Recent Levels and Trends of Fertility and Mortality in Myanmar

Fertility is still high, but there has been some decline. Mortality has declined, but the decline has slowed in recent years

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In Myanmar, the vital registration system was first introduced into some parts of Lower Myanmar in the late nineteenth century and gradually expanded to other parts of the country. It was introduced into the towns of Upper Myamnar in 1906 and the villages of Upper Myanmar in 1907 (Kyin,

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1959, p. 6). By 1931, about 82.5 per cent of the population was covered by the registration system (United Nations, 1959, p. 47). In those days, vital statistics were collected by municipal health offices in urban areas and by village headmen in the rural areas. The reports were published by the Department of Public Health (Sundrum, 1957, p. 7).

Although vital registration was completely stopped during the Second World War, it was revived soon after the war and covered 78 municipalities (Hpu, 1984, p. 3). Then a new system of vital registration, starting with Yangon City and 15 other towns, was introduced on 8 February 1962. It was gradually extended to other towns in the country and by the end of 1984, 245 out of 288 towns were covered (Central Statistical Organization (CSO), 1990, p. 1). However, the vital registration system for the rural areas covers only 25 out of 314 townships. According to a Vital Statistics Report (CSO, 1990, p.1), in 1984 the vital registration system covered 97.4 per cent of the total urban population, but only 33 per cent of the total rural population.

Nowadays, the vital statistics are collected under the authority of the Department of Health, and compiled and published jointly by the Central Statistical Organization. However, the vital registration system covers births (live and still births) and deaths only. Moreover, the latest published report is for the year 1984.

Current level of fertility

Table 1 shows that the crude birth rate (CBR) in the urban areas fluctuated around 40 per thousand until the early 1970s, except for the years 1952 to 1954; thereafter, a fertility decline has been in progress. Between 1971 and 1976, the reported CBR declined by more than 28 per cent. Comparing the reported CBR for five-year averages, there was an 11.7 per cent decline from 1966-1970 to 1971-1975, and a 21.0 per cent decline between 1971-1975 and 1976-1980. Because of variable coverage and probable under-registration, the levels of fertility given in table 1 could hardly be considered reliable and are more likely to be under-estimates. Nevertheless, the fertility decline in urban areas started around 1970. It accelerated in the late 1970s and became stable again at around 28 per thousand women in the 1980s.

However, since the vital registration system fails to represent the whole country, it was decided to make indirect estimates using the census information. The 1983 census reports include tables on the number of live births by the age of the mother. The age-specific fertility rates (ASFRs) and the total fertility rates (TFRs) are calculated, with proper adjustments for errors in reporting by means of the Brass (Brass and Coale, 1968, p. 88),

Table 1: Number of towns covered by vital registration and vital rates in urban Myanmar, 1948-1989

Year	No. of towns	CBR	CDR	MMR	IMR
1948	n.a.	37.2	31.9	n.a.	266.8
1949	n.a.	38.3	48.4	n.a.	350.6
1950	n.a.	39.6	46.8	n.a.	304.0
1951	n.a.	46.1	39.3	n.a.	252.8
1952	n.a.	31.7	34.2	n.a.	239.2
1953	n.a.	31.7	21.6	n.a.	230.6
1954	n.a.	33.9	20.0	6.3	196.3
1955	n.a.	36.6	20.7	5.1	175.9
1956	n.a.	35.6	21.7	5.8	166.8
1957	n.a.	35.8	21.3	6.4	164.3
1958	n.a.	36.6	19.4	4.9	147.6
1959	n.a.	39.8	19.7	4.7	136.9
1960	n.a.	42.3	20.0	4.2	148.6
1961	n.a.	35.8	18.4	3.8	129.9
1962	n.a.	36.2	16.0	8.8	121.5
1963	50	42.7	18.3	4.6	121.8
1964	78	41.0	17.9	3.5	115.4
1965	104	41.3	16.4	3.1	115.0
1966	119	39.5	13.1	2.9	82.8
1967	145	40.6	11.6	2.3	63.7
1968	152	39.1	11.7	1.6	60.2
1969	128	39.6	12.1	1.6	62.4
1970	139	37.6	10.4	1.8	55.8
1971	138	39.2	10.9	1.9	57.7
1972	126	38.0	10.9	1.7	59.0
1973	170	32.5	9.5	1.6	49.9
1974	178	34.1	10.5	1.5	49.3
1975	164	29.7	10.1	1.4	51.9
1976	145	28.2	9.8	1.6	49.2
1977	115	27.2	9.1	1.4	50.8
1978	159	27.0	8.6	1.5	46.0
1979	158	27.8	8.6	1.4	46.2
1980	146	26.9	8.1	1.3	44.0
1981	145	27.7	8.7	1.3	47.3
1982	151	27.6	8.6	1.2	47.1
1983	167	28.3	9.0	1.2	47.2
1984	167	28.3	9.0	1.4	47.1
1985	168	28.6	8.7	0.9	44.7
1986	169	28.5	8.5	1.0	44.5
1987	169	28.6	8.4	0.9	44.5
1988	169	28.6	8.9	1.0	47.0
1989	169	28.5	8.8	1.0	47.1

Sources: Nyan Myint (1988, pp. 35,69); CSO (1990); Ministry of Planning and Finance, MPF (1990, p. 207).

Note: CBR = crude birth rate; CDR = crude death rate; MMR = maternal mortality rate; IMR = infant mortality rate, all of which data are per thousand; and n.a. = not available.

Trussell (United Nations, 1983, p. 32) and Arriaga (1983) methods, using information on children ever born (CEB).

From table 2, the rural-urban differential in fertility can be clearly seen. The reported TFR in the rural areas exceeded that in the urban areas by about 1.8 live births per woman. The difference is almost the same after adjusting for under-reporting. Among the States and Divisions, Chin State had the highest TFR with 6.5 live births per woman and Yangon Division, where the capital city, Yangon, is situated, had the lowest TFR, i.e. 4.2. The level of fertility in the States exceeded 5.5 births per woman except for Shan

Table 2: Reported and adjusted values of total fertility rate by State and Division in 1983 (per woman)

Region	1983 census	Brass	Trussell	Arriaga
Myanmar	4.81	5.24	5.26	5.27
Rural	5.29	5.73	5.73	5.67
Urban	3.47	3.88	3.92	4.11
States				
Kachin	4.94	5.46	5.62	5.73
Kayah	5.37	6.25	6.18	6.22
Kayin	4.84	5.59	5.69	5.67
Chin	5.26	6.31	6.39	6.45
Mon	5.09	5.56	5.59	5.53
Rakhine	5.17	6.00	6.00	5.87
Shan	3.81	5.01	5.01	4.99
Divisions				
Sagaing	5.20	5.73	5.74	5.85
Bago	4.78	5.07	5.09	5.06
Magway	5.45	5.54	5.55	5.58
Mandalay	4.81	5.43	5.43	5.52
Tanintharyi	4.83	6.13	6.17	6.00
Yangon	3.77	4.03	4.06	4.19
Ayeyarwady	5.33	5.06	5.05	4.97

Source: Nyan Myint (1988, p. 39).

State, which had only 5.0 births per woman. Among the Divisions, only Magway, Sagaing and Tanintharyi had a TFR of over 5.5.

CBR was estimated indirectly using the adjusted ASFR obtained from the afore-mentioned methods using the enumerated population for each area/region. In the 1983 census, there were quite large estimated populations in some States. However, since the information on fertility and age distribution of these estimated populations was not available, they were assumed to be the same as those of the enumerated population. The various

Table 3: Reported and estimated values of crude birth rates by State and Division in 1983 (per thousand mid-year population)

Region	Census	Brass	Trussell	Arriaga	VSR
Myanmar	**34.4**	**37.5**	**38.3**	**38.4**	**n.a.**
Rural	36.9	40.0	40.7	40.3	n.a.
Urban	26.9	30.1	31.0	32.5	27.7
States					
Kachin	35.4	39.1	41.1	41.8	33.7
Kayah	37.0	43.1	43.4	43.7	45.6
Kayin	33.7	39.0	40.3	40.3	30.1
Chin	37.7	45.2	46.6	47.0	32.4
Mon	35.3	38.6	39.6	39.2	29.2
Rakhine	37.8	43.9	44.7	43.8	27.4
Shan	28.1	36.9	37.6	37.4	33.3
Divisions					
Sagaing	36.4	40.2	41.0	41.7	27.0
Bago	33.6	35.7	36.4	36.2	25.5
Magway	38.1	38.8	39.4	39.7	28.8
Mandalay	34.1	38.6	39.3	39.9	28.2
Tanintharyi	32.9	41.8	42.9	41.8	27.1
Yangon	28.8	30.8	31.6	32.6	26.9
Ayeyarwady	38.0	36.1	36.7	36.1	26.7

Sources: Nyan Myint (1988, p, 42).

Note: VSR = 1981 Vital Statistics Report (CSO, 1986, p. 13).

CBR estimates for Myanmar as a whole, urban areas, rural areas and the States and Divisions are presented in table 3.

From table 3, it may be observed that the estimates from the Vital Statistics Report of CBR for urban areas of the States and Divisions lie between 27 and 33 per thousand population, except for Kayah State with 46. However, Kayah State is the smallest, in terms of population among the States and Divisions, with fewer than 20,000 urban females. Also, the high fertility in urban Kayah State could hardly affect the fertility level of Myanmar or urban areas as a whole. All States, except Rakhine and Mon States, had a CBR of more than 30 per thousand whilst all Divisions had a CBR of less than 29. Thus, the States had a higher level of fertility than the Divisions.

As with TFR, the three indirect estimates of CBR (by the Brass, Trussell and Arriaga methods) varied mostly within 1.1 per thousand mid-year population or within 3 per cent. The estimates of CBR by the Arriaga method for Myanmar as a whole, rural and urban areas were 38.4, 40.3 and 32.5 per thousand mid-year population, respectively. Two out of seven States had a CBR of less than 40.0 whereas five out of seven Divisions had a CBR of less than 40.0. The lowest CBR, i.e. 32.6, was found to be in Yangon Division; Chin State was highest with 47.0.

From table 3, it can also be seen that the estimate of CBR for the urban areas given by the Vital Statistics Report was an underestimate. However, when compared with the CBR from the 20 per cent sample of the 1983 census, the 1981 Vital Statistics Report seems to give a reasonable estimate for urban areas as a whole. The estimate from the vital registration referred to the year 1981, and the census referred to the period 1982-1983: the Vital Statistics Report was 1.5 years previous to that and indicated that CBR was 0.8 birth higher.

Recent fertility trends and determinants

For recent trends in fertility, the indirect estimates of fertility, using two census age distributions, were computed by the Palmore method. The "Class 3, Type 1" equations are applied in this study. These equations require the census age distribution, female marital status distribution and an estimate of infant mortality only. Infant mortality was estimated by the Trussell method (in subsequent sections). The Rele method was also applied, but estimates of TFR were much lower than the TFR given by the 1983 census (see table 2).

Table 4: Recent trends and levels of fertility in Myanmar (estimated by the Palmore method)

Period	Area	TFR	% change	CBR	% change	TFR (R)
1973	Myanmar	5.65	n.a.	39.4	n.a.	5.13
	Rural	5.66	n.a.	39.4	n.a.	5.27
	Urban	5.29	n.a.	37.3	n.a.	4.68
1983	Myanmar	4.59	- 18.8	35.0	- 11.2	4.20
	Rural	4.87	- 14.0	36.4	- 7.6	4.59
	Urban	3.52	- 33.5	28.8	- 22.8	3.15

Sources: Nyan Myint (1988, p. 45).

Notes: CBR = crude birth rate; TFR = total fertility rate; TFR(R) = TFR estimated by the Rele method.

The decline in fertility during the period 1973-1983 and differential fertility by rural/urban residence can be seen clearly in table 4. It is apparent that the rate of fertility decline was much faster in urban areas. In 1973, the TFR differed by only 0.4 birth per woman, but by 1983, the difference between rural and urban was 1.4 births per woman. During the recent intercensal period, 1973-1983, the TFR declined by 19 per cent in Myanmar as a whole, 14 per cent in rural areas and 34 per cent in urban areas. Similarly, during the same period, CBR declined by 11, 8 and 23 per cent in Myanmar as a whole, rural areas and urban areas, respectively. Within 10 years, CBR declined by 8.5 per thousand population. If these estimates are correct, the population growth rate declined nearly 1 per cent between 1973 and 1983.

To examine the causes of fertility decline, the singulate mean age at marriage (SMAM) and Coale's indices of fertility were computed. In computing Coale's indices of fertility, it was assumed that there was only an insignificant number of ex-nuptial births; thus, I_h, the index of fertility of non-married women, is set at zero. Since there is no fertility information available from the 1973 census, the number of births given by the Arriaga method was used.

From table 5, it can be seen that the SMAMs in 1983 as compared with those in 1973 were one year higher for females in rural areas and 1.5 years higher for females in urban areas. Since the increase in the age at

Table 5: Some fertility determinants in Myanmar

Period	Area	SMAM	I_f	I_m	I_g
1973	Myanmar	21.3	0.467	0.705	0.663
	Rural	21.1	0.480	0.718	0.668
	Urban	21.9	0.429	0.664	0.646
1983	Myanmar	22.4	0.400	0.654	0.612
	Rural	22.1	0.434	0.673	0.645
	Urban	23.4	0.304	0.599	0.507

Sources: Nyan Myint (1988, p. 46).

Notes: SMAM = singulate mean age at marriage;
I_f = index of overall fertility;
I_m = index of proportion married; and
I_g = index of marital fertility.

marriage has played an important role in fertility decline in most developing countries (United Nations, 1987, p. 371), the increase in SMAM in Myanmar might also be an important factor for fertility decline during 1973-1983 although SMAM was already high in 1973. This can be seen clearly by analysing the Coale indices of fertility.

Since I_h was assumed to be negligible, I_f, the index of overall fertility, may be expressed as the product of two other indices, I_m, and I_g.

I_m, the index of the proportion married, is expressed as the Malthusian factor in fertility control; it shows the extent of limitation of fertility through delay of marriage. The decline in I_m revealed a greater delay of marriage. On the other hand, I_g, the index of the fertility of married women, usually explains the control of fertility within marriage. It reflects the effect of neo-Malthusian fertility reduction (Coale, 1967, p. 206). The decline in I_g shows greater use of fertility control methods.

The overall fertility, I_f, in Myanmar fell from 0.47 to 0.40 of national fertility, a fall of 15 per cent within 10 years. Of the 15 per cent decline, the increase in age at marriage, I_m, accounted for 8 per cent and fertility control within marriage, I_g , the other 7 per cent. It seems as if fertility control within marriage increased in the period 1973-1983. Moreover, fertility control was much higher in urban areas than in rural areas. During the same period, the index of overall fertility fell by 10 per cent in rural areas and by 29 per cent in urban areas.

Increasing fertility control within marriage is related to the availability of cheap contraceptives through various ways and means since the mid-1970s. Nowadays, although Myanmar has no official family planning programme, personal observations indicate that the use of modern contraceptives is widespread in almost all regions and by various classes of people.

A factor associated with increasing age at marriage and the use of fertility control methods is higher female literacy. During the period 1973-1983, the literacy rate for females aged 10 and above increased from 61 to 74 per cent in Myanmar as a whole, from 7.5 to 84 per cent in urban areas and from 56 to 70 per cent in rural areas. However, the level of fertility can be studied neither through the level of education nor the literacy of women because of data limitations.

Recent levels of mortality

Although the new vital registration system covers most of the urban areas, Hpu (1984, p. 88) revealed that the published death rates are lower by 30 per cent for males and 40 per cent for females when compared with the perceived rates during 1972-1974. On the other hand, Ueda (1975, p. 42) found that the birth and death rates given by the vital registration system were consistent since the composition of the base population was balanced and the recorded rates were relatively accurate.

Some surveys on health and the nutritional status of children have been carried out, but the coverage and scope were too limited to represent the whole country. Therefore, the censuses are considered the most dependable source for demographic data. Currently only a rough picture of the levels and trends of recent mortality for the urban areas can be obtained from the vital registration system, and indirect estimates, from the census age distribution or from census response to fertility and mortality questions, are needed to study the recent levels and trends of mortality.

Recent levels and trends in urban areas

From table 1, it may be seen that the levels of mortality have gradually declined since the mid-1950s. CDR has declined more than 83 per cent from the peak of 48.4 per thousand population in 1949 to 8.1 in 1980. More drastic changes can be seen in IMR and MMR. In 1950, IMR was 351 per thousand live births, that is, one in every three new-born babies died before the end of the first year of life. IMR declined gradually until the late 1970s. Recently, IMR in urban areas fluctuated around the high rate of 40 to 50

deaths per thousand live births. Similarly, MMR has gradually declined since 1963.

During the 1950s and early 1960s, MMR varied at a level of well over 4 per thousand live births and it declined to just over 1 per thousand live births in the 1980s. Even though the recent level of MMR has been high compared with that of developed countries, it is the lowest among the countries neighbouring Myanmar. The lower MMR compared with neighbouring countries can be explained by a higher proportion of births attended by trained health personnel. In 1984, 97 per cent of births were attended by trained health personnel; this is very high compared with 33 per cent in both India and Thailand (United Nations Children's Fund (UNICEF), 1988, pp. 76-77). The extremely high mortality rates observed during the early 1950s were due mainly to the then unsettled conditions of the country.

Differential mortality

By place of residence (or by State and Division)

Myanmar is quite diverse in terms of geographical situations: most of the States are situated in hilly and mountainous regions, whilst the Divisions are situated in the flat plains. Thus, it is important to study differential mortality by the place of residence or by State and Division. Even though the rates given by the vital registration system are defective, the IMR from the 1981 Vital Statistics Report is also presented in table 6 together with some other indirect estimates.

Four indirect techniques were employed to estimate the infant mortality in this study. These techniques were based on the Brass method (Brass and Coale, 1968, p. 45), and widely used in estimating infant and child mortality. Trussell (l975, p. 97) developed four sets of equations based on the Coale-Demeny model life tables (Coale and Demeny, 1966). Similarly, Palloni and Heligman (1985, pp. 10-33) developed five sets of equations to estimate infant and child mortality together with the reference period using the new United Nations model life tables. Feeney (1980, p. 109) also developed another variant of the Brass method, and the method gives a series of IMR estimates together with their appropriate reference periods. The resultant IMR estimates are given in table 6.

It may be observed from table 6 that the rates in the Vital Statistics Report were severely under-estimated, particularly in some States. Even though it represents only the urban portions of the region, the lowest IMR, i.e. 16 per thousand live births for Chin State, is not realistic since all other

Table 6: Indirect estimates of infant mortality rates by State and Division around 1982 (per thousand live births)

Regional	Trussell	Feeney	Brass	Palloni	VSR
Myanmar	97	98	97	90	n.a.
Rural	104	106	106	97	n.a.
Urban	57	66	63	53	47
States					
Kachin	133	145	138	123	28
Kayan	84	80	84	78	26
Kayin	64	51	53	59	43
Chin	111	125	129	103	16
Mon	56	57	57	52	46
Rakhine	114	113	100	110	41
Shan	90	86	85	85	41
Divisions					
Sagaing	130	130	132	121	39
Bago	70	73	72	65	35
Magway	115	116	118	108	41
Mandalay	96	105	104	89	44
Tanintharyi	96	96	93	88	42
Yangon	58	65	62	54	59
Ayeyarwady	93	94	90	87	44

Source: Nyan Myint (1988; p. 72).

Note: VSR = 1981 Vital Statistics Report and represents urban areas only.

alternative estimates for the whole State were found to be more than 100. This revealed the severe under-registration of infant deaths in Chin State. Similarly, the estimates given in the Vital Statistics Report for all States and Divisions, except Yangon Division, also appear to have been severely under-estimated. According to the 1981 Vital Statistics Report (CSO, 1986, pp. 5-11), 37 per cent of the population covered by the Report lived in Yangon Division and 36 per cent of live births were also recorded in Yangon Division. However, 45 per cent of infant deaths occurred in Yangon Division where the best medical facilities were available. Therefore, the Vital Statistics Report does not provided adequate information for estimating IMR.

The West regional model life tables are considered appropriate for urban areas of Myanmar (Nyunt, 1978, p. 87); IMR estimates obtained by

using the Trussell method have been chosen as the standard. Infant mortality, in general, was very high in Myanmar. Even in 1982, Chin, Kachin and Rakhine States, and Magway and Sagaing Divisions had IMRs of more than 100. Mon State and Yangon Division, economically the most developed regions among the States and Divisions of Myanmar, had the lowest IMR of just less than 60.

Thus, even the lowest IMR among the States and Divisions is unacceptably high. The highest IMR was found in the mountainous and economically least developed States and Divisions, which are located in the country's dry zone.

Type of residence (rural-urban residence)

As in many countries, differential mortality by rural-urban residence is obvious in Myanmar. In table 6, differential infant mortality by type of residence can be seen clearly. IMR in rural areas was nearly twice the IMR in urban areas; whilst the IMR for urban areas was 57 per thousand live births, the IMR for rural areas was 104.

Sex differentials

According to the 1981 Vital Statistics Report (CSO, 1986, p. 5), CDR for males was 9.2 per thousand mid-year population when the CDR for females was 8.2. Similarly, IMR for males was 48.0 and for females 46.5. CDR and IMR for the urban areas of the States and Divisions are presented in table 7.

From table 7, it can be seen that the CDR for urban males was higher than the CDR for females in all States and Divisions, except Kayah State. However, Kayah State is the smallest State in Myanmar and only one of its towns provided input for the 1981 Vital Statistics Report (CSO, 1986, p. 5).

With regard to infant mortality, the sex differential was less pronounced. Except for Kayin and Rakhine States, IMR for females was higher than that for males in all States. However, except for Magway and Sagaing Divisions, the IMR for females was lower than for males in all Divisions. Generally, the sex differential in mortality was less pronounced compared with the pre-war period. Nevertheless, the findings would be appropriate only if the levels of under-registration were the same for both sexes. Since the number of children ever born and children still living was not given by sex in the 1983 census reports, it is not possible to study the sex differential by means of indirect techniques.

Table 7: Crude death rate and infant mortality rate by sex in States and Divisions (urban areas), 1981

Region	CDR		IMR	
	Male	Female	Male	Female
All urban	9.23	8.23	48.0	46.5
States				
Kachin	11.48	8.20	30.6	23.9
Kayah	6.83	7.34	25.6	25.7
Kayin	11.64	8.74	37.0	49.0
Chin	7.85	6.95	11.4	21.0
Mon	9.21	8.36	45.1	45.9
Rakhine	9.55	7.78	42.4	39.1
Shan	10.18	8.61	41.0	41.2
Divisions				
Sagaing	7.60	6.79	38.6	39.5
Bago	8.60	7.30	36.6	32.9
Magway	8.43	7.96	40.8	41.7
Mandalay	9.43	8.84	45.6	42.5
Tanintharyi	11.50	9.10	46.4	38.2
Yangon	9.12	8.38	58.8	58.7
Ayeyarwady	9.74	8.29	47.3	41.0

Source: Nyan Myint (1988, p. 74).

Note: See table 1 for abbreviations.

Infant and child mortality

To study the mortality trends for Myanmar as a whole and the rural and urban areas separately, two indirect methods, namely the Feeney and Trussell methods, are used in this study. IMRs by the Feeney and Trussell methods, and CMR and expectation of life by the Trussell equations with West regional model life tables are presented in table 8.

It may be observed from that table that the decline in IMR occurred faster in the urban areas. During the period 1960 to 1982, infant mortality estimated by Feeney's method declined by 45 per thousand live births in urban areas, 19 in rural areas and 24 in the country as a whole. During the period 1972-1982, IMR (estimated by Trussell's method) declined by 18 per cent for Myanmar as a whole, while that for rural and urban areas fell by 16 and 37 per cent, respectively. The uneven decline in IMR could be due to differences in socio-economic development and the uneven distribution of medical services. Although the Government tried to narrow the gap between the rural and urban situations in terms of health care, only 31 per cent of the rural population had access to health services compared with 100 per cent in urban areas (UNICEF, 1988, p. 69).

Table 8: Recent trends and levels of infant and child mortality and life expectancy for Myanmar, urban and rural areas

Year	Area	IMR(Fy.)	IMR	CMR	e_0
1960	Myanmar	122	n.a.	n.a.	n.a.
	Rural	125			
	Urban	111			
1963	Myanmar	119	n.a.	n.a.	n.a.
	Rural	123			
	Urban	106			
1966	Myanmar	117	n.a.	n.a.	n.a.
	Rural	121			
	Urban	102			
1969	Myanmar	113	121	65	50.0
	Rural	118	126	68	49.1
	Urban	96	106	53	52.9
1972	Myanmar	109	118	62	50.6
	Rural	116	124	66	49.6
	Urban	90	100	49	54.1
1975	Myanmar	100	108	55	52.4
	Rural	106	114	59	51.3
	Urban	80	90	42	56.0
1977	Myanmar	94	102	51	53.5
	Rural	100	108	55	52.4
	Urban	73	83	37	57.5
1980	Myanmar	88	95	46	54.9
	Rural	93	102	50	53.7
	Urban	67	76	32	58.9
1981	Myanmar	85	91	43	55.7
	Rural	89	96	47	54.7
	Urban	67	72	30	59.6
1982	Myanmar	98	97	47	54.6
	Rural	106	104	52	53.3
	Urban	66	57	21	62.9

Source: Nyan Myint (1988, p. 76).

Notes: n.a. = not available; IMR(Fy.) = IMR estimated by the Feeney method. See table 1 for all other abbreviations.

Similarly, during the period 1972 to 1982, CMR for urban areas fell by more than 60 per cent, from 53 to 21 per thousand children aged one. At the same time, CMR for rural areas fell by only 23 per cent. In 1972, the expectation of life at birth for both sexes was 49.1 years for the rural population and 52.9 years for the urban population. The rural-urban difference was only 3.8 years. In 1982, the expectation of life at birth increased to 53.3 and 62.9 years for rural and urban areas, respectively. Therefore, the rural-urban difference became 9.6 years. Thus, it is evident that the decline in mortality was much faster in urban areas than in rural areas and future health policies should be aimed at rural health improvements.

Population and health policies

Myanmar is one of those countries which perceive population growth as beneficial and thus it has limited access to modern methods of contraception (United Nations, 1987, p. 92). The Government considered the country to be under-populated. In a statement to the United Nations World Population Conference in August 1974, the Government stated its pro-natalist attitude thus:

> "....under the prevailing circumstances, due to the geographical, social and economic situations in relation to population, we are confident that the country can support a larger population than at present.... We have as yet no programme oriented toward curtailment of the population." (United Nations, 1979, P. 3).

Similarly, population problems were not viewed in terms of controlling population growth, but of equipping and mobilizing the people for economic growth. The perceived population growth rate was considered satisfactory and population growth was accepted as a factor contributing to social and economic development. In 1974, the Central Population Commission was formed to formulate and implement national population policies. There has been no explicit policy to intervene in fertility and population growth, but Government policies have generally been aimed at the improvement of health, and economic and social development (United Nations, 1979, p. 2; and 1986, p. 8; United Nations Fund for Population Activities (UNFPA), 1987, p. 79). However, the Government has recognized that family planning is desirable if, and only if, it improves maternal and child health (United Nations, 1986, p. 8). In 1986, Family Planning International Assistance provided some family planning commodities (UNFPA, 1987, p. 81). Abortion and sterilization were strictly restricted to maternal health concerns.

Since the time of independence, the general consensus has been that the level of mortality is high and undesirable. Thus, health promotion programmes aimed at narrowing the gap between urban and rural situations in terms of health care and at promoting the mental and physical fitness of all citizens have been implemented (MPF, 1987, p. 211). Mortality decline was mainly a result of the improvements in medical services and also because of the Government's health plans. One of the most successful programmes has been the "People's Health Plan", which has been providing primary health care for the people since 1 April 1978.

Conclusion

As the Government of Myanmar considers the country under-populated, no official family planning programmes have come into existence yet. Fertility is still high, especially in the States, but fertility decline was initiated in urban areas in the mid-1970s. The fertility decline in rural areas is slower than in the urban areas; thus the rural-urban differential in fertility has become more pronounced. A gradually higher age at marriage for females was observed in Myanmar, from 18.2 years in 1952 (Hauser and Kitagawa, 1954, p. 124) to 22.4 years in 1983 and this could be a factor in fertility decline. However, the decline in fertility seems to have stopped at a moderately high level in the early 1980s.

Currently Myanmar still seems to maintain a pro-natalist attitude, although the establishment of a child-spacing programme has recently been accepted by the Government. However, since Myanmar is a Buddhist country and Buddhism does not oppose any kind of contraception, and because the people are familiar with modern methods of contraception, especially condoms and pills, if the Government were to set up a family planning programme, fertility decline could be faster than in some neighbouring countries such as Bangladesh and India.

Since the mid-1950s, mortality has gradually declined, but seems to have slowed down in recent years even though the health plans have been successful. As Ruzicka and Hansluwka (1982, p. 567) stated for South and East Asian countries, the various disease control programmes, which had been initiated to bring about a decline in mortality and morbidity during the pre-war period, were exhausted and more intractable degenerative diseases have remained in Myanmar. Mortality decline was relatively fast from the late 1960s until the mid-1970s. It has remained almost unchanged since the early 1980s.

The geographical distribution of recent levels of mortality is quite diverse: the north-western States and Divisions have the highest mortality whilst the south-eastern States and Divisions have comparatively lower mortality. During recent decades, a decline in mortality has occurred in various States and Divisions and both rural and urban areas. However, the mortality decline was faster in urban areas than in rural areas.

Although Myanmar is still considered as under-populated, population growth must be controlled in order to bring about significant economic development. Since Myanmar is one of the less developed countries, economic development is certainly hampered by the currently moderately

high population growth rate. For instance, even though the magnitude of food production has steadily increased, per capita food production has declined. According to the World Bank (1981, p. 212), per capita food production in 1977-1979 was only 97 per cent of the 1969-1971 level of production. Therefore, it is necessary to slow population growth by controlling fertility in order to achieve economic and social development in Myanmar.

References

Arriaga, E.E. (1983). *Estimating Fertility from Data on Children Ever Born, by Age of Mother*. International Research Document No. 11, (Washington, D.C., U.S. Department of Commerce, Bureau of the Census).

Brass, W. and A.J. Coale (1968). "Methods of Analysis and Estimation", in *The Demography of Tropical Africa*, William Brass (ed.), (Princeton, Princeton University Press), pp. 88-150.

Central Statistical Organization (CSO), (1986). *Vital Statistics Report 1981*, (Rangoon, Central Statistical Organization and the Department of Health).

_____(1990). *Vital Statistics Report 1984*. (Yangon, Central Statistical Organization and the Department of Health.

Coale, A.J. (1967). "Factors Associated with the Development of Low Fertility: An Historic Summary", in *United Nations Proceedings of the World Population Conference, 1965*, Vol. 2, (New York, Department of Economics and Social Affairs), pp. 205-209.

_____ and P. Demeny (1966). *Regional Model Life Tables and Stable Population.* (Princeton, Princeton University Press).

Feeney, G. (1980). "Estimating Infant Mortality Trends from Child Survivorship Data", *Population Studies*, vol. 34, No. 1, pp. 109-128.

Hauser, P.M. and E.M. Kitagawa (1954). "Demographic Glimpses into Burma", in *Interrelations of Demographic, Economic and Social Problems in Selected Underdeveloped Areas; Proceedings of the 1953 Annual Conference*, (New York, Milbank Memorial Fund, pp. 104-129.

Hpu, HIa Myint (1984). *Mortality Statistics of Burma*. Unpublished master's thesis. (Canberra, Australian National University).

Kyin, U (1959). *A Study of the Population of the Union of Burma*, (Bombay, Demographic Training and Research Centre).

Ministry of Planning and Finance (MPF), (1987). *Report to the Pyithu Hluttaw on the Financial, Economics and Social Conditions of the Socialist Republic of the Union of Burma for 1987/88*, (Rangoon, Ministry of Planning and Finance).

_____(1990). *Report on the Financial, Economics and Social Conditions of the Union of Myanmar, 1990/91,* (Yangon, Ministry of Planning and Finance).

yan Myint, U (1988). *Levels and Trends of Fertiliy and Mortality in Burma.* Unpublished master's thesis. (Canberra, Australian National University).

Nyunt, Tin Tin (1978). *Estimation of Vital Rates for Burma and Their Effects on the Future Size of Population.* Unpublished master's thesis. (Canberra, Australian National University).

Palloni, A. and L. Heligman (1985). "Re-estimation of Structural Parameters to Obtain Estimates of Mortality in Developing Countries", *Population Bulletin of the United Nations*, No. 18, pp. 10-33.

Palmore, J.A. (1978). *Regression Estimates of Changes in Fertility, 1955-60 to 1965-70, for Most Major Nations and Territories.* East-West Population Institute Paper No. 58. (Honolulu, East-West Center).

Ruzicka, L.T. and H. Hansluwka (1982). "Mortality Transition in South and East Asia: Technology Confronts Poverty", *Population and Development Review*. vol. 8, No. 4, pp. 567-588.

Sundrum, R.M. (1957). *Population Statistics of Burma.* Economic Research Project, Paper No. 3. (Rangoon, Department of Economics, Statistics, and Commerce, University of Rangoon).

Trussell, T.J. (1975). "A Re-estimation of the Multiplying Factors for the Brass Technique for Determining Childhood Survival Rates", *Population Studies*, vol. 29, No. 1, pp. 97-108.

Ueda, Kozo (1975). *Current Vital Statistics and Their Utility in Asian Countries,* (Tokyo, Institute of Developing Economics).

United Nations (1959). *The Population of Asia and the Far East, 1950-1980,* (New York, United Nations).

_____(1979). *Population Policy Compendium: Burma,* (New York, United Nations Department of International Economics and Social Affairs and the United Nations Fund for Population Activities).

_____(1983). *Manual X: Indirect Techniques for Demographic Estimation,* (New York, United Nations).

_____(1986). *Population Policy Briefs: The Current Situation in Developing Countries,* (New York, United Nations).

_____(1987). *World Population Policies,* Vol. 1. Population Studies, No. 102, (New York, United Nations).

United Nations Children's Fund (UNICEF), (1988). *State of the World's Children, 1988,* (New York, United Nations).

United Nations Fund for Population Activities (UNFPA), (1987). *Inventory of Population Projects in Developing Countries Around the World 1985/86,* (New York, UNFPA).

World Bank (1981). *World Development Report 1981,* (New York, Oxford University Press).

Population Projections for Myanmar, 1983 - 2013

The currently high level of fertility will lead to an increase in the proportion of younger age groups, not working age groups

By Win Tint*

Myanmar is experiencing relatively high fertility and declining mortality rates. In 1973, the population size was nearly 29 million. It increased to 35 million in 1983 with an annual intercensal growth rate of 2.02 per cent (Union of Burma, 1986a; Part 1, p. 14). Since 1948, when it became independent, Myanmar has struggled for economic development and an improved quality of life. But there have been many obstacles and socio-economic development remains the main challenge to be met. Successive attempts have been made by means of various short- and long-term plans.

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To fulfil plan targets, knowledge of the current and future size of the population and its age-sex structures is essential. No effective plan can be made without this knowledge. Population projections are one of the ingredients for development planning and provide some guidelines for national planners and policy makers. In this article, an attempt is made to produce plausible population estimates for Myanmar for the 30-year period from 1983 to 2013, using the most up-to-date and reliable data provided by the 1983 census. The objectives of this study are to examine the levels and trends in basic components of population growth, to project the future size of the population, and to examine some implications of rapid population growth in Myanmar.

Demographic background

Myanmar has a long tradition of keeping population records, but during the reigns of kings no extensive census enumerations appear to have been made. In those days, population counts may have been made for the purposes of military recruitment and taxation, but those records have not survived to the present time. The first population census was taken in 1872 for Lower Myanmar, as a province of India, under British administration; it was followed by a second census in 1881. The first nation-wide census was taken in 1891 and decennial censuses were conducted regularly until 1941 (IMPD, 1975, p. 7). However, the area covered by these censuses varied from one census to another (table 1).

Table 1: Decennial censuses of Myanmar, 1872-1983

Year	Area covered (sq. km)	Population (in 000)	Density per sq. km	Census date
1872	226,770	2,747	12	15 Aug. 1872
1881	225,900	3,737	17	17 Feb. 1881
1891	703,004	8,098	12	26 Feb. 1891
1901	585,881	10,491	18	1 Mar. 1901
1911	597,873	12,113	20	10 Mar. 1911
1921	603,747	13,212	22	18 Mar. 1921
1931	604,744	14,667	24	14 Mar. 1931
1941	678,034	16,824	25	3 Mar. 1941
1953[a/]	678,034	19,103	28	1 Mar. 1953[c/]
1973[b/]	676,578	28,921	43	31 Mar. 1973
1983[b/]	676,578	35,308	52	31 Mar. 1983

Sources: [a/] Nyunt, 1978, p. 9; Lwin, 1983, p. 11; [b/] Union of Burma, 1986a; Part 1, pp. 1-13; [c/] Maung, 1980, p. 2.

Several attempts have been made to estimate the population of Myanmar after independence in 1948. In 1953 and 1954, the census was taken in two stages, urban and rural, respectively. The first stage population count covered all of the urban areas, but the second stage could not cover all the rural areas. Twenty years later, in 1973, the first nation-wide census was carried out and was followed by the 1983 census.

Sources of data and their limitations

In Myanmar, as in many developing countries, almost all available information seems to be inadequate and rather defective for modern demographic research. Therefore, only the last two censuses, those of 1973 and 1983, are used for analysis in this study. They are further supplemented by data from Annual Vital Statistics Reports (AVSR).

While the data from the afore-mentioned sources are fairly reliable, they have some limitations regarding coverage, content and data collection methods. According to the 1983 census, there were 2,190 wards or 288 towns, representing the total urban areas and 13,756 village tracts in the whole country. Of these, all urban areas and 12,814 village tracts were completely covered. Of the remaining village tracts, 112 were only partially covered and 830 totally omitted for security reasons. As a result, the coverage of the 1983 census was 96.6 per cent of the estimated total population (Union of Burma, 1986a; Part 1, p. 11).

Analysis of age-sex distributions

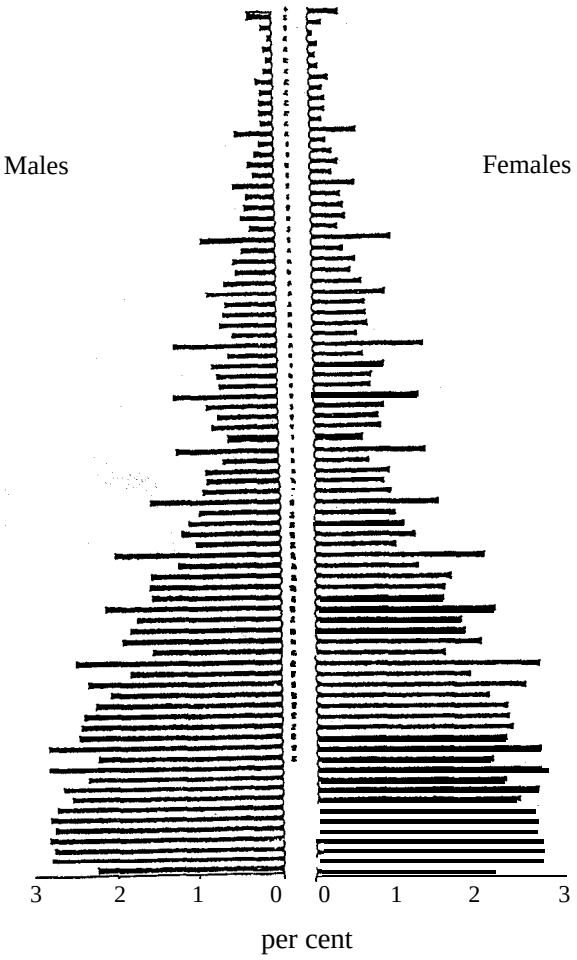
Age reporting errors exist in all censuses and registrations of developing countries for reasons such as illiteracy, ignorance and culture. Although some demographic measures are valid when using basic data with large errors, other uses require more accurate basic data. For population projections, accurate data are important for the calculation of plausible estimates in the future.

Reported statistics

As in other developing countries, census data in Myanmar are affected by under-enumeration and age mis-statement. A population pyramid drawn on the basis of the single-year age returns from the 1983 census is shown in figure 1. It can be seen clearly that large numbers of persons were concentrated at ages ending with 0 and 5 and relatively small numbers at other ages. The terminating digit 2 seems to have been also attractive to people.

In addition, the 1983 single-year age pyramid for the whole country

Figure 1: Population (reported) pyramid of Myanmar, by sex and single years of age, 1983



Source: Union of Burma, 1986; Part 2, pp. 23-28

has a narrow base at age 0. The Government of Myanmar promotes a pronatalist policy and the country is characterized by high mortality (see section starting on p. 26). Thus, the normal expected pattern for the age pyramid would be a gradually declining monotonic sequence with increasing age. Deviation from this pattern is possible if there have been marked previous changes in fertility, mortality and migration (United Nations, 1955, p. 35; Thompson and Lewis, 1965, p. 112; Lucas and McDonald, 1980, p. 140). Since Myanmar has high fertility and mortality and practises a closed population policy, the departure from a regular age pyramid clearly indicates an under-enumeration of infants in the 1983 census. From age one onwards, the age pyramid has an irregular pattern at successive ages. Marked protrusions are also found at ages 12 and 18 for both sexes.

Evaluation, adjustment and smoothing of age data

Age data often suffer from two kinds of error: coverage and content errors. These errors can create distortions in the age composition of a population. Several methods have been developed to measure these irregularities by means of indices.

Table 2 shows Whipple's indices for the 1983 census of Myanmar and

Table 2: Age accuracy indices for Myanmar and some selected neighbouring countries

Country	Year	Indices			
		Whipple's		Myers'	
		Male	Female	Male	Female
Bangladesh[a/]	1981	316	335	68.0	71.0
India[b/]	1981	295	305	63.0	68.8
Myanmar[c/]					
Country as a whole	1983	142	144	14.1	16.0
Urban	1983	114	115	5.8	6.4
Rural	1983	152	154	17.3	19.4
Thailand[c/]	1980	104	103	2.7	2.6

Sources: a/ Ghulam Rabbani, 1984, p. 23;
b/ Union of Burma, 1986a, Part 1, p. 15;
c/ IMPD, 1987b, p. 23.

selected neighbouring countries for comparison. According to Whipple's Index, the 1983 census age distribution of Myanmar was rather "rough" for the country as a whole and rural areas for both sexes. For the urban areas, the quality of age returns fell into the "approximate category". If a comparison is made with neighbouring countries, the quality of age reporting seems to be more accurate than that of Bangladesh and India, but not as good as Thailand's. Similarly, Myers' indices also show that age return of Myanmar was more accurate than those of neighbouring countries, except Thailand.

In Myanmar, when the 1983 census was taken, the populations of remote rural areas were deliberately omitted from the census. However, the populations of those areas were estimated and given in the 1983 census publication as about 1.1 million (Union of Burma, 1986a; Part 1, p. 12). Furthermore, a post-enumeration check (PEC) was conducted in 1984 to provide relevant information on under-enumeration, particularly for young children. According to the PEC, the extent of under-enumeration for the 0-4 age group was about 3 per cent (IMPD, 1987a, p. 4). These under-counts were used to adjust the census data by a pro-rata method.

After these adjustments, the next step is to produce a smoothed age-sex distribution to serve as the base-year population for projection purposes. In connection with this, the smoothing method developed by Hill-Zlotnik-Durch (United Nations, 1983, pp. 241-244) has been used. The resultant age-sex data are shown in Appendix A and figure 2 is drawn using the same data.

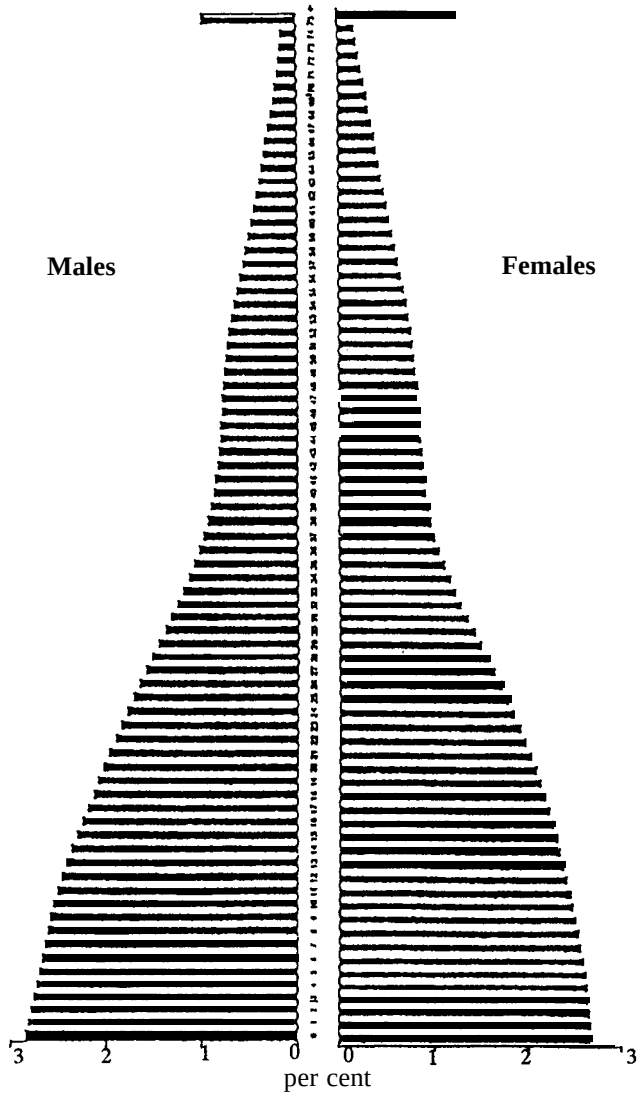
Components of population growth

Mortality, fertility and migration are three basic components that determine population growth. Of these, mortality and fertility define natural increase (or decrease) by the surplus (or deficit) of births over deaths in a given period. Because births substantially outnumber deaths, rapid population growth is of great concern in many developing countries.

Mortality

The level of mortality is both a basic population parameter and an indicator of the health and development of a country. To explore the mortality conditions and trends of a country, vital registration is the main source of data. Although a vital registration system has existed in Myanmar since 1901 (Myint, 1982, p. 6), it has good coverage only in urban areas. In this

Figure 2: Population (smoothed) pyramid of Myanmar, 1983 obtained by Hill-Zlotnik-Durch method



Source: Plotted from primary smoothed data

section, depending on availability of data, mortality measures such as crude death rate (CDR), infant mortality rate (IMR), maternal mortality rate (MMR) and expectation of life at birth (e^{o}_{o}) are discussed.

According to table 3, a dramatic decline in mortality occurred during the post-war period and the greatest reduction was in the decade of 1960-1970. During these 10 years, declines of up to 50 per cent occurred in all three mortality measures, i.e. CDR, IMR and MMR. One of the plausible reasons behind these declines might be the effect of the National Health Programme, started in 1950 by the Government to improve health conditions. In this programme, the Government emphasized control of malaria and leprosy, promotion of environmental sanitation, expansion of health services, infrastructure and professional training. Moreover, in the 1960s, Government expenditures on the health sector were more than double that of earlier times (United Nations, 1980, p. 3).

Estimation of mortality

The mortality measures discussed in the preceding section are not effective enough to show the mortality condition of a population, because there is a deficiency in data, especially in coverage. Therefore, a representative indicator of mortality is needed to cope with defective data. The expectation of life at birth (e^{o}_{o}) is suitable not only as a representative index of the mortality level of a population, but also as a summary indicator of health improvement. Moreover, it is not affected by age structure and is

Table 3: Some mortality and fertility measures for selected years, Myanmar (urban), 1950-1981

	Deaths rates			Birth rate
Year	CDR	IMR	MMR	CBR
1950	46.8	304.0	n.a.	39.6
1955	20.7	175.9	5.1	36.6
1960	20.0	148.6	4.2	42.3
1965	16.4	115.0	3.1	41.3
1970	10.4	55.8	1.8	37.6
1975	10.1	51.9	1.4	29.7
1980	8.1	44.0	1.3	26.9
1981	8.7	47.3	1.3	27.7

Source: CSO, 1989, pp. 6-95.

Table 4: Expectation of life at birth (e^o_0) estimated by different scholars, Myanmar

Scholars	Year	Expectation of life at birth (years)		Excess of female over male life expectancy (years)
		Males	Females	
Thet Lwin [a/]	1911	28.11	27.9	- 0.21
	1921	27.64	30.58	+ 2.94
	1931	32.54	34.49	+ 1.95
	1941	38.60	37.86	- 0.74
Tin Tin Nyunt [b/]	1953-54	35.60	38.20	+ 2.60
	1953-58	37.30	38.30	+ 1.00
	1958-63	39.70	40.80	+ 1.10
	1963-68	42.10	43.30	+ 1.20
	1968-73	44.50	45.80	+ 1.30
	1973	45.60	49.00	+ 3.40
Tin Tin Myint [c/]	1973	48.60	51.50	+ 2.90

Source: [a/] Lwin, 1974, pp. 14-22; [b/] Nyunt, 1978, p. 88; [c/] Myint, 1980, p. 7.

widely used for mortality comparison among populations.

In Myanmar, data on the expectation of life at birth are available from a few sources such as the Annual Vital Statistics Reports, the "Report to the People or *pyithu hluttaw* (Parliament)" and Medical Research Reports. However, very few give representative results for the country as a whole, and estimates differ from one to another. Therefore, some scholars have attempted to provide estimates of mortality for the whole country as shown in table 4.

Table 4 shows mortality conditions in Myanmar during the pre-war and post-war periods. During the pre-war period, male expectation of life at birth exceeded that of females. However, during the post-war period, female expectation of life at birth exceeded that of males and the difference has since gradually increased, except for 1953-1954. Since these estimates of expectation of life came from different scholars using different methods, their consistency is limited; hence, they should be used with caution.

Table 5: Estimates of infant and child mortality by various methods, Myanmar, 1983

Age group (years)	x	Average parity P(x)	Proportion dead D(x)	Infant mortality rates			Mortality level (West)
				Brass q(x)	Sullivan q(x)	Trussell q(x)	
15-19	1	0.0941	0.0838	0.0910	-	0.0951	15.61
20-24	2	0.8024	0.1009	0.1073	0.1090	0.1096	16.00
25-29	3	1.9761	0.1227	0.1255	0.1236	0.1255	15.60
30-34	5	3.3000	0.1442	0.1476	0.1436	0.1479	15.00
Average							15.53
Expectation of life at birth (e^o_o)							56.33 (Female) 53.05 (Male)

* *Source:* Calculations based on the Census Reports of the Union of Burma, 1986a; Part 2, pp. 29-188.

* *Notes:* x = the age of children born to women in the corresponding age group;
P(x) = the average parity at age x;
D(x) = the proportion of children dead at age x;
q(x) = the probability of dying between birth and age x

As this article is based on the 1983 census figures, further estimates of the expectation of life of males and females for the whole country are essential. There are many indirect techniques which attempt to estimate infant and childhood mortality. Three methods, i.e. those of Brass (1968), Sullivan (1972) and Trussell (1975), have been chosen to measure infant and childhood mortality in Myanmar. Then, the proportion of children dead is inverted into a conventional measure of mortality, expectation of life at birth (e^{o}_{o}). In table 5, summary estimates provided by the three methods are presented.

Even though the Trussell method gives higher estimates than the others in table 5, it has been chosen as giving the best fit, because this method avoids information on "dead children of women within the age group 15-19" and relies on larger empirical fertility schedules. To obtain a representative mortality level, the average of q(2), q(3) and q(5) are used although q(1) seems to be quite consistent. Therefore, the West Model mortality level of Myamnar for 1983 was about 15.53 with life expectancies at birth of 53.05 and 56.33 years for males and females, respectively.

Fertility

According to table 3, crude birth rates fluctuated within the range of 42 to 27 per thousand population over the 30-year period, 1950-1980. It is apparent that the crude birth rate started to decline during the decade 1970-1980. This may be due to many reasons. Of these, knowledge and use of fertility control may have spread among women, especially the younger generation. Even though Myanmar assumes a pro-natalist policy, pills, injections and condoms are available through various channels.

This interpretation is supported by Nyunt. In her research, she found that some level of fertility control was present in all age groups of urban women and knowledge of family planning was wider among females in the age group 25-34 years (Nyunt, 1978, p. 112). However, since the coverage of vital registration data varied over time, the CBR values provided in the 1981 Vital Statistics Report should be interpreted with caution.

Estimation of fertility

Because of a lack of reliable data on the number of births occurring in the country every year, the estimation of the levels and trends of fertility for the whole country is a challenge for researchers in Myanmar. Very few scholars have attempted to obtain a representative fertility indicator for the

Table 6: Estimates of fertility level by various methods, Myanmar, 1983

Age group (years)	Reported		Brass		Trussell	Arriaga
	P(i)	ASFR	(I) ASFR	(II) ASFR	ASFR	ASFR
15-19	0.0941	0.0425	0.0467	-	0.0579	0.0578
20-24	0.8024	0.1855	0.2040	-	0.2155	0.2157
25-29	1.9761	0.2274	0.2501	-	0.2501	0.2504
30-34	3.3000	0.2102	0.2312	-	0.2266	0.2268
35-39	4.4347	0.1712	0.1883	-	0.1810	0.1811
40-44	5.2194	0.0878	0.0966	-	0.0864	0.0877
45-49	5.3814	0.0208	0.0420	-	0.0173	0.0350
50+	4.4962	-	-	-	-	-
TFR		4.73	5.29	4.87	5.17	5.27

Source: Calculated from the Census Reports of the Union of Burma, 1986a; Part 2, pp. 29-30.

Notes: TFR = total fertility rate; the TFR of Brass II is calculated as $P(3)^{2/}P(2)$.

country as a whole. Nyunt (1978, pp. 97-105) attempted to estimate the fertility level of Myanmar by applying the reverse survival technique. As age-specific fertility rates (ASFR) were not available from the 1973 census, she borrowed the standard pattern of marital fertility (United Nations, 1967, p. 24) and then estimated the fertility indices. According to her estimate, the total fertility rate (TFR) for Myanmar in 1973 was about 6.26.

The current fertility level is estimated in this study as a basic component for population projections. Four methods were used: the Brass methods I and II (United Nations, 1967, p. 33; Brass and Coale, 1968, p. 88), the Trussell method (United Nations, 1983, p. 32) and the Arriaga method (1983). Of these, the Brass method is the pioneer and the others are improvements. Here, the value obtained by the Arriaga method has been chosen as a plausible estimate for two reasons: first, the TFR estimate of 5.27 is less than the value of P(7) and, second, the Arriaga method allows for changing fertility in the recent past while the others do not.

Migration

As in many developing countries, data on migration are very limited in Myanmar. The last two modern censuses, those of 1973 and 1983, did not include questions concerning migration. Therefore, the extent and magnitude of international and internal migration are unknown. At the international level, owing to the closed population policy of Myanmar, it may be assumed that migration is severely limited and negligible (United Nations, 1987, p. 92).

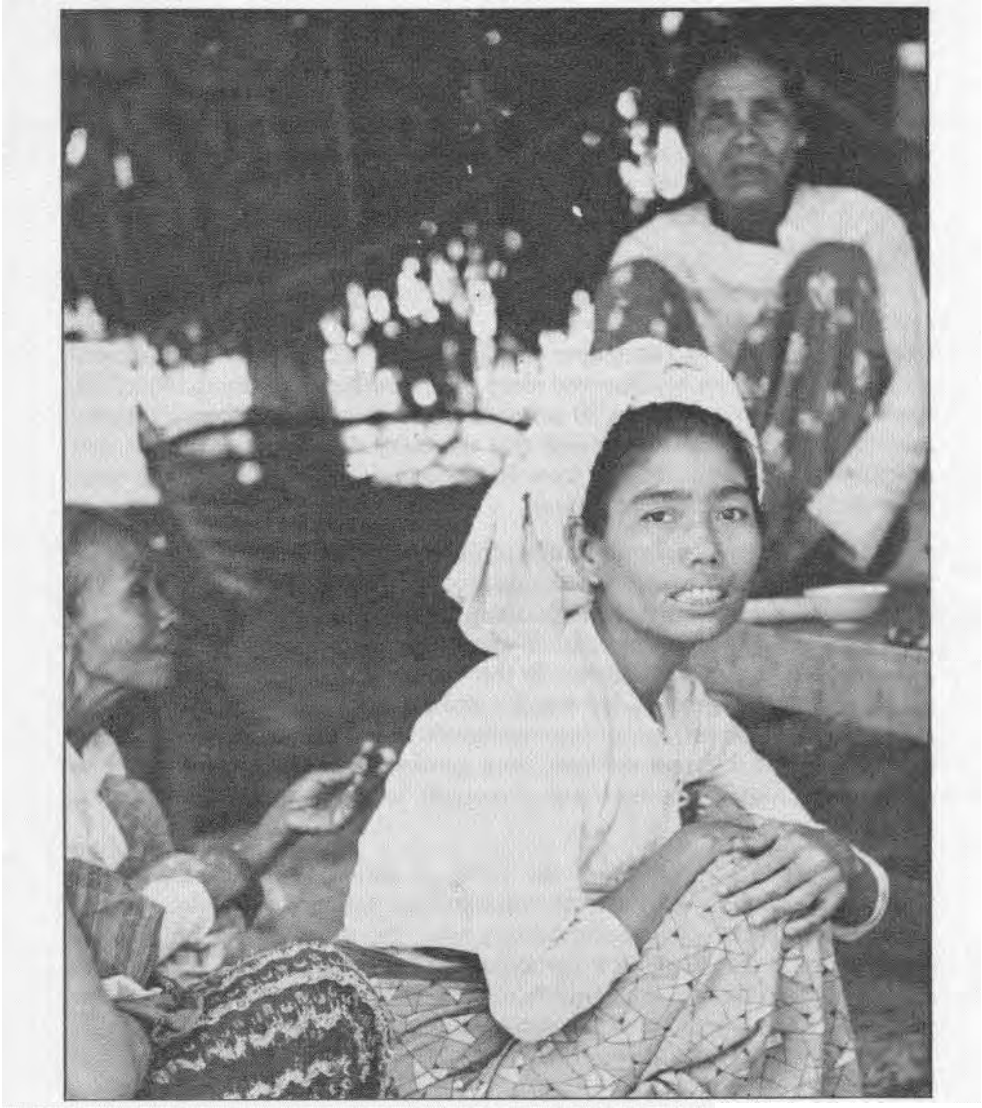
The components of population growth of Myanmar, namely mortality and fertility, have declined over time. Vital statistics show that, although there has been some fluctuation in CDR, IMR and MMR, a substantial downward trend can be observed since 1950. During the period 1960-1970, declines of up to more than 50 per cent are evident by the three mortality measures. Vital statistics revealed that mortality decline was sharp at first and slow later. The estimates from the census data also confirm the mortality decline over time in Myanmar.

The increase in the expectation of life at birth can be observed in three parts. Between 1911 and 1941, the average increase in e^{o}_{o} was 1.8 years for males and 1.7 years for females in every five-year period. During the years 1953 to 1973, the average increase in every five-year period was 2.5 years for males and 2.7 years for females. In the decade 1973-1983, the average increase in each five-year period was 2.2 and 2.4 years for males and females, respectively. However, since these estimates were obtained using different information and different methods, their consistency is limited and therefore no reliable estimate for the trend of increase in expectation of life at birth can be made.

Vital statistics show that the CBR of urban Myanmar has slowly declined. The 1983 census data on children ever born are plausible. According to the reported age-specific fertility rates, the age pattern of fertility of Myanmar indicates a high fertility society. However, fertility decline can be observed by comparing data with those of 1973. In 1973, the TFR value for the country as a whole was 6.26 which declined to 5.27 in 1983. International migration is negligible currently since the Government practises a closed population policy.

Population projections

Population projections are an essential tool for national development planning. No effective plan can be made without regard to the future ex-



A moment of relaxation in rural Myanmar. As the population becomes larger, more development programmes will be needed in the various socio-economic sectors to serve the people, especially those in the younger age groups in which the dependency ratio will be high. (Photograph courtesy of Mallica)

petted size and composition of the population because supply and demand of socio-economic necessities such as food, housing, employment, education and health services depend on it. Since populations are continuously changing over time, plausible estimates of future size and structure are always needed.

Basic data and assumptions

Four kinds of data for the base year are needed in preparing population projections. These data are (a) population by age and sex, (b) level of fertility (e.g. TFR), (c) level of mortality (e.g. e^{o}_{0}) and, (d) level of migration (e.g. net volume of international migration by age and sex).

Different sets of assumptions are formulated about the future courses of the three components of population growth. In this connection, the past and current levels of fertility, mortality and migration are considered.

The general assumption model prepared by the United Nations (1977, p. 8) is used to fix the level of future fertility and mortality. Three types of fertility and mortality declines, namely, low, medium and high variants, were considered over the projection period. For the medium variant, it is assumed that once the decline had begun, fertility would decline by 5 per cent during the first five-year period, by 10 per cent in each of the next two five-year periods and by 15 per cent during each of the three quinquennial periods, after which it would decline more slowly. For the low variant, the decline would begin five years earlier. A constant total fertility rate is assumed for the high variant to study the effect of rapid population growth. Since the vital statistics of Myanmar reflected that the decline in urban fertility started since 1973, 1978 has been chosen as the year in which fertility began to decline for the whole country.

With respect to mortality, the expectation of life at birth has increased over time. To obtain estimates on future mortality levels, the United Nations schedule is followed. In this schedule, a quinquennial gain of 2.5 years in the expectation of life at birth is assumed before e^{o}_{0} for both sexes reaches 55 years. After having attained this level, the quinquennial improvement would follow the "Working Model for Projecting Mortality Levels for Developing Countries" for the medium variant.

For the low variant, a quinquennial gain of 2.0 years of e^{o}_{0} is assumed up to the level of about 62 years, after which the gain would equal 1.75 years. For the high variant, a quinquennial gain of 3.0 years of e^{o}_{0} is assumed up to 55 years, after which the gain would decrease to 2.5 years until e^{o}_{0} reaches about 62.0 years. Above that level, it would be less than 2.5 years.

Table 7: Fertility assumptions over projection period, Myanmar, 1983-2013

Assumption	1983	1983-1988	1988-1993	1993-1998	1998-2003	2003-2008	2008 2013
Low	5.27	4.74	4.03	3.43	2.92	2.63	2.37
Medium	5.27	4.74	4.27	3.63	3.09	2.63	2.37
High	5.27	5.27	5.27	5.27	5.27	5.27	5.27

Source: Calculated according to the United Nations schedule.

Table 8: Assumption of expectation of life at birth over projection period, Myanmar, 1983-2013

Assumption		1983	1983-1988	1988-1993	1993-1998	1998-2003	2003-2008	2008-2013
Low	(Male)	53.50	55.05	57.05	59.05	61.05	62.80	64.55
	(Female)	56.33	58.33	60.33	62.33	64.33	66.08	67.83
Medium	(Male)	53.05	55.80	58.05	60.10	62.00	63.75	65.35
	(Female)	56.33	58.90	61.20	63.40	65.50	67.50	69.40
High	(Male)	53.05	55.55	58.05	60.55	62.55	64.55	66.55
	(Female)	56.33	58.83	61.33	63.83	65.83	67.83	69.83

Source: Calculated according to the United Nations schedule.

The fertility and mortality levels are shown in tables 7 and 8 are derived from the United Nations general assumption model.

Results of projections

A combination of three fertility assumptions and three mortality assumptions produced nine different population projections. The actual computation was done with the help of the "FIVFIV/SINSIN" computer software package. Of these nine projections, only three, namely, the low, medium and high variants, are presented in Appendix B. The medium variant is the most plausible one while the rest can be considered as the lower and upper limits of the medium projection. By 2013, the population of Myanmar might be about 64.5 million; and it would be neither less than 62.8 million nor exceed 81.1 million by the medium, low and high variants, respectively.

To evaluate whether the representative projection (medium variant) is plausible or not, a quick check can be made by comparing the doubling time from the base year, assuming exponential growth. In 1983, at the census date, the total population of Myanmar was 35,442,972 with an average annual growth rate of 2.02 per cent. With a constant rate of increase, the population size would double in 34.7 years. According to the medium variant, the total population size would reach 64,504,980 by the end of the 30-year period. This comparison shows that the medium variant implies little change in average annual growth during the projection period. The current projections along with those of other scholars are shown in table 9.

Table 9: Comparison with other population projections

Variants	Projected population (millions), 2003					
	Nyunt[a/]	Myint[b/]	IMPD[c/]	U.N.[d/]	U.N.[e/]	Tint[f/]
Low	56.18	45.00	n.a.	51.84	47.43	54.77
Medium	58.43	48.93	51.38	55.10	48.50	55.84
High	64.37	51.49	n.a.	58.42	49.59	61.27

Source: a/ Nyunt, 1978, pp. 161-163;
b/ Myint, 1980, p. 10;
c/ IMPD, 1987a, p. 23;
d/ United Nations, 1982, p. 274;
e/ United Nations, 1986, p. 266;
f/ Derived from population projections.

Note: All projected populations refer to the year 2003.

Table 10: Projected percentage distribution of population of Myanmar by broad age group, 1983-2013

Age group	1983	1988	1993	1998	2003	2008	2013
Low variant							
< 15	38 .75	39.06	39.23	38.93	35.36	31.56	28.84
15-59	55.09	56.31	54.74	54.69	58.22	61.82	63.95
60+	6.16	6.20	6.31	6.38	6.42	6.62	7.21
Dependency ratio	0.82	0.80	0.83	0.83	0.72	0.62	0.56
Medium variant							
<15	38.75	39.06	39.26	39.47	36.34	32.90	29.53
15-59	55.09	54.74	54.42	54.17	57.30	60.56	63.34
60 +	6.16	6.20	6.32	6.36	6.36	6.54	7.13
Dependency ratio	0.82	0.83	0.84	0.85	0.75	0.65	0.58
High variant							
<15	38.75	39.06	40.26	42.20	41.95	41.33	40.95
15-59	55.09	54.74	53.53	51.74	52.24	53.04	53.34
60 +	6.16	6.20	6.21	6.06	5.81	5.63	5.71
Dependency ratio	0.82	0.83	0.87	0.93	0.91	0.89	0.87

* *Source:* Derived from projected figures.

Projected population and policy implications

Age structure

The age structure of a population is very important because it influences current and future fertility, mortality and migration. Although there are various ways of examining the age structure of a population, only two are discussed in this section: the distribution by broad age groups and the dependency ratio. Table 10 reveals that in 1983, the proportion of the young population (aged under 1.5 years) was about 39 per cent. This would decrease to 29, 30 and 41 per cent at the end of the projection period according to the low, medium and high variants, respectively. In each five-year period, the high variant provides the largest proportion in the younger age groups.

Table 10 also shows that the greater is the decrease in fertility, the greater is the increase in the proportions in the working age group (15-59 years). These are 64, 63 and nearly 53 per cent by the year 2013, according to the low, medium and high variants, respectively.

The dependency ratio, one of the important economic development indicators for Myanmar, can be obtained from the age structure. The ratio is calculated to measure the burden on the working age group of supporting the young and the elderly. Changes in the dependency ratio depend on changes in the proportions of young and elderly people. In pre-war days, the dependency ratios were stable at about 0.75 on the average (IMPD, 1987b, p. 5). However, the ratios started to increase in the post-war period and reached their peak in 1973 at about 0.87. Although the dependency ratio had declined slightly to 0.82 in 1983, it was still high. This high level will continue during the next 15 years, and then decrease again to 0.58 by the year 2013, under the medium variant. Comparison of base- and end-year of dependency ratios is shown in figure 3 on page 52.

Policy implications

Myanmar is a country which is attempting to achieve socio-economic development by national planning. Development means improvement in the welfare of human beings, including high income, stable employment, more education, better health and nutrition, consumption of more food and better housing (Weeks, 1981, p. 223). However, it is still the main challenge to be met by Myanmar. As the population becomes larger, more development programmes are needed in the socio-economic sectors.

Agriculture

A rapid increase in population density (persons per sq. km) can be considered as a development problem. As shown in table 1, the population density of Myanmar has increased over time. In 1941, population density was 25 persons per sq. km, increasing to 43 in 1973 and 52 in 1983. The latter is more than the average population density of less developed countries (LDCs), i.e. 44 persons per sq. km, and 2.5 times the 20 persons per sq. km of developed countries (Sundrum, 1983, p. 3). In 2013, the projected population density of Myanmar would be about 93, 95 and 120 persons per sq. km, or 1.7, 1.8 and 2.3 times the base-year density according to the low, medium and high variants, respectively. Even though the population has increased not only in numbers but also in density per sq. km over time, extension of arable land was practically nil. Similarly, the area sown under various crops fluctuated and the increase was very much less than population growth. Table 11 shows that in 1973, the total sown area under various crops was almost 23.3 million acres and it increased to 25.1 million acres in 1983 (Union of Burma, 1982, p. 37). The increase in sown area was about 8 per cent, while a 22 per cent increase in population occurred during the same period. The picture is clear from the per capita availability of land use. Actually, per capita sown acreage has drastically decreased from 0.81 to 0.71 during the 10-year period. This is a serious problem unless the

Table 11: Land utilization, Myanmar, 1973-1989

Year	Arable land (000 acres)	Sown area under various crops (000 acres)
1973-74	45,843	23,277
1977-78	45,843	23,579
1981-82	46,029	25,123
1982-83	45,986	24,488
1983-84	46,037	25,100
1984-85	45,931	25,984
1985-86	45,943	25,662
1986-87	45,724	24,546
1987-88	45,691	23,870
1988-89	45,693	23,802
1989-90	45,742	24,497

Sources: Union of Burma, 1982, p. 497; Union of Burma, 1986b, p. 62; Union of Burma, 1987, p. 46; and Union of Burma, 1990, pp. 45,76.

Note: Arable land includes net area sown, fallow land and culturable waste land.

Government plans to increase food production through extension of available land, double cropping, use of high-yielding varieties, application of agro-inputs such as fertilizers and insecticides, because the majority of the population depends on land for their livelihood.

Health

Health is another policy area affected by rapid population growth. Although vital statistics show urban mortality has declined over time, the persistent high infant mortality rate (95 per thousand live births) of the country as a whole provided by the census data indicates that the health services available in rural areas have been inadequate. The Government has emphasized improved health conditions for the people by introducing "People's Health Plans". Table 12 shows that there was very little change in the health sector: a small increase in the number of hospital beds, but the ratio per 10,000 population remained unchanged during the intercensal period. Beyond this period, both the number of hospital beds and the ratio per 10,000 population decreased. Certain improvements were found in the numbers of doctors and nurses as well as the ratios of such medical personnel per 10,000 population.

However, the ratios of hospital beds, nurses and doctors to the population were very low by international standards. According to the World Health Organization, the minimum requirements are 5-6 hospital beds per thousand population and one doctor per thousand population (Adam, 1982, p. 30). The average ratios of the 15-year period for hospital beds, doctors and nurses per thousand population for Myanmar were 0.69, 0.22 and 0.16, respectively. If those ratios hold constant, the projected number of trained personnel required during the next 30 years, according to the low, medium and high variants, are shown in the last three columns of table 12. Note that the requirements for health services are expected to more than double under the high variant, but they would be much less if population growth can be slowed.

Education

About 4.8 million children were of pre-school age (i.e. under five years) in 1983 and this could increase to 6.1, 6.2 and 12.8 million by 2013 according to the low, medium and high variants, respectively. The increase in pre-school-age children indicates not only a problem in terms of educational resources, but also a necessity for more child and maternal health care facilities. An increase in the number of school age population will have more implications in the education sector. An increase in the number of

Table 12: Education and health statistics, Myanmar, 1973-1987

Category	1973-74[a/]	1983-84[b/]	1987-88[c/]	2013[d/]		
				Low	Medium	High
No. of students	4,242,493	5,851,612	6,382,670	8,218,909	9,857,960	13,313,323
No. of teachers	96,597	134,116	228,444	210,741	252,768	341,367
Teacher/student ratio	1:44	1:44	1:28	(1:39)	(1:39)	(1:39)
No. of hospital beds	20,871	25,379	25,309	43,340	44,508	55,949
Hospital beds per 10,000 population	7.07	7.11	6.57	(6.90)	(6.90)	(6.90)
No. of doctors	3,838	8,381	11,021	13,819	14,191	17,839
Doctors per 10,000 population	1.30	2.50	2.86	(2.20)	(2.20)	(2.20)
No.of nurses	3,319	5,335	8,299	10,050	10,321	12,974
Nurses per 10,000 population	1.12	1.50	2.15	(l.60)	(1.60)	(1.60)

* *Sources:* a/ Union of Burma, 1976, p. 246;
b/ Union of Burma, 1986b, pp. 263-265;
c/ Union of Burma, 1990, pp. 193-196;
d/ Calculated according to the average ratio of the columns for 1973-74, 1983-84 and 1987-88.

* *Notes:* Number of students includes only primary, middle and high school students;
the ratios in parentheses are averages of the period 1973-1988

students and teachers can be observed in table 12. In 1983, the number of enrolled basic education students was about 5.9 million, or 52 per cent of the school-age population (i.e. 5-17 years) and the ratio of teachers to students was 1:44. However, this ratio dramatically decreased to 1:28 in 1987. Therefore, the average teacher-to-student ratio during the 15-year period was 1:39. Assuming those rates and ratios hold constant, the projected number of students and teachers in 2013 are shown in the last three columns of table 12, according to the three variants. This emphasizes the need to produce many more teachers if the growth in school-age population follows the high variant.

Conclusion

The projected population and its implications for Myanmar have been examined in this article. Despite the Government's desire to use human resources as manpower in endeavouring to develop the country's economy, it seems that this aim cannot be fulfilled within a 20-year period. High fertility leads to an increase in the proportion of younger age groups, not working age groups. As shown in the section starting on p. 39, if fertility declines quickly, the proportion of working age population would be 64 per cent, while it would be 53 per cent with a constant fertility rate.

It was also seen in that section that, in 1983, 39 per cent of the total population was in the younger age group (0-14 years) and 55 and 6 per cent were in the working and old age groups, respectively. Therefore, the dependency ratio for the base year was about 0.82, reflecting the extent of burden on the work force. According to the medium and high variants, the dependency ratios would reach 0.58 and 0.87, respectively, in 2013. A greater decline in the dependency ratio can be observed for the low variant, which would produce only 0.56 dependency in 2013.

Furthermore, there are many implications of rapid population growth for the socio-economic sectors such as agriculture, health and education. This article estimated the number of trained personnel required during the 30-year period to maintain the base-year levels of education and provision of health care. As a less developed country, it is a difficult task for Myanmar even to maintain those levels.

Of the three variants, the low variant provides the most realistic targets. The higher the level of fertility, the greater the problems for socio-economic development. Therefore, this study suggests that some extent of fertility control, such as family planning, is also desirable as a way out to enhance socio-economic development in Myanmar.

Appendix A: Smoothed age-distribution of Myanmar, 1983, obtained by the Hill-Zlotnik-Durch method

Age c	Population under age c ending in Three N3^ (x-)	Population under age c ending in Eight N8^ (x-)	Average population under age c N* (x-)	Smoothed Males	Reported Males
0	–	–	–	2,448,923	2,415,335
5	–	–	2,448,923	2,324,839	2,291,731
10	4,782,945	4,764,579	4,773,762	2,168,796	2,253,092
15	6,941,478	6,943,639	6,942,558	1,934,842	1,907,168
20	8,870,175	8,884,625	8,877,400	1,681,830	1,664,927
25	10,547,952	10,570,509	10,559,230	1,404,108	1,410,238
30	l1,960,486	11,966,191	11,963,338	1,113,807	1,103,482
35	13,079,037	13,075,253	13,077,145	875,515	863,593
40	13,929,546	13,975,775	13,952,661	751,161	741,001
45	14,685,011	14,722,632	14,703,821	701,420	719,508
50	15,412,101	15,398,382	15,405,241	633,943	655,801
55	16,043,295	16,035,073	16,039,184	521,407	506,480
60	16,562,167	16,559,016	16,560,591	393,884	412,515
65	16,958,236	16,950,715	16,954,475	276,301	262,603
70	17,231,446	17,230,106	17,230,776	178,538	199,272
75 +	–	17,409,314	17,409,314	176,976	179,345
				17,586,290	17,586,290

Age c	Population under age c ending in		Average population under age c	Smoothed	Reported
	Three N3^ (x-)	Eight N8^ (x-)	N* (x-)	Females	Females
0	–	–	–	2,368,679	2,381,739
5	–	–	2,368,679	2,282,073	2,248,827
10	4,657,709	4,643,794	4,650,752	2,143,405	2,162,916
15	6,816,599	6,771,714	6,794,157	1,967,994	1,957,263
20	8,783,242	8,741,060	8,762,151	1,738,408	1,734,896
25	10,506,172	10,494,947	10,500,559	1,447,781	1,448,741
30	11,952,661	11,944,019	11,948,340	1,134,078	1,123,827
35	13,096,412	13,068,424	13,082,418	893,634	862,650
40	13,963,362	13,988,741	13,976,051	778,930	789,625
45	14,740,167	14,769,796	14,754,982	732,983	743,075
50	l5,497,314	15,478,615	15,487,964	662,541	688,222
55	16,157,293	16,143,718	16,150,506	548,396	523,295
60	16,701,469	16,696,335	16,698,902	423,097	446,503
65	17,126,138	17,117,861	17,122,000	307,338	291,380
70	17,431,734	17,426,941	17,429,337	204,871	231,337
75 +	–	17,634,208	17,634,208	222,472	222,383
				17,856,681	17,856,681

Appendix B: Population projections for Myanmar, 1983-2013, low variant (thousands)

Females

Age	1983	1988	1993	1998	2003	2008	2013
0	2,405.37	3,243.09	3,384.52	3,250.19	3,069.62	2,935.72	2,993.56
5	2,282.13	2,318.57	3,143.64	3,297.71	3,181.80	3,018.00	2,896.56
10	2,148.84	2,254.83	2,294.49	3,115.67	3,273.01	3,162.17	3,002.72
15	1,975.06	2,119.62	2,228.03	2,270.95	3,088.50	3,249.21	3,143.01
20	1,747.59	1,938.47	2,085.07	2,196.44	2,243.29	3,056.68	3,220.83
25	1,459.42	1,708.12	1,899.77	2,048.64	2,163.27	2,214.42	3,023.03
30	1,146.51	1,421.80	1,669.01	1,861.51	2,012.78	2,130.78	2,185.79
35	903.00	1,112.83	1,384.43	1,630.13	1,823.48	1,977.16	2,097.97
40	782.96	872.58	1,078.88	1,346.48	1,590.34	1,784.24	1,939.47
45	733.72	751.78	840.60	1,042.71	1,305.45	1,546.63	1,739.75
50	664.15	696.15	715.88	803.34	l,000.05	1,256.40	1,492.98
55	551.61	617.90	650.54	671.92	757.31	946.80	1,193.93
60	426.38	496.76	559.67	592.62	615.61	697.78	876.66
65	309.84	364.19	427.49	485.23	517.66	541.75	618.02
70	206.55	243.08	288.40	341.71	391.54	421.65	444.90
75+	223.20	239.05	274.36	325.57	391.08	462.55	523.61
Total	17,966.33	20,398.81	22,924.77	25,280.84	27,424.80	29,401.95	31,392.80

Age	1983	1988	1993	1998	2003	2008	2013
0	2,480.76	3,343.03	3,496.47	3,363.70	3,182.08	3,047.97	3,111.69
5	2,326.06	2,385.79	3,233.10	3,399.67	3,286.78	3,123.46	3,002.80
10	2,175.03	2,298.22	2,360.56	3,203.23	3,372.59	3,264.58	3,105.50
15	1,944.58	2,145.24	2,270.05	2,334.92	3,172.70	3,344.77	3,241.14
20	1,691.95	1,905.68	2,106.65	2,233.60	2,301.78	3,133.35	3,308.30
25	1,415.07	1,650.37	1,863.70	2,065.40	2,195.12	2,267.30	3,092.27
30	1,125.22	1,376.44	1,610.11	1,823.45	2,026.33	2,159.20	2,235.06
35	884.68	1,089.18	1,336.97	1,569.13	1,782.70	1,987.05	2,122.70
40	755.41	849.58	1,050.18	1,294.08	1,524.45	1,738.10	1,943.12
45	701.99	716.98	809.98	1,005.60	1,244.38	1,471.90	1,683.97
50	634.92	654.36	671.70	762.59	951.34	1,182.80	1,404.68
55	523.97	575.92	596.95	616.25	703.54	882.48	1,102.32
60	396.67	455.82	504.40	526.32	546.94	628.51	792.81
65	278.40	323.79	375.17	418.60	440.40	461.39	533.93
70	179.77	206.45	242.55	283.88	319.94	339.98	359.27
75+	177.38	186.28	209.70	245.98	292.19	340.46	379.45
Total	17,691.87	20,163.13	22,738.25	25,146.39	27,343.26	29,373.30	31,419.02
Grand total	35,658.20	40,561.94	45,663.02	50,427.23	54,768.06	58,775.25	62,811.83

Appendix B continued: medium variant (thousands)

Females

Age	1983	1988	1993	1998	2003	2008	2013
0	2,405.37	3,243.09	3,397.57	3,645.32	3,275.16	3,137.17	3,038.51
5	2,282.03	2,318.57	3,148.35	3,317.24	3,400.30	3,227.83	3,103.88
10	2,148.84	2,254.83	2,295.48	3,122.27	3,294.75	3,381.86	3,214.31
15	1,975.06	2,119.62	2,229.09	2,273.47	3,097.47	3,273.49	3,364.61
20	1,747.59	1,938.47	2,086.36	2,199.42	2,248.07	3,068.85	3,248.97
25	1,459.42	1,708.12	1,901.16	2,052.06	2,168.85	2,221.97	3,039.60
30	1,146.51	1,421.80	1,670.36	1,865.05	2,018.89	2,139.34	2,196.93
35	903.00	1,112.83	1,385.65	1,633.53	1,829.68	1,986.29	2,110.30
40	782.96	872.58	1,079.87	1,349.48	1,596.20	1,793.34	1,952.33
45	733.72	751.78	841.38	1,045.10	1,310.52	1,555.06	1,752.29
50	664.15	696.15	716.61	805.33	1,004.21	1,263.82	1,504.73
55	551.61	617.90	651.35	673.89	760.94	953.12	1,204.56
60	426.38	496.76	560.58	594.84	619.29	703.43	885.98
65	309.84	364.19	428.40	487.61	521.67	547.34	626.26
70	206.55	243.08	289.17	343.85	395.45	427.25	452.46
75 +	223.20	239.05	275.39	328.45	396.72	471.59	536.92
Total	17,966.33	20,398.81	22,956.79	25,556.93	27,938.16	30,151.75	32,232.63

Males

Age	1983	1988	1993	1998	2003	2008	2013
0	2,480.76	3,343.03	3,516.28	3,592.11	3,397.48	3,255.39	3,152.98
5	2,326.06	2,385.79	3,239.80	3,427.49	3,518.35	3,341.59	3,213.35
10	2,175.03	2,298.22	2,361.77	3,211.94	3,402.36	3,496.52	3,324.18
15	1,944.58	2,145.24	2,271.27	2,337.70	3,183.49	3,376.28	3,473.43
20	1,691.95	1,905.68	2,108.23	2,236.93	2,306.72	3,146.60	3,342.19
25	1,415.07	1,650.37	1,865.47	2,069.43	2,201.02	2,274.51	3,108.52
30	1,125.22	1,376.44	1,611.87	1,827.70	2,033.07	2,167.58	2,244.78
35	884.68	1,089.18	1,338.66	1,573.36	1,789.70	1,996.40	2,133.81
40	755.41	849.58	1,051.72	1,298.14	1,531.41	1,747.76	1,955.38
45	701.99	716.98	811.32	l,009.21	1,250.96	1,481.40	1,696.44
50	634.92	654.36	672.96	765.70	957.12	1,191.66	1,416.78
55	523.97	575.92	598.23	619.12	708.44	890.10	1,113.37
60	396.67	455.82	505.67	529.20	551.39	634.83	802.10
65	278.40	323.79	376.34	421.38	444.70	466.92	541.36
70	179.77	206.45	243.47	286.20	323.77	344.92	365.28
75 +	177.38	186.28	210.81	248.79	297.09	347.42	388.40
Total	17,691.87	20,163.13	22,783.84	25,454.39	27,897.08	30,159.88	32,272.34
Grand total	35,658.20	40,561.94	45,740.63	51,011.33	55,835.24	60,311.64	64,504.98

Appendix B continued: high variant (thousands)

Females

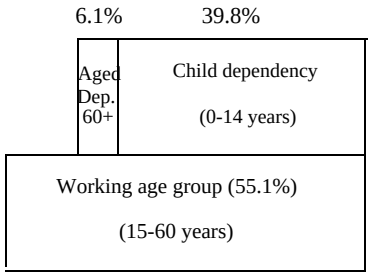
Age	1983	1988	1993	1998	2003	2008	2013
0	2,405.37	3,243.09	3,775.69	4,280.05	4,767.47	5,387.54	6,273.16
5	2,282.13	2,318.57	3,147.78	3,687.54	4,203.60	4,701.60	5,333.18
10	2,148.84	2,254.83	2,295.36	3,121.98	3,663.58	4,181.66	4,682.73
15	l,975.06	2,119.62	2,228.96	2,273.58	3,098.16	3,640.76	4,161.19
20	1,747.59	1,938.47	2,086.20	2,199.59	2,249.09	3,070.42	3,614.53
25	1,459.42	1,708.12	1,900.99	2,052.23	2,170.05	2,223.75	3,042.19
30	1,146.51	1,421.80	1,670.20	1,865.21	2,020.14	2,141.36	2,199.53
35	903.00	l,112.83	l,385.50	1,633.68	1,830.93	1,988.38	2,113.21
40	782.96	872.58	1,079.75	l,349.60	1,597.35	1,795.40	1,955.28
45	733.72	751.78	841.28	1,045.20	1,311.50	1,556.95	1,755.15
50	664.15	696.15	716.52	805.43	1,005.06	1,265.47	1,507.39
55	551.61	617.90	651.25	674.00	761.73	954.58	1,206.98
60	426.38	496.76	560.47	594.97	620.14	704.81	888.16
65	309.84	364.19	428.29	487.75	522.62	548.76	628.25
70	206.55	243.08	289.08	343.97	396.37	428.69	454.34
75+	223.20	239.05	275.26	328.61	398.00	473.88	540.27
Total	17,966.33	20,398.81	23,332.58	26,743.39	30,615.78	35,064.01	40,355.55

Males

Age	1983	1988	1993	1998	2003	2008	2013
0	2,480.76	3,343.03	3,902.43	4,433.35	4,947.82	5,599.12	6,528.62
5	2,326.06	2,385.79	3,237.57	3,803.88	4,346.75	4,871.98	5,534.61
10	2,175.03	2,298.22	2,361.37	3,209.72	3,777.04	4,321.14	4,848.63
15	1,944.58	2,145.24	2,270.86	2,337.30	3,182.22	3,749.35	4,294.58
20	1,691.95	1,905.68	2,107.70	2,236.53	2,307.27	3,146.84	3,714.00
25	1,415.07	1,650.37	1,864.88	2,068.92	2,201.76	2,276.40	3,111.36
30	l,125.22	1,376.44	1,611.28	1,827.12	2,033.75	2,169.79	2,248.73
35	884.68	1,089.18	1,338.09	1,572.79	1,790.35	l,998.65	2,138.25
40	755.41	849.58	1,051.20	l,297.59	1,532.08	1,750.03	1,960.02
45	701.99	716.98	810.88	1,008.71	l,251.59	1,483.64	1,701.12
50	634.92	654.36	672.54	765.28	957.67	1,193.75	1,421.37
55	523.97	575.92	597.80	618.74	708.92	891.92	1,117.63
60	396.67	455.82	505.24	528.82	551.85	636.38	805.81
65	278.40	323.79	375.95	421.03	445.20	468.34	544.46
70	179.77	206.45	243.16	285.91	324.22	346.24	367.90
75 +	177.38	186.28	210.44	248.43	297.67	349.30	392.40
Total	17,691.87	20,163.13	23,161.40	26,664.13	30,656.16	35,252.87	40,729.49
Grand total	35,658.20	40,561.94	46,493.98	53,407.52	61,271.94	70,316.88	81,085.04

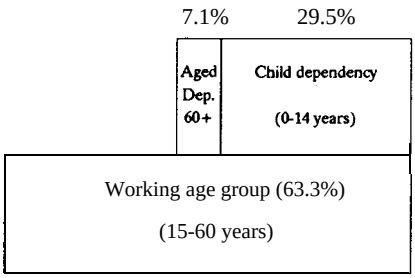
Figure 3: Comparison of base and end year of dependency ratios

(a) 1983 (Base year)



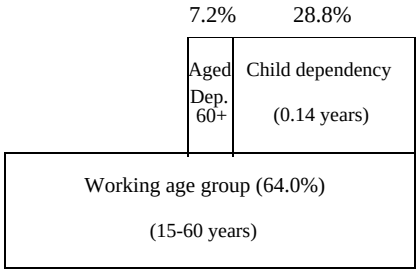
Dependency ratio = 0.82

(b) 2013 (Medium variant)



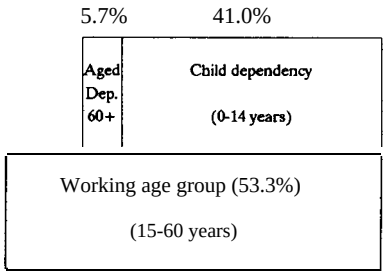
Dependency ratio = 0.58

(c) 2013 (Low variant)



Dependency ratio = 0.56

(d) 2013 (High variant)



Dependency ratio = 0.87

References

Adam, A.Y. (1982). "Population Projections for the Sudan 1973-2003," M.A. in demography thesis, Australian National University, Canberra, Australia.

Arriaga, E.E. (1983). *Estimating Fertility from Data on Children Ever Born, by Age of Mother*, International Research Document No. 11, U.S. Department of Commerce, Bureau of the Census, U.S.A.

Brass, W. and A.J. Coale (1968). "Methods of Analysis and Estimation" in *Demography of Tropical Africa*, (Princeton University Press, Princeton, NJ, U.S.A.), pp. 88-150.

Central Statistical Organization (CSO), (1989). *Vital Statistics Report, 1981*, (The Central Organization and Department of Health, Rangoon).

Ghulam Rabbani, A.K.M. (1984). *Bangladesh Population Census 1981*, (Bangladesh Bureau of Statistics, Ministry of Planning, Dhaka).

Immigration and Manpower Department (IMPD), (1975). *Demographic Report of the Socialist Republic of the Union of Burma*, (Immigration and Manpower Department, Rangoon).

_____(1987a). *Population Projections: Burma, 1983-2003*, (Immigration and Manpower Department, Ministry of Home and Religious Affairs, Rangoon).

_____(1987b). *Changes in the Age-structure of Burma*, (Immigration and Manpower Department, Ministry of Home and Religious Affairs, Rangoon).

Lucas, D. and P. McDonald (1980). "Inter-relations Between the Demographic Variables", in *Beginning Population Studies*, Demography Teaching Notes 2, Department Studies Centre, Australian National University, Canberra.

Lwin, Maung Maung (1983). *Burmese Urbanization: An Overview*, International Economic Conflict Discussion Paper, Economic Research Centre, Faculty of Economics, Nagoya University, Japan.

Lwin, Thet (1974). *Abridged Life-table for the Indigenous Population of Burma (1911-1941)*, Department of Statistics, Institute of Economics, Rangoon.

Maung, Maung (1980). Accuracy, Completeness and Adjustment of the 1973 Burma Census", seminar paper, International Institute for Population Studies, Deonar, Bombay, India.

Myint, Maung Maung (1982). "Abridged Life-table for Greater Rangoon, 1973", seminar paper, International Institute for Population Studies, Deonar, Bombay, India.

Myint, Tin Tin (1980). "Level of Fertility and Mortality and Population Projections for Burma, 1973-2003", seminar paper, International Institute for Population Studies, Deonar, Bombay, India.

Nyunt, Daw Tin Tin (1978). "Estimation of Vital Rates for Burma and their Effects on the Future Size of Population", M.A. thesis in demography, Australian National University, Canberra, Australia.

Sullivan, J.M. (1972). "Models for the Estimation of the Probability of Dying between Birth and Exact Ages of Early Childhood", in *Population Studies*, vol. 26, No. 1, pp. 79-97.

Sundrum, R.M. (1983). *Demographic Factors and Economic Development*, Reproduced by Department of Economics, Institute of Economics, Rangoon.

Thompson, W.S. and D.T. Lewis (1965). *Population Problems,* (fifth edition), (Miami University, McGraw-Hill Book Company, New York, U.S.A.).

Trussell, T.J. (1975). "A Re-estimation of the Multiplying Factors for the Brass Technique for Determining Childhood Survivorship Rates" in *Population Studies,* vol. 29, No. 1, pp. 97-107.

Union of Burma (1976). *Report to the Pyithu Hluttaw on the Financial, Economic and Social Conditions of the Union of Burma for 1976/77,* Ministry of Planning and Finance, Rangoon.

_____(1982). *Report to the Pyithu Hluttaw on the Financial, Economic and Social Conditions of the Union of Burma for 1982/83,* Ministry of Planning and Finance, Rangoon.

_____(1986a). *Burma: 1983 Population Census,* Immigration and Manpower Department, Ministry of Home and Religious Affairs, Rangoon.

_____(1986b). *Report to the Pyithu Hluttaw on the Financial, Economic and Social Conditions of the Union of Burma for 1986/87,* Ministry of Planning and Finance, Rangoon.

_____(1987). *Report to the Pyithu Hluttaw on the Financial, Economic and Social Conditions of the Union of Burma for 1987/88,* Ministry of Planning and Finance, Rangoon.

_____(1990). *Report to the Pyithu Hluttaw on the Financial, Economic and Social Conditions of the Union of Burma for 1990/91,* Ministry of Planning and Finance, Rangoon.

United Nations (1955). *Manual II: Methods of Appraisal of Quality of Basic Data for Population Estimates,* Manual on Methods of Estimating Population, Population Studies, No. 23, (Department of Economic and Social Affairs, New York).

_____(1967). *Manual IV: Methods of Estimating Basic Demographic Measures from Incomplete Data,* Population Studies No. 42, (Department of Economic and Social Affairs, New York).

_____(1977). *World Population Prospects as Assessed in 1973,* Population Studies No. 60, (Department of Economic and Social Affairs, New York).

_____(1980). *Population Policy Compendium,* (Department of International Economic and Social Affairs and the United Nations Fund for Population Activities, New York).

_____(1982). *Demographic Indicators of Countries,* Estimates and Projections as Assessed in 1980, (Department of International Economic and Social Affairs, New York).

_____(1983). *Manual X: Indirect Techniques for Demographic Estimation,* Population Studies, No. 81, (Department of International Economic and Social Affairs, New York).

_____(1986). *World Population Prospects, Estimates and Projections as Assessed in 1984,* Population Studies, No. 98, (Department of International Economic and Social Affairs, New York).

_____(1987). *World Population Policies,* Vol. 1, Population Studies No. 102, (Department of International Economic and Social Affairs, New York).

Weeks, J. R. (1981). *Population: An Introduction to Concepts and Issues* (2nd edition), (Wadsworth, Belmont. California), pp. 223-237.

Population Characteristics in the Lao People's Democratic Republic

The Government recognizes that high fertility contributes to high infant, child and maternal mortality

By Carl M. Frisen*

The Lao People's Democratic Republic is - with the exception of Singapore - the least populated country of continental South-east Asia; it also has the lowest density of population. The country's first nationwide census as of 1 March 1985 reported a preliminary total of 3,584,803 inhabitants

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(Lao PDR, 1986).[1/] The total land area is 236,800 square kilometres, resulting in a density of only 15 persons per sq. km in 1985. A recent estimate places the 1990 population at 4.2 million, or almost 18 persons per sq. km (State Planning Committee, n.d.[a]).

Lao PDR is a land-locked country bordered on the north-west by Myanmar, on the north by China, on the east by Viet Nam, on the south by Cambodia and on the west by Thailand. Its major transit routes are through Thailand on the west and Viet Nam on the east. For the most part, the western boundary is marked by the Mekong River. Only the north-western province of Sayaburi and smaller segments of Oudomsay and Luangprabang provinces lie to the west of the river. The eastern border is generally mountainous, following the ridge of the Annamite Cordillera.

About 80 per cent of the land is between 200 and 3,000 metres above sea level. Extensive river plains of the Mekong and its tributaries are located primarily in the southern half of the country but continue northward to include the plain of Vientiane, on which the Vientiane Municipality is located. Three provinces bordering the Mekong River, namely, Vientiane Municipality, Suvannakhet and Champasak, accounted for 37 per cent of the Lao population in 1985 and had densities of 96, 25 and 26 persons per sq. km, respectively. Map 1 shows the population density in 1985 with the dots distributed randomly by computer.[2/] Over 50 per cent of the Lao people live in provinces bordering the Mekong, most of the population residing within 30 km of the river.

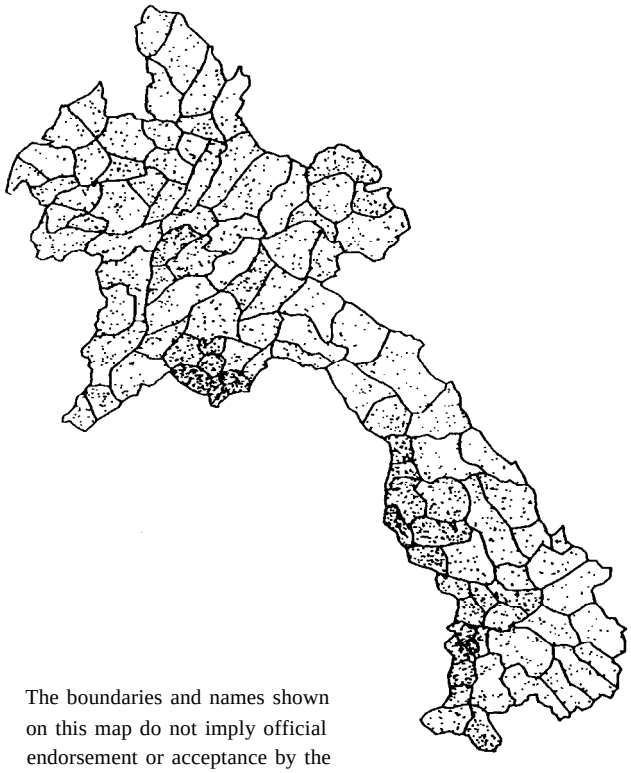
Although no official figures on urban populations have been published, the city of Vientiane was reported to have a population of 150,000 in 1985, Suvannakhet about 50,000, Pakse 20,000 and Luangprabang about 8,000. The rural population is estimated at 85 per cent of the total, residing in 11,000 villages (UNICEF, 1987).

Ethnicity

Ethnic diversity is an important characteristic of the Lao population. There is official reference to 68 ethnic groups, but there is no ethnographic evidence to support this specific number. With 80 per cent of its area defined as mountainous and with limited lines of transportation and communication, Lao PDR faces a difficult task in trying to blend these diverse groups into a “Lao society”. For convenience they are sometimes consolidated into three major groups, as described by Stuart-Fox (1986, p. 45):

Map 1: Density of the population of the Lao People's Democratic Republic by district, 1985

Distribution of population
(1 dot equal 1,000 people)



The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations

> "Based on a combination of cultural, linguistic and geographical criteria, however, it is usual to divide the population of Laos into three broad groups. These have been designated as the Lao Theung, or 'Lao of the mountain slopes', speaking Mon-Khmer languages; the Lao Soung, or 'Lao of the mountain summits', speaking Tibeto-Burman languages; and the Lao Loum, or 'Lao of the mountains and plains', speaking T'ai languages. The ethnic, or lowland, Lao of the Mekong valley constitute but one of the groups making up the Lao Loum."

In the 1985 census, Lao respondents were asked: "What is your ethnic group"? Apparently because of problems of comparability and classification, the results are considered unofficial but they suggest that the Lao Loum comprise about 68 per cent of the total population, the Lao Theung about 22 per cent and the Lao Soung 10 per cent. Smaller ethnic minorities include the Vietnamese, Chinese and Indians, residing chiefly in urban areas.

Age-sex distribution

The reported sex ratio for Lao PDR in 1985 was 96.1 males per 100 females. Aside from possible under-reporting in the census, other factors contributing to the low sex ratio could be the effect of over two decades of military activity and the large-scale out-migration following cessation of fighting. The impact on the national sex ratio by age groups is shown in table 1. The high ratios reported for the 35-39 and 65-69-year-old age groups raise questions of age misreporting.

Lao PDR has a young population. The 1985 census age distribution shows 44 per cent were under 15 years of age, one-half of the population was between 15 and 59 years and 6 per cent were aged 60 years and over (table 2). As seen in table 1, the lowest sex ratios among adults of working age were recorded for the 15-24-year-old age group, indicating that many young working people were lost to the labour force through emigration. Other factors contributing to a low sex ratio were possible underenumeration of males and the effects of the years of internal warfare. The overall impact is reflected in provincial sex ratios for the population 15 years of age and over. Map 2 shows that, in 1985, 10 of the country's 17 provinces reported fewer than 90 males per 100 females and in two provinces the sex ratio of adults was less than 80. Geographically they comprised the four northernmost and eight southernmost provinces with a population of 1.93 million, or 54 per cent of the national total. A band of four provinces stretching across the country at it widest point had adult sex ratios of 95 to 99. Only Vientiane Municipality had a ratio of over 100 for adults.

Table 1: Population of Lao PDR by age and sex, 1985

Age group (years)	Total	Male	Female	Sex ratio
0-4	620,470	315,959	304,511	103.76
5-9	511,103	261,046	250,057	104.39
10-14	454,360	231,548	222,812	103.92
15-19	344,954	161,777	183,177	88.32
20-24	281,716	126,233	155,483	81.19
25-29	277,759	131,810	145,949	90.31
30-34	199,137	95,520	103,617	92.19
35-39	187,923	93,486	94,437	98.99
40-44	128,363	60,492	67,871	89.13
45-49	141,437	67,597	73,840	91.55
50-54	110,826	53,047	57,779	91.81
55-59	102,455	49,505	52,950	93.49
60-64	79,288	39,250	40,038	98.03
65-69	58,447	30,130	28,317	106.40
70-74	36,731	17,205	19,526	88.11
75-79	22,203	10,661	11,542	92.37
80-84	14,499	6,396	8,103	78.93
85-89	6,262	2,795	3,467	80.62
90-94	3,525	1,361	2,164	62.89
95-99	1,591	655	936	69.98
100-104	1,104	410	694	59.08
105-109	196	82	114	71.93
110-114	210	68	142	47.89
115+	244	82	162	50.62
Total	**3,584,803**	**1,757,115**	**1,827,688**	**96.14**

Fertility and mortality

The preliminary results of a multiround survey started in 1988 give a crude birth rate (CBR) of 45.0 and a crude death rate (CDR) of 16.0 per thousand population for the period 1988-1990 (State Planning Committee, n.d.[b]). Lao vital rates remain high and there is as yet no clear indication of a significant reduction in fertility with the possible exception of Vientiane Municipality. Perhaps a better measure of fertility, in view of the skewed sex ratio of the Lao adult population, is the total fertility rate (TFR). This is the number of children that a woman would bear in her lifetime based on current age-specific fertility rates. The preliminary results of the multiround survey reported a TFR of 6.8 for a period of about 18 months in 1987-1988 (State Planning Commission, n.d.[a]). This compares with a 1960 estimate

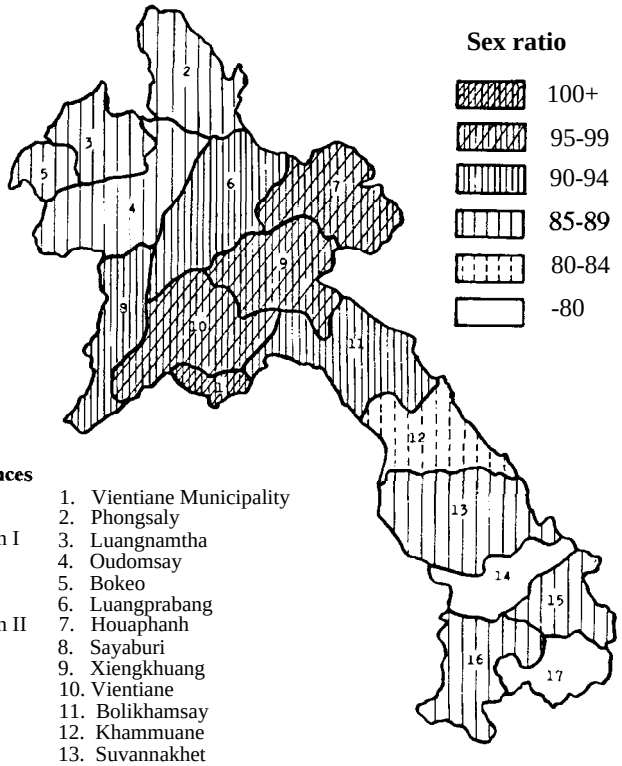
Table 2: Projected population of the Lao People's Democratic Republic to the year 2000 by broad age group

Age group	1985	1990	1995	2000
Number (000)				
0-14	1,600.4	1,864.4	2,170.0	2,467.2
15-19	1,791.4	2,062.4	2,370.6	2,740.3
60+	226.2	243.2	257.4	292.5
Total	3,618.0	4,170.0	4,798.0	5,500.0
Per cent				
0-14	44.2	44.7	45.2	44.9
15-19	49.5	49.5	49.4	49.8
60+	6.3	5.8	5.4	5.3
Total	l00.0	100.0	l00.0	l00.0
5-year change (000)				
0-14	–	+ 264.0	+ 305.6	+ 297.2
15-19	–	+ 271.0	+ 308.2	+ 369.7
60+	–	+ 17.0	+ 14.2	+ 35.1
Total	–	+ 552.0	+ 628.0	+ 702.0
5-year change (%)				
0-14	–	+ 16.5	+ 16.4	+ 13.7
15-19	–	+ 15.1	+ 14.9	+ 15.6
60+	–	+ 7.5	+ 5.8	+ 13.6
Total	–	+ 15.3	+ 15.1	+ 14.6

for Thailand of 6.6 cited by Das Gupta *et al.* (1963), again reflecting the high level of Lao fertility.

As is the case with most Lao demographic data, estimates of mortality tend to vary. In its country presentation to the Second United Nations Conference on the Least Developed Countries, held in 1990, the Lao PDR estimated infant mortality in 1986 at 116 deaths per thousand births. Other estimates for the latter 1980s approximate this figure. Information on maternal mortality is even more difficult to obtain, but there is general recognition that both infant and maternal death rates are too high. It is also evident that rates vary considerably between the urban areas and the remote mountain provinces. The Government's efforts to expand health services, now largely concentrated in the major urban centres, are severely limited by the lack of medical facilities and supplies, problems of transportation and communication and the unwillingness of medical personnel to accept posting in thinly populated, isolated rural areas. Ethnic diversity further complicates the problem. A recent step has been the establishment of a maternal and child health care institute that will seek to reduce the high levels of infant, child and maternal mortality through a programme including birth spacing.

Map 2: Sex ratio of population aged 15 years and over, 1985, Lao People's Democratic Republic



Provinces

	1. Vientiane Municipality
	2. Phongsaly
Region I	3. Luangnamtha
	4. Oudomsay
	5. Bokeo
	6. Luangprabang
Region II	7. Houaphanh
	8. Sayaburi
	9. Xiengkhuang
	10. Vientiane
	11. Bolikhamsay
	12. Khammuane
	13. Suvannakhet
	14. Saravane
	15. Sekong
	16. Champasak
	17. Attapeu

The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations

Population policy

In view of the country's relatively small population and low population density, the Government has adopted a pro-natalist policy. Population growth is viewed as essential to economic development and national security. At the same time, the Government recognizes that high fertility, with short birth intervals, inadequate health services and problems of malnutrition, contributes to high infant, child and maternal mortality. The current expansion of maternal and child health services incorporates the first phase of a child spacing programme to provide services through two clinics in Vientiane city hospitals and clinics in the remainder of Vientiane Municipality and in Luangprabang, Vientiane, Khammuane, Suvannakhet and Champasak provinces. The two clinics in Vientiane Municipality are currently functioning and clinics in the remaining areas should be operational before the end of 1991. It is hoped that the programme will provide nationwide coverage within the next three years.

Migration

Out-migration began before the change in Government in late 1975 and has continued at varying levels up to the present time. The monthly statistical reports of the United Nations High Commissioner for Refugees (UNHCR) provide one measure of emigration from Lao PDR and show that from 1975 to the end of May 1991 a total of 359,000 people entered UNHCR camps in Thailand, i.e. 213,000 lowland Lao and 146,000 hilltribe migrants. In addition, there has been significant unofficial border crossing into Thailand with varying estimates of the numbers involved. Stuart-Fox (1986, p. 52) mentions a possible total of 60,000 which would imply a total out-migration of well over 400,000. UNHCR figures on repatriation show 8,000 have returned to Lao PDR up to 31 May 1991, primarily persons who could not qualify for resettlement in a third country. Stuart-Fox (1986, p. 53) summarized the significance of this movement noting that

> "the outflow not only included most of the former Lao elite, but also represented a substantial proportion of the educated middle class. Laos lost not only most of its professionally qualified doctors, engineers, managers and administrators, but also a large proportion of its mechanics, tradesmen and artisans."

The impact of this stream of emigration is evident today in the age-sex structure of the population and the composition of the labour force.

Labour force

In a report prepared for a United Nations meeting in 1986 on the least developed countries, the Lao labour force was estimated at 1.6 million (Lao PDR, April 1986). A recent tabulation of the 1985 census data confirms the 1.6 million total and provides a sectoral breakdown. Agriculture and forestry accounted for 90 per cent of the labour force while industry and construction involved only two per cent.

The Government is aware that the technical skill of the indigenous labour force is low, noting that at the time of the 1985 census there were only 500 engineers and 1,500 technicians in the country. There is also a shortage of adequately trained managerial manpower. These serve as constraints on the economic development programme (Lao PDR, 1990).

Education

The 1985 census included a question on the educational attainment of the population (table 3 summarizes the results). Primary enrolment begins at age six years and includes grades 1 through 5. Secondary and higher secondary levels include grades 6 through 8 and 9 through 11, respectively. The data indicate that about one-half of the Lao population of school age and above have never attended school.

Education even at the primary level appears to have been very limited in availability until the establishment of the current Government, which made primary education one of its earliest priorities; a major effort was initiated to expand school facilities. A comparison of the numbers of pupils enrolled in general education classes in 1975-1976 and 1987-1988 provides a measure of the Government's achievement (State Planning Committee, 1986, 1989):

Table 3: Level of educational attainment in Lao PDR by sex, 1985

Level	Total	Male	Female
University (higher level)	183	164	19
University*	10,096	7,216	2,880
High level equivalence*	1,271	1,021	250
Middle level*	12,143	7,934	4,209
Higher secondary (3 yrs.)	51,888	34,778	17,110
Secondary (3 yrs.)	195,727	123,854	71,873
Primary (5 yrs.)	1,180,696	655,383	525,313
Total	**1,452,004**	**830,350**	**621,654**

* Includes both those studying and those who have completed the level.

	1975-1976	1987-1988 (in thousands)	Change
Total	**346.3**	**678.1**	**+ 331.9**
Primary	317.1	558.9	+ 241.7
Secondary	26.6	89.0	+ 62.3
Higher secondary	2.5	30.3	+ 27.8

Note: Change calculated using unrounded figures.
Technical and vocational school pupils excluded.

The rapid expansion of the school system has resulted in serious problems, including high percentages of dropouts and repeat enrolment, the use of poorly qualified teachers and inadequate physical facilities and teaching materials (Lao PDR, April 1989; UNICEF, 1987).

Lao schools at the primary and secondary levels are classified as general and vocational, with the latter representing 3 per cent of approximately 700,000 students reported in 1987-1988. Among the schools at the technical first and secondary levels are schools of agriculture, irrigation, forestry, civil engineering, electronics, post and communications, commerce, finance, nursing and fine arts. At the university and higher levels, facilities include polytechnic and medical universities and electronics, architecture, transport and communications and normal schools. Enrolments reported in 1987-1988 were 7,000 pupils in first-level technical schools, 9,200 in secondary technical schools and 5,400 in high schools. About 1,000 students had fellowships for study abroad in institutions of higher education (State Planning Committee, 1989). It may be anticipated that for some time to come the lack of qualified instructors and adequate facilities and equipment will limit the expansion of enrolments in the vocational and higher education levels. This, in turn, will constrain efforts to expand the base of skilled manpower within the country's labour force.

Population projections

Following the 1985 census and a 1986 survey of fertility and mortality, the State Statistical Centre prepared a set of population projections to the year 2000 (State Planning Committee, n.d.[c]). A summary by broad age groups is given in table 2. The assumptions on which the projections are based were not spelled out, but the relatively small changes in the age distributions imply little change in birth and death rates over the 15-year interval. The final results of the current multiround vital statistics survey are expected to provide a basis for a new set of projections and for a set of life tables. Meanwhile, the current decade is expected to show an increase of about 600,000 in the number of children under 15 years of age, 680,000 in

the population between the ages of 15 and 59 years and almost 50,000 in those 60 years of age and over. Total population gain for 1900-2000 is projected at 1,330,000 or 32 per cent.

Conclusion

Given the small size and sparsity of the country's population when compared with its neighbours, the Lao Government's endorsement of a high fertility policy is not surprising. At the same time, Government policy classifies the current level of mortality as unacceptable. With the support of the World Health Organization and the United Nations Population Fund, a child-spacing programme has been started in order to reduce high infant, child and maternal mortality. This is part of a broad programme to expand health care on a nationwide scale. At the same time, the Government is faced with the problem of limited resources with which to improve the quality of its population in line with its social and economic goals.

School enrolment data indicate that growth in the number of schools, teachers and students is failing to keep up with increases in the school-age population, expectation of life at birth appears to be below 50 years, and technically trained manpower is in short supply owing to postwar out-migration and the current lack of adequate training facilities. Should the high growth rate persist through the current decade, it can be expected to exact a cost in terms of slower socio-economic development. The Government faces a difficult task in trying to meet the basic needs of its people and seeking to improve the country's economic status.

Footnotes

1. In evaluating the 1985 census results, it should be noted that all published data are based on a 10 per cent sample except the national and provincial totals which were obtained by manual count. A report on the census issued in 1986 contained tables but no text, and tabulations were limited to national and provincial populations by sex and age, by sex and educational attainment, by family size and by district. The Government is considering preparation of a report including data from the 1985 census, a 1986 fertility and mortality survey and a multiround vital statistics survey recently carried out. In the meantime, any analysis of the 1985 census is tentative in view of the preliminary nature of the published tabulations.

2. District boundaries are not shown for Vientiane Municipality and the population is distributed randomly within the total area. Two new districts have been created in Suvannakhet province since the 1985 census and the 1985 populations are distributed randomly over the areas of the provinces as they existed in 1985. The two southernmost districts in Oudomsay province were part of Sayaburi province in 1985. Map 2 shows the provincial boundaries as of 1989.

References

Das Gupta, Ajit, Samruay Chotechanapibal, Thip Chalothorn and Wiwit Siripak (1963). "Population perspective of Thailand." (Mimeographed). Reprinted in *Perspective on Thai Population.* Research Report No. 11. (Bangkok, Institute of Population Studies, Chulalongkorn University, 1974).

Lao PDR (1986). *Population of Lao PDR (01-03.1985),* Vientiane.

_____(1989). "Report on the economic and social situation, development strategy, and assistance needs of Lao PDR". Prepared for the Round Table Meeting, Geneva, April 1989.

_____(1990). "Country presentation by the Government of the Lao People's Democratic Republic". Prepared for the Second United Nations Conference on the Least Developed Countries, Paris, 3-14 September 1990, United Nations.

Lao State Planning Committee (1986). "10 years of socio-economic development in the Lao People's Democratic Republic", Vientiane.

_____(1989). Basic data about the social and economic development of Lao People's Democratic Republic, Vientiane.

_____ n.d. (a). Lao People's Democratic Republic Multiround Vital Statistics Survey: Preliminary results, July 1987-December 1988.

_____ n.d. (b). Lao People's Democratic Republic Multiround Vital Statistics Survey: Population Size, Distribution and Growth. (Mimeograph report).

_____ n.d. (c). Untitled working paper on age-sex distribution, 1985 to 2000, (unpublished).

Robinson, Warren C. (1989). "Population trends and policies in Laos (Lao People's Democratic Republic) and Cambodia (Democratic Kampuchea)". Paper presented at the IUSSP International Population Conference, New Delhi, 20-27 September 1989.

Stuart-Fox, Martin (1986). *Laos: politics, economics and sociey*, (London, Frances Pinter).

United Nations (1989). Trends in Population Policy. Population Studies No. 114, (New York, United Nations).

_____(1991). *World Population Prospects 1990.* Population Studies No. 120, (New York, United Nations).

United Nations Children's Fund (UNICEF), (1987). "An analysis of the situation of children and women in the Lao People's Democratic Republic", Vientiane, United Nations Children's Fund.

United Nations Development Programme (UNDP), (1989). *Development Co-operation: Lao People's Democratic Republic, 1988 Report*, July.

World Bank (1978). *World Development Report 1978.* (Washington, D.C., World Bank), August.

Zachariah, K.C. and M.T. Vu (1988). *World population projections,* 1987-88 edition. From the data files of the World Bank, (Washington, D.C., World Bank).

Multiround Vital Statistics Survey in the Lao People's Democratic Republic*

Because reliable estimates of the population and related data are needed to guide national development planning, the first population census of the Lao People's Democratic Republic in 1985 was very important as a way of providing valuable statistics on the size, distribution and characteristics of the population. However, while the census provided good estimates of the population size and related measures such as fertility and mortality, it was less useful as a means of identifying the speed and manner in which the population was changing. Thus, a project was developed by the ESCAP secretariat with funding from UNFPA (United Nations Population Fund) to assist the Government in improving civil registration and vital statistics. The project had two broad objectives. The first was to provide training and support to selected village chiefs as a way of strengthening their role as civil registrars in the hope that this would lead to eventual improvement in the national registration system. The second broad objective was to set up a system of statistical collection, involving regular visits to selected households, to provide good estimates of vital statistics. This system is referred to as a multiround survey. Although it has many methodological weaknesses, this type of survey can provide some valuable population data in a country where financial resources for conducting censuses and surveys are limited.

The first visit to selected villages was made in mid-1988. During this visit, basic information was obtained for every usual member of the sample households. In the State Statistical Centre (SSC), these records were read to

* The author of this note is Mr. Laurie Lewis, ESCAP Regional Adviser on Population Censuses and Surveys.

computer to establish a statistical baseline against which future change could be measured. Questions were asked about vital events that had occurred in each household during the preceding year. In an evaluation of the results, it appears that the responses on births were very good and provide useful guidelines for measuring change. The responses on deaths, universally more difficult to obtain, were less reliable, although it is possible to provide some estimates using indirect techniques.

The survey design was most basic, intended to provide broad estimates at the national level. For operational reasons, the sample was drawn from compact clusters, which, as far as practicable, comprised entire villages. However, in order to reduce size variation, large villages were divided into approximately equal clusters. While the clustering effects increase sampling errors, the approach has some important benefits for this type of survey. Since the boundaries of each enumeration area are clear, there is little difficulty in incorporating new households formed during the project life into the sample. The results for any village or cluster can be compared with civil registration records obtained from other sources. More importantly, the approach simplifies fieldwork, including supervision and control, and helps to improve the essential quality of the data.

The sample involved the selection of 300 villages or urban clusters. A sample of this size should provide reasonable estimates at the national level. Some basic national rates have already been produced from this survey, but in general the sample size is too small to provide detailed geographical data. However, to provide more data for this note, records of births and deaths for the two-year period 1988-1990 have been combined. This has effectively created a larger sample and has permitted limited geographical disaggregation of data. In addition, a population count was conducted in late 1990 using the village chiefs as enumerators.

A number of factors should be borne in mind in interpreting the data presented in this note. Limitations in funding and the inability to provide as much supervision or control over operations as desired have meant that, while the data should be very useful, the precision of all figures cannot be assured. Problems with sample size for the multi-round survey have meant that figures are subject to both random fluctuations and sampling errors. Also, it needs to be recognized that many of the approaches used are novel and results are still somewhat experimental; techniques and procedures are still in development. Nevertheless it is hoped that these provisional data will go some way to suggest broad patterns of demographic behaviour and will meet a growing need for basic population data.

Evaluation of data

Fortunately the 300 villages included in the multiround survey provided an excellent resource for estimating under-enumeration in the 1990 census or population count. Weighted provincial populations for the 300 villages provided the key control values; weights were derived from the 1985 census. In 1.5 provinces the actual census counts were used in the procedure; in the remaining two provinces, some adjustment was needed to align areas used for census and multiround surveys.

Based on this procedure, the weighted population of Lao PDR was about 4.20 million, compared with an actual census count of 4.14 million, implying omissions of the order of 1.4 per cent. Dividing the control total by the actual count, a correction factor was obtained. This factor was applied as a constant to all figures, since little was known about the actual distribution of under-enumeration.

Population size and distribution

Given the aforementioned limitations, it has been possible only to provide data for specified geographic areas. Lao PRD has been divided into six regions as shown below, based on similarity in recorded vital rates, to enable spatial distributions to be provided. (See map on p. 61.)

Region	Provinces	Location on map	Region	Provinces	Location on map
I	Phongsaly	2	IV	Vientiane	
	Luangnamtha	3		Municipality	1
	Oudomsay	4	V	Khammuane	12
	Bokeo	5		Suvannakhet	13
II	Luangprabang	6	VI	Saravane	14
	Houaphanh	7		Sekong	15
	Sayaburi	8		Champasak	16
	Xiengkhuang	9		Attapeu	17
III	Vientiane	10			
	Bolikhamsay	11			

The extent to which data can be shown separately for each of these regions depends upon the size and underlying precision of estimates. Thus for the population distribution by sex, shown in table 1, figure for all regions are given. The total population of 4.2 million comprised 2.06 million males and 2.14 million females. The population of Vientiane Municipality is approaching half a million people. The relatively high sex ratio recorded reflects the importance of migration to the growth of Vientiane and the predominance of males among migrants. Conversely, the low sex ratios in rural areas is in part explained by out-migration, particularly by males.

Table 1: Population by sex and region, 1990

Region	Males	Females	Total	Sex ratio*
I	297,663	317,619	615,282	93.7
II	461,813	478,103	939,916	96.6
III	225,849	228,022	453,871	99.0
IV	242,028	226,660	468,688	106.8
V	436,781	460,411	897,192	94.9
VI	397,437	429,274	826,711	92.6
Lao PDR	2,061,571	2,140,089	4,201,660	96.3

* Number of males per thousand females

Population growth

The combined influences of migration, fertility and mortality are reflected in growth rates. The population census of 1985 provides a useful benchmark against which growth can be measured. For Lao PDR as a whole, the mean annual rate of growth was a little below 2.9 per cent, which is very high by global standards.

Not surprisingly, the highest growth is recorded for Vientiane Municipality at a mean average rate of 4.6 per cent. This high rate is the consequence of the net migration flows into Vientiane from the more rural provinces of the country. Nevertheless, while the effects of migration on growth for Vientiane is very significant, the effects on rural areas is more evenly distributed. Thus, in all regions, growth remains high, i.e. between 2 and 3 per cent per annum. Indeed the pattern shown is consistent with the effects of fertility on growth. In the more remote areas in the north-eastern and southern parts of the country, rates of growth are highest. In the provinces closest to Vientiane Municipality, namely, Xiengkhuang, Vientiane, Bolikhamsay and Khammuane, the growth rates are considerably lower.

This pattern is largely supported by evidence from the multiround survey. Some data from this survey are presented below. Processing is continuing but some provisional rates have been calculated: a crude birth rate of about 45 births per thousand population has been obtained. The corresponding mortality rate is about 16 deaths per thousand population. These rates are thus entirely consistent with the growth rate of 2.8 - 2.9 per cent recorded between 1985 and 1990.

Table 2: Mean annual birth and death rates, 1988-1990, by region

Region	Birth rate	Death rate
I	49.6	16.5
II		
III	38.0	12.0
IV		
V	41.9	17.3
VI	47.4	
Lao PDR	45.0	16.0

Mortality estimates are most subject to sampling error and as a result the number of regions presented has been reduced to three. For fertility, the figures are larger and more stable and rates for five regions are presented.

Fertility rates are clearly highest in the north-eastern and southern provinces, remote from the main service centres in Vientiane Municipality. The relatively low fertility in Region V is interesting. These provinces have reasonable access to Vientiane, which helps to explain falling rates. But relatively low rates were also recorded in Bokeo, Sayaburi and Champasak provinces, which in common with Region V, border on Thailand, suggesting that some influences of reduced fertility in that country might have been felt in Lao PDR. It is also of interest to note that during the three years of observation in the multiround survey, some evidence of declining fertility has appeared.

From the evidence available, mortality for Lao PDR seems to have remained persistently high, although a slight decline has most likely occurred. The advantage enjoyed by Vientiane Municipality is very apparent, with its much more elaborate infrastructure of health services.

Concluding comment

Dispite its many difficulties, the vital statistics project has been able to produce some revealing and valuable data on the size, distribution and growth of population. The high levels of fertility and mortality and their uneven distribution should provide useful guidelines to health and population planners.