	50	4%	135

* All costs in U.S. dollars.

TABLE 38 (continued)

DATA CATEGORY	Urban			Lowland				Mountain			% of Total by Category & (% of Fixed Cost Total)	Total Lesotho Sample All Clinics
	Queen Elizabeth Maseru	Teyateyaneng	Leribe	Tsakholo	St. Paul Butha-Buthe	Moloko	St. Rose Peka	Qutsing	St. James Mokhotlong	St. James Mantsonyane		
ANNUAL FIXED COSTS BY CATEGORY (cont.)												
LABOR COSTS (cont.)												
CRS Support Staff	0	414	414	414	414	414	414	414	414	414	11%	373
Other (Drivers, Gardeners)	0	105	50	207	30	0	0	966	0	0	4%	136
Total Labor Costs	3802	4295	2805	4181	3531	2389	1741	5658	2506	2722	100% (83%)	3363
OTHER FIXED COSTS												
Heat, Water, Electricity & Taxes	50	63	41	10	58	40	58	10	113	345	73%	79
Recurrent Maintenance	100	0	0	58	0	50	0	0	28	58	27%	—
Total Other Fixed Costs	150	63	41	68	58	90	58	10	141	403	100% (3%)	108
TOTAL FIXED COSTS	4171	4747	3201	4860	3944	2565	2181	8456	2960	3673	(100%)	4076

TABLE 38 (continued)

DATA CATEGORY	Urban			Lowland				Mountain			% of Total by Category (% of Variable Cost Total)	Total Lesotho Sample All Clinics
	Queen Elizabeth Maseru	Teyateyaneng	Leribe	Tsakholo	St. Paul Butha-Buthe	Mafeteng	St. Rose Peka	Qachas	St. James Mokhotlong	St. James Mantsonyane		
ANNUAL VARIABLE COSTS BY SERVICE CATEGORY												
NUTRITION COSTS												
Supplementary Foods												
Powdered Milk	0	54344	17824	18977	80172	14504	21433	38177	25513	13670	56%	28460
Corn Soya Milk	0	15831	5175	6688	15655	4272	6167	9153	6050	6933	15%	7442
Bulgur Wheat	0	13051	4142	6058	15523	3284	5214	9251	7092	6970	14%	7059
Cooking Oil	0	9111	3110	6171	14556	4531	6356	15417	7539	7743	15%	7453
Total Food Costs	0	92337	30251	37894	125906	26591	39160	71998	46194	35316	100% (98%)	50414
Other Nutrition Costs												
Growth Charts	40	120	50	90	160	40	75	160	81	35	11%	85
Food Transport	0	1380	83	460	377	200	276	90	477	1000	58%	434
Travel to Outstations	0	414	0	414	0	0	276	690	455	58	31%	231
Total Other Nutrition	40	1914	133	964	537	240	627	940	1013	1093	100% (1%)	750

TABLE 38 (continued)

DATA CATEGORY	Urban			Lowland				Mountain			(% of Variable Cost Total)	Total Lesotho Sample All Clinics
	Queen Elizabeth Maseru	Teyateyaneng	Leribe	Tsakholo	St. Paul Butha-Buthe	Moloka'e	St. Rose Peka	Qacha's Nek	St. James Mokhotlong	St. James Mantsonyane		
ANNUAL VARIABLE COSTS BY SERVICE CATEGORY (cont.)												
Total Nutrition Costs	40	94251	30384	38858	126443	26831	39787	72938	47207	36409	(99.8%)	51164
PREVENTION COSTS (Immunizations)												
BCG	87	1	23	33	3	0	40	0	16	7		
DPT	13	4	5	15	39	0	10	0	5	6		
Polio	28	6	8	3	52	0	29	0	29	5		
Smallpox	40	0	47	36	30	0	7	152	9	0		
Total Prevention Costs	168	11	83	87	124	0	86	152	59	18	(.1%)	79
TOTAL VARIABLE COSTS (NUTRITION & PREVENTION)	208	94262	30467	38945	126567	26831	39873	73090	47266	36427	(100%)	51243

TABLE 38 (continued)

DATA CATEGORY	Urban			Lowland				Mountain			% of Total by Category	Total Lesotho Sample All Clinics
	Queen Elizabeth Maseru	Teyateyaneng	Leribe	Teebhoto	St. Paul Butha-Buthe	Mohokare	St. Rose Peka	Qachas	St. James Mokhotlong	St. James Mantsonyane		
COST TOTALS												
Total Variable Costs	208	94262	30467	38945	126567	26831	39873	73090	47266	36427	93%	51394
Total Fixed Costs	4171	4747	3201	4860	3944	2565	2181	8456	2960	3673	7%	4076
Total Annual Costs	4379	99009	33668	43805	129511	29396	42054	81546	50226	40100	100%	55369
Annual Costs Without Supplementary Foods	4379	6672	3417	5911	3605	2805	2894	9548	4032	4784	8%	(4471)
TOTAL CLINIC INCOME												
Annual Income from Clinic Fees	0	5791	2205	4821	5229	1886	3143	5137	3315	1466		3299

TABLE 39
ANNUAL GHANA COSTS/RECIPIENT VISIT

DATA CATEGORY	Highest to Lowest Nutritional Status Outcome									# clinics applicable	Total Ghana Sample All Clinics
	Fijai	Adidome	Kotobabi	Akim Oda	Eerakum	Damongo	Kumasi	Navrongo	Asuo Fomo		
VARIABLE COSTS/RECIPIENT VISIT											
Nutrition											
Supplementary Foods	2.71	.19	3.04	1.51	1.05	1.94	2.16	2.07	2.14	9	1.72
Other Nutrition Costs	.02	.06	.12	.09	.13	.29	.12	.36	.04	9	.17
Prevention (Immunizations)	.004	.004	0	.002	.014	0	.003	.004	.003	9	.006
TOTAL VARIABLE COSTS/RECIPIENT VISIT	2.73	.25	3.16	1.61	1.19	2.24	2.28	2.44	2.18	9	1.89
FIXED COSTS/RECIPIENT VISIT											
Capital Equipment	.01	.14	.02	.09	.03	.02	.04	.03	.02	9	.04
Labor	.56	.96	.52	.70	.46	.80	.42	.46	.29	9	.53
Other Fixed Costs	.02	.01	.002	.03	.05	.002	.01	.001	0	9	.02
TOTAL FIXED COSTS/RECIPIENT VISIT	.60	1.12	.53	.81	.54	.82	.47	.49	.31	9	.59
TOTAL ANNUAL COSTS/RECIPIENT VISIT	3.33	1.37	3.70	2.41	1.73	3.06	2.74	2.93	2.49	9	2.48
ANNUAL COSTS/RECIPIENT VISIT WITHOUT SUPPLEMENTARY FOODS	.63	1.18	.66	.90	.68	1.11	.59	.86	.35	9	.78

TABLE 40

ANNUAL GHANA COSTS/RECIPIENT

DATA CATEGORY	Highest to Lowest Nutritional Status Outcome										Total Ghana Sample All Clinics
	Fijai	Adidome	Kotobabi	Akim Oda	Berekum	Damongo	Kumasi	Navrongo	Asain Fesu		
VARIABLE COSTS/RECIPIENT											
Nutrition											
Supplementary Foods	24.39	1.71	27.36	13.59	9.45	17.46	19.44	18.63	19.26		15.48
Other Nutrition Costs	.18	.54	1.08	.81	1.20	2.61	1.08	3.24	.36		1.53
Prevention (Immunizations)	.036	.036	0	.018	.13	0	.027	.036	.027		.054
TOTAL VARIABLE COSTS/RECIPIENT	24.57	2.25	28.44	14.49	10.71	20.16	20.52	21.96	19.62		17.01
FIXED COSTS/RECIPIENT											
Capital Equipment	.09	1.26	.18	.81	.27	.18	.36	.27	.18		.36
Labor	5.04	8.64	4.77	6.30	4.14	7.20	3.78	4.14	2.61		4.77
Other Fixed Costs	.18	.09	.02	.27	.45	.02	.09	.01	0		.18
TOTAL FIXED COSTS/RECIPIENT	5.40	10.08	4.77	7.29	4.86	7.38	4.23	4.41	2.79		5.31
TOTAL ANNUAL COSTS/RECIPIENT	29.97	12.33	33.30	21.69	15.57	27.54	24.66	26.37	22.41		22.32
ANNUAL COSTS/RECIPIENT WITHOUT SUPPLEMENTARY FOODS	5.67	10.62	5.94	8.10	6.12	9.99	5.31	7.74	3.15		7.02

ANNUAL LESOTHO COSTS/RECIPIENT VISIT

DATA CATEGORY	Urban			Lowland				Mountain				Total Lesotho Sample All Clinics
	Queen Elizabeth Maseru	Teyate-yaneng	Leribe	Tsakholo	St. Paul Butha-Buthe	Moloka'e	St. Rose Pe'	Qachas	St. James Mokhot-long	St. James Mantsan-yane	# Clinics Applicable	
VARIABLE COSTS/RECIPIENT VISIT												
Nutrition												
Supplementary Foods												
Non-fat Dry Milk	0	2.23	2.46	1.23	3.23	2.28	1.82	1.46	2.00	2.43	10	
CSM	0	.65	.71	.43	.63	.67	.52	.35	.47	1.23	10	
Bulgur Wheat	0	.53	.57	.39	.62	.52	.44	.35	.55	1.23	10	
Cooking Oil	0	.37	.42	.40	.59	.71	.54	.59	.59	1.37	10	
Total Food Costs/Recipient Visit	0	3.78	4.16	2.45	5.07	4.18	3.32	2.75	3.61	6.26	10	3.59
Other Nutrition Costs/Recipient Visit	.006	.08	.02	.06	.02	.04	.05	.04	.08	.19	10	.05
Prevention (Immunizations)/ Recipient Visit	.03	.001	.011	.006	.005	0	.007	.006	.005	.003	10	.01
TOTAL VARIABLE COSTS/RECIPIENT VISIT	.033	3.87	4.20	2.53	5.09	4.22	3.38	2.79	3.70	6.45	10	3.65
FIXED COSTS/RECIPIENT VISIT												
Capital Equipment	.03	.02	.05	.04	.01	.01	.03	.11	.02	.10	10	.043
Labor	.60	.18	.38	.27	.14	.38	.15	.21	.20	.48	10	.24
Other Fixed Costs	.02	.003	.006	.004	.002	.014	.005	.0004	.01	.07	10	.008
TOTAL FIXED COSTS/RECIPIENT VISIT	.66	.20	.44	.32	.16	.40	.19	.32	.23	.65	10	.29
TOTAL ANNUAL COSTS/RECIPIENT VISIT	.69	4.07	4.64	2.85	5.25	4.62	3.57	3.11	3.93	7.10	10	3.93
TOTAL COSTS WITHOUT SUPPLEMENTARY FOODS/RECIPIENT VISIT	.69	.27	.47	.38	.15	.44	.25	.36	.32	.85	10	.34

TABLE 42

ANNUAL LESOTHO COSTS/RECIPIENT

DATA CATEGORY	Urban			Lowland				Mountain				Total Lesotho Sample All Clinics
	Queen Elizabeth Maseru	Teyateyaneng	Leribe	Teekhoi	St. Paul Butha-Buthe	Mohales	St. Rose Peka	Qachas	St. James Mokhotlong	St. James Mantsonyane	# Clinics Applicable	
VARIABLE COSTS/RECIPIENT												
Nutrition												
Supplementary Foods	0	34.02	37.44	22.05	45.63	37.62	29.88	24.75	32.49	56.34	10	32.31
Other Nutrition Costs	.054	.72	.18	.54	.18	.36	.45	.36	.72	1.71	10	.45
Prevention (Immunizations)	.27	.01	.1	.054	.045	0	.063	.054	.045	.018	10	.09
TOTAL VARIABLE COSTS/RECIPIENT	.3	34.83	37.80	22.77	45.81	37.98	30.42	25.11	33.30	58.05	10	32.85
FIXED COSTS/RECIPIENT												
Capital Equipment	.27	.18	.45	.36	.09	.09	.27	.99	.18	.9	10	.39
Labor	5.40	1.62	3.42	2.43	1.26	3.42	1.35	1.89	1.80	4.32	10	2.16
Other Fixed Costs	.18	.027	.054	.036	.018	.126	.045	.0036	.09	.63	10	.072
TOTAL FIXED COSTS/RECIPIENT	5.94	1.80	3.96	2.88	1.44	3.60	1.71	2.88	2.07	5.85	10	2.61
TOTAL COSTS/RECIPIENT	6.21	36.63	41.75	25.65	47.25	41.58	32.13	27.99	35.37	63.90	10	35.37
TOTAL COSTS/RECIPIENT WITHOUT SUPPLEMENTARY FOODS	6.21	2.43	4.23	3.42	1.35	3.96	2.25	3.24	2.88	7.65	10	3.06

TABLE 43

PERCENT OF TOTAL COSTS PER RECIPIENT BY CATEGORY (GHANA)

DATA CATEGORY	Highest to Lowest Nutritional Status Outcome									# clinics applic-ablc	Total Ghana Sample All Clinics
	Fijai	Adidome	Kotobabi	Akim Oda	Berekum	Damon-go	Kumasi	Navron-go	Asain Foso		
VARIABLE COSTS/RECIPIENT											
Nutrition											
Supplementary Foods	81%	14%	82%	63%	61%	63%	79%	71%	86%	9	67%
Other Nutrition Costs	.6%	4%	3%	4%	8%	9%	4%	12%	2%	9	5%
Prevention (Immunizations)	.1%	.3%	0	.1%	1%	0	.1%	.2%	.1%	9	.2%
TOTAL VARIABLE COSTS/RECIPIENT	82%	18%	85%	67%	70%	72%	83%	83%	88%	9	72%
FIXED COSTS/RECIPIENT											
Capital Equipment	.3%	10%	.5%	4%	2%	1%	1%	1%	1%	9	2%
Labor	17%	70%	14%	29%	27%	26%	15%	16%	12%	9	25%
Other Fixed Costs	.6%	1%	.1%	1%	3%	.1%	.4%	.04%	0	9	.6%
TOTAL FIXED COSTS/RECIPIENT	18%	81%	15%	34%	32%	27%	17%	17%	13%	9	28%
TOTAL ANNUAL COSTS	100%	99%	100%	101%	102%	99%	100%	100%	101%	9	100%

TABLE 44

PERCENT OF TOTAL COSTS PER RECIPIENT BY CATEGORY (LESOTHO)

DATA CATEGORY	Urban			Lowland				Mountain				Total Lesotho Sample All Clinics
	Queen Elizabeth Maseru	Teyateyaneng	Leribe	Tsakholo	St. Paul Butha-Buthe	Moloko	St. Rose Peka	Qutsing	St. James Michaelong	St. James Mantauleng	Clinics Applicable	
VARIABLE COSTS/RECIPIENT												
Nutrition												
Supplementary Foods	0	93%	90%	86%	97%	90%	93%	88%	92%	88%	10	82%
Other Nutrition Costs	.9%	2%	.4%	2%	.4%	.9%	1.4%	1.3%	2%	3%	10	1.4%
Prevention (Immunizations)	4%	.02%	.2%	.2%	.1%	0	.2%	.2%	.1%	.04%	10	.5%
TOTAL VARIABLE COSTS	5%	95%	91%	89%	97%	91%	95%	90%	94%	91%	10	84%
FIXED COSTS/RECIPIENT												
Capital Equipment	4%	.5%	1%	1%	.2%	.2%	.8%	3.5%	.5%	1.4%	10	1.3%
Labor	87%	4%	8%	9%	3%	8%	4%	7%	5%	7%	10	14.2%
Other Fixed Costs	3%	.07%	.1%	.1%	.04%	.3%	.1%	.01%	.3%	1%	10	.5%
TOTAL FIXED COSTS	95%	5%	9%	11%	3%	9%	5%	10%	6%	9%	10	16%
TOTAL ANNUAL COSTS	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	10	100%

APPENDIX C

A. Face of chart

Name .....

Birth weight ..... kg

REASONS FOR SPECIAL CARE

.....

.....

.....

Mother
Child special care
Father

WEIGHT

1st YEAR

KILOGRAMS

2nd YEAR

3rd YEAR

4th YEAR

5th YEAR

AGE IN MONTHS

B. Reverse of chart

APPOINTMENTS

GROWTH CHART

Health centre	Child's No.
Child's name	
Date first met	Birthday
Mother's name	Registration No.
Father's name	Registration No.
Where the family lives (address)	

BROTHERS AND SISTERS

Year/birth	Boy/Girl	Remarks	Year/birth	Boy/Girl	Remarks

IMMUNIZATIONS

ANTI-TUBERCULOSIS (BCG) Date of immunization	SMALLPOX Date of immunization ..... Date of scar inspection ..... Date of reimmunization .....
WHOOPING COUGH, TETANUS AND DIPHTHERIA Date of first injection ..... Date of second injection ..... Date of third injection	POLIOMYELITIS Date of first immunization ..... Date of second immunization ..... Date of third immunization .....
MEASLES Date of immunization	

LESOTHO GROWTH CHART STUDY - ADDITIONAL COST INFORMATION

Summary Information on Program, Coverage, Deliveries, and Cost

A. Program Identification Information:

1. Type of Facility (e.g., Pre-school Clinic): _____
2. Name and Address of Facility: _____

   _____
3. Name of Manager/Director: _____
4. Types of Services provided (tick):

   ( ) general health/curative
   ( ) preventative health
   ( ) child recuperative (rehabilitation)
   ( ) nutrition education
   ( ) child spacing/ family planning
   ( ) sewing and crafts
   ( ) cooking demonstration
   ( ) hygiene education
   ( ) food distribution
   ( ) clinic gardens
   ( ) community development
   ( ) other: _____
   ( ) other: _____
   ( ) other: _____

B. Program Coverage and Deliveries (for nutrition-related services only)

1. Commodities and Services Provided:

	check if applicable	Amounts delivered per year (19__)* (indicate units used)	Nutritional Composition of Supplementary Foods
Supplementary food			
Powdered Milk	( )	_____	_____
CSM	( )	_____	_____
Bulgur Wheat	( )	_____	_____
Cooking Oil	( )	_____	_____
Other _____	( )	_____	_____
Nutrition Education: direct contact	( )	_____	_____
Mass media	( )	_____	
Health Services/Curative	( )	_____	

*If less than a full year, indicate.

2. Intended Beneficiaries:

	Check if applicable	Estimated Number in area surrounding clinic	Number served by clinic per year
Pre-school children ages 0 to 5 years	( )	_____	_____
Pregnant women	( )	_____	_____
Lactating women	( )	_____	_____
Mothers	( )	_____	_____
Other: _____	( )	_____	_____

3. Effectiveness of Delivery to Intended Beneficiaries (including foods, medicines, vaccines, weight charts, services, etc.)

	Check if applicable	Estimated % of program commodities or services affected
Shipping and handling losses (before storage in Lesotho)	( )	_____
Pilferage losses in country	( )	_____
Storage losses in country	( )	_____
Consumption by others (not by intended beneficiaries)	( )	_____
Malabsorbed because of poor health	( )	_____

C. **Program Costs**
(refers to costs of operating entire health facility & program)

Note: Costs are in Rands; US $1 = R0.87

1. Capital Equipment*	Type	Number Owned	No. currently in operation		How Obtained:		Original Cost	Current Cost	Import** Content %	
			No.	Expected Life(yrs)	Purchased	Donated			RSA	Foreign
Buildings										
Machinery and Equipment										
Vehicles										
Inventories and Supplies										

*Depreciation on capital equipment will not be included in annual operating cost, nor will rents or leasing fees.

**Estimated percent of delivered cost is represented by imports (from the Republic of South Africa and from foreign countries, i.e., outside of Southern Africa).

2. Other nonrecurrent costs (Total = _____)

3. Annual Operating costs (Total = _____)

a. Commodities (foods)

	Type	Donated	Where Obtained Imported Locally	Amount used per year	Cost per unit (CIF)	Clinic Cost per Unit	Import Content %*
Powdered milk							
CSM							
Bulgur Wheat							
Cooking Oil							
Other -							
Medicines							
Vaccines							
Medical Supplies							
Other							

* For imported items, estimate landed cost (CIF price) as % of delivered cost; for domestically produced items, estimate imported inputs as % of total cost.

3.b. Labor Services (Total _____)

Job Title	Qualifications required: Yrs of general education	Qualifications required: Professional ed. or special training yrs. & months	Number employed: Paid	Number employed: Voluntary	Average wage or salary	Total payments per year: Salary	Total payments per year: Other financial benefits	Total payments per year: Benefits in kind
doctor								
staff nurse								
S/N								
family planning worker								
public health nurse								
aides								
nutritionist								
MOH support staff								
CRS support staff								
driver								
maintenance staff								
custodial staff								
village health worker								
other								

3.c. Other Operating Costs (Total = _____)

	Total Cost per Year
Office Supplies	_____
Growth Charts	_____
Fuel (paraffin, coal & wood)	_____
Power (electricity & generator cost)	_____
Transport (supplies)	_____
Travel (including petrol & oil)	_____
Services purchased from other agencies	_____
_____	_____
_____	_____
_____	_____
_____	_____
Rents & leasing fees	_____
Taxes	_____
Recurrent maintenance costs (i.e. window glass, thatching, painting, water & plumbing repairs, etc.)	_____

D. Program Financing

	Capital and other nonrecurrent costs	Annual operating cost
Total program budget		
Financed by:		
Government		
Mission		
CRS		
International assistance (specify)		
Participant payments		
Annual income from mother's clinic fees		

E. Affiliation or cooperation of clinic with local agencies, church groups, village chiefs, etc. including contributions in-kind.

Name of agency or of influential persons helping clinic	Types of support provided	Estimated yearly financial value to clinic

Estimated Allocation of Time in Preschool Clinic by Health Personnel

Job Title	Nutrition Related %	Non-nutrition related %	Hours per clinic day: Clinic treatment/consultation	Personal Time	Health or nutrition education or Demos	Travel (including to cut-station)	Food distribution	Record-keeping	Hrs/mo. other administrative
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Doctors									
staff nurse									
S/N									
family planning worker									
public health nurse									
aides									
nutritionist									
MOH Support Staff									
driver									
Maintenance staff									
custodial staff									
village health worker									
Other									

APPENDIX E

SURVEY DESIGN (UCLA STUDY)

A valid estimate of the prevalence of malnutrition requires:

1. A well-defined universe.

2. A sample that is statistically reliable and representative of this universe.

3. An objective, quantifiable definition of malnutrition (see "Indices of Malnutrition").

SURVEY UNIVERSE

The universe included the entire population of Lesotho (1.2 million), based on the preliminary results of the 1976 Population Census (Table 46).

The Bureau of Statistics, Maseru, delineates geographic areas within Lesotho as lowlands, foothills, the Orange River Valley, and mountains. These zones have been used in various government studies, such as the 1970 Agricultural Census.

This survey followed the same ecological area delineation, with modifications identical to those developed by Planning Assistance for conducting a food and market survey done in mid-1976. Both surveys were designed in consultation with the Bureau of Statistics, Lesotho. These modifications are outlined in Table 45.

For this survey, the lowlands were divided into two strata, urban and rural. The urban areas consisted primarily of the capital city of Maseru, but included larger towns within districts in the lowlands. Urban areas contain only 6% of the total population of Lesotho; the employment, trade and socioeconomic conditions in these towns are different from the rest of the country. The lowlands are uniformly about 5,000 feet above sea level. Economic and other features of the lowlands depend largely on their proximity to Maseru as well as to the Republic of South Africa. About half of the population of Lesotho is in the urban and rural lowlands.

In this report the term "rural children" are all children surveyed in the mountain, foothill, and rural lowland areas. The term "rural lowland" or simply "lowland" refers to those children in the rural lowland areas.

The foothills lie between the lowlands and the mountains and do not include the valleys within the mountain ranges.

TABLE 45

AREAS DELINEATED WITHIN LESOTHO STUDY

1970 Agricultural Census	1976 Food and Market Survey 1976 National Nutrition Survey
Lowlands	Urban Lowlands Rural Lowlands
Foothills	Foothills
Orange River Valley Mountains	Mountains

TABLE 46

PROVISIONAL POPULATION ESTIMATES - LESOTHO 1976 - ECOLOGICAL AREA

District	Lowlands Urban	Lowlands Rural	Foothills	Mountains	Total
Butha Buthe	2659	51167	43103	6618	103547
	(0.2)*	(4.3)	(3.6)	(0.6)	(8.7)
Leribe	9199	91316	54351	24197	179063
	(0.8)	(7.7)	(4.6)	(2.0)	(15.0)
Berea	7525	79820	50041	620	138006
	(0.6)	(6.7)	(4.2)	(0.05)	(11.6)
Maseru	46121	98064	51487	71424	267096
	(3.9)	(8.2)	(4.3)	(6.0)	(22.4)
Mafeteng	4570	96428	47996		148994
	(0.4)	(8.1)	(4.0)		(12.5)
Mohales Hoek	1948	65667	25625	25387	118627
	(0.2)	(5.5)	(2.1)	(2.1)	(10.0)
Quthing	-	-	-	88941	88941
				(7.5)	(7.5)
Qacha's Nek	-	-	-	75392	75392
				(6.3)	(6.3)
Mokhotlong	-	-	-	72380	72380
				(6.1)	(6.1)
Total	72022	482462	272603	364959	1192046
	(6.0)	(40.5)	(22.9)	(30.6)	(100.0)

*Parentheses indicate percentage of total country population estimate.

The mountains comprise the most remote area of Lesotho, accessible in many parts only by airplane or horse. In this survey the Orange River Valley was included in the mountain group although it has some features similar to the foothills. In general, the geographical differences between the ecological areas could not be clearly defined. For example, some parts of the lowland region have features that resemble the foothills. Moreover, many of the nine political districts of Lesotho include lowland, foothill, and mountain areas.

Special Groups

A group of 296 children up to five years of age were measured in their homes in Upper and Lower Thamae and Moshoeshoe II areas of Maseru town, to serve as a special group. These areas were not part of the Lesotho universe already described. Most of these were children of government workers and were considered to have a reasonable degree of nutrition and health care. They provided a basis of comparison with the rest of Lesotho. Measurements done on the special group children included height or length, weight, arm circumference, and triceps fatfold.

SAMPLING

Selection of Sample Sites

The selection of sites was greatly influenced by time and logistic considerations and the Lesotho government's request to coordinate results of this survey with the food and market survey administered by Planning Assistance (PA). These conditions were presented to the Bureau of Statistics, who designed the sampling method. It was decided to visit the same areas (but not necessarily the same households) to enable linkage of useful information from both surveys. As a result of advice from the Bureau of Statistics, it was determined that this survey would include all 19 enumeration areas selected in the food and market survey. These areas had been selected using a random start and fixed sampling interval within each ecological area.

For this survey, a total of 60 enumeration areas were required. An enumeration area (EA) was a compact geographic area of about 1,000 people for rural areas and 3,500 people in urban areas, as derived from the population census. An EA was the primary sampling unit, and the complete list of EAs for Lesotho was the sampling frame.

To increase the number of EAs from the 19 initially selected to the required 60, two steps were taken. First, a smaller sampling interval than that used in the food and market survey was used within each ecological area. For the urban, lowland, and foothill areas, the sampling interval for this survey was one fourth that of the food and market survey and for the mountains one eighth of the sampling interval (Table 47). In this way a total of 88 EAs were initially selected: the 19 EAs from the food and market survey plus an additional 69 EAs that resulted from

TABLE 47

NUMBER OF ENUMERATION AREAS ACCORDING TO DESCRIPTION AND ECOLOGICAL AREA

Description	Lowlands		Ecological Area		
	Urban	Rural	Foothills	Mountains	Lesotho
Total EAs	21	350	254	397	1020
Food and Market Survey (FMS)	3	10	3	3	19
Fraction of Sampling Interval	1/4	1/4	1/4	1/8	
Initial No. of EAs[1]	12	40	12	24	88
No. EAs automatically selected[2]	3	10	3	3	19
Remainder[3]	9	30	9	21	69
No. Samples from Remainder[4]	7	11	7	16	41
Total Samples[5]	10	21	10	19	60
Total Visited	10	21	10	17*	58

Key:

[1]Obtained by dividing FMS no. by fraction of sampling interval.

[2]The same as the no. of EAs from FMS.

[3]1 minus 2.

[4]Simple random sampling.

[5]2 plus 4.

*Three of these mountain sites were visited later. Their results were subsequently included in this report.

decreasing the sampling interval. Second, from the added 69 EAs a total of 41 were selected by simple random sampling within each ecological area. Thus the total of EAs required comprised those 19 automatically selected from the prior survey together with the 41 from the residual 69 primary sampling units.

The total number of sites selected in each ecological area was determined by having approximately 30 sites from the urban and rural lowlands and 30 from the foothills and mountains. Proportionally more sites were selected from the urban areas to make a large enough sample so that a separate urban description was possible.

Simple random sampling was done so that additional EAs could be selected from the remaining 69 primary sample units if time permitted, particularly in those ecological areas where a larger sample size might be required. Due to time constraints and logistic considerations, it was not possible to determine how many sites could be visited prior to the beginning of the survey.

Sampling Within Each Selected EA

In each selected EA, the Bureau of Statistics enumerated (by village and household) all children under five years of age, using recent data from the Population Census of 1976. These children were grouped in clusters of 15 each and two clusters were randomly selected for each EA visited. This grouping of two clusters in an EA was defined as a survey site. This method was considered by the Bureau superior to a single cluster of 30 children and feasible within each EA. The household heads of residences of the children in the selected clusters were listed.

Teams were instructed to begin at one of the identified households in the cluster and visit as many households on the list as were availabile. The 15 children for each cluster usually came from households in close proximity to each other. The procedure was repeated in the second cluster for the EA for the next 15 children. Thus the total number selected in each EA was 30 children.

Inferences

For cluster sampling, it has been proposed that adequate sampling precision requires a minimum of 30 sample sites, each with 30 children for a total sample size of 900 (22). Based on this requirement, a valid inference is satisfied for a description using the entire Lesotho sample or for the whole country excluding the urban areas.

A list of areas to be described, with the number of sites of 30 children or two clusters of 15 is as follows:

Urban	10 sites
Lowlands	21 sites
Foothills	10 sites
Mountains	14 sites
Lowlands, foothills and mountains	45 sites
Foothills and mountains	24 sites

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