Health transition in middle-income countries: new challenges for health care

JULIO FRENK¹, JOSÉ L BOBADILLA¹, JAIME SEPÚLVEDA², MALAQUIAS LÓPEZ CERVANTES³

¹National Institute of Public Health, Mexico, ²General Directorate of Epidemiology, Ministry of Health, Mexico, and ³Yale University, Connecticut, USA

Concepts behind current health systems are no longer adequate for dealing with the growing complexity of the health arena, both internationally and nationally. It is now too simplistic to classify world health in bipolar terms, such as East versus West, or North versus South. Conversely, epidemiologic differentiation within each country is now producing internal polarization: diminishing health care budgets may increase competition for scarce resources between two different groups of health problems — the left-over ills, caused mainly by common infectious diseases and malnutrition; and the emerging threats of chronic ailments, accidents, mental disorders, and now AIDS. In this situation, the former group is likely to lose out.

It is imperative to avoid this pernicious competition by developing new health care models that assume a population-based responsibility. Unless comprehensive and cost-effective solutions to the two groups of health problems are provided simultaneously we risk an unacceptable paradox: instead of being an instrument for equity, health services may serve to increase social inequality.

Introduction

The aftermath of the second world war led to an intense process of industrialization in most middle-income countries. Standards of living rose at a much faster rate than ever before, and new medical and sanitary technologies came into existence. As a result of these and other concomitant factors, the mortality rate declined impressively. Life expectancy of the Mexican population, for example, rose from 41 to 66 years during the period 1940–1985. Many children who previously would have died from infectious diseases survived, thereby increasing the number of people exposed to risk factors (which also increased) for chronic diseases. Nowadays, therefore, middle-income countries not only have to cope with the left-over ills of infectious diseases and malnutrition, but also with new calamities, such as cardiovascular diseases, cancer and accidents.

This paper aims to analyse the dynamics of the health changes that are taking place in middle-income countries, which are in the midst of intensive economic and social transformations.

Justification for this type of analysis stems from the need to anticipate future requirements for the health system. This, in turn, will provide the basis for planning and shaping the health services to meet the complex and changing health needs of populations.

Some might question the need for the advance planning of health systems in middle-income countries: Why not simply continue to import the medical model already developed in high-income countries? The answer is simple but not necessarily obvious. First, the medical model in most developed countries has been shown to be ineffective in coping with increasing demands, partly because of the rising costs of medical technologies. Second, the epidemiologic transition in high-income countries occurred at a different rate and followed different patterns from that of middle-income countries.

Just as the classical epidemiologic transition of the industrialized Western nations cannot be assumed to be the model for underdeveloped countries, so we cannot treat the latter as a
homogeneous group. In fact, it is our contention that catch-all categories, e.g., 'underdeveloped' or 'developing' countries, are becoming increasingly meaningless, at least as far as the health arena is concerned. In many respects, differences between the various groups of developing countries are as marked — or even larger — than comparisons with developed nations. For this reason we will not attempt here to make undue generalizations about the so-called developing countries. Until better classifications are agreed upon we will adopt the one used by the World Bank, which is based on national income per capita. Accordingly, we will limit our discussion to the groups of 'middle-income' countries which, in 1984, had a median GNP per capita of $US 740 for lower middle-income countries, and of $US 1950 for upper middle-income nations.¹

This paper is divided into three parts. First, we review the conceptual basis of the epidemiologic transition, proposing some corrections and additions that are relevant to a large number of middle-income countries. Next, we examine, as a case study, the epidemiologic transition in Mexico, based on the changes in mortality and morbidity during the past 45 years, but mostly forecasting those likely to occur in the next 12 years. Last, we list and describe some of the most relevant effects of the epidemiologic transition on the health system, with particular reference to Mexico.

Epidemiologic transition: new concepts for an old process

Demographers initially proposed the concept of 'transition' to describe the differences in demographic patterns between countries with dissimilar levels of social and economic development. The main emphasis was given to the sequence of decline, first of mortality rates and later of fertility rates: this explained the transformation of the population age structure from a pyramidal shape, with a wide base, to one that was column-shaped.

The original concept of epidemiologic transition was introduced by Omran in 1971,² although in 1969 Frederiksen had analysed the relationship between the economic transition, the demographic transition, and the concomitant changes in health and the organization of health services.³ At about the same time and, it would seem, quite independently, Lerner wrote a paper on what he called the 'health transition'.⁴

The concept of epidemiologic transition refers to the series of interrelated and complex changes in the health and disease patterns that occur in specific human populations over large periods of time. These changes are usually closely related to the major economic, social and demographic transformations of societies. Normally they occur in a sequence that alters from a pattern dominated by infectious diseases — closely associated with the scarcity of essential goods such as food, housing and education — to one where chronic and degenerative ailments predominate.

Most of the theoretical frameworks on the epidemiologic transition posit a linear and unidirectional sequence. This suggests that all countries eventually pass through the same stages of the transition, and that in each stage there is one dominant pattern of morbidity and mortality. In his original formulation, Omran proposed three stages or eras:

- the era of pestilence and famine, when mortality is very high and fluctuating, life expectancy at birth is around 20–40 years and there is no population growth
- the era of receding pandemias, characterized by a reduction in the mortality peaks that were caused by large epidemics, a life expectancy at birth of 30–50 years, and a sustained demographic growth
- the era of the degenerative and man-made diseases, dominated by a sharper decline in mortality, a life expectancy at birth of over 50 years, and the emergence of fertility as the decisive determinant of demographic growth.

Omran documented his concept of the epidemiologic transition with three different models:

- the classical or Western model, experienced mainly in Europe
- the accelerated model, represented by the Japanese experience
- the contemporary delayed model, characteristic of the one followed by the present-day developing countries.
These models are mainly determined by the time of onset and the period then taken to pass from one of the above eras to another. The progression, however, is always proposed to be linear.

Based on the evolving experience of many middle-income countries, we propose some modifications to the original theory, the most important of which are:

1. The eras are not necessarily sequential, since two or more may overlap.

2. The evolutionary changes in the patterns of morbidity and mortality are reversible, giving place to what could be called a ‘counter-transition’.

3. There is, in consequence, a new model of epidemiologic transition, typical of countries where the changes do not fully take place and where different types of diseases coexist in the same population; this we call a protracted epidemiologic transition.

4. The coexistence of pre- and post-transitional diseases leads, in certain countries, to an epidemiological polarization. The old health inequalities among social classes, which hitherto were predominantly quantitative, become qualitative with this polarization. The poorer sector of the population would not only present with higher rates of disease, but these would be of different kinds, mostly either infections or nutritional disorders.

5. Finally, a note on the value judgements implicit in the labels traditionally given to morbidity patterns and groups of diseases. From the dominant discourse of health researchers and officials, there seems to be a notion that some diseases are socially more acceptable than others. The displacement of infections by accidents and chronic diseases is often referred to as a sign of ‘progress’. Some go to the extreme of designating the latter as the ‘ills of civilization’. Actually, these health problems are a result of a defective process of industrialization that has given priority to economic growth over human welfare, as manifested by the new hazards of chemical pollution which now coexist with the perennial problem of biological contamination. Therefore, some of the labels are thoroughly wrong. If such ‘diseases of civilization’ were to exist, they would be the infections — which have, throughout history, been disseminated among human populations by ‘cultural vectors’, such as commerce and migration.

**Mexico as a prototype of a middle-income country**

Analysis of the epidemiologic changes in Mexico must include not only those that have happened in the recent past, but also those that are likely to occur as a result of the decline of fertility and the severe economic crisis that the country is experiencing.

**Changes in the rate, age structure and causes of mortality**

The crude mortality rate in Mexico started a steep decline at the beginning of this century, although most of the reductions occurred in the decades of the 40s and 50s. From a figure of 23.5 deaths per 1000 in 1940, the crude mortality rate decreased to 6.2 in 1980, i.e., a reduction of about 75% (Table 1).

**Table 1. Crude mortality rate and relative change in selected years, Mexico, 1900–1980.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate</th>
<th>Relative change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>33.6</td>
<td></td>
</tr>
<tr>
<td>1920</td>
<td>23.52</td>
<td>–30</td>
</tr>
<tr>
<td>1930</td>
<td>25.6</td>
<td>+9</td>
</tr>
<tr>
<td>1940</td>
<td>23.5</td>
<td>–8</td>
</tr>
<tr>
<td>1950</td>
<td>16.0</td>
<td>–32</td>
</tr>
<tr>
<td>1960</td>
<td>11.2</td>
<td>–30</td>
</tr>
<tr>
<td>1970</td>
<td>9.6</td>
<td>–14</td>
</tr>
<tr>
<td>1975</td>
<td>7.2</td>
<td>–25</td>
</tr>
<tr>
<td>1980</td>
<td>6.2</td>
<td>–14</td>
</tr>
</tbody>
</table>

*Source: Modified from Bobadilla.*

When the age-specific mortality rates are examined, it is clear that the greatest reductions in mortality have occurred among children under five. In contrast, the mortality rates among adults have remained constant and thus the relative contribution to the overall mortality rate

* Since the population age structure showed only slight changes during the period 1940–1980, the age-standardized mortality rate shows no difference when compared with the crude one.
of deaths from this group has risen. The infant mortality rate was around 323 per 1000 births in 1910, dropping to 96.2 in 1950 and further declining to about 35 deaths per 1000 in 1985. In other words, children today under one year old have ten times more chance of surviving than those born at the beginning of the century (Figure 1).

Analysis of mortality trends in the period 1950–1980 reveals three groups of causes of death: first, the group of infectious diseases that show a significant decline, most noticeably malaria, whooping cough and dysentery (Figure 2, above); second, the chronic and degenerative diseases and the accidents, which show a sharp increase — notably ischaemic heart disease, diabetes and motor vehicle accidents (Figure 2, below); and third, the remaining conditions, including congenital malformations and perinatal problems, which show little change.

Table 2 shows the ten main causes of death in the period 1955–1957, and in 1980. The mixed pattern of diseases is again apparent from a comparison of the two periods. In 1955–1957 almost 43% of the total deaths were due to gastroenteritis, influenza and pneumonia, and childhood diseases, whereas in 1980 only 17% of deaths were due to influenza and pneumonia together with enteritis and diarrhoeal diseases. Although the groups are not strictly comparable, the decline in the relative contribution of the infectious diseases is quite clear. In contrast, heart diseases, malignant tumours and accidents were responsible for only 14% of the deaths in the first period, increasing to almost 29% in 1980.

Table 2 also shows the rate of these changes: infectious diseases declined to less than half from...
Health transition in middle-income countries

Table 2. Changes in the first ten causes of death in Mexico, 1955–1957 and 1980. Rate is per 100,000 inhabitants.

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>1955–1957 Rate</th>
<th>1955–1957 %</th>
<th>Cause of death</th>
<th>1980 Rate</th>
<th>1980 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastroenteritis</td>
<td>227.5</td>
<td>17.5</td>
<td>Heart diseases</td>
<td>74.9</td>
<td>11.6</td>
</tr>
<tr>
<td>Influenza and pneumonia</td>
<td>202.0</td>
<td>15.5</td>
<td>Accidents</td>
<td>71.1</td>
<td>11.0</td>
</tr>
<tr>
<td>Childhood diseases</td>
<td>135.3</td>
<td>10.4</td>
<td>Influenza and pneumonia</td>
<td>56.9</td>
<td>8.8</td>
</tr>
<tr>
<td>Heart diseases</td>
<td>91.4</td>
<td>7.1</td>
<td>Enteritis and other diarrheal diseases</td>
<td>55.1</td>
<td>8.6</td>
</tr>
<tr>
<td>Malaria</td>
<td>66.4</td>
<td>5.1</td>
<td>Malignant tumours</td>
<td>39.2</td>
<td>6.1</td>
</tr>
<tr>
<td>Accidents</td>
<td>48.1</td>
<td>3.8</td>
<td>Certain causes of perinatal mortality</td>
<td>39.2</td>
<td>6.0</td>
</tr>
<tr>
<td>Homicides</td>
<td>38.0</td>
<td>2.9</td>
<td>Cerebrovascular diseases</td>
<td>22.6</td>
<td>3.5</td>
</tr>
<tr>
<td>Malignant tumours</td>
<td>37.8</td>
<td>2.9</td>
<td>Cirrhosis and other chronic diseases of the liver</td>
<td>22.1</td>
<td>3.4</td>
</tr>
<tr>
<td>Bronchitis</td>
<td>31.7</td>
<td>2.4</td>
<td>Diabetes mellitus</td>
<td>21.7</td>
<td>3.4</td>
</tr>
<tr>
<td>Tuberculosis, all forms</td>
<td>31.2</td>
<td>2.4</td>
<td>Nephritis, nephrosis</td>
<td>10.5</td>
<td>1.6</td>
</tr>
<tr>
<td>All other causes</td>
<td>390.0</td>
<td>30.0</td>
<td>All other causes</td>
<td>231.6</td>
<td>36.0</td>
</tr>
<tr>
<td>Total</td>
<td>1299.4</td>
<td>100.0%</td>
<td>Total</td>
<td>644.9</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

1956 to 1980, while accidents almost doubled their rate. It is important to note the disappearance of malaria as a cause of death.

The epidemiologic polarization in Mexico is largely explained by the different pace of change in the causes of ill-health among the social classes. Health inequalities have roots in the ways in which population groups are established within the production system; these may be manifested in many dimensions — geographical, institutional, political and certainly occupational. In Figure 3, the five main causes of death for the two main groups of health service users in the Mexican Institute of Social Security are shown. On the left of the figure, numbers refer to the insured population which is employed and entitled to the full range of social security benefits, including health care; these are mainly manual workers. On the right the numbers refer to the inhabitants of rural communities who have geographical access to a subsystem of the health care of this institution; they are mainly agricultural workers, most of them not entitled to social security benefits. Comparison of the causes of death illustrates the epidemiologic polarization, since the former group present a mixed pattern of diseases while the latter show a pre-transitional pattern.

On the other hand, 'Certain causes of perinatal mortality' appear among the ten causes of death in 1980 shown in Table 2. These deaths are mainly due to intrauterine growth retardation and...
preterm birth. Most of them occur in the first 28 days of life and become the major component of infant mortality, as a result of the decline in post-neonatal deaths which had been due to diarrhoeas and acute respiratory infections. Figure 4 shows, for Mexico City, a clear cross-over between these two groups of deaths in about 15 years. This is suggested as evidence that the epidemiologic transition can also be detected in specific age groups.

![Graph](https://example.com/graph.png)

**Figure 4.** Percentages of neonatal and post-neonatal infant deaths in Mexico City.


**Changes in the incidence of infectious diseases**

The current theory of the epidemiologic transition implicitly assumes that mortality trends correspond to changes in the incidence of diseases. The evidence presented in this paper questions this assumption, especially for the case of infectious diseases.

The explanations behind the decline of the mortality rate due to infectious diseases in developed countries are quite different from those involved in developing countries. Most of the convincing evidence given by McKeown on the relatively small contribution of therapeutic and preventive medical technologies to this decline stems from developed countries and does not necessarily apply to the developing countries.

The major improvements in the living conditions of the Mexican population undoubtedly contributed to the decline of the overall incidence of infectious diseases. However, the beneficial effects of antibiotics, vaccines, and measures for the control of vector-borne diseases also cannot be denied, and these effects are likely to have been greater in Mexico than in developed countries, essentially because, at the time when these measures were introduced to Mexico the rates of most infectious diseases there were still very high. The majority of these measures have produced effects that, by and large, are reversible — as will be shown below with some specific examples — in contrast with the improvements in the living conditions, which are more lasting.

Many infectious diseases in Mexico, such as typhus, poliomyelitis and diphtheria, are in a trend towards possible eradication. However, there are also emergent infectious diseases of which there are different types:

- Dengue fever provides a model of a re-emergent disease, as it had practically been eradicated in the 1970s, and has now spread to most of the coastal states.
- Malaria provides a different case since it was a disease that had been brought under control, but in recent years its incidence rate has again started to increase; this type of disease can be labelled as refractory.
- Finally, the acquired immunodeficiency syndrome (AIDS) exemplifies a case of an authentic new emergent disease.

A full description of the changes and incidence rates of infectious diseases in Mexico is beyond the scope of this paper, and can be found elsewhere.

The effects of the economic crisis in Mexico have, during the past six years or so, slowed down some of the previous improvements in the standards of living. In this context, it is possible that the mortality rates of diarrhoea and acute respiratory infections in Mexico will now only further decline by means of modern procedures that reduce the fatality rate, not the incidence rate. This is the case with oral rehydration therapy, and schemes for the treatment of respiratory infections. It is, therefore, not
Health transition in middle-income countries

Challenges for the health system in the twenty-first century

Decline in fertility and changes in the age structure

The second stage of the demographic transition, characterized by the decline of fertility, started in Mexico in the middle 1970s. The birth rate dropped from 40 births per 1000 inhabitants in 1976 to 30.5 in 1982. This trend agrees with those researchers who foresaw, against the neomalthusian thesis, that in order to reduce the fertility rate, it was necessary first to control the mortality rates.

The effects of the fertility decline on the age structure of the population are quite evident. Figure 5 shows the population pyramid for 1980, where the age group 0-4 is smaller than the age group 5-9. On the right of the figure, the pyramid for the year 2000 no longer has a wide base; instead it shows that all groups between 0-5 and 25-30 are about the same size. The proportion of adults of productive age (15-64 years) will grow from 52.5% in 1980 to 64.0% in the year 2000, an increase of about 18 million adults. This ageing process of the population will accelerate the epidemiologic transition.

Competing needs for scarce health resources

Any discussion of a health system must attempt to understand two major phenomena: on one hand, the health conditions (or needs) of the population; on the other, the response that a society organizes to deal with those conditions.

We have, in the previous sections of this paper, sketched some of the major characteristics of the health conditions prevailing in Mexico. We have also described the main changes that will occur in the age composition of the population as a result of the fertility decline. We will now proceed to analyse the consequences of the protracted epidemiologic transition on the provision of health services.

As mentioned at the beginning of this paper, the health scenario for the first 10 years of the twenty-first century will be characterized in Mexico by the coexistence of mixed pathologies, and an increasing amount of health needs at unprecedented levels. Even if during the remaining 12 years of the twentieth century effective preventive measures were introduced, and the fertility rate was further reduced, the demographic and epidemiologic inertia would produce most of the expected burden of disease and disability. The lag time between the exposure to risk factors and the manifestation of some chronic diseases, such as cardiovascular problems and cancer, and now AIDS, explains this epidemiologic inertia. In other words, most of the years of exposure necessary to produce ischaemic heart disease and pulmonary cancer have already occurred in those that will be affected. In a similar way, the mothers of the births that will occur in the year 2000 have already been born. What is the implication of such inertia on health needs? We can illustrate the dilemma with the case of infant deliveries versus medical care for chronic conditions.

Based on the historic trends of fertility, it is estimated that, by the year 2000, there will be about 2 450 000 births in Mexico, i.e., about the same as in 1988. Although the fertility rates will have declined substantially, the number of births will not change because of the momentum of population growth. Consider that, in the past five years, only 55% of all births were delivered by a qualified professional. In the present medical model to deliver babies safely, there is a deficit of 45% for obstetric hospital beds. By the year 2000, Mexico would need new hospital beds to deliver about 1 102 500 births, i.e., the health system would have to double the total number of beds available nowadays. The required budget for constructing and operating the hospitals to deliver 84 808 extra births every year for the next 13 years is formidable.

Even the most optimistic economic forecasts for the next 20 years give no indication that there will be sufficient resources to support the construction of the hospital beds to which we have just referred. However, the most profound problem is not that Mexican society may be incapable of producing the required resources to make its health system grow, but rather that the medical model for meeting health needs is inappropriate.
Clearly, the social response to the health needs of the year 2000 has to be very different. In the case of obstetric care, new innovative models, relying more on simplified health care units and on domestic resources, must be developed, tested and implemented. Hospital beds will have to be reserved for high risk deliveries only.

The problem does not end here. The burden of disease and disability will pose a situation of competing needs for whatever resources exist by the year 2000. A preliminary analysis of the number of deaths and the cases of hospitalization and ambulatory care in 1985 and in the year 2000, suggests that the number of deaths and admissions to hospitals will change only slightly between 1985 and the year 2000. Nevertheless, the admissions due to cancer and tumours, and to heart, circulatory and respiratory diseases, will increase by about 40%. The requirements of beds to deal with those admissions will be considerably larger than for infections and other acute diseases. This is because the length of stay for the former group is several times longer.

The health needs derived from reproduction, particularly those occurring during delivery, will compete in the year 2000 for the same resources required for chronic and degenerative conditions. Once again, a different model of health care will have to be developed to meet the foreseeable health needs in the year 2000. Ambulatory

---

**Figure 5.** Age structure of the Mexican population in 1980, and the forecast for the year 2000.
surgery should seriously be considered to reduce the need for hospital beds. Hospitalization to care for socially deprived patients should be avoided through financing family and neighbourhood support to the sick and disabled. Concrete and explicit norms of rationing hospital services are likely to be inevitable. In addition, the first level of care will have to be strengthened in order to reduce demand for hospitalization.

The above preliminary analysis also shows a small increase between 1985 and 2000 of consultations at the first level of care. The type of consultations will, however, be quite different. Particularly important will be the increase in cancer consultations. The competing needs between cancer and pregnancy care for the same resources will not be easy to solve. In contrast to the situation where the first level of care was mostly designed to deal with acute, episodic and short-term care, it will be necessary to shift to continuous and long-term care, where concerns for clinical and interpersonal quality — and not just for the quantity of services — will be of utmost importance. Such a shift will have profound implications for the composition of the health care team.

There are many factors that have not been taken into consideration in the estimates of the disease load for the year 2000. Some are likely to reduce the load, others quite the reverse. An extremely important one is that the threshold for health demand is very likely to lower with time, as the population will be more educated and better informed. A second important factor is that psychosomatic diseases are likely to increase.17

An essential element of the epidemiologic polarization in Mexico is the social differentiation of disease patterns. The poor will continue to be victims of the left-over ills, whereas the relatively better-off will be the most affected by chronic and degenerative diseases. The competing health needs will not, therefore, have the same chances of winning. The infectious diseases and the health needs derived from reproduction are handicapped in the competition, since those who suffer them have less economic and political power to direct resources in their favour. Health services to deal with infectious diseases, and with pregnancy, delivery and childhood health problems, are unfortunately likely to be neglected if the prevailing health care model remains. The integration of the health system will be of paramount importance if this undesirable outcome is to be averted. Two basic principles for any new health system cannot be overemphasized: universal access, and equity in the distribution of resources.

Towards a new health model
The situation presented for Mexico in the previous two sections is probably similar to that of many other middle-income countries. It is important to face the epidemiologic transition and the health polarization as a common problem, at least of these countries.

It has become quite clear, from many experiences in this century, that the urgent need to make health services more equitable and efficient will not be achieved through free market forces of supply and demand. Most governments will continue to assume the ultimate responsibility for the health of populations. At the same time, it will be necessary to recognize that the growing complexity of contemporary societies demands a pluralistic approach which encourages the active participation of all sectors and organizations with a primary commitment to health. Active participation can only be effective if the decision-making power and the administration of services are delegated to the states or provinces. Central governments have absorbed responsibilities that belong to local authorities, creating a gap between the level at which problems arise and the level at which major decisions are taken. The health polarization among social classes in Mexico has an expression in the regional distribution of dominant patterns of disease and disabilities. For these and other reasons, there has been an active process of decentralization of health services in Mexico during the past five years, which has achieved a greater geographical balance among needs and resources.3 Such a process is the foundation for any reform of the prevailing health care model.

In sum, while governments need not directly provide all health services, they cannot relinquish their responsibility to ensure that health care is, in practice, a social right, to be distributed on the
basis of need and not of purchasing power. Modern health systems must be pluralistic but equitable.

Together with macrolevel structural reforms, it is necessary to make primary health care the articulating element for the entire health system at the microlevel. However, the primary health care approach needs to be defined more specifically in order to respond to the complex health needs of middle-income countries. It is important to eliminate the notion of 'primitive' or 'precarious' health care that is often taken to be synonymous with primary health care. Six basic principles should guide the organization of primary health services:

1. The delivery of health services should be organized for defined population groups, living within specific geographical boundaries. Health facilities of all levels should have population based responsibilities.

2. A subsystem of quality assurance is essential, since equity entails not only more services for those who most need them, but services of a different often more complex, type.\(^{18}\)

3. The participation of the community should be encouraged and supported. This implies three major changes. First, individuals and families should assume an increasing share of responsibility to prevent specific pathologic conditions. Second, it is necessary to reinforce the culture of family and social support for the sick, the disabled and all vulnerable groups (e.g., pregnant women, children and the aged). And, third, the process of local decision making should formally incorporate the voice and opinion of organized groups in the community.

4. The delivery of services needs to be reoriented to deal with the attenuation and prevention of risk, and not only with diseases and other health losses. This is a principle of anticipatory care.

5. The mode of operation should effectively be more integrative, so as to coordinate interventions with other sectors of development (e.g. housing, education, recreation) that are relevant to improve the determinants of health.

6. Innovative models of health care should be developed and tested in order to increase the technical capacity to resolve problems at the local level. An example of this is the development of the Advanced Centers for Primary Health Care in Mexico and Cali, Colombia, which involve, among other things, the adaptation of health centres to provide low-risk obstetric care, ambulatory surgery and emergency care, together with an ongoing system for monitoring performance.

The transition of health and disease requires a transition in the structure of the health system. Any substantial structural change in the health system would entail, by necessity, modifications in the tasks for which human resources are trained. The new health care model, therefore, will demand the reorientation of medical and paramedical education. Skills needed for teamwork, and for broadening the scope and meaning of health, will probably create new personnel profiles.

A common characteristic of middle-income nations is their scientific and technological dependence on developed countries. The economic crisis of this decade has accelerated the urgent need to develop new forms of organization, new technologies and new types of personnel. The social response to the complex health needs of the future will have to be designed on the basis of scientific research with regard to both the evolving epidemiologic reality and the relative effectiveness of interventions. The process of designing, implementing and testing innovations has to be systematic and problem-oriented. Health research should, therefore, not be seen as a luxury, but as the foundation of change and independence.

**References**

Health transition in middle-income countries


Note
This paper was presented at the International Congress for Infectious Diseases, Rio de Janeiro, Brazil, 17–21 April 1988.

Biographies
Julio Frenk, MD, MPH, PhD, is the Director General of the National Institute of Public Health, Mexico. Dr Frenk obtained his MD degree from the National University of Mexico in 1979. He received three advanced public degrees from the University of Michigan; a Master of Public Health in 1981, a Master of Arts in Sociology in 1982, and a joint PhD in Medical Care Organization and Sociology in 1983. In August 1984 he helped found the Center for Public Health Research, a unit of the Ministry of Health of Mexico, of which he became the Director. His research interests include the dynamics of the medical labour market, the organization and evaluation of primary health care and the health problems of large cities.

José Luis Bobadilla, MD, MSc, PhD, is currently at the National Institute of Public Health, Mexico. He specializes in the epidemiology of perinatal health and the evaluation of health services.

Jaime Sepúlveda, MD, is the Director General of Epidemiology, Ministry of Health, Mexico.

Malaquías López Cervantes is based at Yale University, Connecticut, USA.

Correspondence: Julio Frenk, Instituto Nacional de Salud Pública, Fco. de P. Miranda 177/7, Col. Merced Gómez Deo A. Obregon, 01600 Mexico DF, Mexico.