PART THREE

Shifts in Age and Disease Patterns

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Chapter VII

Achieving the MDGs: Health and Mortality Trends in Malaysia

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In the United Nations Millennium Declaration,[1] Governments resolved to achieve eight Millennium Development Goals (MDGs) by the year 2015. Some of these goals were stated in stark numerical terms, for example, to halve the proportion of people with an income of less than one United States dollar per day between 1990 and 2015. However, even for the goals that were not stated in such terms, numerical indicators for monitoring progress were clearly spelled out.[2]

With assessment of progress and achievement being based on averages and aggregates, it has been pointed out that, while none of the goals were on track towards achieving their targets overall at the global level by 2000, the reality is that there is a very uneven pattern of progress (Vandermoortele, 2002). Although the prospects for achieving the MDGs are slim, or even nil, for many developing countries, there are others that will probably be able to reach, and even exceed, some of the goals. Even within a "successful" country, there are often wide disparities, with some social groups being left behind.

In general, East and South-East Asia are considered areas where the MDGs have been met, or are on track for being met (UNDPI, 2004). While there may be countries in these parts of Asia which require increased efforts and resources for achieving the MDGs, Malaysia is one country that has shown remarkable progress. This paper is a review of the achievements of Malaysia with regard to two of the MDGs: to reduce the under-five mortality rate by two thirds, and to reduce the maternal mortality ratio by three fourths, between 1990 and 2015. While the overall national achievement has been good, there are nevertheless particular social groups and geographical areas where progress is slower. The aim of the paper is to identify these groups and areas and to describe the respective health problems for the purpose of recommending where increased efforts and resources should be directed.

In terms of its background, Malaysia is a federation consisting of 11 states in Peninsular Malaysia (formerly Malaya), and the eastern states of Sabah and Sarawak located on the island of Borneo. Table 1 shows the current population and development indicators for the whole country. The most recent population census enumerated almost 23.3 million people, the majority of whom were Malay and other indigenous ethnic groups. The urban population is now 62 per cent of the total, and the average national income is RM 3,361 (US$ 516) per capita.[3]

Although all three entities were formerly British colonies, Malaya was granted independence in 1955, while Sabah and Sarawak joined the federation only in 1963. Sabah and Sarawak are also distinct from Peninsular Malaysia in terms of

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1 A resolution adopted by the United Nations General Assembly on 18 September 2000.

2 The approach underlying the MDGs has been criticized for lacking analytical coherence, for being abstracted from the social, political and economic context in which they are to be implemented, and for being a distraction from other international instruments such as the Beijing Platform for Action. See, for example, Antrobus (2003). While the limitations of the MDGs are recognized, the author does not go into a discussion of these issues in this paper.

3 After the 1997 Asian financial crisis, the Malaysian Government fixed the exchange rate at US$1.00 to RM 3.80, which is currently still in use.

Table 1. Population and development indicators for Malaysia, 2000-2002

Population in 2000	23.27 million
Population estimate, third quarter of 2002	24.66 million
Ethnic breakdown (2000)	
Bumiputra (Malays and other indigenous ethnic groups)	65.1%
Chinese	26.0%
Indian	7.7%
Others	1.2%
Urban population (2000)	62.0%
Dependency ratio (2000)	59.2%
Gross national income per capita at current prices (2002)	RM 13,361.00
Crude death rate (2002)	4.4 per 1,000
Infant mortality rate (2002)	6.7 per 1,000
Life expectancy at birth (2002)	
Males	70.69 years
Females	75.25 years

Source: Department of Statistics Malaysia (2002) *Yearbook of Statistics 2002* (Kuala Lumpur: Department of Statistics, Malaysia).

historical development, geographical terrain and population demographics. The major ethnic groups in Peninsular Malaysia are the Malays, Chinese and Indians; but in Sabah and Sarawak, ethnic diversity is much greater. In this paper, therefore, these three entities are often treated separately.[4]

I. TRENDS IN MORTALITY

Past studies have documented the rapid fall in mortality rates in Peninsular Malaysia. For example, Kwok (1982) examined the trend and rate of decline in infant mortality rates from 1950 to 1978, and Tan and others (1987) made the observation that mortality declines had occurred across all ethnic groups and geographical regions, although the rates of decline have not been similar for all subgroups in every time period. These studies were based on the registration of births and deaths, and generally attributed the rapid improvement in mortality to socio-economic development, which includes sanitation and nutrition, as well as the introduction of effective medical and health technologies after the Second World War (see also United Nations, 1993).

More specific analysis of data from the Malaysian Family Life Survey 1976-1977, a population-based probability sample survey of households in Peninsular Malaysia, pinpointed mothers' education as the most consistent factor accounting for the decline in infant mortality rate between 1941 and 1975, compared with improvements in water and sanitation, which became less important over time. Nevertheless, the greater part of the decline had been due to factors that were not measured in this analysis, which the writers identified as income growth and improvements in medical and health care (DaVanzo and Habicht, 1985).[5]

Other studies making similar observations of declining mortality rates[6] have attributed the rapid fall in child mortality in the 1960s and 1970s not only to socio-economic development, but also more specifically to the primary health-care programmes, in particular, the rural health programme developed after 1960, and other corollary programmes such as the applied food and nutrition programme. The rural health programme achieved a wide distribution of primary health-care services through midwife

[4] Official statistics are often given separately for Peninsular Malaysia, Sabah and Sarawak, and it is also more expeditious to treat them independently.

[5] Other papers on child mortality from this study are DaVanzo and Habicht (1985), DaVanzo (1984) and Butz and others (1982).

[6] Rajakumar and others (1980) and Chee (1990).

clinics and rural health clinics within a very short period of time. In 1960, the midwife- clinic-to-rural-population rate was 1:121,000; by 1965, it had improved to 1:7,300. In 1975, when midwife clinics were being upgraded to rural clinics, the rate had further improved to 1:4,400[7] (Abu Bakar and Jegathesan, n.d.).

Vital statistics for the two eastern states of Sabah and Sarawak are officially considered less accurate in comparison to those for the peninsula.[8] Birth and death registration are considered incomplete owing to the rough geographical terrain and a less widely distributed and established primary health-care network. As such, Kwok (1982) used indirect methods on the 1960 and 1970 population census data, and made estimates of the infant mortality rates for Sabah and Sarawak. In the period 1955-1958, the 1960 census-based estimates of infant mortality were an average of 167 per 1,000 live births for Sabah and 132 per 1,000 live births for Sarawak.[9] Based on the 1970 census,[10] the estimates of infant mortality for 1967 were 84 per 1,000 live births for Sabah and 65 per 1,000 live births for Sarawak, both higher than the 45 per 1,000 live births recorded for Peninsular Malaysia in 1967 (Department of Statistics, 1991). It should be noted that the mortality declines for Sabah and Sarawak started much later than in Peninsular Malaysia (Tan and others, 1987).

A. Child mortality

In Peninsular Malaysia, the decline in mortality rates has been consistent until the current period. In the 30 years between 1960 and 1990 (table 2), the infant mortality rate fell from 68.9 per

Table 2. Mortality indicators for Peninsular Malaysia, 1960-1990

	1960	*1965*	*1970*	*1975*	*1980*	*1985*	*1990*
Crude death rate (per 1,000 population)	9.5	7.9	7.3	6.4	5.5	5.3	4.9
Perinatal mortality rate (per 1,000 live births)	–	39.3	36.9	32.0	26.7	19.3	13.9
Neonatal mortality rate (per 1,000 live births)	30.1	26.5	22.9	20.4	14.8	10.7	8.4
Infant mortality rate (per 1,000 live births)	68.9	50.1	40.8	33.2	24.1	17.0	13.1
Toddler mortality[a] rate (per 1,000 children 1-4 years old)	8.0	5.8	4.20	3.1	2.0	1.4	0.91
Maternal mortality ratio (per 100,000 live births)	240	200	150	80	60	37	20
Life expectancy at birth (years):							
Females	58.2[b]	66.0[c]	65.6	68.7	70.5	72.4	73.5
Males	55.8[b]	63.1[c]	61.6	64.3	66.4	67.7	68.9

Sources: Department of Statistics Malaysia (1991). *Vital Statistics Time Series Peninsular Malaysia 1911-1985; Vital Statistics Malaysia* (various years); *Abridged Life Tables Peninsular Malaysia* (various years) (Kuala Lumpur: Department of Statistics, Malaysia).

[a] The term "toddler mortality" refers to the death of children between one and five years of age.
[b] For 1957.
[c] For 1966.

[7] These figures are for Peninsular Malaysia only.

[8] See the introduction to various issues of *Vital Statistics* from 1991 onward. Nevertheless, this view is contested in the case of Sarawak by Khoo Khay Jin in his "Health care in Sarawak" paper presented at the "Health care in Malaysia" workshop at the Asia Research Institute, National University of Singapore, 9-11 September 2004, where he claimed that the vital statistics for Sarawak were reliable from 1980s onward.

[9] These estimates excluded the Chinese because census data for Chinese child mortality was found to be unreliable owing to extreme underreporting.

[10] According to this study, the 1970 census had a downward bias compared with the 1960 census, which was considered more accurate. This means that actual rates could be higher.

1,000 live births to 13.1, that is, by 80 per cent; while child mortality rate fell from 8.0 per 1,000 live births to 0.9 per 1,000 live births, that is, 88 per cent. Life expectancy rose in parallel from 58.2 years for females and 55.8 for males to 73.5 years for females and 68.9 years for males between 1960 and 1990.

Although mortality rates for Sabah and Sarawak were tabulated for earlier years, consolidated rates from the vital registration data for the whole of Malaysia were more systematically documented only from 1991 onward (table 3). For Malaysia as a whole, between 1991 and 2000, the infant mortality rate dropped from 12.5 to 7.7 per

Table 3. Mortality indicators for Malaysia, 1991-2000

	1991	*1995*	*1998*	*2000*
Crude death rate (per 1,000 population)	4.6	4.7	4.6	4.5
Peninsular Malaysia	4.8	5.0	4.9	
Sabah	3.4	3.2	2.7[a]	
Sarawak	3.7	4.0	4.1[a]	
Perinatal mortality rate (per 1,000 live births)	12.0	9.7	7.9	10.0
Peninsular Malaysia	12.3	–	–	
Sabah	13.4	12.1	8.1	
Sarawak	7.3	6.1	4.2	
Neonatal mortality rate (per 1,000 live births)	8.1	6.8	5.2	3.9
Peninsular Malaysia	7.6	6.3	5.1	
Sabah	12.3	11.1	8.0	
Sarawak	6.7	4.5	3.6	
Infant mortality rate (per 1,000 live births)	12.5	10.3	8.5	7.7
Peninsular Malaysia	12.1	9.8	8.5	
Sabah	17.8	16.7	11.5	
Sarawak	9.5	7.5	6.2	
Toddler mortality rate (per 1,000 children 1-4 yrs)	0.9	0.8	0.7	0.5
Peninsular Malaysia[b]	1.0	0.7	0.7	
Sabah	1.0	1.1	0.5	
Sarawak	0.6	0.5	0.5	
Maternal mortality ratio (per 100,000 live births)	20	20	30	3.0
Peninsular Malaysia	20	20	20	
Sabah	30	20	40	
Sarawak	10	10	20	
Life expectancy at birth (years)				
Females	73.4	74.1	74.6	74.9
Males	69.2	69.4	68.6	70.4

Sources: Department of Statistics Malaysia (2000). *Vital Statistics Malaysia (Special Edition);* (1999) *Vital Statistics Malaysia 1999;* (1996) *Vital Statistics Malaysia 1996;* (1995) *Vital Statistics Malaysia (Special Release) 1991-1993;* (1994) *Vital Statistics Malaysia (Preliminary Release) 1992;* (1993) *Vital Statistics Malaysia (Preliminary Release) 1991;* (2003) *Abridged Life Tables 2000-2002 Malaysia;* (1999) *Abridged Life Tables 1996-1998 Malaysia;* and (1997) *Abridged Life Tables 1991-1996 Malaysia* (Kuala Lumpur: Department of Statistics, Malaysia).

[a] For the year 1997.

[b] These rates were calculated by the author.

1,000, and the toddler mortality rate from 0.9 to 0.5 per 1,000 (table 3; see also footnote "a" of table 2). These drops exceeded by far the MDG target rate of a two thirds reduction within 25 years.[11]

Mortality rates for Malaysia as a whole did not differ much from Peninsular Malaysia even though the additional population of Sabah and Sarawak constituted 20 per cent of the total (population census 2000). Although the mortality rates for Sabah were generally higher than the national rates, this situation has been balanced by the consistently lower rates for Sarawak. These lower rates have been attributed to incomplete registration, although this assumption may be called into question, at least by the 1990s, as there is no reason why registration data for Sarawak should be more incomplete than that of Sabah.

B. Maternal mortality

An earlier study on Peninsular Malaysia had compared the age-specific death rates between males and females for the periods 1967-1969 and 1977-1979, and found that the most remarkable improvement, other than in the 0-5 year age group, was registered in the reproductive age group for females (15-49 years) (Tan and others, 1987). Prior to 1970, female mortality had exceeded male mortality, particularly in the childbearing ages of 15-39 years, but since then, female mortality had been lower than that of males (Fernandes, 1988, as cited in United Nations, 1993). This decline in female mortality has been attributed to the fall in maternal mortality as a result of better medical and health services, older ages at marriage and childbearing, and increased spacing between successive childbearing (United Nations, 1993). In addition, maternal mortality was found to have fallen sharply in the early 1970s across the three major ethnic groups in Peninsular Malaysia, namely, the Malays, Chinese and Indians.

Since 1991, official documents have reported the maternal mortality ratio as being between 20 and 30 per 100,000 live births (table 3). In 1991, however, a system of confidential enquiry into maternal deaths was initiated (Ministry of Health, 1996, p. 142), following which the number of maternal deaths that had been reported increased more than twofold. It was found that previous data were underenumerated, and the more reliable estimates were 44 per 100,000 live births in 1991, 48 in 1992 and 46 in 1993. Nevertheless, the adjusted ratio of 41 per 100,000 live births compares favourably with other developing countries (table 4), although geographical disparities exist within the country, with rural states being worse off (Abu Bakar and Jegathesan, n.d.).

C. International comparisons

Table 4 shows the comparability of Malaysia's mortality indices with other countries. The infant mortality rate for the country as a whole has been below 10 per 1,000 live births since the late 1990s, a rate that is comparable to that of developed countries such as the United States of America (7 per 1,000 live births) and Australia (6 per 1,000 live births), as well as developing countries that have high human development indices such as Cuba (7 per 1,000 live births) and Costa Rica (9 per 1,000 live births). Between 1970 and 2002, the infant mortality rate in Malaysia dropped from 46 to 8 per 1,000 live births, surpassing the average rates for East Asia and the Pacific (which dropped from 84 to 32 per 1,000 live births in the same time period), and comparable to the average rates for countries in the Organisation for Economic and Development Cooperation (which dropped from 40 to 11 per 1,000 live births) (UNDP, 2004). In 2002, Malaysia's female life expectancy at birth was 75.6 years compared with 80.2 in Singapore, 79.8 in the United States and 80.6 in the United Kingdom of Great Britain and Northern Ireland. Other developing countries with a comparable level of achievement in female life expectancy are China, Costa Rica, Cuba, Sri Lanka and Thailand.

D. Geographical disparities

While mortality rates have fallen to low levels, the improvement is not evenly distributed throughout the country. With the exception of Sabah, birth and death registration data are based on place of usual residence of the mother or the deceased, while in Sabah it is based on place of occurrence (Department of Statistics, 2000). The infant mortality rate, as an overall indicator of

[11] In order to achieve the two thirds reduction in 25 years and assuming a linear rate of reduction, the infant mortality rate would have to have been 9.2 per 1,000 and the toddler mortality rate would have to have been 0.7 per 1,000 in 2000.

Table 4. International comparisons of mortality indicators

	Infant mortality rate (per 1,000 live births)		Under-five mortality rate (per 1,000 live births)		Maternal mortality ratio[a] (per 100,000 live births)		Life expectancy at birth (years) 2002	
					Reported[b]	Adjusted[c]		
	1970	2002	1970	2002	1985-2002[d]	2000	Females	Males
Malaysia	46	8	63	8	30[e]	41	75.6	70.7
Thailand	74	24	102	28	36	44	73.4	65.2
Singapore	22	3	27	4	6	30	80.2	75.8
Philippines	60	29	90	38	170	200	71.9	67.9
Indonesia	104	33	172	45	380	230	68.6	64.6
United States	20	7	26	8	8	17	79.8	74.2
United Kingdom	18	5	23	7	7	13	80.6	75.6
Japan	14	3	21	5	8	10	85.0	77.8
Australia	17	6	20	6	–	8	82.0	76.4
India	127	67	202	93	540	540	64.4	63.1
Pakistan	120	83	181	107	530	500	60.7	61.0
Bangladesh	145	51	239	77	380	380	61.5	60.7
China	85	31	120	39	53	56	73.2	68.8
Cuba	34	7	43	9	30	33	78.6	74.7
Costa Rica	62	9	83	11	29	43	80.5	75.7
Sri Lanka	65	17	100	19	92	92	75.8	69.8

Source: United Nations Development Programme (2004). *Cultural Liberty in Today's Diverse World, Human Development Report 2004*, accessed on 6 August 2004 <http://hdr.undp.org/reports/global/2004/>, pp. 168-171, 217-220.

[a] Deaths of women from pregnancy-related causes.
[b] Reported by national authorities.
[c] Adjusted by the United Nations Children's Fund (UNICEF), World Health Organization (WHO) and United Nations Population Fund (UNFPA) for underreporting and misclassification.
[d] Data are for the most recent year available in this period.
[e] A more recently reported figure is 20 per 100,000 live births.

economic and social development, can therefore be taken to reflect geographical disparities in development.

Table 5 compares the infant mortality rate in the various states in the country over the larger part of the decade of the 1990s. The rural states of Pahang, Sabah and Terengganu were among the five states with the highest infant mortality rates both in 1991 and 1998. While Kelantan (also predominantly rural) had very high infant mortality rates in 1991, the level had decreased considerably by 1998. Sarawak, comparable to Melaka in terms of proportion rural, showed much better improvement.

The other seeming aberration is the infant mortality rate for the capital city of Kuala Lumpur, which not only increased between 1991 (10.5 per 1,000 live births) and 1998 (11.5 per 1,000 live births), but was among the five highest in 1998. This could reflect the fact that most of the referral hospitals are in Kuala Lumpur and that "place of usual residence" may not have been strictly adhered to when deaths were registered. On the contrary, this increased rate may also reflect the in-migration of people from the rural areas or immigration from other countries (including undocumented transnational migrants), and their poor living conditions in terms of housing, environment, sanitation and nutrition.

Disaggregated data for rural and urban areas are available for the states of Peninsular Malaysia, although not for Sabah and Sarawak. Overall, infant mortality rates improved between 1991 and 1998. Urban rates also improved by a larger quantum compared with rural rates, with the exceptions of Kuala Lumpur (as previously noted), Melaka (no improvement in either rural or urban areas) and Kedah (no improvement in the urban areas). Generally, rural rates were higher than urban rates, except

Table 5. Infant mortality rate, by states, rural and urban areas, 1991 and 1998

	Infant mortality rate (per 1,000 live births)						*Percentage rural (1999)*
	1991	*1998*	*1991*		*1998*		
			Rural	*Urban*	*Rural*	*Urban*	
Malaysia	12.5	8.1[b]	–	–	–	–	42
Peninsular Malaysia	12.1	8.5	12.7	11.0	9.2	7.9	
Kuala Lumpur[a]	10.5	11.5	–	10.5	–	11.5	0
Selangor	11.4	5.9	11.7	11.1	7.4	5.5	12
Pulau Pinang	10.3	7.8	9.3	11.5	7.5	8.0	15
Perak	9.1	7.1	9.4	8.3	8.1	6.4	34
Johor	13.0	7.6	13.8	11.6	9.3	6.2	45
Melaka	10.0	9.5	10.6	8.0	10.8	7.8	51
Negeri Sembilan	11.0	7.8	11.9	9.2	8.5	6.8	53
Terengganu	16.0	11.4	16.5	14.9	12.3	10.2	54
Kedah	12.6	9.5	13.2	10.7	8.5	10.7	59
Kelantan	15.4	9.6	16.0	13.8	8.9	11.1	61
Perlis	10.4	8.7	11.5	3.2	4.4	14.9	66
Pahang	12.7	10.8	12.9	11.7	11.9	8.5	67
Sarawak	9.5	6.2[b]	–	–	–	–	51
Sabah	17.8	11.5[b]	–	–	–	–	62
Labuan[a]	–	24.1[b]	–	–	–	–	

Sources: Department of Statistics Malaysia (2000). *Vital Statistics Malaysia (Special Edition)* (Kuala Lumpur: Department of Statistics Malaysia); and Ministry of Health (2001). *Malaysia's Health 2001* (Kuala Lumpur: Ministry of Health), p. 272.

[a] Federal Territories; note that Kuala Lumpur, the capital city, is 100 per cent urban.
[b] Based on preliminary estimates of births taken from Vital Statistics 1999 (Kuala Lumpur: Department of Statistics Malaysia).

for Pulau Pinang, where urban rates were higher in 1991 and no marked difference was recorded in 1998, as well as in Kedah and Kelantan, where urban rates were higher in 1998 than in 1991. The rates for Perlis were spurious because of the small numbers (41 deaths in 1998).

II. DISEASE PATTERNS AND MORBIDITY

A. Disease-specific mortality

An overall view of disease patterns may be obtained from death registration and health services-based data, although it should be noted that both sources have their limitations. Although the vital registration data in Peninsular Malaysia are of good quality, since they first became available in 1964, only 30 to 45 per cent of all deaths were ever medically certified and inspected and, therefore, could be classified into distinct disease categories. In 1998, for example, the proportion of deaths that were medically certified and inspected was 44 per cent. Health services-based data, whether on mortality or morbidity, are available only for the public sector.[12] As the private hospital sector has been catering to an increasing proportion of patients, particularly from the early 1980s onward, the picture presented by public hospital mortality and morbidity data will become increasingly skewed.[13] It should also be noted that other than the specific list of communi-

[12] Pending the implementation of the Private Health Care Facilities and Services Act 1998, which includes regulations requiring private health-care facilities to submit data.

[13] In 1980, private hospital beds accounted for 4.7 per cent of total hospital beds, but in 2000, this figure was 21.9 per cent. As a rough indicator, the number of admissions to private institutions was about one quarter that of admissions to government institutions in 1997 (Ministry of Health, annual reports).

cable diseases for which notification is compulsory,[14] health services-based data exclude people who may be ill but who do not seek health care in the formal state sector. For some illnesses, such as mental illness, this could be an important omission.

One study of death registration data between 1964 and 1983 categorized three types of diseases: infectious diseases, nutrition-related diseases and cardiovascular diseases (Chee, 1990). It was found that in the 1960s infectious diseases were still the predominant cause of death, but by 1970, cardiovascular diseases started to overtake infectious diseases. Government hospital data showed a similar trend of heart diseases growing in importance as the principal cause of death through the 1970s, eventually overtaking diseases of early infancy and other infectious diseases. The list of 10 principal causes of death in Ministry of Health hospitals are heart disease and diseases of pulmonary circulation (15.8 per cent of all causes), followed by septicaemia (13.7 per cent), malignant neoplasm (9.3 per cent), cerebrovascular diseases (9.3 per cent) and accidents (7.9 per cent) (Ministry of Health, 2000). Among the cardiovascular diseases, the most important cause of death is ischaemic heart disease (Ministry of Health, 2001).

Official sources characterize this trend as a transition to "diseases of affluence and lifestyle" or "diseases of development" identified as cancer, hypertension, heart and respiratory diseases and trauma, leading to the construction of the concept of the *new* public health which "has to contend with new challenges associated with increasing longevity, overpopulation, increasing industrialization and industrial decline, inequities in health, environmental damage and ecological imbalance" (Abu Bakar and Jegatheesan, n.d., pp. 19-29 and 408, 409). Nevertheless, it is acknowledged that infectious diseases, in particular, HIV/AIDS, dengue fever, tuberculosis and malaria, will continue to pose a challenge.

B. Diseases and ill-health

The most recent and comprehensive source of data on morbidity and diseases is the Second National Health and Morbidity Survey. In the preliminary preparation for this survey, programme and state managers in the Ministry of Health were asked to identify the problems and issues to be included, and the list was revealing of the types of health problems dealt with by ground-level health service personnel (Maimunah and others, 1998). Other than cardiovascular diseases and associated conditions, that is, hypertension, diabetes and obesity, as well as the predominant cancers (gastrointestinal, liver, cervical, breast, nasopharyngeal, gastric and genitourinary),[15] a long list of infectious diseases was identified as important public health problems.

One major problem pointed out by the health personnel was the upsurge in communicable diseases, namely, leprosy, tuberculosis, sexually transmitted diseases, and food and waterborne diseases. The spread of these was attributed to foreign migrant workers, particularly in urban areas.[16] The concern with tuberculosis was that it is now seen among the economically productive age group rather than the older population (more than 60 years old); and also that its incidence was high in spite of good BCG (bacille Calmette Guérin) vaccination coverage.

Among children, a major health problem identified was intestinal worm infestation in rural and urban squatter communities. It was pointed out that intestinal protozoans were common in rural areas where the water supply is not safe, and diarrhoea among children was common. Many children who failed to thrive, began to grow only after treatment for giardiasis.[17] The other infections common among children were identified to be urinary tract infections and acute respiratory infections, which were important causes of outpatient attendance and hospital admissions in young children.

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[14] Even so, private practitioners do not adhere fully to the notification regulations.

[15] The first report of the National Cancer Registry (2002) reported the incidence rates of various cancers among the population of Peninsular Malaysia (Lim and others, 2003). Sabah and Sarawak were omitted because the cancer registration in these two states was considered incomplete. According to this report, the most frequent cancers (in order of decreasing frequency) in men were lung, nasopharynx, colon, leukaemia, rectum and prostate; and in women, breast, cervix, colon, ovary, leukaemia and lung.

[16] The Ministry of Health estimated, in 1997, that the proportion of cases due to foreigners in the country was 13 per cent for tuberculosis, 30 per cent for leprosy, 18 per cent for malaria, 3 per cent for dengue and 2 per cent for HIV infections (Abu Bakar and Jegatheesan, n.d., p. 225).

[17] Infection of the intestines with a protozoan of the genus *Giardia* (especially *G. lamblia*), found in contaminated food and water; it is causes diarrhoea, nausea, flatulence and abdominal discomfort.

Two vector-borne diseases identified as meriting attention were malaria and dengue fever. Malaria was a concern for indigenous populations and immigrant workers employed in rural land schemes, while the incidence of dengue fever, a problem largely related to sanitation in homes and neighbourhoods, was high in the urban areas of Kedah, Kelantan and Terengganu, while relatively lower in Kuala Lumpur, Pulau Pinang and Selangor. Among the non-communicable diseases, anaemia was identified as a major cause of morbidity in pregnancy, while asthma and psychiatric morbidity were also thought of as important health problems.

C. Notifiable communicable diseases

From a list of 27 designated communicable diseases for which notification is mandatory, the 10 that had the highest number of cases for the year 2000 are shown in table 6. Some of these diseases showed fluctuations within the period from 1996 to 2000 because there could have been an epidemic for a short period of time or the statistics could have been showing a cyclical pattern over a longer period. For example, there was an outbreak of enterovirus in 1997, when the incidence rate was 27.7 per 100,000 population. There was another outbreak in 2000, but in between, the levels were low.

Dengue and malaria, two mosquito-borne diseases, showed cyclical patterns. Within a five-year period, the number of malaria cases decreased. The highest incidence of malaria was recorded in the state of Sabah, which constituted 45 per cent of all cases in the country in 2000 (Ministry of Health, 2000, p. 103). In that year, 24 per cent of the cases were in Sarawak and 31 per cent in Peninsular Malaysia.

For HIV/AIDS, the incidence rate should not be taken at face value because mandatory testing is restricted to targeted social groups, and the extent of testing carried out differs from year to year. In any case, it is among the important infectious diseases, and the death rate has been increasing, from 1.28 per 100,000 in 1996 to 2.18 in 1997, 3.11 in 1998, 3.85 in 1999 and 3.97 in 2000.

Although mortality from infectious diseases has fallen over the decades and, as such, these diseases are no longer important causes of mortality, nevertheless they are still very much part of the disease pattern. Diseases such as malaria can contribute to other problems such as anaemia and poor nutritional status, while tuberculosis and sexually transmitted diseases are linked to HIV/AIDS, a problem that is on the rise.

III. UNDERNUTRITION

In many developing countries, undernutrition among children is often an underlying cause of disease and death. In Malaysia, the extreme forms of malnutrition such as kwashiorkor and marasmus are no longer seen, but numerous surveys show the

Table 6. Incidence rate of communicable diseases reported, 1996-2000

	Incidence rate (per 100,000)				
	1996	*1997*	*1998*	*1999*	*2000*
Tuberculosis (all forms)	61.0	63.1	63.6	65.6	64.7
Malaria	245.4	123.0	60.8	48.9	55.7
Food poisoning	15.3	31.1	31.5	38.0	36.6
Dengue	67.3	89.7	123.5	44.7	32.0
Measles	2.2	2.6	2.2	11.5	27.9
HIV	21.7	18.0	20.9	20.7	23.0
Viral hepatitis (all types)[a]	7.5	3.3	24.4	26.5	18.3
Enterovirus, HFMD[b]	–	27.7	4.2	1.9	13.6
Syphilis (all forms)	7.4	6.1	11.1	9.5	7.7
Gonococcal (all forms)	8.4	6.4	5.9	9.8	6.0

Source: Ministry of Health (2000). *Annual Report 2000* (Kuala Lumpur: Ministry of Health), pp. 92-94.

[a] Mostly hepatitis B (12.8 per 100,000).
[b] Hand, foot and mouth disease.

continued existence of poor growth achievement among children. On the contrary, overweight is increasing among adults, particularly in adult women. This gives rise to the paradoxical "twin problems of malnutrition", that is, overnutrition and undernutrition coexisting in the same community.[18] This paper, however, focuses only on child undernutrition, a problem that is closely related to child mortality.

A. National trends

The Ministry of Health carries out nutritional surveillance by monitoring the weight for age of children under five years old who attend government health clinics (Ministry of Health, 2000). From 1991 to 2000, the rate of undernutrition among these children was found to have gradually decreased. In 2000, the prevalence of underweight[19] was 14 per cent. Being a clinic-based sample, this was not representative of the country's population; however, a representative sample at the national level surveyed in 1999 showed comparable rates.

The 1999 survey was based on a stratified random sample from metropolitan, large urban, small urban and rural areas of living quarters representative of the whole country (Ministry of Health, 2001). The weights, heights and ages of all children under five were taken, yielding four indicators: underweight, stunting and wasting (defined respectively as weight for age, height for age and weight for height, each less than minus two standard deviations from the NCHS reference median)[20] and overweight (weight for age equal to or more than two standard deviations from the reference median). Severe underweight, stunting and wasting were each defined as less than minus three standard deviations from the NCHS reference median.

In this study, the overall prevalence of stunting, an indicator of long-term undernutrition, was 16 per cent, which is considered a low prevalence according to WHO criteria.[21] The prevalence of underweight, reflecting current undernutrition, was 19 per cent; although this is a moderate level, it was bordering on high according to WHO criteria.[22] Furthermore, the prevalence of severe stunting was found to be 5.3 per cent and severe underweight was 2.7 per cent. Overweight was not considered a public health problem in this age group, because the prevalence of 2.1 per cent was within the statistical limit of 2.5 per cent.

B. Urban/rural and social class differences

Table 7 shows the prevalence of undernutrition among children based on the 1999 Ministry of Health study as well as the nutritional surveillance system for the year 2000, distributed by states, urban-rural strata and family income. Although prevalence of undernutrition was not always consistently the highest in the most rural states, the more rural states may be seen to have generally higher levels of undernutrition compared with the more urban states. For example, Kelantan had the highest (29.9 per cent) prevalence of undernutrition, followed by Perlis (25.2 per cent), Melaka (24.3 per cent), Terengganu (23.4 per cent) and Sabah (22.7 per cent), all of which are more than 50 per cent rural.

Table 8 shows that rural children in the 1999 Ministry of Health study had higher levels of current undernutrition (as shown by the percentage prevalence of underweight) and chronic undernutrition (shown by the percentage prevalence of stunting) when compared with urban children. When the data are disaggregated by family income levels, the difference in prevalence is even wider. Both current as well as chronic undernutrition are twice as high in families with income less than RM 1,000 per month compared with families with income of RM 1,000 or more per month.

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18 For a recent study on this, see Khor and Zalilah (2003).

19 Defined as weight for age lower than minus two standard deviations from the United States National Center for Health Statistics (NCHS) reference median. WHO is currently developing an international reference, but in the meantime, the NCHS reference is recommended for use in all countries.

20 The term stunting is often used to indicate long-term, or chronic, undernutrition. The term underweight is usually taken to indicate current undernutrition, that is, undernutrition that is occurring at the time the measurement is taken. Wasting is used to denote acute undernutrition, that is, undernutrition that occurred very suddenly and within a short span of time.

21 For children under five years of age, less than 20 per cent stunting is defined as low prevalence; 20-29 per cent is moderate; 30-39 per cent high; and 40 per cent and above, very high (WHO, 1995, as cited in Ministry of Health, 2001).

22 WHO defines less than 10 per cent underweight as a low prevalence, 10-19 per cent as medium, 20-29 per cent as high, 30 per cent and above as very high (WHO, 1995, as cited in Ministry of Health, 2001).

Table 7. Prevalence of underweight among children under five years of age

	1999 MOH study[a]			*2000 NSS*[b]			
	N	*Percentage prevalence Weight for age*		*N*	*Percentage prevalence Weight for age*		*Percentage rural (1999)*
		<–2SD[c]	*<–3SD*[d]		*<–2SD*[c]	*<–3SD*[d]	
Kuala Lumpur	233	13.7	1.7	–	–	–	–
Selangor	353	14.5	2.0	43,507	15.2	0.5	12
Pulau Pinang	269	15.9	3.3	16,965	14.4	0.9	15
Perak	618	20.7	2.9	27,542	10.9	0.9	34
Johor	725	12.8	1.9	38,191	5.5	0.2	45
Sarawak	522	19.2	2.9	49,631	17.7	1.5	51
Melaka	152	24.3	3.9	12,704	20.9	0.5	51
Negeri Sembilan	183	16.4	0	12,875	13.9	1.3	53
Terengganu	261	23.4	4.6	17,358	15.1	0.9	54
Kedah	364	18.2	1.4	25,719	17.5	0.7	59
Kelantan	337	29.9	5.9	27,728	15.1	1.2	61
Sabah	69	22.7	3.3	33,984	13.8	1.2	62
Perlis	147	25.2	4.8	2,531	14.7	1.3	66
Pahang	338	16.3	2.1	23,805	17.3	1.1	67
Malaysia	5,198	16.3	2.8	332,540	14.0	1.0	42

[a] Ministry of Health Study, 1999 *(Ministry of Health, Malaysia's Health 2001).*
[b] Nutritional Surveillance System, 2000 *(Ministry of Health, Annual Report 2000)*
[c] Less than minus two standard deviations from the United States National Center for Health Statistics (NCHS) reference median; includes those who were less than minus three standard deviations from the NCHS reference median.
[d] Less than minus three standard deviations from the NCHS reference median.

Table 8. Distribution of undernutrition in the 1999 Ministry of Health study

	Percentage prevalence			
	Underweight: Weight for age		*Stunting: Height for age*	
	<–2SD[a]	*<–3SD*[b]	*<–2SD*[a]	*<–3SD*[b]
Children <5 yrs				
(1) Strata				
Rural (N=2,335)	25.9	3.3	24.6	6.0
Urban (N=2,723)	19.0	2.2	18.0	4.8
(2) Family income				
<RM1,000 per month (N=2,706)	28.1	3.6	26.9	6.8
≥RM1,000 per month (N=2,390)	14.3	1.6	14.2	3.7

Source: Ministry of Health Study, 1999 (Ministry of Health, *Malaysia's Health 2001)*

[a] Less than minus two standard deviations from the United States National Center for Health Statistics (NCHS) reference median; includes those less than minus three standard deviations from the NCHS reference median.
[b] Less than minus three standard deviations from the NCHS reference median.

The 1992-1995 study on rural communities in Peninsular Malaysia also collected data on the nutritional status of children 18 years and younger (Khor and Tee, 1997). The prevalence of undernutrition in that study was generally higher (about a quarter to more than a third) than the rural prevalence measured in the 1999 Ministry of Health study (about a quarter in rural areas) (table 9). Even though the data for the former study were collected a few years earlier than the latter one, the higher prevalence rates are more likely due to the difference in representation; while the 1999 Ministry of Health study was representative of the country's population, the 1992-1995 study was designed to be statistically representative of five specific types of rural communities, that is, fishing, rice farming, rubber and coconut villages and rubber estates. Undernutrition was found to be particularly high among children in the villages where fishing, rice cultivation and rubber tapping were dominant economic activities.

Table 9. Distribution of undernutrition in the 1992-1995 UPM-IMR[a] study

	Weight for age <–2SD[b]		*Height for age <–2SD[b]*	
Community types (children > 1 up to 6 yrs)	**Boys**	**Girls**	**Boys**	**Girls**
Fishing	39.7	36.8	34.6	26.9
Rice farming	34.0	39.2	31.7	37.1
Rubber	32.3	37.3	34.6	32.0
Coconut	23.2	27.1	14.3	20.0
Estates	28.6	33.7	12.0	17.6
All	32.6	35.9	28.0	28.8
Community types (children ≤ 18 yrs)	**Boys**	**Girls**	**Boys**	**Girls**
Fishing	33.3	24.6	38.6	24.8
Rice farming	30.0	28.5	34.1	30.1
Rubber	31.4	27.6	34.9	31.4
Coconut	22.2	19.1	22.2	23.1
Estates	29.5	24.6	20.6	21.9
All	29.8	25.5	31.3	26.9

Source: Universiti Putra Malaysia and Institute for Medical Research Joint Collaborative Study. See Khor G.L. and E.S. Tee (1997). "Nutritional assessment of rural villages and estates in Peninsular Malaysia: II Nutritional status of children aged 18 years and below", *Malaysian Journal of Nutrition, 3:21-47.*

[a] Universiti Putra Malaysia and Institute for Medical Research Joint Collaborative Study.
[b] Less than minus two standard deviations from the United States National Center for Health Statistics (NCHS) reference median; includes those less than minus three standard deviations from the NCHS reference median.

A follow-up study conducted in 1998 specifically targeted the villages in which the prevalence of child undernutrition had been found to be high (Chee and others, 2002). All children between the ages of 12 and 72 months were included in the study, which was designed to understand the reasons for child undernutrition. Multivariate analysis found that having an income below the poverty level (measured by household income) and not having access to piped water were significant predictors of underweight in children, while mothers having fewer than six years of education was a significant predictor for stunting. The most consistent predictor for child undernutrition was the lack of access to a piped water supply.

IV. GENDER DIFFERENCES

An analysis of mortality rates in Peninsular Malaysia from 1950 to 1978 concluded that the data confirmed higher risks of boys dying in infancy than girls, and that there were no differences in the rate of decline in mortality rates between males and females (Kwok, 1982). The gap in life expectancy at birth between females (75.3 years) and males (70.7 years)[23] is similar to that of developed countries rather than South Asian countries;

[23] Includes non-Malaysian citizens (taken from 2002 life tables) (Department of Statistics, 2003).

during the year 1998 the infant mortality rate for boys (10.6 per 1,000 live births) was higher than that for girls (7.0 per 1,000 live births).

Table 10 summarizes the prevalence of undernutrition among children from the three previously mentioned surveys. The prevalence of undernutrition tended to be higher among boys. The prevalence by sex disaggregated in the different types of rural communities in the study by the Universiti Putra Malaysia and the Institute for Medical Research confirms this pattern (see table 9).

The gender disadvantage in health faced by women in other developing countries, particularly most South Asian countries, is not apparent in the health indicators for Malaysia. This is not to say, of course, that gender inequalities do not exist, as women are still disadvantaged in work, income and political leadership indices (UNDP, 2004).

Table 10. Distribution of undernourished children by sex in various studies

	Percentage of children who are undernourished	
	Females	*Males*
MOH study (1999)[a]	(N = 2,702)	(N = 2,406)
Underweight[b]	18.5	19.4
Stunting[c]	14.4	16.7
Wasting[d]	13.1	13.5
UPM-IMR study (1992-1994) [e]	(N = 2,415)	(N = 2,364)
Underweight[b]	25.5	29.8
Stunting[c]	26.9	31.1
Wasting[d]	8.7	9.3
Family Dynamics study (1997-2001) [f]	(N = 398)	(N = 431)
Underweight[b]	30.2	30.9
Stunting[c]	23.4	21.3
Wasting[d]	8.5	10.7

[a] Ministry of Health Study, 1999, carried out by the Family Health Development Division, was a household-based country-wide representative sample of children under five years old (Ministry of Health, 2001).
[b] Weight for age less than minus two standard deviations from the United States National Center for Health Statistics (NCHS) reference median.
[c] Height for age less than minus two standard deviations from the NCHS reference median.
[d] Weight for height less than minus two standard deviations from the NCHS reference median.
[e] Universiti Putra Malaysia (UPM) and Institute for Medical Research (IMR) study covered rural communities in Peninsular Malaysia with children aged 18 years and younger (Khor and Tee, 1997).
[f] Collaborative study led by Universiti Putra Malaysia, covering subsample of rural communities from the UPM-IMR study chosen for high prevalence of undernutrition among children one to five years old (Chee and others, 2002).

V. INDIGENOUS COMMUNITIES

Various studies have been conducted among the indigenous communities of Sabah, Sarawak and Peninsular Malaysia.[24] In the early to mid-1980s, a primary health-care project was conducted in the Baram District of Sarawak, one of the country's most disadvantaged and isolated areas (Chen and others, 1989a). In 1982, this study calculated an infant mortality rate of 97.8 per 1,000 live births for the Penans in Ulu Baram, which was very high compared with rates of 16.8 for Sarawak and 19.3 for Peninsular Malaysia in the same year. Among children from birth to five years old, 57 per cent were found to be stunted (as a result of chronic undernutrition). Immunization coverage was low; only 22 per cent had received BCG vaccination and 17 per cent had received three doses of vaccination for diphtheria, pertussis and tetanus (DPT). In other

[24] For a bibliographic reference on the Sarawak and Sabah studies, see Baer (2001); for Orang Asli studies, see Baer (1999).

areas, chronic undernutrition among Penan children (under six years old) was about 44-47 per cent. The situation of Kenyah children was slightly better compared that of the Penans; 31 per cent were stunted in Ulu Baram in 1982, and immunization coverage was also better.[25]

In 1987, a similar primary health-care project was started in the Keningau and Pensiangan districts, a poverty-stricken and underserved area in Sabah, which had a combined population of slightly over 50,000 (1980 population census). Nutritional assessment of children aged 0-5 years, conducted in 1987 and 1989, recorded 39-42 per cent stunting. Coverage of BCG immunization, however, was better (98 per cent), but only 41 per cent had received at least three doses of DPT vaccine (Chen and others, 1989b). Studies of other communities in the 1980s also recorded high prevalence of child undernutrition: moderate or severe protein energy malnutrition in 51 per cent of children under six years old in Lubok Antu, 82 per cent of Iban children throughout rural Sarawak, 95-98 per cent of children four to seven years of age in Kapit Division (1981-1983).[26]

In the 1990s, some improvement has been observed for Sarawak State as a whole, with one study using Health Department data reporting that only 23 per cent of children one to four years of age were underweight in 1995 compared with 33 per cent in 1982 (Duffield and Strickland, 1999 as cited in Baer, forthcoming). At the community level, there is a lack of comparable data between the 1980s and the 1990s, but general levels reported in the 1990s seem to be lower than those reported in the 1980s. For example, data from three rural clinics for the year 1999 showed 16 per cent, 20 per cent and 56 per cent moderate or severe malnutrition among Iban children under five years of age (Baer, forthcoming) compared with the much higher levels referred to in the preceding paragraph.

Goitre, iodine deficiency and anaemia were very widespread in the inland areas of Sabah and Sarawak, and continue to be so. Common infectious diseases among the rural indigenous communities are malaria, intestinal parasites, scrub typhus, tuberculosis, pneumonia, gastroenteritis and respiratory problems. The nutritional deficiencies are linked to environmental changes because deforestation and logging lead to a decrease in the animals and fish that used to be important protein sources; however, the ecological impact on the spread of infectious diseases has not been fully studied.

VI. CONCLUSION AND RECOMMENDATIONS

At the national level, the MDGs for child mortality and maternal health are on track to being achieved in Malaysia. However, while national, and even state, mortality rates have fallen to very low levels, considerable problems remain in certain sectors of the population. Child and maternal mortality and related health problems are important among indigenous groups, in particular, those affected by logging and land-clearing as well as those who have been resettled. There are, however, no available longitudinal statistics to enable a numerical accounting of the historical trend in maternal and child mortality rates in these communities. Nevertheless, the child and maternal health indicators for these communities are much worse than the national indicators. From a statistical perspective, when the overall mortality rates reach a very low level, they will most likely plateau, and further declines will have to depend on reducing the rates in the communities where they are still relatively high. Most of the attention will therefore have to be given to improving maternal and child health in these disadvantaged communities.

Maternal mortality at the national level is low, as is child mortality, although the rates in Sabah and Sarawak are still considered incomplete and, therefore, unreliable. Problems related to maternal health persist, in spite of official efforts directed at improving this situation. Anaemia and undernutrition are underlying problems in maternal mortality, which needs to be addressed together with the problem of child undernutrition. There are certain unresolved questions that require further research, notably the relatively high infant mortality rates in the capital city of Kuala Lumpur despite the generally lower rates recorded in other urban centres.

[25] The study reported that the situation improved after primary health-care intervention. The infant mortality rate dropped from 97.8 to 19.6 per 1,000 among the Penans in Ulu Baram, from 30.8 to 0 for the Kenyahs, and from 114 to 62 for the Penans in Tutoh (Chen and others, 1989).

[26] Reviewed in Baer, forthcoming.

The reasons for undernutrition among children have been well established – poverty, low household incomes, food insecurity, low education of mothers, inadequate supply of safe water and poor sanitation. The importance of a safe water supply cannot be overemphasized, and in this context, the loss of forested catchment areas, wasteful leakage of water as a result of bad infrastructure and poor water conservation practices are matters of concern. It is recommended that the Government should conserve water catchment areas and improve and extend water-supply infrastructure.

Child and maternal health problems could also be widespread among the migrant population, but are underresearched. The migrant labour population is about 1 million, but together with undocumented migrants, the total migrant population could be about 2 million. In general, not much research has been done on the health situation and access to health-care services of the migrant population in Malaysia. This issue is pertinent considering the perception among health workers that the spread of infectious diseases is related to the migrant population.

There are ongoing studies on the social and cultural aspects of HIV/AIDS, but these have yet to be completed. Attention has also been given to malaria, tuberculosis and other infectious diseases. However, there has been a lack of research that examines the infectious disease situation in totality, and in the context of economic development, movements of people and environmental changes. The MDGs may be focused on attaining certain specified numerical benchmarks, but it is in understanding and addressing population health problems in a holistic manner that will bring us further along in achieving them.

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Chapter VIII

Trends and Emerging Issues of Health and Mortality in the Islamic Republic of Iran

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Until the late 1940s, the population of the Islamic Republic of Iran had been growing at a very low rate (Bharier, 1968). The first national population and housing census conducted in 1956 revealed a population of 18.9 million with an average annual population growth rate of 1.7 per cent (Amani, 1968; Maroufi Bozorgi, 1967). Ten years later, according to the 1966 census, the size of the Iranian population had risen to about 25.8 million, which implies an average intercensal growth rate of 3.1 per cent per year (Bulatao and Richardson, 1994). After a decade of implementing a family planning programme in the period 1967-1976, the third national census taken in 1976 revealed an average annual intercensal growth rate of 2.7 per cent. However, the country's population grew very rapidly, at 3.9 per cent annually, during the period 1976-1986 mainly as a result of the pronatalist policy adopted after the 1979 revolution. By 1996, the Iranian population had reached 60 million (Statistical Centre of Iran, 1996).

Studies have shown that mortality decline has been the main factor behind the demographic transition in the Islamic Republic of Iran during the twentieth century (Saraie, 1998; 2000; Mirzaie, 1998). This was mainly due to the development initiatives of the Pahlavi regime during the 1960s; these were implemented under what were called "White Revolution" programmes. Mortality declined from 40 per 1,000 in 1900 to about 20 per 1,000 during the 1960s and 1970s (Amani, 1996). However, in the pre-revolutionary period, the level of mortality was high and there was a considerable gap between urban and rural areas.

The rise in the birth rate during the period 1976-1984 and the subsequent fall in the birth rate in the period 1985-2000 contributed to the demographic transition in the Islamic Republic of Iran. The total fertility rate increased to about 7.0 births per woman in 1979/1980, and then started to decline by the mid-1980s. There was a sharp fertility decline during the 1990s, and the total fertility rate decreased to the replacement level by the year 2000 (Abbasi-Shavazi, 2000; 2001; 2002). As a result of the change in the age structure of the population brought about by the rapid decline in fertility, the demand for education, health and other social needs, including employment, has increased. As the very large post-revolutionary birth cohort passes through the childbearing years, there may be a rise in the number of births ensuing from the baby boom generation's echo effect. This will in turn have many policy implications for the Iranian Government.

In the following section, we briefly describe socio-economic changes as well as the improvements in the health network system in the post-revolutionary period.

I. RURAL DEVELOPMENT AND THE EXPANSION OF THE HEALTH NETWORK SYSTEM

In 1956, about 69 per cent of the Iranian population lived in rural areas, but the figure declined to 62 per cent in 1966, to 53 per cent in

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1976 and to 43 and 39 per cent in 1986 and 1996 respectively (Statistical Centre of Iran, various years). Thus, the majority of the population (61 per cent) is now living in urban areas.

With rapid urbanization, the majority of the people have better access to health facilities in urban areas; as a result, mortality has declined. By contrast major changes have occurred in the rural areas of the Islamic Republic of Iran. Rural development initiatives after the 1979 revolution were aimed at improving conditions in rural areas and reducing the pre-revolutionary inequalities between rural and urban areas. A number of development projects were implemented to accomplish this goal. Soon after the revolution, the Construction Crusade Organization or *Jihad-e Sazandegi* was established to revive and develop the cultural, economic and social conditions of the rural and underdeveloped areas. The activities of this organization ranged from providing educational and health services to constructing roads and irrigation pools, extending the supply of drinking water, establishing the electricity network and distributing agricultural machinery and equipment. These activities contributed to the establishment of a sound and healthy rural environment after the revolution, and made rural areas of the Islamic Republic of Iran significantly different from those of other countries in the Central Asian subregion. By 1996, the majority of rural communities had access to primary health services (95 per cent), piped water (86 per cent), electricity (95 per cent), television (68.5 per cent) and radio (88 per cent) (Abbasi-Shavazi and others, 2002; Ministry of Health and Medical Education (MOHME), 2002). Such developmental processes facilitated the success of health programmes in general, but particularly in rural areas.

In addition, one of the important achievements of the Islamic Republic of Iran has been the expansion of the health network system. For the majority of the people, the health system during the 1940s and 1950s was very remote; most people in rural areas of the country did not have access to health services. A number of health projects, including the Malaria Reduction Project, were carried out to eliminate the main sources of infectious diseases during the late 1940s and 1950s. During the 1960s and 1970s, various attempts were made to modernize the country and reduce the inequality between rural and urban areas. Under the White Revolution, the Health Corps (*Sepaheyan-e Behdasht)* and the Literacy Corps (*Sepaheyan-e Danesh*) were employed and sent to rural and deprived areas of the country to improve the literacy and health levels of rural areas. That regime had also planned to establish a health network system throughout the country. West Azarbaijan Province was selected as the pre-test area; the aim was to expand the system throughout the country, although the project was not implemented before the revolution. Another initiative towards health improvement of the deprived regions and rural areas of the country was the employment of foreign medical doctors and practitioners from countries such as India, Bangladesh, the Philippines and Pakistan. These were sent to remote areas to provide services to rural people. This plan was continued until the late 1980s. However, by the late 1980s there was a surplus of medical doctors graduated from both government and private universities. The Government discontinued the programme for employing medical doctors from foreign countries and terminated the contracts of those who were already working in rural and underdeveloped areas.

In 1981, the Ministry of Health implemented the health network system that had been planned by the previous regime. The aim was to expand primary health-care services to people in the rural and deprived areas. By 2003, there were 15,394 health houses or health clinics (*khanah-e Behdasht)* throughout the country. Each health house, which is the most peripheral rural health facility in the network, provides services to about 1,500 people in the villages as well as surrounding satellite villages. Health houses follow an integrated health approach in rural areas. The main functions of a well-established health house include taking an annual census of the population covered, educating the public about health matters, providing family planning and reproductive health services, offering case findings and disease-control services and promoting environmental health as well as collecting, recording, storing and periodically reporting health information (Mehryar, 1996; 1997). Currently, the health houses cover more than 95 per cent of the rural population in the country. In addition to the village health houses, there are health centres at the district level as well as in urban areas. Health houses are usually supervised by rural health centres, situated in the same rural district, which are staffed by a general practitioner, several health technicians and administrative personnel. Urban health centers, which are similar to rural health centres, service about 12,000 people and provide ambulatory curative services.

The establishment of the health network system and the extension of it to the rural and deprived areas in the country have been among of the key factors in the improvement of health in general and in the reduction of infant mortality rates in particular.

II. SOURCE OF MORTALITY DATA

This section describes the main sources of data needed in the analysis of health and mortality trends, together with an assessment of the quality of data. The health improvements and the reduction of mortality are discussed thereafter. Mortality statistics in the Islamic Republic of Iran are collected mainly by three official sources, the Civil Registration Organization (CRO), the Statistical Centre of Iran (SCI) and the Ministry of Health and Medical Education. CRO is officially responsible for the timely collection of vital statistics, particularly births and deaths. However, studies have shown that death registration is far from complete (Zanjani, 1991; Zanjani and Koosehshi, 1992; Amirkhosravi, 1994; Amani, 1996). SCI also conducts decennial population censuses, but the data and information on mortality have been collected only in the last two censuses conducted in 1986 and 1996 (Mehryar and Malekpour, 1994). The Health Ministry collects and publishes morbidity and mortality statistics as a means of evaluating the impact of its health projects. Despite the fact that various organizations collect data on mortality, information on death and causes of death are far from complete. For this reason, mortality figures have always been based on indirect estimations drawn from census or vital registration data.

Information on causes of death is vital for monitoring the health, morbidity and mortality situation in any population. Despite its importance, however, CRO has not been able to collect the data necessary on causes of death for the following reasons. First, registration of death with accurate causes can have some legal and financial consequences for the family of the deceased. Second, diagnosis, registration, data-gathering, classification and information analysis about causes of death require an intersectoral effort across government organizations and institutions such as the aforementioned Health Ministry and CRO, the Medical Community Organization and the Forensic Medicine Bureau. Municipalities also engage in this effort.

In order to increase the coverage of timely registration of death and to collect data on the causes of death, the Death Registration Project was implemented in 1998 in collaboration with CRO, the Ministry (through district hospitals, health houses, health volunteers, the Forensic Medicine Bureau) and authorized cemeteries. The objectives of the project are to:

- Organize intersectoral cooperation among different responsible sectors at the district, provincial and national levels for managing the statistical death registration system;
- Establish the statistical death registration system and collect mortality data according to cause of death in terms of age, sex, region, district and province;
- Identify an approved and scientific model for monitoring the health situation, examine factors affecting the society's health and prioritize programmes according to the importance of each cause through calculation of the disease burden and related dangerous factors;
- Make continuous improvements in the diagnosis, registration, classification, collection and analysis of death data;
- Identify strengths and weaknesses of the project to further improve the data-collection system.

The project was aimed at covering the entire population, although initially it was implemented only in Booshehr Province; in 1999, it was expanded to three other provinces. In 2000, six other provinces were added to the project and by 2001 the project was implemented in 18 out of the 30 provinces in the Islamic Republic of Iran, thus covering about 37 million of the country's total population. The Government plans to expand the project throughout the country by 2005.

As part of this project, CRO is responsible for the timely recording of all deaths. Hospitals, cemeteries and rural councils as well as health houses were expected to complete unified forms and questionnaires related to the deceased and report the information gathered to the provincial committee of the project. If a death does not occur

in a hospital and the cause of death is not clear, a team from the health department, including a general practitioner and health official, identify and report the cause of death. The data are collected, compared and evaluated at the district health centre, and after omitting repeated cases, the defective and non-reliable cases are corrected through contact with the reporting sources. Information sought on a death includes the deceased's name, age, sex, place of residence, and cause and date of death. The collected data are then sent to provincial health centres where data entry occurs, using death registration software especially designed for this purpose. The software compares entered cases and deletes repeated ones after verification. This thorough procedure has improved data quality from the time of the initial phase of the project. The results of the project have been published separately for each phase (Naghavi, 2000; 2001; 2003). This paper uses the published information on causes of deaths based on the Death Registration Project in 18 provinces of the Islamic Republic of Iran.

In addition, some of the estimates on infant and child mortality in this paper are drawn from the Iran Demographic and Health Survey (DHS). The Health Ministry conducted the DHS in 2000 in collaboration with SCI, CRO, UNFPA and UNICEF. The survey covered about 114,000 households throughout the county and collected information on mortality as well as other demographic and health issues.

III. MORTALITY LEVELS AND TRENDS

Mortality in the Islamic Republic of Iran had been very high during the 1900s and the first half of the twentieth century. However, a substantial mortality decline has occurred in recent decades. Although the level of mortality during the late nineteenth century is unknown, estimates show that the crude death rate had been as high as 36 to 40 per 1,000 between 1880 and 1900 (Saraie, 1998; Amani, 1996). During the early twentieth century, mortality declined, albeit at a very slow pace. Amani (1996) showed that the crude death rate declined from about 36 per 1,000 during the period 1896-1901 to about 32 per 1,000 during the period 1926-1931, and then to about 24 per 1,000 during the period 1951-1956.

As mentioned previously, a number of health projects, including the Malaria Reduction Project, were carried out to eliminate the main sources of infectious diseases during the late 1940s and 1950s. During the 1960s and 1970s, as part of the White Revolution, members of the Health Corps were sent to rural and remote areas to put in place programmes to improve the health of the people. In addition, the first official family planning programme was started in 1966 and remained effective until the 1979 revolution. These programmes have contributed to the improvement of health and the reduction of mortality during the 1960s and 1970s. Consequently, mortality declined at a faster pace during this period as compared with the first half of the twentieth century. The level of mortality declined from 24 per 1,000 in the 1950s to about 14 per 1,000 and then to about 10 per 1,000 during the period 1986-1990 (Amani, 1996).

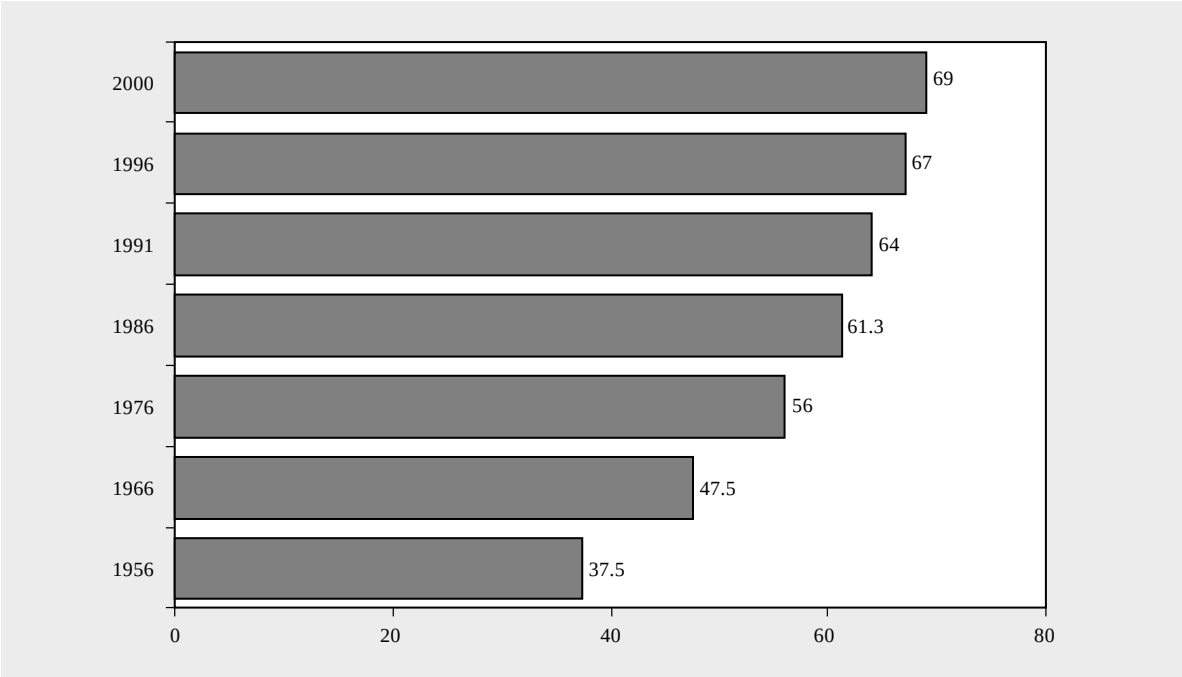
The mortality statistics published by organizations such as the Health Ministry, SCI and CRO were not always in agreement. Recently, the Committee for Unifying Mortality Statistics was established. After reviewing the estimates from various organizations, the Committee announced that the crude death rate (CDR) for 2001 was 5.87 per 1,000 (Statistical Centre of Iran, 2004). However, statistics derived from the Health Ministry for that year indicate that the rate was not higher than 5.0. Given the young structure of the population and the improvements in health status, for the national level CDR would not likely be higher than the figure accepted by the Committee.

The acceleration in the pace of mortality decline in recent decades is due to the reduction in under-five mortality and declining deaths caused by infectious diseases, as a result of the improvements in the health network system and increasing rural development in the post-revolutionary period. The young structure of the population in the Islamic Republic of Iran is also another factor bringing CDR to low levels.

Along with these changes, considerable gains have been observed in life expectancy at birth. Although there are no statistics for mortality during the early 1900s, scholars have estimated that life expectancy at birth was around 25 years in the period 1900-1920, which gradually increased to around 40 years in the 1940s and 1950s (Saraie,

1998; Amani, 1996). The results of the 1966 census showed that life expectancy had increased to 47 years in the period 1956-1966, and to 56 years in the period 1966-1976. The increase in life expectancy was pronounced during the last two decades because of the improvements in health conditions and the reductions in infant and child mortality. Studies showed that life expectancy at birth climbed to 61 years by 1986 and then to 67 and 69 years by 1996 and 2000, respectively (figure 1) (Mirzaie, 1998; Zanjani and Nourollahi, 2000; MOHME, 2002).

Figure 1. Life expectancy at birth for both sexes, Islamic Republic of Iran, 1956-2000



Source: Figures for 1956, 1966 and 1976 obtained from M. Mirzaie (1998). "Swings in fertility limitation in Iran", Working Paper in Demography, No. 82, Canberra, Australian National University; figures for 1986 and 1991 were obtained from H. Zanjani and M. Koosheshi (1992). *Study of Mortality in Iran* (Tehran: Urban Planning and Architecture Research Centre); and figures for 1986 and 1991 were obtained from the Ministry of Health and Medical Education (2002). *Iran Demographic and Health Survey* (Tehran: MOHME).

There is a two-year gap between the life expectancy for males and for females. In 1996, life expectancy for females was estimated to be 68.4 years while that of males was 66.1 years. There was also a gap between the life expectancy for males and females in rural and urban areas. Despite the improvement in health conditions in rural areas, male and female life expectancy was lower for those in disadvantaged areas compared with those living in urban areas. In 1996, the life expectancy for males and females in urban areas ranged from 67.4 to 70 years, while the figures for those in rural areas were about 65 and 66, respectively (Zanjani and Noorollahi, 2000).

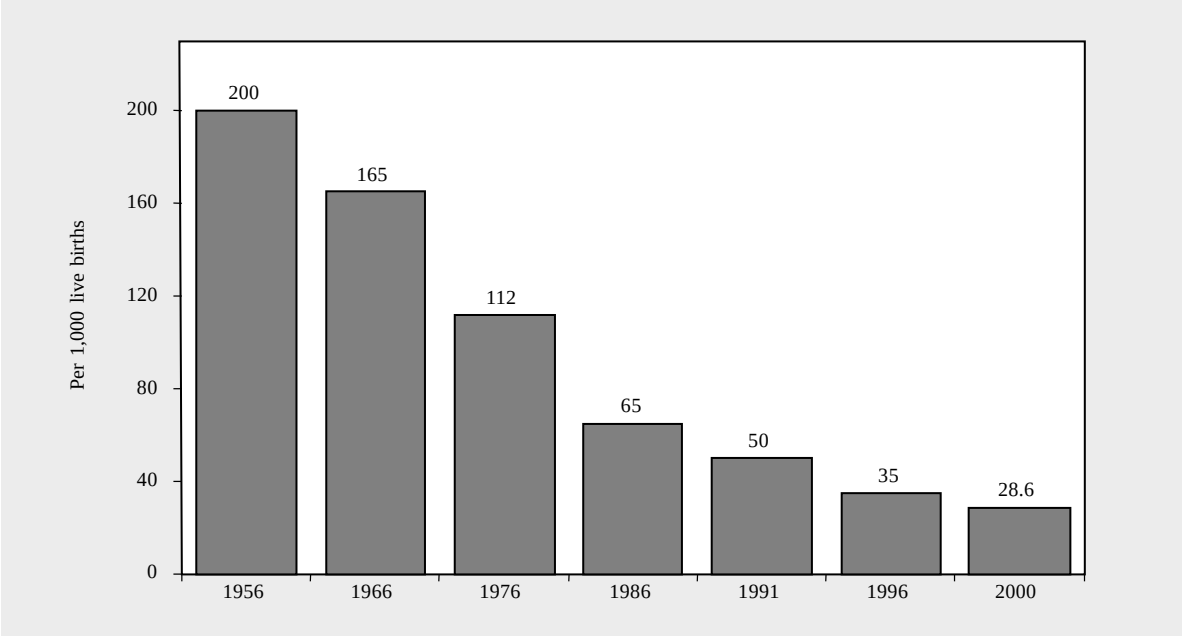
There were also provincial variations in life expectancy, which may be attributed to the level of socio-economic development in the provinces. Sistan Baluchistan Province, which is one the least developed provinces in the country, recorded the lowest life expectancy for males (60.7 years), females (62.2 years) and both sexes (61.5 years). Kohgilooyeh-Booir Ahmad, Ilam and Kosdestan should also be added to the list of provinces with lower life expectancies than others. On the contrary, such provinces as Isfahan, Tehran and Gilan enjoyed the highest life expectancies (above 68 years for both sexes) in 1996. These provinces are among the most developed in the country. Therefore, the health system should take into account provincial variations, and priority should be given to the remote provinces in terms of health policy formulation and implementation.

A. Infant and child mortality

Considerable improvement has been made in infant and child mortality rates in the Islamic Republic of Iran during the twentieth century. Evidence suggests that infant mortality was around 305 per 1,000 live births in the period in 1900-1920, but gradually declined during the first half of the twentieth century, falling to 256 per 1,000 live births in the period 1920-1940, and to 201 per 1,000 live births in the period 1940-1956 (Sariae, 1998, p. 56). Substantial declines in infant and child mortality rates were recorded in 1956 and 1976 owing to the implementation of development programmes under the regime in power during that period.

Based on the Population Growth Survey conducted in the period 1973-1976, Aghajanian (1993) showed that infant mortality was about 112 deaths per 1,000 live births while the rates for urban and rural areas were 76 and 130 deaths per 1,000 live births respectively. The rate calculated from the Iran Fertility Survey for the same period was 121 deaths per 1,000 live births, slightly higher than the rates based on the Population Growth Survey. The decline in infant mortality rates during the last two decades has been phenomenal. Recent statistics show that the rate decreased from 65 deaths per 1,000 live births in 1986 to around 29 deaths per 1,000 live births in 2000 (figure 2).

Figure 2. Trends in infant mortality rate, Islamic Republic of Iran, 1956-2000



Sources: Figures from 1956 to 1996 were obtained from M. Mirzaie (1998). "Swings in fertility limitation in Iran", Working Paper in Demography, No. 82, Canberra, Australian National University; and figures for 2000 were obtained from Ministry of Health and Medical Education (2002). *Iran Demographic and Health Survey* (Tehran: MOHME).

Several factors have contributed to the sharp decline in the infant mortality rate in recent decades. As mentioned previously, the increasing level of urbanization, the expansion of the health network system along with the increasing level of education and access to electricity and piped water have made the situation in rural areas of the Islamic Republic of Iran more favourable to the decline than in earlier periods. In 1996, around 58 per cent of the rural areas had access to electricity and around 87 per cent had access to piped water (Abbasi-Shavazi, 2000). The level of literacy in both rural and urban areas also increased sharply during the last two decades. For example, in 1976, around 75 per cent of women aged 15-19 years in urban areas and around 20 per cent of those in rural areas were literate. The figures increased to around 97 per cent and 85 per cent respectively in 1996 (table 1). The

results of a multivariate analysis by Zanjani and Koosheshi (1992, p. 123) using 1986 census data showed that factors such as female literacy rate, access to piped water and percentage employed in agriculture were the main factors determining life expectancy in rural areas. The impact of female literacy was much higher than that of other variables. In addition, owing to the increase in the coverage of vaccination, the prevalence of diarrhoea and respiratory tract infections has decreased. The improvement in child survival has been very important in the reduction of demand for children, which has contributed to the success of family planning programmes and the reduction in fertility in recent years. The fertility decline has also contributed to the improvement of maternal and child health.

Table 1. Literacy rate for women in the age groups 15-19 to 25-29 in the Islamic Republic of Iran, by rural and urban areas, 1966-1996

Age groups	*1966*		*1976*		*1986*		*1996*	
	Urban	*Rural*	*Urban*	*Rural*	*Urban*	*Rural*	*Urban*	*Rural*
15-19	57.7	5.4	75.4	19.8	85.8	53.0	96.9	86.4
20-24	41.2	2.7	59.4	10.1	75.8	36.5	93.8	77.9
25-29	29.5	1.4	49.4	4.9	65.5	22.0	89.5	65.4

Sources: Statistical Centre of Iran (various years). *Census on Population and Housing* (Tehran: SCI).

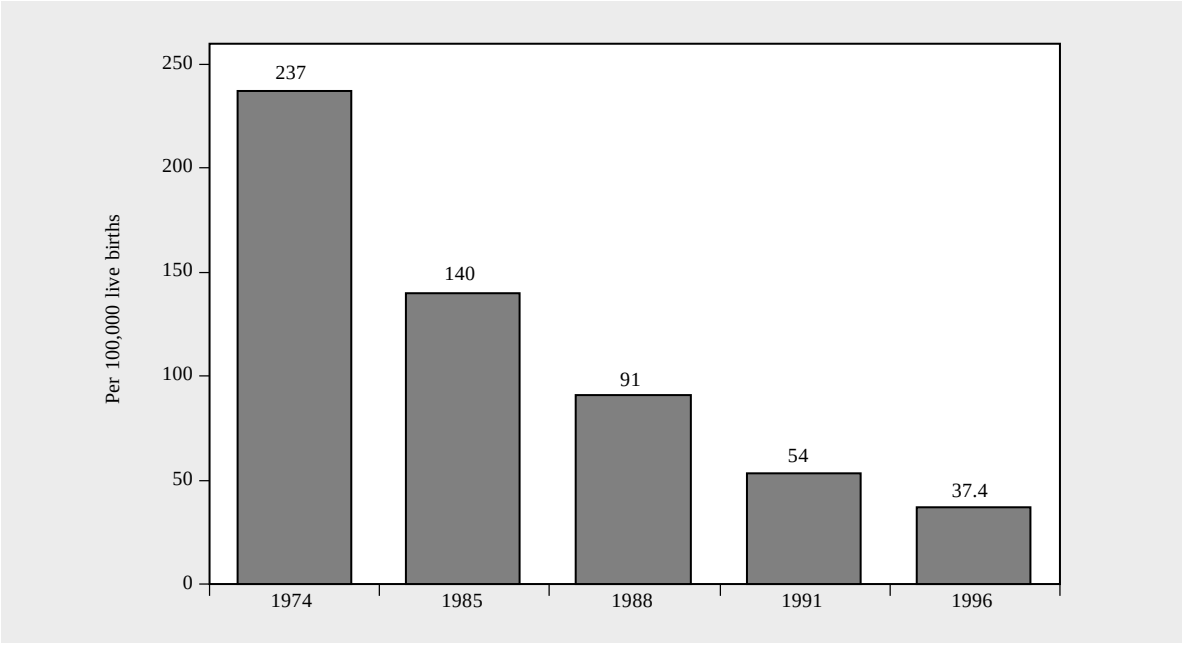
Despite the improvement in child survival, substantial differences exist in the level of infant mortality between rural and urban areas as well as across provinces in the Islamic Republic of Iran. For example, DHS (MOHME, 2002) showed that infant mortality for rural areas (30 deaths per 1,000 live births) was higher than that of urban areas (28 deaths per 1,000 live births). Sistan and Baluchistan provinces recorded the highest infant mortality rates, while Tehran, Gilan and Isfahan enjoyed the lowest such rates in the country. According to Health Ministry statistics (unpublished report), infant mortality rates in rural areas of the provinces covered by the health system declined significantly in 2003, but the figures ranged between 10 deaths per 1,000 live births in Tehran Province and 33 per 1,000 live births in Sistan and Baluchistan provinces. The rates were also high in provinces such as Lorestan (31 per 1,000 live births), Kordestan (29 per 1,000 live births), Kerman (29 per 1,000 live births) and Hormozgan (27 per 1,000 live births).

Provincial as well as rural-urban variations in health status call for further investigation and improvements. It should be noted that, despite the vast improvement in the health network system during the 1980s and 1990s, health houses in rural areas are facing serious challenges in the maintenance of their services. With the large flow of rural-to-urban migration during the last two decades, many people have left rural areas seeking a better life, including better health care and education, in urban areas. The Ministries of Health and Education and other organizations responsible for rural development planning are not as active and supportive as they were during the 1980s, and this has had a considerable impact on the health of the people who are still living in rural areas. Furthermore, little is known about the health of minority groups; thus, further research in these areas is needed.

B. Maternal mortality

Figure 3 also shows the trends in maternal mortality from 1974 to 1996. There has been a remarkable drop in the maternal mortality ratio from around 237 deaths per 100,000 live births in 1974 to 140 per 100,000 live births in 1985. A significant decline in maternal mortality also occurred during the subsequent decade, 1986-1996, falling to 91 deaths per 100,000 live births in 1988, to 54 per 100,000 live births in 1991 and then to 37.4 per 100,000 live births (54.5 in rural areas and 24 in urban areas) in 1996 (Mehryar and Malekpour, 1994; and MOHME, 2002).

Figure 3. Trends in maternal mortality, Islamic Republic of Iran, 1974-1996



Sources: A. Mehryar and M. Malekpour (1994). *Changing Pattern of Mortality in Iran: A Review of Available Evidence* (Tehran Institute for Research in Planning and Development); and Ministry of Health and Medical Education (2002). *Iran Demographic and Health Survey* (Tehran: MOHME).

It should be mentioned that the maternal mortality ratio has always been estimated by indirect methods. However, in 1996, at the request and expense of the Health Ministry, the Statistical Centre of Iran included a question in the post-enumeration survey administered to households with the aim of identifying women aged 15-49 who had died. Following the census, the Health Ministry conducted a follow-up survey and re-interviewed the households that reported a woman aged 15-49 as having died in the census period in order to identify whether that death had been due to a complication of pregnancy, the delivery of a child, or other medical problem. The figure for 1996 is, therefore, a direct calculation based on a national survey covering all dead women. Recent data collected through the National Maternal Mortality Surveillance System under the Health Ministry indicates that in 2003 only 332 cases of maternal mortality had been reported (Department of Family Health and Population, 2004). The estimates for the number of births ranged between 1,172,000 and 1,300,000. Thus, with either of these figures, the maternal mortality ratio for the Islamic Republic of Iran for the year 2003 is estimated to be between 25.5 and 28.3 deaths per 100,000 live births.

The phenomenal decline in maternal mortality during the decade 1985-1996 was due to the tremendous improvements in maternal and child heath care in the Islamic Republic of Iran. According to the DHS, in 2000 more than 90 per cent of deliveries occurred in hospitals or clinics. With the increase in female education, women were more likely to be concerned about having safe pregnancies and deliveries. The other reason for the reduction in maternal mortality was the sharp fall in fertility in recent years. Studies have shown that the total fertility rate for Iranian women in both urban and rural areas declined from 7.0 children per woman in 1979 to the replacement level (about 2.1 children per woman) in 2000 (Abbasi-Shavazi, 2000; 2001; 2002).

Despite the high percentage of deliveries occuring in hospitals (75 per cent in rural areas and 95 per cent in urban areas), statistics show that around 63 per cent of maternal mortality is due to the low quality of care provided in hospitals, including inappropriate, inefficient or mistimed care.

C. Mortality by causes of death

As the major causes of death shift from communicable diseases to non-communicable conditions during the mortality transition, major risk factors shift from those originating from poverty and underdevelopment to conditions associated with lifestyle and the environment (Choe, 2004). In this section, using various data mentioned previously, mortality by causes of death in the Islamic Republic of Iran is analysed.

There is insufficient data on mortality by causes of death to facilitate the study of the course of the mortality transition during the early twentieth century. However, in view of the high mortality and particularly high infant mortality rates it can be concluded that socio-economic and health conditions during the early twentieth century were characterized by a high incidence of death from infectious diseases. It is for this reason that a national pesticide campaign was launched during the 1940s and 1950s to reduce the number of deaths resulting from pest-borne infectious diseases.

Until recently, no comprehensive study has been undertaken at the national level on the causes of death in recent decades. However, a few studies have been conducted at the provincial and regional levels. For example, in a study of the mortality situation in greater Tehran in 1977, Farahani and Kazemipour (1977) found that diseases of the circulatory system (26.9 per cent), respiratory diseases (12.7 per cent) and internal, infectious and parasitic diseases (11.9 per cent), followed by neonatal diseases (10.4 per cent) were the main causes of death. Accidents, poisoning and suicide comprised only 9.2 per cent of the deaths at that time.

The data collected by the previously mentioned Death Registration Project enabled the examination of mortality by causes of death and such demographic characteristics as age, sex and residence. The results presented in this section are based on the findings of the data collected in 18 provinces of the Islamic Republic of Iran, the population of which was 36 million in 2000.

Table 2 shows the distribution of total deaths by cause for urban and rural areas as well as for males and females in 2000. WHO's *International Statistical Classification of Diseases and Related Health Problems* (ICD-10) was used for defining the causes of death under 20 main categories; data on about 130 specific causes of death were collected. The results show that the majority of deaths may be explained by seven causes as shown in the table, while the rest (34 per cent) were categorized as other causes, which will be explained later in this section. As can be seen from the table, cardiovascular diseases (35 per cent), followed by accidents (12 per cent) and cancer (11 per cent) are the three main causes of death. Deaths from prenatal diseases also contribute to around 4.5 per cent of the total deaths in the Islamic Republic of Iran. However, the rates for suicide (1.5 per cent) and violence (1.0 per cent) are also notable. Infectious diseases are far less important as a cause of death (1.7 per cent), indicating that the mortality transition from high to low levels of mortality has occurred with the shift towards non-communicable diseases. "Other causes" are responsible for 34 per cent of deaths, but owing to the limitations of space they are not presented in the table. These causes include congenital malfunction and chromosomal abnormality, respiratory diseases, symptom signs

Table 2. Percentage of total deaths, by cause, area and sex, in 18 provinces of the Islamic Republic of Iran, 2000

Area and sex	*Cardio-vascular diseases*	*Cancers*	*Accidents*	*Prenatal causes*	*Suicide*	*Infectious diseases*	*Violence*	*Other*	*Total*
Total	34.8	10.7	12.0	4.4	1.5	1.7	1.0	33.9	100.0
Rural	33.8	11.7	12.4	4.5	1.9	1.6	1.2	32.8	100.0
Urban	35.4	10.0	11.8	4.3	1.3	1.7	0.9	34.6	100.0
Males	33.1	11.2	15.7	4.2	1.3	1.6	1.5	31.5	100.0
Females	37.5	10.0	7.0	4.2	1.9	1.8	0.3	37.3	100.0

Source: M. Naghavi (2003). *Situation of Mortality in 18 Provinces of Iran* (Tehran: Ministry of Health and Medical Education).

Note: The provinces included in the project are as follows: Markazi, Isfahan, Ilam, West Azarbaijan, Booshehr, East Azarbaijan, Fars, Kerman, Gilan, Zanjan, Kordestan, Semnan, Khorasan, Charmahal Bakhtiari, Kashan, Kermanshah, Golestan, Hamadan and Yazd.

and abnormal clinical and laboratory findings not classified elsewhere, psycho-behavioural diseases and neuro-system diseases.

The pattern of causes of diseases for both rural and urban areas is identical to the national level. However, the percentage of cardiovascular diseases in urban areas (1.6 per cent) is slightly higher than in rural areas. The other striking differences are the higher incidence of accidents and suicides in rural areas than in urban areas. The proportion of deaths from prenatal causes is relatively similar in both rural and urban areas, which is an indication of improvements in the health network system and the expansion of maternal and child health care in rural areas of the Islamic Republic of Iran.

Table 2 also shows causes of death for males and females. Although the general pattern of causes of death is similar for both males and females, differences exist between the three main causes of death for both sexes. As expected, the proportion of deaths from accidents is much higher for males (15.7 per cent) than females (7 per cent). This is also true for deaths due to violence, which is significantly higher for males than females. On the contrary, the proportion of cardiovascular diseases is higher among females than males.

D. Mortality by causes of death and age

The age pattern of causes of death is shown in table 3. Prenatal causes were the main causes of death for under-five mortality, followed by accidents and infectious diseases, mainly acute respiratory infections and diarrhoea. On the contrary, cardiovascular diseases were a common cause of death in the age groups 40-44 and higher, ranging from around 29 per cent to 52 per cent. For example, about half the deaths in the age group 55-79 were due to cardiovascular diseases.

As expected, accidents were the cause of death at young ages, particularly in the age group 20-29 for which around 47 per cent of deaths were due to accidents. Strikingly, accidents (mainly car and motorcycle accidents) were also the main cause of death in the age groups 5-9 and 10-14. However, in view of the very young population structure

Table 3. Percentage of total deaths, by cause and age, in the Islamic Republic of Iran, 2000

Age groups	*Cardio-vascular diseases*	*Accidents*	*Cancers*	*Prenatal causes*	*Infectious diseases*	*Suicide*	*Violence*	*Other*	*Total*
0-4	3.0	7.2	1.1	48.8	5.1	0.0	0.1	34.7	100.0
5-9	8.0	43.7	10.1	0.2	2.3	0.0	1.2	34.4	100.0
10-14	6.4	40.1	12.2	0.2	3.2	4.1	1.5	32.4	100.0
15-19	6.5	42.7	9.8	0.0	1.3	12.8	3.9	23.0	100.0
20-24	4.8	47.4	6.1	0.0	1.7	12.4	7.5	20.0	100.0
25-29	8.3	47.5	7.0	0.0	1.8	8.3	5.9	21.2	100.0
30-34	13.0	40.9	10.2	0.0	1.6	5.4	5.8	23.1	100.0
35-39	17.4	34.1	13.7	0.0	2.4	3.4	3.8	25.1	100.0
40-44	28.5	27.2	14.8	0.0	1.7	2.9	1.9	22.9	100.0
45-49	35.5	21.0	16.7	0.0	2.1	1.5	1.4	21.8	100.0
50-54	45.2	12.4	18.5	0.0	1.2	1.3	0.9	20.5	100.0
55-59	48.1	9.1	18.6	0.0	1.4	0.8	0.6	21.4	100.0
60-64	49.4	7.4	17.7	0.0	1.2	0.3	0.2	23.8	100.0
65-69	52.6	5.7	14.9	0.0	1.2	0.3	0.2	25.2	100.0
70-74	50.9	3.8	13.5	0.0	1.1	0.2	0.2	30.3	100.0
75-79	49.3	3.0	10.9	0.0	1.3	0.1	0.0	35.4	100.0
80-84	35.6	1.8	6.1	0.0	1.1	0.1	0.0	55.2	100.0
85-89	32.2	1.8	3.5	0.0	0.9	0.1	0.0	61.4	100.0
90-94	27.0	1.5	2.7	0.0	1.2	0.0	0.0	67.6	100.0
95+	22.5	1.3	2.5	0.0	0.6	0.1	0.0	73.1	100.0
Total	34.8	12.0	10.7	4.4	1.7	1.5	1.0	33.9	100.0

Source: M. Naghavi (2003). *Situation of Mortality in 18 Provinces of Iran* (Tehran: Ministry of Health and Medical Education).

of the Islamic Republic of Iran, the proportion and the number of deaths from accidents are very high. Thus, preventive measures should be taken to save the lives of more people. Moreover, it should be noted that about 12-13 per cent of deaths in the age groups 15-19 and 20-24 are a result of suicide.

In general, the above-mentioned pattern holds for rural and urban areas as well as for males and females. However, there are slight differences between the level of each cause by age, area and sex. For example, suicide in the age groups 15-19 and 20-24 was considerably higher among females than males. The figures were also higher for those living in rural areas than those living in urban areas.

Considering the index of the expected number of years of life lost, accidents have been the leading cause of death in the Islamic Republic of Iran owing to the high incidence of death from accidents among persons at young ages (Naghavi and Akbari, 2002).

IV. OTHER EMERGING HEALTH ISSUES: ADOLESCENTS AND OLDER PERSONS

Within the mix of population issues meriting attention, adolescent reproductive health and population ageing and the health condition of these two groups are among the emerging health issues in the Islamic Republic of Iran.

Owing to the country's very young population structure along with the increasing level of education and the rise in the age at marriage, adolescent reproductive health has emerged as one of the main issues which should be addressed by the Government and particularly the health system.

The Iranian population, though still currently young, will age rapidly in the future. In 2002, those aged 65 and older accounted for only 5 per cent of the population, but this segment of the population will increase to 22 per cent of the total by 2050 (United Nations, 2002). Behind this rapid shift in the age structure are the rapid fertility decline and substantial improvements in life expectancy. The initial increase and subsequent fall in fertility over the last two decades has created a unique age structure, reflecting the current very young population that will be followed by an ageing population in the coming decades. The issue of ageing in the Islamic Republic of Iran becomes much more salient and current, however, if note is taken of the considerable movement of young people from rural to urban areas. The issues involved include increased burdens of chronic disease, appropriate and affordable health care and social support, the role of family members, and pension and income security schemes (Abbasi-Shavazi, McDonald and Hosseini Chavoshi, 2004).

These concerns present many challenges to the country, particularly for the rural health-care delivery system. Further studies are needed to identify the demographic, socio-economic and health status of older persons in the Islamic Republic of Iran, and to examine the adequacy of the health and support systems for older persons. Such studies should assess the implications for programmes and policies relating to the health-care system and old-age security that affect the well-being of older persons, particularly in the rural areas.

V. SUMMARY AND CONCLUSION

This paper reviewed the socio-demographic changes in the Islamic Republic of Iran and examined the level and trends of mortality over the last 50 years. Findings from various studies show a remarkable fall in mortality rates, particularly infant and child mortality, and a substantial rise in life expectancy at birth for both males and females in rural and urban areas. The analysis has also revealed a shift in disease patterns from infectious and communicable diseases to non-communicable diseases. Cardiovascular diseases, accidents and cancers are the three main causes of death for males and females in both rural and urban areas. The Health Ministry has taken various steps towards further improvement of the health-care system, taking into consideration the recent changes in death and mortality transition.

In view of the fact that the majority of deaths are caused by cardiovascular diseases, accidents and cancers, the Government should adopt appropriate strategies to reduce the number of deaths from these causes. Monitoring the health of older persons, including providing services for health check-ups and cholesterol control as well as behavioural changes including diet and exercise, should be a

prime strategy in attempting to reduce cardiovascular diseases. Another issue is the expansion of advanced medical technology and access to specialized doctors and hospitals, which is possible only through the increase in coverage of insurance and government subsidies to monitor the health of older persons.

As shown, accidents are the second highest cause of death; they occur mainly among people at young ages. In view of the young population structure, policies aimed at reducing traffic accidents among young people would contribute to a further fall in mortality. The introduction of heavy penalties on unlawful driving, stronger controls on the issuance of driving licences along with improvements in motorcycle and car production, as well as public awareness about safety issues would contribute to the reduction of mortality as a result of accidents among the young. Despite the improvements in health and the reduction in mortality, few studies have examined the trends and levels of mortality by causes of death in the Islamic Republic of Iran. Further studies are needed to deepen understanding of the mortality transition in the country.

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