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9. ABSTRACT

This monograph uses two perspectives in planning: sectoral and inter-sectoral. Sectoral planning attempts to use fully resource allocations within a given sector. In sectoral planning decision-makers often work with resources immediately under the control of a sector, for example, agriculture or health. However, this does not mean that all resources for successful project implementation are under the control of sectoral planners. Chapters II and III (Health Status of the Population: Diagnosis of the Situation and Assessment of Resource Adequacy) give two aspects of sectoral planning. The ten considerations outlined in Chapter III all provide estimations of health care resources but describe only those resources within the health sector. Inter-sectoral planning attempts to identify what effect programs in a particular sector will have on other sectors and the impact of cooperation among sectors. Chapters IV (Inter-Sectoral Problem Solving) and V (Assessment of Project Impact: A conceptual Model) both rely on the concept of inter-sectoral planning. In Chapter IV, for example, the point is made that the nutritional status of a population (the health sector) is inlfuenced directly by the crops grown for consumption (the agricultural sector) and the patterns of trade (the economic sector). Effective planning, therefore, requires the coordination of both sectoral and inter-sectoral planning. Delineating distinct spheres of planning is not an attempt to separate entities but to unify them so that plans can be made, evaluated, and restructured according to the criteria.

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SYNCRISIS:

THE DYNAMICS OF HEALTH

An Analytic Series on the Interactions of Health and Socioeconomic Development

III: PERSPECTIVES AND METHODOLOGY

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June, 1972

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PREFACE

The desire for health (sometimes conceived as the absence of suffering), both physical and mental, has been one of the unifying motivations of mankind. In some parts of the world societies have made progress toward reaching this state; most societies, however, carry an immense burden of disease and suffering. Now, more than ever before, health is intimately related to the wealth of the individual and especially of the community. With the greater visibility of the dichotomy between rich and the poor, there is less tolerance for the disparity in opportunity. This means not only opportunity for comfort and well-being, but also for health and freedom from suffering and disability. However, wealth alone cannot buy immunity from sickness and suffering. From this perspective, mankind now chooses to ask of itself questions: questions of the obligation and relationship of men to one another, questions of the impact that one man or one nation has on another, and questions of whether our advancement as a people and as individuals is dependent upon the advancement of others. It is becoming increasingly essential to identify the nature of health and the conditions which promote the development of this state in man.

The technological advancement of mankind seems inevitable; man's storehouse of knowledge may well double or triple within the next thirty-five years. Such rapid advancement obviously presents as many problems as it does solutions--perhaps more. These problems will be made more acute if nations and populations lag in development because of insufficient, inadequate, and/or destructive physical and social environments. If the state of health is defined not only as bodily well-being, but also as mental well-being, then much of the world's population will find itself appallingly unprepared for tomorrow's world.

Clearly, we have only the present in which to plan for the future. Since the current situation is becoming increasingly complex at a geometric rate, our plans for the immediate and distant futures take on an impressive and critical importance. It is our conviction that effective methods for dealing with present and future problems will come only from the application of rational thought to the definition of these problems and the identification of potential solutions to reach the goals which have been socially defined. This is the nature of the planning process. Disease is no longer seen as an unalterable process, but rather as the outcome of sets of circumstances,some of which can be altered. These circumstances incorporate the concepts of interactions of multiple causes and the interactions of the host, agent, and environment. Two manifestations of these interactions are health and disease. The concept implicit in the planning process is that if these multiple causes can be identified, some of them may be subject to change, thereby preventing, diminishing, or eliminating some problems.

Inherent in the concept of problem identification is the realization that planning for health involves consideration of phenomena in areas other than health itself. It concerns the effects that actions in other sectors and areas have upon health, at all levels. Sectors are arbitrary ways of conceptualizing complex systems of social, political, and economic interactions which are mutually interrelated. Accordingly, we want to know how activities and energies in the health sector can be structured to enhance activities (or inhibit aversive activities) in other sectors, and vice versa. For example, many diseases are directly linked to a society's standard of living. We should urge activities in the economic and social sectors which will raise the standard of living, thereby reducing the load upon the health sector's resources. These resources are then released to deal with other problems, and a healthier population is free to pursue its economic and social goals. There are five questions critical to the identification of areas which relate health to socioeconomic development:

1. How can resources in the health sector be best applied to deal with basic problems?

2. Can resources from other sectors influence the progression or resolution of these problems?

3. Can policy decisions be identified that will benefit both the economic and the health sectors?

4. To what extent will health influence the outcome of proposed economic development projects?

5. To what extent will proposed economic development projects alter the health status of a population?

This monograph attempts to provide a start in the answering of these questions and a framework for further investigations. It is based upon our experience in case studies of health in the developing situation using the perspectives and methodology outlined here. The concepts incorporated in our studies are only a partial view of the discipline of health planning and cannot constitute a complete collection of tools, the application of which would provide the desired answers and solutions. Health planning is perhaps better described as an analytic perspective that divides problems into "form" and "contents" and deals with each in a multi-disciplinary way. The intent thereby is to provide an ordering system for investigating and dealing with problems whether they are present on the global, national, or local scale, or in individual relationships between teacher and student, physician and patient.

Future studies will broaden and strengthen the base on which studies of this nature are constructed, with the hope that an ever-increasing body of knowledge and expertise will be drawn to the task of evaluating the level of man's accomplishments and potential, thereby attempting to improve the quality of life for all men. Efforts of this nature are never completed: their very nature requires change and innovation that becomes more refined as more disciplines are brought to bear on problems.

ACKNOWLEDGEMENTS

This is one of a continuing series of publications on the interactions of health and socioeconomic development prepared within the Division of Planning and Evaluation of the Office of International Health, under the support of the Agency for International Development. In this volume we have sought to present a series of perspectives and methodology on planning in general, and health planning in specific. We encourage comments and suggestions for the future development of these concepts. Many individuals within the Office of International Health and other agencies have provided encouragement and advice. However, the responsibility for judgements made in this paper must remain with the authors. Particular gratitude is expressed to the following who have contributed to the development of this monograph: Miss Candace Perry, Mrs. Linda Gangloff, and to the Musgrave Associates for their consultations. A special word of thanks is due to the secretarial staff for their cooperation and patience in the preparation of this report.

Paul O. Woolley, Jr., M.D.
Washington, D.C.
June, 1972

CHAPTER I: THE EPIDEMIOLOGIC BASIS FOR PLANNING

Perhaps the greatest challenge to man is the realization of his full potential within an environment that is complex and difficult to comprehend and control. Man's impact upon this environment is mediated through his perceptual organization of the environment and his use of these processes for synthetic creation. Koffka and Köhler suggested that the perception of the environment is ordered and integrated into mental constructs or models. These models are crystallizations and miniaturizations of the world and are formed by generalization, stereotyping, and analogy. The models provide perspective for interpretation of the environment and permit investigation and experimentation. They indicate the need for information, or for strategic decisions, and allow the analysis of consequences of action.

Comprehensive planning, whether for health or for the economy, politics or education, or other social goals, is one means of dealing with the challenge of self-realization. It deals with the environment in a rational, future-oriented way to improve the lot of individual man and society collectively. Comprehensive planning seeks to do this by exploring alternative modes of action, their consequences, and their costs in terms of resources consumed and alternative opportunities lost. In its striving for rationality, the planning process has two major obstacles to overcome: the value decision inherent in goal-formulation and reformulation; and the problem of decision-making in a climate of uncertainty, especially uncertainty and expectations about cause and effect relationships. In order to deal with these problems, large amounts of information are essential.

If accurate information is basic to decision-making and hence to the planning process, it is clear that the information must be formulated in a meaningful and useful manner. Theories, models of action and decision-making (political, sociological, and economic), and models of organization and administration provide perspectives which assist in the assimilation of information in a useful way. A new approach to the gathering and interpretation of information relative to the planning process is possible through the construction of a model based upon the assumptions and methodology of epidemiology. This model deals with the problems of equilibrium states and their alterations and derangements in a system of complex and interacting parts.

Since one of the problems inherent in information handling is the semantic problem (i.e., communicating accurately to the receiver the message of the sender), an epidemiologic model provides not only a structure and methodology with which to investigate and analyze a problem, but also a semantic structure which allows understanding of the material transmitted. The epidemiologic model supplies a methodology for investigation, a perspective for interpretation, and a terminology for communication.

Although epidemiology as a science is concerned with health processes, a model constructed from its principles has broad applications to social systems. To delineate the features of the epidemiologic model, it is appropriate to consider its features in relation to health and then to consider the possibility of its usefulness within the planning process. This approach, therefore, embodies a belief in the universality of certain ideas and concepts which can be shared by many disciplines.

Epidemiology and the Health Sciences

"One of the urgent needs of highly developed societies is to identify ways of healthy living, the wisdom of body and mind and the principles of social organization that will reduce the burden of the chronic diseases and improve the quality of life. The quest for this knowledge is the main use of epidemiology." In this way, Morris summarizes his "Uses of Epidemiology" and issues his challenge to the scientific disciplines.

Epidemiology, in its narrowest sense, has applied to the study of epidemics of disease. However, this meaning has been continually broadened to cover endemic phases of epidemic diseases, then infectious diseases that do not appear in epidemic form, on to the study of chronic and environmental diseases, and finally to concern itself as a field of science with all those factors that determine the occurrence and distribution of health and disease. This

trend has returned the current concept of epidemiology to the origin of the word: those factors that exert their effects upon man.

In viewing medicine as a diad of social science and human biology, Morris has suggested a number of "uses" of epidemiology that go beyond the traditional concepts and allow generalization and extension such that the epidemiologic model can be constructed. Two of these "uses" can be selected for their relevance: to define health problems for community action through community diagnosis; and to search for causes of health and disease in order to understand the interrelationship of host, environment, and personal behavior characteristics.

As a corollary, epidemiology provides an intelligence service to society by diagnosing problems, searching for and creating problems, and probing the consequences of social trends and policies. If epidemiology is the study of health and disease of populations in relation to the environment and ways of life, it has the duty to study contemporary social movements for their impact on people, to be alert to potential problems, and to help prepare for the future. Epidemiology must necessarily be concerned with the changing role of social institutions and the bearing this has upon health. Conversely, epidemiology can help our social institutions apply the scientific method to their own workings. This, then, carries epidemiology into the realm of "social medicine."

The epidemiologic model makes it possible for the social sciences to view their respective problems from a new perspective and functions as a new tool to investigate the happenings within mankind in an analytic manner in order to yield a useful explanation of the causes of health and disease, social creativity, stability, illness, destruction, and "desirable" and "undesirable" phenomena. Its purpose is to provide an analysis that allows explanation, and prediction, and suggests the possibility of areas for preventive intervention.

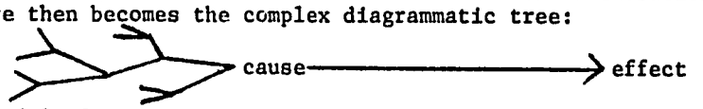
The epidemiologic model can be viewed as consisting of: (a) structure: the epidemiologic method; and (b) a motivating force: a set of concepts, a philosophic perspective.

(a) The <u>epidemiologic method</u> is the method of the research sciences, consisting of collective, descriptive, analytic, and constructive processes which test hypotheses and predict future events. It represents a method for using the body of knowledge of the occurrence and distribution of a disease process and a means for gathering new knowledge for the purposes of explanation and practical prevention. As such, its methodology is appropriate to all scientific investigation and to the investigation of the social ills as well.

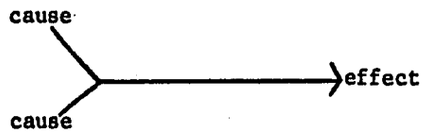
(b) The concepts by which epidemiology functions are the main concern of this paper, for they provide the dynamic potential for broad application. They include causality, multiple etiology, and the spectrum of health and disease.

1. The basic assumption which underlies much academic investigation is that of <u>causality</u>. In its simplest form, the cause-effect relationship can be diagrammed in this manner:

Cause ⟶ effect, where the single cause is both necessary and sufficient to produce invariably the observed effect. This is the concept of logical necessity. This simple model probably operates only rarely, for the initial cause is usually an effect produced by a previous cause, and so on, <u>ad infinitum</u>, resulting in an infinitely regressive sequence which MacMahon calls "the web of causation", or a means-end continuum. The picture then becomes the complex diagrammatic tree:



This model of causality can be extended to include concepts of multiple causation and multiple effects, thus:



or

The model of causality has a number of implications:

(a) that a time sequence of events occurs in which the causes precede the effect;

(b) specificity of association: high specificity, a cause leads to a single effect; or low specificity, where a cause may be associated with a large variety of effects, e.g., smoking with respiratory and cardiac disease, or low socio-economic class with illness, illiteracy, etc.;

(c) intensity of association or degree of correlation of the cause with the effect. For infectious diseases, the association of the pathogenic agent with the disease process is high. For chronic or environmental diseases, the association is a statistical or probabilistic association which allows a conviction rather than certainty. (Such is the case with the protective nature of exercise and diet against ischemic heart disease.) Notice that we are no longer dealing with the logical necessity of the first model, but with statistical probability;

(d) consistency: that the causative agent can be observed invariably contributing to the effect;

(e) associations may be related to existing theory, or may allow the formulation of a new theory, which yields the prediction and demonstration of new associations. These associations and theories then serve to reinforce one another.

It is clear that the degree to which each of these characteristics operates is highly variable. For most of the infectious diseases, their importance can be demonstrated, for they adhere closely to the characteristics in Koch's postulates. As noted above, the specificity, intensity, and consistency of association for the chronic and environmental diseases is sufficient to provide only a conviction of the relationship. The simple cause-effect model has many uses, but its weakness is that it does not describe the interactions within the system very well.

It is more useful to assume a different point of reference, that which underlies much of epidemiology. This perspective views man as a component of a complex system which includes the environment in its broadest implications. Such a perspective emphasizes the strong interactions that occur between the components of the system, while also considering the importance of the components themselves. (This is the basis for systems analysis in disease processes.) Disease in this concept is viewed as a failure of the interaction system, or a failure of adaptation within the system. Study of the system is not necessarily disease-centered, for study of other components and their interactions may be equally rewarding. This allows development of the interaction concepts of the epidemiologic model without negating the usefulness and the assumption of causality concepts.

2. The simplest, almost traditional concept of interaction has been that of ecologic balance, the triad in which the host, agent, and environment are in dynamic equilibrium, as

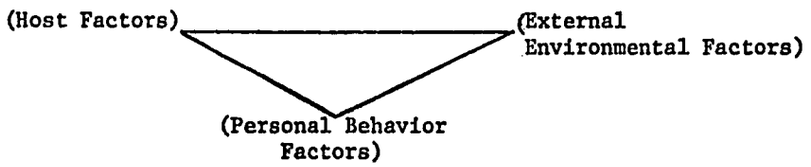
pictured below:

The concept of equilibrium implies a certain inertia, providing stability to the interaction. However, alteration in any of the participating factors alters the relationship within the whole, such that if great enough, the derangement called illness is recognized. For practical purposes, emphasis has generally been given to the host-agent interaction, while the environment is considered as a pool of physical factors. Likewise, attention is largely directed to the host as a genetic being altered by the onslaught of physical experiential phenomena including pathogenic agents. Expediency and economy have usually directed intervention at altering the host-agent relationship or at creating an environment hostile to the agent.

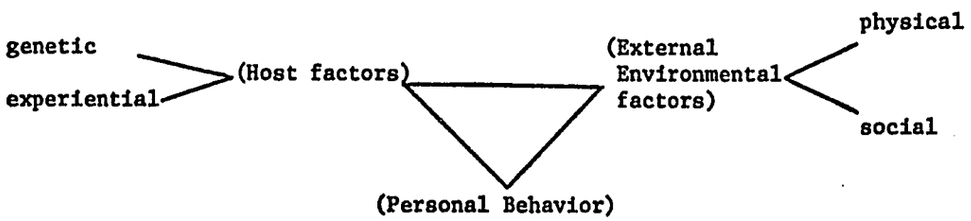
This concept has clearly had dramatic successes in the control of communicable diseases. It is the concept that allows the "magic bullet" theory of drug therapy, immunization, or excision of disease by the surgeon, to tip the balance in favor of the host (Man). This development was a natural consequence of the acceptance of the "germ theory," Koch's postulates and the work of Jenner. However, its failing is the assumption of a single causative agent based upon statistically absolute correlation (where, in fact, this may not exist), its common dependence is upon single interventions, and its concern with physical factors because of their accessibility and observability.

Placing a high value on utility and being accustomed to success with this model, our society has sought to apply it to a number of social ills without recognizing its inherent limitations. Characteristic beliefs in our society assume that a single injection of a vast sum of money could cure any social problem or that the excision of deviants from society removes the nuisance and solves the problem. This attention to the irritating symptoms and the short-run yield has been one of the features of "disjointed incrementalism" and its means of therapy has been the "magic bullet" concept borrowed from infectious disease epidemiology.

3. Morris suggested enlarging the "see-saw" concept above into a triadic relationship that incorporates the many non-physical attributes of the world, especially personal and social behavior. This model concerns itself with those situations in which there may be no specific etiologic agent, or where the agent is considered a part of the physical environment. The relationship would be pictured as follows:



Embodying the concepts of "ecologic holism," this model recognizes that the social environment has greater daily impact upon man than does the physical environment, and that both contribute to the composite equilibrium. Thus:



From the above it is clear that host factors include inherited variables (such as predispositions) and experiential factors (active and passive immunity, exposure to agents, etc.). The external environmental factors include physical factors (pathogenic agents, climate, air pollution, etc.) and social factors (social status, education, acceptability, etc.) not directly under the control of the host. Finally, it is essential to give special emphasis to the importance of personal behavior which is influenced by, and influences, the host and environmental factors.

This concept of the triad of host-environmental-behavioral factors and the relationship of physical and social factors precludes over-emphasis on the host-agent relationship and allows consideration of:

(a) multiple etiologies,
(b) chain reactions,
(c) spiral etiologic phenomena,
(d) multi-factor systems, and
(e) the spectrum of health and well-being.

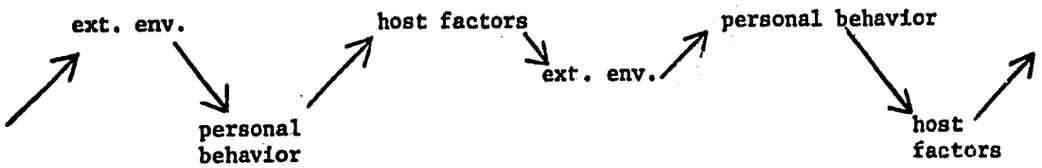
(a) Multiple etiology implies that no single agent is sufficient (although perhaps prerequisite) to produce the observed derangement of the equilibrium which exists in the host-environmental-behavior interaction. This concept stresses the idea of necessary sets of causes, combined with such impact as to create an upset in the balance. (We use "necessary" here in the probabilistic rather than in the logical sense.) Herpes Simplex carried by a large part of the population remains generally asymptomatic, but periodically causes minor fever blisters, occasionally severe stomatitis, or rarely (in certain individuals) encephalitis with high mortality. This spectrum of derangement certainly suggests that a variety of factors must be active. Of those persons exposed to radiation at Hiroshima, a large number did not develop leukemia, presumably because the majority did not have a sufficient complement of the "necessary sets of causes," although exposed to an agent. In many instances, the necessary sets of causes may be difficult to identify, but in others a reasonable approximation may be made. In considering carcinoma of the lung, some of these necessary sets of causes include: inherited predispositions (genetic host factors), previous lung injury by disease or surgery (experiential host factors), air pollution (environmental), cigarette smoking, the seeking of care (personal behavior), etc. Many more factors in each category can be identified for this disease.

Although multiple causes have been described as necessary sets of causes, combinations are possible in which one factor may be absent and replaced by another. Consequently, it is appropriate to consider those combinations that operate in different individuals and different populations. Obesity, for example, plays a significant role in ischemic heart disease only for some people. These combinations are possible because some causes are either not highly specific or not highly consistent (as defined above).

(b) A corollary to the necessary sets of causes is the concept of chain reactions, or interacting chains of events. For example, childhood drug poisoning can occur after a sequence of events involving advertising promotion of medications, self-medication by adults, attractive, ready-access packaging of pills and syrups, carelessness in storage, inadequate supervision of children's play, etc. For recurrent rheumatic fever, with heart disease, the chain might follow this pattern: hereditary predisposition for rheumatic fever--multiple causes that allow untreated strep infections (geographic area, age, exposure, susceptibility, etc.)--clinical rheumatic fever (if diagnosed)--failure of prophylaxis (with multiple causes)--recurrent cases of rheumatic fever--development of rheumatic valvular disease--heart failure--death. This, or a similar sequence, may occur as a chain reaction, with contributing multiple causes and the single necessary, though insufficient, cause: the strep infection. Although penicillin represents the "magic bullet" to achieve a measure of prevention, intervention in a number of other multiple causes might also have a significant impact. Single intervention in a chain sequence may prove to be effective, especially if convenient or economical (as safety closures on pill bottles), but the alternatives should also be considered and the possibility of multiple interventions. The chain of events might be diagrammed as follows:

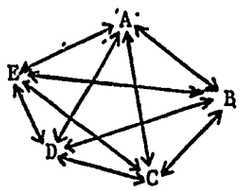
A--B--C--D--E-- *-----end result

(c) As the concept of interacting chains of events blends with necessary sets of causes to delineate multiple etiology, the picture becomes more complex in considering the <u>spiral chain reactions</u>, pictured below:



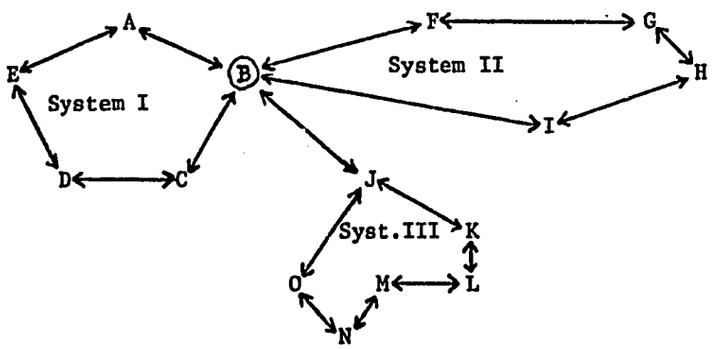
This vicious spiral is not the only one possible, but suggests that which is already known, at least superficially: that environmental factors can alter personal behavior, which can then alter experiential host factors, and some inherited factors for future generations, and that these host factors can then again influence the environment, etc. On this basis, Grotjahn (1911) formulated a set of principles for the systematic study of human disease from a social viewpoint. Education, employment, and social acceptance can alter behavior (smoking, alcohol consumption, seeking and acceptance of medical care), which may be reflected in health and well-being (infant mortality, congenital malformation, accident rates, etc.), and these may further depress the environmental situation, encouraging thereby the perpetuation of the cycle. For some individuals and population groups this may be a dramatic downhill progression, and a single intervention may diminish the progression, but it is more likely that multiple interventions directed at the sequence of self-perpetuating factors are more appropriate. Although poor housing has a dramatic impact on health status, it is unreasonable to assume that an alteration in the housing situation alone will necessarily provide a major improvement in health.

(d) Multivariable models of processes can be constructed to demonstrate the impact of interactions. Thus, in a system in which there are five variables, a diagram would show this relationship:



System I

This relationship could also have been illustrated by a simple matrix. The concern here is the interaction between each variable and every other variable. The diagram shows the ten possible relationships. In addition, it is possible to conceive that variable B is not limited to System I alone, but may also be a factor in another or several other systems. The conceptual model can then become exceedingly complex, but it is shown in simplified manner below:



Linked Systems Through Variable B

This model represents the simplest interaction between three different systems mediated through the single variable B. The simple two-dimensional matrix is usually not adequate for these multidimensional interactions.

As the number of variables involved increases, and as the number of systems involved increases, the model becomes multidimensional. At this point it is appropriate to consider the clustering of variables. The recent work of Rogers and Messenger has been directed at the investigation of the ecological association of variables by factor analysis in an attempt to "approximate a model of man's relations with his total environment." The suggestion is that such a model will have a significant role "as a common ground among the several disciplines concerned with studies of man and his environment."

(e) Finally, epidemiology has helped to further the concept of the spectrum of health and well-being by the identification of carrier states, subclinical disease, and precursor states. These concepts allow the definition of normal variations in a population and the identification of deviations which may herald disturbance. As the identification of typhoid carriers allows the explanation of transmission of disease, and the recognition of widespread inapparent polio infection explains the puzzling observation of sporadic paralytic cases, so too can these concepts be applied to other phenomena of illness which make sporadic appearances. What role does subclinical social and psychological malfunction play in the changing pattern of social institutions and social illness? What is the normal variation of social or individual psychological maladjustment which is tolerable?

These questions are difficult to answer because relatively little is known about the epidemiology of personal behavior, especially at the present time, when it appears that social norms may be changing drastically. Important differences in many types of behavior seem to be between individuals and cut across customary groupings by class, occupation, or residence. Many newer challenges in controlling the disease processes are aimed at the altering of personal behavior. This lack of information about changing social patterns suggests the need for greater social introspection, perhaps the realm of social-medical research.

Summary

The epidemiologic model is a tool for viewing the illnesses of mankind, whether physical or social. It utilizes the scientific method of investigation and analysis. The underlying concepts are ecologic and holistic: the health of mankind depends upon the establishment of an equilibrium between man and his environment. This equilibrium exists in triadic form among: (a) the physical and social environment, (b) the genetic and experiential host, and (c) the personal behavioral characteristics of the host. The host as viewed in this model may be the single individual or population group. Operating within the triad as mediators, or as altering forces, are the necessary sets of causes (multiple etiologies). Their influence is felt in combinations, interacting chains of events, and spiraling chains of events. Subclinical and precursor states represent deviation from the normal, but retain sufficient adaptation to maintain equilibrium. As such, they are a warning that a potential for derangement exists that can lead to overt illness. Necessity as used here does not imply inevitability, but rather a degree of probability. It is also used to imply the prerequisite nature of some causal relationships.

The model focuses attention on the interactive processes among the variables that comprise the necessary sets of causes. It also seeks to investigate the relationships between linked systems. The model utilizes the assumptions basic to causality models, but in terms which are relative. It does not seek to negate the concepts of causality, but rather to extend their power by investigating the process of transforming causes into effects.

Comprehensive Planning and the Epidemiologic Model

"The despotism of custom is everywhere the standing hindrance to human advancement, being in unceasing antagonism to that disposition to aim at something better than customary, which is called, according to circumstances, the spirit of liberty, or that of progress or improvement." In this manner, in his essay "On Liberty," John Stuart Mill (1859) sees the contest

between tradition and the desire for improvement as the "chief interest of the history of mankind." This contest is clearly as active today as it was a century ago. The balance of forces seeking to improve the lot of mankind and those seeking to preserve the stability and certainty of tradition is difficult to achieve. Certainly, medicine is in the midst of this contest, and the social implications of medicine are of growing importance.

Shortly before Mill was formulating his ideas, Neumann wrote in Germany that "medical science is intrinsically and essentially a social science..." Virchow added his emphasis: "Medicine is a social science, and politics nothing but medicine on a grand scale." Grotjahn continued this interest in the interplay between social conditions and disease and health and suggested that intervention in disease processes might involve either medical treatment or social measures.

In a direct line, despite the time span, is the attempt to deal with the most difficult and persistent health problems of mankind through rational, future-oriented analysis. Comprehensive planning is an attempt to deal with the environment in a rational way, to promote the well-being of man. This is to be accomplished through collective decision-making about goals for the future and methods for achieving these goals. Such decision-making involves dealing with complex and conflicting value systems and problems of uncertainty. Through the device of broad involvement and collective decision-making it seeks to reduce the threat that Mill foresaw, that: "the spirit of improvement is not always a spirit of liberty, for it may aim at forcing improvements on an unwilling people..."

If the challenge is enormous, or even threatening, so too is the need. As the discrepancies in health, wealth, opportunities, and education increase, this need becomes more pressing. With the changing role's demands and expectations, the alteration in social norms, and the change in the power of social institutions, the exploration of solutions becomes more difficult.

The immediate task becomes the analysis of problem areas to determine the myriad contributing causes and evaluating the potential sites for intervention. The evaluation of alternative, or multiple interventions and their consequences is a rigorous task. In that it provides a framework or perspective within which to consider multiple causation and multiple intervention, the epidemiologic model can be a useful tool. Combined with other analytic models, it provides alternative views of a problem. By requiring consideration of "necessary sets of causes," chain reactions, interactions among many variables, and the resultant dynamic equilibrium within which man lives, the epidemiologic model suggests the need for careful scrutiny of many problems. The emphasis on "holism" as developed most recently in the study of human ecology denies the easy acceptance of "magic bullets" until other possibilities have been considered. In this manner, the epidemiologic model provides the conceptual underpinning upon which systems analysis and consequent cost-utility analysis can be built. Removing the model from the restricted study of disease processes to the larger realm of those factors that affect mankind and alter man's living situation, health and disease, a new tool can be brought to the social sciences. By bringing a scientific method to the investigation of the social ills, the model calls for new insight in the study of these problems and provides one of many approaches that is possible for their analysis.

Chapter II: HEALTH STATUS OF THE POPULATION: DIAGNOSIS OF THE SITUATION

The foregoing chapter discussed an epidemiologic model in planning as a philosophic underpinning for the planning process. The application of this model requires an accurate diagnosis of the health situation in the community and a survey of the application of current resources to meet the health needs of the population. The following chapter provides a model and a set of criteria for estimating the adequacy of health resources. A subsequent chapter deals with problem solving within resource constraints by means of inter-sectoral planning.

The diagnosis of the health situation of a community or population requires the availability of accurate and useful data which can be assembled into meaningful, action-oriented information. Frequently, these data are not available in the developing situation, and it is necessary to make judgements from limited data and data collected for different purposes. Although there are immense inaccuracies and difficulties in this process, the outcome can be information of sufficient accuracy to allow the rational development of national and international policies and programs. It is our hope that the following exploration of this data analysis will demonstrate the utility of our approach.

The derivation of a national health status from available mortality data and scant morbidity data can result in misplaced emphasis upon certain diseases and unawareness of significant problems not identified within the reporting system. The interpretation of mortality data carries with it certain significant problems:

a. It provides only some indication of the underlying cause of death with no information about nonfatal or fatal, concurrent disease.

b. Deaths reported are not necessarily certified by a physician. Such reports are questionable in part because of the deficiency of medical knowledge in diagnosis and because of the influence of medical fads among lay and paraprofessional personnel. These death certifications must generally be discounted.

c. Most important, mortality data may provide little insight into the disease load carried by the live population.

In an advanced society, the limitations of these data are more important because of the increased role of the chronic and noncommunicable diseases. In the developing situation, where communicable diseases are the primary causes of death, mortality data are more useful because they accurately reflect the prevalent illnesses.

Many developing societies are in a state of transition in which the range of extremes is great. The rural areas are characterized by a traditional and agricultural social structure with poorly distributed facilities and few available services. This is especially true for health care and is accompanied by a high load of preventable disease.

By contrast, the urban areas are undergoing rapid transition with an influx of population, rapid urban growth, creation of urban slums, and outstripping of available resources: food, water, sewerage, sanitation, transportation, education, and employment. Health coverage, at least for the extreme moments of birth and death, is generally available although the quality of such coverage varies greatly. Modern sophisticated, comprehensive, and specialized care may exist within the cities although the availability of such services to large segments of these urban populations is frequently open to question.

It is because of the contrasts outlined above that it is generally necessary to deal separately with the health status of the rural and the urban populations. Generally, there are four major considerations for the diagnosis of health in the community:

1. analysis of mortality data

2. analysis of morbidity data

3. analysis of disease-specific data, and

4. estimation of the coverage of the population by health and health-related services

In addition, there are a number of sub-categories of data to be considered depending upon the quality of data available. Examples of these sets of data can be organized as follows:

I. Mortality Data

A. Leading causes of death by age

1. estimation of percent of deaths which are preventable

2. estimation of percent of deaths which form cluster groups

3. estimation of percent of deaths with common associated causes, e.g., undernutrition, environmental hazard, lack of immunization, etc.

4. estimation of percent of deaths requiring specific actions, e.g., early care, continuing care, etc.

B. Data obtained from distribution of medical certifications of death

1. percent of deaths not certified, with urban/rural distribution

2. percent of deaths attributed to obscure and ill-defined causes; percent of deaths attributed to senility

3. differential distributions of medical certifications according to disease types

4. discrepancies in certifications and case reports in diseases with high case fatality ratios, e.g., tetanus.

II. Morbidity Data:

A. Reported cases of communicable diseases by age and urban/rural location

B. Data from medical consultations

C. Data from hospitalizations

1. cause

2. duration of stay by age and category

3. percent bed occupancy

III. Disease-Specific Data--these are overlapping sets of diseases used as indicators and and diseases clustered according to associated cause or problem

A. Indicator diseases; indicator phenomena:

1. socioeconomic status of the population: tuberculosis, infant mortality maternal mortality

2. availablity of health care: maternal mortality, complications of pregnancy and delivery, etc.

3. environmental safety: enteric infections, parasitism, etc.

B. Disease clusters as manifestations of associated causation:

1. high lethality of childhood disease: malnutrition

2. vector-borne disease also indicators of geographic climatic influences: yellow fever and dengue

IV. Coverage of the Population by Health Care Services: observed receipt of health care from the perspective of the consumer

A. Data from medical certification of death

B. Data from professional attendance at delivery

C. Data from immunization for selected diseases -- preventive services

D. Data for coverage of special populations: MCH services, well-baby, etc.

From the above four categories of data, the following judgements can be made:

1. Estimation of percent of population receiving regular health care

2. Estimation of percent of population receiving occasional health care

3. Estimation of percent of population receiving no health care

4. Definition of basic problems in health

5. Identification of potential intervention mechanisms

6. Identification of possible complicating factors: population growth, etc.

7. Identification of the role of extra-sectoral factors

The following pages of this section discuss selected aspects of four major areas of consideration using a sample developing country. This discussion is presented as an illustration of some of the thought processes involved and does not, therefore, include all categories or provide a large amount of data. There are many generalizations meant to show a viewpoint rather than provide country-specific accuracy. A more technical application of this methodology can be studied in Syncrisis, Vol. I.

I. Mortality Data

A. Leading Causes of Death in a Sample Developing Country

A review of the leading causes of death reemphasizes the transitional nature of many developing societies and especially the rapid changes with which the health care system must deal. The first four leading causes commonly include: (1) ischemic heart disease (2) cancer (3) accidents, poisonings, and suicides (4) stroke. These causes of death indicate the relatively advanced standard of living of many people and demonstrate sufficient longevity to allow for the development and manifestation of these chronic diseases. The violent causes of death frequently appear in this list and provide some insight into the social climate. In the developing situation, the remaining six leading causes of death are usually a collection of communicable diseases; notably pneumonia, enteritides, tuberculosis, and diseases of the new born. In this example, these ten causes of death account for approximately 65% of all deaths medically certified and, considering the preventable and treatable nature of many of the conditions, identify areas in which public health activity might be fruitful. Winslow writes: "In addition to the loss of life-capital through premature death, preventable disease imposes a heavy burden in the loss of productive power due to nonfatal but disabling illness and in increased needs for the medical and institutional care of those afflicted."

Further data on the ten leading causes of death broken into age ranges reemphasizes that a significant number of deaths are attributed to preventable and treatable communicable diseases. The following data provide an analysis of deaths in specific age ranges:

a. Ages 1-4 years: In this example, approximately 46% of the deaths are attributed to communicable disease, notably gastritis-enteritis, influenza-pneumonia, bronchitis, whooping cough, measles, tuberculosis, and diphtheria. Anemias and accidents are also common. In many countries, as many as 60% of children under age five suffer some degree of protein-calorie malnutrition. The effects of these diseases are exaggerated by malnutrition. At least theoretically, 15% of deaths in this age group attributable to preventable diseases could have been averted by appropriate immunization, and an additional 15-20% of the deaths (especially gastritis, enteritis, pneumonia-bronchitis, and TB) could have been averted by safe water supplies, accessible medical care, and a reasonable state of nutrition -- all simple, effective, known techniques.

b. Ages 5-14: Accidents head the list of causes of death, accounting for between 13-18% of deaths from all causes. This suggests the need for concern by both school and health officials for designing the environment and teaching accident prevention, particularly in a society with growing technology. Again, communicable diseases account for a large proportion of deaths, with tuberculosis high on the list. Anemias, as second cause, reflect the problems of malnutrition and along with enteritis give some insight into the significance of intestinal and parasitic diseases that might be prevented through effective environmental sanitation and personal hygiene. The large role played by diseases for which immunization is available reflects the currently inadequate coverage of the susceptible population by immunization services and the margin by which deaths might have been averted in this age range. Furthermore, all of these diseases interact in the recycling spiral as described in Chapter I.

c. Ages 15-44: This group represents the working-age population upon whom the economy is primarily dependent. Again, accidents are a significant cause of mortality (approximately 17%) and when combined with the other violent causes of death (homicide and suicide) the total of 27% is of major concern. It can be reasonably assumed that accidents are also a major cause of morbidity and impose a burden on the health care system. Frequently, these are consequences of the rapid urbanization; traffic accidents are especially numerous because of the nonmechanized traffic control in the cities and are complicated by the unawareness of traffic danger by the recently urbanized rural migrant. Urban planning and the design of good transportation systems within the urban areas can reduce this toll.

Tuberculosis is another leading cause of death in this age group. To a great extent, this disease can be prevented and treated, and as such it is a useful indicator of socioeconomic status of the population. The chronic debilitating nature of the disease accounts for long-standing, severe disability before eventual death. The costs to society in deaths and disability, lost wages, and increased consumption of resources and medical care are discussed in the Chapter, "The Cost of Disease And The Costs of Inaction."

In this age group, deliveries and complications of pregnancy relate directly to the maldistribution of medical care, especially in the rural areas where as many as 60% of the deliveries have no professional attendance.

d. Ages 45-64: As expected, in this productive age group, heart disease, cancer, and stroke become the leading causes of death. Tuberculosis, influenza-pneumonia, and anemias are still present, but less significant. Here the burden of care rests primarily upon the therapeutic resources of the health care system, and practical preventive techniques (better nutrition, parasite control, tuberculosis control) will influence only 10% of deaths in this age range.

e. Ages 65 and over: The pattern for this age range is essentially the same as in the above group showing some predictable increase in the deaths attributable to stroke.

Deaths from Communicable Diseases

The study of death patterns from communicable diseases is useful because the patterns of these diseases reflect not only characteristics of the physical environment, characteristics of the human host, and functioning of preventive services, but also the political, economic, and social realities of the countries. In some situations, yellow fever, smallpox, and cholera become epidemic because of the political-economic decisions that are made rather than because of technical problems. Interpretation of communicable disease patterns requires a historical perspective for the country and a comparative analysis with similar countries.

In addition to the diseases indicated above, communicable diseases which frequently cause death are the enteritides, dysenteries, pneumonia, tuberculosis, and tetanus. It can be noted that the percent of medical certification compared to total deaths varies with the nature of each disease and provides an indication of the availability of medical care. Generally, medical attention is much less available in fatal cases of a rapidly evolving disease than in cases of slowly developing disease.

For example, in one situation, for deaths ascribed to tetanus only 46% were medically certified. On the other hand, of the deaths ascribed to tuberculosis, approximately 76% are based upon medical certification. The assumption is that the duration of this chronic debilitating disease and the persistence in severity of the symptoms are sufficient to motivate the patient to seek medical care. However, for various reasons the patient lacked the necessary medical care to be cured, although there was sufficient time for his death to be medically certified.

With two childhood diseases, measles and pertussis, only 29% and 15% of deaths, respectively, were medically certified, again suggesting nonavailability of health care services. It may also reflect parental attitudes toward childhood diseases and the general assumption that these are self-limited diseases (i.e., diseases which are resolved without specific therapy). The combined total of tetanus, pertussis, and measles may account for approximately 10% of all deaths. These diseases could be virtually eliminated through universal immunization and some modification in hygiene and housing standards.

The combined deaths ascribed to the dysenteries and tuberculosis reflect strongly upon the socioeconomic standards of housing, environmental sanitation, and nutrition. Although they are infectious diseases, their pattern of spread and their mortality rates are strongly influenced by specific improvement in the standard of living.

II. Morbidity Data

B. Data from Medical Consultations

Data on the cause, frequency, distribution, and effectiveness of medical consultations and of hospitalizations are insufficient alone to make major decisions for health programs. However, combined with other data in the report, the consultation data support the identification of health problems.

The medical conditions for which the population seeks care are usually obtained from reporting data from selected health centers and hospitals. As an example, the most frequent cause for consultation is dental disease, and about 60% of these consultations may be provided for the school-age population. Ranking second are the helminthic infections, which accounted for a very high volume, 25% of which were in the population under five years of age. Other large-volume consultations were for diseases of the respiratory tract, accidents, enteritis, and diseases of the genitourinary tract. There are no data about the type of services provided or the relative consumption of preventive as compared to curative services. However, it is apparent that the large volume of consultations could be more effective if basic preventive measures were the central core of services about which diagnostic and curative services were built. Furthermore, the majority of consultations are for diseases essentially preventable: helminthic infections, enteritis, and some respiratory infections. Emphasis on good nutrition, hygiene, and accident prevention could greatly alter the pattern of consultations.

C. Data from Hospitalizations

Hospitalization data are obtained from the major national referral hospital. By far, the most frequent causes of hospitalization are conditions related to pregnancy: normal delivery, complications of pregnancy, and abortions. Nearly one-half of these hospitalizations were attributed to abnormal states of pregnancy. The second most common cause is the miscellaneous category, "special studies and examinations." Ranking third are diseases of the genitourinary tract. Accidents and violent episodes were the fourth ranking cause. The fifth place is occupied by intestinal obstructions and hernias.

To a great extent all of these conditions are related to the availability of quality outpatient medical care, poor nutritional status, infectious diseases, and intestinal parasitism. If the hospital admissions are representative of the disease problems of the population, there must be a great waste of life and vitality. Such waste causes suffering and economic loss by disability and calls for effective health services.

The average duration of stay in the hospital reflects characteristics of the medical problems for which hospitalization has been necessary and the relative health status of the population which is hospitalized. Pediatric admissions in this example consume a large number of days, averaging 14.2 days per case. This reflects the fragile health status of the pediatric age group. It is significantly less than that of other comparable countries, but still well above the U.S. average pediatric stay of 6.6 days. The average duration of stay in the nonpediatric category is 5.5. days, the lowest for all comparable countries, and reflects the trends of hospitalization for short-duration, acute problems, especially pregnancy,tests,and accidents.

III. Disease-Specific Data

This section is comprised of more detailed discussions of the morbidity and mortality experience in the population of the sample country from tuberculosis, malaria, and enteric infections. These diseases are selected for presentation for a number of reasons. Perhaps most important, all three diseases are indicators of socioeconomic problems operating at the interface of the health care system with other sectors of the society. They produce significant disability and death, with variations for certain age groups of the population, province of residence, and the availability of health care. Because categorical disease programs for tuberculosis and malaria have been active for some time,much good data are available.

The consideration of costs of specific diseases is not in any way intended to place emphasis especially upon these entities in order to initiate further activities, but rather to illustrate the way in which certain diseases are manifestations of more basic social and economic or geographic problems.

IV. Observed Health Care Receipt

Receipt of health care is probably best determined through a mass survey and examination procedure. Since this frequently is not possible, various sets of data are used to estimate the extent and availability of medical care received by the population. Data on medical certification of deaths are used to relate the availability of care at the time of death to the availability of care at the time of illness. These data are also used to determine which members of the population receive some care and to what extent this receipt of care is influenced by severity or duration of illness. Services delivered to special segments of the population are also used to assess the general availability of medical care. These data are also compared with those derived from maternal and child health services. Finally, information on immunization is used to ascertain to what degree routine, simple methods of prevention are available to the population, to suggest the theoretical excess of a disease that exists when these methods are not employed, and thereby to assess the unnecessary burden on already limited health services.

A. Data from Medical Certifications of Death

In 1968, approximately 55% of all reported deaths in the sample country were medically certified as summarized below:

	Number	Percent
1968 Total Deaths	9,849	100
with medical certification	5,443	55.3
without medical certification	4,406	44.7
1968 Total Urban Deaths	3,743	100
with medical certification	3,564	95.2
without medical certification	179	4.8
1968 Total Rural Deaths	6,106	100
with medical certification	1,879	30.8
without medical certification	4,227	69.2

These data show that 95.2% of all deaths in urban areas, but only 30.8% of deaths in rural areas are medically certified. This means that 96% of all non-certified deaths occur in rural areas. Certification of death means that registry of death carried the signature of a physician who was in attendance at, or shortly before or after, the time of death. Approximately 70% of those dying in the rural areas (43% of all those dying) are not seen at or near the time of death by a physician, thus, a major proportion of the population does not receive medical care at the time of death, particularly in the rural areas. It is reasonable to infer that some of these deaths might have been prevented or life significantly extended.

To obtain some further insight into the problems of availability of medical care, an analysis has been made of data presenting causes of death. Those with rapidly-evolving, severe illnesses are at greater risk of dying without benefit of medical care. This was discussed previously. With a rapidly-evolving disease, such as tetanus, only 50% of the deaths were medically certified, while with a more chronic disease such as tuberculosis, 75% of the deaths were medically certified. This signifies that at least half of those victims of the more rapidly-evolving disease died before they were able to receive medical attention. With a disease of longer duration, a greater percentage of the patients were able to be seen by a medical person at least before death. Apparently, care is not readily available to a large portion of the population, and, in addition, the sick may not seek care until they experience a disease of some duration or severity.

Since a significant segment of the population does not receive medical care at the time of death, a similar proportion may also not be receiving medical care when acutely ill. Data indicate that a large percentage of all deaths are ascribed to obscure causes ("symptoms and morbid states ill-defined"). Analysis indicates that these deaths occur in rural areas. In most non-certified deaths a member of the family makes the report and suggests a cause. Had the illness ever been medically diagnosed, the reporter would probably have some idea as to the specific cause of death. At least one-fifth of those dying in the rural areas have diseases so ill-defined, and probably undiagnosed and untreated at any time, that not even a lay name is used for the cause of death. Furthermore, an additional 50% of rural deaths are not medically certified, so that there is only lay reporting as to the cause of death. This suggests that this group of patients may or may not have had some recent medical care, but probably none at the time of death.

These considerations are presented as follows:

Distribution of Care at Time of Death in Rural Areas:

70% Deaths Not Medically Certified	20% Ill-Defined and Obscure Cause of Death	20%	Presumably No Death Related Medical Care
	50% Lay Reporting as to Cause of Death	50%	May or May Not Have Had Some Recent Medical Care But Probably None At Death
30% Deaths Medically Certified	30% Medical Certification as to Cause of Death	30%	Probably Some Medical Care Available At Time of Death

From these data, it may be possible to extrapolate the availability and accessibility of health care to the rural ill. If 20% of the rural population suffers eventual fatal disease that may never have been diagnosed by a physician, then this group may be representative of a 20% sample of the ill population also not receiving diagnosis or treatment. If 50% of the persons dying in rural areas have had sufficient medical attention to allow for even a crude determination of the cause of death to be cited by a lay person, but no medical attendance at the time of death, perhaps this group is representative of a 50% sample of the sick who have only sufficient medical care to identify problems without adequate, definitive treatment at the time of acute illness.

This concept may be presented as follows:

Assumed Distribution of Medical Care in Rural Areas

20%	--No care or very little care
50%	--Limited care available
30%	--Possible regular preventive or therapeutic care

The assumption that a range of 20 to 70% of the rural population receive little or no care is further supported by the data reported for three special categories of the population: pregnant women, infants under one year, and children age one to four years. National data

from hospitalizations and medical consultations show that in 1965 only 40% of pregnant women and 75% of infants under one year were seen through the available Maternal and Child Health services. Only 50% of the children aged one to four years were seen at least once annually. This means that from 25 to 60% of certain population groups did not receive even simple, routine care.

B. Data from Professional Attendance at Delivery

Further evidence of maldistribution or non-availability of professional care is evident in a review of professional attendance at the time of delivery. The figures reveal that approximately 61% of the total births had professional attendance at the time of delivery. However, here again the marked urban-rural disparity is evident, with 96% of the urban births but only 37% of the rural births being covered by professional attendance.

C. Data from Immunizations

Analysis of immunization data provides two perspectives of the health sector. From the viewpoint of the recipient, the data allow the inference of the availability of routine preventive services. Since immunization is not necessarily dependent upon physician attendance, the most basic health services received by the population can be estimated. Coverage is far short of the national goal, with at least one-third to one-half of the susceptible population not receiving this basic preventive service.

From the viewpoint of the providers of care, the susceptibility to disease far in excess of a theoretical minimum results in high morbidity and mortality and places an unnecessary and expensive burden on care facilities and resources already severely limited. The result is inefficient use of these resources.

The following discussion seeks to demonstrate the relationship between immunization coverage and basic health care from these two perspectives, the implications for the future, and a brief outline of a possible approach to solution.

Since a national goal to immunize 80% of the susceptible population has been established, it is appropriate to evaluate the performance of the immunization activities against this stated objective. However, it is difficult to interpret the significance of the number of doses of vaccine consumed, or to estimate the various susceptible populations. Accordingly, national immunization data can be calculated as percentages of the estimated annual "young population increase" for recent years. This technique clearly presents a more favorable picture of the immunity status of the population than may obtain in reality. However, it provides some insight into the best coverage the current system could provide if devoted entirely to protecting the highly susceptible "new" population.

The annual increase of the young in the population is approximated by using the number of live births minus deaths of children under one year of age. This increase is approximately 3% of the total population. Assuming that each individual immunization confers lifelong protection, that all immunization is going to the "young population increase," and that no person already immune is re-immunized, at current population growth and immunization program rates, the "young population increase" would enjoy virtually complete protection against smallpox, approximately 65% protection against tuberculosis, and 50% protection against diphtheria, pertussis, and tetanus. Except for smallpox, these figures fall short of the national goal of immunizing 80% of the total susceptible population. In the "real" situation, the immunity of the total population is far below the theoretical percentages presented above.

Although these may seem to be relatively satisfactory immunization levels, a restatement of the situation using tetanus as an illustration is enlightening. From the data it is determined that the current campaign rate could have protected only 70% of the yearly "young population increase." (This is only 2% of the total population.) Therefore, if immunization is to continue at that rate and is restricted annually to the "young population increase,"

leaving the remainder of the population unprotected, the best that can ever be expected is that only two-thirds of the whole population will be protected. Moreover, it will take at least a full generation to achieve even this level of protection, which is again far short of the national goal of 80%. The projected tripling of the population within the next generation will require a similar increase in the immunization program just to maintain the current inadequate level of coverage.

Immunization programs can be designed to achieve optimal allocation of limited resources. For example, if the BCG program were to continue at the current national rate, maximum protection could be achieved by allocating the immunization resources through the basic health services to those provinces with high incidence and prevalence, i.e., to high risk groups. Three such provinces stand out: one, with a relatively good supply of professional personnel and facilities, but with very crowded living conditions; and the other two with inadequate and decreasing health care resources.

Combined intensive use of the simpler therapeutic regimens and of preventive measures are logical in these areas. Studies by the World Health Organization indicate that the simplest diagnostic/treatment approach for symptomatic patients in developing countries will benefit only 5-10% of the active tuberculosis cases at any one time. Cost-benefit studies show that BCG vaccination will be considerably more successful. The important question, however, is not whether BCG vaccination should totally replace diagnostic/treatment programs, but whether it is possible to determine the optimal combination of immunization and simplified treatment to provide maximum protection from tuberculosis at reasonable cost.

Application to Program Planning

In the foregoing discussions, we have demonstrated how available data can be interpreted and used to make judgments about the state of health of a population. We have provided estimates of the percent of the population receiving regular, occasional, or no health care. From the consideration of the data it is possible to identify important diseases and also basic problems in health. These basic problems can be defined as: problems of environmental safety, non-availability of health care, and malnutrition. Specific discussion of the genesis and role of malnutrition as a health problem is reserved for a subsequent chapter. From the consideration of the basic health problems and disease mechanisms, it is possible to identify potential intervention mechanisms, some of which lie within the responsibility of the health sector, others of which lie in other sectors of the society.

In order to demonstrate how estimations of the coverage of the population might be used for program planning, the following discussion of the potential impact of a family planning program is presented:

Major demands for health services in the form of consultations and hospitalization relate to the problems of pregnancy, diseases of early childhood, and illness resulting from unsanitary environment and accidents. Active maternal and child health programs have been underway for some time, perhaps reflecting the social value of mothers and children. In 1965, there were 48 health centers providing maternal and child health care. Nearly 35,400 or 75% of infants under one year were seen in the same centers. Older children did not fare so well. In the age group one to four years, only 50% of children received services at the health centers.

In 1965, approximately 23,350 pregnant women (48% of the population in need) were seen through MCH centers. Pregnant women represent approximately 20% of the total fertile female population (defined as those age 15-44). Only half of the pregnant women receive care through MCH centers, the theoretical maximum of only 10% of the fertile female population will experience at least a single contact with the service in a given year. Since some degree of non-acceptance, rejection, or dropping out of the program does occur, the theoretical maximum of 10% coverage cannot be met. A conservative estimate of this failure is 20%. Thus, family planning programs which are extended through MCH centers can cover only 8% of the total fer-

tile female population. It is estimated that the current program covers 4% of this population. Such limited coverage is insufficient in a situation where excessive population growth will result in the placing of heavy burdens on already limited systems.

It is assumed that were basic health services readily available, they would be utilized more frequently by more people than the specialized MCH services. This allows greater opportunity for contact with the patient. If this assumption is correct, then it would be more effective for family planning services to be made available through the basic health service system on a continuing basis and combined with other needed health care.

We have defined several basic problems in health and demonstrated how available data may be analyzed in order to draw some basic conclusions regarding these problems. The collection, ordering, and analysis of these data provide baseline information which may be considered and utilized in planning and implementing programs to provide health care. Effective program planning relies heavily upon data availability; therefore, a program should be designed to provide feedback in the form of accurate data.

In this chapter we have provided an example of a health status situation, and identified a few of the problems involved. In following chapters we will discuss the allocation of resources and the possibility of inter-sectoral resource allocation and propose a model for dealing with these problems in a methodological way.

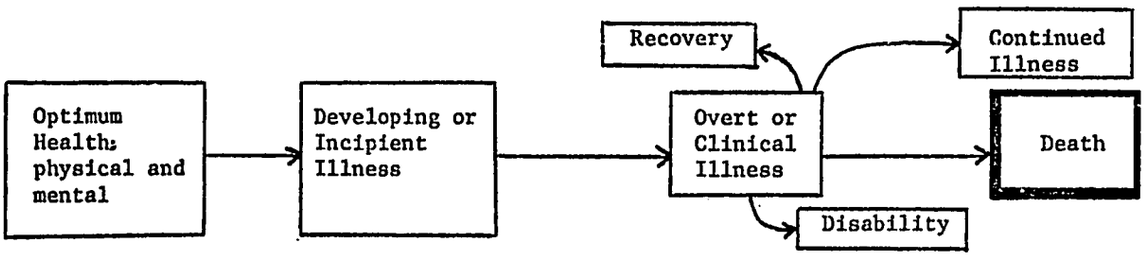
CHAPTER III: ASSESSMENT OF RESOURCE ADEQUACY

Traditionally, the adequacy of resources in health has been assessed in the context of optimum or minimum ratios of personnel, facilities, and budget expenditures to the general population or the identified populations at risk. Occasionally, more complex and refined numerical indicators (instruments) are applied which take into account the composition of health teams. It is the thesis of this paper that the adequacy of resources can be assessed only against the demand for services and the need (potential demand) for services. Demand and need are determined in part from the estimates of coverage of the population by services as outlined in the section on health status, from the intervention points in the health-disease spectrum, and from the following determining factors:

1. Incidence, prevalence, duration, and severity of disease to be treated;
2. The extent of coverage of the population by preventive services;
3. The quality and efficiency of professional practice;
4. The accessibility to the population of available health services as modified by geographic,economic, and cultural factors;
5. The quality of care received as modified by cultural, social, psychological, and economic factors;
6. The level of health education, awareness, and expectations;
7. The role of extra-sectoral factors;

The Health Spectrum:

The progression from life to death carries with it a progression through a series of illnesses sometimes with recovery, sometimes with continuing illness or disability. Most of these states are ill-defined, and optimum health is an elusive commodity at best. Conceptually, at least, these states can be ordered along a continuum or spectrum ranging from optimum health through incipient illness, overt illness, to death, with each state arbitrarily defined for the purposes of convenience.



Graphically, the spectrum from optimum health to death, with the intermediate outcomes, can be presented as above. It is clear that the concern of health workers and health theory should be to identify the factors that influence the progression along the linking processes from one stage to another; and further, to be able to identify the characteristics of each of the stages. While death is generally recognizable, incipient illness is uniquely difficult to identify and quantify. Although there are overlapping responsibilities, in most societies the responsibilities for the treatment of communities and individuals in the disease stages on the right of the spectrum fall upon hospital-based practice; those generally in the middle stages upon ambulatory health care and medical practice; and earliest stages, dealing with the conversion from optimum health to incipient illness, is the responsibility of the public health preventive medicine disciplines. Clearly, the earlier the intervention point along the spectrum, and the greater the effectiveness of this intervention, the less will be the demand for care and rehabilitation services upon the medical and hospital practice

systems. Such is the case made for preventive medicine.

The obstacles to implementing preventive services in developing countries lie in problems of feasibility, attitudes, overwork from dealing with demand at the end of the spectrum, lack of technical knowledge to prevent certain conditions, and lack of technical ability to identify and define disease in its early stages. Nevertheless, in the developing countries vast amounts of care, and hence resources, are expended in treating preventable illness and its complications. The hope would be that resource allocation decisions would direct these resources toward earlier intervention points in the spectrum. It seems necessary that these decisions must then be country-specific and at least disease-group specific. This leads us into the consideration of the determining factors outlined above.

The Determining Factors:

Analysis of the determining factors provides a system for the careful definition and scope of the basic problems in health and the application of health resources to these problems and those anticipated for the future. This again is the plea for careful problem definition. The health spectrum discussed above provides the perspective, the determining factors provide the mechanism. The first six of the determining factors deal with those problems and hence resources under the direct control of the health sector. The solution to these problems is a matter of resource allocation within the health sector. The final determining factor is a consideration of the role of activities, programs, and policies outside of the health sector--hence, extra-sectoral. A fuller exploration of this is made in the chapter about project analysis in the input/output model and in the final chapter. The solution to these problems lies in the realm of inter-sectoral planning and implementation.

1. Disease Characteristics:

   This factor of the incidence, prevalence, duration, and severity of disease to be treated is identified to stress the basis for all effective planning: diagnosis of of the situation. It is essential to identify the disease characteristics of the area and develop an explanation for these characteristics. Although accuracy of data is desirable, it is not always attainable, and certain generalizations or disease clusterings must be accepted. Clearly, it is not possible to plan for manpower development, the development of administrative systems, or the construction of facilities in a rational way without a clear definition of what diseases must be treated, how, and by whom this will be done.

2. Preventive Services:

   The disease load carried by the population can be dramatically altered by the introduction of preventive services. In many developing countries, a major portion of medical consultations and hospitalizations is consumed in dealing with preventable diseases and their complications. Because these problems might have been averted, resources consumed in this manner are not used effectively nor efficiently. Levels of immunization are useful indicators of the degree to which preventive measures are taken for a population. Likewise, the availability of safe water supplies and sanitary excreta disposal systems provides an indicator of the protection from some environmental hazards. The combined effect of substandard nutrition and repeated infections significantly determines disability or death in the more fragile. Inadequate and unsafe working conditions with long hours and unsanitary, overcrowded living conditions aggravate the situation still further. The disease load that results from insufficient preventive services contributes to the overload on the limited health services and to the high morbidity and mortality from preventable disease.

3. Professional Practice:

It is not possible to evaluate from afar the quality of health care as delivered. It might be expected that the physicians trained in the medically developed nations conform to high standards of practice. The training of the other health professionals can also be expected to be of good quality. However, even if the quality of care delivered is ideal, there are still the major problems of efficiency of delivery and relevancy of training to the problems of the country. It has frequently been noted that a majority of physicians are concentrated in urban areas far in excess of the population. A similar pattern is noted for other personnel and for hospital beds. Furthermore, many physicians may have more than one job, thus dividing their time among a variety of responsibilities. With a significant shortage of nurses and other trained personnel, and the unwillingness of some physicians to delegate work and responsibility, duties devolve upon the physician which could be performed by professionals with more suitable training. Because physicians are frequently trained in the developed situation, they often have little perception of the more urgent and basic health needs of the population and are oriented toward hospital-based therapeutic care. Consequently, the physicians and others have not been providing routine preventive care to the population nor have they sought to reach out and extend their care to the populations that are poorly served by the system. In this system, the reservoir of unknown disease is never identified nor reduced. Thus, even under the pressure of limited resources, the current utilization and allocation of human resources is not efficient.

Accessibility:

A number of factors--geographic, cultural, and economic--restrict the accessibility of existing services to the population in need. Of particular concern is the provision of services in the rural areas. Because of difficult transportation, access to the cities for routine or occasional medical care is not practical for large segments of a population. The same conditions create obstacles to bringing care to the population. The lack of adequate transportation and communication services impedes the development of sectors other than health; it impedes the marketing of agricultural produce, limits opportunities for secondary and higher education, and accentuates the flow of the rural population to the cities. The costs of medical care and the economic prohibitions of leaving the home or job to obtain care can reduce the accessibility of medical care for many. Even where the costs of care are negligible or are paid for through a work or insurance program, other costs may be prohibitive. Because of the intangible benefits of preventive and early therapeutic care, many people seek care only in urgent medical conditions. Ultimately, this too is wasteful of the limited resources of the health care system.

5. Care as Received:

Although services, both preventive and therapeutic, may be available to the population and the quality of professional practice highly developed, there may be social, cultural, or economic factors that influence the quality of care as received by the population. It is essential that these factors be identified, or all else is in vain. In most preventive and ambulatory health care situations, the patient is a free agent who participates in the health process in so far as he understands and perceives that it is to his benefit and in so far as it is congruent with his social and cultural values and economic means. Instructions given by the professional are to no avail unless followed. Medications prescribed are of no use unless taken. Professionals are all aware of the futility of prohibiting exertion to the cardiac patient who lives on the fifth floor of a walk-up flat, or of prescribing hot baths to the patient without the bath tub. Therefore, it is essential that the health care system and the health professional in each instance recognize and define the boundaries placed upon their effectiveness by these social, cultural, and economic factors and learn to modify professional practice such that it can be received by the individual patient and the community. When there is no such modification, we see a technical exercise in futility in dealing with the "uncooperative" patient. Resources consumed in such an exercise are then wasted resources.

6. **Health Education and Expections:**

Attitudes toward health, concepts of normalcy and illness, expectations toward quality care, interest in prevention, and awareness of the causes of disease influence the course of disease and the nature of resources necessary to prevent and treat disease. A low level of health education of the population significantly increases the burden upon the health care system. Even rudimentary knowledge of the causes of disease, of the importance of personal and environmental hygiene, and of basic nutritional needs for health are generally lacking in many areas. Manifestations of this lack of knowledge are particularly evident in the disease problems of children. In less-developed nations and in isolated areas of the developed nations, there is an extremely high incidence and prevalence of repetitive infections and of malnutrition. The effect by retardation of growth and development in the young population is of particular concern. Even schools frequently operate in an unhealthy environment and do not provide the basic needs for healthly living. As a consequence, the population has little awareness of the basic preventive measures that can be taken and of their effectiveness. Lack of understanding of the concept of early care, especially in the childhood illnesses, has the result that children become seriously ill and even die prematurely. It is our conviction that effective education for health can prevent much unnecessary illness and its complications and can lead to appropriate and efficient utilization of the services that are offered and be consonant with personal freedom and social values.

7. Extra-sectoral Factors:

The incidence, prevalence, duration, and severity of disease to be treated depend to a great extent on the remaining determining factors and also on the intervention points in the spectrum of health and disease. However, disease patterns and the incidence and prevalence of disease are strongly influenced by factors outside of the health sector. Clearly, health and disease are strongly influenced by the environment--physical, psychological, political, administrative, and social. Geography and climate relate strongly to the development and transmission of many diseases; e.g., malaria and parasitism. The development of agricultural production, marketing, and transportation influence the availability of food critical to the needs of the pregnant women, the growing children, and the worker. The availability and quality of housing influence the pattern and spread of disease, notably respiratory disease. In many developing countries, the increasing demand of the growing urban populations exceeds the supply of housing, employment, and urban services, complicating the existing health problems and attempts to deal with them. Consequently, it is essential to diagnose the community health situation to define and to quantify the roles played by extra-sectoral factors in the development of health and disease.

In summary, the limited resources for health frequently are not utilized most effectively for the protection and promotion of health and the treatment of disease. Working within the constraints of these limited resources, it is possible to deal with many of the problems identified and develop a more favorable health status of the population. We have sought to identify a perspective and series of criteria for the analysis of the factors determining the health status of the population, factors which are critical in the allocation of resources for health. In this paper, it is asserted that there are no easy rules for the evaluation of current resources or planning for adequate resources in health. Rather, the adequacy of resources is unique to the local situation and depends upon careful investigation of the demands for care, projections of future demand (based upon need) and the current ability of available resources to meet these needs. We have suggested that reallocation of resources, reflecting a changed emphasis, may be more effective in dealing with the problems of the community, and attention to extra-sectoral factors are essential to rational resource planning. In presenting the concept of the spectrum of health we have sought to provide a perspective on potential intervention points for the allocation of resources with identification of responsible agents. With the identification of the seven determining factors we have sought to provide a format or procedure for analyzing resource allocation in a non-technical way.

CHAPTER IV: INTER-SECTORAL PROBLEM SOLVING

In a previous chapter we reviewed the theoretical background for health planning. The application of this theory involves a number of assumptions: we hold health as desirable in its own right; health is essential to the development of individuals and of nations; decision-makers have a stake in the decisions they reach; and decision-makers are conscientious, competent individuals who will endeavor to make the most economical and effective decision within the context of available information and a system for assessing alternative actions. As previously discussed, there is great difficulty in gathering pertinent data adequate for sound decision making. This involves the definition of reality, i.e., identifying, defining, and evaluating problems as they exist. However, much problem-solving activity goes awry because of incomplete and imprecise definition of basic problems. Frequently, problems are identified intuitively as equivalent to their symptomatic manifestations. By careful analysis, however, the planners can look beyond the symptoms of problems to identify a basic operative mechanism and thereby develop effective action and resolution.

As indicated in Chapter II, this chapter will explore the basic problem of malnutrition and its manifestations in a sample developing country. Although this discussion will not cover all of the factors involved in the mechanism of malnutrition, it will demonstrate an answer to the question: "How can policy decisions be identified that will benefit the economic sectors and the health sector?" The development of this answer cuts across the traditional concept of sectors because this concept is artificial and therefore arbitrary. Effective planning necessitates crossing lines and changing the traditional boundaries of many sectors. Health is inextricably related to agriculture, sanitation, water supply, transportation, education, and nutrition.

The underlying premise is that there are overlapping areas of responsibility among sectors and that the effects of programs in one area or sector will influence the status of other areas or sectors. If these overlapping areas of responsibility are identified, it is possible to develop coordinated programs which use resources more effectively.

The following discussion presents a simple example of this for the purposes of illustration. The sectors considered in this instance are the common areas of health, nutrition, and agriculture. We have identified nutrition adequacy as a basic problem area by looking beyond its many manifestations; not solely malnutrition, but also high morbidity and lethality of childhood illness, retarded growth and development, and possibly poor mental performance. Attention simply to infectious childhood illness, though laudable, would not deal with the basic problem nor its other manifestations. In identifying the problem of nutritional adequacy, we have identified some of the causes of perceived deficiencies and have sought to determine which of these could be influenced by government policies and programs. We have therefore defined the problems and looked at some of the alternatives.

Definition of the problem: NUTRITION

Good nutrition is basic to health. In the infant and the growing child, demands for adequate calories and vitamins, and especially the needs for high quality protein, must be met first for survival and then for realization of both physical and mental potential. In the adult, nutritional status relates to resistance to disease and level of productivity.

The health status of the population is significantly lowered by prevalent malnutrition. Children and adults adversely affected as a result of poor nutrition cannot develop as individuals nor contribute effectively to the development of the economy.

Nutritional Status of the Population

The 1970 Nutrition Report of the Ministry of Health of one Republic states that approximately 15% of the population consumes less than 70% of the minimum amounts of proteins, calories, and vitamins necessary for proper growth, development, and productivity -- that is,

one person in six is malnourished. Further evidence is seen in clinical manifestations of poor nutrition. Five percent of the people in urban areas and 7% in rural areas have frank anemia, attributed primarily to iron and folate deficiency. Endemic goiter has a country-wide prevalence of 16.5%, indicating an inadequate intake of iodine.

The prevalence of protein-calorie malnutrition among children under five years of age is estimated at 60.7%. The impact of malnutrition upon children is evident in height and weight graphs. After one year of age, the children are retarded in height as judged by the national standard. At five years, this retardation equals approximately one year. The weight retardation is even more striking--the six-year-old child weighs approximately the same as a four-year-old on this conservative standard. The observation that weight retardation is more pronounced than height retardation suggests that caloric deficit in children is even more severe than protein deficit in this instance.

Nutrition and Work Productivity

Winslow cites studies in the mines of the Ruhr which showed an increase in manual labor productivity of 50% above the starting baseline productivity when the diet was changed from a minimal level to one designed for workers in heavy industry. In addition to increased productivity with the improved diet, body weight increased moderately during the year.

During the construction of the Pan-American Highway, there was considerable dissatisfaction with the productivity of the Central American labor force. Contractors felt that production was low simply because the laborers were unwilling to work. However, when three well-balanced meals were provided, the average weight of the laborers increased 10-15 pounds within a few months, and production (laying of concrete) rose from 1.8 to 5.9 cubic yards/man/day, an increase of 230%. It was felt that the dietary inadequacies of this population related directly to the lack of transportation needed to make food production practicable, accessible, and profitable. Correction of the nutritional deficits benefitted the workers and allowed construction of a road which permitted the development of a food-growing industry, the building of more roads, and opportunities for further development.

Where calorie supply is marginal, starvation may not be obvious, but malnutrition can be detected. The available calorie supply may meet the needs for survival but prove inadequate for physical development and resisting disease. Death rates from a variety of diseases have been significantly lowered as a direct result of some changes in diet.

Primary malnutrition results from a food supply inadequate to the needs of the body. This occurs partly because total production of nutritionally required foods is insufficient. In part, however, this malnutrition is due to a number of socioeconomic and cultural factors which hinder adequate distribution, accessibility, and consumption of food. Some of these factors include inadequate knowledge about nutrition, inadequate and inappropriate agricultural production, inadequate storage facilities and transportation systems, undeveloped local markets, and low purchasing power.

Activities which seek to increase the production, improve the distribution, and provide for improved quality of food are directed mainly at solving the problems of primary malnutrition. Such activities will have less benefit for those whose malnutrition is caused by disease processes, especially tuberculosis, the dysenteries, intestinal parasitism, and malaria. Secondary malnutrition caused by diseases is best corrected by prevention and the treatment of the underlying disease itself, while simultaneously correcting any dietary deficiency. In this chapter, we explore the role of agricultural production in malnutrition.

Agricultural Production

One reason for insufficient agricultural production is that not enough of the potential agricultural land is in use. Various studies differ in estimating land which might be used for agriculture. Only 3% of total land area in this country is now under cultivation. At least an additional 12% is lying fallow or in pasture land and could be reclaimed. Although cultivated soil is not especially fertile, production could be raised by developing lands not currently in use, or by improving land now in use.

Agricultural output can be significantly increased by developing new strains of crops and by improving agricultural practices. These have been responsible for a dramatic increase in banana production in the last four years in this country. However, the advances which appear so dramatic in production figures are less impressive in the face of rapid population growth. Although there has been an 85% increase in agricultural production, the per capita increase has been just over 20%, and most of that has come in the last four years. In fact, there were several years in which per capita production dropped, as is illustrated in the graph at the end of the chapter.

Almost all agricultural production is food, as opposed to cash crops. It is important to remember that production figures do not reflect actual food consumption.

Total and per capita production figures give only a rough idea of the adequacy of food production for nutritional needs. National production of high-protein foods--milk, eggs, meat, beans, and vegetables--meets only 60% of national nutritional needs. Production of grains, tubers, and fruits meets less than 90% of needs. Only corn, bananas, and raw sugar exceed nutritional requirements, and the latter two products are partly produced for export. In short, food production is inadequate to meet the minimum nutritional requirements of the population, and increases in agricultural production will be largely offset by rising population.

Barriers to Consumption

Not only is total food production inadequate for the nutritional needs of the population, but a number of social and economic factors interfere with the optimal distribution, accessibility, and consumption of the food that is produced. For most people living in a money economy or aware of the power of money while living in a more traditional economy, economic values can alter the dietary pattern by altering the choices of food. Certain generalizations can be offered:

(1) As income increases, the family gradually restructures its diet.

(2) This restructuring occurs within the context of a dietary heritage and within ecologic constraints.

(3) The rate of change depends upon the rate of change of per capita income, the availability of a variety of food choices, and other demands placed upon the available, now-disposable income.

(4) As income increases, the dietary trend is roughly as follows: marked increase in consumption of fats and sugar with moderate increase in animal protein; marked decrease in starches and vegetable fats and moderate decrease in vegetable proteins.

Because of their economic value, the country also exports many foods which could be used to improve the nutritional status of the population. While diets are lacking in eggs, 18 metric tons of eggs are being exported at almost half the unit price at which 40 metric tons are being imported. This may, however, be at least partly explained by a lack of eggs during certain seasons, thus the necessity to import eggs at a cost increased by import taxes, transportation costs, and higher foreign production costs. International economic experts have suggested that livestock be exported, although there is a deficiency of meat in the diet. Part of the reason for these export practices may be that domestic demand for these products may be less than necessary for adequate nutrition simply because many people cannot afford to buy them. In these instances, economic constraints strongly influence food availability and consumption.

Agricultural Goals for Nutrition

The country thus suffers not only from shortages in total agricultural production but also from the underproduction of foods with the highest nutritional values. Many nutritious foods that are produced are exported. These problems are compounded by lack of transportation,

lack of purchasing power, and poor understanding of proper nutrition. Not only does agricultural production have to meet the nutritional needs of a rising population, but it also has to provide produce for export to help overcome an unfavorable balance of trade. The task of setting agricultural goals within these constraints is difficult but not impossible.

As one example, corn production amounts to approximately 354% of the country's need for corn, while bean production is only 52% of the recommended need for beans. Corn has become the dietary staple because of its availability and relatively low price. Thus, demand has risen, and the agricultural goal of eliminating the small amount of imports and becoming "self-sufficient in corn" was set and reached within four years. In reality, corn is overproduced as compared to the minimal desirable nutritional standards for this country. This self-sufficiency in corn production grew from an effective agricultural financial incentive policy.

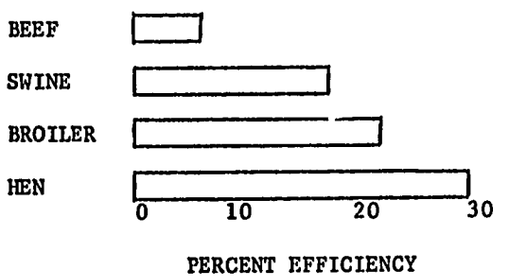
Some major changes could be readily effected, with the simple assumptions that the area under cultivation remains the same, that average yield per acre remains the same, and that acre for acre corn cultivation can be converted to edible dry bean cultivation. If corn production is reduced to 100% of nutritional need, land used for corn production would drop from 105,000 hectares to approximately 28,000 hectares. This leaves approximately 77,000 hectares for new agricultural uses. To increase bean production from 52% of nutritional need to 100%, it would be necessary to increase land under bean cultivation from 15,000 hectares to 28,000 hectares, leaving 49,000 hectares of the 77,000 hectares still available for yet other use.

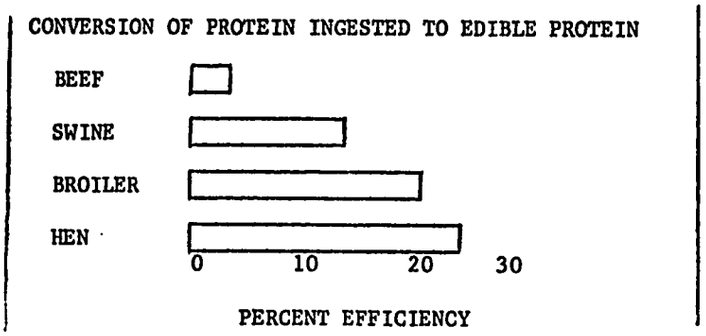
The impact of such a program would be considerable. Corn and bean production would then meet 100% of the nutritional needs for those foods. Savings on imports of beans alone would amount to about $685,000 or $900,000 annually--corn valued at $190,000 was imported in 1965, but none has been imported since that time. The nutritional value of the diet would be enhanced because beans have approximately twice the protein value of corn and beans are highly acceptable as a staple within the diet. Furthermore, this can be accomplished without any change in the efficiency of converting land to food.

In addition, 49,000 hectares are freed for other agricultural use. They could continue to be used for corn production, for export of animal feed, or converted to bean production for export. Based upon 1965 import costs ($210/metric ton for beans and $82/metric ton for corn), beans are approximately 2½ times as valuable a crop as corn. Even if corn in excess of the 100% level were desired, it might be more profitable to raise beans for export and to import corn. The 49,000 hectares could also be used to raise other vegetables to the level of need. This would entail a better transportation system so that the vegetables would not deteriorate on their way to markets.

Another alternative might be raising animal feed grains, possibly even corn, to facilitate the production of meat sources. Swine and poultry have a relatively high conversion efficiency of total feed to edible carcass and of ingested protein to edible protein, as suggested in the illustration as follows:

CONVERSION OF TOTAL FEED TO EDIBLE CARCASS





Raising chickens is already widespread in this country. Chickens are a valuable source of meat in a tropical country without food refrigeration facilities and without an extensive transportation system. In addition, the size of poultry is appropriate for family meals; poultry can be killed immediately before cooking so that there is little waste and spoilage, and poultry require relatively little room for care.

We have not presented these examples as solutions, but to point out the types of considerations which are relevent to solving the problems. The agriculturalist may, at the same time he is improving agricultural technology, have significant impact upon the economy and health status of a population. An example of the type of data which would be relevent to the agriculturalist is presented in the illustration "Number of Days of Protein Requirement" which appears at the end of this chapter. With this data, the planner may use considerations of labor, land, and resource imputs, and economic and nutritional outputs, to optimize the overlapping areas of responsibility of the agricultural and health sectors.

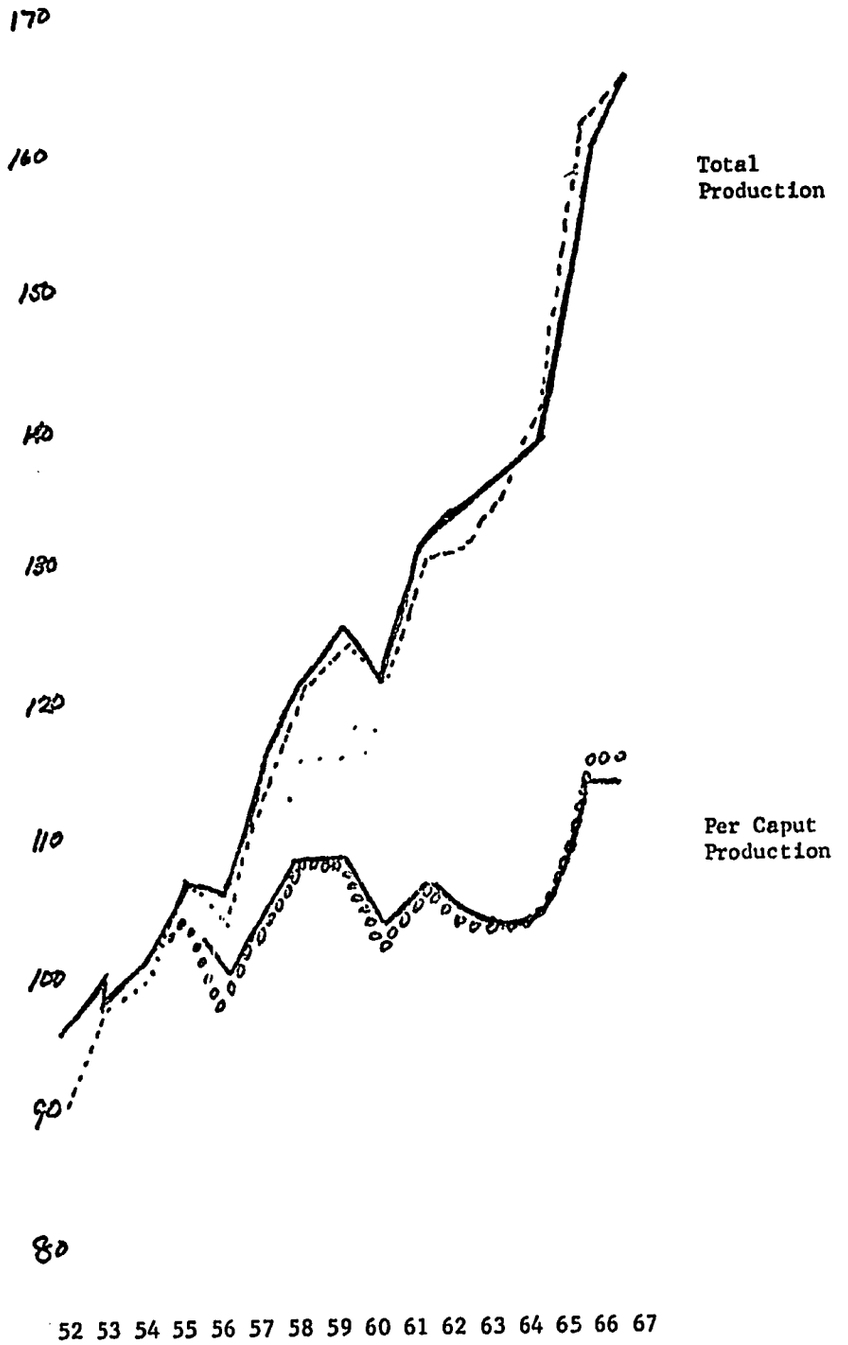
Conclusion:

It seems possible that agricultural goals can be altered to provide the basic protein-caloric needs of a country. That such a system is feasible has been demonstrated in this particular country. The current "overproduction" of corn reflects the effectiveness of a financial incentive system in the absence of evaluation. There is no system for setting agricultural goals that reflect nutritional needs.

As the example shows, there are basically two parts to our approach. The first is to define the problems at hand, and the second is to define the resources available to deal with those problems. Due to this internal consistency, it is necessary to make judgements within the context of the country. The only appropriate method of examination is to use nutritional recommendations for the country, present agricultural output figures, arable land, land presently under cultivation, etc. and to relate these parameters to the health problems and food needs. The basic premise has been that the agricultural sector exists to provide food and/or jobs and money. If it does not produce food, its money output should be sufficiently high to allow the purchase and importation of food. In the example presented neither food nor money output is optimally used.

We have presented a simple example suggesting one form of optimization of the sector relationships. This can save the country considerable money, free land for development, and markedly improve the quality of the diet and therefore the health of the population. In this context we have demonstrated that inter-sectoral planning can be feasible and productive to the involved sectors; that a government policy can be defined which can use resources more effectively with more desirable outputs, and that this can be done within the context of the culture, society, and economy.

INDICES OF AGRICULTURAL AND FOOD PRODUCTION
TOTAL AND PER CAPUT



Base 1952-56=

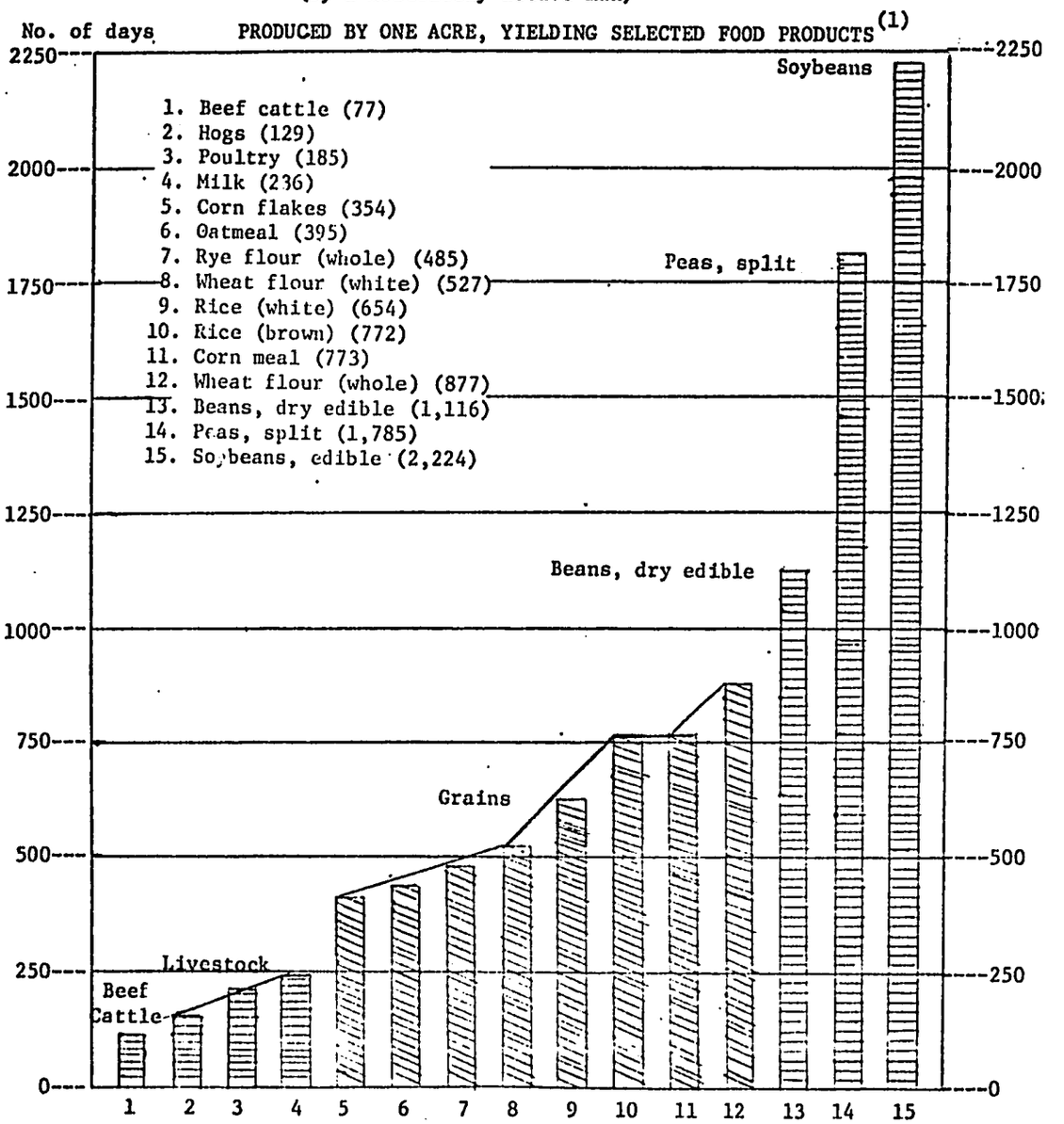
.....: Per Cap. Agric. Production

_____: Per Cap. Food Production

- - - - -: Total Agric. Production

_____: Total Food Production

NUMBER OF DAYS OF PROTEIN REQUIREMENT
(by a moderately active man)



(1) From Bean, L.H. WHO/FAO/UNICEF Protein Advisory Group News Bulletin No. 6: 20-31 April 1966

CHAPTER V: ASSESSMENT OF PROJECT IMPACT: A CONCEPTUAL MODEL

Despite the proliferation of projects which seek to help "developing" countries, there seems to be a dearth of information which adequately evaluates projects and the relevance of their outputs to the developing country. Project planning rarely incorporates predictions of project impact. Predicting outputs consists of two related components: what will the program achieve in the most immediate sense, and what effects this will have on the country, both the immediate, broad-based effects and the long-range effects.

Assuming that an agency designs and implements programs which will succeed in its goals, and that these goals will benefit the country, several things must be considered in the planning stage. There is a need for precision in defining the goals of the project and the resources needed to reach these goals; it is essential that the goals are ultimately beneficial to the country.

It is generally accepted that there is a direct relationship between health and development. Too frequently, however, administrators and health planners overlook the relationship of health to development (economic, social, agricultural, et. al.), as well as development to health. The results of such oversights can be disastrous in terms of unnecessary human suffering as well as wasted resources. Sometimes we have learned from past mistakes; frequently, however, we have not perceived the causes, and similar mistakes are repeated. In any event, expansion and development are progressing too rapidly for such mistakes to be simply learning tools. Societies have vast development packages they are attempting to implement; testing them through trial and error can no longer be acceptable. It is becoming increasingly essential for the planners to consider interrelationships between projects and the environment early in the planning stage.

Our society is more frequently demanding answers to the questions: What have you done? What are you doing? Does it do any good, anyway? Most planning and evaluation concepts emphasize the definition of objectives or goals, the development of an effective methodology for utilizing scant resources, and the subsequent measurement of change from the baseline situation according to previously defined criteria. This emphasizes the definition of objectives and the allocation of resources once a problem has been identified, or at least perceived. It does not, however, necessarily relate the project to the environment in which it operates.

It is possible, through a systematic approach, to design programs which are feasible, desirable, and for which the resulting effects on the environment become reasonably predictable. We will begin to construct a model by posing the following set of general questions about a given project:

1. What resources will the project use?

2. What resources are actually available from the proposed source?

3. What resources must be supplied from other sources?

4. What is the real environment in which the project must operate?

5. What is the environment essential to the success of the project?

6. If the project works, what are its outputs?

7. If the project doesn't work, what are its outputs?

8. What secondary effects of the project can be anticipated?
   a. What is the order of magnitude of these secondary effects?
   b. Are they desirable?
   c. What is their probability of occurrence?
   d. When will they occur?
   e. In what sectors of the society will they occur?

The Planning Process:

The development of answers to these questions establishes an operational planning system that extends beyond the intuitive skill of the decision-maker and encourages the development of information critical to his needs. The operational planning process operates within a system of previously defined priorities and goals, and usually concerns itself with the design and implementation of an identified project. In its initial stages this is a sequential process involving the study of proposed resources, analysis of the actions to be taken, projection of probable results, and the evaluation of the impact and desirability of the primary and secondary effects of the project. Finally, the process is reviewed, and a decision for action or revision is made. Once the decision-making process has been initiated, it can be thought of in terms of a decision-making tree, in which one decision creates a new situation some of which require new decisions, which again have further implications.

Once the decision for action has been made, the process repeats itself with the actual consumption of resources, implementation of the project, results achieved, and evaluation of the effects of the results. This process can be presented in the form of a dynamic input/output model which allows the analysis of a broad range of projects crossing professional and technical disciplines. In this model, scrutiny is directed at the planning process, inputs, and the outputs rather than at the project itself. There is no purpose in considering the operational methodology of a project until the effects of the project have been studied.

This illustration is presented graphically on the following page.

Inputs and Outputs:

Our consideration of inputs deals with the first two questions above: What resources are available and which are used. The inputs are those resources needed and available to the action agency; those resources under the decision-making control of the agency. Generally, this means money, personnel, facilities, and equipment, as well as an administrative system for controlling the expenditure of these inputs. Ordinarily, this administrative system is the action agency or a surrogate designated by it.

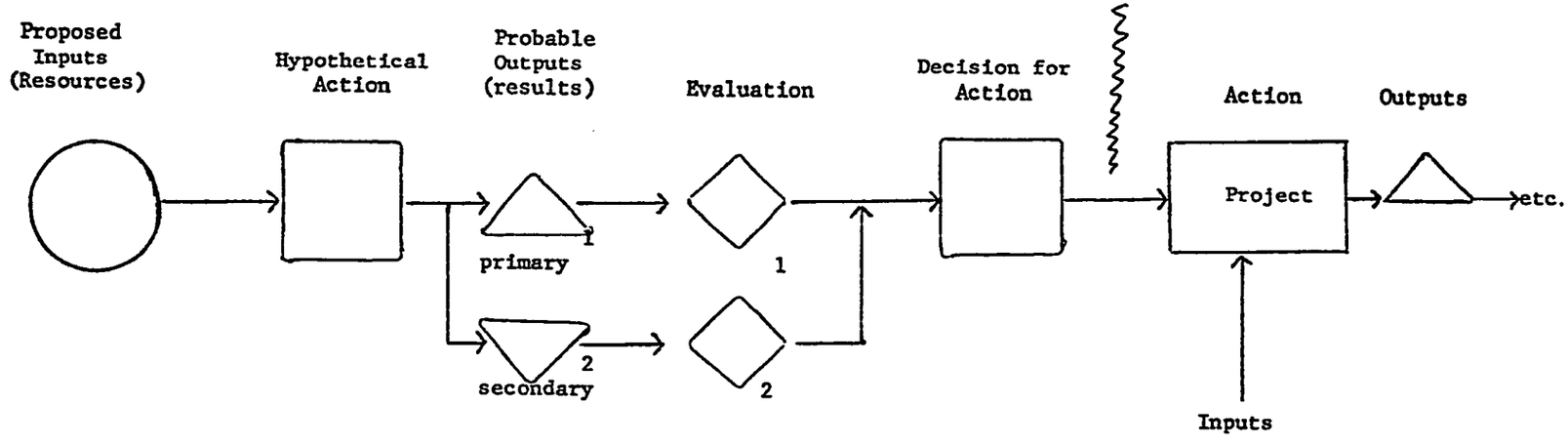
The Outputs are the immediate planned consequences (the primary effects) of the project related to some objective or goal identified within the planning system. In this sense, the outputs are the purposes for which the inputs are expended, and the project is the mechanism by which those resources are transformed into planned consequences.

Clearly, this is a simplistic representation of the relationship of inputs, outputs, and the project, and is not sufficient for the analysis of the effects of a project. It does, however, provide a basic conceptual framework from which we may operate. It is also important to recognize and define the environment--the aggregate of factors not under the immediate control of the action agency.

Projects are meant to change the state of things, presumably for the better. As a project is initiated, it changes the environment in which it operates. In the optimal situation this is a dynamic process involving the transformation of the initial environment, over time, into the desired environment. This creation of a desired environment does not always occur.

It is frequently the case that the ultimate success of a project will depend on resources which lie outside the scope of the project, in the environment. These resources must be supplied by the environment; they must be carefully identified and their availability verified. For example, a project may accomplish the building of a hospital in a developing area, only to find that there are no personnel to staff it and no funds to operate it. To avoid similar problems, attention must be directed to the third and fourth questions above: what is the real environment in which the project must operate (the operating environment), and what is the environment necessary for the project to do what is planned (the necessary environment).

THE PLANNING PROCESS



Definition of the Environment Concepts:

Although a project may have sufficient input resources to function, the outputs of the project may not be generated (or may not be desirable) because of characteristics of the environment in which the project functions. We define the necessary environment as the environment that must exist for the project to achieve its stated goals. For both theoretical and practical purposes, it is useful first to define the nature of the environmental characteristics that must be available for the success of the project. In this context we are defining the environment which is prerequisite to the project's operation and success, and then comparing this with the real situation in order to identify elements which may be lacking for the project to achieve its stated goals.

We may divide the necessary environment into six broad and overlapping environmental components: (a) physical, (b) intellectual, (c) social-cultural, (d) psychological, (e) organizational, and (f) spiritual. Any number of these factors may be operative at any given moment. Each of these components has qualitative and quantitative aspects.

(a) Physical - When we speak of the physical environment that surrounds a project, we are thinking of geography, climate, and other physical variables that impede or accelerate implementation. Factors such as the annual rainfall and the occurrence of extensive dry or rainy periods play a great part in determining the feasibility of some projects. Physical environment also includes such factors as water and sewerage systems, electric power, roads and transportation facilities, etc.

(b) Intellectual - When we speak of the intellectual environment, we want to know whether there exists sufficiently high and specific skills in the environment in which the project is to function. In addition, we want to know the quantity of such intellectual resources as well as their availability to the project.

(c) Social-cultural - Similarly with the social-cultural environment, we wish to know whether (and to what degree) traditionally and institutionally a society is amenable to the project at hand. Again, we are interested in knowing whether sufficient and necessary conditions exist for the project's implementation.

(d) Psychological - Psychologically, we must be aware of the attitudes, fears, and strengths of the people who will perform and accept the project. Traditional modes of thought as well as recent events combine to establish the advisability or inadvisability of any given action. As with the social environment; we need to know both whether the necessary psychological atmosphere exists, and to what degree.

(e) Organization - We must also be aware of the organizational capabilities present in the environment. Are there sufficient administrative, organizational, manpower, and information systems to support the type of activity we propose?

(f) Spiritual - The spiritual environment is closely associated with the social-cultural and the psychological environments. In considering the spiritual environment it is important to consider the religious and philosophical predispositions of the people for whom the project is presumably being run. If the goals of the program are inconsistent with these predispositions, those goals become ethically suspect.

It is impractical to credit the development of such capabilities to the inputs of a project because of the restrictive nature of project inputs. Money allocated for health is not likely to be spent for building roads with which to gain access to health facilities.

The operating environment: Based upon available inputs, and the definition of essential environmental characteristics, it is now possible to assess the "real" situation in order to determine to what extent these necessary resources are available. It may be found that the real situation (the operating environment) provides all of the necessary characteristics to allow the proposed project to produce the desired outputs by means of the proposed inputs. In this sense, both the operating and the necessary environments can be said to be congruent. In many instances, it may be found that the necessary and the operating environment are not

congruent. In this case, it is required either for the environment to be changed, or for the proposed inputs to be reordered to generate the desired outputs.

A health center is dependent upon the availability of a transportation system to bring patients to its location. If there is no such transportation system the health center cannot perform its function. The project must stop or fail, change the environment by convincing someone else to provide a transportation system, or change its inputs to provide its own system. Similarly, the effective functioning of a health center may require educational or informational programs. Consequently, definition of the environmental prerequisites allows a comparison of the theoretically necessary and the real environment. Based upon this comparison, the decision-maker can predict the success of his project, look toward developing realistic input predictions, and identify the environmental components which must be changed for the project to function.

The Problem of Secondary Effects:

At this point it is possible to determine whether the project will function as planned. We have set our objectives, surveyed the resources, and defined the nature of the environment as it exists and the environmental factors essential to the project. Seemingly, success is assured. However, at the beginning of the paper we said that projects are funded to solve problems and to improve the environment. If this is true, it is essential to assess the projects impact on the environment and not be satisfied merely with the immediate output of the project.

These changes in the environment are the "secondary" effects of a project--outputs which are not necessarily identified or quantified in the project's planning. The distinction between primary and secondary effects is rather arbitrary; the concept of secondary effects illustrates the fact that a project, in addition to producing pre-defined outputs, also changes the environment in which it operates. In this sense, secondary effects are logical extensions of outputs and have dimensions in time and space. They may be more or less predictable, and more or less quantifiable.

Secondary effects should be quantifiable in the following respects:

a. Planners should be able to define what the effects are

b. They should be able to estimate how large the effects are

c. They should be able to predict in what sector the effects will occur

d. They should be able to estimate when the effects will occur

e. They should be able to estimate the cost of preventing the effects, short of eliminating the project, and

f. They should be able to give an estimation of the social desirability of the secondary effects

It appears that secondary effects are not limited to the sector for which the project is intended and will cut across sectoral lines both in the present and in the future. Secondary effects are not isolated incidents and therefore become part of a "decision tree" (c.f. multiple causality in Chapter I) that manufactures an ever-increasing but self-diluting (because subsequent generations of secondary effects become farther and farther removed from the causal action) chain reaction of events.

As an illustration of these secondary effects, we might use as a project the baking of a cake. In this case, the inputs will be the actual ingredients of the cake; the program methodology and implementation will be represented, respectively, by the recipe and the actual process of mixing the ingredients; the output will be the cake, itself. There will also be secondary effects which may be more or less desirable. If the cake is baked in the winter, baking it may help heat the house; if it is baked in the summer, it may make the house too warm. The act of baking the cake will remove the ingredients from the environment,

and make it impossible to use them for other projects; it will preclude the baker from performing other tasks while he is baking the cake; eating the cake may affect his nutritional status, increasing obesity and displacing protein consumption.

Opportunity Costs:

Closely related to the concept of secondary effects is that of opportunity costs. That is to say, the expenditure of resources to achieve one end when the same resources could have been used to realize a number of other possibly more desirable ends. The concept of opportunity costs and the definition of alternative benefits and their desirability can only be studied in the context of prior identification of the basic problem areas in a society. This problem identification and analysis is an integral part of the definition of the environment.

The concept of opportunity costs, although valuable, is not universally applicable because resources are often available for only one use. For instance, priority constraints within an agency allow it to be responsive to requests in only specified areas. Even if it should receive an exceptional proposal in an area it does not fund, the proposal would be impossible to implement. These resources have restrictive tags attached to them.

To realistically assess the effectiveness and desirability of a proposed project, it is essential to determine the likely effects of the project. This is done with attention to the immediate and long-term effects in time and the local and distant effects in various sectors of the society.

The Completed Model:

The model has developed beginning with the definition of the real and necessary environments; the project then operates within the environment by consuming resources and generating outputs, but with secondary effects which have dimensions in both time and space. Seen in this manner, the model has come full circle, with the development of a new environment influenced by the project, its outputs, and secondary effects.

The model is now ready to be "run," but only with the realization that it is dynamic; hence, each successive "running" will produce different outputs, which, in turn, will result in a different real environment. Decision-makers' ability to anticipate such secondary effects and subsequent changes in the real environment determine the success or failure of a project. Obviously, much of the time this is done intuitively. However, if it is done conscientiously and systematically, decision-making can become more effective. The task of defining secondary effects is not an easy one, but if it can be done successfully, the planning mechanism will be able to function in a continuous fashion rather than on a hit-and-miss basis. The interdependency of projects will become apparent, and with this knowledge, more efficient and realistic programs may be designed.

This "running" of the model is the answering of the eight questions outlined at the beginning of this section and establishes an operational planning system that deals with the "real" environment and anticipates the consequences of action.

In the remainder of this section, we take a closer look at the input-output model, make some more specific comments about real and necessary environments, and apply the model in some real situations.

For illustration, we have selected several operating international development assistance projects of USAID. However, this model applies equally well to proposals of less broad scope, e.g., city planning, health services development, etc.

The proposed targets and course of action of the projects are quoted and accepted at face value. AID has presented only immediate inputs and outputs. We are not evaluating the methodology of the project or the efficiency with which the resources are transformed. Although very important, we are not commenting here on the appropriateness of the outputs to the "real" problem or the nature or quality of the problem identification; nor are we making value judgments regarding outputs and secondary effects.

A study of assistance projects indicates that AID is active in many sectors of Country X: housing, transportation, urban development, health-planning, and others. Encouraging as the diversity of this involvement may be, it does not necessarily ensure the greatest good for the greatest number. There is no assurance that the projects fit into a meaningful composite such that the outputs of the various projects are mutually reinforcing. Furthermore, many such projects are dependent upon factors in the environment that may lie outside the assistance scope of AID and may require action from governmental and other assistance agencies.

Accepting the fact that an agency has limited resources, it is necessary to define optimal possibilities for the deployment of those resources. Assuming that a project will perform 100% as described, we define input requirements, the necessary environment, and the likely outcomes of the project as we perceive them. Included in the probable outcome are (1) the planned outputs, and (2) the secondary effects.

In the past, there has been insufficient attention given to the secondary effects; the necessary environment has suffered the same neglect. Therefore, projects may not have been designed to meet needs or may be impossible to evaluate as to their effectiveness in the way in which resources have been used. Again, the necessary environment is thought of as those resources that must be available for the project to do what is planned; resources not under direct control of the action agency. An essential part of program implementation, therefore, will be to create the necessary environment for the program's success. Although resources spent in this endeavor may not be related directly to the project, they may still be considered as inputs and their cost included in the project's package.

Following the reasoning outlined in this paper, we have chosen four actual projects to illustrate our method. Clearly, these projects share very tangible and intangible goals. The point is that projects which would ordinarily be considered vastly different can be analyzed in much the same way. Our examples thus show that our methodology is adaptable and that our rationale can accommodate cross-sectoral evaluations of projects aimed at seemingly unrelated goals.

HEALTH POPULATION

Proposed Target and Course of Action

"The health and population proposal is a six-year, $2,000,000 project to continue to develop a program of population and family planning in conjunction with the Ministry of Health of the Government and the Family Planning Association of the country, a private organization."

Necessary Environment

1) access to the centers--economic, cultural, social, transportation
2) interest and some knowledge by population and the professionals in family planning
3) outreach mechanisms and development of community interest and participation
4) professional acceptance and utilization of community involvement
5) professional and job opportunities for the health planning professionals and auxiliaries that are to be trained under the project
6) in a program that involves so much cultural acceleration the people must be presented with tangible rewards - or they must perceive some benefit coming from their participation
7) educational and informational programs
8) some degree of congruence with social values

Inputs

1) professional and administrative personnel
2) training resources--facilities and personnel
3) medical equipment
4) buildings and equipment, water, sewerage and electric power, and maintenance systems

Outputs

1) trained professionals in health planning
2) development of community interest and influence in the operation of centers
3) family planning centers and presumably some family planning acceptors with possible decrease in birth rate among these
4) opportunity for the evaluation of the effectiveness of this kind of project in meeting its stated objectives

Secondary Effects

1) independent family planning centers direct attention to the program and may draw increased moral and financial support
2) decrease in birth rate can decrease the demand on other sectors and allow greater development
3) decrease in the number of children and child spacing improves the health of mothers, increases per capita resources within the family and may allow some women to enter the labor force
4) development of planning philosophy among the population and professionals may carry over to other activities, e.g. education, welfare, finances
5) with a major problem of access to health care and limited resources in health, the establishment of independent family planning centers will divert resources (professional, administrative and financial) away from health care, especially preventive services, to deal with a limited problem
6) independent family planning centers may draw attention to activities in family planning/population control and become controversial or disruptive if ethical or social issues become involved
7) If poorly administered, a program concerning such a personal problem could greatly harm any subsequent government program

AGRICULTURAL DEVELOPMENT

Proposed Target and Course of Action

"To support Government efforts to increase agricultural output for domestic consumption and for export while attempting to assist in formulating and improving implementation of policies designed to raise the level of income and social and economic opportunities of the rural masses. Production will be approached through increased inputs and extension of modern technological methods, tied closely to institutional upgrading under government administration. The subsistence and quasi-subsistence rural population will be approached through community development and increased attention to the marketing problems of this group. An agricultural development loan of 4.0 million dollars to be made in 1969 will focus on income increases among small, marginal producers. The life of the project is 10 years and the U.S. cost is $2,716,000 (1972 figures)."

Necessary Environment

1) agriculturalists for educational purposes
2) sympathy of farmers towards advanced technology
3) transportation facilities - roads, trucks, boats, trains
4) marketing machinery and a market
5) storage facilities
6) credit associations for farmers
7) system and climate for institutional upgrading
8) data base for planning and analysis system
9) equipment repair facilities and personnel
10) technology adaptable to climate, terrain and acceptable crops
11) governmental cooperation and continuity
12) time

Inputs

1) advanced technological equipment
2) technicians
3) equipment, repair facilities, training.
4) $2.7 million

Outputs

1) higher nutrition for population
2) better balance of trade
3) increased crop production - increased revenue
4) higher standard of living
5) more highly skilled labor force
6) community development

Secondary Effects

1) more diverse economy through foreign trade - presumably more stable
2) ability to attract sophisticated foreign industry and investors
3) sophistication of planning mechanism
4) spill-over effects of increased technology
5) diversion from crops for local consumption to crops for export may impair nutrition and reduce production
6) disappearance of small producer
7) agricultural irrigation if used may aggravate disease problems - malaria, parasitism
8) improved communications

URBAN DEVELOPMENT

Project Target and Course of Action

"A six-year, $1,544,000 project to increase the capabilities of the government and private sector of the country to meet rapidly growing demand for housing and urban development programs such as comprehensive planning for the cities, self-help and cooperative housing, privately financed low and middle-income housing, urban redevelopment and the construction of related streets and public utilities while assisting in the expeditious completion of urban short-term impact projects currently under execution. Activities under this project are linked to objectives sought under the projects for community development manpower training and utilization, labor development, government administration, private enterprise, and the proposed FY 1970 loan for strengthening interior cities."

Necessary Environment

1) road access and construction systems
2) electric power and usually gas systems
3) water and sewerage treatment plants and network
4) schools
5) health centers and services
6) police protection and traffic control
7) markets and stores
8) transportation facilities - bus, etc.
9) job opportunities for new residents
10) recreation opportunities

Inputs

1) labor force--skilled and unskilled, healthy, and adequate in size
2) construction materials
3) relocation housing for occupants of buildings to be demolished
4) $1.5 million

Outputs

1) better and safer housing
2) development of savings and loan systems
3) development of regional planning and national housing policy
4) development of concept of cooperative system (housing) for social and community development

Secondary Effects

1) improved housing environment and housing safety
2) improved health in housing-related disease - TB, respiratory disease, insect and rodent borne disease
3) improved health in sanitation-related diseases - enteric and parasitic infections, malnutrition
4) improved access to facilities and services
5) promotes growth of associated industries and services, development of credit system and planning concept
6) initially and during construction, the destruction of a social system and community breakup by compulsory relocation
7) promotion of influx of rural population to cities owing to improved facilities and services
8) population inmigration further increases the demand on other sectors - food, transportation, jobs, education, health, etc.
9) psychological and social isolation of the rural migrant attracted to the city

GOVERNMENT ADMINISTRATION AND FISCAL REFORM

Proposed Target and Course of Action

"The Government Administration and Fiscal Reform proposal is designed to increase the responsiveness and efficiency of the Government agencies responsible for (1) planning and executing programs of social and economic development, and (2) marshalling the resources necessary to support those programs. Technical assistance grant funding is sought for these activities, but plans are being developed to finance most of the project costs through an AID development loan. AID costs would be limited to direct-hire personnel and participant training categories. The total cost of the project is projected at $3,544,000. The life of the project is 11 years (1972 figures)."

Necessary Environment

1) strong executive department capable of providing impetus for the coordination of executive ministries
2) ministerial and governmental interest in reform; commitment by the government and the people to the concept and tolerance to the process of change and the inherent confusion and conflict
3) flexible and educated upper and middle level management personnel and systems
4) continuing training of lower level management personnel
5) adequate and current data systems in the various sectors to permit planning
6) adequate language capabilities for training and trained personnel
7) sufficient resources to support the programs which may be developed

Inputs

1) $3.5 million U.S. dollars
2) U.S. personnel
3) governmental money from host nation
4) personnel from host nation

Outputs

1) improved management flexibility and efficiency-upgrading of employees by training
2) improved fiscal accounting
3) development of agencies capable of planning for socioeconomic development
4) increased revenues from tax and customs enforcement

Secondary Effects

1) develop coordinated planning to optimize intersectorial effect of programs and policies of the government
2) opportunity to increase the ability to absorb and utilize effectively external assistance and capital
3) rationalization of domestic investment through the development of national policies, e.g. manpower development, education, nutrition, agriculture, trade, water and sewerage, health, etc.
4) opportunity to evaluate the effectiveness and impact of policies and programs
5) administrative and fiscal reform implies change from the status quo and a shift of power, both political and economic
6) intersectoral planning obligates the executive agencies to deal with one another and lessen opportunities for personal, professional and political recognition
7) professional government with the establishment of a civil service system can decrease the flexibility in hiring, decrease political, social or professional input and lead to employee mediocrity.
8) improved data and planning can suggest a shift in emphasis or priority that may not be palatable to certain power groups, e.g. land reform, distribution of capital, social welfare legislation, tax reform, etc.
9) over-administration and over-accounting by a highly complex auditing system may negate benefits

CONCLUSION:

The foregoing examples illustrate the application of our input/output model to functioning projects. We have provided partial definitions of the necessary environment and secondary effects. Secondary effects and outputs are displayed as different consequences of action, but they differ only in degree and not in kind. It is the thesis of this paper that in its present state, planning must necessarily consider outputs and secondary effects separately. In the future these need not be separately defined because the results of actions taken on an environment will become increasingly predictable. Insofar as this is achieved, secondary effects will become planned outputs of the program.

Even though these examples, and the model on which they are based, are oversimplifications, we feel that we have presented a useful way to look at projects in order to discover their consequences. We hope that the concepts expressed will be used as a base for further investigation.

CHAPTER VI: THE COSTS OF DISEASE AND THE COSTS OF INACTION

The impact of a disease upon a society has traditionally been considered in terms of the number of lives lost as a result of the disease, the number of ill or disabled persons afflicted with the disease, or the degree and length of suffering caused by the disease. While these considerations are essential, they do not identify the full burden placed upon the society. They also do not demonstrate the costs of inaction, which are often greater than taking action to control a problem. Disease carries certain economic costs which are borne by the society--the direct costs of prevention and care and certain indirect costs which are often borne without the knowledge of the society. The direct costs can be consciously reduced through decisions to ignore the problem. Indirect costs, however, remain the same or increase if the disease problem is ignored, so that inaction proves more costly than minimal action to contain disease. These costs can be reduced only through prevention or eradication of the disease.

In this section, emphasis has been placed upon the indirect costs in order to illustrate the magnitude of the hidden burden of disease to the society. The costs can only be presented in terms of approximate figures which are based upon reasonable and conservative estimates of situations. They also imply, but do not make explicit, the opportunity costs of allocating health-sector resources poorly. Resources used for one purpose obviously cannot also be used for alternative purposes. The realization of such phenomena is also useful when making cost/benefit comparisons of the effectiveness of health-sector resource allocations.

This presentation shows one of the techniques for dealing with the problem of resource allocation within the planning process.

There are six types of costs presented here. Some of these costs are considered in more detail than others. Specific application of the methodology is illustrated in Syncrisis: Vol. I. The general method for calculating the costs is presented as follows:

1. The direct costs of diagnosis and care:

   This includes private, governmental, and international expenditures. When no data are available to compute the direct costs for any disease to the various sectors or within any one sector providing care, the only figures which can be used are budget expenditures allocated to categorical disease problems. Although these budget allocations include some prevention funds, they understate the total direct costs as they exclude other government and private expenditures.

2. The indirect costs of lost wages and lost productivity:

   These estimates recognize that when a worker is ill enough to be reported as a disease case to the health authorities, he is not working and is, therefore, not receiving his normal salary. While it is possible that he receives some payments from insurance by the government, i.e., Social Security, he is not producing, and his lost productivity can be counted in terms of his equivalent lost wages. The many possible costs of lost wages and lost productivity are derived by combining various assumptions regarding the nature of a specific disease and the characteristics of the working population. These assumptions include a minimum daily wage; varying periods of disability; work weeks of five or six days; and a working population discounting female labor or equating female labor.

3. The indirect costs attributed to increased caloric needs of all the population, working and nonworking:

   These cost estimates are derived from the model developed by Sheldon and Pollack for the Institute for Defense Analyses (IDA). The model recognizes that febrile illnesses accelerate the metabolism and thereby exert a caloric demand which must eventually be replaced by increased food consumption. This caloric increment attributable to the disease process consumes food that is essentially wasted. The costs of the caloric increment can be assessed in terms of food in three different ways--the number of persons it could feed if reallocated, the number of working days required for its production, or its value in the market place.

The number of persons to whom the food could be reallocated is based on a daily minimum diet of 2,400 calories. For each, an average annual caloric increment per case is calculated. The caloric increment per case multiplied by the number of cases gives the total annual caloric increment for the disease. This increment is then expressed in terms of the number of man-days of full nutrition it could have provided. A man-day of full nutrition is defined as a day in which 2,400 calories are made available to one man. Alternatively, the annual caloric increment can be expressed as man-days of labor-increment nutrition. Labor-increment nutrition represents the caloric difference between full nutrition (2,400 calories) and nutrition sufficient only for basal metabolism (2,000 calories). This difference of 400 calories theoretically can convert a person at subsistance level (2,000 calories) to a worker (2,400 calories) and corresponds to the number of calories of saleable labor per person per day.

The number of working days required for the production of the food wasted by disease is figured in terms of the calories expended by the food producer. This is based upon an estimated input/output caloric conversion ratio of 1 to 16. It is calculated in terms of wasted man-days of labor-increment nutrition, assuming that each worker has only 400 calories per day for sale. From the viewpoint of the worker, this is not wasted labor, for he has produced a marketable product from which he receives his livelihood. From the viewpoint of society, the man-days of labor are leeched from an already poorly nourished society to produce food which is not effectively utilized for progress and development, but is instead essentially wasted.

The market value of the total annual caloric increase for each disease can be figured in terms of the prices of the food staples (rice, corn, or wheat) required to meet the caloric demand. However, these costs are misleading as they represent satisfaction of caloric food needs through the application of the cheapest staples without regard to the quality and composition of the usual diet. The more realistic market value of the food is based upon the minimal balanced diet as defined for that population.

The costs are based upon the assumption that had death from a given disease not occurred to the group of working-age males in a given year, the group on the average would have reached the average life expectancy. Using the age and sex distribution of deaths from a given disease, it is possible to estimate the number of years of life lost because of premature death from the disease and to calculate from this the loss of potential earnings.

5. <u>The indirect costs attributed to investment in individuals who die as a result of the disease:</u>

This includes government investments in education, childhood medical care and other programs identified as directed at children, e.g., school lunch programs, and represents wasted investments. Nongovernmental and private expenditures for the care, education, and raising of nonproductive individuals also should be included. The expected benefits of these expenditures are not realized when premature death occurs. For this reason, these costs are mentioned to illustrate a "waste" of the society's efforts. Because data are usually not available to estimate the magnitude of this investment, these costs are calculated for individual diseases.

6. <u>The indirect costs to the government through Social Security payments:</u>

In countries where such a system exists, the Social Security Fund is supported by compulsory contributions from the employee, the employer, and the government. Self-employed persons may choose to contribute. Payments made to the sick through this fund are estimated to illustrate the impact a given disease has upon a specific government organization and upon the workers and employers who support it. These costs are not included in the totals for the costs of the disease because they represent a portion of the costs of lost wages. Costs of disease to the Social Security Fund are based upon the assumption that the proportion of cases with a disease in the working-age population can be applied to the working-age population with Social Security coverage.

In summary, although there are more ways to demonstrate the costs of disease borne by a society, they all have three things in common. First, there are more indirect than direct costs, both in number and magnitude. Indirect costs almost always outweigh direct costs. Second, such indirect costs are often the result of inactivity (unconscious decision-making), which proves more costly in the long run than allocating sufficient health-sector resources to deal with disease entities. And third, although this costing methology is at best illustrative, it may prove useful in constructing cost/benefit models for evaluating projected health-sector resource allocations.

CHAPTER VII: THE ROLE OF HEALTH PLANNING IN HEALTH SCIENCE EDUCATION

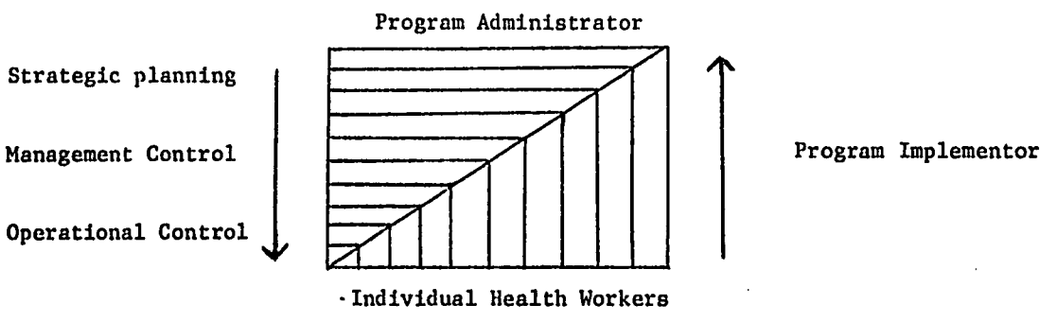
In this monograph we have stressed the importance of health planning as a mechanism to improve the health status of populations by making rational use of available resources. We have stressed the careful identification and definition of problems in health, the setting of goals and objectives through the societal decision-making process, and the investigation of alternative actions to solve the problems and meet the desired goals.

The effective implementation of a program requires understanding of the process of health planning, commitment to program goals by all members of the health team, and understanding the relationship of individual actions to the effectiveness of the program. This understanding and commitment can be achieved through education and through the subsequent participation of health teams, and the individual members of those teams, in the planning process, both locally and regionally, and at all levels of the health care hierarchy.

We have approached the general problem of health planning in a methodological way, considering goals, alternatives, and probable outcomes of our planning model. We have, in fact, used the very methodology we propose for the planning of specific programs. We have made a case for the cross-sectoral applications and implications of the methodology and demonstrated that it is adaptable horizontally. That is, the model can be applied across a broad range of programs, from health to agriculture to economic planning. It is equally clear that the model is vertically adaptable--that the same methodology which is useful and desirable at the national level for the effective planning of health programs is equally useful at every level of the health care delivery structure; that is, its applicability is not only cross-sectoral, but also crosses disciplinary and professional lines. The model may be adapted to any planning situation at any level.

The implication of the above considerations is that planning is a rational rather than a mystical process, and therefore is a skill which can be acquired through both formal and informal education. In order to structure the process of education for planning, it is essential to understand the planning function at each level in the health hierarchy. A useful framework for this purpose has been suggested by Anthony. He suggests that the planning process consists of three principal activities: strategic planning, management control, and operational control. Strategic planning is concerned primarily with decisions concerning goals and objectives; the management control function deals with the implementation of the program to carry out those goals and objectives and with quality control and evaluation; operational control is concerned with the performance of individual tasks within the program framework.

In the structure of a health program, it is clear that all members of the health team are, to some degree, involved with each component of the planning process. Obviously, agency administrators and program planners are primarily concerned with strategic planning, program implementors and project managers are primarily concerned with management control, while the individual health care workers are primarily concerned with operational control. However, these are not exclusive responsibilities, for at each level the planning activity is a combination of strategic planning, management control, and operational control with one of the three being a predominant activity at a given level. Graphically, this spectrum of involvement may be presented as follows:



To the degree that each member is involved in planning at any of the three levels of the planning process, it is essential that the individual understands and has experience in planning at that level. In addition, since planning at each level is a composite of the three planning activities, it is essential that each member of the organization has an appreciation of the planning process at all levels. It is important that administrators have a thorough knowledge and understanding of the principles of strategic planning; in order to plan effectively, they also need an understanding of management and operational procedures. The field worker needs a complete understanding of operational control, as well as a general understanding of management control and strategic planning.

Insofar as the health worker is upwardly mobile within the health care hierarchy, it becomes essential that he has a more complete understanding of the decision-making apparatus which operates above him. Although this may become perspicuous through experience, it may be desirable to provide a theoretical framework through formal education. This will provide a general context in which the individual may organize the knowledge he gains through experience. Continuing education in planning may also be desirable as the individual ascends through the planning hierarchy.

It is clear that planning, to some degree, is a function of each member of the health team. We have made the logical assertion that planning may be taught as a curriculum in general, and that it may then be applied in individual instances. This rests on the theory that any problem may be divided into two components: form and content. By learning general problem "forms," problems in many areas and disciplines may be approached and solved in a systematic and rational manner. A curriculum of this sort has the additional benefit of teaching a technical problem-solving language which will facilitate communication among many different disciplines.

Health planning perspective and methodology may be best taught by combining it with the individual health science curricula. In that way, the subjects may be brought to bear more specifically on the individual professional disciplines, providing useful and relevent theory and information at all levels of the health care structure. Such a curriculum would aim at increasing the efficiency and effectiveness of individual members of the health team, and insure that the health care system would have greater and more efficient impact on the health of the entire population.

For example, members of the health teams clearly have an important role to play in the development of manpower policy, in the definition of roles in various professional categories, and the operational planning of programs in both the clinical and community setting. Although these decisions and definitions may be made in general at the national level, they become more specific as they approach the operational level. Planning at the national level cannot be expected to be specific for every operational unit involved in a program. The responsibility, therefore, devolves onto the various regional and local teams, and eventually onto the individual health care worker. It is in the interest of the program that each worker understands the program he is working in, and that he understands the planning methodology both as it relates to him from above and as it becomes his proper function to plan his own activities in a rational and methodological manner consistent with the program goals and objectives. It is equally essential to the planning and evaluative functions that the worker has access back up the planning hierarchy. In this way, the health care delivery system becomes dynamic and increasingly efficient and effective.

The educational process in the health sciences provides a unique opportunity to teach the health planning perspective and methodology to those who will have a major role in the implementation and success of health programs and individual health actions. Although program planning has had some traditional role in schools of public health, it is clear that the health planning curriculum should be expanded to include other professional disciplines, not only doctors and nurses, but also social workers, health educators, administrators, technicians, etc.

The implementation of any program on any level, from national-public to individual-private should be carried out in the context of a rational plan for action. Ideally, this should be a goal-directed activity, where the goals are identified and the action is initiated in the context of achieving those goals.

As a microcosmic example we may consider a physician treating an individual patient. The physician assumes the role of problem-solver and health planner. He attempts to identify the problem and to help the patient plan a course of action which will effect a cure. In order to perform these tasks, the physician has been taught a scientific approach and a problem-solving methodology which he applies to individual cases. In this context, the physician assists the patient in defining goals and objectives and in providing support for the patient to achieve those goals. In most cases, the patient is the final decision-maker, acting in the context of his values, goals, and motivations upon the alternatives as identified by the physician.

This process occurs at every level of the health team. Each member of the health team becomes responsible for the definition of problems and identification of potential solutions within the context of his professional discipline. The client, whether individual patient or community, is the final decision-maker in most instances. In the sense described above, each member of the health team is a problem solver and a planner. Since each member becomes responsible for his own actions and judgements in this context (as well as for the actions and judgements of those below him in the health care hierarchy), it is clear that each member should receive specific training to fill this role. Insofar as every member of the health team is an independent actor, he is responsible for problem identification, allocation of resources, and program efficiency. This is as true for medical technicians as for physicians, for community workers as well as for program administrators. Within the limits of supervision, each worker must decide what he must do and how he should invest his resources in order to optimally contribute to the program function.

As we pointed out elsewhere in the monograph, disease may be socially and culturally defined. Therefore, it becomes necessary that the health teams' education also deal with these factors, in addition to the more technical and conventional aspects. To identify social factors related to disease is not sufficient for the physician's purpose or the patient's care. Each worker must be taught how to cope effectively with these factors. This becomes a logical extension of training in the scientific approach: it provides the capability for the individual health care worker to expand his technique of dealing effectively with social and cultural causes and manifestations of disease. This function becomes more important as we consider broader contexts of medical practice. A physician with a large private practice, for example, is continually faced with the problem of allocating man-power resources, both those of his staff and his own. Similarly, in community programs for health the same process is operative, differing only in scope. If these programs are to be effective, it is essential that the individual workers be prepared to understand and deal with the problems that arise.

Conclusion: In this paper we have suggested that the individual health care worker acts as a health planner, defining problems and potential solutions to these problems; the client, whether patient or community, identifies the value system and acts as the final decision-maker. In community and national programs, the same separation in responsibility exists. The planning function can be viewed as a composite of the three activities identified by Anthony: strategic planning, management control, and operational control. Each health care worker provides varying degrees of each of these activities. Education for health planning incorporated within the health science curriculum prepares the worker to accept this responsibility and to function effectively. Education in planning prepares the worker to be a planner according to his individual role and needs and prepares the society to accept its task as decision-maker.

CHAPTER VIII: GUIDELINES FOR MODEL IMPLEMENTATION: FAMILY PLANNING

In the foregoing chapters we have presented a model for conceptualizing the planning process. This chapter will expand and clarify that model by demonstrating aspects of the thought processes which would be necessary in planning a particular type of program. In this case, we have chosen the education component of a family planning program to demonstrate a small part of the thinking that goes into conceptualizing such an activity.

The paper presents a rationale for the need for informational and educational methodology within family planning programs. It is built on the assumption that family planning programs are desirable so long as they provide a structure allowing individual free choice. It does not discuss specific educational plans, nor does it deal with the "population control" implications of family planning.

There are several essential steps in designing a family planning program, as there are in any public health program. First, it is necessary to define the program's goals and objectives in both quantitative and qualitative terms. This results in the conscious definition of the effect projected for the program. This goal definition should be made with realistic recognition and identification of resources, performance of other programs, and activities of other programs in the same community. Further goal definition should take into account prevalent social values.

Objective criteria for evaluation of the program's performance and the ultimate success or failure should be inherent in the planning. In this context, it is desirable to define optimum performance, acceptable performance, and the minimum level of performance (that is the level below which the program would be considered a failure). Performance indicators will show the primary effects of the program such as the number of program participants and desired spacing between children. In addition, it is valuable to consider and quantify the secondary effects of a family planning program. For example, in addition to the quantitative measure of new acceptors, it might also be appropriate to consider social factors, such as improved standards of living and improved maternal and child health, which might be expected to result from a family planning program. Possible negative results, such as competition for scarce professional and material resources, should also be considered. Anticipation of these secondary effects and collection of data to evaluate their magnitude will markedly improve the quality of public programs.

Goal definition, alone, is not sufficient for the success of a program. In addition, it is necessary for the planners of a program to determine what conditions must obtain in order to achieve the goals of the program. In order to do this, they might consider the program in terms of the conditions which are necessary and sufficient to achieve the goals. That is, it is possible to list a number of conditions which are individually necessary and collectively sufficient for the achievement of the desired goals.

As an obvious example, we might examine the conditions which are necessary and sufficient in order to bake a cake: it is necessary to have the ingredients for the cake, the knowledge of how to prepare it, a pan to bake it in, and an operable oven. If all of these conditions obtain, sufficiency is achieved and the cake may be baked. If, however, one of the necessary conditions is absent, sufficiency is not achieved, and it becomes impossible to bake the cake.

Similarly, we may establish, in very general terms, a list of necessary and sufficient conditions for the success of a family planning program. Although each program will vary in scope and focus, the following conditions appear to be necessary for any program.

* Excerpted with permission of the publishers from an article in Health Educators At Work, August 1972. Chapel Hill, North Carolina: Department of Health Education, School of Public Health, University of North Carolina.

In general, it would seem necessary that the target group achieve and sustain a high motivation to plan their families; further, it seems necessary that the population have knowledge of contraceptive techniques, that contraceptive technology be available, accessible, and acceptable to them, that they know that the contraceptive technology is available, and that they use it properly. It is also essential that the health care providers understand the technology, be committed to the program goals and methods, be sympathetic to consumer needs and act to educate the consumer either directly or through an intermediary. The health educator can provide an essential service by interpreting the consumers' needs to the health providers, and by directing the educational program for the consumers. The existence of these conditions permits, but does not guarantee, the success of a program. However, by definition, it is certain that unless the sufficiency condition obtains (the sum of the necessary conditions), the program will not succeed.

Within this conceptual framework the implementation of a program must be seen as the creation of the conditions necessary for success. Clearly, from the set of necessary conditions listed above, the essential need for informational and educational components in family planning programs is demonstrated. Much of this responsibility falls on the educational community, and the health educators in particular.

Assuming that there are resources to make contraceptive technology available and accessible to a target population, the first step is to make this availability known. It is obvious that without this knowledge, the target population will not be able to take advantage of the services offered. This is clearly the role of an informational program, and may generally be approached in a traditional manner by making use of mass media and informal methods of communication. Of course, care must be taken that the information given is accurate, useful, understandable, and acceptable to the target group; that, in fact, it reaches the target group.

Next it is important that, given the resources and the knowledge of their availability, those in the target group who respond are educated in the proper use and inherent risks (if any) of the contraceptive method they choose. Such an educational program will make the acceptor aware of the choices available and aid him in making a choice consistent with his goals, attitudes, and tastes. Again, it is imperative that the information given be useful and acceptable to the individuals in the target group. It is desirable to provide information which is action-oriented and consistent with the level of education of the group involved. There is some danger of presenting a target group with too much information, which may serve to confuse or intimidate them.

First efforts in the program will reach that part of the target population already sufficiently motivated to make use of family planning services when those services become available. In most cases this represents only a small fraction of the target group. The majority may not be conscious of the relevance family planning could have to their lives, may not be ready to practice family planning, or may be unwilling or unable to practice family planning for other reasons.

The great problem the program administrators and health educators face, then, is the development of a comprehensive program to reach this portion of the population, and to deal with the problems defined above. Education or information cannot, in itself, provide motivation for these people to accept family planning. In this regard, a wide range of educational activities will be directed toward increasing the awareness of the target group to the possibilities open to them, helping the consumers and potential consumers relate family planning to the achievement of their personal goals, desires, and aspirations, and helping the consumers and potential consumers relate their own behavior to the realization of these goals. Educational programs are designed to allow and encourage the individual to analyze his aspirations, make a free choice, and to effect his own destiny.

In this regard, it is essential to note the difference between education and propaganda which is designed to manipulate the individual into making a specific choice. As we have defined it, it is neither the goal nor the desire of an educational program to change an individual's system of values; more properly, an educational system is designed to provide

the individual with additional information so he may make a free choice consistent with his system of values and goals. Factual information may alter specific beliefs, but it is unlikely to alter an individual's basic value system, it is also unlikely to alter emotionally-derived behavior. For example, a woman may not desire to use an I.U.D. because she may believe it is harmful, and she values her health. If she learns that the I.U.D. is safe, she may decide to use this form of contraception. The value she places on her health does not change, but education has altered her beliefs and her actions.

Educational programs can help establish the legitimacy of family planning activity in the minds of the target group by demonstrating that family planning is acceptable to other people--in particular, to other people who are important to the individual. Although controversial, there exists a fine line between education and manipulation; the goal of education is to present salient facts in order to allow the individual to make a free and independent decision. An educational program should not be designed to pressure the individual, but to encourage and support him.

In order to meet the conditions outlined above in the development of an educational program it is important to identify the characteristics of the target group. The health educator may define the program to give maximum exposure to this group; the information must be available, accessible, understandable, useful, and acceptable to the group at hand. To achieve this, current practice and theory demonstrate the value of including members of the target group in the actual planning of the program.

Just as it is neccesary to define the goals of the family planning program, it is necessary to define the goals of the educational component. The planners and educators should have a clear concept of what they are trying to achieve through their educational program. As a family planning program evolves, it is necessary to re-evaluate the educational focus. When the program is initiated, there will be a need to give priority to certain target groups, as well as to provide information to the general public; later, the educational component will address itself to additional program needs. Each will be analyzed, and appropriate educational methods utilized. Since the total educational program will have motivational/educational/informational components directed toward various constituents of the target group, the health educator must define each of these educational characteristics for the successful implementation of his program. To meet these defined goals becomes the actualization of a necessary condition.

We have seen that information and educational programs are essential for the success of family planning programs. In order to achieve the conditions necessary for the success of a program, there must be educational input at several levels. Obviously, education alone is not sufficient to achieve success; however, it is certain that a program cannot succeed without that input. We have presented a methodological system to assist program planners in defining their goals and objectives with consistency and in designing their educational program to meet these goals. This system requires a careful evaluation of the conditions necessary and sufficient for success, and provides the starting point toward bringing these conditions to obtain. The health educator is in the unique position to develop the specific educational technique to be used in a particular program.

This paper has sought to point out salient factors and a framework which family planning program administrators should utilize as they design their programs. There has been a wealth of research in the area of education and information; there is a great potential for more, particularly in the area of motivation. The performance of a family planning program depends directly on the effectiveness of the educational program. As we continue to develop more effective educational methods, we can expect increasingly successful and efficient programs.

CHAPTER IX: SUMMARY-TWO PERSPECTIVES IN HEALTH PLANNING

In this monograph, we have used two perspectives in planning: sectoral and inter-sectoral. Sectoral planning attempts to optimize resource allocations within a given sector; it is often construed that in sectoral planning, decision-makers are working with resources that are immediately under the control of a sector: for example, agriculture or health. However, this does not imply that all resources for successful project implementation are under the control of sectoral-planners. Chapters II and III (Health Status of the Population: Diagnosis of the Situation and Assessment of Resource Adequacy) give two aspects of sectoral planning. The ten considerations outlined in Chapter III all provide estimations of health care resources but describe only those resources within the health sector.

Inter-sectoral planning attempts to identify what effects programs in a particular sector will have on other sectors and the impact of cooperation among sectors. Chapters IV (Inter-Sectoral Problem Solving) and V (Assessment of Project Impact: A Conceptual Model) both rely on the concept of inter-sectoral planning. In chapter IV, for example, the point is made that the nutritional status of a population (the health sector) is directly influenced by the crops grown for consumption (the agricultural sector) and the patterns of trade (the economic factor).

Effective planning, therefore, requires the coordination of both sectoral and inter-sectoral planning. Delineating distinct spheres of planning is not an attempt to separate entities but to unify them into a meaningful and useful construct from which viable plans can be made, readily evaluated, and restructured according to intelligently devised success criteria.

The epidemiologic model is a tool for viewing the illnesses of mankind, whether physical or social. It utilizes the scientific method of investigation and analysis. The underlying concepts are ecologic and holistic: the health of mankind depends upon the establishment of an equilibrium between man and his environment. This equilibrium operates among: (a) the physical and social environment, (b) the genetic and experiential host, and (c) the personal behavioral characteristics of the host. The host as viewed in this model may be the single individual or a population group. Operating within this triad as mediators, or as altering forces, are sets of causes (multiple etiologies). Their influence is felt in combinations, interacting chains of events, and spiraling chains of events. Subclinical and precursor states represent deviation from the normal, but retain sufficient adaptation to maintain equilibrium. As such, they are a warning that a potential for derangement exists; one that can lead to overt illness.

The model focuses attention on the interactive processes among the variables that comprise the necessary sets of causes. It also seeks to investigate the relationships between linked systems. The model utilizes the assumptions basic to causality models, but in terms which are relative. It does not seek to negate the concepts of causality, but rather to extend their power by investigating the process of transformation of causes into effects.

All models rely on information-gathering systems in all stages of operation. Initially, there is the need for accurate assessment of the health status of a community. Without useful information, models are not relevant to problems because problems are improperly defined.

A major task in determining the health status of a population is recognizing and dealing with the limitations of information-reporting systems, especially the difficulty in discovering the disease load carried by the live population as indicated from the mortality data. There are four major considerations in diagnosing the health status of a population: 1) analysis of mortality data; 2) analysis of morbidity data; 3) analysis of disease-specific data; and 4) estimation of the coverage of the population by health and health-related services. These considerations must be applied to various age groups and populations at risk before an accurate diagnosis can be made.

The expansion of item four above (estimation of the coverage of the population by health and health-related services) is the assessment of health resource adequacy. Health resource adequacy can be assessed through the use of the following considerations: the demand for services, the problem of measuring incipient disease, the importance of disease intervention points, the characteristics of various diseases, the importance and availability of preventive services, the aspects of professional practice, the accessibility of medical care for the population, the quality of care as received, the level of health education and expectations, and extra-sectoral factors.

We have shown the role of inter-sectoral planning in a specific case which stresses the inter-dependency of actions. The example involves the nutritional status of an actual population and demonstrates that protein-calorie malnutrition is closely linked to worker-productivity, agricultural production, balance of payments, and goals for production. Through an inter-sectoral approach, it seems feasible to modify the production and consumption patterns of the population so as to provide adequate nutrition while using no more resources than before and operating within prevalent cultural values.

Models are often devised to accommodate inter-sectoral reallocations of resources of this kind. In the past, decisions about resource redistribution have often suffered from an inability to predict the impact of projects upon the environment in which the project operates. An aid to predicting this impact is the following list of eight questions.

1. What resources will the project use?
2. What resources are actually available from the proposed source?
3. What is the real environment in which the project must operate?
4. What resources must be supplied from other sources?
5. What is the environment essential to the success of the project?
6. If the project works, what are its outputs?
7. If the project doesn't work, what are its outputs?
8. What secondary effects of the project can be anticipated?

These questions make use of terms that are fundamental to the operation of an input/output model whose function is to systematize and answer them. Inputs are resources under the control of (but not necessarily available to) the acting agency. Outputs are the planned outcomes of a project. Some inputs and outputs lie outside of the control of the acting agency. Resources that are required for the success of a project but which are not under the control of the acting agency comprise the necessary environment.

The necessary environment is often not congruent with the real environment. The real environment must somehow be modified and made congruent with the necessary environment before a project will produce its anticipated outcomes. The unplanned outcomes of a project are the secondary effects, and these change the real environment, i.e., the unaltered situation to which the project was applied. Insofar as secondary effects can be predicted and controlled they can become the planned outcomes (outputs) of a specific project.

The cost of a project is generally figured in the amount of resources consumed. Diseases may also be thought of as projects which consume resources, both in the direct costs of programs which deal with disease entities and in the indirect costs of ignoring a disease. The indirect costs are often borne by a society without its knowledge and are frequently considerably more than minimal preventive and/or curative actions. Some of the direct and indirect costs of disease useful as illustrations are:

1. the direct costs of diagnosis and care
2. the direct costs of Social Security payments
3. the indirect costs of lost wages and productivity
4. the indirect costs of the increased caloric needs of ill people
5. the indirect costs of the loss of productivity owing to premature death caused by disease
6. the indirect costs of the loss in investing schooling and other social services in people who die before they become productive

Most of these indirect costs are the result of unconscious decision-making by avoiding or refusing to deal with a disease entity. The price of inaction is therefore greater than minimal action. In this instance, not to decide is still to decide.

Education is the key to successful health planning. We view the importance of health planning as a mechanism to improve the health status of populations. Effective health planning demands the participation of health workers at all levels of activity. We have applied Anthony's model to health planning. He has defined three levels that operate in planning systems. They are:

1. strategic planning
2. management control
3. operational control

These three levels operate within the health planning hierarchy, and education is necessary as the individual ascends through this hierarchy.

Education, coupled with an information system, also plays a major role in the effectiveness of programs such as family planning. Given the assumption that family planning is based upon individual choice, we define five basic steps to a successful program.

1. defining goals quantitatively and qualitatively

2. defining success criteria for the project

3. defining the necessary conditions that must obtain for the realization of the project's goals

4. defining the sufficient conditions that must obtain for the realization of the project's goals

One outstanding and elusive "necessary and sufficient" condition for the success of health programs in general and family planning programs in particular is motivation of the population. One of the greatest problems is reaching that portion of the population not already motivated toward family planning (for example) while holding the individual values of the people in this population constant. Re-evaluation is imperative in family planning and in all health programs.

This monograph asserts that parallels exist between individual and community actions, and that the same intuitive steps that individuals take in problem solving can be quantified and applied to decisions affecting populations. We define the role of the health planner as identifying and quantifying problems to be submitted to the planning process; we also see his role as exploring alternative solutions to problems and making these solutions available to socially determined and sensitive decision-making bodies. We do not see the health planner as a decision-maker. Decision making is the role of society at large and demands the careful analysis and consideration of social values and priorities that often lie outside of the health sphere.

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