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THE ECONOMICS OF HEALTH, EDUCATION, AND COMMUNICATIONS IN DEVELOPING COUNTRIES

by

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Chapter I

INTRODUCTION AND OVERVIEW

Our main goal in writing this paper is to investigate the relationship among health, education, communication technology, and national development from an economic perspective. In this context the main direct association investigated is that between health status and economic development. Education is viewed as a means of influencing health status of individuals, whether through the training of health care personnel, such as physicians, nurses, and aides, or through education to the major portion of the population. Education to the population may be oriented toward a variety of topics such as nutrition, birth control, personal hygiene, community sanitation. In many developing countries, which is a focus of this paper, education is also oriented toward the breakdown of cultural barriers that retain the importance of native curative techniques and the subsequent build-up of reliance upon personnel trained in modern medicine.

Education strategies are constructed in one of two basic structures: the formal education system and non-formal settings. Formal education is viewed as being a structured program administered on a regular basis and usually offering some type of degree or certification upon completion. This is the typical choice for training of health care personnel. Education for the general population in this setting is often relegated to some portion of a larger, more diverse curriculum such as one usually found in elementary, secondary, and university education. Non-formal education is usually directed toward persons who are not participating in the formal school system, either because of age, access to education, or economic pressures to drop out. In many respects health education must be directed toward this group as family decisions regarding nutrition family size, use of medical facilities, and hygiene, and community decisions regarding general sanitation projects and support of medical facilities, will be made by the adults rather than the school-age children. However, a concentration on health education to adults only

is a problematic strategy. Education must compete with many other demands on the time of adults and must combat life-long habits. Those participating in formal education have fewer outside demands on their time and at younger ages will be more willing to accept health education in areas for which they have not yet established habits.

For any of the education formats described above, communication technology is typically regarded as an alternative delivery system for the information contained in the health education programs. A variety of social science and technical approaches may then be used to determine a number of system features: when, in terms of costs and impacts, a communication technology system should be used; who should receive the instruction; what type of specific curriculum should be delivered by the communication technology; which levels or types of education or regions of the country should participate in the communications technology system; and how, in both an engineering and administrative sense, can the communication technology system be best structured and implemented.

When viewed in this manner, one has managed to construct a very disaggregated approach to policy decisions. The structure of economic analysis in this context is to provide information to the decisionmaker on the economic feasibility and superiority of a communications technology system as some alternative education delivery system. Clearly, this decision is related to the economists' analysis of how education and health are related to national economic development. This approach, which is disaggregated and sequential, leads one to conclude that it is possible to undertake major health status changes through the choice of an appropriate educational delivery system and that, given a demonstrated relationship between health status change and productivity, this choice will increase national economic development.

This microeconomic type approach, even though it treats the relationship between education and health decisions on one hand and economic growth on the other hand, generally ignores the national and international economic structure in which decisions take place. As we describe in greater detail in later sections of this paper, microeconomic analysis generally takes the distribution of and accessibility

to resources as given. Therefore, for example, if one teaches people about nutrution, and knowledge gains can be observed, and one can then establish a relationship between nutrition and health status and between health status and economic development, the problem is solved. The only need is to choose the best delivery system for nutrition education. The essential elements missing are, however, very important to understanding the context of nutrition education: the economic structure that leads to a nutrition problem in the first place and the accessibility to food to solve nutrition problems. In analyzing choices of delivery system, one is in essence dealing only with symptoms of problems rather than underlying causes. A rudimentary study of policy analysis reveals that one can only solve problems by working on causes.

Despite this explicit precaution to economic analysis, we devote the bulk of our efforts in this paper to discussion of the microeconomic approach and specific problems inherent in it. A smaller portion is devoted toward an understanding of the overall structure in which health education decisions are made. The major reason for this is an acquiescence to the reality that most decisionmakers have limited control over the effects of their decisions, and that without major social change one tends to rely on incremental analysis. Therefore, we feel it important to understand the economic approach to decision analysis, the associated research methodology, and the specific problems with each.

In the remainder of this section, we provide a discussion of the organization of the paper and a brief summary of the following sections.

In Chapter II we present a discussion of the major health problems experienced within developing countries. This discussion is centered on specific symptoms of the health problems and statistics on health status such as incidence of disease, malnutrition, life expectancy, infant mortality, health spending patterns and availability of medical facilities and personnel. In essence, this type of data provides the framework in which one analyzes and solves health problems. It is the particular orientation that one takes that is important in solutions.

One approach is the type of health interventions discussed in Chapter III in which the concentration is on specific ways of interfacing the health system with the general population. In this section, we

discuss some of the main differences between curative and preventive measures for handling health problems. Some of the social forces that lead to an emphasis on one form of intervention vis-a-vis the other is also discussed.

In the second part of Chapter III the different type of health education strategies are discussed. The major recipients of health education are health care personnel and the general population, with the former usually involved in formal education systems and the latter in formal or nonformal structures. A model describing the relationship of health education to health status is also described.

An approach is presented in Chapter IV as an alternative to that presented in Chapter III, in order to deal with the type of health problems raised in Chapter II. In Chapter IV, we discuss the social context of health care from a national and international perspective. From a national perspective we analyze the consistency of the health care structure with the national economic structure. Societies generally seek stability by establishing consistent structures in all social institutions. Additionally, the national economic structure will affect the incidence of diseases and other health problems and will provide constraints for possible solutions which may be constructed. The international economic structure also leads to potential problems within countries and provides constraints on solutions. The predominant forms of international economic intervention are through world agriculture policies, and investment by multinational corporations in developing countries.

For the remainder of the paper, we focus almost entirely on the microeconomic approach. In Chapter V, we provide a detailed discussion of microeconomic analysis in four specific areas of importance in the delivery of health care or health education: demand, cost, cost-effectiveness and cost-benefit. Demand analysis is used to provide an understanding of public desire for and capability to participate in health care or education systems. Budget constraints often force decisionmakers to be concerned with cost analysis. In the absence of effectiveness or benefit information, cost analysis uses basic service level measures and estimates costs of alternative means of providing

the service. In cost-effectiveness analysis one combines the cost analysis of the previous technique with changes in health status. In cost-benefit analysis these health status changes are translated into specific economic changes. For each of the four analytic techniques we describe the basic economic methodology, the types of models used, the items measured, and the problems with the technique.

In Chapter VI, we discuss some of the more important societal issues related to these microeconomic approaches: the relationships among health, education, and economic growth. In these sections we analyze measures and models of national economic growth and the ways in which changes in health status and education can both increase and decrease growth.

In Chapter VII, our attention is directed toward a specific delivery system for health education and health care: communication technology. We analyze the types of communication technologies and some of the major advantages and disadvantages to these and how the usually high initial investment costs affect both the methodology of Chapter V and potential social impacts.

We also provide a brief summary of the use of communications technology in health education projects in developing countries.

In Chapter VIII, we discuss the basis research methodologies used to answer the questions raised in the microeconomic approach. Specifically, we examine experimental design, econometric techniques, and measurement problems.

Chapter II

THE HEALTH PROBLEM

Severe health problems exist throughout the developing world although the magnitude of the problems differ among countries according to a variety of social and economic factors. In this section we analyze several manifestations of the health problems: resource availability for health care in terms of per capita health expenditures, the physician-population ratio, and the hospital bed-population ratio; longevity, infant mortality, and birthrates; disease incidence; and malnutrition. We conclude with a discussion on the manner in which many of these situations are interrelated and lead to a magnification of health problems in developing countries.

A. Spending for Health

Per capita spending on health is usually significantly lower in developing countries than in developed countries. Jordan (1977) reported that a World Bank survey of 65 developing countries revealed that these countries typically had government financed health expenditures of one percent of gross national product (GNP). Comparable figures for developed countries range anywhere from four to seven percent. Combining this higher percentage allocation with significantly higher per capita GNP in developed countries leads one to extraordinary differences in absolute levels of spending. These differences are illustrated in Table II-1, which presents the expenditure data reported by the World Bank (1975) for several countries.

The higher health budget as a percent of GNP per capita combined with higher GNP per capita lead to per capita health spending levels of, for example, $105.16 in the United Kingdom, $180.00 in the United States, $0.80 in Brazil, $3.74 in Bolivia, and $10.10 in Jordan. As Gish (1970) and Sorkin (1976) pointed out, major increases in the percentage of the budget devoted to health spending in developing countries would do little to close this gap. For example, Sri Lanka has virtually the same

Table II-1

GOVERNMENT HEALTH EXPENDITURES

Country	Health Budget as % of Gov't Budget	Health Budget as % of GNP	Gov't Health Expenditure per Capita
Rwanda	8.7	0.8	$ 0.45
Ethiopia	6.9	0.8	0.67
Sri Lanka	8.1	3.6	3.76
Haiti	13.7	0.7	0.78
Kenya	6.4	1.2	0.14
Bolivia	3.6	2.0	3.74
Egypt	8.4	1.8	3.91
Jordan	9.5	2.8	10.10
Turkey	21.4	2.6	8.21
Brazil	1.4	0.2	0.80
Yugoslavia	38.2	10.1	73.75
Venezuela	18.4	4.1	43.18
USSR	5.8	3.4	47.04
United Kingdom	9.5	4.3	105.16
United States	20.0	7.7	180.00

Source: World Bank (1975)

percentage budget allocation to health spending as the USSR but winds up with an absolute spending level of less than 10 percent of that in the USSR. In fact, it is reasonable to expect that in the foreseeable future the gap in absolute spending levels will increase. Even if developing countries rapidly increase the percentage of GNP spent on health (at the cost of foregoing alternative government or private spending) and experience a higher GNP growth rate than developed countries, the higher population growth rates in developing countries and the smaller percentage increases of a much larger initial spending on health in developed countries will result in the gap widening.

The health spending gap is increased between developed and developing countries by the probable differences in private spending. Table II-1 only reports information on government health expenditures. The large amount of private health spending, particularly in countries with private insurance plans such as the U.S., will significantly increase the gap. Furthermore, differences in income and willingness to allocate income to health expenditures will also tend to increase the gap.

There are two factors that lead to the gap appearing larger than it may be in reality. Differences in wage structures for physicians, as evidenced by a large migration of physicians to developed countries (World Bank, 1975; Sorkin, 1976) will lead to an overstatement of the gap for the same input of physician time. This inflow of foreign medical graduates from developing countries to countries like the U.S. result in a subsidization of health training for developed countries. The influx of trained physicians leads to the need to devote fewer resources to medical training and an overall reduction in medical expenditures for developed countries.

A second factor that would lead to an overall reduction in the gap is the likelihood that much of the health spending in the affluent countries is unnecessary. For example, the U.S., with perhaps the highest per capita health spending in the world, ranks fifteenth in infant mortality and twentieth in longevity. However, these relatively poor statistics may be a result of the distribution of these expenditures within the U.S. or environmental factors that increase disease incidence. Furthermore, the medical structure in the U.S., including government payments, private

insurance plans, and physician control of hospitals, creates incentives for excess use of health facilities.

B. Resource Availability

The difference in spending patterns for health may be further seen in the availability of health facilities in different countries. Sorkin (1976) reported that there were 1.2 million physicians in developed countries and 300,000 physicians in developing countries. Large differences in population between these two regions result in very large differences in population-physician ratios. In fact, the U.S. with five percent of the world's population has 350,000 physicians. Table II-2 gives the ratio of population per physician and per hospital bed in several countries.

By comparing resource availability in Table II-2 with spending in Table II-1, one can see that spending is not necessarily a good predictor of medical care in terms of the physicians and hospitals available. For example, the USSR has one-fourth the government health spending of the U.S. (the proportion would diminish if private spending were included) and nearly double the availability of physicians and hospital beds. Similarly, Jordan with 10 percent of the spending of the U.K. has 25 percent as many physicians available and 15 percent as many hospital beds.

Clearly, the data in Table II-2 is very incomplete from the standpoint of the wide range of facilities that are typically utilized. For example, the cost of training physicians and the small number typically available in most countries has led to a consideration of training paraprofessionals. Caldwell and Dunlop (1977) reported on the average ratio of paraprofessionals to physicians in nine Latin American countries and 18 African countires. Dividing these countries into 14 high income (average GNP per capita of $360) and 13 low income (average GNP per capita of $105) countries, they reported that the high income countries typically had an average paraprofessional to physician ratio of 5.0 and low income countries a ratio of 9.0. A higher ratio indicates fewer physicians and more substitution by paraprofessionals.

Table II-2

PHYSICIAN AND HOSPITAL BED AVAILABILITY[1]

Country	Population per Physician	Population per Hospital Bed
Rwanda	52,763	771
Ethiopia	73,750	3,124
Tanzania	23,967	625
Kenya	8,914	805
Sri Lanka	3,681	335
Thailand	8,041	972
India	4,399	1,980
China	8,142	1,000
Japan	864	97
Jordan	2,822	706
Egypt	1,516	478
Turkey	2,016	488
Brazil	1,811	282
Bolivia	2,487	561
Venezuela	925	344
USSR	369	86
United Kingdom	756	106
Canada	581	142
United States	616	150

[1]Data is from 1973 except: U.S. physician data is from 1974, U.S. hospital bed data is from 1976, Canada physician data is from 1976, and Canada hospital bed data is from 1975.

C. National Health Statistics

The health problems associated with health expenditures and resource availability may be seen in the health statistics typically reported: life expectancy, infant mortality, and general mortality. Additionally, data for birth rates and population growth are sometimes seen to give an indication of some of the overall impacts of population health status. These five types of data are reported in Table II-3 for the same countries as reported in Table II-2.

In Table II-3, one can see striking differences between developed and developing countries in terms of mortality statistics. Life expectancy at birth in the developing countries is only 60-70 percent of that in developed countries. Additionally, infant mortality rates are between five and ten times as high as developing countries. In comparing the data from Table II-1, II-2 and II-3 one can see that there is not a clear relationship between spending and resource availability and health statistics. For example, Venezuela with four times the number of physicians and ten times the per capita government health expenditure as Sri Lanka has the same infant mortality rate. Egypt with twice the number of physicans and hospital beds per capita (but only 40 percent of the expenditures of Jordan) has an infant mortality rate five times higher than Jordan. India has twice as many physicians and half as many hospital beds as China, but a life expectancy only 65 percent that of China and an infant mortality rate that is more than double. Birth and death rates for all countries show major differences in population growth. Whereas, death rates in developing countries have been brought closer to the level of developed countries, birth rates remain more than three times as high, contributing significantly to higher population growth rates in developing countries.

The improvement in both general and infant mortality rates is shown by Sorkin (1976) in a comparison for several developing countries over a 28-year span from 1943 to 1971. For the eight countries analyzed (Chile, Colombia, Guatemala, Jamaica, Egypt, Mauritius, Thailand, and Singapore) mortality rates in 1971 were one-half to one-fourth of that in 1943, and from 25 to fifty percent of the decrease had been accomplished after 1960.

Table II-3

NATIONAL HEALTH STATISTICS

Country	Year of Data	Life[1] Expectancy at Birth	Infant Mortality (under 1 year) per 1000 popula.	Birth Rate per 1000 population	Death Rate per 1000 population	Population Increase (in %)
Rwanda[2]	1970-75	41.0	132.8	50.0	23.6	2.6
Ethiopia	1970-75	38.1	84.2	49.9	25.8	2.4
Tanzania	1967	40.5	162.5	47	22	2.5
Kenya	1970-75	48.9	51.4	48.7	16.0	3.3
Sri Lanka	1972	65.8	45.1	29.5	7.7	2.2
Thailand	1970-75	56.1	21.8	43.4	10.8	3.3
India[2]	1973	41.2	12.2	34.6	15.5	1.9
China	1970-75	61.6	55	26.9	10.3	1.7
Japan	1973-74	73.7	10.8	18.6	6.5	1.2
Jordan[2]	1970-75	52.3	21.9	47.6	14.7	3.3
Egypt[2]	1974	52.7	100.4	35.5	12.4	2.3
Turkey	1967	53.7	153.0	39.6	14.6	2.5
Brazil[2]	1970-75	59.3	94.0	37.1	8.8	2.8
Bolivia	1970-75	46.8	77.3	44.0	19.1	2.5
Venezuela[2]	1970-75	66.4	46.0	36.1	7.0	2.9
USSR	1973-75	69.0	27.7	18.2	9.3	0.9
United K.[2]	1974	70.8	16.3	13.3	11.9	0.2
Canada	1976			15.8	7.2	1.0
U.S.A.	1976	72.8		14.6	8.85	0.7

[1] Average for males and females.

[2] For these countries life expectancy data is from five to ten years earlier than that reported for the other data.

D. Disease Incidence

While mortality rates have dropped and birth rates remain high, these rates, as Myrdal (1968) pointed out, do not present a sufficient understanding of the health problems faced in developing countries. Debilitating and widespread disease affects great numbers of people and presents a serious block to development in many countries. Additionally, diseases contribute to large numbers of deaths. Bryant (1969) reported that one-third of the deaths of children under five in Latin America are a result of diarrhea. Modern medicine and major curative health expenditure increases will not likely have major impacts on this problem. For this and many other diseases, expenditures should most likely be directed toward preventive measures. For example, Sorkin (1976) suggested that a decline in preventive measures has resulted in increases in trypanosomiasis (sleeping sickness) and malaria.

Chang (1971) reported on the annual number of cases and deaths attributed to certain specific diseases throughout the world in the 1960's. There were 150 to 200 million cases of malaria and in one percent of these cases, death resulted. There were 15 to 20 million cases of tuberculosis with 15 percent of the cases resulting in death. Schistosomiasis results in the infection of 180 to 200 million persons annually and is regarded as a severely debilitating disease. Trachoma, which affects 400 million people, can result in total blindness in one percent of the cases and severe vision loss in 14 percent of the cases. Chang (1971) also reported that 500 million people suffered diseases each year from the use of unsafe water. Caldwell and Dunlop (1977) in their survey of Latin American and African countries revealed that clean water was accessible to only 50 percent of the total population in relatively high income countries and 15 percent in low income countries. Additionally, the accessibility rate in rural areas for all countries tended to be one-half of the national averages. Additionally, Blanca and Graham (1974) reported that low income persons in Peru spent 2.7 percent of their income on water, whereas, higher income persons spent only 0.7 percent. As reported in Section II F below, disease also leads to malnutrition, food loss, and land loss.

E. Malnutrition

Perhaps one of the most serious problems for developing countries is the widespread existence of malnutrition. Chang (1971) reported that 300 million pre-school age children suffer from malnutrition. Puffer and Serrano (1971) in a study of selected areas of Latin American countries reported that malnutrition resulted in five percent to 15 percent of the deaths of children under five and was an associated cause of death in 30 percent to 60 percent of the cases. Calories and protein requirements vary, depending upon individual needs, from an average of 1300 calories and 23 grams of protein per day for infants to 3000 calories and 56 grams of protein for active, growing males. In certain manual labor situations in hot climates the calorie requirement increases sharply. In addition, pregnant women require 300 more calories and 30 grams more protein per day than non-pregnant women (the normal requirement is 2000 calories and 46 grams). Lactating females require 500 more calories and 20 grams more protein than the normal level. In the countries studied by Caldwell and Dunlop (1977) an average per person calorie availability of only 2200 was found and the likely unequal distribution of this amount, will cause serious problems for a portion of the populace. Schuftan (1977) reported an average daily calories deficit of 100 to 200 calories in Tanzania.

Malnutrition affects children in several basic ways: reduced brain size, reduced physical size, and increased susceptibility to disease. Additionally, malnutrition of pregnant and lactating women result in damage to the fetus. There is some disagreement on the link between malnutrition and brain and physical development due to an inability to separate malnutrition effects from other associated social and economic characteristics. Sorkin (1976) reported that most brain development takes place from 30 weeks of gestation to 18 months postnatal. Sagan (1977) in an analysis of human intelligence also discussed a link between nutrition and early brain development. Malnutrition in infants can be extremely important, as Cravioto (1966) reported that the effects of malnutrition experienced up to the age of six months is not reversible, although after six months children appeared to be able to recover given a steady nutritious diet. Scrimshaw (1967) and Winick and Rosso (1969) reported that the effects of malnutrition before the age of

two would not be reversible and that malnutrition was linked to brain size. Sagan (1977) argues that there is some associationship between brain size and intellectual development. The interrelationship of malnourishment and brain development is also supported by the work of Stock and Smythe (1968), although they did not control for other factors associated with malnutrition. Additionally, Kugelmoss, Poull, and Samuel (1944) reported that treatment for malnutrition especially in early years resulted in IQ score increases ranging from 10 percent to 18 percent.

Moreover, several other studies indicate a relationship between malnutrition and child development (Cravioto and Robles, 1965; Cravioto and De Licardie, 1968; and Monckleberg, 1968). Gopalan (1958) reported that 90 percent of the lower SES children studied in India were in the lower 10 percent of physical size. Jelliffe (1966) also pointed out that malnourished children would be of smaller physical size. However, many of these studies did not control for other factors. Kallen (1969) acknowledged that severe malnutrition was associated with reduced intellectual capacity. However, a clear relationship had not been established between mild or chronic malnutrition and intellectual capacity. He felt that lower performance of malnourished children was due to associated malnutrition effects such as, lethargy and apathy and that this limit on a child's performance led to reduced desire to achieve. Given that the studies linking malnutrition with development were linked to lower economic status, Kallen asserted that apathy could come from either source. Therefore, increasing nutritional standards for low-income children would not necessarily eliminate the other causes of apathy and hence, not necessarily increase performance.

The general result of research into the development of the human brain is that malnutrition leads to a permanent loss in brain development during brain cell division (the approximate span of 30 weeks after conception to 18 months of age) and that after this period malnutrition would reduce brain cell size (not necessarily irreversibly). Therefore, it is clear that malnutrition of pregnant and lactating women leading to malnutrition of the child and malnutrition of infants is likely to lead to a situation in which social advancement would be difficult, even if all other social factors did not prevent low

income children from moving upward in society.

Belli (1971) made the point that countries would experience substantial economic returns from reducing malnutrition in pregnant mothers and infants. While these economic returns will be discussed in more detail in Section V-E, the nutrition of the mother has been identified as a key problem in a number of studies. The report from the International Conference on Nutrition Education (Kreimer, 1977) reported that protein deficiency of pregnant women in Thailand led to below normal birthweights of 2.5 - 2.6 kilograms in low income families and 3.0 kilograms in higher income families. Chapra, Camacho, Kevany and Thomson (1970) also discussed as association between maternal nutrition and birthweights and infant mortality. Dayton (1969) reported that while more research was needed to determine whether a severe or chronic malnutrition of pregnant women was important, the evidence from many studies supported the notion that lactating mothers would need dietary supplements after children reached six months of age.

F. The Relationship of Nutrition and Disease

Perhaps one of the more important impacts of malnutrition is its interaction with disease. Many authors in discussing this relationship term the effect synergistic in that malnutrition leads to increased severity of disease and disease lead to increased severity of malnutrition. Sorkin (1976) stated that two-thirds of the 800 million children in developing countries encountered sickness or disabling disease that was brought on or aggravated by malnutrition, specifically, protein-calorie deficiencies. Kallen (1969), Gordon (1969), and Scrimshaw, Taylor, and Gordon (1968) all reported that higher disease incidence, diseases of longer duration, and increased fatality from disease were associated with malnutrition. Additionally, it was stated that disease intensified the malnutrition. Scrimshaw (1961) argued that malnutrition led to higher disease incidence by decreasing the person's defense mechanisms and increasing the susceptibility to infection and the probability of secondary infections.

As pointed out by Gordon (1969) and Kallen (1969) the interaction of diarrhea and malnutrition have created particular problems for young children. In deaths due to diarrhea Puffer and Serrano (1971) found that in Latin American countries malnutrition was an associated cause in 40 percent to 70 percent of the cases. This statistic may indicate that with appropriate nutrition many of these deaths may not have occurred.

Disease increases the malnutrition problems by increasing the body's need for nutrition. For example, chills associated with malaria can increase caloric requirements to 5000 calories per day. Respiratory tuberculosis increases calories requirements by 20 percent. Dysentery, due to the inability of the body to absorb food, increases requirements by 40 percent. Clearly, in situations where caloric deficiencies already exist the increased need for food in illness will result in an exacerbation of the malnutrition problem. Sorkin (1976) reported that overall disease led to a food loss of 20 percent in terms of food ingested but not absorbed. Malnutrition, through the inavailability of food, can also be aggravated by disease by a reduction in agricultural output through disease as discussed by Malenbaum (1970).

The possibility of disease has also resulted in the loss of large tracts of agricultural land. Hughes and Hunter (1970) reported that a reduction in trypanosomiasis would open lands in East Africa to cattle grazing. Nash (1974) reported that the eradication of malaria in the Rapti Valley of Nepal opened tracts of fertile land for agriculture. This was an especially important effect as the labor effort to cultivate 10-12 acres in the valley was the same as required for 2-3 acres in the mountains. Hunter (1966) reported that incidents of onchocerciasis, a severely debilitating disease that often leads to blindness, led to population emigration from fertile lands in Ghana.

The problems of health in developing countries are severe and complex. Simple resolutions are not possible. As briefly mentioned in this section, many of the serious problems of disease and malnutrition are correlated with socio-economic status. In addition, agricultural policies and food distribution also lead to malnutrition. While all of these areas must be effectively attacked to eliminate health problems we turn our attention in the next section to different types of specific health interventions.

Chapter III

HEALTH INTERVENTIONS

A. Health Care Strategies

Curative and preventive health care strategies are the two basic forms of health intervention in a society. Curative strategies are basically those which treat persons who have contracted some form of disease or severe malnutrition. Curative practices include most expenditures on hospitals, medical centers, medical equipment, physicians, and paraprofessionals. Preventive measures include inoculation, disease eradication through eliminating environments conducive to parasites, education for better personal health care, and medical personnel and facilities devoted toward early disease detection or situations that may lead to disease. Typically these facilities and personnel are the same as used for curative procedures, and it is unclear if any of the statistics reported below divide hospital or personnel expenditures between the two basic health care methods. What is clear, however, is an overall bias toward expenditures on curative care. As Sorkin (1976) stated, the bias in most countries is toward expensive hospitals and medical personnel concentrated in urban areas, as opposed to low-cost preventive techniques. Alternative explanations for this phenomenon are given in Chapters IV and V. For the remainder of our discussion in this section we focus upon a variety of statistics that reveal the existence of a relatively large resource allocation toward curative expenditures, with a trend toward increased spending on preventive measures in some countries.

Curative solutions may be much more expensive than preventive ones. Sorkin (1976) reported the following expenditures for curative and preventive approaches to three diseases. Tetanus inoculations cost only $.20, but treatment can cost from $200 to $400. While drugs to treat tuberculosis and measles are relatively inexpensive at $2.50 and $5.00, respectively, inoculations are even less expensive at $.15 and $.50, respectively. While these cost comparisons do not take account of the greater number of persons that must receive preventive measures

than curative ones, the cost comparison in many cases will still likely favor prevention. Moreover, in addition to the treatment cost, one must add the economic loss due to the reduction in work associated with the disease. The potential benefits for those diseases that can be eliminated or reduced by preventive measures may therefore be quite substantial.

As Gish (1970) stated, and as apparent from our discussion of Table II-1, major increases in percentage budget expenditures toward health will not result in very large increases to per capita health expenditures. These per capita expenditures will not approach that of the developed countries, the level of which is determined by the choice of the expensive, centralized hospital and physician based health strategy. It would, therefore, seem that opting for a centralized, curative system would leave many individuals outside the health system.

Table III-1 gives data for several countries according to total public expenditures on health and the division of these expenditures according to expenditures on preventive, curative, and training and research programs. The larger allocation toward curative expenditures is clear. Most developing countries spend 75 to 85 percent of their budgets on curative measures. However, the trend may be to increased expenditures on preventive measures. Tanzania, which spent 80 percent of its budget on curative measures in 1970-71, has steadily reallocated its expenditures toward more decentralized facilities (rural health centers as hospitals) and more spending on preventive measures. This data for Tanzania is reported in Table III-2 for years 1970-71 through 1976-77. As is apparent from this table, the data in Table III-1 is for recurrent expenditures only, and, in the case of Tanzania, excludes approximately 10 to 20 percent of the total government budget. In 1970-71, the government spent $2.76 million on capital expenditures and 52 percent of this on hospitals. By 1976-77, the budget had increased to $12.22 million and the percentage spending on hospitals had decreased to 25 percent (although total spending doubled). A large increase in capital expenditures for preventive measures from one percent of the 1970-71 budget to 21 percent of the 1976-77 was realized. This increase amounted to nearly a hundredfold increase in total expenditures. Large increases, though not of the same magnitude, were also realized in the recurrent budget.

Table III-1

ANALYSIS OF GOVERNMENT HEALTH EXPENDITURES IN SELECTED COUNTRIES

Country	Year	Total Public Expenditures ($ millions)	% for Public Health or Prevention	% for Curative Care	% for Training & Research
Sri Lanka	1957-58	34.3	23.3	74.4	2.3
Tanzania	1970-71	19.5	4.9	80.3	4.4
India	1965-66	236.0	37.0	55.5	7.5
Laos[1]	1971-72	2.3	14.3[2]	19.9[3]	44.8
Kenya	1971	27.8	5.2	83.8	11.0
Thailand[1]	1971-72	83.6	28.1[4]	46.6[3]	19.1
Paraguay[1]	1972	10.0	10.5[5]	84.6[3]	—
Tunisia[1]	1971	15.8	—	86.3[3]	—
El Salvador[1]	1971	30.4	3.3[6]	52.9[3]	1.1
Turkey[1]	1972	303.7	16.3[7]	—	13.5
Colombia	1970	203.0	18.7	79.3	2.0
Mongolia[1]	1972	—	—	—	7.2
Chile	1959	63.8	18.3	77.0	4.0
Panama	1967	28.4	30.0	-----(70%)---	
Venezuela	1962	—	18.0	76.5	5.5
Israel[1]	1959-60	82.7	4.9	80.3	4.4

[1]Classification of residual categories of expenditure is unknown.

[2]Expenditure for "environmental health services."

[3]Expenditure for government hospitals only.

[4]Expenditure for "control of communicable diseases, laboratory services, environmental health services and occupational health services."

[5]Expenditure for "campaigns against communicable diseases, maternal and child health and vaccinations and laboratory services."

[6]Expenditure for "immunization and vaccination activities, laboratory services and environmental health services."

[7]Expenditure for "mass campaigns against communicable diseases, immunization and vaccination activities, laboratory services and environmental health services."

Source: World Bank (1975).

Table III-2

NATION AND REGIONAL HEALTH BUDGET EXPENDITURES IN TANZANIA
1967/70 - 1976/77

	1970-1971	1971-1972	1972-1973	1973-1974	1974-1975	1975-1976	1976-1977
	(breakdown by percentage)[1]						
A. Capital							
1. Hospital	52	52	27	15	12	22	25
2. Rural Health Centers & Dispensaries	24	33	35	33	24	34	23
3. Preventive Services	1	2	10	2	8	14	21
4. Training & Manpower	22	13	18	48	55	30	31
Total Expenditures ($ U.S. millions)	2.76	0.55	1.92	7.25	9.05	9.17	12.22
B. Recurrent Budget							
1. Hospital	80	79	72	69	60	60	61
2. Rural Health Centers & Dispensaries	9	11	18	19	19	20	21
3. Preventive Services	5	4	4	5	12	11	11
4. Training & Manpower	2	3	4	5	6	7	6
Total Expenditures ($ U.S. millions)	16.97	19.32	24.07	25.71	37.74	42.00	50.74

[1] Percentages may not add up to 100% due to exclusion of smaller expenditure categories.

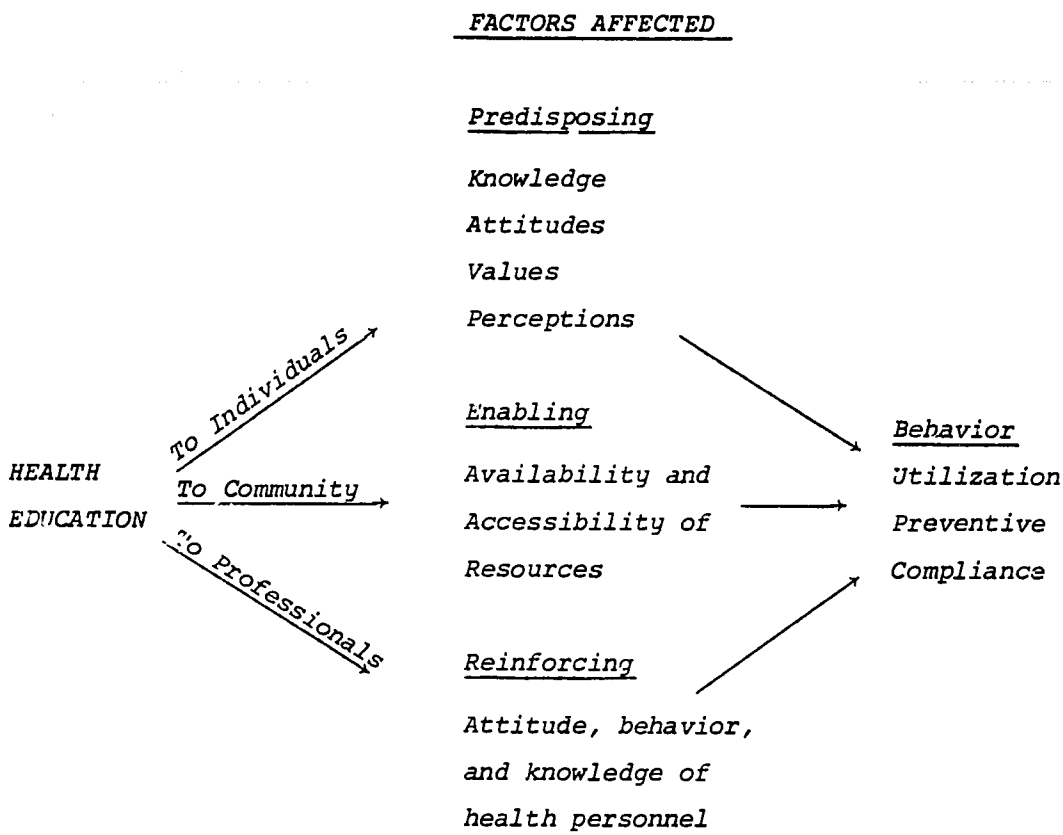
Source: Caldwell and Dunlop (1977)

B. Health Education Strategies

Green (1974) distinguishes between three basic strategies for health education: individual, community, and professional. He sees all three as necessary to affecting behavior toward medical care. A simplified version of his model is presented in Figure III-1. Individual education is viewed as necessary for creating predisposing characteristics toward health care. These predisposing factors include knowledge, attitudes, values, and perceptions. Community education is oriented toward enabling factors: the availability and accessibility of resources. Finally, professional education is viewed as reinforcing factors: the attitudes, behavior, and knowledge of health personnel. All three factors are viewed as combining to form behavior leading toward utilization of health care facilities, preventive measures, and compliance with health care procedures.

In this model of health education, the entire health care and health education system is viewed as an integrated whole leading toward curative and preventive measures. This is an appropriate approach if one views, as Green does, that the overall goal of health education is to create certain behaviors that lead to changes in health status and eventual social and economic impacts. However, as we have alluded to previously, there are other social forces that lead to alternative allocations to the curative and preventive elements of the health education system. Therefore, it is reasonable to expect that the entire health education system may be oriented in either direction. For example, Smith (1974) reported that in China the "barefoot" doctor receives a small amount of training (three months of initial training and one to three months each year of continuing education) and that her/his primary responsibilities are preventive, such as health education. Seidel (1972) reported that these personnel received a wage of one-half the amount normally paid to physicians. However, the training for physicians is much more expensive, and a decision to focus on physician training would likely be tied toward a decision to concentrate on curative measures.

Differences in training costs for medical persons in Tanzania were reported by Sorkin (1976). These figures are as follows:



Source: Adapted from Green (1974)

Fig. III-1—An integrated health education system.

	Pre-Training	Training
Medical Officer	6 yrs. @ $220	5 yrs. @ $3400
Medical Assistant	4 yrs. @ $220	3 yrs. @ $ 500
Rural Medical Aide	none	3 yrs. @ $ 400

Clearly, one could train many more rural medical aides in a shorter amount of time than medical officers for a fixed budget level. However, the decision on training must be consistent with the choice between curative and preventive measures. We turn, in Chapter IV, to a discussion of the national and social structures that affect these resource allocation decisions.

Chapter IV

THE SOCIAL CONTEXT OF HEALTH

Throughout our discussion of health problems in the developing world it was apparent that many instances of disease and most cases of malnutrition were associated with lower income groups. It is clear that middle and higher income poeple do not typically need to worry about problems of malnutrition but rather of excess consumption. In fact, the consumption patterns of more affluent people throughout the world are seen by many authors as a direct cause of malnutrition in developing countries. We discuss this problem in more detail in Section IV-C. However, in Section IV-A we first discuss general theories of and approaches to the relationship of the health status of the population of a given country to its associated economic and social structure. For example, as mentioned in Chapter III, the decision to concentrate on a particular type of health care strategy (curative or preventive) is related to other organizational biases within the country: decentralized or centralized. In Section IV-B we discuss more specific evidence of income and regional differences in disease and malnutrition incidence and in access to health facilities.

A. National Health Structures

The acknowledgement that poverty is associated with high disease and malnutrition incidence is difficult to argue with in the light of significant evidence of its existence. It is the interpretation of this evidence in terms of potential patterns of causality and solutions to the problem that vary depending upon alternative political economic theories.

There are two major areas in which one can trace the interaction of the social system with health care: (1) the relationship between the agricultural system and food availability, with nutrition levels being directly related to the availability and accessibility of food; and (2) the relationship between general economic well-being levels.

Disease levels are affected by both the incidence of disease and the availability of health care facilities. Therefore, the dichotomy

between curative and preventive strategies is important. We discuss first the relation of national agricultural policies to food supply. Schuftan (1977) stated that malnutrition was a biological transformation of the socioeconomic, cultural, and historical development of the country. He claimed that this approach was significantly different from the traditional approach, as expressed by Hakim and Solimano (1975), in which the main focus is on policy change within what is seen as a neutral environment. Within this latter viewpoint one concentrates on changing the nutrition status of individuals, perhaps through education, and this in turn fosters economic development. An alternative view, as expressed by Jay (1973), Berg (1973), and Schuftan (1978), among others, is to first view development patterns as an explanation of nutrition problems. Jay (1973), for example, felt that most malnutrition could be eliminated, rendering public health programs unnecessary, by concentrating on increasing purchasing power.

Schuftan, Ozerol, and Carter (1977) provided a detailed model of the interrelationship of food production and consumption and the eventual impact on health status and economic development. Simply stated, this model takes the form shown in Figure IV-1.

In Figure IV-1, the basic relationships can be seen. The focal point of the diagram is food consumption. The capability of people to consume is affected by the availability of food as determined by food production and distribution and by the accessibility to food as determined by individual SES (socioeconomic status) and health. The consumption of food in turn effects health and economic status. The more traditional view tends to concentrate mostly on the synergistic effects of health and nutrition and the direct impacts of health on economic status. As Schuftan, Ozerol, and Carter (1977) pointed out, traditional public health programs focus on the individual only in terms of health, education, and habits, and ignore the entire food system and other economic influences on food consumption. The wide number of factors affecting nutrition and the small number of items affected by public health programs may be seen explicitly in Figure IV-2, adapted from Schuftan, Ozerol, and Carter (1977).

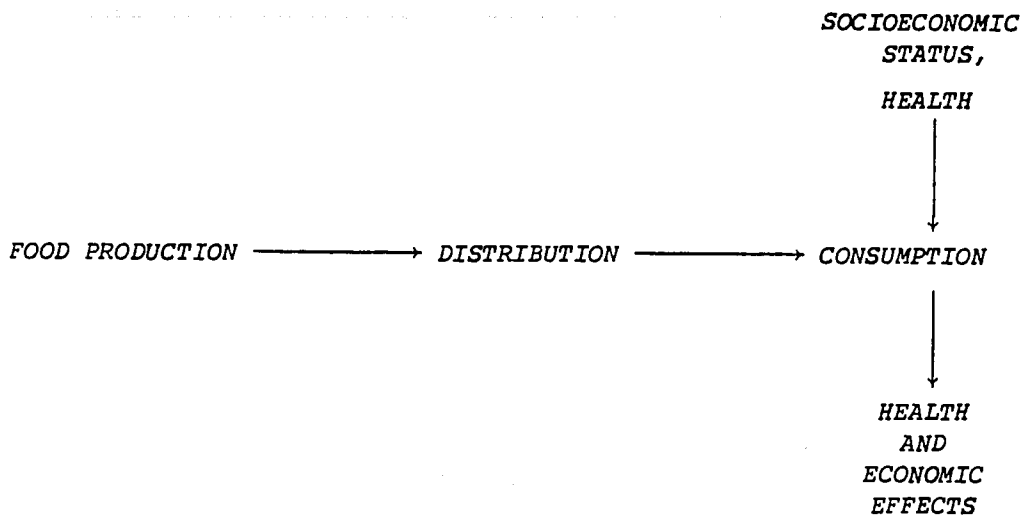
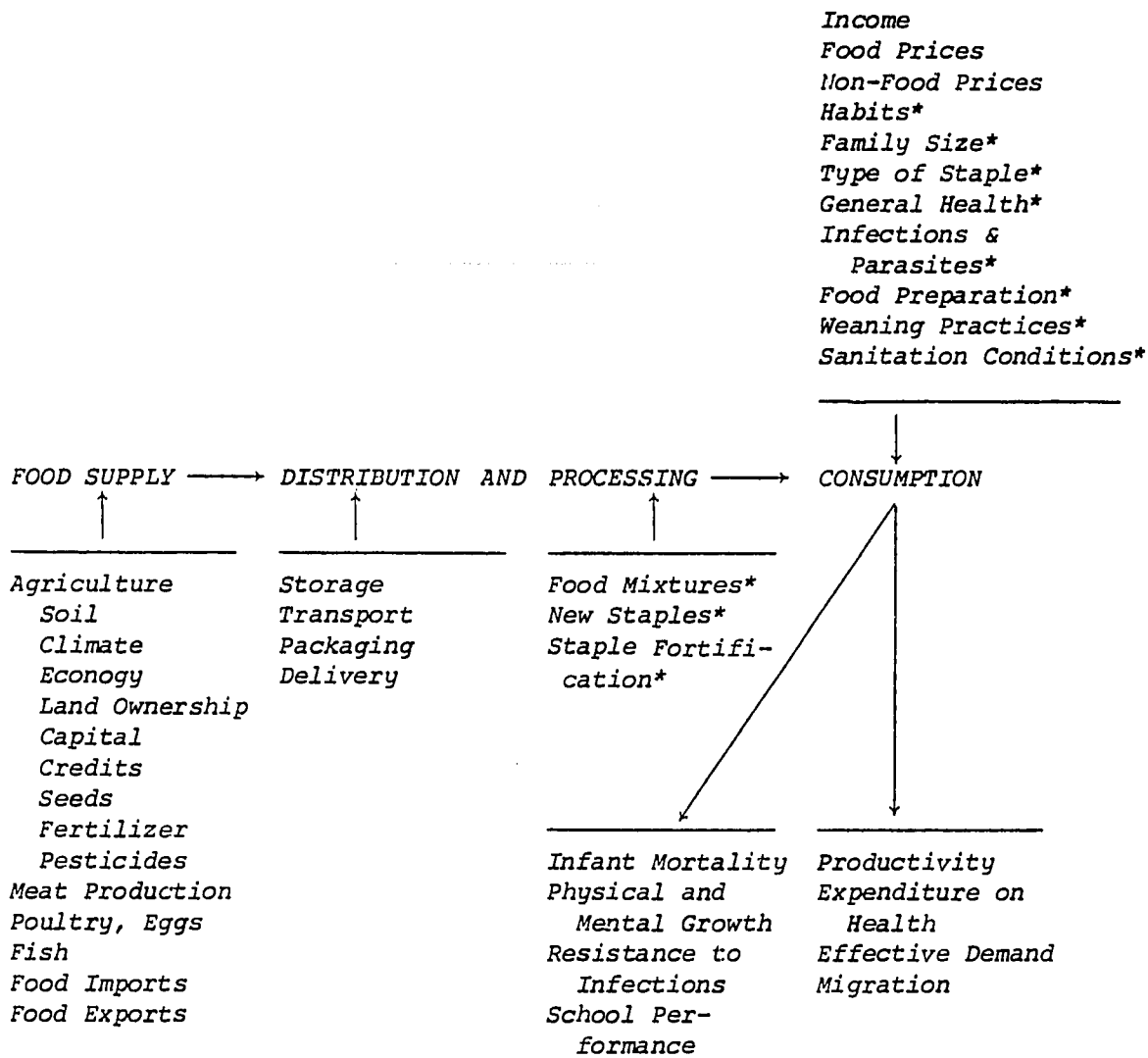


Fig. IV-1 —A simple food system model.



*Points of intervention of the traditional public health approach to malnutrition and disease.

Source: Adapted from Schuftan, Ozerol, and Carter (1977).

Fig. IV-2—A detailed food system model.

As is evident from the diagram, the traditional public health approach only affects some factors that have a direct influence on the individuals's ability to use food. Part of these factors are related to health status, thus recognizing the synergistic effect that leads to the body's need to consume more food when ill. The other area of concentration is on those factors that can be affected by health education programs aimed at the public. These education programs include those that affect food consumption habits, family size (important in terms of the numbers of individuals among whom the family food supply will be divided), and habits such as, food preparation, weaning practices, and sanitation conditions. It should be noted that the public health approach is basically one of preventive care: the education of persons to change a variety of habits to improve nutrition. A more curative approach would treat the health effects of nutrition status. Dayton (1969) expanded the concept of nutrition to include social cultural effects such as, psychosocial deprivation but also ignored economic effects. The success of this public health approach is severely limited in its application by the income of individuals, prices in the economy, and agricultural and industrial conditions that lead to food being available.

Recommendations for alternative mechanisms by which public health programs can improve nutrition vary considerably. For example, May and Lemons (1969), suggest four categories of activities to affect malnutrition similar to those in the model:

1. Health education programs to the general public;
2. Health education programs to professionals;
3. Agricultural programs such as quality and quantity of food and harvesting practices; and,
4. Industrial programs such as modernization, tax rebates and waivers, and loan programs.

This approach basically takes the social structure as given and looks to relatively minor changes within that structure. Schuftan (1977) in his discussion of a more expanded model of the one presented in Figure IV -2 argued that there was a 'fundamental bias' to concentrate on characteristics of the malnourished rather than on the characteristics of

the social order. While traditional approaches include education and agricultural policies, in general they do not consider a significant alteration in income and wealth distribution, consumption habits of the well-nourished portion of the population, or the approach taken to economic development. Clower, et.al. (1976) pointed out that promoting economic development, as measured by growth in GNP, would not necessarily lead to an alteration of living standards of the masses. Similarly, Harrison (1978) argues that although malnutrition was a result of poverty, a rising GNP would not necessarily be distributed so as to alleviate malnutrition.

One aspect affecting agriculture and food supplies is land ownership. While many authors recommend increased availability of credit and education for small farmers, an alternative is to reorganize the land ownership pattern away from centralized, large farms to small farms. As discussed in Sorkin (1976) and Ashby, Klees, Pachico and Wells (1978) research evidence has indicated that crop yields will be higher on small farms. The availability of labor in rural areas also make this alternative attractive. Bates and Donaldson (1975) pointed out that the research evidence was leading to a shift of international development funds from urban and industrial to rural and agricultural areas. For example, the World Bank has shifted from an average of 8.5% of total funds allocated to rural areas in 1948 through 1963 to 20.5% in 1969 through 1974. However, Jordan (1978) maintained that many rural development projects focus on a rural elite and ignore the rural class structure. Therefore, for example, a program that improved the health of persons in rural areas would not necessarily lead to increases in productivity, as indicated in Figure IV-2, unless effort was made to simultaneously improve employment prospects.

The model presented in Figure IV-2 is, therefore, incomplete. There is no inclusion of external social and economic factors that may assist or hinder the conversion of increased health to increased productivity. The main reason is that the model has no reference to aspects of the economy other than those directly connected with agriculture and food distribution. Noticeably absent from this model are the ownership patterns of other sectors of the economy and the structural possibilities that would

allow for an individual to improve income as a means for obtaining additional food. It is reasonable to expect that most countries foster societal stability through developing consistant social institutions. This consistency is achieved in two major ways: similar organizational structures and cross-support among institutions. If the industrial institutions are centralized with a hierarchical structure one may expect similar structures in the government, medical, and education areas. Also, decisions undertaken in each institutional setting will reinforce those in another. For example, Galbraith (1967) discussed government support of military expenditures as a means of supporting the technological bias of those in control of large scale industrial organizations. Gintis (1971) and Bowles and Gintis (1973) criticize education institutions for maintaining social class distinctions. Kleinbach (1974) stated that social stratification extended into and was reinforced by medical schools. Jordan (1977) deduced that health efforts would be directed more toward reducing absenteeism of low skilled employed persons in industrial sector rather than improving health or even reducing deaths of the unemployed.

Many authors from a variety of political, economic, and philosophical beliefs would acknowledge an overall consistency in a society's institution. However, the viewpoint that dominates the critical analysis of existing problems of poverty, education, and health throughout the world points to a relatively concentrated private ownership of capital, both nationally and internationally, as the cause of most social ills. Therefore, to understand the prospects for health care in the context of societies dominated by private ownership one must understand the structure of industry: the primary outlet for private capital. It is important to note that a criticism of private ownership is based on generally acknowledged facts such as medical expenditures biased toward urban areas and curative systems and an association of poverty and health, but an interpretation that these distributions are both based upon and support private ownership. Therefore, the wide array of programs aimed at specific health problems or incentives to private industry to raise general income levels can only be taken efforts doomed to failure without widespread effects since the underlying concentration of economic control is not altered.

Navarro (1975) compared the industrial structure with the health structure in the U.S. The industrial structure is highly concentrated with a small minority owning and/or controlling major corporations. He described a hierarchical, pyramidc wage structure with a small percentage receiving high levels of compensation and increasing numbers receiving lower wages. This wage structure is repeated in the health sector. Through investment and aid programs to developing countries this pattern of employment in the health sector in advanced capitalist countries is replicated in the developing world. Additionally, the industrial structure is characterized by large firms with capital intensive investment. Galbraith (1967) wrote that the companies needed control over their markets to ensure security and stability in their planning. The portion of the economy that is decentralized tends to be labor intensive. This industrial structure is reflected in medical care in what Jordan (1977) calls a bias to in-patient, curative care as manifested in technology-based expensive hospitals with expensive medical personnel.

Cosminsky (1977) also provided an excellent example of the impact of biased technology transfer: Western medical practices for birth deliveries. Traditional techniques in these countries often relied on the use of herbs, sweat baths, and a kneeling position. Cosminsky argues that the pressure for horizontal delivery and the use of forceps are designed to reinforce the hierarchical doctor-patient relationship, the dependency on related medical technology, the utilization of patent medicines, and the concept of efficiency in operations in which the highest value is placed on the doctor's time. Navarro (1977) claimed that the focus on specialization of medical personnel is a division of labor similar to that in industry, except that it is more a reflection of the bias of treating parts of health problems rather than the whole. Navarro saw alienation in the medical system as reflected in placing patients in a state of helplessness and dependency upon physicians.

A more direct relationship to explain the centralization of medical institutions based on consistency and support among institutions was offered by Rodberg and Stevenson (1977).

Capitalism is seen as a system that requires continuing investment to absorb the surplus value generated in the industrial sector. Surplus value is the term applied to profits, seen by many to be a capture of money for no productive work (eg.Schumacher, 1973) or as unearned income (e.g. United States Internal Revenue Service). As markets for industrial goods are expanded to their limits investments are sought in other areas. Rodberg and Stevenson saw an extension into the traditionally labor intensive service sectors, such as medical institutions, as a logical extension of this investment. The subsequent conversion of the service sector into a centralized, capital-intensive sector will naturally follow. They concluded that medical institutions also absorb surplus labor. In 1969 in the United States, 4 percent of hospital personnel were physicians, 40 percent were nurses, attendants, and orderlies, and 40 percent were clerical and maintenance (they did not mention the remaining 16 percent of the hospital staff).
reformists as reinforcing the industrial structure. For example, Galbraith (1967) wrote that the state supported industry by supplying trained personnel, underwriting risks, and research, and purchasing products. Navarro (1977) argued that the same trend may be seen in the health sector wherein state intervention facilitates capital accumulation by shifting to corporate control of medicine with a subsidization of technological development and manpower training.

The impact of higher spending and more capital intensity is not structured to improve the health status of the population but to provide an avenue for investment. Eyer and Sterling (1977) argue that the irrelevance of high spending on curative care can be seen in the United States. State welfare programs giving medical access to poorer persons have not brought disease and death rates of poor persons to the levels of wealthy persons even though access to health care facilities tends to be equal. The main viewpoint is that the medical welfare programs are used to support the invested capital in medical facilities. Additionally, the potential of overspending in many countries is supported by research from many sources not founded upon an anti-capitalist philosophy.

In terms of life expectancy, Cochrane (1972) found no increase with increased health spending in the U.K., Forbes (1967) stated that doubling or halving expenditures would not affect longevity, and Fuchs (1974) stated that the marginal contributions of additional spending was negligible. Yet the bias toward increasing centralization and technocracy in medical systems has been transferred to developing countries. These systems would not be equitable and would conform to a very narrow definition of efficiency: the capability to allocate resources to a demand situation that has been created through control of the structure. Therefore, in developed countries, costs and demands for medical service continue to rise although the effect of the care and the concurrent diseases created by growth of the industrial structure result in small gains in population health status.

One can see a reaction to this trend in several countries, notably Tanzania, Chile under Allende, China and Cuba. Many of the changes instituted in these countries have not been solely directed toward health but rather health and other social problems related to a social class structure have been simultaneously attacked.

In Tanzania, according to Schuftan (1977) a series of related reforms have included: reduction of income differentials through higher minimum wages, price controls, and a rise in prices of luxury goods; a restructuring of economic institutions including nationalization, a reduction of imports, and more women in labor force; a restructuring of health institutions through an increasing health budget combined with greater emphasis on preventive measures and rural health centers; a restructuring of political institutions through decentralization and participation; and a restructuring of agricultural institutions through the creation of the Ujamaa villages, land redistribution, subsidization of food production, and agricultural credits.

During the Allende years in Chile, changes in several related policies and institutions yielded a 17% reduction in malnutrition for children under six. Some of these policies according to Schuftan (1977) included a milk distribution program, a land redistribution to smaller farms, the formation of rural cooperatives, and an attempt to redistribute food resources in a country with sufficient but inequitably distributed

food supplies and a foreign exchange food deficit in 1973 of $775 million.

Heller (1973) reported that prior to 1949, China was a disease ridden country with infant mortality rates of 20 %. Until 1966 a pyramidic urban oriented health structure remained. However, the orientation has changed to an emphasis on rural based preventive measures, using in part traditional treatments such as, acupunture and herbs, and paraprofessionals. The Western model of a highly skilled labor combined with a capital intensive structure results in few individuals willing to work in rural areas. The impact of these policies can be seen in Table II-3 where infant mortality had declined to 5.5 percent and was as low or lower than most other developing countries. In Cuba, according to Guttmacher and Danielson (1977) major changes after the 1959 revolution associated with medical care included the nationalization of drug and medical equipment companies, a stress on rural medical clinics with preventive care, and an opening of medical schools to women,blacks, and the working class.

B. Income and Regional Differences in Health Care

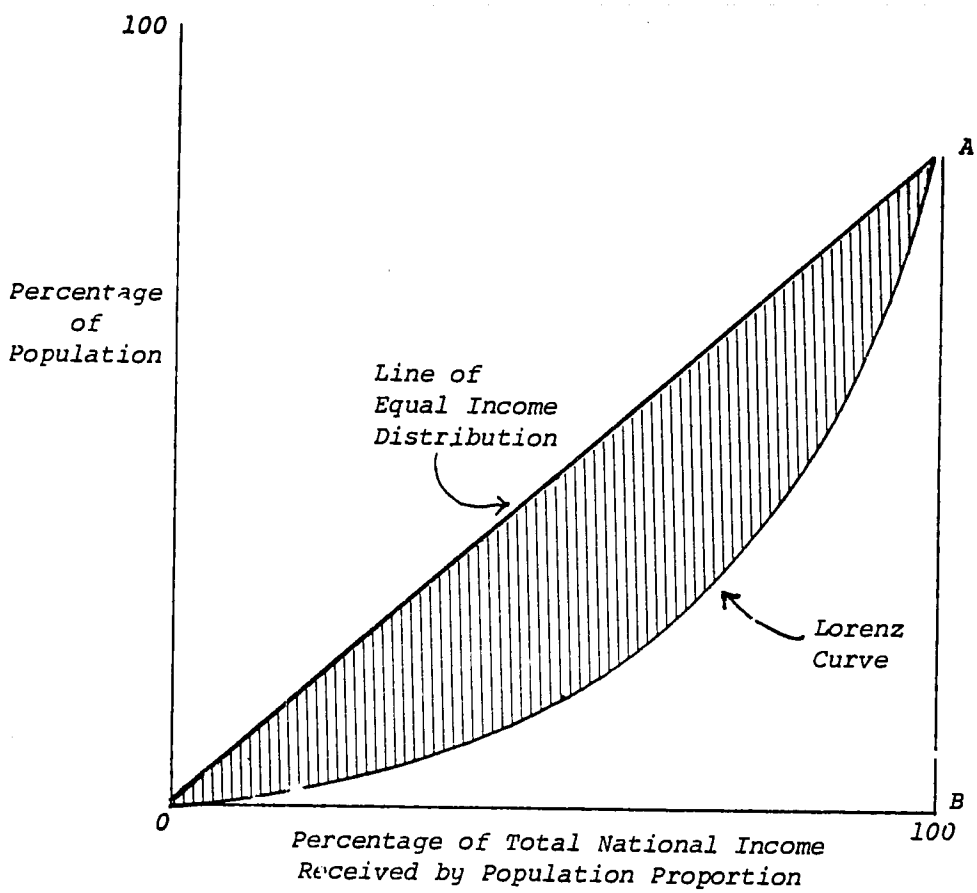
The social structure was consciously altered in countries like Chile, Tanzania, China and Cuba to redress disparities in the allocation of resources according to income and regional differences. This reallocation affected health facilities, as well as a wide variety of other resources. In this subsection we analyze available data that demonstrates the substantial differences within nations in the allocation of health care facilities and disease incidence by income groups and regions.

The differences among income groups can be seen in a variety of ways. Blanca and Graham (1974) reported that the price of clean water was higher for the urban poor in Lima, Peru and that these differences in part resulted in the poor spending 2.7 percent of their income on water and higher income groups spent only .7 percent. Oshima (1967), in a study of calorie consumption among income groups in India, revealed that lower income groups consumed an average of 1500 calories per day, middle income groups consumed 2300 calories per day, and higher income groups consumed 2900 calories per day.

These differences in access to sanitation and food availability can lead to situations, such as in Thailand (Kreimer, 1977), where birthweights of children from low income families average 2.5 - 2.6 kilograms and birthweights of children in middle income families average 3.0 kilograms. North (1970) reported that in the United States, respiratory ailments are 10 times more common among children from families of lower economic status than children from families of the highest status.

Unfortunately, a raising of living standards can lead to the seemingly contradictory situation of a decrease in health standards. In particular, Reutlinger and Selowsky (1976) pointed out that higher per capita incomes accompanied by mothers working could worsen infant malnutrition as studies showed a marginal propensity to consume of 5 percent for infant diets, i.e., every $1 increase in income would result in a $ .05 increase in spending on infant diets. However, they estimated that 50 percent of a mother's earnings would be required to substitute for the reduced nutrients from a lack of breastfeeding. For some segments of the population, one has the unfortunate problem of rising income and diminishing nutrition.

However, it is not only rising per capita GNP's which affect health but also the distribution of that income. Roemer (1977) pointed out that infant mortality was high in countries with relatively high GNP's per capita but relatively unequal distributions. This problem was also analyzed in an interesting study of nine Latin American and eighteen African countries conducted by Caldwell and Dunlop (1977). They presented part of their findings for the 27 countries by dividing them into four categories according to average per capita GNP and income distribution as measured by Gini coefficients. A Gini coefficient of 0.0 would indicate a completely equal distribution of income and as the coefficient increases the equitability of the income distribution diminishes. The calculation of the Gini coefficient is determined from Lorenz curves as indicated in Figure IV-3. Lorenz curves describe the relationship between the percentage of population



Gini Coefficient = The ratio of the cross-hatched area to the triangular area, OAB.

Fig. IV-3—Calculation of the Gini Coefficient.

and the percentage of total national income received by that proportion of the population. A diagonal indicates the relationship of perfect equality. In this situation, 10 percent of the population receives 10 percent of the income, 25 percent receives 25 percent of the income, and so on.

In Table IV-1, the 27 countries in the Caldwell and Dunlop (1977) study are divided into four categories: those with a high income per capita, $359, and high Gini coefficient, 0.574, and three other groups with average incomes per capita and Gini coefficients of $388 and 0.483, $104 and 0.602, and $103 and 0.4[illegible], respectively. There are clear differences between the high income and low income countries according to health inputs; the low income countries spend smaller amounts on health, and reach lower health inputs and outputs, as measured by access to water, daily calorie consumption, and infant mortality rates. There are also considerable differences in spending on health care according to income distribution. The countries with the more equitable income distribution (lower Gini coefficient) spend an average of 50% more than the other countries. However, the health status of the countries with a less equitable income distribution tends to be higher.

Similar patterns may be observed in urban-rural disparities; most of the data available shows differences among rural and urban areas according to access to health facilities. For example, for the countries reported on in Table IV-1, the percentage of persons with access to water in rural areas is half that of the access of the total population. The difference in distribution of physicians between urban and rural areas may be seen in Table IV-2. This table provides data for twelve countries on the ratio of the population to physicians for the country, the capital city (or a major urban center), and the remainder of the country. On a per population basis, there are about 30 times more physicians available in the capital cities of Haiti, Kenya, Thailand, and Guatemala. Tanzania, according to Sockin (1976), has a similar ratio with a population/physician ratio of 1200:1 in the capital and 31,000:1 in the rest of the country.

Considerable reallocation between rural and central areas has taken place in China, Cuba, Chile, and Tanzania, with a heavy emphasis on rural

Table IV-1

MEASURES OF HEALTH STATUS AND RESOURCE COMMITMENT IN 27 AFRICAN AND LATIN AMERICAN COUNTRIES 1970-1973; COUNTRIES DISAGGREGATED BY INCOME CONCENTRATION AND PER CAPITA INCOME

	High Gini & High Income Countries	High Gini & Low Income Countries	Low Gini & High Income Countries	Low Gini & Low Income Countries
Average Gini Coefficient	0.574	0.602	0.483	0.471
Average Per Capita Income	$359.00	$104.00	$388.00	$103.00
	N=7	N=5	N=7	N=8
1. Average Growth Rate in Income per Capita	1.7	2.8	2.3	2.2
2. Average % per Capita Income Spent by Gov't on Health Expenditures	1.09	0.90	1.67	1.58
3. Average % Total Access to Water	49.3	15.8	48.7	12.5
4. Average % Access to Water: Rural Areas	25.5	8.4	27.3	6.5
5. Average Calories per Day	2272	2091	2229	2167
6. Average Support Personnel per Physician	4.7	8.1	5.4	10.1
7. Average Infant Mortality	94.1	143.8	108.7	147.3
8. Average Crude Birth Rate	44.4	46.8	41.6	47.4
9. Average Crude Death Rate	14.2	18.9	14.6	20.6
10. Average Population Growth	2.91	2.70	2.83	2.64

Source: Caldwell and Dunlop, 1977.

Table IV-2

DISTRIBUTION OF MEDICAL DOCTORS BETWEEN THE CAPITAL AND THE REMAINDER OF THE COUNTRY IN SELECTED COUNTRIES, 1968

Country	Population/Medical Doctors		
	Nationwide	Capital City	Remainder of Country
Haiti	14,700	1,350	33,300
Kenya	10,999	672	25,600
Thailand	7,000	800	25,000
Senegal	19,100	4,270	44,300
Ghana*	18,000	4,340	41,360
Tunisia	6,486	2,912	10,056
Colombia*	2,220	1,000	6,400
Guatemala	4,860	875	22,600
Iran	3,750	906	6,220
Lebanon	1,470	650	3,000
Jamaica	2,280	840	5,510
Panama	1,850	760	4,400

*Major urban centers instead of capital city.

Source: International Bank for Reconstruction & Development (1975).

medical units. In Tanzania, Gish (1973) pointed out that 80 percent of the population is within 10 miles of a rural health center, although most people must walk to the centers. A study of Tanzania by Van Etten (1972) revealed, as one would expect, that utilization of hospital facilities diminished as persons lived further from the facility. For example, at one hospital 50 percent of the outpatients came from within 10 miles, 20 percent from 10 to 20 miles, and the remainder distributed from areas further removed from the hospital. The shift in resources from hospitals to rural health centers may be seen in Table III-2. Recurrent budget expenditures increased from nine percent of a $16.97 million budget in 1970-71 to 21 percent of a $50.74 million budget in 1976-77, a tenfold increase in absolute expenditures. This shift in expenses is justified according to a cost/capacity analysis undertaken by Sorkin (1976), examining equivalent capital and recurrent expenditures on one regional hospital or 15 rural health centers. The regional hospital would have a capacity of 9000 inpatient admissions, 400,000 outpatient visits and cover a population of 10,000 to 30,000. The fifteen rural health centers would have a capacity of 15,000 inpatient admissions, 1,000,000 outpatient visits and cover a population of 30,000 to 500,000.

The reallocation of medical expenditures in Tanzania is also indicated in data analyzed by Caldwell and Dunlop (1977). Even though capital and recurrent expenditures for hospitals increased between 1972 and 1976, the increasing population resulted in an increase in the population covered per hospital. In the same period of time, however, the population per health care facility declined.

Interestingly, although rural areas typically have far lower access to health facilities, their health status can be higher. For example, in the Bangladesh case study reported in Kreimer (1977), the average daily calorie consumption in rural areas was only 2251. Consumption in urban areas was even lower, at 1732 calories. The differences are potentially related to access to food between the areas. Food access is a major problem for developing countries and, according to many authors, it is dependent upon world agricultural systems and multinational corporations.

C. The International Social Structure

Tudge (1977)claimed that sufficient food would be available on a worldwide basis if farms grew crops for nutrition rather than profit, and if there was an avoidance of single, cash crop agriculture. He further argues for a greater emphasis on small farmers, a minimum use of technology, and a reduction of waste in developed countries. Many authors, such as Lappé and Collins (1977), similarly reason that the emphasis on food scarcity is a myth and sufficient food is available if better managed and distributed. Reutlinger and Selowsky (1976) calculated that the worldwide calorie deficit is 419 billion calories, and that this is equivalent to 38 million metric tons of grain or four percent of world production. In a later study, Harrison (1978) estimated that the world production of 1.3 billion metric tons of grain would provide 3000 calories and 65 grams of protein daily, equivalent to the nutrition standards for a physically active 170-pound male, for each of the four billion people in the world.

The four major interrelated factors mentioned most frequently as influencing food deficits in developing countries are food consumption patterns in developed countries, agricultural practices in developing and developed countries, the oil crisis, and the effects of multinational corporations. Food cosumption patterns in developed countries have been termed excessive. The excess is not only overconsumption, but also a heavy consumption of beef protein. For example, Lappé (1975a) stated that 16 pounds of grain are required to produce one pound of beef. In fact, the United States, known as a major beef producer, is the leading importer of beef in the world. Berg (1973) pointed out that during the 1960s meat production increased in Central America but meat consumption declined. In Costa Rica meat production had increased by 92 percent, and per capita consumption had declined by 25 percent with most of the meat winding up in U.S. franchise restaurants.

The impact of beef protein consumption can be seen in other ways. For example, according to Borgstrom (1974), American livestock consume six times the amount of protein of human consumption. Patton(1968) claimed that 50 percent of total acreage in the United States was directed toward livestock consumption . Much of the grain fed to livestock is high in protein and nutritionally sufficient for protein

consumption of humans. Lappé (1975b), discussed the protein content of three groups of grain and the amount fed to livestock. For example, soybean contains 35 percent to 40 percent protein, by weight and over 90 percent of the crop is fed to livestock. Corn, barley, and oats contain protein contents ranging from 8 percent to 14 percent and 90 percent of this crop is fed to livestock. Although only 24 percent of the wheat crop is fed to livestock, it is also a good source of protein containing 11 percent to 14 percent protein.

Overconsumption is not confined to the United States alone but to all developed countries. In fact, the developed world imports more protein from the developing world than it exports to it (Borgstrom, 1974). Europe imports one-third of the African peanut crop (an excellent protein source) to feed is livestock. Holland, a known dairy producing country, is the leading importer of milk. Lappé (1975a), stated that the average person in the U.S. eats twice the daily protein requirement. As protein is a daily need and cannot be stored by the body, any amount consumed in excess of the daily requirements are converted to carbohydrates for energy. There are simpler ways of consuming carbohydrates, notably grains. U.S. livestock can be reduced by 25 percent, according to Lappé (1975a) and still provide enough protein from beef to meet each person's daily requirements.

The impact of this beef consumption on agricultural land can easily be seen. As stated previously 50 percent of agricultural land in the U.S. is used to feed livestock. More importantly, there is only one acre of culturable land per person in the world and 3.5 acres are needed to sustain one meat diet (Lappé 1975a). Feed lots in the United States are designed to increase the fat content of beef by a heavy feeding of protein,

Food problems in developing countries may be increased by agricultural practices in developed countries, in more ways than illustrated above. In analyzing U.S. agriculture Lappé (1975a), stated that since 1940 large productivity increases have created a food surplus "problem". It is difficult, if not impossible, to sell the excess at a profit. The food is not going to developing countries because of their lack of foreign exchange and escalating food prices. Brown & Eckholm (1974) reported that wheat prices had tripled from 1972 to 1973 and that, in a 24 month period, soybean

prices had quadrupled. The inability to purchase food and the excess supplies have led to a situation that Lappe (1975a) described as an institutionalization of waste in agricultural and nutrition practices. This situation led in the U.S. in 1972 to the withholding from planting of one acre for every 4.5 acres harvested. In that year $3.6 billion was spent to subsidize non-planting, an expenditure equivalent to three times the food aid bill to developing countries. As Lappe succintly described the process:

> Since our economic system does not recognize need, but only 'effective demand' (an economist's euphemism for ability to pay), we have been totally unable to recognize waste.

While agricultural and food practices in the developed countries have reduced the world food supply, there have been other international economic forces which have also had deleterious effects on developing countries. One of these factors has been the artificially imposed oil crisis. In the developed world the impact has been inflation, perhaps mostly yielding a curtailment of leisure time activities. In the developing countries the impact has been starvation. In the U.S., according to Brown and Eckholm (1974), 75 percent of energy used in agriculture is for transportation, processing, and preserving food. The remainer, presumably, is absorbed in fertilizer production. Fertilizer is a major component of agriculture and over 50 percent of nitrogen fertilizer used is processed with natural gas. The additional productivity of fertilizer would be higher in the developing world. With similar soil conditions, rice yields in Bangladesh are one-third of that in Japan. Similarly, India produces half the agricultural output as the United States and both countries have equivalent amounts of crop land. The rising price of energy has occurred at the same time that the major reserve currency (U.S. dollars) held by developing countries has been severely devaluated.

The lower yield on agricultural lands is accompanied by a heavy pressure from political/economic forces to devote agricultural lands to cash crops. The economic theory used to promote these policies was that cash crops would lead to the accumulation of foreign exchange, which the country could use to buy industrial goods and food to compensate for the lost agricultural land. This theory was based upon the principle of

comparative economic advantage which basically leads to resources allocated in each country to those products that can be produced efficiently relative to other countries. In the developing countries this process led to the planting of a series of crops with no nutritional value: sugar, tobacco, coffee, tea, cocoa, and rubber. This agricultural decision was made for the developing countries when they were colonized and large tracts of land were grouped in plantations. However, while the theory partially worked in terms of accumulation of foreign reserves there was no internal process that caused the recipients of agricultural profits to forego luxury goods to purchase food for the population.

According to Revelle (1974), coffee has become a primary economic livelihood for fourteen countries, subjecting the entire economies of these countries to price fluctuations of a single commodity. The international economic pressures that lead to the removal of agricultural land from nutrition crops can be seen in the case of Brazil, where a hectare planted in carnations has a value of 1,000,000 pesos while the value of land planted in corn or wheat is only 7500 pesos (Barnet and Muller, 1974a).

A major impetus for many cash crops has stemmed from multinational corporations which control the supply of many of these crops. However, this is only one of the harmful impacts attributed to multinationals (Barnet and Muller (1975b). Another major impact of these companies has been the heavy advertising in developing countries for non-nutritious products, such as Coca-cola and white bread. This advertising has stressed status, convenience and, in the case of substituting for mother's milk, modernization and has led in many instances to the neglect of nutritious foods.

In this section we have analyzed a wide variety of national and international political and economic problems that have exacerbated the health problem confronting developing countries. To many, the appropriate policy is to alter the major social forces that relate to the health problems. However, among others, who see major change as unlikely or undesirable, there is a desire for analytical tools that aid in sensible choice among a set of more limited, feasible alternative courses of action. Thus many policy analysts have been attracted to the microeconomic

tools of demand, cost effectiveness, and cost-benefit analysis, which are believed to help one to choose among alternative policies that differ marginally, and retain the status quo in terms of distribution of power.

We turn next to a discussion of these approaches.

Chapter V

MICROECONOMIC ANALYSIS OF HEALTH DECISIONS

A. Basic Principles of Microeconomics

> If economists can help to rationalize and make more explicit the decision making process...they will be making their own contribution to health and the economy.
>
> Fuchs (1972)

> Planning should be based on more than humanitarian principles.
>
> Sorkin (1976)

> Planning should be based on more than humane principles. It can cost a nation significant amounts of money to alliviate malnutrition. There also can be a significant opportunity cost of making these expenditures in light of other possible expenditures for equally worthy programs.
>
> Cesario, Simon, and Kinne (1970)

> While informed judgement is useful and important, excessive use of it defeats the principal purpose of model building which presumably is to replace judgement with an objective evaluation.
>
> Cesario, Simon, and Kinne (1970)

The approach suggested in the quotes and references above summarize the basic principles of microeconomics as applied to health system interventions. Microeconomics is based upon allegedly rational, objective, quantifiable criteria for choosing among alternative investments (both private and public). Society's resources are scarce. Any allocation of a resource to some specific investment removes the possible use of that resource from alternative investments. In the public sector, resources may be allocated to a wide range of projects including: agriculture, education, health, housing, and conservation of environment. These same resources may have been used in the private sector for a wide range of goods and services. Hence, there is an

opportunity cost associated with any resource allocation decision. Opportunity cost is a valuation of that resource in alternative activities. Economists make this valuation based upon certain explicit assumptions: individuals act in their own rational, economic self-interest, individual decisions are independent of each other, there is not market power exerted in the economy, and all individuals have access, at no expense, to information regarding prices, qualities, and production technologies for goods and services. If all of these conditions hold the prices assigned to goods and services in the economy can be viewed as reflecting the value that society as a whole places on the goods. The first assumption above is based on an economic interpretation of human behavior and perhaps of human "nature". It is this characteristic that leads to a preference for private ownership in the economy and, perhaps as well, to the occurrence of overconsumption of food and the production of non-nutritional cash crops in the face of worldwide malnutrition and disease. While this economic assumption of economically self-interest individual behavior (i.e.profit maximizing producers and utility maximizing consumers) may or may not hold, the other assumptions of the perfectly competitive market seem to hold rarely.

There are numerous situations in which the decisions of individuals affect others. For example, the decision of some people to purchase a good leads to a production process that leads to the pollution of the environment of others. The persons in the polluted environment will then need to allocate resources to clean-up activities or to medical care to reverse the negative effects of pollution. Therefore, what economists call an 'externality' occurs whenever one allocation of resources in reponse to supply and demand conditions results in the imposition of a resource allocation decision on others. It should be noted that most economists do not consider an 'externality' to occur when one group of consumers desire a product such as coffee or tobacco, prime farm land is allocated to meet this demand, and food production is relegated to less fertile land where there is a greater resource need to produce the crop. This description of our present world agricultural system is seen as an efficient allocation of resources, since the underlying economic theory does not question the distribution of

wealth which directs consumer demand.

The assumption that there is an absence of market power is also not realistic. There are clearly large corporations which can greatly influence market prices, as well as affect demand through mass advertising . The increase in oil prices that created havoc for agriculture in developing countries was not a result of a free interplay of market demand and supply. The price increase was mostly the result of power politics among a few producers. Large corporations with market control are a fact of life in developed countries. The extension of these corporations to multinational operations has had a wide variety of impacts. Although we have mentioned some of the negative impact reported in the literature other authors, such as Thompson (1975), have discussed the benefits derived from this concentration of economic power. A wide range of products, lower prices, and technological process are among the more important benefits mentioned.

Finally, there is considerable controversy over whether information is available. The fact that many persons in developing countries allocate their income from needed nutritious foods to nutritionally useless foods such as soda and coffee is seen by many critics to be a direct result of the market power exerted through advertising. They feel that the 'information' contained in advertising does not focus on the inherent functional characteristics of the product but reinforces product decisions based upon irrelevant criteria such as, product packaging, brand name, and status for food products. Supporters of the 'free' market system (i.e. free from government interference that restricts the scope of business decisions) claim that advertising merely informs consumers of the availability of products and continuing sales of any product is based upon quality and satisfaction of consumer desires rather than any psychological forces of advertising.

Economic analysis based on these free market assumptions is often considered to be an objective approach to decision-making, no individual's values dominate, but rather the convergence of values of many people determines resource allocations within society. Within this reasoning structure, resource allocations may be based on or result in unequal resource distributions, but these inequalities are usually considered outside the scope of such economic analyses of efficiency. In the remainder of this section we primarily ignore these equity issues and discuss some of the main techniques used by this economics framework to aid in decision-making, that are relevant to health program decisions: demand, cost, cost-effectiveness, and cost-benefit analyses.

Demand analysis can be used to estimate the market's desire for different types and amounts of medical care service including: health education programs, hospitals, smaller health care facilities and physicians. Cost, cost-effectiveness, and cost-benefit analyses are three means economists use to evaluate the impact of supplying medical service to meet demand. The cost element of the analysis is the same for all three. The difference is the type of impact assessed relative to the cost of the program.

In cost analysis one usually compares an alternative's cost with the level of service provided, such as, number of students reached, number of hospital in-patients, number of outpatients serviced, or number and type of a variety of specific medical services rendered. In cost-effectiveness analysis one translates these service levels into health status variables, such as mortality and morbidity statistics for segments of the population. In assessing a health education program one often measures knowledge or attitude change as a result of the intervention but this is an intermediate output to health status. Finally, in cost-benefit analysis changes in health status are converted to monetarily measurable impacts. The typical outcome measured is changes in productivity. While improvements in productivity are related to economic growth and changes in GNP we reserve a discussion of this topic for Chapter VI. In our discussion in this chapter of cost-benefit analysis, we concentrate only

on improvements in productivity for an average individual receiving the health education or service.

In the remaining four sections of this chapter we discuss methodologies, models, examples, and problems for each of the analytic techniques.

B. Demand Analysis

Demand analysis is used to assess the desire of the public for a certain level of medical service or health education. While many commentators on health problems discuss concepts of "need" in terms of societal health problems that should be corrected, economists focus on demand, or the willingness of people to pay for a service. A good or service will only be supplied by a competitive economy if there is "effective" demand. "Effective" demand may be interpreted as the payment for services that is sufficient to induce private producers to provide the service at a profit. Therefore, as economists consider income distribution as given, or as a separable issue, the analysis of any services to be supplied is based mostly upon ability to pay, rather than fulfilling social needs (although a government may provide the "demand" for a service).

The estimate of a demand for a service is considered to be basically a price-quantity relationship, as shown in Figure V-1. As can be seen, for any of the demand curves (assumed to be linear) depicted, as the price of the service increases the quantity demanded decreases and vice versa. For demand curve A, a decrease in price from P_1 to P_2 will be accompanied by an increase in demand from Q_1 to Q_2. There are no policy measures that can induce a movement along a demand curve, but rather they may shift the demand curve. The position of the demand curve is affected by a variety of factors, including income, prices of other goods, preferences, and education. Therefore, a shift in demand, depicted by demand curves A and B, could have occurred if an increase in income increases the demand for medical services (a movement from P_1, Q_1 on curve A to P_1, Q_2 on curve B). Alternative reasons for a shift from A to B include a decrease in prices of other goods or an increased preference for medical services as induced by education.

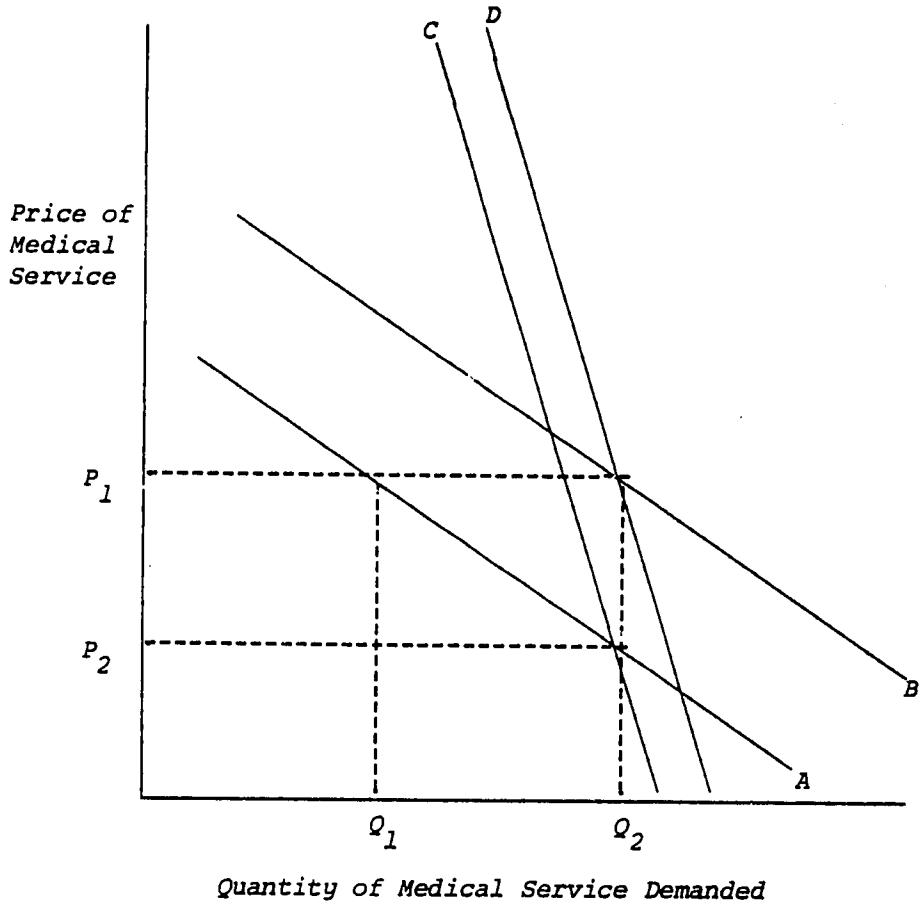


Fig. V-1 — Demand curve relationships.

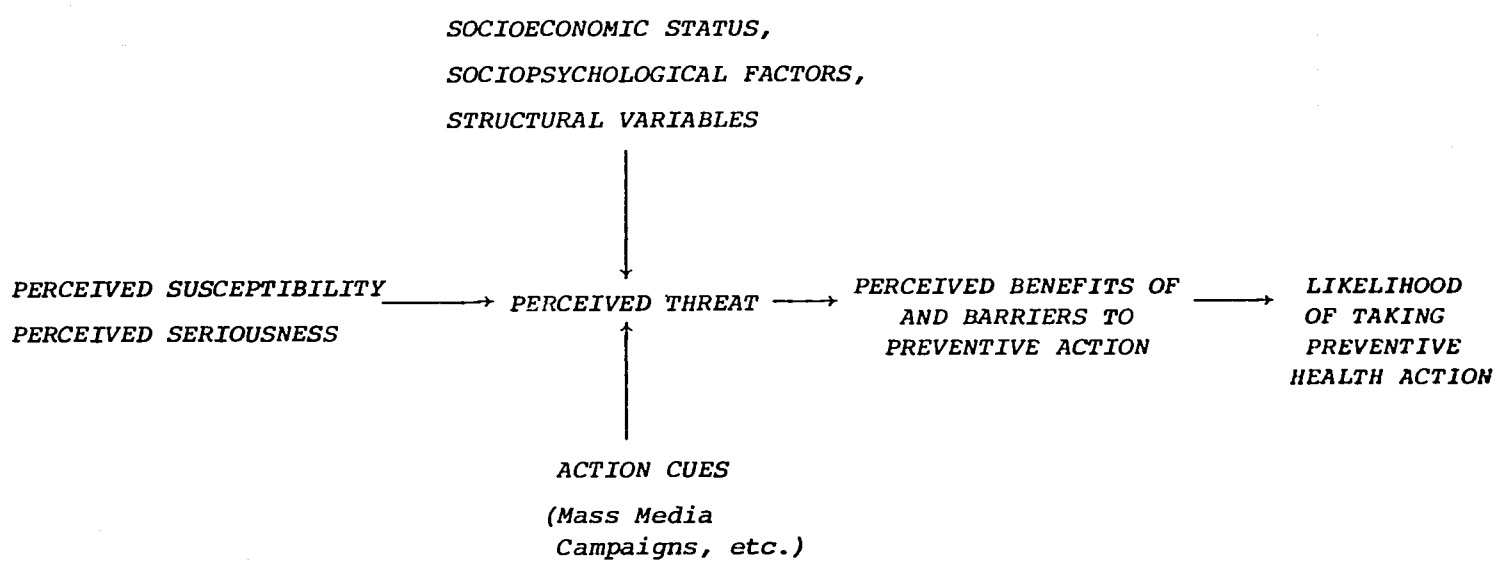
Ruchlin and Rogers (1973) suggested that medical services are different from other goods and services in that medical insurance or government subsidization of medical service would tend to lessen individual ability to pay, and thus price, as a determinant of demand. This situation may result in demand curves such as C and D in which demand is relatively insensitive to price.

It is important to note that demand curves, as depicted in Fig. V-1, are usually drawn for a specific period of time and represent the aggregate market demand. Therefore, shifts in market demand curves are affected by general social changes in preferences, income, and the production of other goods and services. Changes among individuals in terms of income or preferences is accounted for in the individual demand curves that are used to construct a market demand curve.

A typical economist version of demand analysis was undertaken by Rosenthal (1974). In his analysis, he attempted to estimate the demand for hospital beds as affected by price, income, insurance, and a variety of factors assumed to affect preferences, such as age, marital status, sex, race, urbanization, education, and population per dwelling. In the econometric technique of linear regression analysis (described in more detail in Chapter VIII) one can allegedly determine a demand curve (the quantity-price relationship) as factors affecting shifts in demand (income, insurance, and preferences) are "controlled" for.

Equations of the type estimated by Rosenthal (1974) are attempts to provide specific quantification of general process models of consumer behavior. An example of a depiction of a process model to describe demand is offered by Becker, Drachman, and Kirscht (1974). A modification of their model is presented in Figure V-2. In this model they analyze the factors that change the likelihood of taking preventive health actions. In economists' terms, this would be an "effective" demand.

This demand for preventive care is affected by a variety of items affecting preference or perceived threat of the disease: perceived susceptibility and seriousness of the disease, socioeconomic status (age, sex, race, income, etc.), sociopsychological factors (personality, peer and reference group pressure, etc.), structural variables



Source: Adapted from Becker, Drachman, and Kirscht (1974)

Fig. V-2—Demand model for preventive care.

(knowledge about the disease, prior contact with disease, etc.), and cues to action (mass media campaigns, advice, illness of family member or friend, newspaper or magazine articles, etc.). All of these factors affect the perceived threat of the disease and the person's perceived benefits of taking preventive action and perceived barriers to action. The difference between benefits and barriers affects the likelihood of taking action (barriers also include the cost of preventive care). As apparent from this model, one can see the potential impact of health education interventions through mass media campaigns and knowledge about the disease.

The perceived benefits and barriers to action are interpreted by economists to be associated with two ways of viewing the purposes of a good or service: consumption and investment. Mushkin (1962) and Grossman (1972) analyzed medical care in terms of consumption and investment components. Consumption components are associated with the satisfaction one gains from being healthy or protected from disease. This type of satisfaction is similar to that attached to the use of any good, such as automobiles, furniture, and clothing. The investment component of the good is the one more subject to economic analysis in that the benefits of the good are accrued through economic returns such as increased income. From this perspective, in order to calculate a derived demand for health services, Chernichovsky (1977) analyzed the expected lifetime earnings as a sum of the discounted values (this concept is explained in Section V- C) of the wage for each year adjusted by the probability of surviving and the probability of being physically capable of working , according to the following equation:

$$(5.1) \qquad LE = \sum_{i=1}^{n} \frac{P^{S}_{i} P^{C}_{i} W_{i}}{(1+r)^{1}}$$

where LE = the discounted sum of lifetime earnings,

P^s_i = the probability of surviving in year i,

P^c_i = the probability of being physically capable of working (given that the individual has survived)in year i,

W_i = the expected wages in year i, and

r = an interest rate used to discount future earnings.

Other equations could be estimated to relate the change in probabilities of survival and work capability with the demand for health services. In a similar vein, Becker (1965) assumed that the major resource that households had to allocate was time of household members. This time allocation resulted in a given labor supply. Based on this principle Florencis and Evenson (unpub.) analyzed the allocation of nutrition to household members. They felt that nutrition would go to the highest wage earners (the adult males) in the household if nutrition were viewed as an investment good.

In analyzing the relationship between income and demand for food (potentially non-nutritious or low nutrition), Johnston and Millar(1962) calculated an income elasticity (the percentage increase in spending for a 1 percent increase in income), for all foods in developing countries, equal to .6 . Mellor and Lele (1972) estimated the marginal propensity to consume (the percentage of a one unit income increase) of different income groups in India. Lower income groups had a marginal propensity to consume all foods of .76 (70 percent of any additional income would be spent on food) whereas those with income ten times higher only spent 34 percent of additional income for food. Moreover, the food consumed by power groups is clearly affected by price as much as nutrition; for example, lower income groups spent 55 percent of their incomes on grains and higher income groups only 2 percent.

Although most of the analyses above are concerned with 'effective' demand as a means for analyzing the market for health services, it is not necessarily the best approach for national development. The cycle of poverty is evident in that lower income families must choose which members of the family can receive appropriate nutrition and that large percentages

of income must go to food (leaving little for other health services). In these situations those with a greater ability to pay can bid health services away from lower income groups, thus relegating them to little or no health care. Hall (1974) discussed needs assessment models for predicting the requirements for health care personnel, as an alternative to the economist's effective demand approach discussed above. In his biologic demand model one assesses the health problems expected to exist in the country. In his service target model one determines the level of service to be made available. Both of these models depend on a heavy governmental involvement in the health sector in order to respond to such conceptions of social need.

Within the microeconomics framework we are discussing, the existence of a consumer demand for a service is not sufficient to justify its provision, but this demand must be balanced with the cost of providing the service. In analyzing the costs of a health care system, economists often measure the value of resources used to produce a given level of service. Cohen (1967) used a weighted index of several service level measurements including patient days, x-ray procedures, laboratory tests, out-patient visits and operations to measure the output of the model. Leslie (1978a) discussed audience size as a measure of the 'outreach' or service level of health education programs. The major problem with level of service measurements is that little or no consideration is given to the quality of services or the impact of the service. Therefore, service levels should be simply viewed as a guide to discussions of cost. In the remainder of this section we will discuss some basic concepts of cost analysis(see Klees and Wells, 1978 for a more detailed discussion) and apply them to health systems.

The prime consideration of economic analysis is the allocation of resources considered to be scarce. Therefore, in analyzing any health system it is necessary to explicitly list all resources used in the system including personnel, facilities and equipment. In view of the fact that health care systems are often operated for several years one should list the resource requirements according to year of operation. This listing of resources should be in physical terms, such that one knows the number and type of specific resources according to the general categories. In order to project resource requirements it is necessary