THE TRANSFER OF INAPPROPRIATE HEALTH TECHNOLOGY TO THIRD WORLD COUNTRIES

by

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ABSTRACT

The transfer of inappropriate health technology to less developed countries constitutes a large obstacle to the improvement of health in the Third World. Technology transferred through three major mechanisms is examined: Multinational Corporations, Foreign Aid and Education. The technology is evaluated based on a criteria of appropriateness determined from the needs of less developed countries. The criteria of appropriateness incorporates morbidity and mortality, economic, sociocultural, and political factors. Recommendations to redress the inappropriate transfer of technology are set forth in the conclusion.

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DEDICATION

BISMILLAHIR RAHMANIR RAHIM

(In the name of Allah, the Most Beneficient, the Most Merciful.)

This work is dedicated to the 49th Imam and the Ismailis,

His Highness Agakhan Prince Karim Al-Huseini

and

The Agakhan Foundation

for inspiring and supporting this project.

AL-HAMDU LILLAHI RABBIL ALAMEEN

(All Praise is due to Allah, the Maintainer of all beings.)

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INTRODUCTION

The advancement of medical science in the Western World has been accompanied by the rapid diffusion of health technology to developing countries. Countries like the Phillipines have built major heart research and treatment centers; Saudi Arabia has imported the entire hospital technology including equipment, technical staff and systems to provide the finest care to her citizens.

As the world has grown more interconnected, and countries become increasingly dependent, the diffusion of technology from the advanced to the developing countries has become the norm. This diffusion, while holding out the potential for an acceleration in economic growth, is not without its concern.

The growing concern today is about the appropriateness of the technology being transferred. Is the technology that is being transferred relevant, economical, culturally and socially acceptable given the existing conditions in Less Developed Countries (hereinafter referred to as LDC)? In this paper we will be concerned with the transfer of technology and inappropriateness in the health care field.

For our purposes, the word technology is defined as the totality of means employed to harness resources and knowledge for social and economic benefit. Technology is embodied in machines, hardware, devices, drugs, and even knowledge in the form of human capital, e.g., nurses and doctors.

The objective of the paper is to examine the transfer of inappropriate technology to the LDC. This is not to suggest that there is no transfer of appropriate technology but is simply chosen to delimit the area and to focus on it. To begin with, a criteria of appropriateness in health technology is developed, based on the needs of LDC. This is followed by a description of three major mechanisms of transfer of technology and their underlying factors: Multinational Corporations, Foreign Aid, and Education. The appropriateness of the technology so transferred is evaluated using the criteria developed earlier on. This is followed by a final section providing policy recommendations which address the question of inappropriate transfer of technology.

Chapter one develops the criteria for evaluating appropriate technology. Chapters two, three, and four describe the major mechanisms of transfer of technology and evaluate the technology transferred. Chapter five concludes with recommendations dealing with issues raised throughout the paper on the inappropriateness of technology transferred.

CHAPTER 1

APPROPRIATE HEALTH TECHNOLOGY FOR THE THIRD WORLD

The term appropriate technology carries with it a number of connotations. Firstly, it implies the existence of choice; the technology that is available is not restrictive. Secondly, the concept of appropriateness is relative. It therefore begs the question: appropriate to whom and what? Thirdly, the term appropriate technology implies a form of evaluation. Thus, a criteria becomes implicit in the mention of the word appropriate technology.

The purpose of this chapter is to develop criteria for evaluating the appropriateness of technology. The criteria are developed in relation to the needs of the LDC. The first section of the chapter paints a scenario of the health and socio-economic conditions in LDC and existing health services in LDC. This is followed by a section on responses to meet the needs of the developing countries. And finally, criteria for appropriate health technology are developed.

THE THIRD WORLD SCENARIO

The Third World will be looked at in terms of health and socio-economic indicators, the general pattern of diseases, and the conditions of lives as reported in the literature.

At the outset, it must be acknowledged that all statistics and indicators for LDC are subject to the weakness of averaging. In LDC, the rural population constitutes 70 per cent of the total population; whereas, in the industrialized countries, it is only 30 per cent or less. Health and socioeconomic indicators for the urban and rural areas differ significantly. Any generalized indicator is thus subject to this averaging effect, unless it is weighted.

In addition, statistics have a tendency to be manipulated by LDC governments who are interested in demonstrating progress in health status to the aid-donor agencies.[1] Notwithstanding the above, statistics and indicators are nevertheless a powerful tool in indicating conditions in the Third World.

Disease Pattern in LDC

The major diseases in the Third World fall under two basic categories: infectious diseases and malnutrition. Between them, they are responsible for the large majority of mortality and morbidity, particularly for children under the age of five. In some areas they account for 80 per cent of the significant health problems.[2]

In the absence of reliable information from individual countries, the U.N. simulated a model under specific assumptions to convey the disease pattern in LDC.[3] The assumptions for a LDC were as follows: life expectancy at birth of 40 years and a young age structure. For a developed country, the assumption were an older age structure and a life expectancy at birth of 70 years. These assumptions reflect the

demographic pattern in developing and developed countries, respectively. The outcome of the model demonstrates the distribution of diseases in LDC and contrasts it against that in developed countries. This table is illustrated below.

TABLE 1

PERCENTAGE OF DISTRIBUTION OF DEATHS BY CAUSE IN TWO SELECTED MODELS

	Model developing country	Model developed country
Infectious, Parasitic, and Respiratory diseases	43.7	10.8
Cancer	3.7	15.2
Diseases of the circulatory system	14.8	32.2
Traumatic injury	3.5	6.8
Other causes	34.3	35.0
All causes	100.0	100.0

Source: Health Sectory Policy Paper, second edition (Washington: World Bank), February, 1980, Table 2, p. 13.

The results of the simulation show the significance of infectious, parasitic, and respiratory diseases in LDC. They constitute almost 50 per cent of all the diseases, whereas, in developed countries, they constitute only 11 per cent of all diseases causing death.

Infectious diseases can be analysed according to their method of transmission: faecally-related diseases, air-borne diseases, and vector-

borne diseases. In the faecally-related disease category, the most common are the intestinal parasitic and infectious diarrheal diseases (including enteritis and dysentery). Polio, typhoid and cholera also fall under this category. These diseases are a major cause of death in LDC, as well as causing many chronic and debilitating diseases. All of these diseases are a consequence of the insanitary conditions and contaminated water. The vast majority of the Third World population lives in rural areas where less than 25 per cent of the people have access to clean water supplies.[4] Sewage and clean water supplies tend to be concentrated in the urban areas, where they benefit a few people.

In the absence of clean water and sanitation, these diseases spread rapidly. In Pakistan, for instance, "all forms fo dysentery" is the most common category of communicable infectious diseases.[5] In India, in the province of Punjab, a death rate of 3,446 per 100,000 infants has been reported from acute diarrheal diseases.[6]

Intestinal parasitic diseases have a very high rate of occurence in developing countries. These diseases tend to be chronic and debilitating in nature, although they do not result in acute illness and death. The WHO estimates that in 1971, there were around the world 650 million people with ascaris, 450 million people with ancyclostomiasis, 350 million people with ameobiasis, and 350 million people with trichuriasis.[7] One also finds high incidences of roundworm, hookworm, and whipworm. It is estimated that one in four persons around the world is infected with roundworm.

Air-borne diseases are the second major category of infectious diseases prevalent in the Third World. They include tuberculosis, diphtheria, whooping cough, meningitis, influenza and chicken pox. These diseases are spread by the inhalation of airborne respiratory secretions of infected persons. At least 50 million people are thought to suffer from tuberculosis.[8] In Chile and Guatemala, they accounted for 16 per cent and 19 per cent of the deaths (1975), respectively. The spread of these diseases is greatly facilitated by the overcrowding and inadequate housing found especially in urban areas of LDC.

The third major category of infectious diseases are the vector-borne diseases. Vector-borne diseases are transmitted to human beings by disease vectors such as mosquitoes (malaria), water snails (schistosomiasis), or tsetse flies (sleeping sickness). It is estimated that two hundred million people throughout the world suffer from malaria. After the age of twelve months, almost every child in the tropics in Africa has the disease and each year one million African children die of it.[9] Malaria is rampant despite attempts by the WHO to eradicate it. The incidence of schistosomiasis (or bilharzia) is placed at two hundred and fifty million people and is thought to be rising.[10] Many African countries have a high prevalence of African sleeping sickness (trypanosomiasis). River blindness (onchocerciasis) affects more than half the inhabitants of the African savannas, causing blindness in twenty per cent or more of the adult population.[11]

The other major cause of morbidity and mortality in LDC is malnutrition. Over fifty per cent of all childhood mortality can be

attributed to nutritional deficiencies. In total, about one-half of all the children in the developing world may be undernourished. It is approximated that in LDC, 10 million children under the age of five suffer from severe malnutrition, 80 million from moderate malnutrition, and 120 million from less obvious, milder forms of malnutrition.[12]

Malnutrition is the primary cause of ill health in children under the age of five, causing chronic ill health and debility, and lowering resistance to infectious diseases. Malnutrition and infectious diseases operate as synergistic variables. A Latin American study established that in the 10 per cent of childhood deaths due to measles, in 60 per cent of the cases, malnutrition was a contributory cause.[13]

The deficiency in the diets of people in the Third World causes many chronic diseases. The lack of vitamin A causes many people to go blind. In India, fifteen thousand people go blind each year to the lack of this vitamin. It is common to find diseases of dietary deficiencies such as scurvy, pellagra, and beri-beri. The cause of this pattern of disease is the lack of basic sustenance of life - food. It is thus more accurately referred to as a problem of under-nutrition rather than malnutrition.

The under-nutrition in children combined with the infectious diseases leads to a high infant-mortality rate and stunted growth. In child-bearing mothers, the under-nutrition leads to children of low birth-weight, increasing the chances of infant and maternal mortality rates.[14]

The pattern of infectious diseases and malnutrition is often attributed to the state of underdevelopment of the Third World. It must be pointed out, however, that industrialized countries like Britain also underwent a similar phase in nineteenth century. These diseases have now virtually disappeared in these countries not because of the advance in medicine, but because of the general amelioration in the standard of living.[15] The improvements in housing, sanitation, drainage, refuse disposal, education and a higher standard of living for the general masses have been significant factors in changing the disease pattern.

Social and Economic Conditions

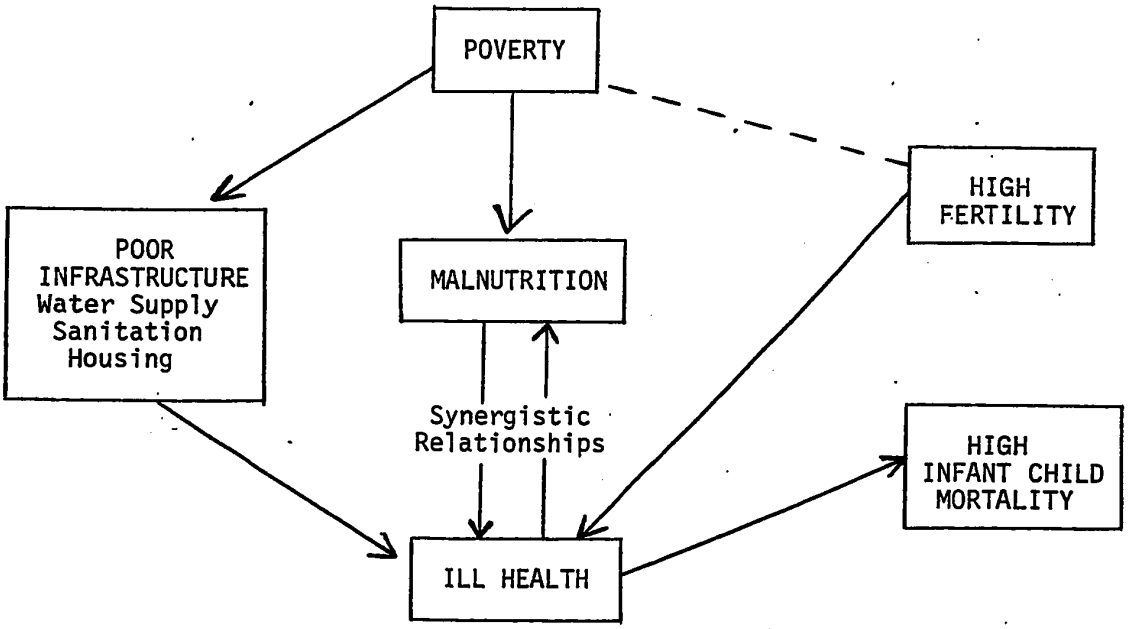
Poverty

The condition of human environment in the Third World is dominated by one principle factor: poverty. Poverty in an absolute sense implies an individual's inability to satisfy his basic needs. It is the core of many of the existing problems in the Third World. Poverty is related to malnutrition, high infant mortality, ill health, and poor infrastructures. We use the diagram below to illustrate this relationship.

Poverty results in malnutrition because people are unable to support their basic sustenance needs. Malnutrition leads directly to debility. Poor countries and poor regions are ill-supplied by adequate housing, sanitation, and clean water supply, thus increasing the chances of faecal and air-borne infectious diseases. Poverty is also associated with high fertility rates. There is less likelihood of practicing birth control when a high percentage of your infants are going to die.

FIGURE 1

THE INTERRELATIONSHIP BETWEEN POVERTY AND OTHER HEALTH RELATED VARIABLES



Source: M. J. Sharpston, A Health Policy for Developing Countries. World Bank Reprint Series: Number Sixty-seven. Reprinted from Leading Issues in Economic Development (Oxford University Press), 1976, p. 497.

Children, in the LDC, are perceived to be a source of manpower and social security in their old age.[16] A high fertility rate in the midst of poverty leads to malnutrition. And malnutrition combined with poor infrastructures leads to high infant mortality rates. The cycle of poverty

is indeed viscious.

In a study done by the International Labour Office, it is estimated that some two-thirds of the population of developing countries in 1972 had insufficient income to purchase a bundle of goods necessary for them to lead a decent life.[17] The criteria for poverty was socially defined and varied according to culture and climate. The figures obtained are shown in Table 2.

TABLE 2

ESTIMATES OF THE NUMBERS OF PERSONS LIVING IN POVERTY IN DEVELOPING REGIONS, 1972

	Seriously poor		Destitute	
	Millions	Percentage of population	Millions	Percentage of population
Asia	853	71	499	42
Africa	239	69	134	39
Latin America	118	43	73	27
Total	1,210	67	706	39

Source: ILO, Employment, Growth and Basic Needs: A One-World Problem (Geneva, International Labour Office, 1976), table 2 in UNCTAD, "Transfer of Technology: Its Implications for Development and Environment," TD/BK.6/22 (New York: United Nations, 1978), p. 12.

This picture of poverty is made worse by the bipolarity in income distribution. The average per capital income in developing countries in 1979 amounted to $230 (compared to the industrialized countries' of

$9,440).[18] The average income in the bottom 20 per cent, however, amounts to well below $200 and is often below $100 per person. In the top 5 per cent, the average incomes are of the order of several thousand dollars. This polarity, while varying in extent from country to country, is a fact of life in developing countries. Moreover, it has been found that in seven countries--Bangladesh, India, Indonesia, Malaysia, Pakistan and the Phillipines--which constitute 70 per cent of the developing world's rural population, the lowest income groups have experienced a decline in real income.[19]

The unemployment picture in LDC is dire. Unemployment reaches high proportions in developing countries but it remains by and large unmeasurable. The high unemployment together with the high dependency ratio (1,483 dependents per 1000 active population in 1970) exacerbate the condition of poverty.

Health and Nutrition

The poor economic and environmental conditions existing in LDC are reflected in a lower average life expectancy in the population. The World Bank figures (1981) estimate life expectancy at birth for low-income countries at less than 55 years. The distribution of life-expectancy by geographical boundaries for the years 1965-1970 are given below.

Several conditions affect health and, as we referred to earlier on, nutritional status plays a dominant role. The standard for determining adequate levels of food consumption has been the "maintenance cost of energy." This refers to the energy required to support the continued

TABLE 3

AVERAGE LIFE EXPECTANCY AT BIRTH
(Years)

Region	1965-1970
Southern Asia	48.8
East Asia	52.2
Africa	43.3
Latin America	60.2
Total developing regions	49.0
Total developed regions	70.4

Source: World Bank, Population Policies and Economic Development (Baltimore, Johns Hopkins University Press, 1974), statistical annex, table 2 in UNCTAD, TD/B/C.6/22, p. 14.

maintenance of life and allows for a minimal level of activity. In Asia, an adult male's average daily maintenance cost is 1,900 kcal; it amounts to 2,000 kcal for countries in which body weights are on the average much higher.

By this measure, 460 million people all over the world were underfed in terms of this definition of minimum food requirement. Contrast this figure, which amounts to 25 per cent, with the industrialized or developed countries where only 3 per cent of the population is underfed. The Table below shows the distribution of people who fall below the minimal food requirements (1970).

Data relating calorie consumption to income indicate that in practically all cases, low income is associated with low energy consumption.

TABLE 4

ESTIMATED NUMBER OF PEOPLE WITH AVERAGE ENERGY (CALORIE) INTAKE BELOW THE MINIMUM REQUIREMENTS, 1970

	Number of persons below limit (millions)	Percentage of total population
Developing countries	434	25
Latin America	36	13
Far East	301	30
Near East	30	18
Africa	67	25
Developed countries	28	3
Total	462	16

Source: "Assessment of the world food situation, present and future" (E/CONF. 65/3), table 13 in UNCTAD, p. 14.

The bottom 20 per cent in urban areas usually get less than 1,600 kcal daily per person. Ironically, low-income is associated with strenuous work which increases the demand for energy consumption.

When a household can afford less than the sufficient amount of food, it is the non-working members of the family who receive the smallest share. This has serious implications for children under the age of 5 and women in pregnancy and lactation because at this time the nutritional requirements of both are highest.

Another variable contributing significantly to health is adequate water supply and sewage disposal facilities. Here, the urban population is much better off; 70 per cent of the urban population has access to

water supply. In rural areas, the supply is staggering low, amounting to 12 per cent only. On the average, less than 25 per cent of the population to safe water. A distribution of the water and sewage facilities (1970) is given below.

TABLE 5

COMMUNITY WATER SUPPLY AND SEWERAGE FACILITIES, 1970
(Percentages)

	Urban population		Rural population	
	With access to water supply	With sewage disposal facilities	With reasonable access to water	With adequate disposal facilities
Africa south of Sahara	67	51	11	18
Latin America and the Caribbean	76	65	23	22
West Asia and north-east Africa	86	94	20	21
Algeria, Morocco and Turkey	73	40	44	5
South-east Asia	53	74	5	3
East Asia and western Pacific	75	80	22	5
Total	69	69	12	8

Source: C. S. Pineo and D. V. Subrahmanyam, Community Water Supply and Excreta Disposal Situation in the Developing Countries: A Commentary (Geneva, WHO, 1975) in UNCTAD, p. 15.

The Third World countries are straddled with a population explosion in addition to the existance of high population. Population in the low-income countries grows at an annual rate of 2.5 per cent, whereas in the industrialized countries it remains at 1.0 per cent.[20] The crude birth rate per thousand population for Third World countries of 40 is double that of industrialized countries.

The high birth rate is related to the high infant mortality and child death rate (aged 1-4 years) in LDC. It leaves the developing countries with a demographic distribution in which there is a relatively large number of young children aged sixteen and under. The infant mortality in a few selected countries is demonstrated in the next table.

TABLE 6

INFANT MORTALITY RATES IN SELECTED COUNTRIES

Country	Infant mortality rate per thousand (aged 0-1)
Finland	10
Canada	15
United States	16
Malaysia	35
Phillipines	72
Egypt	101
Nigeria	163

Source: World Bank, Health Sector Policy Paper, pp. 67-70.

Further damage to the marginal health of LDC is caused by the importation of dangerous industries seeking cheap labour and deregulated environments. Many multinational corporations open plants in LDC ostensibly to provide jobs and promote development, but bring ill health.[21] Occupational health hazards are greater in LDC because of the poor nutritional status of workers, the lack of unions, the absence of official awareness, and the lack of industrial health services. Serious ill health results from these industrial processes, whose reverberations are felt for generations when they affect young men and women.

The misuse of pesticides in improving agricultural productivity also constitutes a rising health hazard. Pesticide technology crosses the national boundaries of LDC very quickly, even when it has been banned in the country of origin.

The creation of infrastructures using modern civil engineering technology to promote development has also resulted in health implication. The building of dams and the creation of man-made lakes has led to the forced resettlement of people and a destroyal of their means of subsistence. These projects have often been accompanied by malnutrition, as was observed when the Tonga people were displaced from the Kariba dam project.

Hydro-electric schemes produce ideal breeding grounds for vector-borne disease such as schistosomiasis and malaria. Where river blindness is endemic, the creation of man-made lakes serves to exacerbate the situation. This is not to suggest that these development schemes are all bad since they are a health hazard, but merely to emphasize that

these schemes can be planned with health considerations in mind.

Housing

In the developing countries, an average of 5 persons live in a dwelling (compared to 3 in the developed countries). However, what is referred to as a dwelling consists of no more than a room. This is the case with 50 per cent of the total living quarters in Zambia in 1969, 40 per cent of the total housing units in Mexico in 1970, and 48 per cent of the Indian households.[22] These slums and quarters lack the most elementary sanitary conditions. They have rapidly grown up around urban centers to ease the migration problem. Combined with unemployment, malnutrition, and poor sanitation, overcrowding in such dwellings only serves to aid in the rapid spread of diseases.

Education

Literacy rates in developing countries average 47 per cent, compared with 90 per cent in developed countries.[23] The total enrolment in primary, secondary, and higher education represented only 14 per cent of the population in Africa, 18 per cent of Asia and 20 per cent of Latin in 1971/73.[24] Only a few of the children enrolled in primary school reach a higher level of schooling.

Pattern of Health Services in LDC

Most LDC are characterized by a dual economy, i.e., an urban-entrepreneurial economy and a rural primitive economy.[25] This parallel also exists in health care. There is a dual system of health existing side by side: one for the urban and another for the rural population.

The basic paradigm of health and medical care services, the socio-political-economic system is presented below. It consists of three factors: effective demand, health programme and delivery systems.[26]

- Effective demand reflects the ability of powerful groups in society to affect the allocation of resources to produce certain types of goods and services to meet their needs.
- Health programme determines the nature of the services, be it curative or preventive.
- Delivery systems reflects the technique of distribution of goods and services of a health programme by a capital:labour mix in three spheres
  - construction techniques in public health, e.g. building sanitation ditches or hospitals can be capital or labour intensive;
  - the type and level of manpower, e.g. medical auxiliaries versus medical doctors;
  - the manpower and equipment used in providing traditional or western medical services.

The health programme and delivery system comprise the health system. The nature of the health system is conditioned primarily by

effective demand and the endowment of the factors of production.[27] Effective demand is conditioned by the per capita income and by the interplay of socio-political forces.

It is argued that the highly curative and capital-intensive health systems in the developed countries were predated by more preventive, labour intensive systems.[28] As their GNP's grew and as preventive infrastructures were developed, new resources were channelled into more capital-intensive curative programmes, which are distributed by their health systems presently.[29]

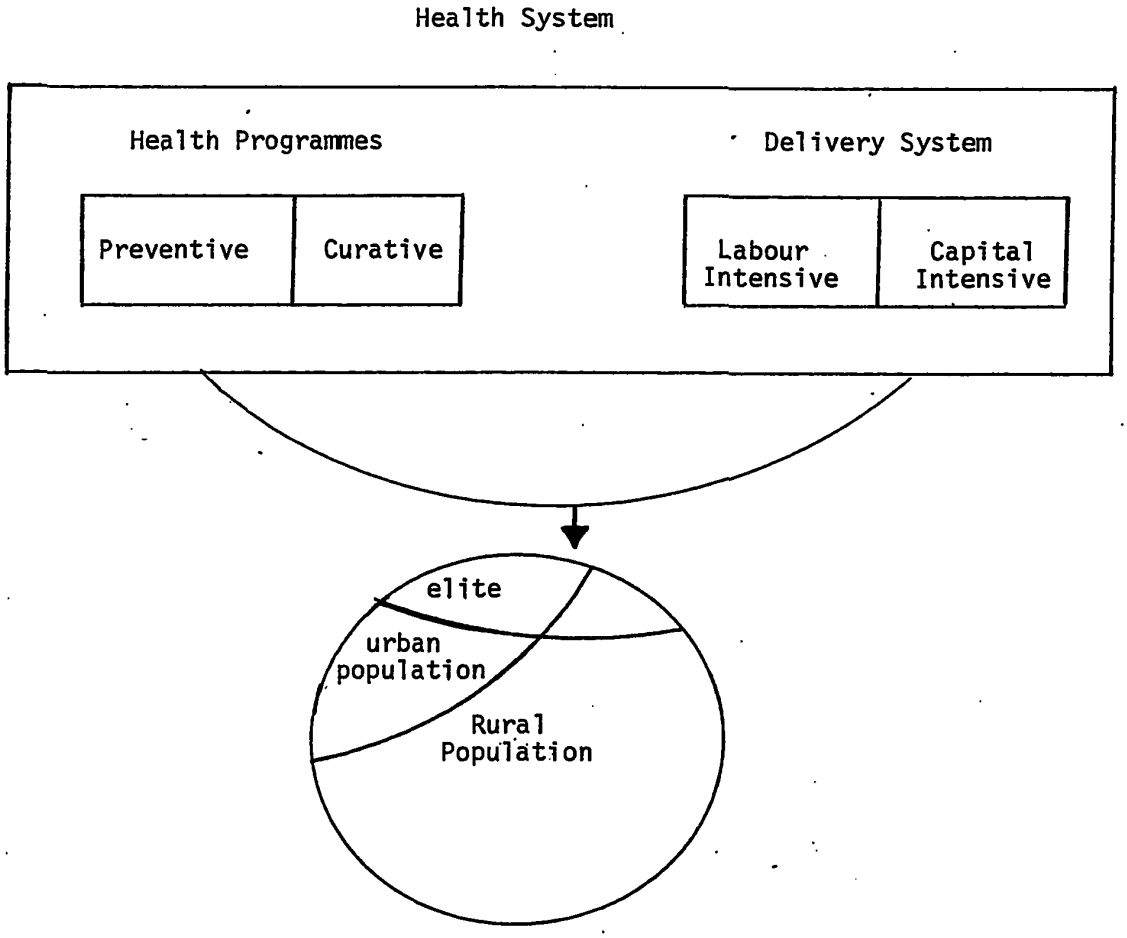
LDC with their low levels of GNP, underdeveloped infrastructures, and plentiful labour, would according to this paradigm, stress prevention and labour intensive methods.[30]

The situation in most LDC, however, is quite the opposite. Figure 3 illustrates the situation there. The distribution of goods and services favours the relatively rich and the skilled urban minority at the expense of the poor and the unskilled. Health programmes have stressed cure rather than prevention. The delivery systems have been capital-intensive, focussing on hospitals and highly skilled doctors, rather than auxiliaries. Western medicine has been endorsed to the exclusion of traditional medicine.

The situation described above is generally true for most countries, though not all. China is the notable exception here and its health care system, which emphasizes prevention and labour intensiveness, is portrayed in Figure 4. The above description has been found to be true in Latin America,[31] Bangladesh,[32] Ghana,[33] and also in Kenya[34] among other

FIGURE 2

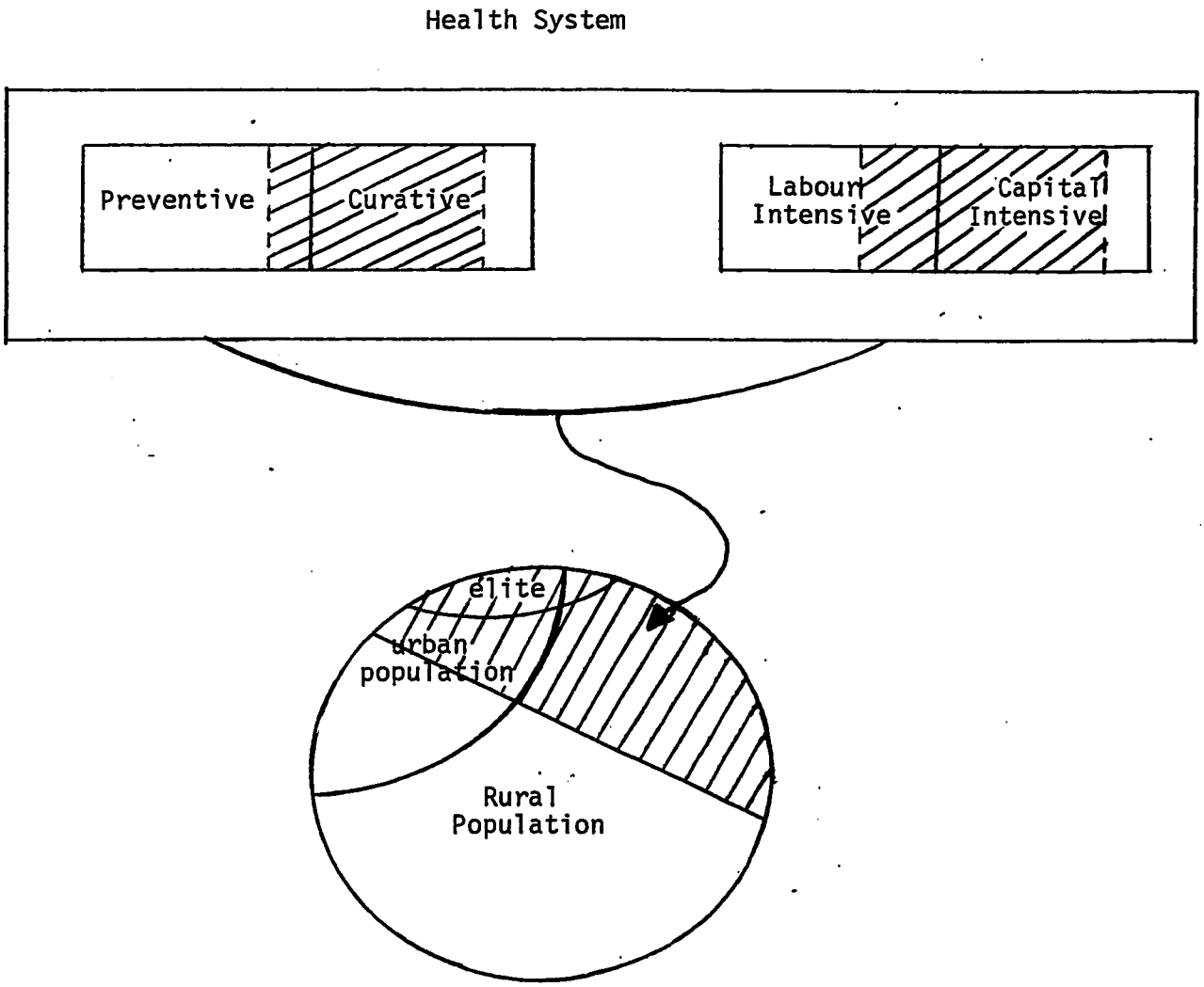
PARADIGM OF HEALTH AND MEDICAL CARE SERVICES



Source: Susan B. Rifkin and Raphael Kaplinsky, "Health Strategy and Development Planning: Lessons from the People's Republic of China," Journal of Development Studies 9 (Jan. 1973), p. 214.

FIGURE 3

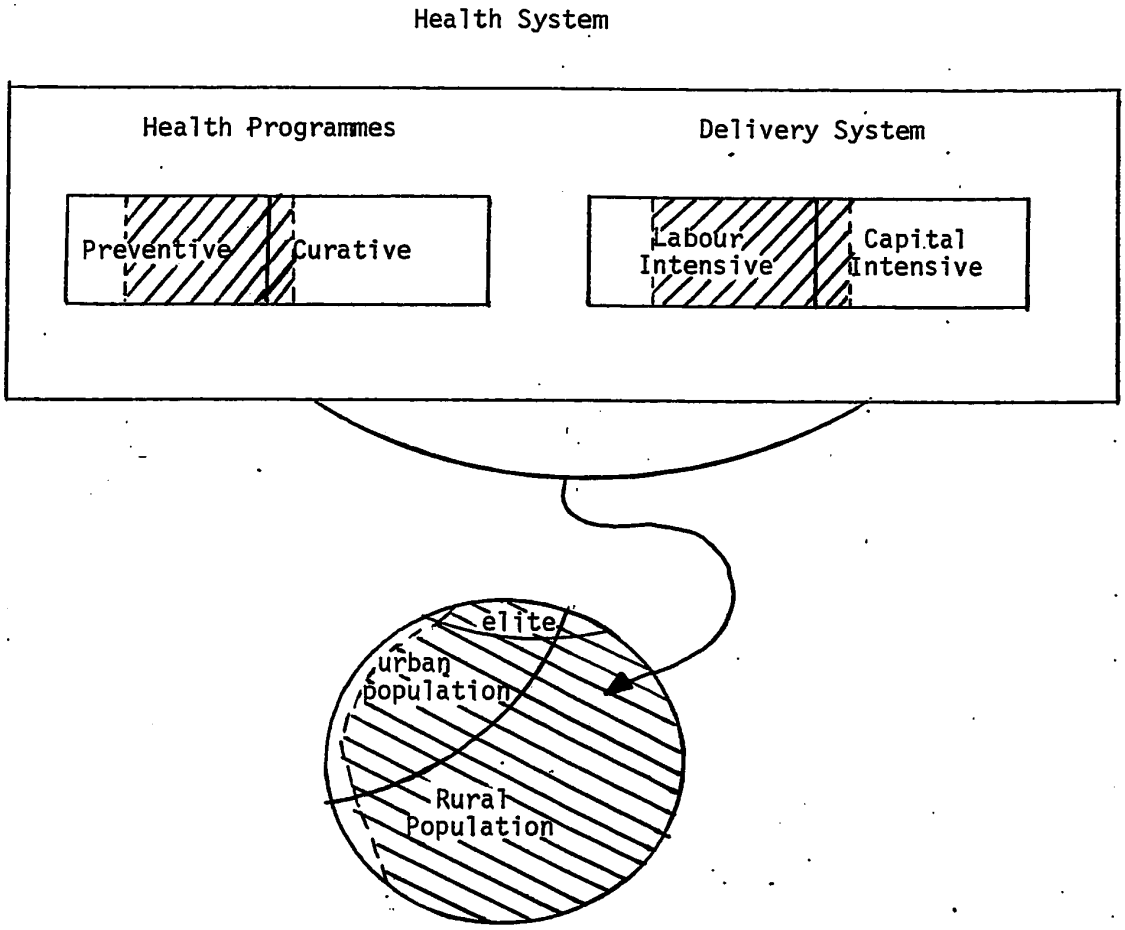
PARADIGM OF HEALTH AND MEDICAL CARE SERVICES
IN A TYPICAL UNDEVELOPED COUNTRY



Source: Rifkin and Kaplinsky, p. 215.

FIGURE 4

PARADIGM OF HEALTH AND MEDICAL CARE SERVICES
IN THE PEOPLE'S REPUBLIC OF CHINA



Source: Rifkin and Kaplinsky, p. 216.

countries.

One finds that a majority of the material and human resources are concentrated in the urban areas. A large proportion of the country's health budget is spent on hospitals to serve the 30 per cent of the population demanding specialized curative care.[35] The rural population has poor access to even primary health care. It is ironical that medical care received by people is a function of their social class and therefore an inverse function of their need for health services[36]; the class that needs it most gets the least of it.

Health care systems in developing countries have often been patterned after those found in industrialized countries. The reasons for this are varied. One of the reasons may be due to the structure of the effective demand.[37] The "demonstration-effect" in the industrialized countries may well be another reason to mimick them. Many countries have historicalties of ex-colonies to the mother country, which influences the choice of health delivery model. Banerji has cited the case of India in this respect.

In the LDC, there are in effect two nations within a country: the urban and rich and the rural and poor population. The former have high incomes and good health, therefore making a lesser demand on preventive services. They desire curative services. The latter, in contrast, have very little access to health care of any form. Their needs are for preventive services. In health care as in other realms, the need is human, the solution is economic and logistical, but the decision is always political. One finds the middle and upper class in the urban population

making its demands for curative services felt to a greater extent.

Thus one finds in LDC excessive hospital facilities built in relation to primary health care facilities. Curative care is emphasized, while prevention and early treatment are ignored.

There are many problems existent in the nature of health delivery systems in LDC. We will discuss these and their impact under the following headings: Health Facilities, Health Manpower, Accessibility and Availability, and Traditional Medicine.

Health Facilities

As mentioned previously, there is a high emphasis on curative facilities rather than preventive ones. Most of the capital and operating budgets of health in LDC are absorbed by hospitals and medical education institutions. This amounts in some cases to up to two-thirds of the health budget. The second highest expense after hospitals is the cost of drugs. These are imported from the multinational producers in industrialized countries.

In the rural areas, health services consist basically of scattered clinics or dispensaries, staffed by health auxiliaries. Health supplies frequently run short and tend to be under staffed. For the large majority of the population this is the only access to health care. These dispensaries do preventive as well as curative work.

Because curative care is emphasized, a large proportion of the population is denied basic health care needs. The emphasis on curative medicine and the resultant importation of drugs and medical equipment

results in a drain of foreign exchange reserves. Developing countries spend from $1.00 to $8.00 per capita on health care.[38] This relatively small amount must be spent effectively if health care is to be accessible to all.

Health Manpower

In LDC, the manpower patterns resemble either extremes of the pattern existing in industrialized countries. One extreme consists of countries whose manpower pattern is exemplified by Latin American countries. The other extreme consists of countries whose pattern is exemplified by African countries. In countries exemplified by Latin America, the manpower pyramid with the physician at the top, supported by a large number of health professionals other than the doctor (nurses, auxiliaries, clerks, etc.) is lacking. Instead, one finds a large number of physicians and a relatively small number of other health professionals. Pakistan is a good example of such a country. The number of doctors to nurses ratio is 5:1, which is the opposite of that found in industrialized countries.

In the LDC, it is exemplified by the manpower pattern in African countries. Here one finds an extremely large proportion of health professionals other than the doctor, relative to the number of doctors. If one were to add the traditional medical healers to the group of health professionals, this ratio would be even greater. This situation arose due to large expense of training medical doctors; more auxiliaries were therefore trained.

In the countries exemplified by the manpower pattern in Latin American countries a problem arose. Because the large number of doctors are trained in the "western" way and wish to practice in a hospital and live in the urban areas. The rural areas are therefore bereft of physicians, whom they cannot afford to pay for their services anyway. This results in the unemployment of doctors in urban areas and the Brain Drain to developed economies.

For the LDC, the brain drain is a loss of a large investment (in the form of medical education) in human capital. The education of the medical doctor is in any case not what is required to treat 90 per cent of the cases in LDC; an auxiliary working in a health dispensary can handle these.

The training of health auxiliaries represents a more cost-effective way of reaching more people; 10 to 15 auxiliaries can be trained for the same amount that it takes to train one physician. The ten per cent of cases that cannot be handled by an auxiliary can be referred to a physician, whose role becomes that of a consultant under a developed referral network. An auxiliary from a rural area is also more likely to return to his/her home, thus becoming a health worker who is already socialized into the customs and mannerisms of the population to be served.

Accessibility

It is generally known that geographic distance proves to be a great barrier in health services. People will not travel long distances to attend a dispensary. In LDC, a dispensary will often serve more than 1000 square kilometers in the rural areas. Routine preventive and promotional activities thus tend to be neglected.

Cultural and social obstacles also exclude people from utilizing health services. For the large majority of population, concepts of medicine as practiced in industrialized countries, must be adapted to the specific characteristics of the society if they are to be useful. For example, in many African countries (Zambia and Ghana), a male nurse is more acceptable socially than a female nurse.

Financial cost constitutes another barrier. Many LDC have instituted use charges in order to discourage the abuse of services. Drug costs must also be payed for. Health insurance does not exist in most LDC. For the poor, the cost of transportation, time away from work, and user fees make health care inaccessible.

Traditional Medicine

Most LDC have inherited an indigenous form of medicine, which we call traditional medicine. It exists side by side with western medicine, serving the health needs of the poor and the majority with no access to western medicine. It serves the needs of the "poor nation" within the country.

Its existence since antiquity and the socialization of the traditional medicine men into society lends credence to its effectiveness, as far as the indigenous people are concerned. Frequently, traditional medicine is the primary health contact when ill-health befalls the villager[39, 40]; western medicine is used as a last resort when all else fails.

In LDC, the endorsing of western medicine has ostracized the traditional medicine men. Instead of being integrated into the main stream of health care, they must work "unofficially" at the fringes. And yet they represent an excellent source of primary contact that is readily acceptable to many people.

Having up to this point discussed the needs of LDC and examined the pattern of existing health services, we now suggest a remedy.

FULFILLING THE NEEDS OF LDC: A RESPONSE

What strategy should LDC adopt in order to cater to the health needs of its population? There exist two "nations" in LDC: the urban and rich and the rural and poor. Both make differing demands and have differing needs. The present strategy of emphasizing curative care can only result in a lop-sided and inequitable distribution of health resources.

The International Conference on Primary Health Care at Alma-Ata, in 1978, called for a new approach to health and health care to close the gap between the "haves" and the "have-nots."[41] Primary health care is the approach thought to be essential in achieving an acceptable level

of health throughout the world.[42]

Primary health care has been defined as "essential health care made universally accessible to individuals and families in the community by means acceptable to them, through their participation, and at a cost that the community and the country can afford. It forms an integral part both of the country's health system of which it is the nucleus and of the overall social and economic development of the community." [43]

In the declaration of the Alma-Ata eight tasks are enumerated which form the minimum core pf primary health care[44]:

1. health education
2. food supply and nutrition
3. water and basic sanitation
4. maternal and child health and family planning
5. immunization
6. communicable disease control and prevention
7. basic curative care
8. essential drugs

The World Bank has referred to this as the "Basic Needs" approach. Its definition encompasses a similar emphasis. Recently, the role of hospitals in primary health care has been brought into focus by the conference sponsored by the Agakhan Foundation and the WHO in Karachi, Pakistan (1981). Speaking at the conference, Dr. Mahler saw a role for frontline hospitals--located in districts or equivalent position--in supporting primary health care, promoting community health development action, basic continuing education of all categories of health personnel, and in

research.[45] He noted that, "hospitals . . . shape the public and professional image of health . . . (and) could become one of the flag bearers of this movement, but only if they change their ways."[46]

Primary health care, as we have defined it, tackles the core issues in LDC. It is preventive as well as curative, and it represents a solution that is midway between the existing problems of LDC and what is offered by western health technology to the problems of LDC. Primary health care is seen as the cornerstone of a system of health which can reach everybody.

Even poor countries like Bangladesh can afford to provide primary health care to all.[47] Gish maintains that such a system is possible, having at its core a unified system for the delivery of primary care together with an integrated but decentralized rural infrastructure.[48]

The solution offered here is not new. It has been known for many years. Some countries like China and Tanzania have attempted to operationalize it with varying degrees of success. In the case of China, implementation of this strategy has resulted in a definite improvement in its mortality and morbidity picture.

In addition to primary health care, a strategy of training a large number of health auxiliaries would complement the human resource need of skilled, locally trained workers. The auxiliaries ought to be trained cost-effectively, i.e., the minimum skill level to perform the job must be provided and should preferably be selected from rural areas to which they will likely return.

Primary health care will result in a greater access to health care for the majority of the people, by providers who are socially and culturally acceptable to the society. Locally trained manpower would mitigate the unavailability of skilled health manpower in rural areas, as well as the brain drain from LDC.

CRITERIA FOR APPROPRIATE HEALTH TECHNOLOGY

Today, there is a growing awareness of the problems caused by the use of inappropriate technology. This is true at the national and international level,[49] as well as among development specialists.[50]

What is appropriate technology? Various authors have attempted to define appropriate technology.[51,52,53,54,55,56]

For some, a technology becomes appropriate when it is adapted and applied to the local context. Others have stated that a technology is appropriate when it contributes to employment, citizen participation, and social justice. For still others, appropriate technology is one that is simple, small, durable, local, indigenous, accessible to a large number of people, and fits within the existing political structure.

The appropriateness of a technology for LDC has been defined in terms of its attributes: it has been called labour-intensive, low-cost, village-level, intermediate, labour-saving, and progressive. Common to these viewpoints is the notion that science and technology must be appropriate to its local setting.

For our purposes, appropriate health technology is one that addresses the mortality, morbidity, and social problems of a country. It

must address the prevalent issues. Therefore, if infectious diseases is the problem, the solution is sanitary measures, clean water supplies, and health education, not the building of curative facilities (hospitals) for the sick, nor the importation of more drugs. If fertility is the problem, the appropriate technology is birth control, not neonatal units.

This rationale applies to appropriate skill in health manpower. Appropriate health technology must be cost-effective. When an allied health worker can be used, a doctor's training is not justified. A simple health measure may not produce as complete a benefit as a more complex one, but it may be more cost-effective for mass use.

We have outlined the basic needs of LDC in the earlier sections. Having defined appropriate technology, we now procede to develop specific criteria to evaluate health technology that is appropriate. This is not to suggest that the solution of the LDC problems lie in the transferring of more technology from the industrialized countries. However, should technology be transferred, it should be of a kind and nature defined by the following criteria.

The criteria developed below are based on the synthesis of criteria presented by Taylor,[57] the World Bank,[58] and Hvelplund.[59]

Criteria 1 (Mortality-Morbidity)

The technology must address the mortality and morbidity issues of LDC.

Sub-criteria

- The innovation must be accessible to a large number of people.
- The technology must be durable and readily maintained by people with minimal education or technical skill.
- The technology must be compatible with local energy sources.
- Drugs and equipment should withstand diverse climatic conditions and not require refrigeration.
- The technology must be ecologically sound. It must provide safety with minimal complications and side-effects.

Comment

Any technology that serves a very limited segment of the population is inappropriate. Given the large proportion of the population residing in the rural areas, our definition of appropriateness will be directed to this majority.

Accessibility includes geographic and financial barriers.

The rural areas suffer from poor transport infrastructures and are generally poorly serviced. Tools and processes utilized must therefore be under the maintenance and operational control of local workers. Rural areas are generally also lacking in refrigeration facilities.

Criteria 2 (Economic)

The technology must make economic sense for the LDC.

Sub-criteria

- The technology (drug, equipment, skill, or technique) must be cost-effective.
- The innovation must be as small as is compatible with efficiency.
- The technology should use indigenous materials where available and utilize local and labour intensive manufacture.
- It must, where possible, utilize local human resources to create jobs.
- It must not result in an excessive drain on the foreign exchange reserves of the country.
- It must have a low cost per unit of service, despite the lack of economies of scale.

Comment

The manufacture of indigenous technology may not be possible in LDC despite the existence of local raw material. This may be due to the state of economic development and the different priorities of the country concerned.

One of the greatest assets of LDC is its untapped manpower capital. Thus, it makes sense to utilize labour-intensive methods to improve productivity and provide employment instead of using scarce financial resources for capital-intensive technology.

Criteria 3 (Socio-Cultural)

The technology must be socially and culturally acceptable to the societies in LDC.

Sub-criteria

- The technology must be aesthetically appealing to the culture of adoption.
- Technology must prevent external cultural domination.
- If imported technology and materials are used, some control over them must be available to the community.
- Health programs should favourably influence the long-range welfare of the community, enabling it to stand on its feet, genuinely encouraging responsibility, initiative, self-reliance and build upon human dignity.

Criteria 4 (Political)

The technology must be politically acceptable.

Sub-criteria

- The innovation must be in keeping with the national goals of the country.
- The technology must be acceptable to the goals of individuals in society.

Appropriate technology would ideally meet all the above criteria and sub-criteria. In our discussion though, we will only be applying the four major criteria to evaluate health technology. When dealing with a specific country and situation, it is useful to state a measure when evaluating technology; for instance, a technology is appropriate if it meets 75 per cent of the four criteria. Also, every criterion and sub-criterion must have a measure associated with it. However, in our discussion, we will not make these demarcations since we will be dealing with LDC in general.

In the next three chapters, the methodology developed here will be used to evaluate the inappropriateness of technology transferred. We will use the following tabular format in our discussion.

	Criteria	Not applicable	Yes	No
1	Mortality-Morbidity			
2	Economic			
3	Socio-cultural			
4	Political			

CONCLUSION

The word appropriate health technology is associated with technology best suited to meet the basic human needs of the population. The majority of this population resides in the rural areas and is poor. Many of the technical solutions being transferred to developing countries do not benefit this group.

In this chapter we have developed a criteria for the evaluation of technology more appropriate to this majority of people in LDC. In the next three chapters, we apply this criteria in evaluating inappropriate technology.

CHAPTER 2

MAJOR MECHANISMS OF TRANSFER OF TECHNOLOGY: THE MULTINATIONAL CORPORATIONS

The transfer of technology to LDC has supply side and demand side determinants. The Multinational Corporations (MNC) represent one supply side determinant. The MNC use a multitude of methods to effect the transfer of technology. Much of the technology transferred to the LDC, however, is not appropriate for the needs of LDC.

In the past, they have been accused many wrong-doings including, the dumping of drugs banned in the developed world in LDC, making unjustified and occasionally outright false claims for the safety of their products, putting pressure on health professionals to promote the sell of their products, and engaging in international corruption to achieve their means.[1]

In this chapter we will be concerned with the evaluation of the technology transferred by MNC. We begin with a brief description of the methods used by MNC to transfer technology and then examine the technology that is transferred. The technology is thereafter evaluated for appropriateness in relation to the criteria developed in the earlier chapter. The evaluation of technology is restricted to that transferred by multinationals in the pharmaceutical, medical and dental supplies, and capital technology (hospitals) industries.

METHODS USED BY MULTINATIONALS TO TRANSFER TECHNOLOGY

The basic drive underlying the expansion of MNC into developing countries has been the search for new markets to increase their profits. The MNC are characterized by three basic attributes: diversification, profitability, and concentration. They produce a wide product line which includes pharmaceuticals, chemicals, computers, cosmetics, and electronic equipment.[2] In ensuring their sales, they make use of a wide variety of marketing techniques. We describe the major ones here.

The Use of Detail Men

Detail men are the intermediary between the MNC and the health professional in the LDC. Multinationals invest highly in the detail men who are, in effect, their sales force. Whereas in the United States there is one detail man to 10 physicians, in LDC the ratio is much larger. In Ecuador it is 1:8; in Colombia it is 1:5; and in Guatemala and Brazil it is 1:3.[3]

The large number of products on the market (especially drugs) makes the health professionals reliant on the detail men to keep them informed of the new products. The salesmen thus assume the role of information provision. Trained to make a persuasive sales pitch, they often determine whether a drug like chloramphenical is prescribed instead of tetracycline or whether an ultrasound machine is bought instead of three x-ray machines.

The Health Professional

The provision of free samples of infant formula feed to well-child workers, hospital pharmacies, and government medical supply stores is another method of influencing the health professional.[4,5,6,7] The approach used here is manipulation by assistance; since thirty to fourty per cent of health care expenditures in LDC are on drugs, free samples are always welcome.

MNC also trains milk nurses who make home visits and home deliveries, while simultaneously promoting their brand of infant formula.[8]

Political Manoeuvring and Corruption

MNC have a huge financial leverage which, in addition to their organizational capacity, lends them a potent capacity to influence decisions. Political manoeuvring take place at two levels: in the host country of MNC and in the LDC whose markets are being sought.

In the industrialized countries, the MNC work hand in glove with the government to ensure that the foreign-aid given is tied-aid. Eli Lilly, a pharmaceutical firm, for example, set up a special agency to permit the United States A.I.D.-program to purchase pharmaceuticals for LDC from it.[9] It is common knowledge that pharmaceutical firms are one of the largest donors to the United States presidential campaign fund.

In LDC, it is a common practice for MNC to bribe officials of the Ministry of Health and other authorities. More companies in the drug and health care industry disclose "questionable corporate payments" overseas than in any other industry.[10] Merck, a pharmaceutical company,

admitted to having provided $3.5 million to employees in 36 foreign governments between 1968 and 1975.[11] The bribing and payoffs result in dangerous, inefficacious, and unnecessarily expensive technology being introduced on the market.

Other Methods

Frequently, MNC are able to transfer a lot of technology because of the absence of regulation in LDC. They justify this on the basis that they are not breaking any laws.[12] In many LDC, there are no laws governing drug promotion.[13] Where laws do exist, MNC have been known to violate them.[14]

MNC also ease the acceptance of the technology they have to offer by using marketing gimmicks to influence consumer expectations; the use of billboards with infant formula advertisements and radio announcement can significantly change consumer tastes. As a result, in some countries bottle-feeding the baby has become the accepted norm rather than breast-feeding.

The sponsoring of conferences, association with the medical associations in LDC, the provision of scholarships and the printing and distribution of literature are other methods used by MNC. In many LDC, the equivalent of the Physician's Desk Profile on Drugs is made freely available to practitioners by the pharmaceutical industry; in LDC, this literature is rarely vetted by a regulatory authority. The MNC can therefore advertise what they please.

TYPES OF TECHNOLOGIES TRANSFERRED BY MULTINATIONALS AND THEIR EVALUATION

A Plethora of Drugs

The sophisticated marketing by pharmaceutical companies results in a large number of drugs imported in LDC. MNC invest millions of dollars in research and development to produce drug innovations. Innovations can be of two kinds: differentiated and progressive. The multinationals' major emphasis is on differiated or "me-too" products. Table 7 illustrates this in the case of Spain. There are 110 brands of tetracycline, 106 brands of chloramphenicol, 95 brands covering four or five relevant corticosteroids, and 39 penicillin brands. The same company will also intensely differentiate its own products; Pfizer had 17 brands of tetracycline in 1965.[15]

The large number of specialty products poses an information problem for the health professional. The thousands of specialties (or differentiated products) make it difficult for the health professional to keep up to date with the current information. It blocks the vital information channels. As Dr. Mahler, the Director-General of WHO put it: "If you have to deal with 80,000 different types of drugs on the market in any particular country, it is impossible for any doctor to have sufficient knowledge."[16]

Many of the products have little relevance to the disease patterns in LDC, i.e., they are not progressive innovations. The products marketed in LDC are the same ones that are developed for industrialized countries, where the disease pattern is different. Thus, one finds an

TABLE 7

NUMBER OF PHARMACEUTICAL SPECIALTIES SOLD TO SOCIAL SECURITY PER GENERIC GROUP, SPAIN, 1968

Sales Ranking	Generic Group	No. of Brand Names
1	Chloramphenicol	106
2	Tetracycline	110
3	Corticosteroids	95
4	Penicillin-streptomycin	38
5	Liver extract	32
6	Sulfonamides	24
7	Tonics and reconstituents	46
8	Analgesics and antirheumatics	52
9	Vitamin B_1	41
10	Tranquilizers	31
11	Neutralizers	31
12	Respiratory system	40
13	Penicillin	39
14	Other hormones	37
15	Others (digestive system)	25
16	Other antibiotics	16
17	Vitamin B_{12}	15
18	Vitamin A	27
19	Vasodilators	13
20	Ampicillin	19
21	Gamma globulin	12
22	Hydracides	17
23	Vitamin C	7
24	Hypotonics	7
25	Psychotropics	11
26	Kanamycin	13
27	Vitamin B_6	9
28	Cholagogues and choleretics	10
29	Streptomycin	11
30	Urinary system	11
31	Diuretics	6
32	Dermatological	8
33	Lipotropic	8
34	Antidiabetics	4
35	Erythromycin	7
36	Antiallergics	5
37	Others (vascular system)	9

TABLE 7 (Cont'd)

Sales Ranking	Generic Group	No. of Brand Names
38	Anabolics	4
39	Neomycin	3
40	Antiarrhythmics	6
41	Antihelminthics	5
42	Antidiarrheics	5
43	Antiepileptics	6
44	Antitoxins	5
45	Obesity	4
46	Contraceptives	4
47	Radiological contrasts	3
48	Biological extract	1
49	Factor PP	2
50	Vaccines and immunologics	3
51	Analeptics	1
52	Relaxants	2
53	Antivaricose	1
54	Antivertiginous	1
55	Secretogogues	1

Source: Felix Lobo, "Monopolistic Structures and Industrial Analysis in Spain: The Case of the Pharmaceutical Industry," Int. J. Health Serv. 9 (1979), pp. 672-673.

excessive variety of vitamins, tranquilizers, cough syrups and tonics which do not complement the pattern of infectious diseases and malnutrition existing in LDC. The pattern of drugs in India is shown in Table 8. It is illustrative of the mis-match between the pattern of disease and the number and types of formulations on the market. It has been estimated that over 90 per cent of health problems (in LDC) could be covered by between 100 and 200 drugs, a range which physicians could cope with.

TABLE 8

ANALYSIS OF PRODUCTS OF INDIAN PHARMACEUTICAL INDUSTRY, 1972

	Products (Group-wise)		No. of formulations in the market	
1	Vitamins -	Multivitamins	308	1 134
		Vit. B complex	406	
		Vit. B_{12}	126	
		Others	294	
2	Tonics, nutrients or deficiency drugs			685
3	Tranquilizers and sedatives			376
4	Expectorants, cough syrups, decongestants			340
5	Analgesics and antipyretics			296
6	Antibiotics:	Penicillin and salts	99	527
		Chloroamphenicol	155	
		Streptomycin	82	
		Tetracycline	115	
		Neomycin	28	
		Others	48	
7	Anti-infectious:	Sulphas	320	1 068
		Anti-TB drugs	223	
		Antidysentery	185	
		Antimalarial	133	
		Anthelminetics	66	
		Antifilarials	48	
		Antileprosy	20	
		Antifungal	19	
		Antiseptic	54	
8	Steroids and hormones			354
9	Anti-histamines			151
10	Antiacids			113

TABLE 8 (Cont'd)

	Products (Group-wise)	No. of formulations in the market
11	Anaesthetics (local and general)	88
12	Laxatives and purgatives	69
13	Anti-inflammatory drugs	75
14	Alkaloids	445
15	Galenicals (crude drug extracts)	55
16	Inorganic elements and compounds (excluding iron preparations)	146
17	Sera and vaccines	49
18	Enzymes	104
19	Household remedies (dexture, gripe water, etc.)	180
	Others	1 144
	Total	7 399

Source: Compiled from product information given in Indian Pharmaceutical Guide 1972, 10th edition (Pamposh Publications, New Delhi) in UNCTAD, Case Studies in the Transfer of Technology: The Pharmaceutical Industry in India, p. 8.

Many hazardous drug products are dumped on LDC. Silverman cites the example of chloramphenicol, oral contraceptives (Depo-Provera) and corticosteroids in making the accusation that many products are marketed without adequate information on adverse reactions and indications.[17] Package inserts in products are usually lacking.[18] Where they are present, the indications are numerous, the adverse reactions are glossed

over, and the hazard ones are not even mentioned.[19]

Drugs sold to LDC are not only of the wrong type, too numerous, and hazardous, they are also old and outdated. Drugs which have passed their expiry date and can no longer be sold to the industrialized countries are sold to LDC.

Using unethical tactics (bribes), MNC have managed to cajole health ministry officials into making purchase of drugs beyond their expected needs. For example, Yudkin reports that Central Medical Stores, which distributes all pharmaceuticals in Tanzania, had a 46 year supply of Reverin,[R] a 5 year supply of Orbenin,[R] and a 5 year supply of Lente-Insulin.[20] These products, which are antibiotics and insulin, have a shelf-life of less than 6 months in tropical countries. No doubt the lack of management had something to do with this fact also.

Pesticides that are banned in the industrialized countries readily make their way into LDC, brandishing a different name but carrying the same hazardous implications.

As a result of the advertising campaign one also finds that breast-feeding is declining, while the purchase of infant-formula feed is increasing. The latter causes dysentery and marasmus in young children because of the absence of a safe water supply.[21]

Drugs, in the LDC, consume up to one-third of the health budget. Since most of the drugs are imported, they constitute a net loss of foreign exchange.

Having examined the technology (drugs) transferred, we now proceed to evaluate it using the criteria we have developed. We use specific examples to show the inappropriateness of technology transferred. The first example will be that of the infant formula feed. As shown in the table below, this technology meets none of the applicable criteria and

	Technology: Infant-formula			
	Criteria	Not Applicable	Yes	No
1	Mortality-Morbidity			✓
2	Economic			✓
3	Socio-cultural			✓
4	Political			✓

may therefore be deemed inappropriate. The first criterion of addressing the morbidity and mortality issues in LDC is not met because infant-formulas have in fact increased the infant mortality rate due to the high incidence of marasmus and dysentery associated with it. Due to the extensive poverty, it is not accessible in required amounts to the majority of the population.

The economic criterion is not met because bottle feeding is not a cost-effective solution. Breast-feeding, which is natural and healthier and which also delays the return of ovulation, is more in keeping with LDC needs. The purchase of the many brands of infant-formula from MNC is a net loss of scarce foreign exchange for developing countries.

The third criterion of socio-cultural acceptability is also not met because bottle-feeding introduces an alien method of feeding infants,

when breast-feeding is more natural to much of the society in LDC. It also represents a form of cultural domination: of the western way over the traditional way.

The fourth criterion is definitely not met. National governments have for years been fighting the hard-sell tactics of MNC in this industry.

Thus, infant-formula represents an example of a blatantly inappropriate technology. The criteria developed can also be applied in the determination of appropriate and inappropriate drugs. We take the example of a long-lasting, slow release preparation of penicillin, and contrast it with a tranquilizer like valium or an anti-hypertensive like propranolol.

	Technology: Penicillin			
	Criteria	Not Applicable	Yes	No
1	Mortality-Morbidity		✓	
2	Economic		✓	
3	Socio-cultural		✓	
4	Political		✓	

Penicillin, an antibiotic, meets all the above named criteria. It addresses the mortality and morbidity issues of LDC, it is cost-effective and efficient (although it may not be produced by the industry in LDC), and it is socio-culturally and politically acceptable.

Anti-hypertensives and tranquilizers, on the other hand, do not meet most of the criteria since they were designed for the disease

	Technology: Anti-hypertensive (Propranolol) Tranquilizer (Valium)			
	Criteria	Not Applicable	Yes	No
1	Mortality-Morbidity			✓
2	Economic			✓
3	Socio-cultural			✓
4	Political			✓

patterns of industrialized countries. Popping a pill to relax or to control hypertension is culturally alien for many societies. This is true especially for a silent disease like hypertension which has few external manifestations in the early years. Economically, the drugs do make sense only if used for the treatment of specific diseases.

Finally, we will examine the case of birth control pills. Are they appropriate? This is one example of a technology that meets only 75 per cent of the criteria in many countries but which can be induced to meet 100 per cent of the criteria.

	Technology: Birth Control Pills			
	Criteria	Not Applicable	Yes	No
1	Mortality-Morbidity		✓	
2	Economic		✓	
3	Socio-cultural			✓
4	Political		✓	

Despite being alien to the culture of many countries, it has successfully been used to control birth rates; China is one of the successful examples. This has been made possible by large government support,

making information available, and good marketing practices which have resulted in the socio-cultural acceptability of birth control pills.

Medical Equipment, Supplies, and Techniques

Medical equipment, supplies and techniques transferred to LDC range from the smallest items like thermometers and sphygmomanometers to half-way technologies like transplants of heart and renal technology designed to compensate for incapacitating diseases. Other products that make their way to LDC include disposable surgical dressings, heart pacemakers, computerized x-ray equipment, surgical appliances, dental equipment and supplies and x-ray apparatus and tubes.

Piachaud has noted that LDC are among the very early recepients of sophisticated high technology like CAT scanners and ultrasound equipment for the hospital.[22] The equipment is imported without being evaluated for their efficacy and their impact on health services. Much of the equipment that arrives in these countries soon becomes idle because of poor maintenance and inadequate skilled manpower to properly utilize it. It lies and rots away in storage.

The MNC have a policy of promoting the obsolescence of equipment to increase their yield of profit. New equipment often accomplishes less than the older equipment it replaces in terms of quality. Yet, new equipment is purchased because of its "newness" and because it is propounded to be the most advanced.

Once again we must address the question of appropriateness of technology in this field. All the technologies mentioned here will not be

evaluated. We will use a few illustrative examples.

Is a half-way technology like a renal dialysis machine appropriate technology for LDC? Applying our criteria we find, as shown in the table below, that it meets none of them.

	Technology: Renal Dialysis			
	Criteria	Not Applicable	Yes	No.
1	Mortality-Morbidity			✓
2	Economic			✓
3	Socio-cultural			✓
4	Political			✓

Renal dialysis does not address the mortality and morbidity issues of the population at large. It is expensive, takes skill to maintain, and is inaccessible to the large majority of people. It is alien to the culture and is divergent from the national goals of governments in LDC to provide health care to all, rather than life-saving care to a few. Renal dialysis is therefore inappropriate technology. Similarly, techniques like heart transplants and cardiac catheterization, which are very expensive, require a high degree of skill, and which do not address the mortality and morbidity problems in LDC, are inappropriate technologies.

In contrast, supplies like thermometers and sphygmomanometers which are small, durable, cost-effective, simple and culturally and politically acceptable may be termed appropriate technology.

What about x-ray machines? Are they inappropriate? Our evaluation shows that x-ray machines constitute an appropriate form of technology, as shown in the table below.

	Technology: X-ray Machines			
	Criteria	Not Applicable	Yes	No
1	Mortality-Morbidity		✓	
2	Economic		✓	
3	Socio-cultural		✓	
4	Political		✓	

X-ray machines are useful for the early detection of tuberculosis, which is still prevalent in LDC. It is cost-effective although the cost per unit of service is high; it is not hazardous when used properly; and it is socio-culturally and politically acceptable as a technology.

Capital-Embodied Technology

The transfer of capital-embodied technology to LDC is a relatively new phenomenon. Under this category, entire hospitals are transferred to LDC. Investor-owned hospital corporations are actively expanding abroad through the ownership of hospitals there--the export of capital--and through management contracts--the export of expertise, and with it, ideology.

An example is the American Corporation which manages hospitals in Saudi Arabia, Mexico (Hospital Corporations of America), Iran (American Medicorp), and London (American Medical International). In addition, it

owns them in Paris and Guan (Hospital Affiliates International).[23]

How does this technology fare in terms of appropriateness for LDC? The transfer of hospital technology wholesale from the industrialized countries to the LDC is inappropriate as demonstrated by the criteria below.

	Technology: Hospitals			
	Criteria	Not Applicable	Yes	No
1	Mortality-Morbidity			✓
2	Economic			✓
3	Socio-cultural			✓
4	Political		✓	

Hospitals only reach a minor proportion of the population (usually in the catchment area), while consuming a disproportionately large proportion of the health resources. They are not the most cost-effective way of delivering health care. They result in a drain on foreign reserves and emphasize curative care, which is not the most efficient manner of providing health care in LDC. In many countries, hospitals have a reputation of being institutions to die in. Despite this, hospitals are politically acceptable to many LDC. Overall, however, hospitals represent an inappropriate form of technology.

The management of hospitals in LDC by multinational affiliates is also inappropriate. Hospitals in the Third World cannot be managed along the same lines as those in industrialized countries. The values of people and administrators in LDC will be different from those in

industrialized countries. In addition, the running of health care institutions for profit is an ideology totally unacceptable to the poor LDC. (Most management contracts have an agreement which includes a share of the profit.) On this grounds, this constitutes a form of inappropriate technology being transferred.

CONCLUSION

In this chapter we have examined the types of technologies transferred to LDC by multinational corporations. We have attempted to evaluate some of the technologies for their appropriateness and have indicated why and where they are inappropriate.

Multinationals represent one of the supply-side determinants of the transfer of technology. The other supply-side determinant is foreign aid. In the next chapter, we examine foreign aid as a mechanism for the transfer of technology.

CHAPTER 3

MAJOR MECHANISMS OF TRANSFER OF TECHNOLOGY: FOREIGN AID

Foreign aid is the second major mechanism of transfer of technology to LDC. In this discussion, we will examine the health technology transferred under bilateral aid, multilateral aid, and aid by private non-governmental organizations. A description of the above methods of aid is given first, followed by a description of the technologies transferred and their evaluation for appropriateness.

METHODS OF GIVING AID

Countries wishing to funnel aid to LDC generally do it through two modes: directly aiding the LDC or through a common pool from where aid is disbursed. The former is known as bilateral aid, and the latter as multilateral aid. A major proportion of all aid to developing countries remains bilateral aid.

Bilateral Aid

In 1967, bilateral aid constituted 90 per cent of all official development assistance.[1] Typically, this aid given by most industrialized countries is tied aid, constituting less than one per cent of their annual GNP. This type of aid is granted to LDC in the form of grants with the condition that all purchase of products and materials be from

manufacturing companies in the industrialized countries.

In the United States, for example, the Agency for International Development (AID) buys goods from over 4,000 American corporations and pays approximately 1,000 private institutions, firms, and individuals for technical and professional services to carry out projects overseas.[2] Similarly, May and Dobson report extensively on the impact of the United Kingdom's bilateral aid programme on the British industry.[3]

The result of the bilateral aid programme is that far from exporting dollars and capital abroad, there is net inflow of capital from LDC to industrialized countries. Bader reports that in 1971, U.S. foreign aid in the form of loan and grants from AID resulted in the financing of 7.1 per cent of all U.S. exports to developing. Therefore, it is in the national interest of industrialized countries to provide tied-aid because this aid also stimulates their own economies.

The multinational companies that take advantage of this aid programme include the makers of scientific and medical equipment, pharmaceutical companies, and other non-health related industries.

The recipients of aid among the Third World are those nations in whom the donor country has an interest, be it for military security, for developing markets, or other pecuniary interest. Foreign aid can in fact be regarded as one of the instruments of foreign policy. Industrialized countries in the western world are more likely to give aid to LDC which have democracies, free-enterprise systems, and non-communist governments.

Multilateral Aid

Multilateral aid is generally thought of as a more acceptable form of aid than bilateral aid. Multilateral agencies depend upon government support and final authority over them rests in these governments. They have, however, developed an existence of their own relatively free of interference of control by other members.[4] This permits them to concentrate on development issues, rather than political distractions.[5]

The allocations of funds from multilateral aid agencies is determined by a voting system; the one-vote-per-country makes the programs of these agencies heavily weighted in favour of developing countries, who are large in number.[6] Where there is weighted voting, i.e., where the largest contributor of aid has more votes, the policies and programs that emerge are those favoured by the industrialized countries. This is applicable in the case of the World Bank and the International Monetary Fund. Examples of the former include UNICEF and UNESCO.

The International Monetary Fund and the World Bank are known as the unofficial governors of the Third World because of the large debts accumulated by LDC. These agencies therefore carry a lot of clout in LDC; it is said that they can make or break a country.

An example of Britain's bilateral and multilateral aid for the year 1973 is shown in Tables 9 and 10. The major proportion of the multilateral aid goes towards the United Nations Development Fund.

TABLE 9

UK OFFICIAL DISBURSEMENTS FOR TECHNICAL COOPERATION TO INDIVIDUAL DEVELOPING COUNTRIES BY MAIN PURPOSE 1973 AND 1978 (THOUSAND)

		1973	%		1978	%
Students and Trainees		10,668	14.7		24,301	15.9
Personnel Overseas		37,730	51.9		68,561	44.8
Other		24,324	33.4		60,328	39.3
Suppliers and Equipment	3,044			11,933		
Land Surveys	1,883			3,903		
Geological Surveys	148			604		
Consultancies	5,601			9,583		
Research	4,860			10,205		
British Council	7,361			19,301		
General	1,338			480		
TOTAL		72,632	100.0		153,190	100.0

Source: British Aid Statistics (London: ODA) in W. Manser and S. Webley, Technology Transfer to Developing Countries (London: The Royal Institute of International Affairs), 1979, p. 25.

TABLE 10

UK OFFICIAL DISBURSEMENTS FOR TECHNICAL COOPERATION TO DEVELOPING COUNTRIES VIA INTERNATIONAL AGENCIES 1973-1978 (THOUSAND)

	1973	%	1978	%
UN Development Fund	8,500	55.7	25,434	44.1
UNICEF	1,150	7.5	6,532	11.3
UNFPA	1,400	9.3	1,875	3.2
UNRWA	2,000	13.1	4,598	8.0
UNHRC	814	5.3	4,796	8.3
Other UN	370	2.4	1,155	2.0
WHO Research Programmes	—	—	2,726	4.7
European Economic Community	—	—	2,806	4.9
Other International Orgs.	1,030	6.7	7,796	13.5
TOTAL	15,264	100	57,718	100

Source: British Aid Statistics (London: ODA) in W. Manser and S. Webley, Technology Transfer to Developing Countries (London: The Royal Institute of International Affairs), 1979, p. 25.

Private and Non-Governmental Aid

Foreign and local voluntary agencies are important providers of health care in LDC. In Bangladesh, for instance, voluntary agencies from the rich countries are the major donors in health care. Examples of private, non-government organizations include the Canadian University Services Overseas (CUSO), the Rockefeller Foundation, the Agakhan Foundation, and OXFORD.

TYPES OF TECHNOLOGIES TRANSFERRED

Bilateral aid for the most part results in equipment-embodied technology being transferred. Much of the technology is sophisticated equipment for hospitals. It includes cardiac catherization, computerized tomography, ultrasound, electronic fecal monitoring units and other sophisticated medical equipment.

In addition to equipment-embodied technology, pharmaceuticals and professional medical personnel are also transferred. British aid for many years constituted the sending of salaried personnel overseas to serve in all fields including health (see Table 9).

Bilateral aid also funds the capital cost of health-related projects in LDC. Health-related projects include efforts to wipe out malaria and the supplementation of diets to alleviate malnutrition. Unfortunately, the operational cost of these projects is frequently not funded resulting in project abandonment when funds run out.

Bilateral aid also tends to be very megastructure-oriented. The building of hospitals is a more visible symbol of aid, and is in keeping

with the health care systems in the industrialized countries. Therefore much aid goes towards hospital construction. The operational cost of hospitals is rarely subsidized. However, there is some fund allocated towards the training of health-related manpower.

Multilateral aid tends to more project-oriented.[7] Multilateral agencies tend to fund health programmes of a long term nature (5-10 years). For example, between 1957 and 1974, the WHO technical assistance program in the Phillipines funded prestigious pilot projects, education fellowships and specialized training (paediatric nursing and occupational therapy) at the University of Phillipines, and a pro-urban sewage plan. During the same time, it funded in Cuba eradication of communicable diseases, the improvement of environmental sanitation in rural districts, and maternal and child health programmes.[8]

In other countries, the efforts of multilateral agencies have been directed towards fertility control and small pox eradication. The World Bank has played a prominent role in assisting LDC in building institutions and programs that will enable them to influence the growth of their populations.[9] It is now moving ahead with large-scale programs in India and Indonesia.[10] In Indonesia, the total investment is worth $33 million over the course of five years. Only one-third of the cost will go towards construction of 300 local health clinics and training facilities scattered over Java and Bali. The rest will go towards population education, information and communication, technical support and evaluation.[11]

The above programmes describe the wide range of projects that multilateral agencies support and the types of technologies transferred thereby. There is a great variety of them. Many of the projects undertaken have been, since McNamara's annual address to the Board of Governors of the World Bank in 1973, directed to the welfare of the poor.[12]

Private and non-governmental organizations also undertake a variety of programmes resulting in varied technologies transferred to LDC. The CUSO programme in Canada, for instance, transfers health manpower to LDC for a period of one to two years. Pharmacists, doctors, and nurses from industrialized countries go to serve in foreign posts located by CUSO.

Philanthropic organizations like the Rockfeller Foundation have been involved in the immunization of large sectors of population against polio and other preventible diseases. In Bangladesh, the OXFORD famine relief committees and other voluntary national organizations have set up health care units which emphasize prevention rather than cure. The health centers established by foreign voluntary agencies are modeled after patterns existing in the west.[13]

The Agakhan Foundation is another philanthropic organization that has undertaken projects in health, housing and education in LDC.[14] In Pakistan, it has established a network of 106 primary health care centers linked to a $300 million tertiary care hospital. The latter is part of a University complex designed to train local doctors, nurses, auxiliaries, and health administrators for the country.

Depending on the focus of the voluntary agencies, they transfer different types of technologies to LDC.

EVALUATION OF TECHNOLOGIES TRANSFERRED

Many of the technologies transferred under bilateral aid are similar to those transferred by multinational corporations. These were covered in the previous chapter and will therefore not be evaluated here. Similarly, the technology transferred by private donor agencies is health manpower and this will be discussed in the next chapter.

The first technology to be evaluated is that transferred by multilateral aid. We will use the example of WHO's technical assistance to Cuba and the Phillipines to evaluate its appropriateness and inappropriateness. In Cuba, it will be recalled, the technical assistance was initially used to eradicate communicable disease, improve environmental sanitation in rural districts, and to provide maternal and child health programmes. After the case rate in communicable diseases declined (1962), Cuba's request for technical assistance was diversified to medical education and industrial health. In 1972, it embarked on a program to modernize its laboratory services.

Is this appropriate technology? By our evaluation, this incremental transition to a complex delivery system, from its beginnings in primary health care, constitutes appropriate technology.

The nature of the technology changed at approximate intervals of a decade. Yet, at all times, the technologies addressed the mortality-morbidity issues, were economical solutions, and were culturally and

politically acceptable solutions. Cuba had become a socialist state by then and primary health care emerged as a very acceptable solution. By our definition, the technology transferred and supported by the WHO aid in Cuba was always appropriate.

In contrast, the Phillipines used the WHO aid during this same interval to fund research centers devoted to specific diseases (influenza and bilharzia), for pilot projects, fellowships and specialized training, and for a pro-urban sewage system. Is this appropriate technology? Consider the conditions existing in the Phillipines at the time: the majority of the Philline citizens suffered from a lack of clean water, malnutrition, and basic communicable diseases such as malaria, measles, whooping cough, and typhoid. Public health and environmental sanitation was superficially addressed by the Manila sewage plan. Only 9.7 per cent of the provincial towns and cities benefited from this plan, despite their greater need.

Using our criteria to evaluate these technologies, we observe that a majority of the criteria are not met. The sewage plan was probably a good choice but it did not meet the sub-criteria of addressing a majority of the population. Since health is a public good, the rural as well as the urban population must be provided with good sanitation for there to be an improvement in general health.

The funding of research centers, providing fellowships, and specialized training (of paediatric nurses and occupational therapists) is inappropriate when public health is a priority. None of the above meet the first and second criteria of addressing mortality-morbidity issues

and being economical. Even if the technologies meet criteria 3 and 4, these technologies have to be deemed inappropriate for the Phillipines.

The second technology to be evaluated here is one that was given by a private voluntary agency, the Salvation Army.[15] It illustrates how the lack of understanding socio-cultural factors renders the most well-intended technology inappropriate. In India, the Salvation Army hostel was equipped to provide health care to the lowest caste in India, the Untouchables. However, the Untouchables did not take advantage of this service. Members from other social groups used this service instead. This condition was the result of the hostel being manned by staff from another social group. Thus, as we see below, the criterion of socio-cultural acceptability renders this technology inappropriate.

Technology: Salvation Army Hostel				
	Criteria	Not Applicable	Yes	No
1	Mortality-Morbidity		✓	
2	Economic		✓	
3	Socio-cultural			✓
4	Political		✓	

The third technology to be evaluated is that transferred by the work of the voluntary agency, OXFORD, in Bangladesh. Many community health care centers were established by them. They provided mostly preventive services and some curative services. Briscoe, in evaluating these programs found them to be suffering from the following drawbacks[16]:

- Decision makers had a superficial understanding of Bengali society in Bangladesh.
- A large proportion of the project funds (70 to 80 per cent) were spent on foreign personnel costs.
- Lip service was paid to projects being community based programs. Projects offered people no responsibility and no opportunity to make decisions.
- Failure to develop meaningful community involvement in their health programs.
- Programs were built on the basis of a village in which all classes were represented, resulting in inevitable control by the powerful. The poor were not reached.

Applying our criteria in evaluating this technology, we find that it meets the first and last criteria only. The community health services are not efficiently run and do not permit community input. Criteria 2 and 3 are not met, and constitute inappropriate technology.

Technology: Community Health Care Centers in Bangladesh				
	Criteria	Not Applicable	Yes	No
1	Mortality-Morbidity		✓	
2	Economic			✓
3	Socio-cultural			✓
4	Political		✓	

This example serves to illustrate the point that it is not the availability of health services per sec that determines its appropriateness. Community health centers delivering preventive care are in keeping with the needs of LDC. But the economic, socio-cultural and political

variables also determine appropriateness. The process of delivering appropriate care must take these into account.

CONCLUSION

Foreign aid along with MNC represent the two supply side determinants of health technologies transferred to LDC. Much of the technology transferred through these mechanisms, although by no means all, is inappropriate, as we have observed in our discussion. In the next chapter, we will examine yet another mechanism for the transfer of inappropriate technology--education. Education, in contrast to MNC and foreign aid, is a demand side determinant of transfer of technology.

CHAPTER 4

MAJOR MECHANISMS OF TRANSFER OF TECHNOLOGY: EDUCATION

In examining the mechanisms of transfer of technologies, we find that there are two aspects that visibly affect the kinds of technologies transferred: supply side and demand side determinants. Education represents a demand side determinant. Market demand for technologies is frequently dictated by doctors and other health professionals. The process of imparting knowledge is not as neutral as one would think it to be. Education represents a significant mechanism, determining the types of technologies transferred.

The objective of this chapter is to evaluate the appropriateness (and inappropriateness) of technology transferred through the mechanism of education. Education connotes skilled manpower. The discussion in this chapter begins with a description of how the process of imparting knowledge and skills (health education) to people acts as a vehicle for the transmission of values which determine the kinds of technologies transferred. This is followed by the kinds of technologies transferred and the evaluation thereof.

VALUE FORMATION IN MANPOWER

Knowledge and skill is passed on to LDC by two major channels. One channel consists of sending advisors, trainers, and demonstrators to the LDC; the other channel brings students and trainees to the more advanced country for the impartation of knowledge and skill.

Both these channels result in the formation of values held by developed countries in the manpower being trained. The training given to health professionals always assumes, whether explicitly or implicitly, a paradigm. In the case of manpower being trained in the west, the paradigm assumes a mechanistic view of man. The trainee has to understand and accept these assumptions in order to function effectively. He or she begins to think within the framework of the paradigm. The acceptance of these values also results in the acceptance of the external manifestations of the paradigm.

What are the assumptions underlying the western paradigm and what are its external manifestations? A summary of the assumptions is given below.

Assumptions Underlying the Western Paradigm[1]

1. Body and mind are separate;psychosomatic illness is mental and may be referred to a psychiatrist.
2. Mind is a secondary factor in organic illness.
3. Body is seen as a machine in good or bad repair.
4. Disease or disability is seen as a thing (entity).
5. Emphasis is on eliminating symptoms (disease).
6. Patient is dependent.
7. Professional is authority.
8. Professional should be emotionally neutral.
9. Pain and disease are wholly negative.
10. Primary intervention with drugs, surgery.
11. Treatment of symptoms.

12. Specialized.
13. Emphasis on efficiency.
14. Placebo effect shows the power of suggestion.
15. Primary reliance on quantitative information (charts, tests, dates).
16. Prevention is largely environmental: vitamins, rest, exercise, immunization, and no smoking.

This paradigm is contrasted with the Emerging paradigm, which is increasingly challenging it today in the advanced countries. The Emerging paradigm is presented here because to a large extent it resembles the assumptions underlying traditional medicine. It is more holistic in nature, incorporating brilliant technological advances, while restoring and validating intuitions about body-mind relationships.[2] The assumption underlying the Emerging paradigm are presented below.

Assumptions Underlying the Emerging Paradigm[3]

Body-mind perspective; psychosomatic illness is province of all health-care professionals.

Mind is primary or coequal factor in *all* illness.

Placebo effect shows the mind's role in disease and healing.

Primary reliance on qualitative information, including patient's subjective reports and professional's intuition; quantitative data an adjunct.

'Prevention' synonymous with wholeness: work, relationships, goals, body-mind-spirit.

Search for patterns and causes, plus treatment of symptoms.

Integrated, concerned with the whole patient.

Emphasis on human values.

Professional's caring is a component of healing.

Pain and disease are information about conflict, disharmony.

Minimal intervention with 'appropriate technology,' complemented with full armamentarium of non-invasive techniques (psychotherapies, diet, exercise).

Body seen as dynamic system, context, field of energy within other fields.

Disease or disability seen as process.

Emphasis on achieving maximum wellness, 'meta-health.'

Patient is (or should be) autonomous.

Professional is therapeutic partner.

The western paradigm has its roots in the Flexner report, which emphasized the scientific study and practice of medicine.[4] Table 11 gives the characteristics of the Flexner biomedical model. The scientific focus in medicine persists even today. It has resulted in the mechanistic view of man. The body is seen as a machine made of various parts. Malfunction of any part results in a symptom. For every symptom, the underlying cause is a malfunctioning of the related body part. Correction is brought about by replacement or mending (surgery) or by drugs to reverse the malfunctioning.

The role of the mind in causing disease (dis-ease) is ignored. The environment plays a miniscule role. Emphasis is placed on curing the malfunction, which is entirely organic. Specialization is deemed to be very important. Specialization is by body part or body systems and it stems from the vast amount of medical information related to a given body part.

TABLE 11

CHARACTERISTICS OF THE FLEXNER BIOMEDICAL MODEL

1. Disease is considered as an entity of its own--independent of person and person's environment.
2. Disease affects discrete tissues, organs or parts.
3. Each disease has a cause which results in some organic malfunction.
4. Drugs are considered to be specific for a particular symptom or disease.
5. Man is a passive victim of disease.
6. Causes can be deduced from symptoms and signs.
7. Etiology and treatment of disease is replicable.
8. Dysfunctions are measurable.
9. Disease can be objectively measured.
10. Disease can eventually be conquered through science and technology.
11. Medical professionals specialize on the basis of human anatomy.

Source: Suzanne Jackson, Planning for Health in a Changing Society, Thesis, University of Waterloo, 1981, Figure 3.1.

The western paradigm embodies itself in the health care model of western countries. The highly trained physician and specialist are the pivot of the system. The system is hospital-based, with a curative emphasis. Almost all medical training is hospital oriented and based. Primary care as well as tertiary care is delivered by the physician. The role of the nurse and other auxiliaries is liaisoning between the patient and the physician; very few auxiliaries are used. The health care system is expensive to run but it can exist because the productive capacity of the industrialized nations can support it; the pattern of mortality and morbidity in industrialized countries also justifies a curative-based health care model.

TECHNOLOGIES TRANSFERRED TO LDC

What happens to the medical trainee who studies western medicine? When a country trains its health manpower within the perspectives of a certain paradigm, the manpower returns carrying with it that view of man. Thus when a doctor or a nurse trains within the framework of the western paradigm, they accept that paradigm. But the paradigm is also associated with a mode of delivery of health care. Therefore, the health professional thinks within the pattern of assumptions of that paradigm and its method of delivery; the two are closely related.

The trainee therefore thinks in terms of hospital care where ill-health is concerned. The curative emphasis registers itself on the mind of the trainee. Because the training has taken place in hospital-based system with an excessive reliance on sophisticated technology, this is

thought to be the norm. Specialization is viewed as the way to acquire more knowledge to cure disease.

When the trainee returns to his homeland in the LDC, he returns with this new system of curing disease--the western medical model--firmly engrained in him. He has witnessed a practice of medicine which works in industrialized countries: the infant mortality is lower, the population is healthier, and all other health indicators are favourable. Why then should this system not function in his country--a LDC?

In LDC, just as in developed countries, doctors have much influence in the procurement of pharmaceuticals, supplies, equipment and advicing on health care matters. What they do and say, however, is in keeping with the paradigm they have accepted. Man has a tendency to think in terms of the familiar.

Stemming from this pressure, one finds a predisposition towards hospitals, sophisticated high technology equipment (including half-way technologies) to treat rare diseases, and a heavy reliance on curative pharmaceuticals. The reliance on drugs has become so heavy that it is now a consumer expectation for a patient to have a drug prescribed for every malady.

The power that doctors command in rejecting reform that is not in keeping with their accepted values has been documented. In Sri Lanka[5] and in Chile,[6] the doctors' ideology had a major influence over the type of health services delivered to the population. Doctors exercise a lot of influence in health matters.

We have so far examined the transfer of one major technology: manpower trained and socialized in keeping with the needs of advanced countries. The skilled health manpower, especially the doctor, in turn influences the transfer of other technologies which also reflect the needs of the population in advanced countries, and which constitute a very minor need in LDC.

Another technology that is transferred to LDC is the specialized training of physicians. This is highly encouraged by the developed nations and foreign agencies. The Rockefeller Foundation, for example, has been actively promoting the western medical model in LDC. In Thailand, the Foundation helped reorganize the only medical school from one that produced doctors and auxiliaries to one that is fashioned along the western model of medical education.[7]

Universities in advanced countries "adopt" medical schools in LDC, thus facilitating the medical education of doctors along western standards and curriculum design. The faculty of medicine at McGill University sends teaching staff to the medical school at the University of Nairobi, Kenya. Similarly, medical faculty members from Connecticut go as lecturers to the medical school in Northeast Brazil.[8] The sponsors and supporters of this program are MNC and U.S. foundations.

Associated with the large scale training of doctors is also the concept of appropriate population: doctor ratios. Some LDC have accepted the notion of an acceptable population doctor, which is below 1,000:1 in the industrialized countries, and have worked towards the attainment of this ratio by churning out more medical doctors. Doctors are expensive

to train and do not reach the majority of the population in the rural areas; doctors prefer working in urban areas within the proximity of the hospitals. The large output of doctors results in unemployment of doctors in urban areas and their migration to the advanced economies (brain drain).[9]

Auxiliaries, on the other hand, are cheaper to train; 10 to 15 auxiliaries can be trained for the cost of the training of a medical doctor in LDC.[10] One also finds that auxiliaries can cater to 90 per cent of the diseases that are routinely encountered at primary health care centers.[11] Although we have specifically referred to the excessive training of doctors in the above example, the same holds true for other health professionals like nurses and technologists.

In Zambia, a strategic decision was reached to train all nurses in accordance with the western standards and methods.[12] All nurses were to attain the highest degree (of Registered Nurse). Even the Registered Nurse Assistant category was to be discarded. The nursing students enrolled were all female.

This policy of imitating education standards in the west did not take into account cultural values and existing belief systems. In the Zambian society, it is more acceptable for a nurse to be male. Moreover, the nursing students learning their new 'western' role and concepts of nursing, still maintained their belief in the traditional system of medicine with which they grew up.[13] The traditional system of medicine maintained that "all illness is fundamentally spiritual (and that) the victim must be brought afresh into harmony with the social and

spiritual order of the community, and indeed the universe."[14] The nurses were therefore imperfectly socialized into the western concept of illness. The result of this conflict in values was disastrous for the image of nursing in Zambia.

LDC have a tendency to readily endorse the western system of medicine which includes its prototype manpower as well as its physical embodiments in buildings (hospitals). This results in the overlooking of a tremendously significant source of potential health manpower housed in the traditional healers. The result is that they now have to maintain their practice outside the legal boundaries.

EVALUATION OF TECHNOLOGIES TRANSFERRED

Is the skill and training imparted to health manpower destined to work in LDC appropriate? In our discussion, we have alluded to the fact that the training of manpower also brings along with it its physical embodiments: the hospital-system bias, the excessive reliance on equipment embodied technology, and the curative emphasis. These have previously been evaluated in previous chapters. In this section, therefore, our evaluation will be restricted specifically to the manpower training per sec, i.e., curriculum design, and the level of skill in manpower.

The first technology to be evaluated is that of a cardiac specialist. Consider the following case: a Nigerian doctor, after his medical training and specialization at the Hadassah Medical School's cardiovascular department in Israel said that, "I'm going home with a sound knowledge of basic techniques like electrocardiography, x-ray, as well as

more sophisticated methods like cardiac catheterization. I look forward to applying this new knowledge in the service of my people."[15]

The earnestness of such a specialist has to be weighed against the opportunity cost of 10 to 15 auxiliaries. An auxiliary with a training that is much simpler than that of a physician can treat most of the diseases. Using our four point criteria to evaluate this technology, we observe that a heart specialist is quite inappropriate for the needs of LDC.

	Technology: Heart Specialist			
	Criteria	Not Applicable	Yes	No
1	Mortality-Morbidity			✓
2	Economic			✓
3	Socio-cultural	✓		
4	Political	✓		

The training of a heart specialist does not address the mortality and morbidity pattern existing in LDC where diseases associated with the circulatory system are not significantly important. The training of such a specialist may be necessary for a tertiary care hospital which deals with referral cases. For the majority of the population, however, the training is excessive and not cost-effective.

By the same logic, the training of physicians is excessive for the pattern of diseases existing in LDC. The large number of physicians are not necessary for the majority of the existing ailments. Other health workers can be used instead. The physician's role in LDC becomes that

of a consultant to handle cases that are beyond the local health worker's (auxiliary) capacity. This renders the population:physician ratio a poor tool as a measure of adequate health manpower distribution in LDC.

The training of health professionals utilizes curriculums designed for the needs of the industrialized nations. The training of doctors and nurses therefore contains a relatively high content of time devoted to diseases and techniques that are rare and unaffordable in LDC. This renders the training inappropriate by our criteria.

Let us now evaluate the training of nurses in Zambia which was described earlier on. Using our criteria, we find that it is the socio-cultural criterion that is not met. In addition, one may argue that the first criterion is also not met because the curriculum design addresses the mortality and morbidity pattern of the industrialized countries. This, together with the failure to take into account society's values and the cultural background of the nursing students, renders the training inappropriate.

Technology: The Training of Nurses in Zambia

	Criteria	Not Applicable	Yes	No
1	Mortality-Morbidity			✓
2	Economic		✓	
3	Socio-cultural			✓
4	Political		✓	

By contrast, let us evaluate the training of health auxiliaries in Tanzania. Tanzania has a population:doctor ratio of 17,000:1, which amounts to a total of 700 doctors for the entire nation. To meet the primary health care needs of the population, reliance has been placed on health auxiliaries, medical assistants, rural medical aides, and maternal and child health workers.[17] The training varies from 1 to 3 years for the different categories of auxiliaries; entrance requirements also vary with the programmes but do not exceed secondary school certificate. A total of 250 medical assistants and 400 rural medical aides graduate annually.

The vast number of such auxiliaries can be trained at a price that would train only a handful of doctors. The physician's role has become that of a consultant for referral cases from the auxiliaries. The training of auxiliaries is oriented to rural practice without the heavy emphasis on technology and rare diseases that is present in medical schools. Most of them return to their village where knowledge of local customs and language is invaluable. The medical assistants assume the role of the family practitioner, handling up to 90 per cent of the cases.

Using our criteria to evaluate the appropriateness of these auxiliaries, we find that it meets all of them.

The policy of using auxiliaries in rural areas is especially in keeping with Tanzania's political objective of rural development. Auxiliaries constitute a cheap and readily available form of manpower that is efficiently trained to deal with the country's health care needs; in addition the manpower is socialized to the customs and culture of the

	Technology: Health Auxiliaries in Tanzania			
	Criteria	Not Applicable	Yes	No
1	Mortality-Morbidity		✓	
2	Economic		✓	
3	Socio-cultural		✓	
4	Political		✓	

country. The local training of workers with curriculum design addressing the country's needs means this form of manpower will be unlikely to migrate to other countries, i.e., it will reduce brain drain. The training of auxiliaries in Tanzania is therefore deemed appropriate technology.

CONCLUSION

We have illustrated the transfer of inappropriate technology resulting from the inappropriate training of health manpower as well as the inappropriateness of training itself.

What can be done to redress these issues? Inappropriate technology stems from supply side as well as demand side determinants. In the next chapter we will undertake the formulations of recommendations to address issues that have been raised in the last three chapters.

CHAPTER 5

A POLICY RESPONSE TO THE TRANSFER OF INAPPROPRIATE TECHNOLOGY

During the course of our discussions we have described how many inappropriate technologies get transferred to LDC. Having analysed the causes, we have to ask ourselves what corrective measures can be taken. The objective of this chapter is therefore to make recommendations on policy responses to mitigate the flow of inappropriate health technology to LDC. Each recommendation will be set out, followed by a discussion on it.

RECOMMENDATION 1

International agencies can play a greater role in the dissemination of information on the appropriateness and inappropriateness of technology for LDC.

The significant role that the international agencies can play in this area is aptly demonstrated by the infant formula battle. In this battle, international agencies demonstrated that they could do what individual countries for many countries could not do: to influence the multinationals to change their ways by disseminating information.

The infant formula battle resulted in WHO's adoption of the infant formula code which was accepted by a vote of 118 to 1, the United

States being the lone dissenter.[1] The battle took place in three stages.[2] The first stage (between 1960 and 1970) took the form of papers in professional journals suggesting the ill-effects of infant formula and noting the rise in "commerciogenic" malnutrition, i.e., malnutrition caused by commercial advertising that encouraged consumers' adoption of infant formula.

The second phase (1970 to 1973) was initiated by the United Nation's Protein-Calorie Advisory Group (PAG). This group held meetings with pediatricians, nutritionists, and representatives of the infant food industry. The result of these meetings was consciousness raising on both sides and a number of recommendations. They included[3]:

1. Clear policy guidelines for feeding practices for young infants.
2. General proposals to the medical and health professionals, industry, and government for action to promote desirable policies and practices.

In addition, the PAG bulletin released many studies related to bottle feeding, malnutrition, and mortality rates.

The third and more recent phase of the attack on the infant formula industry has been legal and journalistic. The publication of the booklet, "The Baby Killers," in Britain has raised public consciousness to the atrocities of MNC.[4] On the legal front, infant formula manufacturers have been taken to court.[5] The Center on Corporate Responsibilities (ICCR), a movement related to the National Council of Churches, has encouraged stockholders to inquire into the marketing techniques of their companies.[6]

The PAG's efforts have been weakened by its inability to inforce its recommendations. Nevertheless, the effort did result in a voluntary proposal on marketing ethics by at least one pharmaceutical company (Ross Laboratories).[7]

The effort expended in this industry can logically be extended to other industries, like the pharmaceutical industry. International agencies can potentially play a very large role in this area. The vaccum remains to be filled.

Recently a private organization, inspired by the work of E. F. Schumacher, has begun disseminating information on appropriate technologies. Known as the Appropriate Technology Group, it is based in London, England and has branches in many developing countries (Kenya, India, Pakistan, etc.).[8] This organization is manned by professionals in various fields interested in developing alternatives to the present technologies, which are deemed inappropriate. Developing alternatives and disseminating information on existing choices to LDC is their primary concern. International agencies may wish to consider supporting the work of such private groups.

RECOMMENDATION 2

Non-governmental organizations have demonstrated a greater flexibility in experimenting with new ideas to solve existing health problems. They should be given more moral and financial support.

Non-government organizations have lifted the veil of conservatism in attempting to deal with the myriad of health issues in developing countries. A good example of a non-governmental organization is the Agarkhan Foundation, which is recognized by the United Nations as a non-communal, philanthropic organization in the field of social welfare.

The Foundation has undertaken many projects in health, housing, and education in Africa and Asia. In Pakistan it has established many housing schemes and a $300 million tertiary care hospital linked to 106 primary health care centers all over the country. In many cases, these health care centers have been the first sources of primary health care for the rural population. In another bold move, it convened a conference in conjunction with the WHO (1982), to explore the role of hospitals in primary health care.

Non-governmental organizations often lead the way in transferring and encouraging the use of appropriate technology. International agencies and national countries then imitate these models.

LDC and international agencies should encourage them with their full support where possible.

RECOMMENDATION 3

Developing countries must seriously consider the institution of health planning that is related to the countries' development objectives.

Primary health care for all is one of the fundamental development objectives for LDC. Health planning must evolve to reflect this

objective. It must be reflected in the interdepartmental structures and the allocation of capital and operating budgets for carrying out the related activities.

The allocation of resources only is not enough. Administration and implementation require great attention in LDC.

RECOMMENDATION 4

Developing countries should introduce a network of regulations and laws to ensure that there is a qualitative and quantitative evaluation of the technology before it becomes widespread in the country. Developing countries must increase their efforts to regulate multinationals.

The absence of regulation has led to MNC taking advantage of the situation in LDC. Drugs like Depo-provera (a fertility drug) and other drugs that have not been approved in the United States readily find a market in LDC. Many products that are dangerous or have been banned and have passed their expiry date are allocated for Third World markets. Many products contain no package inserts on the directions, indications for use, and side-effects of the drugs. And what is sold under prescription in developed countries is available over-the-counter in LDC.

Much of the equipment that LDC procure is not evaluated for its cost-effectiveness and impact on health. For example, what is the impact of introducing a computerized blood analysis equipment in a laboratory that caters to all the rural health care centers in LDC? From the experience of developed countries, it is also known that a technology

which is once accepted without evaluation is later difficult to remove, even though it ma y be uneconomical. Thus, evaluation must proceed before the technology becomes widespread.

The many ill-effects associated with the absence of a regulatory body makes its presence imperative. The front-end cost of establishing such a regulatory agency is likely to be high and may take a number of years to achieve full functioning. But it is necessary.

Regulation must also be extended to methods of promotion. The legal jurisdiction and political power to control product promotion techniques lies with the state. Therefore each nation must autonomously determine which promotional practices are in keeping with its objectives as stated in the health planning document. Those promotional practices that promote inappropriate technology must be filtered using a regulatory mechanism.

RECOMMENDATION 5

The sharing of information on new and old technologies transferred to LDC must be undertaken between the countries. The creation of an information bank to generate and disseminate this information is recommended.

Just as the international agencies have a role in collecting and disseminating information, LDC can share their experiences and information on technologies. This may be an extension of the sharing of information related to technology in fields other than health.

RECOMMENDATION 6

Public health education is of the utmost importance to counter the effects of multinational advertising campaigns. Where possible similar advertising strategies can be used by LDC to counter their effect and to educate the public.

The marketing practices used by MNC are very effective, leading to large changes in consumer tastes and expectations. This was withnessed in the case of the infant formula marketing. Mothers who normally breast-fed their children because it was a strong culturally ingrained norm, switched to bottle feeding in response to the advertising. LDC can counter this by using similar marketing practices to educate people in the use of healthier methods. Education which raises consciousness in people is more effectative than the strict regulation of MNC's marketing practices, which in any case is difficult.

RECOMMENDATION 7

The introduction of a drug formulary, suited to the LDC needs is endorsed.

The WHO has formulated a list of approximately 300 essential drugs which cover almost 90 per cent of diseases occurring in LDC. This drug list should be modified to meet specific needs in individual countries.

The use of a drug formulary will result in the elimination of needless duplication which only serves to block information channels; there is only a limited number of drugs that a health professional can effect-

ively deal with. Drugs should be bought in the cheapest generic form rather than by brand names.

A few countries like Sri Lanka, Tanzania, Mozambique, and more recently Bangladesh, have adopted this policy.[9]

RECOMMENDATION 8

LDC should train manpower that is appropriate to their needs. Auxiliaries must form the backbone of the health care system. The training of an excessive number of medical doctors must be avoided.

The productive capacity of LDC simply cannot afford the luxury of a population:physician ratio of less than 1,000:1 that exists in most developed countries. In view of the fact that auxiliaries can perform a large amount of the work that physicians normally perform, it makes sense to use the person with the least formal training to carry out the task.

Health manpower needs must be planned and resources deployed to meet the country's needs. In LDC, this calls for the use of health auxiliaries like midwives, medical assistants, rural health workers, prevention oriented public health officials, and "barefoot" doctors. Thishealth manpower must be integrated into the network of referral system where the physician sees only the cases that cannot be dealt with by auxiliaries due to their complexity. Physicians would still be present in this system, but their role would become more

that of a consultant. In such a system population to physician ratios will naturally be very high.

LDC may also wish to consider giving professional status to those working in primary health care, similar to that given to secondary and tertiary care workers.[10] This recognition may be granted formally by introducing the notion of specialization in primary health care.[11] Academic degrees, promotion, and income are other variables that can be used to recognize the work of health personnel in primary health care.

Health auxiliaries must not be regarded as a transitional solution to a critical shortage of doctors as has been the case in Malaysia. There, a large number of "hospital assistants" were used only until enough doctors could be trained. Auxiliaries represent an appropriate solution in themselves.

RECOMMENDATION 9

The curriculum design for health manpower must reflect the social, cultural, and economic realities, as well as the morbidity patterns existing in LDC. Imitation of western curriculum designs in their entirety must be avoided.

The curriculum for health professionals in LDC is presently too biomedically and technologically oriented. The curriculum is essentially designed for developed countries where stress related diseases and a curative emphasis prevail. The training takes place in hospitals, leaving health

personnel too addicted to the hospital environment. Training of health personnel should be extended well beyond the Hospital walls.

Much attention needs to be paid to the curriculum design of doctors. The role of the doctor in LDC is not to hand out pills or to provide injections, but to monitor, support, and guide the medical team in his district. To succeed, his training will require a knowledge of epidemiology, statistics, preventive and curative procedures.[12] It requires more than a knowledge of anatomy.

Medical school curricula will have to steer away from the traditional mono-discipline, department-oriented, individual-patient-oriented approach to one that is more community oriented, preventive, and multidisciplinary in nature.[13] The training must include experience in local clinics, directing immunization programmes, carrying out nutritional campaigns, clean water reforms, and sanitation improvement.

The training of all health professionals in LDC must be oriented towards primary health care, which must form the core of the health care system.

RECOMMENDATION 10

Foreign aid must be judicially used. It must not be entirely rejected, but should be used for the procurement of technology that is in keeping with the health planning objectives and criteria of appropriateness. LDC must exercise

more muscle in voicing theirs demands. Rejection of aid is called for when it is felt that the technology to be transferred as a result of it will be inappropriate.

Tied aid (purchases tied to a country) and double tied aid (purchases tied to a project and a country) are a hindrance to LDC wishing to select appropriate technology because they restrict choice. When accepting foreign aid results in the transfer of inappropriate technology, LDC must learn to say no to such aid.

Developed countries have as much to gain, if not more, from giving aid to LDC. Developing countries must therefore exercise this small leverage that they possess.

When arranging for the financing of projects, the operational cost of the project in LDC must also be planned. Accepting the financing of capital costs only is not enough. Operational cost s must also be financed, whether from external or internal means.

RECOMMENDATION 11

The appropriate health paradigm for a LDC must evolve to suit the country's need. Niether the western paradigm nor the one represented by traditional medicine are by themselves appropriate. The solution lies in the meeting of these two extremes.

What is good for the developed countries is not necessarily good for LDC. And what has existed since antiquity (traditional medicine) is not the best for the country today. The solution lies in-between these extremes. The exact locus of the solution will vary for each country.

Should the scientifically based western paradigm prevail? And what about traditional medicine? Traditional medicine exists as the only acceptable system of health delivery for a majority of the people in LDC. Taylor has found that formal health systems have been unsuccessful in crowding out traditional practitioners. [14] Substitution of modern medicine for traditional medicine has not occurred entirely. It has been shown that up to 40 per cent of the people in LDC go to traditional healers, 10 per cent to private practitioners of western medicine, and 40 per cent may be using self-care.[15]

This calls for the recognition of this parallel system of health care--traditional medicine. Recognition for some countries means official endorsement. India and China are primary examples of countries that have officially integrated traditional and modern systems of health care. Recognition also means awareness of its existence and its significance for a large proportion of the population in LDC. This becomes important when one is building a health care system that is socially and culturally acceptable. Traditional medicine men, for example, represent a health personnel resource for primary health care since they are already socialized into the culture and customs of the population they serve.

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CONFIDENTIAL RESUME

OF

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EDUCATION

1980-1982

Master of Health Administration Program
University of Ottawa
Ottawa, Ontario

In addition to core courses in Finance, Economics, Research Design and the Canadian Health Care System, the program included:

- Cost Accounting
- Hospital Administration
- Labour Relations and Collective Bargaining
- Public Health
- Epidemiology
- Public Speaking

1980

Preparatory Courses in Administration
Simon Fraser University
Vancouver, British Columbia

1974-1979

Pharmacy Program
Bachelor of Science in Pharmacy, 1979
University of British Columbia
Vancouver, British Columbia

Licenced Pharmacist in B.C.

EXPERIENCE

Summer 1981

Residency at Vancouver General Hospital as part of the MHA program.

- Residency included exposure to senior management decision-making, planning and administration in the hospital via observation, participation and specific project work.

Summer 1981 (Cont'd)

. In addition, the residency provided an exposure to the interrelationships between the provincial and municipal governments and the health institutions.

September-November 1979

Pharmacist and Nurse aide at the Downtown Community Health Centre, Vancouver.

Pharmacist at United's Oakridge Pharmacy, Vancouver.

Pharmacist at Shoppers Drug Mart, Commerical Dr. and 33rd Ave., Vancouver.

Summer 1978

Research Assistant to Dr. Basil Rufogalis, Department of Pharmacology, Faculty of Pharmacy, University of British Columbia.

Summer 1977

Research Assistant to Dr. R. I. Hamilton, Virologist, Agriculture Canada, Research Station, University of British Columbia.

ADDITIONAL EXPERIENCE

COMMUNITY

1982-1983

Executive member of the Board of Trustees (Treasurer) Sandy Hill Health Care Centre, Ottawa

1976-1979

Member of the Ismailia Association, B.C. Regional Committee of the Ismaili Community. Activities included:

- organizing and teaching at summer camps
- planning and producing plays
- editor of the News Organ
- organizing and implementing religious education system.

1979

Womens' Auxiliary, St. Paul's Hospital, Vancouver

UNIVERSITY

While attending University of Ottawa:

1982 (Winter)

Member of the Admissions Committee Masters in Health Administration Program

1981 (Fall)

Vice-President of the M.H.A. class. Functions included:

1981 (Fall) (Cont'd)	• representation of student voice at the MHA Faculty Council, and • organization of student socio-academic activities.
1981 (Fall)	Secretary of Health Administration Graduate Students Association

SPORTS

Vancouver Women's Field Hockey League (1976-1977)

B.C. Women's Soccer League, player and manager (1978)

Also enjoy skiing, skating, tennis, swimming, jogging, and weight-lifting.

AWARDS

1980-1982	Agakhan Foundation Scholarship
1980	Simon Fraser University Open Scholarship
1980	Simon Fraser University Bursary
1978	Medical Research Council Scholarship
1978	Canadian Foundation for the Advancement of Pharmacy

AFFILIATIONS

Canadian College of Health Service Executives

British Columbia Pharmacists Society

OTHER INTERESTS

Fond of reading on the occult and mystical poetry. Enjoy classical music.

REFERENCES

Available upon request.