Early-age mortality, socio-economic development and the health system in Mongolia

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Abstract

Since the 1920s Mongolia has developed an extensive and well-staffed health care system that has made modern health technologies accessible to most of its population. In addition, the country experienced rapid economic and social development whose benefits were equitably distributed among the population. In spite of this progress, infant and child mortality levels are high by contemporary standards and during the past 20 years these rates have remained virtually constant.

The modern health care delivery system, externally imposed, failed to take into account the specific characteristics of the Mongolian culture; this fact is identified as one of the major determinants of the unexpected levels of early-age mortality. The excessive orientation toward curative medicine, the lack of health prevention and promotion activities and the lack of community participation have resulted in the people continuing to believe in traditional therapeutic patterns and self-care. They perceive the modern system exclusively in curative terms and not with regard to health preservation and disease prevention.

Most Mongolians do not fully understand the health care system, and use its services mainly because they have no alternative, or because of coercion rather than conviction based on the learning and internalization of its basic principles. In practices and ideas of child care, preservation of health and disease prevention, people seem to identify more with the traditional health care system.

Like other former socialist countries, Mongolia is experiencing deep economic and social transformations, whose implications for the health care system are discussed. An economic crisis whose end is nowhere in sight, emergent social inequalities, a vague health insurance model with unclear financing sources, and lack of concern by most policy-makers in strengthening the preventive component of the health system, are not positive factors for substantial infant and child mortality decline in the near future. A clear advantage is, however, the fact that there is a wide space for major improvements with existing internal and external resources.

During the two decades following the end of War World II remarkable advances have been made in reducing early-age mortality in the developing countries. These declines created rampant optimism in the 1960s and 1970s about a real possibility for a child survival revolution unprecedented in speed and geographical extent. During the 1980s this trend continued in most Third World countries. Nevertheless, some studies suggest that a slowdown in infant mortality decline has taken place in many countries at still relatively high mortality levels (Gwatkin 1980; Palloni 1981; Hull and Jones 1986). The main reason provided for this deceleration is that public health interventions, usually exogenously developed, could not result in sustained mortality declines because of only limited

improvements in the developing-country living standards (Ruzicka and Hansluwka 1982). In other words, there is a limit to the mortality decline that can be achieved primarily through medical techniques, if socio-economic development remains at a low level. Other more recent studies suggest, however, that the rate of infant mortality decline in most Third World countries has not decelerated over the last three decades (Hill and Pebley 1989). Moreover, the evidence provided suggests that, in some countries, infant mortality decline has continued in spite of a downturn in economic conditions.

The relationship between socio-economic progress, improvements in living standards and development of the health system on the one hand, and infant mortality on the other, has been repeatedly established in several studies (see, for example, Vallin and Lopez 1985). However, this relationship does not seem monotonic nor has the mechanism that explains it been extensively explored. Like any other processes that happen within a society, infant mortality trends are affected and regulated by the society's institutional structure. To ignore this postulate is to assume that social processes are uniform across societies or change in predictable ways through time. A series of case studies is required to understand fully the extent of variation in early-age mortality across countries and to identify commonalities. These should be undertaken in countries at diverse stages of development, with different health policies and economic, social and political conditions. Comparisons of country experiences should allow better assessment of infant and child mortality levels and trends in individual countries and help to identify similarities and differences under distinct sets of historic, social, economic and environmental conditions.

This paper is concerned with early-age mortality in Mongolia in relation to its health system and socio-economic development. A number of characteristics make this country a particularly interesting case that will certainly provide new insights for the study of infant and child mortality in developing nations. Mongolia developed an extensive and well-staffed health care system that has made modern health technologies widely accessible. In addition, during the past five decades the country has experienced a process of rapid economic and social development and the benefits of such development have been equitably distributed among the population. In spite of this progress, infant and child mortality levels are high by contemporary standards and during the past twenty years these rates have remained virtually constant. Recent estimates show that the infant mortality rate is 92 deaths per thousand births and the under-five mortality rate is 136 per thousand. During the past two decades early-age mortality rates have declined by only 10 per cent. This paper has three objectives: first, to show that infant and child mortality in Mongolia are high considering its economic and social progress records as well as its extensive health care services; second, to provide an explanation for the unexpected level of mortality; and third, to discuss some policy implications.

Background of the country

Mongolia is a land-locked country in the northern part of Central Asia bordering Siberian Russia to the north and China to the south, east and west. The country has a vast but sparsely populated territory. It covers more than 1.5 million square kilometres, about one half the size of India and four times that of Japan.

In 1206, Genghis Khan unified Mongolian tribes and formed the first Mongolian state that subsequently expanded its territory to cover most of modern-day China, Korea, and as far as Central Europe. By the mid-1300s, however, the Mongolian Empire had disintegrated and a long period of internal strife followed. In 1691 Mongolia ceased to exist as a political entity and became a frontier province of China; it remained as such until the second decade of the present century. It was a traditional and impoverished society with an economy based almost exclusively on subsistence nomadic animal husbandry (Milne et al. 1991).

By 1924, political autonomy from China was achieved and a socialist People's Republic founded. A system of centrally planned economy dates from the late 1930s. The following decades witnessed a dramatic process of economic and social change, a strengthening of ties with the former Soviet Union, and increasing industrial and mining activity facilitated by Soviet aid. Modern Mongolia is a well-structured society with a population of approximately 2.3 million, 51 per cent of whom live in urban areas with major concentrations in the three industrial cities of Darhan, Erdenet and the capital Ulaanbaatar. As previously stated, in the past Mongolians were totally nomadic, moving seasonally with their herds over the vast lands of the country. Currently, most of the rural population is involved in semi-nomadic animal husbandry, along with wheat and vegetable production on state co-operatives and farms (Sanders 1987; Bawden 1989; Worden and Savada 1991).

By the mid-1980s, mounting internal and external economic imbalances became evident. Domestic prices were not adjusted to balance the higher costs of imported inputs, resulting in a distorted structure of investments and output. Budgetary subsidies expanded but were not equated by domestic revenue increases. This plus increasing capital outlays led to expanding deficits that were financed almost entirely by loans from the Soviet Union (Milne et al. 1991). These economic problems, combined with the emerging political and economic reforms in the USSR, pressed Mongolia into the loosening of central economic, social and political directives. Reforms were limited and focused mainly on improving the efficiency of the command economy. However, by late 1989 Mongolia began to experience an unequivocal transformation of its economy from a centrally controlled one to a market-oriented system, followed by the opening of the country to international socio-economic and political forces. The country also experienced changes in political leadership and a drastic revision of its economic, social and political ideology. Throughout the present decade, because of the protracted crisis of central planning, the economic and social reforms themselves, and the discontinuation of economic support from the former USSR, Mongolia has been experiencing a deep economic crisis characterized by increasing unemployment, high inflation, shortages of food, and a drastic reduction in government expenditures.

Early-age mortality in Mongolia

Life expectancy at birth in the developing countries has increased by almost a third since 1960, from 46 years to 62 years. Most of this rise was caused by a reduction in infant mortality rates, from almost 200 deaths per thousand births in 1960 to 79 in 1988 (UNDP 1990). Infant mortality has also declined in Mongolia and its present level, 92 deaths per thousand births, is lower than the rate exhibited by a number of developing countries. However, it is higher than the developing countries average and, what is more important, it has declined by only 10 per cent since the early 1970s.

Table 1 shows infant and child mortality estimates for Mongolia. The values are expressed in terms of probabilities of dying. (1)Q(0) represents the probability of dying between birth and age 1 and (4)Q(1) the probability of dying between age 1 and age 4. Considering that early-age death statistics from the vital registration system in Mongolia are affected by serious problems of underregistration, an indirect technique was used to estimate infant and child mortality. A discussion of this technique is presented in an appendix at the end of the paper.

Table 1
Mongolia: probabilities of dying between ages 0 and 1[a] and between ages 1 and 4[b], 1970 - 1989

	1970-74	1975-79	1980-84	1985-89
Male				
(1)Q(0)	0.10689	0.10460	0.10228	0.09992
(4)Q(1)	0.05889	0.05385	0.05151	0.05083
Female				
(1)Q(0)	0.09789	0.08760	0.08555	0.08386
(4)Q(1)	0.05283	0.05370	0.05135	0.04716
Total				
(1)Q(0)	0.10235	0.09614	0.09401	0.09199
(4)Q(1)	0.05589	0.05378	0.05143	0.04901

Notes [a] (1)Q(0); [b] (4)Q(1). Source: Author's calculations based on the 1989 Census.

It was possible to compute indirect estimates only up to the period 1985-89. For more recent years, direct estimates of infant mortality based on registered births and deaths were calculated. The probabilities of dying between birth and age 1 for the years 1990, 1991 and 1992 are 0.0646, 0.0623 and 0.0639 respectively. Although these values are affected by problems of underregistration, they suggest that infant mortality has not experienced major changes during the first years of the present decade. Regarding the period before 1970, reliable estimates could not be obtained either; however, it can be speculated that early-age mortality in Mongolia began to undergo a substantial decline starting in the 1930s. This decline can be associated with the development of a public health sector, the import of modern medical technology, and improvements in the standard of living of the population. Anyhow, as mentioned before, infant and child mortality in Mongolia almost ceased to decline by the early 1970s and this deceleration occurred at a still high level.

Information regarding infant mortality by cause of death is quite deficient: data are available only for some years but there are serious problems of definitions and reliability. According to data from the Ministry of Health, corresponding to 1988, acute respiratory infections, especially pneumonia, and gastro-intestinal diseases, mainly diarrhoea, are the main causes of infant deaths. Together they account for approximately three-quarters of child mortality (50 and 22 per cent respectively). Perinatal causes, primarily birth trauma, constitute 11 per cent of all infant deaths, infections 6 per cent and others 11 per cent. These statistics correspond only to infant deaths that have taken place in health care institutions. Although they should be considered with caution, they certainly suggest that pneumonia represents the largest single cause of early-age mortality. A study, conducted in 1988, based on a sample of children below three years of age attending creches in Ulaanbaatar, shows a morbidity rate for pneumonia of 92.3 cases per thousand children and a rate for diarrhoea of 25.5 cases per thousand children (UNICEF/Ministry of Health 1990).

Table 2
Indicators of economic and social development for selected countries

Country	Under-five mortality rate	GNP per capita	Real GDP per capita[a]	Adult literacy		Gross secondary enrolment ratio		Female labour force participation [b]	Persons per doctor (thousands)	One-year olds immunized[c]
				Male	Female	Male	Female			
	1987	1987	1987	1985		1986-1988		1988	1984	1987
Afghanistan	300	-	1000	39	8	10	5	8.4	-	27
Kampuchea	199	-	1000	85	65	45	20	39.2	-	47
Nepal	197	160	722	39	12	35	11	33.8	32.7	71
Bangladesh	188	160	883	43	22	24	11	7.1	6.7	18
Pakistan	166	350	1585	40	19	26	11	12.1	2.9	65
Laos	159	170	1000	92	76	23	16	44.7	1.4	20
India	149	300	1053	57	29	50	27	25.6	2.5	63
Mongolia	136	760	2000	95	87	88	96	46.4	2.7	67
Indonesia	119	450	1660	83	65	-	-	31.2	9.5	71
Myanmar	95	200	752	85	57	-	-	37.4	3.7	24
Vietnam	88	-	1000	88	80	44	41	46.9	1.0	58
Philippines	73	590	1878	86	85	66	66	31.6	6.7	82
Thailand	49	850	2576	94	88	-	-	45.1	1.5	79
Sri Lanka	43	400	2053	91	83	63	69	26.8	5.5	79
China	43	290	2124	82	56	50	37	43.2	1.0	96
Albania	34	540	2000	-	-	80	71	41.1	-	95
Korea, R.	33	2690	4832	96	91	91	86	33.9	1.2	89
Korea, Dem.	33	470	2000	-	-	-	-	45.9	-	59
USSR	32	4550	6000	98	97	-	-	48.1	-	83
Cuba	18	860	2500	96	96	85	92	42.0	-	93

Author's calculations for under-five mortality rate in Mongolia.
State Statistical Office of Mongolia (1991) for GNP per capita and people per doctor in Mongolia.

Notes [a] The real GDP per capita is a purchasing-power-adjusted GDP estimate developed in the International Price Comparison Project, a collaborative effort of the UN Statistical Office, the World Bank, EUROSTAT, OECD, ECE and ESCAP (see UNDP 1990:13).

[b] As a percentage of total labour force.

[c] Average of the vaccination coverages of children under one year of age for the four antigens used in the Universal Child Immunization Programme (UCI).

Socio-economic changes, the health system and early-age mortality

Several classifications of the factors affecting infant and child mortality in the developing countries have been proposed by different authors. These classifications permit a distinction between the broad categories of socio-economic factors on the one hand, and medical and health factors on the other (United Nations 1973). The purpose of this section is to demonstrate that the levels and trends in infant and child mortality in Mongolia are surprisingly high considering the performance of several socio-economic variables and the degree of development of its public health care system.

Table 2 locates Mongolia's early-age mortality level, as well as its economic and social situations, with respect to Asian and other selected countries. The former USSR was included because of its influence in the development of the Mongolian health system and Albania and Cuba because of both past socio-political affinities with Mongolia and a similar degree of development.

A rapid examination of Table 2 reveals that the level of early-age mortality in Mongolia is not consistent with the values exhibited by the other variables included in the table. The under-five mortality rate in Mongolia is certainly not among the highest in Asia but it is much higher than that observed in some countries in which the indicators included in the table suggest a lower degree of economic development and more limited social progress. Much of the discussion that follows concentrates on this issue.

Socio-economic changes and improvements in the standard of living

Some analysts have pointed out that the rapid decline in mortality in developing countries during the past decades has been largely independent of socio-economic conditions (United Nations 1973; Preston 1975, 1980). The declines have rather been attributed to technological advances in the prevention and control of diseases and the growth and expansion of public health and medical services. However, as mentioned above, there appears to be a ceiling on the improvement in infant and child mortality that could be achieved by an extensive health care system without a parallel process of socio-economic development and improvements in the standard of living.

Per capita gross national product and real per capita gross domestic product are crucial indicators of socio-economic development although the former is a better indicator of living standards, since it is a purchasing-power-adjusted measure. Mongolia can be classified as a medium-income country according to their values in these variables (see Table 2). However, its early-age mortality record is inferior to that exhibited by several countries with lower GNP and real GDP per capita. For example, Mongolia has the same, or a similar, per capita real GDP as Albania, China, the Democratic Republic of Korea, the Philippines and Sri Lanka, but all these countries have much lower under-five mortality rates.

It is important to mention that the relationship between per capita income levels and early-age mortality is usually explained by the fact that increases in income result in a greater availability of material resources and hence in higher economic living standards. As a result of higher income or wealth, individuals and families improve their access to a list of goods, services and assets that are essential for child survival, such as food, housing, clothing, and sickness care (Mosley and Chen 1984). However, indicators of development based on average per capita income may conceal substantial inequalities in the access to the benefits of development. This is not the case with Mongolia. Economic growth, based on industrialization and the modernization of the agricultural sector, was accompanied by the creation of an extensive network of social services. Moreover, socio-economic disparity was

kept to a minimum by a system of near-universal entitlement. These supports allowed the existence of a relatively stable and egalitarian society and the absence of social groups affected by problems of absolute or relative poverty for an extended period of years (Bawden 1989). Cross-national comparisons of infant mortality yield the conclusion that better records are found in countries where social policies and health systems would suggest greater equity (Roemer 1985). Clearly, economic and social progress was not spectacular in Mongolia, but at least not as modest as to have prevented a substantial improvement in the socio-economic situation of the population conducive to a more significant decline of infant and child mortality.

Maternal education

Another relevant factor in the analysis of infant and child mortality is maternal education. Data from several countries show a negative relationship between the extent of women's education and the level of early-age mortality (Behm 1979; Caldwell 1979, 1986; Caldwell and McDonald, 1981; Cochrane, Leslie and O'Hara 1982; Farah and Preston 1982; Haines and Avery 1982; Hobcraft, McDonald and Rutstein 1984; Vallin and Lopez 1985). Although declines in illiteracy rates and increases in school attendance are associated with socio-economic development, these factors appear to determine infant mortality in their own right. Caldwell (1979) has argued that the link between increased maternal education and reduced child mortality is that education gives women the power and determination to take decision-making into their own hands. Three factors are important in this regard: first, disagreement with traditional patterns of illness acceptance, such as fatalism, and adoption of the therapeutic patterns of modern medicine; second, a greater capability in manipulating the world such as knowing where facilities are, getting the attention of doctors and nurses and understanding their explanations; and third, a change in the traditional balance of family relationships that shifts the focus of power away from the father and grandparents and ensures that a greater share of available resources is directed to children.

According to Table 2, almost 90 per cent of Mongolian adult women are literate, a percentage similar to or higher than that observed in countries with significantly lower under-five mortality rates. Not only is the illiteracy rate of the female population in Mongolia noticeably low, but also female school enrolment is high (see Table 2), as well as the number of years of formal education: more than one-third of women have completed secondary education and on average, women have eight years of formal education (State Statistical Office 1991). In addition, the status of women both in the society and within the family has been traditionally high. In the Mongolian traditional nomad society women played an important decision-making role within the family regarding different aspects of life including those related to production. They were never restricted from assuming roles outside the house; on the contrary, they played an active part in all the activities related to animal husbandry (Montagu 1956; Worden and Savada 1991; Cooper and Gelezhamtsin 1993). This position has not changed in modern Mongolia, as suggested by a substantial participation in the labour force and a high school enrolment level (see Table 2). Women's position has actually been improved by an official policy of strengthening gender equality.

The development of the modern health care system

Among the countries presented in Table 2, Mongolia has a low ratio of population to physician and the percentage of one-year-olds immunized is comparatively high. These statistics do not provide sufficient indication of quality, utilization and distribution of health services but can provide a crude indication of the general current level in the development of health services.

The idea of societal responsibility for the health of the population was adopted at the time of independence in Mongolia. The improvement of population health, especially of women and children, was defined as a priority by the government (Ibragimov and Denberel 1977; Academy of Sciences of the MPR 1991). The first civil hospital started functioning in 1925, and in 1927-28 the first specialized hospitals for expectant and nursing mothers and children were set up. Some provincial and rural medical facilities were opened between 1925 and 1930. From 1926 to 1938 five Soviet medical care, medical research and development expeditions worked in Mongolia to render medical services and promote the formation of the country's public health network. In 1933 the first medical vocational school was created: this was a first step in training national medical personnel. In 1935 the country had only 56 medical posts in provincial areas; this number increased to 157 in 1940. Between 1940 and 1960 a nationwide system of unified medical services was established and by 1960 almost one-quarter of all *somon* (rural districts) had health facilities, including several general and specialized *inter-somon* hospitals. In 1978 a comprehensive Health Law was established, designed to expand and further improve the national health service. This law provided the current structure of the health-care delivery system.

The Mongolian health-care organization comprises a five-step referral system based on the administrative units within the administrative structure of the country: rural posts, *somon*, *inter-somon* hospitals, provincial hospitals, and national hospitals. All the services provided by the health-care system are free of charge except for drugs prescribed for children over three years of age and adults outside hospital.

The resources allocated to health services increased 5.7 times between 1960 and 1987, and today account for 8 to 9 per cent of the state budget expenditure (State Statistical Office 1991). The country has approximately 27 physicians and more than 80 health workers per 10,000 population. The number of hospital beds is more than 100 per 10,000 population. Recent data show that there are 1.5 gynaecologists and 5.2 pediatricians, with 14.9 gynaecological hospital beds and 2.9 hospital beds for children, per 10,000 population. Immunization coverage for children under one year is high: for example, coverage for poliomyelitis (third dose) is 70 per cent and BCG 87 per cent. Coverage for measles is 90 per cent and it is 81 per cent for DPT (third dose) (UNICEF/Ministry of Health 1990).

The health service of Mongolia is well staffed with both medical and paramedical personnel and adequately adapted to the needs of the country. Mongolia never reached a degree of socio-economic development able to sustain a health system similar to those existing in industrialized Western countries. However, the primary health care system, with its extensive network of dispensaries and clinics throughout the country, which seems to reach nearly all children, could have reduced early-age mortality more rapidly and significantly than in fact occurred. In addition, since independence the emphasis of the health policy has been the health of high-risk groups such as pregnant women and children.

A simple exercise was conducted to provide additional support to the proposition that the level of infant mortality in Mongolia is not consistent with its degree of social development and the standard of living of its population. With data from the 130 countries included in the United Nations *Human Development Report* (1990), a multiple regression equation was computed using under-five mortality as the dependent variable and the logarithms of real GDP per capita, percentage of literacy among the female population and population per doctor as independent variables. These variables are significantly related as indicated by a multiple correlation coefficient of 0.84. Using this equation, the early-age mortality rate of Mongolia was calculated and the value obtained was 73, against a real value of 136. This multiple regression analysis, and the data from Table 2, provide a general indication of an infant and child mortality in Mongolia in excess of the levels that its income ranking, women's education and density of medical practitioners would lead one to expect. Additional explanations presented in this section regarding a highly equitable distribution of the benefits

of development, substantial inputs into the health care system, universal access to social services including education and health, and considerable female autonomy, certainly confirm that infant and child mortality in Mongolia are unexpectedly high.

Obstacles to early-age mortality decline

A major determinant of the difference in infant and child mortality between the less developed and the more developed countries is that the former are still beset by infectious diseases not yet brought fully under control (United Nations 1990). As shown, Mongolia is not an exception. However, the peculiarity is that the two main causes of infant mortality in the country, pneumonia and diarrhoea, could have been effectively managed at the community level using control strategies that are not difficult to carry out within a primary health care system such as the one developed by Mongolia. The high educational level of the female population, especially the low illiteracy rates, could have also contributed substantially to the success of such interventions. Nevertheless, there appear to be factors that may have inhibited the beneficial effect on infant and child mortality of the extensive network of health care services. The purpose of this section is to suggest and discuss two of those factors.

Climate and housing

Mongolia has a hyper-continental climate, with low precipitation, long winters, with average temperatures below freezing for seven months of the year, and intense solar radiation. More than half of the country is underlaid with permafrost. The average altitude is 1,580 metres above sea level, the lowest point lying at an altitude of 532 metres. In order to cope with this harsh environment and to conduct nomad pastoralism, Mongolians have developed simple but effective technologies during the centuries. Transportable shelters are essential to a pastoral way of life and, in the freezing cold of Mongolia, are a matter of survival: the Mongolian *gerh* or *yurt* is superbly adapted to this. *Gerh* are demountable and portable single-room round tents, usually made of felt, which can accommodate a family of four to eight. A stove, located in the centre of the tent, is used for cooking and to provide heating; animal dung, wood or coal is used as fuel.

The rapid population growth of urban areas, as a result of both natural increase and internal migration, boosted the demand for housing. In all urban localities physical expansion was rigorously planned. Dwellings consist mainly of four to twelve-storey apartment blocks with full services, including central heating. Nevertheless, demand for housing outstripped supply in spite of the fact that the State treated housing as a highly subsidized social service like health and education. The problem was solved by using the *gerh* in urban areas. Cities are usually surrounded by encampments of *gerh*: in some cities, as much as 70 per cent of the population lives in this type of housing (Habitat 1992). All categories of human settlements in Mongolia exhibit the typical pattern generated by the division between the highly differentiated morphologies of the formal government housing and the *gerh* encampments.

The use of *gerh* in urban areas is not defined by most government officials as a social problem in spite of the fact that *gerh* encampments do not have the normal level of public services such as piped water, sewerage, electricity, and central heating. To some extent *gerh* areas in cities resemble the shanty towns of other Third World cities. However, the vast majority of their residents have formal employment in the urban economy and have access to the available social services such as education and health care. In addition, occupiers represent a cross-section of income and occupational groups. *Gerh* areas, especially in the largest cities and provincial capitals, are officially designated by the municipal government,

which exercise some degree of control and supervision of the plot layouts. The use of the land, however, is rent-free.

As mentioned, the *gerh* is a dwelling well adapted to the long and cold winters but conditions are excellent for the transmission of airborne bacteria, particularly in winter months when ventilation inside the tent is reduced because of the extremely low outside temperatures. This problem, plus crowding and poor sanitary conditions existing in most *gerh* areas, may help to explain the high incidence of acute respiratory infections and gastro-intestinal diseases. One of the few epidemiological studies available in Mongolia shows some evidence regarding differential morbidity among children under five years of age living in *gerh* areas and in formal housing in Ulaanbaatar (UNICEF/Ministry of Health 1990). In winter, the morbidity rate for pneumonia among those children who live in *gerh* areas is 80 cases per thousand children and for those living in formal housing 36 per thousand. In summer, these rates decline to less than 10 per thousand in both cases. On the other hand, in summer, the rates for diarrhoea among children living in *gerh* areas is 85 per thousand and for those living in formal housing only 28 per thousand.

While housing and sanitary conditions for a large sector of the urban population are unsatisfactory, there is no reason for believing that those in rural places are much superior. *Gerh* are almost universally used in rural areas and the sanitary problems resulting from living in this type of dwelling seem also be present, although problems of water pollution, rubbish disposal and crowding may be less serious than in the urban *gerh* encampments. Unfortunately, data to compare early-age mortality between the rural population and the urban population living in *gerh* are not available.

In any case, there is little doubt that the severity of the climate combined with a particular model of housing is a major determinant of the high degree of prevalence of acute respiratory infections, gastro-intestinal diseases and probably other conditions, which are the main causes of early-age mortality. However, considering that Mongolia has developed a social services infrastructure that has made health services accessible to nearly everyone, the health system might have been expected to be able to control these major diseases and to promote programs or interventions to reduce prevalence rates.

The weaknesses of the health system

An issue that would need further discussion is the quality of the services provided by the Mongolian health care system, especially deficiencies in case management, inaccurate diagnoses, inappropriate treatments and availability of equipment to treat severe cases in remote areas (for example, oxygen-delivery capability in *somon* and *inter-somon* hospitals). Information regarding these aspects of the health services is not available. However, the examination of official documents that describe the characteristics of the Mongolian health system and also statistics regarding its activities reveal two major drawbacks: limited preventive and promotional efforts and absence of community participation (Ibragimov and Denberel 1977; Academy of Sciences 1991; Ministry of Health 1992). In the Mongolian health care system the concept of preventive medicine seems quite limited and rather confusing. Basic preventive interventions such as compulsory immunization for children or quarantine measures are practised, but there are almost no preventive tools such as sanitary hygiene or nutritional education, campaigns to control selected diseases, promotion of public health measures, community or environmental health programs, and epidemiological surveillance measures. The idea of preventive medicine found in official documents mainly refers to preventive inspection of the population, which has been practised in the past. Typically, mobile medical teams would visit working places and schools where people were compulsorily examined, with the aim of controlling epidemic diseases. However, the effectiveness of this type of intervention is quite limited, especially in terms of controlling

pneumonia, the main cause of child deaths in Mongolia. According to Rosen (1974), this idea of mandatory examinations was rather authoritarian and paternalistic, and was framed within the notion of 'medical police' adopted by the former Soviet Union, whose health care system Mongolia embraced. Poor development of health preventive work has been frequently mentioned as a major limitation of the Soviet health system (Schepin, Semenov and Sheiman 1992).

Efforts to promote community self-reliance and participation in the planning, organization, operation and control of the health care system were never made in Mongolia. Budgetary policies, and in particular expenditure allocations, administrative and operational policies, even for the rural clinics, were designed and directed by the central government (Ibragimov and Denberel 1977). Mongolia never attempted to infuse political ideology into the health system, for example, through participatory support by the community or through the participation and activism of individuals and community representatives in management and decision-making control. Decisions about implementation of directives, resources and administration were made only by health care providers following central commands. In other words, the health system was not responsive at all to public demands. A number of authors agree that the key to the success of the post-revolutionary Chinese health system did not lie in the area of technical and operational innovations, but in the high degree of community involvement in local health services (New and New 1977; Kane 1985; Caldwell 1986; Tuan and Yu 1990). This involvement was ideological and political and supported by the central government. Similar efforts of community involvement were made in other socialist Third World countries such as Cuba (Danielson 1979) and Vietnam (Ladinsky and Levine 1985).

Although the sanitation problems faced by *gerh* encampments in urban areas have been recognized by Mongolian health officials (Habitat 1992), there have never been campaigns, interventions or programs to solve problems of provision of basic sanitation, adequate supply of safe water, and rubbish disposal in these sections of the cities. Nor have special health programs been implemented, considering the higher health hazards experienced by the people living in these areas. No attempts have ever been made to organize tenants in order to improve the sanitary conditions. Clinics and health posts are noticeably lacking in *gerh* encampments. Integrated health promotion programs, involving different sectors such as housing, education and agriculture, have never existed in Mongolia.

Towards an explanation

It is important to begin this section by mentioning that until 1921, health practices in Mongolia were based exclusively on Buddhist-Tibetan traditions, with lamas as the main health practitioners. Use of traditional medicine ended at the same time as the complete suppression of all religious activity in the 1930s (Ministry of Health 1992); at that time, a modern health delivery system was established in the country. As mentioned before, this system was a clone of the model set up in the former Soviet Union; it was initially implemented by Russian practitioners and later by Mongolian professionals trained in the USSR.

Palloni (1981) has argued that when health policies do not take into account traditional health practices, a vacuum may result. The introduction of modern health systems in Third World countries may result in populations living in the worst of two worlds, where the traditional practices and knowledge of self-care have been lost and most people have difficulties internalizing or even understanding the new system. Studies among low-income population sectors in Brazil (Woortmann 1978) and among Canadian Inuits (Hobart 1975) confirm this argument. It has been proposed that the implementation of a modern health system in a traditional society registers better records in terms of service utilization,

acceptance and following of treatments when it takes into consideration ideas and concepts of the traditional system (Foster and Anderson 1978; Pelto and Pelto 1983; Mosley 1985).

As in other Third World nations that imported modern medical technology from more developed countries, morbidity and mortality improvements during the first half of the present century appear to have been quite impressive in Mongolia. However, the fact that early-age mortality has not continued declining appears to be related to the previous argument.

In Mongolia, the rapid and drastic move from traditional health practices to an externally imposed modern health service delivery based on the provision of almost exclusively curative services, limited implementation of preventive and promotional health programs and absence of comunnity participation had two major consequences: most of the population has not internalized health preservation practices consistent with the modern health system, and, at the same time, has problems in adopting its therapeutic patterns.

Inadequate nutritional habits are probably among the most important indicators of limited internalization of modern practices of health protection and maintenance. In a study on maternal mortality in Mongolia, based on extensive interviews with a small sample of women, it was found that most of them, including those with secondary education, have little knowledge of the relationship between a balanced diet and health (Cariceo 1994). As in most traditional societies, adequate diets among Mongolian women tend to be thought of in terms of quantity, not quality, of sufficient staple foods, not a balance of many foods.

These findings are consistent with the results of a national survey conducted among children from 0 to 4 years of age in 1992 by the Mongolian Nutrition Research Centre with assistance from UNICEF (cited in Government of Mongolia 1993). Severe protein-energy malnutrition was found in 2.4 per cent of the children's sample. Low weight-for-age was found in 12.3 per cent of the children. Iodine-deficiency disorders, vitamin D deficiency or rickets, and iron deficiency anaemia were also detected. These problems should not be present in a country where the state has genuinely assumed the societal responsibility of providing families with sufficient economic resources to have access to adequate quantities of food. The explanation of these nutritional deficiencies appears to be related, not to limited food availability in the society or within the household, but to a lack of variety in the available foods and inadequate nutritional practices. Because of geographical and climate constraints, the variety of food produced in Mongolia is quite limited. However, at least during the 1970s and 1980s, the country was always in a position to finance massive imports from its own exports or from additional aid provided by the former Soviet Union and other countries of Eastern Europe (see Milne et al. 1991). In spite of this possibility, the government never carried out a food supply program to make available a larger variety of food to improve the diet of the population.

A household survey of breastfeeding practices was conducted in 1992 by the agencies mentioned above (cited in Government of Mongolia 1993). It included a national sample of mothers with children of ages 0 to 24 months. It measured a continued breastfeeding rate of 81 per cent at one year and 61 per cent at 2 years: these figures suggest that breastfeeding is a general practice. The proportion of infants aged 0 to 6 months fed only with breastmilk was found to be only 47 per cent; this proportion decreased to approximately 10 per cent among infants 6 to 9 months. The problem here is that complementary feeding consists mainly of powdered milk, which greatly increases the risk of infection, in particular diarrhoeal diseases. Another food supplement given to infants is the *bantan*, a traditional soup of mutton and wheat flour. *Bantan* has a good potential as a supplementary food but, 'to make it more digestible for infants' it is usually 'thinned' by adding more water and using less meat. The amount of calories and nutrients in this food supplement is quite meagre. In the previously mentioned nutritional survey it was found that 18.3 per cent of the children aged 13 - 24 months were found to have low weight-for-age compared to 4.1 per cent for infants under six

months and 12.8 per cent for infants 6 - 10 months. This trend is certainly related to the replacement of breastmilk by less nutritious food as infants grow older.

Health care is effective only if people follow instructions carefully and persist with recommended treatments: this arises primarily from an understanding and adoption of the therapeutic patterns of the modern health system. In Mongolia, according to a survey conducted in 1992 by the Ministry of Health and the World Health Organization (cited in Government of Mongolia 1993), 70 per cent of parents and other carers had some knowledge of oral rehydration therapy and its importance in treating diarrhoea. Nevertheless, fewer than half of those using ORS prepared the solution correctly, and fewer than 10 per cent gave it in the proper amounts. The same survey showed a marked overuse of drugs in the treatment of diarrhoea: in almost 50 per cent of the cases, children were treated only with drugs in spite of the fact that ORS was also prescribed.

Another example of the slight understanding of modern concepts of health preservation among the Mongolian population and, at the same time, of the poor preventive role of the health system is the universal practice of tightly swaddling small children almost all the time especially in winter. It not only deprives them of sunlight but it is also conducive to acute respiratory infections. Swaddling is so tight that it limits lung compliance and no layer of air is allowed as insulator. Instead of enabling them to get warm, the practice may cause hypothermia. This practice does not appear to have been discouraged by health education.

The health care system appears to have done very little to improve situations like those described above through, for example, campaigns directed to eradicate harmful traditional health practices, or nutritional education campaigns based on knowledge of parents' food beliefs and practices and actual food availability. The lack of health prevention and promotion activities as well as the lack of community participation in the development of the health system in Mongolia have resulted in a situation in which the people have continued to believe in traditional therapeutic patterns and self-care. Most Mongolians were faced with a health care system that they did not fully understand, and made use of its services mainly because they did not have any alternative, or because of coercion rather than a conviction based on the learning and internalization of its basic principles and rules. In other words, being externally imposed, the establishment and development of the Mongolian health care delivery system failed to take into account the specific characteristics of the Mongolian culture.

The limited concern and knowledge of the Mongolian population regarding modern treatments and health preservation practices could be related to a lack of awareness and knowledge of the scientific basis of diseases. This factor has been mentioned in the literature as an important determinant of the effectiveness of health care programs (Mosley 1985; Preston 1985). The study on maternal mortality in Mongolia mentioned above (Cariceo 1994) reports that for most women the idea of germs as a cause of disease is unfamiliar or not considered relevant in terms of health preservation. The prevalent idea is that health prevails when certain elements of the body are in balance appropriate to the age and condition of the individual in his natural and social environment. When the equilibrium is disturbed, illness results. The evidence previously presented regarding nutritional practices and failure to follow prescribed treatments also suggests poor knowledge of modern disease theory among the Mongolian population. However, in the case of Mongolia, what seems more important than any understanding of disease-causation ideas is the limited identification of the people with the whole modern health system. Its excessive orientation toward curative medicine appears to have resulted in people perceiving the modern system exclusively in curative terms and not with regard to health preservation and disease prevention. When it comes to practices and ideas of child care, preservation of health, or even medication, people seem to identify more with the traditional system. Under these circumstances, parents are not likely to change traditional patterns of child care, including adopting more adequate nutritional practices.

This interpretation may also explain why increases in female literacy and school attendance have made only a limited improvement in early-age mortality records in Mongolia. Formal education probably provided mothers with more cultural autonomy as well as with the ability and capacity to accept more easily modern disease prevention practices and to understand therapeutic methods. However, it seems that the health system was so centred in curative care that it never promoted such practices or disseminated health information to make future mothers become more sensitive to the nutritional status of children and strive to improve hygienic conditions in the household. Nor did the health system develop promotional programs jointly with the educational sector. In other words, there was no source of health preservation practices other than the traditional disease theory.

One last issue that needs to be addressed here is the fact that the health system of Mongolia provided very limited family planning services until the late 1980s. Before the reform movement of 1989, the government had a policy of encouraging childbearing. Financial incentives were given to encourage births, special taxes were levied on single adults and childless families, and women of reproductive age were called on to do their patriotic duty. Contraception, sterilization and abortion were prohibited by strict laws. In 1987 the government loosened some pronatalist measures, and in 1989 there was a major shift in favour of family planning since it was considered that the earlier policy undermined attempts to reduce maternal and infant mortality rates (Neupert 1994). It seems too soon to evaluate the direct impact of the change of policy on early-age mortality. However, it is important to note that the existence of family planning services in the past might have had a significant effect on improving the use of health services and changing traditional concepts of health care, especially if it had been integrated with other maternal and child health services.

Policy implications

As mentioned before, throughout the present decade, Mongolia has been experiencing the worst economic crisis of its recent history. During the last three years production has declined dramatically. For example, total agricultural output fell by 7.4 per cent and industrial output by 11.7 per cent from 1990 to 1991. The level of unemployment, virtually non-existent in the past, reached 6.5 per cent by the end of 1992. The consumer price index for basic commodities has increased more than four times between 1990 and 1992. During the same period, the real income of the population has decreased by 40 per cent. In January 1992 there tries in which the indicators included in the table suggest a lower degree of economic development and more limited social progress. evel. Severe food shortages have also been a major economic and social problem (Government of Mongolia 1993).

The health system has also been affected seriously by the economic crisis. To begin with, it is undergoing a difficult period of structural transformations, adjusting to new social policies and the realities of a market economy. This difficult situation is further aggravated by the extreme shortage of essential drugs, equipment, instruments, ambulances, spare parts, fuel, and personnel (Asian Development Bank 1992; Government of Mongolia 1993).

During the transition period the public health sector will continue to provide free services to the whole population, but the government is encouraging private and co-operative practice by doctors. The plan is to develop a phased program to move from the current system of free access to one based on a health insurance system. This plan was supposed to start by 1993 but institutional problems, mainly management expertise and co-ordination, have prevented significant progress. In any case, the government plans to maintain a public health sector aimed mainly at providing free medical services to children, pregnant women, the elderly and other vulnerable groups in the population.

The results of these transformations are difficult to predict, especially regarding the coverage of the public health sector and the quality of the services. In any case, throughout

the present decade, and probably during the next, the country will have limited financial resources to improve and expand the health care system, especially its technical capabilities. Even improvements regarding housing and environmental sanitation would be hard to achieve because of economic constraints. These facts, together with only marginal or no progress in the economic situation of the population, call for health policy interventions based on a more rational use of the limited resources available.

The key to attaining a substantial infant and child mortality decline with the available resources in Mongolia is that the medical system takes into consideration the specific characteristics of today's Mongolian culture and economy. The base of the policy in the past was to extend curative medicine services throughout the country by making modern health technologies widely accessible. Taking into account the discussion previously presented, it is unlikely that investments of the scarce internal resources or those provided by the international donor community in this type of policy will have the expected results. The recovery of the health care system and its eventual further quantitative expansion does not seem to be the solution.

More substantial health and mortality improvements will require families to feel more identified with the health system, its therapeutic patterns and health preservation practices. It is within the family that the modern health system interacts with the traditional system and that most health interventions succeed or fail (Mosley 1984). Therefore, the basis of a new public health policy should be education concerning prevailing health problems and the methods of preventing and controlling them; awareness regarding the relationship between food and health as well as promotion of food supply; and internalization of better hygienic habits based on the dissemination of modern concepts of disease prevention. These interventions should not only involve the health system itself but also include grass-roots organizations, the formal education system, and other sectors.

A general policy based on the ideas presented above will encounter major difficulty. In general, Mongolian policy-makers have a unidimensional approach to dealing with public health issues: they still favour a health strategy implemented from above, based on a quantitative expansion and technical modernization of the existing facilities. In general, there is little understanding of the importance of developing a sound public health program based on educational campaigns and community health programs. In a study previously mentioned on maternal mortality in Mongolia (Cariceo 1994), a question regarding the most important changes necessary in the health care system was asked of a small sample of health workers. All of them agree that technical modernization, mainly in terms of equipment, would be the most relevant modification. Nobody mentioned the need to develop preventive and health promotion programs. Also, the government is considering importing technology to strengthen the domestic drug manufacturing industry; the viability of this type of approach needs careful evaluation (Asian Development Bank 1992). Bell (1985) suggests a possible explanation for the lack of concern for public health and disease prevention in most developing countries: in general, those who control health policies and budgets are urban-based and middle-class oriented and favour an allocation of health resources that replicates the hospital based care patterns and the highly technical medical education of industrialized countries. This type of attitude is present in most Mongolian policy-makers, especially after the reform movement of 1989, when social policies from Western and Asian developed countries began to be increasingly perceived as attractive.

At present, Mongolia is receiving considerable emergency foreign aid from donor countries and international agencies geared to the health sector. It is important that this support be directed to social and community health programs, offered in accordance with community preferences that could be more widely accepted; such support should not only be used to acquire sophisticated medical infrastructure.

It is precisely on the crucial interaction between the modern and traditional health systems that policy-relevant research is needed in Mongolia. For example, one of the most interesing issues regarding infant and child mortality in Mongolia is women's high level of education. A research priority would be to examine why the formal educational system was unable to introduce changes in the traditional perspectives on child care and health among the population. The main challenge seems to be, however, to study the traditional disease theory in terms of both its beneficial components and those aspects that have prevented a more adequate and efficient use of the modern health system. The contribution of this knowledge would be of much help in designing more effective public health interventions.

In order to monitor and to evaluate programs and interventions, substantial efforts should be made to improve the system of data collection on infant and child mortality both in general and by cause of death, and on morbidity. Conventional international definitions and practices should be adopted in this respect. An adequate vital events collection system exists in the country and the statistical section of the Ministry of Health also has the institutional and physical capability to expand and improve the quality of the health data that it has been collecting. Efforts in this direction do not appear to be costly or involve major institutional changes and the benefits would be quite considerable.

Conclusions

A major issue that needs to be addressed here is whether or not Mongolia is merely one case of a wider phenomenon found in some other former socialist countries. The much better early-age mortality records of other socialist Third World countries such as Albania, China, Cuba and Vietnam indicate that Mongolia's high infant and child mortality levels are not related to its political and economic system. The evidence discussed in the previous section suggests that the problem in Mongolia is associated with limitations regarding preventive and promotional health programs and absence of community participation in the development of the health system which, in turn, have made it difficult for the population to adopt modern health prevention practices and accept modern therapeutic patterns.

In the particular case of Mongolia, these limitations appear to be quite relevant because of the complete elimination of the traditional medical system and also because of the rapidity of the socio-economic and cultural transformation experienced by the country during the present century. From a simple subsistence, pastoral and nomad society it moved to an industrial-agricultural one. An increasing part of the population began to settle in urban areas and became engaged in non-agricultural economic activities. The rest of the population continued a semi-nomadic life-style but this time in bureaucratically organized state co-operatives and farms. However, this transition, labelled by Lattimore (1962) one of 'nomads and commissars', did not change many aspects of the Mongolian culture. One example is the persistence of traditional health-preservation and therapeutic ideas which were not consistent with the modern health care system and with the socio-economic and cultural transformations that the country was experiencing. The result was a substantial initial decline in early-age mortality followed by a noticeable stagnation. It seems that there was a limit to the mortality decline, caused by the lack of preventive and health promotion interventions.

There is abundant literature regarding strategies, programs and interventions that developing countries should include in their social policy in general, and health policy in particular, to improve infant and child mortality levels (see, for example, Wallace and Giri 1990). During the past 70 years social and health policies in Mongolia appear to have created the right conditions for substantial improvements in early-age mortality and morbidity. However, absence of community involvement in the development of the health system, and limitations in preventive and promotional health programs, have resulted in a virtual stagnation of infant and child mortality during the past two decades.

The future perspective does not appear optimistic. An economic crisis whose end is nowhere in sight, emergent social inequalities, a vague health insurance model with unclear financing sources, and a lack of concern by most policy-makers in strengthening the preventive component of the health system, are not positive factors for substantial infant and child mortality improvements in the near future. A clear advantage is, however, the fact that there is a wide space for major improvement with existing internal and external resources. Perhaps the single most important need is for informed, expert, local analysis of the situation of the country and for constructive proposals for policies and programs. In this sense, the objectives of this paper seem to have been accomplished. Despite the limited information, the main possible determinants of early-age mortality in Mongolia were identified, the respective policy implications were discussed and policy-oriented research priorities were suggested.

Methodological appendix

Mongolia has, in general, a well-developed system of population data collection. Seven censuses have been conducted in the country and a civil registration-vital statistics system has been in existence since 1951. From the 1960s on, the degree of completeness of the registration of vital events has, in general, been high (Neupert 1992). The exception, however, is the registration of early-age deaths.

According to the present Mongolian legislation, parents must register the birth of a child within one month of its occurrence. However, as in other countries, frequently parents may consider it futile to register both the birth and the death of a child who died at a very early age. Therefore, it is likely that many infant deaths that occur before the child is one month old may never be registered. Even if the child died after a month and the birth has been registered, parents can fail to register the death. This seems to be specially the case in rural areas where ties with the government administration are weaker and burial permits are, most of the time, not necessary.

Considering a probably significant underregistration of infant and child deaths, the Palloni and Heligman (1985) version of the original Brass indirect technique for infant and child mortality estimation was used in this study to obtain more accurate estimates than those provided by vital statistics. The data required, the mean number of children ever born and the proportion of children surviving, were obtained from the 1989 Mongolian population census. The estimates were performed with the procedure CEBCS of the program MORTPAK (United Nations 1988). Although censuses have been taken in Mongolia since 1935, earlier censuses do not provide the information necessary for the application of indirect techniques.

The indirect estimates of early-age mortality presented in Table 1 were obtained through the Palloni-Heligman technique. This method of infant and child mortality estimation is based on the use of the United Nations model life tables for less developed countries. The selection of the particular pattern or family among the five available (Latin American, Chilean, South Asian, Far East, and General) should be based on the knowledge of which pattern fits better the specific mortality pattern existing in the country. In the case of Mongolia, the South Asian Pattern was selected. The selection of the South Asian pattern was based on a comparison between observed and model life tables. The observed life tables correspond to 1979-84 and 1984-89. The procedure COMPAR from the program MORTPAK, previously cited, was used for this analysis. This pattern is typified by extremely high mortality under age five and relatively high mortality at older ages. Correspondingly, mortality during the prime adult ages is relatively low.

Table 3 shows the direct estimates of early-age mortality. They were computed from registered death statistics. The values of early-age mortality estimated from census data with indirect methods (Table 1) are much higher than those calculated directly from registration data. This fact suggests that there are serious problems of underregistration. These problems were identified not only in the age group 0 to 1 year, but also in the group 1 to 4 years of age.

Table 3
Mongolia: probabilities of dying between ages 0 and 1 and between ages 1 and 4 computed directly from vital statistics

	1970-74	1975-79	1980-84	1985-89
Male				
(1)Q(0)	0.08564	0.08141	0.07721	0.06955
(4)Q(1)	0.04358	0.03893	0.05476	0.04027
Female				
(1)Q(0)	0.07195	0.06816	0.06472	0.05813
(4)Q(1)	0.03934	0.03887	0.05415	0.03778
Total				
(1)Q(0)	0.07871	0.07479	0.07102	0.06390
(4)Q(1)	0.04149	0.03890	0.05448	0.03905

Source: Author's calculations based on vital statistics

In order to examine the consistency of the indirect estimates obtained, an additional independent analysis was performed. Using the indirect estimates of early-age mortality already computed and adult mortality computed directly from registered death statistics, life tables were constructed for the four five-year periods under consideration. The values of (n)Q(x), or probability of dying, corresponding to adult mortality were graduated in order to smooth the respective age patterns. The life tables were constructed by using the demographic software PAS (Arriaga and Associates 1992). The graduation of the probabilities of dying was performed with the procedure UNABR from the package MORTPAK previously cited. Adult mortality was computed by a direct method since underregistration of adult deaths appears quite low, as revealed in a study where underregistration of vital events was evaluated (Neupert 1992).

As mentioned, the model life table that better fits the mortality experience of the Mongolian population is the South Asian Model from the United Nations model life tables for less developed countries. Using observed adult (n)Q(x) and the South Asian model life tables, early-age (n)Q(x) were obtained. Any (n)Q(x) uniquely determines a life table within the system once a family of models has been selected (in this case the South Asian). Thus each (n)Q(x) implies a life table. An expected early-age (n)Q(x) can be established by adopting the life table implied by a given adult (n)Q(x). For example, the expected probability of dying between birth and one year of age for the period 1985-89 can be obtained from the model life table that, within the South Asian pattern, corresponds to the observed (5)Q(20). It is important to mention that death statistics on the adult population are not affected by serious problems of underregistration. The completeness of adult death registration was estimated using the Bennett and Horiuchi (1981) technique. This technique evaluates adult death statistics based on the population age distribution from two censuses and registered deaths by age groups for the intercensal period. For the purposes of this study, the adult deaths registered between 1970 and 1979 were evaluated using the age distributions of the 1969 and 1979 censuses. The adult deaths registered between 1980 and 1989 were evaluated with the 1979 and 1989 censuses. The procedure BENHR from the demographic computer program MORTPAK was used for this purpose. The application of this technique to the data suggests that, in fact, underregistration of adult deaths is almost negligible.

Through the procedure described above, several estimates of expected infant and child mortality were established, each corresponding to the model life table consistent with

different adult probabilities of dying. The results are presented in Table 4 where the expected probabilities of dying in early infancy are compared with those obtained from registration data and from indirect estimates for the period 1985-89. The procedure MATCH from the computer program MORTPAK was used to perform this analysis.

Table 4
Mongolia: comparison among expected, observed and indirectly estimated probabilities of dying between ages 0 and 1 and between ages 1 and 4, 1989

	Male		Female	
	(1)Q(0)	(4)Q(1)	(1)Q(0)	(4)Q(1)
Expected				
20	0.10257	0.05694	0.08158	0.04178
30	0.10823	0.06206	0.08866	0.04850
40	0.10681	0.06076	0.10368	0.06421
50	0.10752	0.06141	0.10096	0.06122
60	0.12356	0.07675	0.07814	0.03868
Observed	0.06955	0.04027	0.05813	0.03778
Indirect	0.09992	0.05083	0.08352	0.04769

Almost all the expected probabilities of dying corresponding to life tables consistent with adult mortality at different ages are not only much higher than the directly estimated infant and child probabilities of dying but also those estimated through indirect methods. This exercise was also done for the previous three five-year periods and almost identical results were obtained. This analysis suggests that the values obtained by the indirect technique do not overestimate early-age mortality and that, in fact, the values calculated directly from death registration statistics are affected by serious problems of underreporting.

It is necessary to clarify that, in spite of the results presented in Table 4, the accuracy of the indirect estimates presented in Table 1 is still subject to discussion. An independent source of data, such as a demographic survey, would be necessary to substantiate the figures estimated here or to obtain more exact estimates. Nevertheless, there is little doubt that infant and child mortality are high in Mongolia and that little progress has been made during the past 20 years.

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