Health Care in the Developing World: Problems of Scarcity and Choice
(Shattuck Lecture)

SPECIAL ARTICLE

SHATTUCK LECTURE — HEALTH CARE IN THE DEVELOPING WORLD: PROBLEMS OF SCARCITY AND CHOICE

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THE World Health Organization (WHO) and UNICEF, together with representatives of 134 member governments, launched a campaign in 1978 to achieve "Health for All by the Year 2000" through primary health care.\(^1\)\(^2\) The objective of this campaign was to increase the political commitment of member countries to address the health needs of their people and particularly to improve the health status of the rural and urban poor in the Third World. Our presentation describes the difficulties of putting this objective into practice, and what may be possible on the very limited budget available for health in most developing countries.

WHO and UNICEF might well have found the text for their plan in the Report of the Sanitary Commission of Massachusetts, which Lemuel Shattuck presented to the Massachusetts state legislature in 1850.\(^3\) The report was based on a careful survey of the health status of the population of Massachusetts, and its recommendations embodied the essential elements of primary health care: immunization and communicable-disease control; promotion of child health; improved housing for the poor; environmental sanitation; training of community-oriented health manpower; public-health education; promotion of individual responsibility for one's own health; mobilization of community participation through sanitary associations; and creation of multidisciplinary boards of health to assess health needs and plan programs in response to sound epidemiologic evidence. Recognizing the importance of political commitment, Shattuck built a strong public-health constituency by highlighting both the major differences in life expectancy between rural areas and Boston and the deterioration of health status over a decade in major cities in the United States.

The conditions described by Shattuck in the United States in 1850 prevail today in most countries of the developing world (Table 1).\(^4\)\(^5\) In low-income countries, life expectancy at birth averages only 51 years, and in several it is less than 45 years. Mortality rates are 10 to 20 times higher for infants and for children aged one to four than in developed countries. Nearly half of all deaths occur in children under five years of age. The major causes are diarrheal diseases, respiratory infections, tetanus, and childhood infectious diseases such as diphtheria, measles, and whooping cough, all of which can be effectively and cheaply controlled by measures used in developed countries. Malnutrition is important as an associated — and even primary — cause of death in young children, and short birth intervals adversely affect the survival of infants. For those who reach the age of five, life expectancy is only eight to nine years less than in developed countries. The commonest causes of death are similar to those in industrialized countries: cancer, cerebrovascular disease, heart disease, respiratory disease, and trauma. However, in developing countries, tuberculosis ranks among the most common causes of death. These nations are also plagued with endemic diseases such as malaria, schistosomiasis, trypanosomiasis, onchocerciasis, and leprosy, which are major causes of serious morbidity and mortality in

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>Year</th>
<th>LOW-INCOME COUNTRIES</th>
<th>MIDDLE-INCOME COUNTRIES</th>
<th>INDUSTRIALIZED COUNTRIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross national product per capita ($)</td>
<td>1979</td>
<td>240</td>
<td>1420</td>
<td>9440</td>
</tr>
<tr>
<td>Crude birth rate (births/1000 population)</td>
<td>1979</td>
<td>42</td>
<td>34</td>
<td>15</td>
</tr>
<tr>
<td>Crude death rate (deaths/1000 population)</td>
<td>1979</td>
<td>16</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Life expectancy at birth (yr)</td>
<td>1979</td>
<td>51</td>
<td>61</td>
<td>74</td>
</tr>
<tr>
<td>Infant mortality rate (deaths/1000 live births)</td>
<td>1978</td>
<td>(49-237)</td>
<td>(12-157)</td>
<td>13</td>
</tr>
<tr>
<td>Child mortality rate (deaths/1000 children 1-4 yr old)</td>
<td>1979</td>
<td>18</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Per cent of population with access to safe water</td>
<td>1975</td>
<td>25</td>
<td>58</td>
<td>87</td>
</tr>
<tr>
<td>Daily per capita calorie supply (% of requirement)</td>
<td>1977</td>
<td>96</td>
<td>109</td>
<td>131</td>
</tr>
<tr>
<td>Adult literacy rate (%)</td>
<td>1976</td>
<td>43</td>
<td>72</td>
<td>99</td>
</tr>
</tbody>
</table>

\(^*\)Thirty-four low-income developing countries with a per capita income of $370 or less in 1979 (China and India are excluded from the low-income group in this table).

\(^\d\)Sixty middle-income developing countries with a per capita income of more than $370 in 1979.

\(^\d\d\)Eighteen industrial-market economies.

\(^\d\d\d\)Weighted averages; figures in parentheses denote the sample range.

\(^\d\d\d\d\)Data not available but assumed to be close to 100 per cent.

\(^\d\d\d\d\d\)Requirements based on calories needed to sustain a person at normal levels of activity and health, taking into account age and sex distributions, average body weights, and environmental temperatures, as estimated by the United Nations Food and Agriculture Organization.

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adults and children, but for which effective control measures have not been available or have proved difficult to implement or maintain.

Even in middle-income countries, more favorable national statistics in the aggregate disguise wide disparities between the conditions, on the one hand, of the rural and peri-urban poor that are typical of low-income countries and the conditions, on the other hand, of more affluent urban dwellers who are better educated and have better access to health services and whose health status closely resembles the profile in industrialized countries. Table 2 contrasts the high mortality rates for infectious and parasitic diseases in the less developed northeastern and frontier regions of Brazil with the high rates for cancer and cardiovascular diseases in the more affluent southeastern region of the country. As economic development proceeds, the more prosperous regions of the country have the advantages of greater individual and collective wealth and greater political leverage. Consequently, national health policies give priority to their needs, and the limited resources of hospitals, equipment, drugs, physicians, and other health personnel are concentrated in the urban areas, widening the gap between urban and rural populations.

In the push for development, particularly industrial and commercial development, protective measures for workers and the environment usually lag behind, as they did in the earlier stages of developed countries. These measures are often disregarded because they are initially expensive, and can generally be enforced only by firm legislation and inspection. Rapid development accelerates the appearance of new health problems such as traffic accidents, work accidents, accidental poisoning, and environmental pollution. Similarly, disruption of families and community, migration, and unemployment contribute to a variety of disorders of individual behavior — alcoholism, violence, promiscuity — each with attendant physical and mental risks, counterparts of those seen in industrialized countries.

Urban problems will increasingly dominate the health pattern of the developing world. According to United Nations projections, the urban population in developing countries will increase by 1.32 billion between 1975 and 2000; by 2000 it will average 43 per cent of the population of the less-developed regions overall, and 75 per cent of the population of countries in Latin America. The primary-health-care approach for rural health problems may need to be modified to address different problems arising from life styles and diets in the urban setting. For example, recent analyses indicate that in several countries there are large numbers of malnourished urban dwellers, and that their numbers are increasing more rapidly than those of the rural malnourished.

Table 2. Regional Variations in Cause-Specific Mortality in Brazil, 1970.*

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Region</th>
<th>Northeast</th>
<th>Frontier</th>
<th>Southeast</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>per cent of all deaths</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infectious and parasitic</td>
<td></td>
<td>24.5</td>
<td>26.6</td>
<td>11.2</td>
</tr>
<tr>
<td>diseases</td>
<td></td>
<td>Neoplasms and cardiovascular diseases</td>
<td>21.1</td>
<td>19.1</td>
</tr>
</tbody>
</table>


The pattern of diseases in northern Europe and the United States evolved in stages over the past two centuries, and with each stage distinctive control measures were introduced.

The first stage, dominated by major and minor infectious diseases linked to poverty, malnutrition, and poor personal hygiene, responded slowly to improved food supply, housing, and literacy made possible by greater prosperity, and to public-health measures, particularly safe water supply, sanitation, and immunization campaigns. The steady decline in infant mortality (Table 3) and the reduction in child mortality as a percentage of all deaths (Table 4) may be attributed to these changes. As scientific advances provided a wide array of immunologic and therapeutic techniques to control acute bacterial and viral infections, life expectancy increased, and heart disease, cancer, and stroke replaced respiratory and gastrointestinal infections as the principal causes of death. For example, in the United States in 1900, the three leading causes of death (influenza and pneumonia, tuberculosis, and gastroenteritis) accounted for over 30 per cent of all deaths, whereas heart disease, cancer, and strokes were responsible for 18 per cent of deaths. By 1975, only influenza and pneumonia (3 per cent) ranked in the top 10 causes of death, whereas heart disease (38 per cent), cancer (20 per cent), and stroke (10 per cent) together accounted for over two thirds of all deaths.

The second stage in the evolution has been dominated by chronic diseases, particularly cardiac and cerebrovascular diseases, cancer, diabetes, arthritis, and mental disorders. As the threat of infectious diseases receded, public-health measures were relegated to a regulatory role, and personal health services became the primary channel for prevention and treatment of health problems. The development of expensive and complicated technology for diagnosis and treatment has led to the transfer of care from doctors’ offices to elaborate and expensive hospitals. Doctors and patients have looked to these curative techniques and facilities to provide striking improvements in health. Sadly, experience has shown that for many problems the benefits hoped for have not been realized. As Cochrane has noted, the massive public and private expenditures on health, now close to $1,000 per capita annually for capital and recurrent costs in
the benefits to be gained from the intensive services for there are signs that this rate of progress is not being the interventions used are of proved effectiveness, and northern Europe and the United States. However, status of the population. Only a small proportion of improvement in health status than those achieved in the wealthier industrialized countries, have not pro-

Table

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>COUNTRY</th>
<th>SWEDEN</th>
<th>FRANCE</th>
<th>UNITED STATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1751-1755</td>
<td></td>
<td>206</td>
<td>277</td>
<td></td>
</tr>
<tr>
<td>1851-1855</td>
<td></td>
<td>149</td>
<td>166</td>
<td></td>
</tr>
<tr>
<td>1901-1905</td>
<td></td>
<td>91</td>
<td>141</td>
<td>124</td>
</tr>
<tr>
<td>1971-1975</td>
<td></td>
<td>10</td>
<td>14</td>
<td>18</td>
</tr>
</tbody>
</table>


Access to health services is very uneven, and large segments of the rural population are not reached. Health facilities and personnel are concentrated in urban areas, and within the urban population the services are oriented to the middle-income and upper-income groups, neglecting the peri-urban poor. Political considerations may override all other priorities, and little progress can be expected unless there is a political commitment to apply resources where the need is greatest.


<table>
<thead>
<tr>
<th>YEAR</th>
<th>AGE GROUP</th>
<th>TOTAL (0-5 YR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;1 YR</td>
<td>1-5 YR</td>
</tr>
<tr>
<td>1880</td>
<td>27.7</td>
<td>13.3</td>
</tr>
<tr>
<td>1900</td>
<td>27.4</td>
<td>9.0</td>
</tr>
<tr>
<td>1920</td>
<td>17.7</td>
<td>4.1</td>
</tr>
<tr>
<td>1950</td>
<td>7.5</td>
<td>1.0</td>
</tr>
<tr>
<td>1970</td>
<td>2.5</td>
<td>0.04</td>
</tr>
</tbody>
</table>

national averages disguise the fact that in some rural areas there may be only one doctor serving 40,000 to 200,000 people. Furthermore, the pyramid of health manpower is inverted, particularly in the least developed countries. Instead of a broad base of inexpensively trained, less skilled personnel working at the community level, priority has been given to expensive training programs for “conventional” doctors, who expect sophisticated facilities and equipment, gravitate to practice in the cities, and have a propensity to emigrate. To achieve effective coverage of the population, large numbers of less skilled personnel need to be trained, and these health workers need to be part of a system that will provide supervision, drugs and supplies, and the support services necessary for their practice. Otherwise dissatisfaction will lead to high turnover of health workers and low utilization of their services as patients bypass the first level of care in the community in favor of higher-level facilities, which properly should function as referral centers. Doctors are key participants in the referral and supervisory systems; if they operate as primary-care workers, their expensive training is wasted and the cost of their practice may outweigh the benefits. The supervisory and managerial role of the physician in the health system must be addressed more directly in the process of medical education and in the career development and rewards for the physician in practice.  

Lack of Appropriate Technology

A second obstacle to progress is the lack of appropriate technology to address Stage 2 and Stage 3 health problems and to cope with the serious endemic diseases prevalent in the developing world. For Stage 1 health problems, much of the technology needed is already available, and in the case of vaccines technologic advances that would reduce dependence on the cold chain are imminent. In contrast, for Stage 2 health problems, relatively few technologies for dealing with the serious diseases of the adult population are appropriate to the circumstances and financial resources of less developed countries. Most of the technologies that are being transferred from the developed world are expensive, and the equipment is often difficult to maintain. It is necessary to determine which interventions are effective and which yield large benefits at acceptable costs. The greater challenge is in the search for preventive measures to reduce the large burden of illness from cancer, hypertension, diabetes, respiratory, cardiac, and cerebrovascular disease. For Stage 3 health problems, we are still handicapped by inadequate understanding of behavior and the links between social and environmental hazards and specific diseases. We have much to learn about conveying health-education messages, motivating community participation, and using modern communications technology to circumvent the barrier of illiteracy.

The “tropical diseases” (e.g., malaria, schistosomiasis, filariasis, trypanosomiasis, and leprosy) are a particular problem for developing countries, in part because they generally have climates and ecologies conducive to disease vectors. Techniques for technologic control of vectors or transmission routes are available but are expensive and require repeated application over wide areas. Treatment of patients is generally expensive, sometimes risky, and often delayed. Prophylactic measures such as vaccination are largely undeveloped. Knowledge of the biology of the diseases is far from complete. Research on these diseases has so far been largely neglected by the scientific community and the pharmaceutical industry, which have been preoccupied with cancer, cardiovascular disorders, and the other major diseases of the industrialized world. The Special Program for Research and Training in Tropical Diseases led by the WHO is an attempt to mobilize the health-science research community throughout the world to focus attention on these neglected tropical diseases in order to discover appropriate technologies for their control.

The scientific and development resources of the developing countries are limited, and their problems are difficult to solve. The most promising results will come from combining the scientific and technologic potential of the industrialized world with the local knowledge of scientists and professionals in developing countries who will have responsibility for applying the new technologies.

Pharmaceutical Policies

The most widely used technologies in health are drugs and vaccines. Shortages of supplies and failure to provide for the timely distribution of drugs and vaccines are serious problems that must be overcome for an effective health program. In looking to the future, however, the problems may be excessive and irrational use of drugs and unsustainable costs to the health system. Patients who consult health personnel expect to receive a prescription or, in some cultures, an injection. As access to health services broadens with the implementation of primary-health-care programs, a rapid increase in the consumption of drugs may be expected. Experience in less-developed countries supports this contention. In China, with nearly universal access to health care, curative medicine occupies 90 per cent of the time of “barefoot” doctors, and nearly all patients receive medication; there is evidence that drugs and traditional medicines account for two thirds of overall health expenditures. In countries with less complete coverage of the population, expenditures on drugs constitute about 40 to 60 per cent of the health budget (as compared with 15 to 20 per cent in developed countries) and over half of private health expenditures. In most developing countries, the majority of drugs are imported, and these outlays are a considerable drain on foreign exchange.

The importance of drugs to the quality of health care, to the credibility of community health workers, to the development of iatrogenic disease (for exam-
ple, from toxicity or antibiotic-resistant microorganisms), and to the cost of health services makes it imperative that developing countries establish better mechanisms for assessing drug requirements and for purchasing, quality control, storage, and distribution of drugs. Experience in Tanzania and Ghana indicates that savings of up to 70 per cent of the budget for pharmaceuticals could be achieved by promoting generic alternatives and introduction of controls against overprescription.\textsuperscript{16,17} The South Pacific Pharmaceutical Scheme projects cost savings of at least 25 per cent through limiting the availability of nonessential drugs and through bulk purchasing.\textsuperscript{18} Without policies for national formularies, procurement, prescription, and pricing, this powerful and ubiquitous health technology could become more of a liability than an asset to the health system.

Management of Health Resources

One of the most difficult and pervasive problems to solve in the establishment of effective health services in developing countries will be deficiencies in management. The health sector presents a formidable organizational challenge. Some of its objectives can be achieved only with the cooperation of other sectors such as water supply and sanitation, education, agriculture, and community development. The delivery of health services involves widely dispersed facilities, numerous categories of personnel, general and specialized hospitals, vertically organized programs to control individual diseases such as malaria, tuberculosis, leprosy, or venereal disease — each with its own personnel and support services, community health-care programs with multipurpose workers, and a system of indigenous medicine with traditional healers and birth attendants. The different elements need to be organized to reduce conflict and duplication between programs and to provide a coherent system to screen and treat patients according to the level of care required and to refer patients with difficult problems. Supervision and continuous in-service education of health workers, improved logistics and supply to maintain credible services, institution of personnel policies and rewards to maintain the quality, distribution, and morale of staff, and policies and financial arrangements that encourage rational use of the health resources by the public are essential corollaries to enhance sector performance.

The weakest links in the administrative chain of most developing countries are institutions at district and local levels, which are usually poorly staffed, have inadequate authority or control of resources, and are unable to provide the necessary support and supervision of field staff. The development of planning and administrative capability at the district level is of special importance, since this is normally the lowest tier of the health-services organization still communicating directly with central government but also in contact with the villages, aware of their needs, and in a position to encourage community participation. It is at this level that matching of health needs and resource allocation is most likely to occur.\textsuperscript{19} Community-based non-governmental organizations active in health care may make an important contribution to the process of devolution of administrative responsibility.

The management of a system of health services is much more than the management of its facilities and support systems. It involves decisions about priorities and resource allocation that are based on the health needs of the population to be served. This epidemiologic perspective is missing from the training of many of those in positions of responsibility, and the information system on which to base such management decisions is typically inadequate. Management also involves gaining the cooperation and compliance of highly independent professionals and specialists who have their own constituencies and political support.

The medical profession is of special importance because of the profound steering effect of individual clinical decisions on the demand for expensive facilities and the consumption of resources for diagnosis and treatment. Most practicing physicians give relatively little weight to consideration of the efficacy of these procedures and almost no attention to the real cost and foregone opportunities in terms of resources used. Abel Smith (personal communication) has estimated that the consequential costs generated by the average medical specialist in Great Britain are on the order of £500,000 per year; if eliminating unnecessary procedures reduced expenditures by 10 per cent, the savings nationwide would be enormous. In developing countries, the secondary-health-system costs generated by physicians are smaller, largely because of the absence of much of the high-cost diagnosis and treatment modes, but the same problem exists as in developed countries, and the implications are more serious because of the much more limited resources available for health. To give priority to medical education and to a reward system for physicians is to place clinical decisions about the individual patient in the context of the health needs of the population and to promote more discriminating use of scarce resources for diagnosis and treatment based on evaluation of the effectiveness and the cost of these procedures. These decisions involve difficult ethical judgments. The concepts behind these decisions have only recently been introduced into medical education and health-services administration in developed countries.\textsuperscript{14}

Poverty

Money alone will not ensure good health. However, in the opinion of most development specialists, the overriding constraint to improving health status in the least developed countries is the extreme poverty of most of the population and the low level of the gross national product per capita (below $400). Health must compete with other pressing developmental needs for extremely limited public resources.
The problem is made worse by the rapid growth in population, which averages 2.4 per cent per year among developing countries as a group and reaches nearly 4 per cent per year in Kenya; at this rate, the population of Kenya will double in 17 years. At current average annual growth rates, half the population will be under 15 years of age; and demands for employment, housing, and all basic services will increase rapidly. Public expenditures on health will have to increase commensurately just to “hold the line” on current levels of quality and coverage of services. Since population is the critical denominator of all development activities, with such limited resources reduction of fertility will be a decisive factor in attempts to improve services such as health care. At the same time, wider coverage of the population with effective services for maternal and child health and family planning is a necessary part of any strategy to reduce population growth.

Given the extremely limited resources and the rapid growth in population, several basic questions need to be addressed. First of all, what are the prospects for increased public expenditures on health, and to what extent are improvements in health dependent on economic progress? What other sources of financial support might be mobilized? Secondly, can existing resources be used more effectively? And thirdly, within these constraints is “Health for All” through primary health care feasible?

**Financing of Health Services**

Analysis of health expenditures in developing countries is hampered by a lack of satisfactory financial information on programs operated by different levels of government and the private sector. The available data indicate striking differences in the levels of current total public expenditures on health for capital and operating purposes, with average figures of $2.60 per capita per year in the poorest countries (1.1 per cent of the gross national product), $19 in middle-income developing countries (1.2 per cent of the gross national product), and $469 in industrialized countries (4.4 per cent of the gross national product). The combined public and private health expenditures in the United States and several northern European countries are close to $1,000 per capita per year — more than 100 times the level in the poorest group of countries. At the other extreme, a few of the poorest countries — Bangladesh, Ethiopia, Indonesia, and Zaire — have annual public expenditures on health of only $1 per capita. Since recurrent expenditures are concentrated in urban areas where hospitals and specialized manpower are located, it may be concluded that the resources available to operate health services for the rural population are very limited and in the poorest group of countries average substantially less than $1 per capita.

During the decade 1980-1990 the average annual growth in gross national product per capita is estimated to be 2.1 to 2.3 per cent in middle-income oil-importing countries, and 0.7 to 1.8 per cent in low-income countries. Assuming that public expenditures for health remain at the same proportion of the gross national product as in 1977, the allocation for health in low-income countries may be expected to increase by only $0.40 to $0.80, to a level of $3 to $3.40 per capita per year by 1990; the increment will be only $0.20 to $0.50 in Asia and even lower in Africa, where a reduction in per capita income is possible in the sub-Saharan countries during the decade. Predictions for the year 2000 show little further improvement, particularly in the low-income countries, with the gap between rich and poor countries continuing to widen. A substantial increase in poor countries’ public resources for health by 2000 is possible only if there is a shift in resources from other sectors. This seems unlikely, unless investing in health can be justified more convincingly to ministries of finance and planning, in terms of immediacy of benefit and return on investment.

To what extent are improvements in health dependent on economic progress? Preston’s study of the contribution of economic factors to declines in mortality, which uses national income and mortality data from populations in 43 countries between 1938 and 1963, indicates that income is a critical but not major determinant of mortality level. In the aggregate, income growth accounted for only 16 per cent of the improvement in life expectancy in the countries studied. In the subgroup of countries with incomes below $400 per capita, there appeared to be a stronger correlation of income and mortality trends. Nevertheless, Sri Lanka and the state of Kerala in India and the People’s Republic of China are examples of countries that have attained a life expectancy close to the level in the industrialized world, with income levels in the range of the least developed countries. The achievements may be explained in part by the public priority given to literacy, food, and health and by special features of social and political organization. Furthermore, as McDermott illustrated in the case of chemotherapy for tuberculosis in blacks in New York City and Maoris in New Zealand, advances in medical technology can be very effective in reducing mortality promptly without any preceding improvement in living standards. These examples are of great importance for the least developed countries, which have such gloomy economic prospects for the next two decades.

In view of the continuing scarcity of public resources, what opportunities exist to supplement a central government’s capacity to finance health services by mobilizing support from other sources? The possibility of revenue sharing by local government for local services warrants further exploration, although the capacity of local government to generate tax revenues is limited. In two regions of Senegal 8 per cent of general rural taxes are set aside for health, and in Colombia 35 per cent of the state beer tax is earmarked for hospitals. If these taxes generate new public revenue,
they could expand support for health; otherwise, the process is merely an exercise in allocation.

Social-security schemes based on contributions by employers, employees, and sometimes governments are an important financing mechanism in middle-income countries, particularly in Latin America. The services financed are predominantly curative, and since the benefits are restricted to employees, the schemes cannot be relied on to attain full coverage of low-income populations, many of whom are outside the wage economy. The equity of social-security systems has been questioned, since the public-sector contributions in effect serve to subsidize the better-off segment of the population, and employers may pass on their costs to consumers by raising prices. Private financing of health care has also been undertaken by productive sectors. One of the largest examples is the Colombia Coffee Growers' Association, which in 1978 alone contributed two fifths (41 per cent) of the total operating costs of the rural health-delivery system in that country.*

User fees and contributions in kind from the individual or the community are also important means to supplement financing from government. Many governments resist any form of user charges, for fear of excluding the poor or in the belief that consumers will not understand the value of the services. Paradoxically, imposition of user charges can have a positive impact on utilization of health services, by increasing the perceived value of services and therefore the demand for them over alternative "free" care. Mission clinics and hospitals have demonstrated the feasibility of recovering a considerable part of their operating costs for selected curative services when quality of care is acceptable. Institution of a pricing policy for selected curative health services has been attempted in several countries. The establishment of community pharmacies in the Philippines and of village drug cooperatives in Thailand and Senegal are examples of this approach. Traditional healers and birth attendants practice on a fee-for-service basis and enjoy a high level of community acceptance; with appropriate training, they could serve as a valuable extension of the health system financed by user fees. Village organizations and popular self-help movements such as Saemaul in Korea and Sarvodaya in Sri Lanka illustrate the value of community participation for mobilizing local labor and materials for health facilities and salary support of community health workers. However, local initiatives may lead to disillusionment if they are not supported by appropriate services within the public-health system. Multiple independent initiatives may complicate the evolution of a rational system unless they are developed within a general framework.

China, one of the few low-income countries with a broadly based health-care system, uses a variety of financing devices. In addition to central, provincial, and county-government appropriations and some user fees, health-insurance schemes are also employed. The "public-medical-expenses" scheme is similar to a social-security system covering government employees and students. The "labor-medical-insurance" scheme covers about 10 per cent of the population and is financed by 2 to 3 per cent of factory income before payment of salaries. The large rural population is covered by "cooperative medical services" financed by the participating communes through production "brigade revenue," individual premiums equivalent on average to 1.5 per cent of the family's disposable income, and user fees. All expenditures for preventive health care are borne by the state.

Much work remains to be done in analyzing the effect of prices on the demand for health services in developing countries; the success of the private sector in this area is not necessarily a reliable guide to public-sector pricing policy. Even when a superior public service replaces a private one, the public cannot be assured of capability to collect the same level of charges, since it is less able to refuse services to those unwilling to pay, as has been shown in the case of public water supply. Nevertheless, since private spending is estimated to be three to four times greater than government expenditures on health in many developing countries, it is clearly one of the most important sources of financing to explore.

Mobilization of resources for health from the widest spectrum of alternative sources should be actively pursued, ensuring that these resources are a net addition to public funding rather than a substitute for it. They have the added benefits of reducing the uncertainty associated with total dependence on public funding and of increasing the participation of the individual, community, cooperative, or local government in planning and managing the health services.

In many countries the principal alternative to government financing has been official development assistance from bilateral and multilateral agencies and extensive local contributions by foreign nongovernmental organizations. According to Howard, assistance for health from all external sources totalled $3 billion in 1978 — less than one quarter of the total estimated public and private expenditures on health in the 67 poorest developing countries (excluding China). The largest component, $1,008 million, came from 18 bilateral donors; they allocated approximately 10 per cent of their total concessional assistance to the health sector — a share only exceeded by agriculture, public utilities, and education. In view of the economic difficulties facing industrialized countries, it seems unrealistic for developing countries to rely on any appreciable increase in external assistance for health in real terms to compensate for a shortage in public expenditures. Furthermore, care must be taken to avoid capital expenditures financed by external assistance if the recurrent cost obligations that they create are not in keeping with the pri-
orities for use of the limited public funds available for health.

The tendency of governments to discriminate in budget allocations against programs with high recurrent costs in favor of capital-intensive projects is aggravated by the policy of many external donors not to support operating costs. In general, recurrent costs generated per dollar of capital investment are substantially higher for health than for other major public sectors, such as agriculture or transportation, and the ratios are particularly high for primary-health-care programs and rural health centers, in which expenditures are mainly for manpower and drugs. This makes these programs very vulnerable to budget cutting by government. In addition, even when general operating expenditures have been met, neglect of maintenance expenses leads to further capital expenditures for rehabilitation or replacement of facilities and equipment — a much more costly approach to sector development. An important consideration in the success of primary health care will be the willingness of governments and external donors to place appropriate priority on the financing of recurrent costs.

**Efficiency and Effectiveness of the Use of Resources**

National capability to plan and implement strategies and programs that make the best use of scarce resources is seriously deficient in most developing countries. The coexistence of subpopulations with different health needs requires programs that are designed for these groups and not based on national averages. The need to select from among a broad range of possible interventions the most appropriate mix of personnel, facilities, and technologies requires information on relative cost effectiveness, trade-offs between capital investment and recurrent costs, and assessment of the political and administrative feasibility of implementation — for all of these, data are seriously deficient.

Health planning is under a cloud of skepticism because the substantial efforts to date have had little effect on resource-allocation decisions for the health sector in most countries. Much of the planning has been normative, based on international estimates of the number of personnel and hospital beds needed to establish or extend coverage of services rather than on the nature of the health problems of a given population and the most cost-effective methods of solving them. Almost all planning and management have been central, with inadequate understanding of the real constraints on implementation at the operating level.

Matching programs more closely with needs will depend on strengthening planning in several areas. Some initial definition of priorities for the sector is essential. This may be achieved by a review of estimates or epidemiologic measures of the disease profile of representative population groups, clarification of explicit health-sector objectives, and assessment of the technical, political, and administrative feasibility of dealing with the most important problems. From this general framework it should be possible to define population-specific objectives for health investments and to establish targets for reductions in critical sector-development indicators such as infant mortality, malnutrition, fertility, or disease prevalence. Setting targets provides a mechanism not only to assess the value of use of scarce resources but also to monitor and evaluate program performance. Alternative approaches to achieve the targets should be reviewed, and the most cost-effective solution selected, weighing not only technical and financial considerations but also cultural acceptability and feasibility of implementation. This exercise will raise difficult questions about trade-offs: whether to pursue inexpensive short-term symptomatic therapy or more expensive long-term measures to eliminate the cause of disease; the relative merits of interventions in health and in other sectors such as water supply and sanitation; and the choice between disease-specific, vertically organized health services and the multi-purpose, horizontal primary-health-care approach. Walsh and Warren reviewed published reports of infectious and parasitic diseases endemic in tropical countries and concluded that the strategy of intervention should be selective — based on evidence of the contribution of each disease to mortality and morbidity, the efficacy and cost of currently available control measures, and the feasibility of applying these measures. The extensive studies of Morrow and his co-workers in Ghana illustrate the potential value of cost-benefit analysis in sorting out priorities within the health sector and in justifying to the government the investments in health vis-à-vis other sectors. Application of this technique is limited by the difficulty in quantifying benefits in health, the inadequacy of the human-capital approach to life valuation, and the lack of suitable data for analysis in most developing countries. In the absence of cost-benefit analysis, unit costs of specific health improvements may be compared in order to identify the least-cost solution. To apply these epidemiologic and economic measurements when planning health programs, requires much information and takes time. In many cases, detailed measurements cannot be made, but more rigorous review of available evidence on the health needs of different population groups and the consideration of cost effectiveness in selecting interventions offer the best hope for stretching limited resources to achieve maximum impact on health. In addition to encouraging better policies and practices in the health sector, this should enhance the acceptability of proposals by ministries of health to ministries of planning and finance.

The development of measurement capability for both planning and managing health services has a high priority for health administrators, physicians, and others with leadership responsibility in the health system. This can be best achieved by strengthening existing institutions through mid-career training of
the staff, improving management information systems, and undertaking operational research on health services at central and peripheral levels of the health system.

**Financial Feasibility of Primary Health Care**

Primary health care has been accepted by the member governments of the WHO as the key to achievement of universal access to health care by 2000. Assuming that the low-income countries will have no more than $3 to $4 per capita per year in public resources to devote to health by 2000, is it possible to achieve the goals envisaged in the primary-health-care approach with this financial constraint?

Evidence from six primary-health projects undertaken in the late 1960s and 1970s in developing countries indicates that marked health improvements can be demonstrated within five years through provision of basic services with annual operating costs ranging from about $0.50 to $3.50 per capita (Table 5). When corrected for inflation, these figures would be $1 to $7 per capita in 1981 prices. The results must be interpreted with caution since five of the projects were of a pilot nature; most involved very small populations; the cost data varied greatly. As a rule, they did not include capital investment, training, expenditures beyond the primary level of health care, or the value of expatriate and volunteer labor. The contribution of voluntary health workers is of special importance because they provide a large share of rural health services and because volunteerism may be difficult to sustain over the long term.

Although there should be economies in scaling-up to national programs, in fact higher marginal costs would be expected with expansion of primary health care to more widely dispersed populations. Furthermore, political and administrative problems involved in scaling-up would add costs for management, supervision, and support systems. Nevertheless, the results of the pilot projects, adjusted for inflation, are of the same order as the estimates of $1 to $3 by Joseph and Russell and $5 by Patel (unpublished data) for per capita recurrent costs of primary-health-care programs.

An alternative approach to estimating the cost of primary health care is to price the individual components of a model program designed to treat the principal causes of mortality in children in low-income countries, as outlined in a recent WHO discussion paper. The model for a total population of 100,000 would try to provide basic care for children under five years of age (about 17,000), tetanus toxoid, iron and folic acid for pregnant women (about 4000), and contraceptive advice and supplies for fertile women (about 5100 at a 30 per cent level of coverage). On the basis of estimates of the need for immunization against common infectious diseases and for treatment of diarrhea, acute respiratory infections, malaria, and intestinal parasites, and assuming that all patients in need will be treated with the least expensive, effective treatment available, it is possible to calculate the annual cost of drugs and supplies for each condition. For example, to immunize the 4000 children under one year of age against measles, 3200 doses would be required to achieve 80 per cent coverage (recognized as sufficient to halt transmission), which at $0.17 a dose would cost $544 each year.

The annual cost of all the drugs, vaccines, and supplies for the model program was $35,000, or $0.35 per capita, for the population as a whole to cover the selected target groups.

The cost of commodities is, of course, only one component. It is necessary to add the cost of salaries of health workers, training, transportation, and maintenance. If these additional costs are in the same proportion to total primary-health-care costs as drugs are in national health budgets (drugs account for 25 per cent according to a conservative estimate), then the total annual recurrent costs for primary health care may be in the range of $1.40. Since annuitized capital costs for primary care are about one third of recurr-

| Table 5. Impact and Cost of Selected Primary-Health-Care Projects.* |
|----------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| **PRODUCT**                     | **PERIOD**      | **ESTIMATED POPULATION COVERED** | **INFANT MORTALITY RATE** | **CHILD MORTALITY RATE** | **PROJECT COST PER CAPITA** |
|                                 | **MONITORED**   |                                | **BASE OF STUDY PERIOD** | **END OF STUDY PERIOD** | **PER CENT REDUCTION** | **BASE OF STUDY PERIOD** | **END OF STUDY PERIOD** | **PER CENT REDUCTION** | **$** |
|                                 |                 |                                | **deaths/1000 live births** |                                |                     |                                |                                |                     | |
| Miraj, India                    | 1974–77         | 230,000                        | 68 | 23 | 66 | † | † | † | 0.50 |
| Jamkhed, India                  | 1971–76         | 80,000                         | 97 | 39 | 60 | † | † | † | 1.25-1.50 |
| Narangwali, India               | 1968–73         | 10,500                         | 128 | 70 | 45 | 19 | 11 | 42 | 0.80-2.00 |
| Hanover, Jamaica                | 1973–75         | 65,000                         | 36 | 11 | 69 | 13-15 | 5-6 | 60 | 0.50 |
| Deschapelles, Haiti             | 1968–72         | 9,600                          | 55 | 34 | 38 | 11 | 6 | 45 | 1.60 |
| Rural Guatemala                 | 1969–72         | 3,000                          | 150 | 55 | 63 | 28 | 6 | 79 | 3.50 |


†Comparison of average rates for 1970-73 in medical-care intervention and control areas. Child mortality reflects deaths in children 12 to 36 months of age per thousand children in that age group.

‡Child mortality reflects deaths in children 1 to 48 months of age per thousand children in that age group.
rent costs, $0.45 to $0.50 may be added to cover capital investments. The combined capital and recurrent costs of the primary-health-care program would be under $2 per capita per year, well within the financial reach of low-income countries.

The fragility of the assumptions involved in multiplying the commodity costs is acknowledged. The model itself is relatively insensitive to changes in the assumptions about the commodities with the exception of the contraceptive prevalence rate. (Increasing contraceptive prevalence to half the women at risk would increase per capita costs of commodities from $0.35 to $0.43.) A more important factor is the assumption that the primary-health-care worker will provide early diagnosis and treatment. For example, if treatment of diarrhea were delayed so that 50 per cent of children rather than 10 per cent required intravenous fluids and antibiotics, the cost of commodities would be increased from $0.35 to $0.62 per capita. The model also assumes encouragement of breastfeeding and nutrition education of mothers and children at nominal cost, but if food supplements are added, the cost of the package of commodities would be substantially increased. Using data from Project Poshak in India on the cost of the basic food supplements, adjusted for inflation and an assumed 30 per cent prevalence of malnutrition, as reported in several national nutrition surveys, the added cost would be $0.71 per capita — twice the cost of supplies for the basic health and nutrition interventions. Provision of rural water supply, which might be proposed in addition to or as an alternative to primary health services, is estimated to cost $5 per capita, of which approximately half would be annuitized capital cost. (This estimate is based on a reported capital cost of $26 per capita in 1977 and annuitized at a 10 per cent discount rate and including complementary operation, maintenance, and support costs.)

The value of the modeling exercise is limited by the pyramid of assumptions on which the calculations are based. More important than the results, however, is the process involved in developing the model, which illustrates the trade-offs that countries must consider in determining the balance of services to be provided to their population. The process of choosing the most cost-effective approaches to meeting health needs is the essence of the planning and decision-making process outlined above.

Conclusions

Developing countries face the challenge of coping with a heavy burden of illness that differs markedly in subgroups of the population at different stages of development. The greatest improvement in life expectancy from health investments can be expected in the rural and peri-urban poor through a program that provides maternal and child health services, including control of the major infectious and parasitic diseases of children under five. Effective technology for such a program is now available and affordable even within the financial constraints of the least developed countries. Two major problems remain: the first is the political will to allocate the necessary resources for the program, and the second is the management capability to organize and operate a system of services for the rural and peri-urban populations that use multi-purpose community-health workers.

No satisfactory strategy has been developed to meet the health needs of older children and adults within the financial means of most developing countries. There are relatively few simple, effective interventions to control the metabolic, vascular, degenerative, and malignant diseases of the adult population, and there is little understanding of the behavioral disorders. Without new technologies for control and prevention, it is unlikely that the poorer developing countries will be able to provide more than symptomatic care for most patients with these health problems. Furthermore, adoption of the expensive technologies now used for the diagnosis and treatment of these diseases in the industrialized world will divert the limited resources available for programs for the rural and peri-urban poor to sophisticated, hospital-based, urban services, which will have, at best, a marginal impact on health.

The search for health technology appropriate to the financial and organizational circumstances of developing countries must be seen as a high priority for the research and development community of the entire world. Existing technology must be critically evaluated, and new, simpler techniques developed for the control and prevention of common chronic diseases. Greater attention should be given to research and development on the “tropical” diseases, which are a major component of the disease burden of developing countries but have been largely neglected by the world’s scientific community. Pharmaceuticals are of special importance since the timely supply of essential drugs is critical to the quality of health care and the credibility of community health workers. The dangers of excessive use or inappropriate choice of drugs necessitate the introduction of policies on procurement, prescription, pricing, and quality control to avoid health hazards and excessive costs.

Financial constraints will be an overriding consideration in the development of the health sector for the foreseeable future, particularly in the least developed countries. The poorest countries that now have public expenditures on health averaging only $2.60 per capita per year also have the least favorable economic prospects for the next decade. Greater efforts are required to mobilize resources for health from other sources, particularly the private sector, and to ensure that the limited resources available from all sources are used in the most cost-effective manner. Few developing countries have the institutional capability to select health interventions on the basis of expected health impact, least cost, and feasibility of implementation, and to integrate independent facilities, practitioners, and disease-specific programs into a
more coherent, economical, multipurpose system. A high priority should be given to strengthening the capability of administrators, physicians, and other personnel in positions of leadership in the health system at central and local levels in order to develop a population perspective in the analysis of health problems, a cost-effectiveness attitude toward the use of resources, and management skills appropriate for a human-services organization. More efficient management of health services is one only aspect of the problem. It is equally important to mobilize communities and individuals to take a more active role in promoting health and in financing health services, rather than to rely passively on a government system.

Scarcity of money for health is a critical limitation on progress toward the goal of "Health for All by the Year 2000." More money alone, however, will not produce the desired outcome unless there is a political commitment to programs for those in greatest need, as well as the managerial capability to implement them. This is first and foremost a challenge for developing countries, but it is also a consideration in the investment policies of donor agencies. Progress toward the goal of "Health for All" can be accelerated if more external assistance can be provided for the areas of greatest need and if the unique scientific and technologic resources of the industrialized world can be made available to developing countries, to strengthen their institutions and to collaborate in the development of appropriate technology to meet their needs.

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