CHAPTER IV

MORTALITY LEVELS, TRENDS AND DIFFERENTIALS

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1. Introduction

Data on deaths have to be obtained through censuses and surveys since there is no effective vital registration system in Nepal. Even the data obtained through censuses and surveys suffer from various problems related to quantity and quality. In the 1991 census, information on deaths during the twelve-month period preceding the date of census was obtained. The number of deaths reported was 98,513, which would yield a crude death rate of less than 6 per 1000 population. This obviously is unacceptably very low. Thus the mortality estimation has to be performed by indirect means.

2. Estimation of Mortality Level

2.1 Estimation of mortality based on age distribution of population at one point of time.

The age distribution of population can be used to estimate vital rates. This method assumes stability of age distribution and consequently of constancy of mortality and fertility. Stability of age structure is satisfied to a greater extent in the case of females than males since males migrate more than females at the national level. For Nepal which has open borders with India, it is appropriate to use female age distribution in the derivation of stable estimate of mortality. When there are distortions in the age distribution, stable ogive matching the age 35 i.e.., C(35) is suggested for use (UN, 1967, p. 23). Using the reported female age distribution of 1991 census and the 1981-1991 inter-censal average annual female growth rate of 2.35 per cent, the level of female mortality has been estimated. Corresponding to C(35)[1], the life table level (according to Coale-Demeny West Model female) was 11.74. The female life expectancy at birth, thus estimated, comes to 46.9 years. This obviously is an under-estimate since the estimated female life expectancy in 1981 was over 48 years (CBS, 1987a, p. 260).

[1] Using C(35) along with 1_5 would be a better procedure in determining the level of life table. Unfortunately the estimate of 1_5 is not reliable since, the data on children ever born and children surviving are very poor in the 1991 census. For a detailed discussion, see section 2.4 of this chapter.

Female age distribution around the slime time is also available from the Nepal Fertility, Family Planning and I Health Survey (Household data) conducted in 1991-1992 (MOH, 1993). Use could also be made of this age distribution to estimate the level of female mortality. The question was whether to take the growth rate based on census-recorded population or the rate obtained from census-adjusted population[2]. The true rate may lie between these two. An average of the two values, namely, 2.51 per cent was chosen for use in the estimation of female mortality based on the female age distribution from the survey. As may be seen from Table 1, the expectation of life at birth thus estimated, is 53.65 years. This value is in the acceptable range.

The enumerated population of 1991 was not only suspected for census undercount but also known to be suffering from age reporting errors. For example there are fewer persons recorded in the age group 0-4 compared to 5-9 age group. Hence adjusted age distribution was obtained by estimating the population at ages under 10 years and by smoothing the age distribution for ages 10+ (see Chapter 1, this Volume). Based on the adjusted age distribution[3] and adjusted growth rate of females, the expectation of life at birth for females was estimated to be 53.8 years as shown in Table l. Shown in the same table are !he stable population estimates derived from the 1981, 1971 and 1961 census female age distributions.

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[2] The enumerated population in the 1991 census was suspected to be suffering from the problem of under-counting. There are indirect indications that the overall census under-count could be around 4 per cent with a lower value for females than males. If we consider an under-count of 3 per cent for females, adjustment For completeness of 97 per cent would yield a total female population of 9,556,828 in 1991, resulting in an adjusted average annual female growth rate of 2.66 per cent during 1981-1991 while the recorded growth rate for females during this period was 2.35 per cent.

[3] The adjusted and the reported 1991 census age distributions for females are the following:

Age	Reported	Adjusted
00-04	14.4	16.5
05-09	14.8	13.8
10-14	12.1	11.6
15-19	9.9	10.1
20-24	9.3	9.0
25-29	7.8	7.8
30-34	6.5	6.4
35-39	5.5	5.4
40-44	4.7	4.6
45-49	3.9	3.8
50-54	3.1	3.0
55-59	2.3	2.4
60+	5.7	5.6
Total	**100.0**	**100.0**

Table 1: Stable Population Estimates of Female $e^{\circ}_{\circ}$ and the Corresponding CBR and CDR Based on Female Age Distribution and Growth Rate, Nepal, 1961-1991.

	Coale-Demeny Female West Model Life Table Level	Female Stable Population e^{o}_{o}		
		CBR	CDR	(female)
1991 census adjusted female age distribution (Adjusted growth rate:2.66%)	14.53	40.0	13.4	53.82
1991/92 NFHS 1/ female age distribution (Average of reported and adjusted growth rates : 2.51%)	14.46	38.7	13.6	53.65
1981 census smoothed 2/ female age distribution (Growth Rate: 2.44%)	13.48	39.4	15.0	51.20
1971 census smoothed 2/ female age distribution (Growth rate: 1.80%)	9.34	40.6	22.6	40.85
1961 census smoothed 2/ female age distribution (Growth rate: 1.60%)	8.38	40.8	24.8	38.45

Source:
1/ Computed from MOH, 1993, household age distribution, p. 23
2/ CBS, 1987a, p. 260.

The 1991 estimates obtained from the census and the survey are very consistent, the $e^{\circ}_{\circ}$ values for females being 53.8 and 53.7 respectively. The 1981 estimate of 51.2 does not seem to fit well into the trend. The mortality level seems to have been somewhat under-estimated, the corresponding CDR being 15.0 per 1000 population. This under-estimation is obviously related to the higher growth rate during the inter-censal period 1971-1981. The drop in CDR from 22.6 in 1971 to 15.0 in 1981 amounts to about 33 per cent and the corresponding increase in $e^{\circ}_{\circ}$ being from 40.8 to 51.2 years. It is not known whether the very high inter-censal growth rate of population was on account of a precipitous fall in mortality or due to heavy immigration. In either case, the application of stable population technique would be inappropriate and hence the resulting 1981 estimates should be treated with caution.

Evidence of a gradual decline in mortality over the years is also provided by the 1991 census age distribution. Life table levels estimated at different ages are shown in Table 2. Life table levels, based on the cumulative age distribution of population, at younger ages viz.. upto 25 years, are larger than those at older ages, indicating a decline in mortality over the years.

Table 2: Model Life Table Levels 1/ Corresponding to Cumulative Age Distribution of Females, 1991 Census, Nepal

1991 Census Female Population				
Age x	**Reported Cumulative age distribution C (x)**	**age distribution Model Life Table Level**	**Adjusted Cumulative age distribution C (x)**	**age distribution Model Life Table Level**
5	0.1442	18.35	0.1647	14.53
10	0.2926	12.98	0.3024	14.70
15	0.4132	12.30	0.4181	15.29
20	0.5118	12.78	0.5186	15.47
25	0.6044	12.13	0.6090	15.11
30	0.6827	11.77	0.6871	14.60
35	0.7476	11.74	0.7512	14.53
40	0.8028	11.69	0.8055	14.46
45	0.8495	11.64	0.8516	14.31
50	0.8883	11.65	0.8898	14.23
55	0.9197	11.84	0.9150	16.00

Source: 1/ Coale-Demeny, 1966, (West Model Female).

2.2 Estimation of inter-censal mortality based on two census age distributions

For the reason mentioned earlier, namely, the female age distribution is influenced by migration to a much less extent than that of males, the present set of estimations have been carried out on the female age distributions.

2.2.1 Preston-Bennett Technique

This method (Preston and Bennett, 1983) estimates levels of life expectancy at ages 5 and above. It uses two population age distributions and assumes that the completeness of enumeration and age reporting errors are of the same extent at the two points of time. Based on the inter-censal growth rate of population in each age group, this technique estimates the cumulative number of years lived by the population and the number of person-years at exact ages, from which life expectancies are computed at ages 5 and above (Arriaga, 1992). Since this technique does not provide an estimate

of life expectancy at birth, the implied $e^{\circ}_{\circ}$ values from known model life tables are obtained, as shown in Table 3. This exercise has been carried out using the reported as well as the adjusted female age distribution of 1991 census. In Table 3, the estimated life expectancies at ages 10, 15 and 20 are used to obtain the implied $e^{\circ}_{\circ}$ values as well as an average of these. The average value of female $e^{\circ}_{\circ}$ based on the adjusted age distribution is about 53.02 years whereas that based on the reported age distribution is 47.86 years, the average being 50.44 years as implied by the West model. The corresponding average value implied by the North Model is 48.5 years.

2.2.2 Integrated Technique

This technique, developed by Preston (1983) estimates level of mortality, crude birth rate etc. for the inter-censal period, utilizing the age structure from two consecutive censuses. This method provides estimates of the level of mortality using life expectancies for ages 5 years and above. The results based on reported age distribution, presented in Table 4, indicate that the inter-censal estimate of female $e^{\circ}_{\circ}$ was around 47 years with the corresponding CBR and CDR being around 42 and 18 respectively. Use of adjusted 1991 age distribution, instead of the reported age distribution, provided a lower mortality level - the intercensal estimate of $e^{\circ}_{\circ}$ being nearly 49 years and the corresponding CBR and CDR around 44 and 17 respectively.

It may be recognized that inter-censal migration produces a significant effect on the level of mortality estimated by this method. Age misreporting has an impact on level of mortality as well as on crude birth rate. Further, since this method is sensitive to differential completeness of enumeration of the two censuses, the estimates presented in Table 4 should not be accepted at their face value. In view of the contention that a certain amount of upward bias in 1981 and a downward bias in 1991 census enumerations were probably present, the mortality estimated by this method would be on the lower side.

The inter-censal estimates of female $e^{\circ}_{\circ}$ during 1961-1971, 1971-1981 and 1981-1991 are presented in Table 5. Estimates derived by extrapolation of these trends to the year 1991 are shown in the same table.

Table 3: Estimates of Life Expectancy for Females by Age, Based on 1981-1991, Inter-censal Survival, Using Preston-Bennett Method

Age X	Life Expectancy at age x	Implied $e^{\circ}_{\circ}$ for females according Coale-Demeny Model		
		West	North	South
		Based on 1991 Census Reported Female Age Distribution		
10	50.43	47.17	46.12	41.71
15	48.82	51.94	49.82	46.53
20	41.21	44.46	41.86	38.62
	Average	47.86	45.93	42.29
		Based on 1991 Census Adjusted Female Age Distribution		
10	54.12	53.96	52.50	51.12
15	51.45	57.27	55.45	51.78
20	42.85	47.83	45.27	42.10
	Average	53.02	51.07	48.33
	Overall Average	50.44	48.50	45.31

Table 4: Estimates of $e^{\circ\circ}$, CBR and CDR for Females Based on 1981-1991, Inter-censal Survival, Using Integrated Technique

Age Range	CBR	CDR	$e^{\circ}_{\circ}$ (Coale-Demeny Model: West)
	Based on 1991 Census Reported Female Age Distribution		
05-60	40.92	17.40	47.45
10-60	41.87	18.36	46.71
15-60	43.07	19.55	45.81
05-70	40.61	17.09	47.98
Average	41.62	18.10	46.99
	Based on 1991 Census Adjusted Female Age Distribution		
05-60	43.49	16.93	49.03
10-60	43.97	17.41	48.65
15-60	45.61	19.05	47.48
05-70	42.92	16.36	49.96
Average	44.00	17.43	48.78
Overall Average	42.81	17.77	47.88

Table 5: Average Inter-censal 1961-1971, 1971-1981 and 1981-1991 Estimates of Female Life Expectancy at Birth and Estimates for 1991

Inter-censal Period	Female $e^{\circ}_{\circ}$
1961-1971 (1966) 1/	36.66
1971-1981 (1976) 1/	44.29
1981-1991 (1986) 2/	49.16
Estimate for 1991:	
Extrapolation based on: 1976-1986	51.60
1966-1986	52.28

Source:

1/ CBS, 1987a, Table 11.9, p. 268
2/ Average of Preston-Bennett Estimate of 50.44 (Table 3) and Integrated Technique Estimate of 47.88 (Table 4).

2.3 Widowhood Method for Estimating Adult Male Mortality

Estimation of male mortality is more problematic than female mortality when indirect methods of estimation are contemplated. This is because age distribution from one or two censuses are often used in indirect estimation and presence of migration biases these estimates. The age distributions of males in general and particularly in the case of Nepal are affected by migration. Widowhood method (UN, 1983, p.111) provides an opportunity to estimate male mortality. Proportion of women who are not widowed at different ages, form the basic data in this method, and these are available in censuses in the form of age-marital status distribution of women. In the 1991 census of Nepal, such information was obtained on females aged 10 years and above. About 0.7 per cent of these women did not provide information on marital status and hence were classified as the not-stated category. It is contended that in the social context of Nepal, women of dissolved marriages namely, the widowed/divorced/separated, are not always enthusiastic about reporting their marital status. Marital status not-stated category are distributed, on pro-rata basis, to the widowed, divorced and separated categories of women. Proportion of females not-widowed, by age group, and the estimated probability of adult male surviving to different ages from age 20 are shown in Table 6. Estimated life expectancy at birth for various reference dates are also shown in Table 6.

Table 6: Estimates of Adult Male Mortality by Widowhood Method, 1991 Census of Nepal

Age group of Respondent	Proportions of Females Not Widowed	Probability of an Adult Male Surviving from age 20 to age x		Male Life Expectancy at Birth Coale-Demeny Model West	Reference Date
		Age x	Hill-Trussell Equation		
20-25	0.9950	25	0.9943	70.7	Aug. 1989
25-30	0.9899	30	0.9911	72.3	May 1987
30-35	0.9805	35	0.9832	71.1	Feb. 1985
35-40	0.9602	40	0.9625	67.7	Jan. 1983
40-45	0.9262	45	0.9280	64.7	Feb. 1981
45-50	0.8765	50	0.8789	62.2	Jul. 1979
50-55	0.7948	55	0.8003	59.1	Jan. 1978
55-60	0.7317	60	0.7433	LT 20.0	Feb. 1977

Source: Appendix Table Al.

The estimated $e°_o$ for males is far higher than acceptable level by any standards. The values are more than 70 years. This lower estimate of male mortality may be attributable to under-estimation of the proportion of widowed women. The method seeks information on widowhood from first marriage whereas the census data provides only information on current marital status. The proportion of widowed women in the census would thus be lower than the proportion widowed from first marriage by the extent of widow-remarriage in the community.

2.4 Estimation of Infant and Child Mortality Using Data on Children Ever Born and Children Surviving, by Age of Mother

Estimation of infant and child mortality is possible from data on children ever born and children surviving at the time of a census or survey. Instead of assuming constancy of mortality, dating of estimates could be accomplished. These time reference estimates are obtained by Coale and Trussel Method based on Coale-Demeny model life tables and also by Palloni-Heligman method based on the United Nations model life tables (Arriaga, 1992).

Estimations were accomplished using data from the 1991 census and also from the 1991/92 NFHS. Average number of children ever born and still surviving, by age of mother, from the census and the Survey are shown in Table 7. Estimates of infant mortality rate ($_1q_0$), child mortality rate ($_4q_1$) and life expectancy at birth ($e°_o$) are obtained using census and also survey data. From Table 8, it

may be seen that, based on West model life table, the census yielded an infant mortality rate of 67, child mortality rate of 27 and life expectancy at birth of 60.7 years for March 1989. On the other hand the survey data yielded IMR of 102, CMR of 51 and e°◦ of 53.6 years for October 1989. The estimates based on the survey data are obviously more acceptable than those based on the census data. The very low estimate of mortality yielded by the census data is clearly on account of data deficiency. From Table 7, it may be seen that the proportion of dead children by age groups, are all lower in the census than in the survey. Failure to report the dead children seems to have occurred to a great extent in the census. Table 7 shows that the proportion of children ever born is significantly lower in the 1991 census than in 1991-92 NFHS at all ages. It may be realized that the average number of children ever born in the census are very close to the average number of children surviving in the Survey, at all ages. This indicates that in the census, many women may have reported the surviving number, also for the question on ever born number. This is not uncommon in developing Countries where illiterate women tend not to distinguish between children born alive and children living. This problem becomes acute in the census whereas in a survey this information is obtained through a number of questions. Also more time is available to probe and elicit correct response in a sample survey compared to a total census. The estimated life expectancy at birth of 53.6 years for both sexes, as of October 19 89, derived from the survey data seems close to the true level.

Table 7: Proportion of Children Ever Born and Surviving by Age of Mother for 1991 Census and 1991/92 NFHS.

Age of women	Census 1991			NFHS 1991/92		
	Average no. of Children Proportion			Average no. of Children Proportion		
	Ever Born	Surviving	Dead	Ever Born	Surviving	Dead
15-19	0.170	0.158	0.071	0.150	0.132	0.120
20-24	1.155	1.068	0.075	1.332	1.178	0.116
25-29	2.346	2.141	0.087	2.749	2.371	0.138
30-34	3.275	2.936	0.104	3.840	3.229	0.159
35-39	3.959	3.468	0.124	4.731	3.818	0.193
40-44	4.351	3.712	0.147	5.309	4.218	0.206
45-49	4.433	3.689	0.168	5.653	4.322	0.235

Source:- CBS, 1993c. Appendix Table A2
MOH 1993, Appendix Table A3

Note : NFHS 1991/92 data appearing in this table differs very slightly from the data contained in the published main report (MOH, 1993). The values in Fable 7 were computed from the original data tape. It became necessary to use the original tape because the published tables did not contain sub-national level tables which were need in the present study.

Table 8: Estimates of Infant Mortality, Child Mortality and Life Expectancy at Birth (Both Sexes) Based on Data on Children Ever Born and Children Surviving, 1991 Census and 1991/92 NFHS

Age group	1991 Census				1991/92 NFHS			
	Ref. date	IMR	CMR	$e^{\circ}_{\circ}$	Ref. date	IMR	CMR	$e^{\circ}_{\circ}$
15-19	Jul. 1990	0.079	0.035	58.1	Feb. 1991	0.145	0.083	45.9
20-24	Mar. 1989	0.067	0.027	60.7	Oct. 1989	0.102	0.051	53.6
25-29	Feb. 1987	0.068	0.028	60.5	Sep. 1987	0.103	0.051	53.4
30-34	Sep. 1984	0.074	0.031	59.2	Feb. 1984	0.108	0.055	52.4
35-39	Dec. 1981	0.082	0.036	57.7	Mar. 1982	0.121	0.065	50.0
40-44	Feb. 1979	0.089	0.041	56.2	Mar. 1979	0.120	0.064	50.2
45-49	Mar. 1976	0.092	0.044	55.5	Apr. 1976	0.126	0.068	49.1

Source:- Appendix Tables: A2, A3.

Note: Estimates based on Coale-Demeny West Model.
IMR: Probability of death before one year of age.
CMR: Probability of dying between ages 1 and 5 years.

2.5 Plausible Estimates of Mortality in 1991 for Nepal

Stable population analysis performed on the female age distribution yielded an estimate of $e^{\circ}_{\circ}$ of 53.8 years for the 1991 census and 53.7 in the case of 1991/92 NFHS data (Table 1). The Inter-censal Survival methods and their extrapolation to 1991 yielded an estimate of $e^{\circ}_{\circ}$ of 51.6 for females according to the 1976-1986 trend and 52.3 according to the 1966-1986 trend (Table 5). The census counts of 1981 and 1991 are suspected for a certain degree of over and under-enumeration respectively (Chapter XV, this volume). Taking into account, the nature of the differential completeness of coverage in the 1981 and 1991 censuses, the Inter-censal Survival Methods are to be treated as somewhat of under-estimates. In view of this, an estimate of about 53.5 years for $e^{\circ}_{\circ}$ in 1991 appears appropriate for females.

The estimate of $e^{\circ}_{\circ}$ for males could not be based on any hard data. However it has been known that $e^{\circ}_{\circ}$ for males had all along been higher than that of females in Nepal. Larger male than female $e^{\circ}_{\circ}$ has more or less been the pattern in countries of the Indian sub-continent. During 1971-1981 in Nepal, the male $e^{\circ}_{\circ}$ was estimated to be about 2.0 years higher than that of females (CBS, 1987, p. 268). In view of a likely narrowing of a male-female gap in $e^{\circ}_{\circ}$, a gap of 1.5 years is assumed in 1991, thus placing the male $e^{\circ}_{\circ}$ at 55.0 years. Assuming a sex ratio at birth of 105 males per 100 females, the $e^{\circ}_{\circ}$ for both sexes is estimated as 54.26 years for 1991.

The estimated $e°_0$ for both sexes, based on children ever born and children surviving, is 53.6 years and this estimate refers to October 1989 (Table 9). The present estimate of 54.26 years for $e°_0$ both sexes in 1991 is consistent with the above estimate derived from data on early childhood mortality mentioned above. The corresponding rates of infant and child mortality and the resulting Crude Death Rate, are also summarized in Table 9.

Table 9: Plausible Estimate of Female $e°_0$ and Mortality Indices for Nepal, 1991.

Method	**Estimated $e°_0$**	**Sex**	**Reference Year**
Extrapolation of inter-censal estimations: 1/			
Trend based on 1976-86	51.60	Female	1991
1966-86	52.28	Female	1991
Stable Population Analysis:2/			
Census 1991	53.82	Female	1991
NFHS 1991/92	53.65	Female	1991
Proportion Dead Among Children Ever Born: 3/	53.60	Both Sexes	Oct. 1989
Plausible Estimate	53.50	Female	1991
Mortality Indices for 1991	Male	Female	Both Sexes
Expectation of Life at Birth ($e°_0$)	55.00 4/	53.50	54.26 5/
Life Table Level (Coale-Demeny West Model)	16.37	14.40	15.41
Infant Mortality Rate ($_1q_0$)	94	101	97
Child Mortality Rate ($_4q_1$)	36	50	43
Crude Death Rate (CDR) 6/	12.9	13.6	13.3

Source:

1/ See Table 5
2/ See Table 1
3/ See Table.8
4/ $e°_0$ for males assumed to be 1.5 years greater than that of females
5/ $e°_0$ for both sexes assumes sex ratio at birth of 105 males per 100 females
6/ Obtained by applying the age-specific death rates to the adjusted age distribution of males and females (CBS, 1994).

3. Trends and Differentials in Mortality

3.1 Crude Death Rates 1961-1991

One of the commonly used measures of mortality is the Crude Death Rate (CDR) which is the ratio of annual number of deaths to the mid-year population. Various estimates of CDR available since 1961 are presented in Table 10. Needless to state, these estimates do not present a very consistent trend. This is because they were obtained from two distinct types of sources of data, namely, the decennial censuses and periodic surveys. While there are basic differences between these two types of sources with regard to the extent of coverage and the quality of data on deaths, the differences among censuses and among surveys themselves are not trivial either. The coverage of deaths in the censuses has always been poor, requiring the use of indirect methods for estimation. Age reporting errors, differential completeness of population coverage between consecutive censuses have all contributed to biases in the indirect estimates. The direct data obtained from surveys suffer also from sampling errors. The Demographic Sample Surveys of 1976, 1977 and 1978 were longitudinal in nature.

Table 10: Trends in Crude Death Rate by Sex, Nepal, 1961-91

Source	Period of estimate	Crude Death Rates		
		Both sexes	Males	Females
Gubhaju, 1975 1/	1961	22.0		
Central Bureau of Statistics, 1977 1/	1961 – 71	21.4	21.3	22.6
Demographic Sample Survey, 1976 1/	1974 – 75	19.5	18.6	20.4
Demographic Sample Survey, 1977 1/	1976	22.2	21.5	22.8
Demographic Sample Survey, 1978 1/	1977 – 78	17.1	17.9	16.2
Central Bureau of Statistics, 1985 1/	1971 – 81	13.5	12.2	14.9
New Era, 1986 1/	1984	10.9	10.8	11.0
Demographic Sample Survey, 1987 2/	1986 – 87	16.1		
Central Bureau of Statistics 3/	1991	13.3	12.9	13.6

Source:
1/ CBS, 1987a. Table 13.1 p. 298
2/ CBS. 2044/45. pp. 41-43
3/ Table 9.

The CDR was a little over 20 in the 1960's which came down to under 20 in the 1970"s which seems to have further reduced to under 14 by 1991. The inter-censal estimate of 11.3 during 1971-1981 and the survey estimate of 10.9 for 1984 (New Era 1986) appear to be on the low side. The New Era estimate was a direct estimate based on the deaths during the two-year period preceding the survey and thus subject to under-reporting of deaths. Similarly the estimated CDR of 13.5 was

based on the intercensal 1971-1981 growth rate which was suspected to be unusually high. The Demographic Sample Survey (1987) obtained information in a prospective manner through three visits made during 1986-1987, the CDR estimated from which comes to 16.1.

In spite of the fluctuations, one thing is clear, namely, between 1961 and 1991 the CDR seems to have declined nearly by a third, which is an impressive decline by any standards. Sex differential in mortality has been such that higher female than male mortality had persisted all along.

3.2 Age Sex Patterns of Mortality

The risk of death varies with age and is generally the highest at the very young and at the very old ages. The age pattern of death varies with the level of development. At low level of development the age curve of mortality assumes U-shape which transforms to J-shape as the level of development rises. This is because the impact of improvements in public health is faster and greater on mortality at infant and childhood ages than at older ages. The higher mortality of early childhood drops fast as age increases reaching about the lowest levels by teens and early twenties, increasing slowly thereafter upto about age 40 and then faster to old ages.

Table 11: Adjusted Age-specific Death Rates by Sex Obtained from the Demographic Sample Surveys of 1974/75, 1976, 1977/78 and 1986/87, Nepal (Rates per 1000)

Age group	Males				Females			
	1974/75 1/	1976 1/	1977/78 1/	1986/872/	1974/75 1/	1976 1/	1977/78 1/	1986/873/
0	141.2	128.4	109.9	111.2	123.0	137.9	97.9	104.6
1-4	33.2	32.6	23.4	20.1	35.9	37.2	22.1	35.8
5-14	4.8	5.2	4.7	3.4	5.6	6.1	5.2	6.6
15-24	5.0	6.0	4.4	4.3	7.9	6.0	4.3	4.1
25-34	4.7	7.3	6.0	5.6	7.7	10.7	6.5	4.2
35-44	6.7	8.0	11.9	7.0	12.6	14.8	10.2	6.8
55-64	36.2	45.1	33.0	34.2	38.2	48.1	39.2	28.9
65+	98.3	134.5	116.7	82.1	120.8	108.1	102.3	99.1
All ages	18.6	21.5	17.9	15.8	20.4	22.8	16.2	17.0

Source:

1/ CBS, 1987a, Table 13.5, p. 304

2/ CBS, 2044/45, pp.47- 48 and CBS, 1987b, Table 1.4 p.33.
(Urban and Rural ASDR were combined, using the weights of 0.171271 and 0.189478 for urban male and urban female respectively).

In the absence of effective vital registration system, data on deaths should come from censuses and surveys. With census data on deaths suffering from serious problems of coverage and quality, periodic surveys have become the main source of mortality data in Nepal. The demographic sample survey (DSS) of 1974-75, 1976, 1977-78 and 1986-87 collected information on deaths by age and sex. The age specific death rates for males and females adjusted for under-reporting, from these four surveys are presented in Table 11 and graphically shown in Figs. 1, 2.

The age pattern of mortality in Nepal is still U-shaped, both for males and females, signifying a high infant and child mortality. The mortality curve does come down by teen-ages and early twenties and does rise slowly up to about age 40 and faster there after.

There seems to be a continuous decline in infant and child mortality and this comes out clearly in the case of males than females. It is suspected that coverage errors as well as age reporting errors probably exist to a greater degree among females than males. Even then, the data suggest higher overall mortality for females than males. The data also suggest higher female than male mortality at ages between 15 and 50, more clearly in the mid nineteen seventies and less clearly in the mid nineteen eighties. The higher female than male mortality at these ages should be due to maternal mortality and this apparently had been declining.

The high levels of infant mortality, child mortality and maternal mortality, which not long ago were significant contributors to the overall mortality in Nepal have started coming down. Their actual levels and their time trends are discussed in latter sections.

Knowledge of the age pattern of mortality helps in the identification of appropriate model life table family. Model life tables have become an indispensable tool in the estimation of vital rates and in the projection of population by age and sex for most developing countries. The choice of the life table model and the procedure adopted in its selection for Nepal are discussed below.

3.3 Choice of Model Life Table

In demographic estimation and projection, model life tables are of immense use. During the past decades, Coale-Demeny model life tables have been used in demographic analyses particularly in developing countries. Coale-Demeny model life tables are a set of four families of life tables known as West, North, South and East.

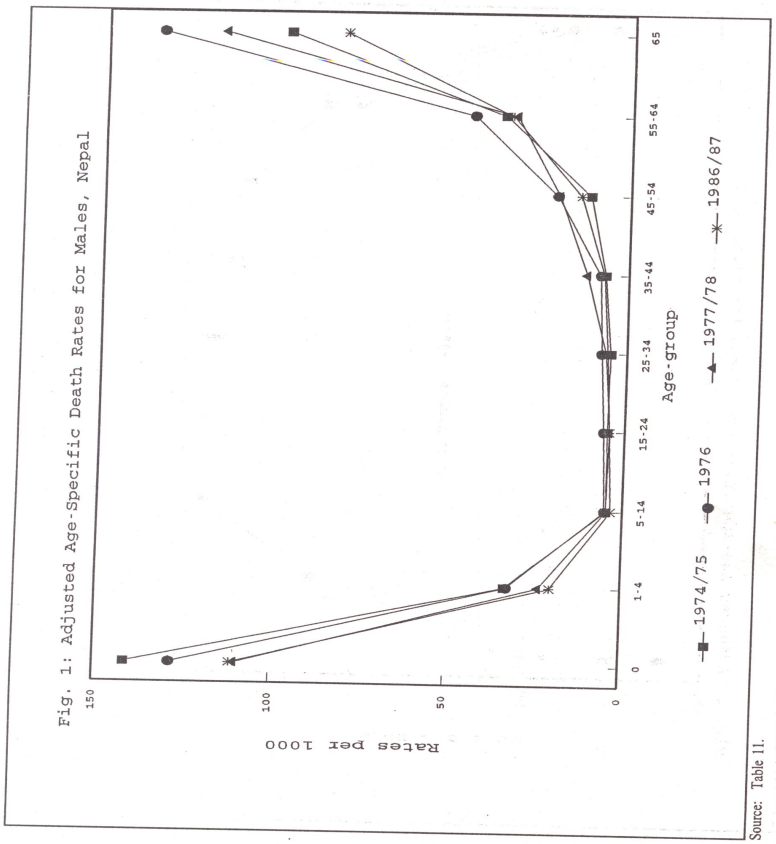
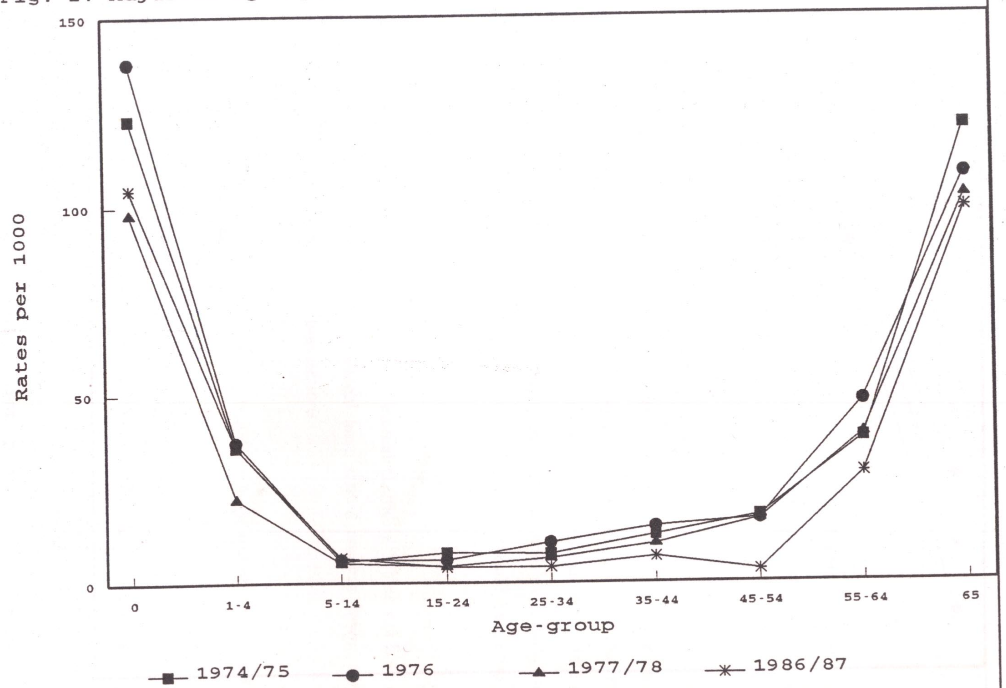


Fig. 1: Adjusted Age-Specific Death Rates for Males, Nepal
Rates per 1000
150
100
50
0
0
1-4
5-14
15-24
25-34
35-44
45-54
55-64
65
Age-group
1974/75
1976
1977/78
1986/87
Source: Table 11.

Fig. 2: Adjusted Age-Specific Death Rates for Females, Nepal



Source: Table 11.

100

In order to be able to decide which of these models would be appropriate for Nepal, an idea of the age pattern of mortality would be necessary. There is no reliable age distribution of mortality for Nepal to use, in deciding the right family that fits. Completeness in death reporting in Nepal in the 1991 census was less than 40 per cent. Thus, the search for the appropriate model life table for Nepal had to be based on fragmented data. The following is an attempt in that direction.

In Table 12, infant mortality rate(1qo) and child mortality rate (4q1) are shown for the four families of Coale- Demeny model life tables corresponding to life expectancy at birth ($e°_o$) of 52.5 years for females and around 54.0 years for males, which closely represent the situation in Nepal. The knowledge that the current level of' infant mortality in Nepal is around 100 per thousand live births, precludes the suitability of the South and the East models for Nepal. West and the North models appear to be nearer to the Nepalese situation. Between the West and the North, it may be seen that the West model is characterized by lower child mortality and higher infant mortality compared to the North model. It may be noted that causes underlying child mortality are largely exogenous and hence controllable, compared to infant mortality which to a significant extent is related to endogenous causes which are relatively more difficult to Control. In fact child mortality seems to have declined faster than infant mortality in Nepal (Table 13). A high prevalence of immunization may be a significant contributor to the drop in child mortality. Nearly 75 per cent of all children 1-4 years of age are understood to have been immunized for one or the other childhood diseases (MOH, 1993. p.161). Further, the 1991 levels of infant mortality ($_1q_0$) and child mortality ($_4q_1$) estimated for Nepal, for both sexes combined, are 98 and 51 respectively (MOH, 1993. p. 136), and these show the closest agreement with the West model.

Table 12: Infant and Child Mortality in the West, North, South and East Families of Coale- Demeny Model Life Tables Corresponding to e°0, of' 52.5 for Females and Around 54.0 for Males.

	1000 Q (x)			
	West	**North**	**South**	**East**
		Female (e^0_o = 52.5)		
1q0	105.5	95.0	121.3	131.7
$_4q_1$	59.8	72.8	85.9	56.2
		Male (e^0_0 = 54.0) 1/		
$_1q_0$	98.6	89.6	115.1	124.3
$_4q_1$	42.7	55.8	63.2	40.7

Source:
The actual values are 54.137, 53887, 54.103 and 53.683 for West, North· South and East Respectively.

Table 13: Relative Declines in Infant and Child Mortality in Nepal

1991/92 NFHS 1/			World Development Report 1984 2/		
Reference Year	**IMR($1q_0$)**	**Child Mortality ($_4q_1$)**	**Reference Year**	**IMR**	**Child Mortality (Central D.R.)**
1976	**.127**	.069	1960	.195	33
1989	.102	.051	1982	.145	22
% Decline	19.7	26.1		25.6	33.3

Source:

1/ MOH, 1993, p. 134 and Appendix F
2/ World Bank, 1994.

These observations point to the appropriateness of the West model, among the four families of the model life tables of Coale-Demeny, for Nepal. Choice of the West model is further supported by the fact that contemporary and past estimations of vital rates have all been based on the West model.

It is not enough to establish the suitability of a model life table on the basis of infant and child mortality. Suitability considerations should also include adult mortality. In an attempt to extend the investigation of the appropriate life table model for Nepal, the age pattern has been compared with the four families of the Coale-Demeny models and also with the U.N. Model Life Tables (UN, 1982). Age specific death rates estimated from the 1986/87 Demographic Sample Survey 4, for males and females, are compared with those of the U.N. and Coale-Demeny model life tables. The results are shown in Table 14 for males and in Table 15 for females.

The age specific mortality schedule of males evidently is more accurate than that of females. The age specific death rates are expected to increase monotonically at older ages. From age group 40-45 onwards, the continuous increase in age specific death rate exhibited by males is absent in the case of females.

Further, the implied life expectancy at birth corresponding to age specific death rate in different age groups are not expected to exhibit much variation. The variation in the case of females is much larger than in the case of males, in all the comparisons with different model life tables. These

[4] See teh note under Table 11.

variations are indicated by the index labeled as 'Average absolute deviation from Median' computed for the age ranges 0-10, 10+ and 0+. All these indexes of variation, without exception, are larger in the case of females than males. These observations point to the fact that the age specific mortality schedule of males is more accurate than that of females, thus prompting the comparison to be confined to males.

If mortality under age 10 and the mortality over 10 lead to the same life expectancy at birth, then the child mortality - adult mortality link in the country (Nepal) is identical with that of the model life table under comparison. The identically is measured by the difference between the median $e°_o$ of age range 0-10 and median e^0_0 of age range 10+; the smaller the difference, the more identical are the age patterns. Based on the comparison of male mortality schedule, it may be concluded that the West Model having the least difference (1.3) is the most appropriate one for Nepal, followed by U.N. General Model (1.8) and North Model (2.3). Once again the appropriateness of the West Model of Coale-Demeny is indicated for Nepal.

3.4 Infant Mortality Rates, 1961-1991

Infant mortality rate (IMR) is conventionally computed as the number of deaths under one year of age per 1000 live births during a period of time, usually one year. IMR has long been considered an indicator of the socio-economic level and general health conditions in a society. This may not be true any more since substantial reductions in IMR are being achieved on account of the development of public health technology without significant improvements in socio-economic development. Infant mortality forms a sizable part of overall mortality in the developing world. For example, in a society which has a CBR of 40 births and a CDR of 16 deaths, per 1000 population, an IMR of 100 means that infant deaths form 25 per cent of all deaths. Reducing the IMR to half its size in such a society would in itself cause at least 12.5 per cent decline in CDR. Reduction of infant mortality is a desirable goal not only from the stand point of achieving a measurable reduction in the overall mortality, but also from its special significance particularly to couples and families. Much of the infant mortality taking place in the developing countries is preventable and hence unnecessary.

Table 14: Comparison of Model Age Patterns of Mortality with those of Nepal, 1986/87, (Male).

IMPLIED LIFE EXPECTANCY AT BIRTH

Age Group	Empirical M(X,N)	UNITED NATIONS MODELS					COALE-DEMENY MODELS			
		Latin American	Chilean	South Asian	Far East	General	West	North	East	South
0- 1	.11123	54.5	56.4	57.0	46.7	52.9	53.3	51.0	56.9	57.0
1- 5	.02011	49.7	39.4	53.1	40.9	46.1	46.2	49.4	44.8	51.6
5-10	.00389	51.7	41.8	51.5	46.5	49.6	48.5	57.9	48.0	49.6
10-15	.00288	46.7	42.2	41.0	47.9	46.9	48.1	53.8	41.1	44.3
15-20	.00466	43.8	42.8	33.5	46.9	44.9	45.9	48.7	40.3	43.0
20-25	.00385	55.2	53.5	41.3	55.2	54.4	57.0	61.2	54.5	54.1
25-30	.00795	43.9	44.8	28.7	46.2	43.5	43.9	45.0	36.6	40.5
30-35	.00326	62.1	62.6	52.8	61.3	61.2	62.1	66.0	59.7	59.3
35-40	.00878	48.4	51.3	37.6	52.1	49.2	49.0	47.6	42.8	42.0
40-45	.00521	62.7	64.4	57.2	64.5	63.1	62.9	63.5	60.7	59.2
45-50	.01237	50.7	55.2	46.0	58.2	53.7	52.0	48.7	47.9	44.2
50-55	.01582	51.3	56.6	50.9	61.9	56.1	54.3	49.6	51.2	46.1
55-60	.02448	47.0	54.1	48.5	60.9	53.7	50.5	43.7	47.4	41.7
60-65	.04386	32.9	44.8	40.2	57.7	44.9	41.3	35.4	35.3	34.5
65-70	.08213	LT20.0	28.8	22.9	47.7	29.2	28.9	26.5	24.2	25.9
Average Absolute Deviation from Median										
Ages 0 to 10		1.6	5.7	1.9	1.9	2.3	2.4	2.8	4.0	2.5
Ages 10 and over:		8.0	7.6	7.7	5.7	7.0	6.8	8.0	8.4	6.6
Ages 0 and over:		7.1	7.9	8.4	6.5	6.0	6.0	7.2	7.6	7.0
Medn(0-10)-Medn(10+)		4.1	-10.6	12.0	-10.0	-1.8	-1.3	2.3	2.9	8.0

Source: Table 11.

Table 15: Comparison of Model Age Patterns of Mortality with those of Nepal, 1986/87, (Female).

IMPLIED LIFE EXPECTANCY AT BIRTH

		UNITED NATIONS MODELS					COALE-DEMENY MODELS			
Age Group	Empirical M(X,N)	Latin American	Chilean	South Asian	Far East	General	West	North	East	South
0- 1	.10456	53.9	60.0	58.9	47.9	52.6	54.2	52.0	58.5	59.1
1- 5	.03585	43.2	33.5	45.4	32.4	39.2	37.6	41.1	36.5	45.0
5-10	.00949	39.1	29.0	37.6	31.4	37.4	32.1	45.6	32.2	36.4
10-15	.00364	44.5	41.6	39.4	43.2	45.3	48.5	52.5	42.0	44.1
15-20	.00375	49.8	50.0	45.6	53.8	51.9	54.1	54.2	48.7	50.2
20-25	.00445	52.6	52.9	46.0	56.0	54.1	55.7	54.5	51.0	51.6
25-30	.00304	60.8	60.5	53.4	63.0	61.3	63.4	64.3	60.3	59.5
30-35	.00539	55.3	55.4	46.6	58.3	56.0	57.0	56.4	52.7	51.1
35-40	.00294	67.1	66.5	59.9	68.2	66.7	67.9	68.5	65.4	63.0
40-45	.01069	46.8	48.8	37.0	53.8	48.5	47.2	46.1	41.1	38.4
45-50	.00154	GT80.0	GT80.0	77.3	GT80.0	GT80.0	79.3	GT80.0	78.7	76.9
50-55	.00487	73.0	73.7	70.8	76.2	74.0	74.5	74.8	73.0	69.1
55-60	.01826	52.7	56.1	53.0	63.1	57.1	53.4	48.6	50.9	43.7
60-65	.03961	35.6	41.3	40.5	51.8	42.7	40.0	35.9	38.2	34.6
65-70	.09906	LT20.0	LT20.0	LT20.0	22.2	LT20.0	LT20.0	20.3	21.7	20.3
Average Absolute Deviation from Median										
Ages 0 to 10		4.9	10.3	7.1	5.5	5.1	7.4	3.6	8.8	7.6
Ages 10 and over:		11.6	11.4	11.0	10.7	11.1	11.2	11.8	11.5	11.6
Ages 0 and over:		10.9	12.5	10.3	12.1	10.9	11.6	10.9	11.9	11.2
Medn(0-10)-Medn(10+)		-9.4	-20.6	-1.0	-24.8	-15.9	-17.3	-8.7	-14.4	-5.6

Source: Table 11.

Table 16: Trends in Infant Mortality Rate by sex, Nepal

Source	Period of estimate	Infant Mortality Rates		
		Both sexes	Males	Females
Vaidyanathan and Gaige, 1973 1/	1954	-	260	250
Worth and Shah, 1969 1/	1965-66	152	-	-
Gubhaju, 1974 1/	1961-71	-	200	186
Central Bureau of Statistics, 1974 1/	1971	172	-	-
Demographic Sample Survey, 1976 1/	1974-75	133	141	123
Demographic Sample Survey 1977 1/	1976	134	128	138
Demographic Sample Survey 1978 1/	1977-78	104	110	98
Nepal Fertility Survey, 1977 1/	1976	152	-	-
Gubhaju, 1984 1/	1973-74	171	-	-
Central Bureau of Statistics, 1985 1/	1978	144	147	142
New Era, 1986 1/	1981	117	136	111
Fertility and Family Planning Survey, 1986 2/	1983-84	108	117	98
Demographic Sample Survey, 1987 3/	1986-87	107	-	-
Nepal Fertility Family Planning & Health Survey, 1991 4/	1989	102	-	-
Nepal Fertility Family Planning & Health Survey, 1991 5/		98	105	91
Population census 1991 5/	1991	97	94	101

Source:

1/ CBS. 1987a, Table 13.2 p. 300
2/ MOH, 1987, p. 85
3/ CBS, 2044/45, p.43
4/ MOH, 1993, Appendix F, (Indirect Method)
5/ MOH, 1993, pp. 136 & 139 (Direct Method)
6/ Table 9

Trends in infant mortality are shown in Table 16. These trends are based on estimates, direct and indirect, obtained from data from censuses and surveys which suffer from problems of differential completeness and quality differences. A high IMR of over 250 seems to have prevailed before the 1960s and during the 1960's the estimate varied between 200 and 150. During the 1970s there was wide variation in the estimates of IMR from as low as 104 for 1977-78 to as high as 172 for 1971. The very low values were direct estimates from data from Demographic Sample Surveys which may have suffered varying degrees of under-reporting. The Nepal Fertility Survey estimates an IMR of 152 for 1976. New Era's estimate of 117 for 1981 is based on Nepal Fertility and Mortality Survey. This is consistent with the 1983-84 estimate of 108 and the 1986-87 estimate of 107 shown in Table 16. The 1989 indirect estimate based on children ever born and children dead from the Nepal Fertility, Family planning and Health Survey (NFHS) conducted in 1991/1992 varied from 102 to 98 depending on the model life table used in the estimation. Estimates based on female age distributions, from the above survey and the 1991 census, are 102 and 97 respectively.

There is clear evidence that infant mortality of males had been and still is higher than that of females. It is hard to say at this stage whether and to what extent this is a result of sex differential, if any, in the completeness of reporting of births and infant deaths. But the consistency lends support to the belief that is probably real.

3.5 Differentials in Infant Mortality by Socio-economic and Demographic Variables

Infant mortality, as one of the most important aspects of mortality, deserves special consideration. The socio-economic and demographic differentials are of particular interest since these provide clues for the identification of priority groups in policy formulation and programme implementation. The Nepal Fertility Survey (NFS) of 1976 collected information for the first time on a nation-wide basis, which enables study of socio-economic differentials in infant mortality. This survey estimated IMR for the period 1962-71. Similar information was again collected by the Nepal Fertility and Family Planning Survey (NFFS) of 1986, providing direct estimate on IMR during 1982-85. Indirect estimates of IMR which refer to the year 1983 obtained by Trussel technique[5] are also available by a few background variables. The Nepal Fertility, Family Planning and Health Survey (NFHS) of 1991/92 provides IMR by socio-economic variables for a ten year period preceding the survey and for a five year period for data on medical maternity care. These results are presented in Table 17.

Infant mortality rate is higher when mother has no education than when she has some education. This finding comes out uniformly in all the three surveys. Father's education seems to help in lowering IMR but this finding is not as consistent as with mother's education. The highest education in the household also seems to be related inversely with infant mortality, the relationship however is stronger when education is dichotomized as no-education and some-education. Male babies seem to suffer higher rate of infant death than female babies. IMR is also related to birth order. The first parity and late parities are known to be associated with higher infant mortality. The data shows that the IMR related to parities 2 and 3 is lower than that related to 1st parity and parities 4+. If this is true, one should expect a higher IMR in the case of younger mothers. Indeed the IMR is the highest at maternal ages below 20. Maternity during the ages of 20-29 seems to enjoy the lowest infant mortality; as age advances the IMR again rises. It is a known fact that babies born to teen-age women or older women (age 35+) have a higher risk in terms of health/survival compared to those whose mothers are in age group 20-35. The Nepal data subscribes to this adequately. Also babies

[5] For more details see: MOH, 1987, pp.79-85.

Table 17: Socio-economic and Demographic Differentials in Infant Mortality, Nepal, 1962-1991

Variable	NFS 1976[1] (1962-71)	NFFS 1986[2] (1982-85)	NFFS 1986[2] (1982-84) Indirect Estimate	NFFS 1991 3'
Education of Mother				
No education	166	95	113	103
Some education	154	87	103	56
Education of Father				
No education	170	89	-	-
Some education	152	105	-	-
Highest education in households				
No education	-	101	-	-
Primary (1-5)	-	88	-	-
above (6+)	-	94		
Sex of child				
Male	171	96	117	105
Female	161	94	98	91
Birth order				
1st	185	-	-	116
2-3rd	157	-	-	83
4-6th	163	-	-	92
7+		-	-	130
Maternal Age				
less than 20	216	105	-	137
20-29	162	86	-	88
30-39	142	102	-	94
40-49				99
Previous birth interval				
NFS 1976 NFHS 1991				
< 18 Months < 2 Years	236			155
18-35 Months 2-3 Years	180			78
36+ Months 4 Year +	95			39
Antenatal/delivery care				
Not received	-	-	-	84
Received	-	-	-	85
Availability of Latrine				
Flush, Pan	-			28
Pit, Other	-	89	52	69
No facility	-	96	116	84

Source:

1/ CBS, 1987a, Table 13.7 p. 309

2/ MOH, 1987, PP. 83 & 85

3/ MOH, 1993, PP. 136-139.

born following a short birth interval are prone to a high risk of infant death. When a baby is born too soon following the earlier birth, he/she faces sibling competition for care and nutrition, and further the mother herself is probably not physiologically ready for this birth at short duration. Reasons such as these are associated with the inverse relation between IMR and duration since last birth. The inverse relation is clearly shown in the case of Nepal. Availability of latrine in the house is deemed to indicate higher socio-economic status compared to its non-availability. Data in Table 17 shows higher IMR for populations having no latrine facility compared to those who had. As one would expect, babies whose mothers received antenatal/delivery care suffered lower infant mortality than those babies whose mothers did not receive such care.

3.6 Neonatal and Post-neonatal Mortality

Neonatal and Post-neonatal mortality are two component parts of infant mortality. Neonatal mortality rate is the number of deaths within four weeks of age per thousand live births, whereas the Post-neonatal mortality rate is the number of deaths during 1-12 months of age per 1000 live births. The causes of death are more of endogenous type in neonatal mortality and of exogenous type in the case of post-neonatal mortality. It is this type of bifurcation. that is of interest in the prevention of deaths during infancy. Exogenous factors being more amenable to control with public health measures, compared to endogamous factors; it should be easier to reduce post-neonatal than neonatal mortality. Available evidence, though meagre, demonstrates that this has been the case in Nepal. The Nepal Fertility Survey of 1976 (as cited in CBS, 1987a, p.302) had for the first time obtained information on neonatal and post-neonatal deaths and these two rates were 75.4 and 66.9 respectively. The Nepal Fertility, Family Planning and Health Survey of 1991/1992 (MOH, 1993, p. 136) provided an estimate of 56.8 for neonatal and 41.2 for post-neonatal mortality. According to these estimates, the decline during about one and a half decades, was 25 per cent in the case of neonatal and about 38 per cent in the case of post-neonatal mortality. This greater decline in post-neonatal than neo-natal mortality, which conforms to one's expectation, is a reflection of the great strides made by Nepal in the field of public health.

3.7 Maternal Mortality

Maternal mortality refers to deaths to mothers due to complications in pregnancy and child birth. While complication of pregnancy and the related death can occur any time during the entire period of gestation, child birth related complications can lead to death long after child birth. Thus, the time-

reference for maternal death and the problem of cause of death classification, render the estimation of maternal mortality difficult especially in developing countries. Maternal mortality rate (MMR) is the ratio of the number of maternal deaths to the number of live births during a period of time, usually an year. The time-reference considerations for maternal deaths, make the hospital statistics inappropriate for the estimation of maternal mortality rate. The hospital based maternal mortality rate (Malla, 1986 as cited in MOH, 1993, pp.142) during 1979 to 1985 was 189 per 100,000 live births, a level too low to be acceptable for Nepal. The Fertility, Mortality and Morbidity Survey conducted in 1977-78 in three rural areas of Kathmandu, Rupandehi and Kavre provided MMR estimate of 850 per 100,000 live births (by FP/MCH as cited in CBS, 1987, p. 250). For the first time an attempt was made in the Nepal fertility, Family Planning and Health Survey (NFHS) 1991/92 to estimate maternal mortality rate at the national level. The sisterhood method of estimation was used in the computation of MMR. In this method, ever-married women aged 15-49 years were the respondents who provided information on the death of their sisters who died during pregnancy, child birth or within two months after a birth or termination of pregnancy. The maternal mortality rate was estimated to be around 515 per 100,000 live births during the 10-14 years prior to the survey. An estimated MMR of 510 per 100,000 live births in Bangladesh around the same time, about 545 in urban and 874 in rural Andhra Pradesh state of India are some of the comparative levels available for this region (Bhatia, J.C., 1986 as cited in MOH, 1993, p.144).

3.8 Life Expectancy at Birth

Life expectancy at birth is a summary index of mortality at different ages. This measure indicates the number of years on the average, a new born baby is expected to survive. The computation is accomplished through the construction of a life table, using the age specific death rates. Since male and female mortality are usually different in level and age pattern, a separate life table is constructed and life expectancy ($e°_o$) at birth and at other ages established for each sex.

When age specific death rates are not available, which is often the case in developing countries, a model life table is identified which best describes the country's situation. Such identification is done using age distributions of population at one or two points of time. Identification may also be done on the basis of infant and child mortality and/or adult mortality estimated by indirect methods.

Various estimates exist for $e°_o$ of males and females for Nepal as shown in Table 18. Before 1960, the life expectancy at birth was less than 40 years and during the 1960s it was slightly more than

40 years. A further increase took place and the estimates point to a level of about 45 years for the mid 1970s.

Based on the age sex distribution of the 1981 census, $e°_o$ was estimated as 50.9 years for males and 48.1 years for females. Analysis based an age sex distribution of 1991 census and the analysis based on the data on children ever born and children surviving from the 1991/1992 Nepal Fertility Family Planning and Health Survey led to $e°_o$ estimates of 55.0 and 53.5 years for males and females respectively for 1991. The corresponding life tables for males and females derived from Coale-Demeny West Model are presented in Appendix Table B.

There is continuous evidence, with a few exceptions, that male e^o_o has been greater than female e^o_o. This is consistently shown by all estimates since 1971. Higher male than female $e°_o$ has been a feature of the countries in the Indian sub-continent, the reasons for which are not fully known yet.

Table 18: Trends in Expectation of Life at Birth by Sex, Nepal. 1954-91

Source	Reference period	Expectation of life at births	
		Males	Females
Vaidyanathan and Gaige, 1973 1/	1954	27.1	28.5
Central Bureau of Statistics, 1977 1/	1953-61	35.2	37.4
Gubhaju, 1974 1/	1961-71	42.9	38.9
Central Bureau of Statistics, 1977 1/	1961-71	37.0	39.9
Gubhaju, 1982 1/	1971	42.1	40.0
Demographic Sample Survey, 1976 1/	1974-75	46.0	42.5
Demographic Sample Survey, 1977 1/	1976	43.4	41.1
Central Bureau of Statistics, 1986 1/	1971-81	46.3	44.3
Central Bureau of Statistics, 1986 1/	1981	50.9	48.1
Central Bureau of Statistics, 1987 2/	1983	51.8	50.3
Central Bureau of Statistics, 1993 3/	1991	55.0	53.5

Source:

1/ CBS. 1987a, Table 13.10 p. 313
2/ CBS, 1987b, p.73
3/ Table 9

3.9 Urban Rural Differentials

Historically in Europe and North America, mortality in urban areas was higher than in rural areas. High population density, over crowding and the consequent inadequate water supply and waste disposal, leading to infections deceases and other health hazards were some of the causes of higher urban than rural mortality. With the import of public health and medical technology which became available to a greater extent in urban than in rural areas in developing countries, it was possible to achieve a lower urban than rural mortality in these countries.

The Demographic Sample Surveys of 1974/75, 1976, 1977/78 and I986/87, all show a higher mortality in rural than in urban areas (Table 19). The rural-urban differential however has been decreasing over the years. Rural death rates which were twice as large as the urban death rates in the mid 1970s are only one and a half times larger by the mid 1980s.

Table 19: Rural Urban Differentials in Crude Death Rate (CDR), Evidence From Demographic Sample Surveys of 1974-75, 1976, 1977-78 and 1986-87, Nepal

Year	CDR		
	Urban	Rural	Total
1974-75 1/	9.0	19.8	19.5
1976 1/	8.9	22.6	22.2
1977-78 1/	12.0	18.6	17.1
1986-87 2/	11.8	16.8	16.1

Source:-

1/ CBS. 1987a, Table 13.6 p. 309
2/ CBS, 2044/45, p.43

The rural-urban differentials in infant mortality exhibited by various surveys are presented in Table 20. Urban IMR has all along been lower than that in rural areas. The ratio of urban to rural IMR was around 40 per cent in the mid 1970s which became over 60 per cent and further increased to more than 70 per cent by latter part of 1980s. Thus the narrowing of rural-urban gap observed in CDR earlier also seems to be true in the case of IMR.

3.10 Regional Variations

Variations in mortality by geographic areas are expected on account of climatic and other ecological differences, among others. The infant mortality rates and the corresponding life expectancy at birth are presented for Ecological Zones and Development Regions in Table 21. Among the Ecological Zones, the highest IMR was always obtained for the Mountain area. This is expected in view of the inadequate availability of health services and the environmental conditions which are different from the other two zones. The Hill areas seem to have the lowest IMR although this finding is not supported by the 1981 census data which presumably is due to data quality differences among the Ecological zones. The Nepal Fertility Survey of 1976 (Ghubhaju, 1985 as cited in CBS, 1987, pp.309) shows IMR estimates of 190, 145 and 184 for Mountain, Hill and Terai, presenting the lowest IMR in Hill areas; these estimates refer to 1962-71. The Hill areas also exhibited the greatest and the most consistent decline, among the three zones, in infant mortality.

Table 20: Infant Mortality by Urban-Rural residence, Nepal 1962-1991

Source	Period of estimation	IMR		
		Urban	Rural	(U/R)100
Nepal Fertility Survey, 1976[1/]	1962-71	127.0	167.0	76%
Demographic Sample Survey, 1976[1/]	1974-75	57.1	134.8	42%
Demographic Sample Survey, 1977[1/]	1976	52.8	136.1	39%
Demographic Sample Survey, 1978 [1/]	1977-78	67.2	105.1	64%
Nepal Fertility Family Planning Survey 1986 [2/]	1982-85 Direct Est.	63.0	97.0	65%
	1982-83 Indirect Est.	56.0	111.0	51%
Demographic Sample Survey 1986/87 [3/]	1983 Indirect Est.	78.0	111.0	70%
Demographic Sample Survey 1986/87 [4/]	1986 Prospective data direct Est.	82.1	110.6	74%
Nepal Fertility Family Planning and Health Survey NFHS, 1991 [5/]	1981-91 Direct Est.	60.4	100.2	60%
Nepal Fertility Family Planning NFHS, 1991 [6/]	1989 (Indirect Est.)	69.0	105.0	66%

Source:-

1/ CBS, 1987a, 'Fable 13.7 and 13.8. pp. 309 and 311
2/ M011, 1987, 'Fable 8.2 and 8.3. pp. 83-85
3/ CBS, 19876, "Table D1-D2
4/ CBS, 2044/45, p. 43
5/ M011, 1993, p. 136
6/ MOH, 1993, Original Data tape (Appendix Tables A4, A5).

Table 21: Estimates of Infant Mortality and Corresponding Life Expectancy at Birth for Ecological and Development Regions of Nepal Based on Proportion Dead Among Children Ever Born to Ever Married Women (Coale-Demeny West Model)

Source/ Parameter	Ecological Zones			Development Regions				
	Mountain	Hills	Terai	Eastern	Central	Western	Mid-Western	Far Western
1981 Census 1/								
IMR	187	164	124	130	138	148	177	169
e^o_o	39.3	42.7	49.2	48.3	46.9	45.2	40.8	42.0
Ref. Year	1978	1978	1978	1978	1978	1978	1978	1978
1986/87 (DSS) 2/								
IMR	111	103	120	-	-	-	-	-
e^o_o	51.8	53.4	50.2	-	-	-	-	-
Ref. Year	1984	1984	1983	-	-	-	-	-
1986 NFFS 3/								
IMR	163	104	100	-	-	-	-	-
e^o_o	43.0	53.2	53.9	-	-	-	-	-
Ref. Year	1984	1983	1983	-	-	-	-	-
1991/92 NFHS4/								
IMR	155	83	112	99	94	86	124	i36
e^o_o	44.2	57.3	51.8	54.2	55.2	56.7	49.6	47.4
Ref. Year	1989	1989	1989	1989	1989	1989	1989	1989

Source:
1/ CBS, 1987a, Table 11.13, p. 272
2/ CBS, 1987b, Table DI. p. 73
3/ MOH, 1987, Appendix 7B-7D
4/ MOH, 1993, NFHS, 1991/92 Original data tape. (Appendix Tables A6-A13).

Among the development regions, the two regions, namely, the Mid-Western and the Far-Western stand out distinctly as the ones having higher mortality than others. The other three regions, namely, the Eastern, Central and Western do not vary greatly with respect to IMR although their ranking is different in the 1991 census and the 1991/92 NFHS. The life expectancy estimated for 1989 on the basis of 1991/92 NFHS is 54.2, 55.2 and 56.7 in the Eastern, Central and Western development regions whereas it is less than 50 years in the Mid-Western and Far-Western Development Regions which is reflective of their lower level of development.

4. Conclusion

In the absence of vital statistics system, mortality data has to continue to be obtained from census and surveys. Sample surveys have proved to be better sources than censuses, in this respect. Even in surveys, collection of mortality data had received less attention compared to fertility data probably because the latter is closely linked with family planning which is more often investigated. Most of the time, early childhood mortality estimated from two fertility related items of information, namely, the number of children ever born and the number dead, had been used to estimate the life expectancy at birth. Hardly any information is available on adult mortality even for indirect estimation.

The present analysis makes use of the limited information to throw light on the levels and trends in mortality, their differentials by socio-economic and other background variables, ecological and regional variations, and age-sex patterns of mortality in Nepal. The findings do certainly have policy relevance in the identification of priority areas and specification of target groups.

A case is hereby made for greater attention for mortality data collection and special effort for its quality improvement than has been the case so far.

Table Al: Estimates of Adult Male Mortality by widowhood Method, 1991 Census, Nepal

AGE GROUP OF RESPONDENT	PROPORTION FEMALES NOT WIDOWED	PROBABILITY OF AN ADULT MALE SURVIVING FROM AGE 20 TO AGE X	
		AGE X	HILL –TRUSSELL EQUATION
20-25	.9950	25	.9943
25-30	.9899	30	.9911
30-35	.9805	35	.9832
35-40	.9602	40	.9625
40-45	.9262	45	.9280
45-50	.8765	50	.8789
50-55	.7948	55	.8003
55-60	.7317	60	.7433

CORRESPONDING MALE LIFE EXPECTANCIES

AGE GROUP OF RESPONDENT	REFERENCE DATE	UNITED NATIONS MODELS					COALE -DEMENY MODELS			
		LATIN AM.	CHILEAN	SO. ASIAN	FAR EAST	GENERAL	WEST	NORTH	EAST	SOUTH
MALE LIFE EXPECTANCY AT AGE TWENTY										
20-25	AUG 1989	54.9	52.8	51.2	50.3	52.9	53.3	57.3	52.9	53.3
25-30	MAY 1987	56.7	55.0	53.2	52.2	54.7	54.3	58.6	54.0	54.5
30-35	FEB 1985	55.9	54.5	52.6	51.5	53.9	53.5	57.7	53.2	54.1
35-40	JAN 1983	53.6	52.4	50.5	49.4	51.7	51.5	55.1	51.1	52.1
40-45	FEB 1981	51.6	50.6	48.9	47.9	49.9	49.9	52.6	49.4	50.3
45-50	JUL 1979	50.0	49.3	47.9	47.0	48.7	48.6	50.5	48.2	48.9
50-55	JAN 1978	48.1	47.7	46.9	46.2	47.2	47.0	48.2	46.8	47.0
55-60	FEB 1977	LT 20.0	LT 20.0	LT 20.0	LT 20.0	LT 20.0	LT 20.0	LT 20.0	LT 20.0	LT 20.0
MALE LIFE EXPECTANCY AT BIRTH										
20-25	AUG 1989	70.5	68.5	62.4	67.6	68.9	70.7	75.6	70.2	67.1
25-30	MAY 1987	73.5	71.9	66.8	70.2	71.7	72.3	77.3	72.1	69.5
30-35	FEB 1985	72.2	71.1	65.5	69.3	70.6	71.1	76.2	70.7	68.7
35-40	JAN 1983	68.4	67.8	60.9	66.4	67.1	67.7	72.3	66.8	65.0
40-45	FEB 1981	64.8	65.0	57.2	64.3	64.1	64.7	68.0	63.0	61.4
45-50	JUL 1979	61.9	62.9	54.8	62.9	61.9	62.2	64.0	60.2	58.3
50-55	JAN 1978	58.2	60.2	52.2	61.7	59.2	59.1	59.4	56.6	54.3
55-60	FEB 1977	LT 20.0	LT 20.0	LT 20.0	LT 20.0	LT 20.0	LT 20.0	L7 20.0	LT 20.0	LT 20.0

Table A2: Indirect Estimation of Early Age Mortality for Nepal: 1991 Census

ENUMERATION OF JUN 1991 — **PROBABLITY OF DYING BEFORE AGE X**

AGE OF WOMAN	AVERAGE NO. OF CHILDREN BORN	SURVIVING	PROPORTION DEAD	AGE X	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) (PALLONI-HELIGMAN EQUATIONS) LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
15-20	.0170	0.158	.071	1	0.075	0.082	0.075	0.075	0.075	0.079	0.078	0.079	0.075
20-25	1.155	1.068	.075	2	0.079	0.081	0.079	0.078	0.079	0.079	0.076	0.079	0.079
25-30	2.346	2.141	0.87	3	0.088	0.90	0.089	0.088	0.088	0.086	0.082	0.087	0.088
30-35	3.275	2.936	.104	5	0.107	0.106	0.108	0.105	0.106	0.103	0.100	0.103	0.104
35-40	3.959	3.468	.124	10	0.131	0.128	0.131	0.129	0.130	0.126	0.128	0.126	0.127
40-45	4.351	3.712	.147	15	0.150	0.150	0.153	0.150	0.150	0.147	0.149	0.147	0.148
45-50	4.433	3.689	.168	20	0.172	0.171	0.171	0.173	0.173	0.167	0.168	0.167	0.167

MEAN AGE AT CHILDBEARING = 28.52

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	LAT AM	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	MAY 1990	.075	0.082	0.075	.075	0.075	JUL 1990	0.079	0.078	0.079	0.075
20-25	MAR 1989	.065	0.074	0.066	.067	0.067	MAR 1989	0.067	0.061	0.071	0.068
25-30	JUN 1987	.067	0.079	0.068	.069	0.069	FEB 1987	0.068	0.060	0.074	0.071
30-35	FEB 1985	.073	0.088	0.075	.075	0.075	SEP 1984	0.074	0.065	0.082	0.078
35-40	JUN 1982	.080	0.100	0.084	.082	0.083	DEC 1981	0.082	0.070	0.092	0.087
40-45	JUN 1979	086	0.111	0.093	.088	0.089	FEB 1979	0.089	0.075	0.102	0.094
45-50	DEC 1975	.092	0.118	0.099	.090	0.094	MAR 1976	0.092	0. 078	0.107	0.099
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	MAY 1990	.039	0.017	0.35	.033	0.034	JUL 1990	0.035	0.051	0.023	0.027
20-25	MAR 1989	.031	0.015	0.028	.027	0.027	MAR 1989	0.027	0.036	0.019	0.021
25-30	JUN 1987	.032	0.016	0.030	.028	0.029	FEB 1987	0.028	0.035	0.020	0.023
30-35	FEB 1985	.037	0.020	0.035	.032	0.033	SEP 1984	0.031	0.038	0.023	0.029
35-40	JUN 1982	.044	0.025	0.043	.038	0.040	DEC 1981	0.036	0.043	0.028	0.037
40-45	JUN 1979	.049	0.030	0.051	.043	0.045	FEB 1979	0.041	0.048	0.033	0.045
45-50	DEC 1975	.055	0.033	0.057	.045	0.049	MAR 1976	0.044	0.050	0.036	0.050
LIFE EXPECTANCY AT BIRTH											
15-20	MAY 1990	61.0	62.2	63.8	54.1	59.4	JUL 1990	58.1	56.9	61.3	64.5
20-25	MAR 1989	63.8	64.0	66.0	56.5	61.7	MAR 1989	60.7	61.0	62.8	66.5
25-30	JUN 1987	63.4	62.9	65.4	55.9	61 2	FEB 1987	60.5	61.3	62.3	65.7
30-35	FEB 1985	61.8	60.9	63.8	54.3	59.5	SEP 1984	59.2	60.2	60.9	64.0
35-40	JUN 1982	59.7	58.4	61.7	52.2	57.4	DEC 1981	57.7	58.8	59.2	61.6
40-45	JUN 1979	58.2	56.2	59.7	50.6	55.8	FEB 1979	56.2	57.5	57.6	59.7
45-50	DEC 1975	56.6	54.8	58.3	50.1	54.5	MAR 1976	55.5	56.9	56.6	58.5

Table A3: Indirect Estimation of Early Age Mortality for Nepal, NFHS, 1991-92

AGE OF	AVERAGE NO. OF CHILDREN		PROPOR-TION	AGE	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS)					COALE-DEMENY MODELS (TRUSSELL EQUATIONS)			
WOMAN	BORN	SURVIVING	DEAD	X	LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENER AL	WEST	NORTH	EAST	SOUTH
15-20	.150	.132	.120	1	.134	.146	.134	.132	.133	.145	.143	.143	.140
20-25	1.332	1.178	.116	2	.123	.125	.124	.121	.122	.123	.119	.123	.124
25-30	2.749	2.371	.138	3	.139	.141	.141	.138	.139	.136	.130	.137	.138
30-35	3.840	3.229	.159	5	.164	.163	.165	.161	.162	.158	.154	.158	.160
35-40	4.731	3.818	.193	10	.205	.199	.204	.201	.203	.194	.197	.195	.197
40-45	5.309	4.218	.206	15	.210	.210	.214	.211	.210	.204	.207	.205	.205
45-50	5.653	4.322	.235	20	.242	.240	.241	.243	.242	.232	.234	.233	.233

MEAN AGE AT CHILDBEARING = 28.59

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) LAT AM	CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	OCT 1990	0.134	.146	0.134	0.132	0.133	FEB 1991	0.145	0.143	0.143	0.140
20-25	OCT 1989	0.097	.112	0.098	0.099	0.099	OCT 1989	0.102	0.094	0.108	0.100
25-30	JAN 1988	0.098	.119	0.101	0.103	0.102	SEP 1987	0.103	0.091	0.112	0.102
30-35	JUL 1985	0.104	.129	0.108	0.108	0.107	FEB 1985	0.108	0.094	0.120	0.107
35-40	AUG 1982	0.115	.147	0.121	0.118	0.119	MAR 1982	0.121	0.103	0.136	0.119
40-45	JUN 1979	0.113	.148	0.122	0.116	0.117	MAR 1979	0.12	0.101	0.137	0.119
45-50	DEC 1975	0.121	.157	0.131	0.119	0.127	APR 1976	0.126	0.105	0.146	0.125
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	OCT 1990	0.106	.049	0.095	0.086	0.091	FEB 1991	0.083	0.115	0.057	0.104
20-25	OCT 1989	0.060	.030	0.056	0.530	0.054	OCT 1989	0.051	0.066	0.037	0.051
25-30	JAN 1988	0.062	.034	0.058	0.056	0.057	SEP 1987	0.051	0.063	0.039	0.053
30-35	JUL 1985	0.067	.039	0.065	0.060	0.062	FEB 1985	0.055	0.066	0.043	0.059
35-40	AUG 1982	0.080	.049	0.079	0.071	0.074	MAR 1982	0.065	0.075	0.053	0.074
40-45	JUN 1979	0.078	.049	0.080	0.068	0.072	MAR 1979	0.064	0.073	0.053	0.074
45-50	DEC 1975	0.087	.055	0.090	0.071	0.079	APR 1976	0.068	0.077	0.059	0.082
LIFE EXPECTANCY AT BIRTH											
15-20	OCT 1990	45.9	49.1	50.5	39.7	45.0	FEB 1991	45.9	43.0	50.9	48.2
20-25	OCT 1989	55.3	55.8	58.4	47.7	53.2	OCT 1989	53.6	53.2	56.5	58.2
25-30	JAN 1988	54.9	54.4	57.8	46.9	52.6	SEP 1987	53.4	53.8	55.8	57.7
30-35	JUL 1985	53.6	52.5	56.4	45.7	51.3	FEB 1985	52.4	53.1	54.6	56.4
35-40	AUG 1982	50.8	49.2	53.6	43.1	48.5	MAR 1982	50.0	51.0	52.0	53.5
40-45	JUN 1979	51.3	48.9	53.2	43.6	48.9	MAR 1979	50.2	51.5	51.9	53.4
45-50	DEC 1975	49.4	47.3	51.4	42.9	47.4	APR 1976	49.1	50.5	50.5	51.8

Table A4: Indirect Estimation of Early Age Mortality for Urban areas, NFHS, 1991-92

ENUMERATION OF NOV 1991 — PROBABLITY OF DYING BEFORE AGE X

AGE OF WOMAN	AVERAGE NO. OF CHILDREN BORN	SURVIVING	PROPOR-TION DEAD	AGE X	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
15-20	.121	0.117	.033	1	.036	.039	.036	.035	.035	.038	.038	.038	.037
20-25	1.017	0.940	.076	2	.081	.083	.082	.080	.081	.082	.079	.081	.082
25-30	2.327	2.096	.099	3	.102	.103	.103	.101	.101	.100	.096	.101	.102
30-35	3.305	2.943	.110	5	.114	.113	.115	.112	.113	.111	.109	.111	.112
35-40	4.048	3.490	.138	10	.147	.143	.147	.145	.146	.142	.145	.142	.144
40-45	4.450	3.921	.119	15	.122	.122	.124	.123	.123	.121	.123	.121	.121
45-50	4.806	3.995	0169	20	.174	.173	.173	.176	.175	.170	.172	.170	.170

MEAN AGE AT CHILDBEARING = 29.10

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	LAT AM	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
15-20	OCT 1990	.036	0.039	0.036	.035	0.035	DEC 1990	0.038	0.038	0.038	0.037
20-25	SEP 1989	.067	0.076	0.068	.068	0.068	OCT 1989	0.069	0.064	0.073	0.070
25-30	FEB 1988	.075	0.090	0.077	.078	0.078	NOV 1987	0.078	0.069	0.085	0.080
30-35	DEC 1985	.077	0.093	0.079	.079	0.079	AUG 1985	0.079	0.069	0.087	0.082
35-40	JUN 1983	.088	0.110	0.092	.090	0.091	JAN 1983	0.091	0.078	0.102	0.095
40-45	JUL 1980	.073	0.093	0.079	0.75	0.076	APR 1980	0.075	0.064	0.085	0.082
45-50	FEB 1977	.093	0.119	0.100	.092	0.096	APR 1977	0.094	0.079	0.109	0.100
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	OCT 1990	.011	0.005	0.010	.009	0.009	DEC 1990	0.011	0.016	0.006	0.005
20-25	SEP 1989	.032	0.015	0.029	.028	0.028	OCT 1989	0.029	0.038	0.019	0.023
25-30	FEB 1988	.039	0.020	0.037	.035	0.036	NOV 1987	0.034	0.043	0.025	0.031
30-35	DEC 1985	.041	0.022	0.039	.036	0.037	AUG 1985	0.035	0.042	0.026	0.033
35-40	JUN 1983	.051	0.029	0.050	.045	0.047	JAN 1983	0.043	0.051	0.034	0.045
40-45	JUL 1980	.038	0.022	0.038	.033	0.034	APR 1980	0.032	0.037	0.025	0.032
45-50	FEB 1977	.056	0.034	0.057	.046	0.050	APR 1977	0.045	0.051	0.037	0.051
LIFE EXPECTANCY AT BIRTH											
15-20	OCT 1990	72.7	72.8	73.9	66.5	71.0	DEC 1990	67.5	67.8	69.3	74.9
20-25	SEP 1989	63.4	63.6	65.6	56.1	61.3	OCT 1989	60.2	60.4	62.5	65.9
25-30	FEB 1988	61.0	60.6	63.3	53.4	58.7	NOV 1987	58.4	59.0	60.4	63.3
30-35	DEC 1985	60.6	59.8	62.8	53.1	58.4	AUG 1985	58.2	59.0	60.0	62.8
35-40	JUN 1983	57.6	56.3	59.9	50.1	55.3	JAN 1983	55.8	56.8	57.5	59.6
40-45	JUL 1980	61.6	59.9	63.0	54.2	59.3	APR 1980	59.1	60.4	60.4	63.0
45-50	FEB 1977	56.4	54.5	58.1	49.7	54.3	APR 1977	55.1	56.6	56.3	58.1

Table A5: Indirect Estimation of Early Age Mortality for Rural areas, NFHS, 1991-92

ENUMERATION OF NOV 1991			PROBABLITY OF DYING BEFORE AGE X										
	AVERAGE NO.	PROPOR-		UNITED NATIONS MODELS					COALE-DEMENY MODELS				
AGE OF	OF CHILDREN	TION	AGE	(PALLONI-HELIGMAN EQUATIONS)					(TRUSSELL EQUATIONS)				
WOMAN	BORN	SURVIVING	DEAD	X	LATAM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	WEST	NORTH	EAST	SOUTH
15-20	.153	0.133	.131	1	0.146	.159	0.147	0.144	0.145	0.159	0.157	0.157	0.153
20-25	1.363	1.200	.120	2	0.127	.129	0.128	0.125	0.126	0.128	0.123	0.127	0.128
25-30	2.784	2.393	.140	3	0.142	.144	0.143	0.141	0.141	0.139	0.132	0.140	0.141
30-35	3.877	3.249	.162	5	0.167	.166	0.168	0.164	0.165	0.160	0.156	0.161	0.162
35-40	4.786	3.845	.197	10	0.208	.203	0.208	0.204	0.207	0.197	0.200	0.199	0.200
40-45	5.382	4.243	.212	15	0.216	.216	0.220	0.217	0.216	0.209	0.213	0.210	0.211
45-50	5.716	4.347	.240	20	0.246	.244	0.245	0.247	0.246	0.235	0.237	0.236	0.236

MEAN AGE AT CHILDBEARING = 28.55

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	LATAM	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	OCT 1990	.146	0.159	0.147	.144	0.145	FEB 1991	0.159	0.157	0.157	0.153
20-25	OCT 1989	.100	0.116	0.101	.102	0.102	OCT 1989	0.105	0.097	0.111	0.103
25-30	DEC 1987	.100	0.122	0.103	.104	0.104	AUG 1987	0.105	0.092	0.114	0.103
30-35	JUN 1985	.105	0.131	0.109	.109	0.109	JAN 1985	0.110	0.095	0.122	0.108
35-40	JUL 1982	.117	0.149	0.122	.120	0.121	FEB 1982	0.123	0.104	0.138	0.120
40-45	MAY 1979	.116	0.152	0.125	.119	0.120	FEB 1979	0.123	0.103	0.141	0.121
45-50	OCT 1975	.123	0.159	0.132	.120	0.126	FEB 1976	0.128	0.107	0.149	0.127
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	OCT 1990	.123	0.057	0.111	.100	0.105	FEB 1991	0.093	0.128	0.065	0.122
20-25	OCT 1989	.063	0.032	0.058	.056	0.057	OCT 1989	0.053	0.068	0.039	0.054
25-30	DEC 1987	.064	0.035	0.060	.057	0.058	AUG 1987	0.053	0.064	0.040	0.055
30-35	JUN 1985	.069	0.040	0.066	.062	0.063	JAN 1985	0.056	0.067	0.044	0.060
35-40	JUL 1982	.082	0.050	0.081	.073	0.075	FEB 1982	0.066	0.076	0.054	0.075
40-45	MAY 1979	.081	0.052	0.084	.071	0.074	FEB 1979	0.066	0.075	0.055	0.077
45-50	OCT 1975	.089	0.056	0.092	.073	0.080	FEB 1976	0.070	0.078	0.060	0.084
LIFE EXPECTANCY AT BIRTH											
15-20	OCT 1990	43.0	46.6	47.9	37.1	42.3	FEB 1991	43.7	40.6	49.0	45.2
20-25	OCT 1989	54.6	55.1	57.8	46.9	52.5	OCT 1989	53.0	52.5	55.9	57.4
25-30	DEC 1987	54.5	54.0	57.5	46.5	52.2	AUG 1987	53.1	53.4	55.5	57.3
30-35	JUN 1985	53.3	52.1	56.1	45.3	50.9	JAN 1985	52.1	52.8	54.3	56.1
35-40	JUL 1982	50.4	48.7	53.2	42.6	48.0	FEB 1982	49.7	50.7	51.7	53.1
40-45	MAY 1979	50.6	48.2	52.6	42.9	48.3	FEB 1979	49.6	50.9	51.3	52.8
45-50	OCT 1975	49.0	46.9	51.0	42.6	47.0	FEB 1976	48.8	50.2	50.1	51.4

Table A6: Indirect Estimation of Early Age Mortality for Mountain, NFHS, 1991-92

ENUMERATION OF NOV 1991					PROBABLITY OF DYING BEFORE AGE X								
	AVERAGE NO.		PROPOR-		UNITED NATIONS MODELS					COALE-DEMENY MODELS			
AGE OF	OF CHILDREN		TION	AGE	(PALLONI-HELIGMAN EQUATIONS)					(TRUSSELL EQUATIONS)			
WOMAN	BORN	SURVIVING	DEAD	X	LATAM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	WEST	NORTH	EAST	SOUTH
15-20	.122	0.106	.131	1	0.147	.160	0.147	0.144	0.145	0.159	0.158	0.158	0.154
20-25	1.224	1.007	.177	2	0.191	.194	0.192	0.188	0.189	0.192	0.186	0.191	0.193
25-30	2.728	2.216	.188	3	0.192	.195	0.194	0.190	0.191	0.188	0.180	0.189	0.191
30-35	3.841	3.031	.211	5	0.219	.217	0.221	0.215	0.217	0.212	0.207	0.212	0.214
35-40	4.778	3.718	.222	10	0.236	.230	0.236	0.232	0.235	0.226	0.230	0.227	0.229
40-45	5.449	4.185	.232	15	0.238	.238	0.242	0.239	0.238	0.233	0.237	0.233	0.234
45-50	5.170	3.845	.256	20	0.264	.263	0.263	0.267	0.265	0.255	0.257	0.256	0.256

MEAN AGE AT CHILDBEARING = 28.96

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	LATAM	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	OCT 1990	.147	0.160	0.147	.144	0.145	FEB 1991	0.159	0.158	0.158	0.154
20-25	OCT 1989	.143	0.168	0.146	.147	0.147	NOV 1989	0.155	0.143	0.164	0.145
25-30	MAR 1988	.130	0.159	0.133	.135	0.134	NOV 1987	0.139	0.123	0.151	0.132
30-35	NOV 1985	.132	0.166	0.137	.137	0.137	JUN 1985	0.142	0.124	0.157	0.133
35-40	JAN 1983	.130	0.166	0.136	.133	0.134	SEP 1982	0.140	0.119	0.156	0.132
40-45	DEC 1979	.126	0.165	0.135	.129	0.130	OCT 1979	0.136	0.114	0.155	0.131
45-50	JUN 1976	.130	0.169	0.140	.128	0.134	OCT 1976	0.138	0.115	0.160	0.134
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	OCT 1990	.124	0.058	0.111	.100	0.106	FEB 1991	0.093	0.129	0.066	0.123
20-25	OCT 1989	.117	0.063	0.109	.103	0.106	NOV 1989	0.090	0.114	0.069	0.111
25-30	MAR 1988	.099	0.057	0.093	.089	0.091	NOV 1987	0.078	0.095	0.062	0.091
30-35	NOV 1985	.100	0.061	0.097	.091	0.093	JUN 1985	0.081	0.095	0.065	0.093
35-40	JAN 1983	.098	0.061	0.096	.087	0.090	SEP 1982	0.079	0.090	0.065	0.092
40-45	DEC 1979	.093	0.060	0.095	.082	0.085	OCT 1979	0.076	0.086	0.064	0.090
45-50	JUN 1976	.098	0.063	0.102	.081	0.089	OCT 1976	0.078	0.087	0.067	0.095
LIFE EXPECTANCY AT BIRTH											
15-20	OCT 1990	42.9	46.5	47.8	37.0	42.2	FEB 1991	43.6	40.4	48.8	45.1
20-25	OCT 1989	43.9	45.1	48.2	36.5	42.0	NOV 1989	44.2	43.0	48.0	46.9
25-30	MAR 1988	47.2	46.8	50.9	39.1	44.9	NOV 1987	46.9	46.8	49.8	50.2
30-35	NOV 1985	46.8	45.5	50.2	38.8	44.5	JUN 1985	46.3	46.7	49.0	49.9
35-40	JAN 1983	47.3	45.6	50.4	39.6	45.0	SEP 1982	46.8	47.7	49.0	50.1
40-45	DEC 1979	48.3	45.8	50.5	40.6	45.9	OCT 1979	47.3	48.6	49.2	50.4
45-50	JUN 1976	47.2	45.0	49.4	40.7	45.2	OCT 1976	46.9	48.3	48.4	49.6

Table A7: Indirect Estimation of Early Age Mortality for Hill, NFHS, 1991-92

ENUMERATION OF NOV 1991 **PROBABLITY OF DYING BEFORE AGE X**

AGE OF WOMAN	AVERAGE NO. OF CHILDREN BORN	PROPOR-TION SURVIVING	PROPOR-TION DEAD	AGE X	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
15-20	.104	0.092	.115	1	0.132	.143	0.132	0.129	0.130	0.145	0.143	0.142	0.140
20-25	1.185	1.077	.091	2	0.098	.100	0.099	0.097	0.098	0.099	0.096	0.099	0.100
25-30	2.602	2.266	.129	3	0.132	.134	0.133	0.131	0.131	0.129	0.124	0.130	0.131
30-35	3.702	3.180	.141	5	0.146	.145	0.147	0.144	0.145	0.141	0.137	0.141	0.142
35-40	4.637	3.820	.176	10	0.188	.182	0.187	0.184	0.186	0.178	0.181	0.179	0.180
40-45	5.203	4.221	.189	15	0.193	.193	0.197	0.195	0.194	0.188	0.191	0.189	0.189
45-50	5.628	4.383	.221	20	0.228	.227	0.227	0.230	0.229	0.219	0.221	0.219	0.220

MEAN AGE AT CHILDBEARING = 28.89

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	LAT AM	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	OCT 1990	.132	0.143	0.132	.129	0.130	MAR 1991	0.145	0.143	0.142	0.140
20-25	NOV 1989	.079	0.091	0.081	.081	0.081	DEC 1989	0.083	0.077	0.088	0.083
25-30	MAR 1988	.094	0.113	0.096	.098	0.097	NOV 1987	0.098	0.087	0.107	0.098
30-35	SEP 1985	.094	0.116	0.098	.098	0.097	MAY 1985	0.098	0.085	0.108	0.098
35-40	NOV 1982	.107	0.136	0.112	.110	0.111	JUN 1982	0.112	0.095	0.126	0.111
40-45	AUG 1979	.106	0.138	0.114	.109	0.110	JUN 1979	0.111	0.094	0.127	0.112
45-50	FEB 1976	.115	0.149	0.124	.114	0.119	JUN 1976	0.119	0.100	0.138	0.120
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	OCT 1990	.104	0.047	0.093	.083	0.088	MAR 1991	0.082	0.115	0.057	0.104
20-25	NOV 1989	.043	0.021	0.039	.037	0.038	DEC 1989	0.038	0.049	0.026	0.034
25-30	MAR 1988	.057	0.031	0.054	.051	0.052	NOV 1987	0.048	0.059	0.036	0.049
30-35	SEP 1985	.057	0.032	0.055	.051	0.052	MAY 1985	0.048	0.057	0.037	0.049
35-40	NOV 1982	.071	0.043	0.070	.063	0.065	JUN 1982	0.058	0.067	0.047	0.064
40-45	AUG 1979	.070	0.044	0.072	.061	0.064	JUN 1979	0.057	0.066	0.047	0.065
45-50	FEB 1976	.080	0.050	0.083	.066	0.073	JUN 1976	0.630	0.071	0.054	0.076
LIFE EXPECTANCY AT BIRTH											
15-20	OCT 1990	46.4	49.6	50.9	40.3	45.5	MAR 1991	46.0	43.0	51.1	48.2
20-25	NOV 1989	59.9	60.3	62.5	52.5	57.8	DEC 1989	57.3	57.1	59.9	62.5
25-30	MAR 1988	56.1	55.6	58.9	48.1	53.8	NOV 1987	54.4	54.7	56.7	58.7
30-35	SEP 1985	56.1	55.0	58.6	18.2	53.7	MAY 1985	54.4	55.2	56.5	58.7
35-40	NOV 1982	52.7	51.2	55.4	45.0	50.4	JUN 1982	51.7	52.7	53.6	55.3
40-45	AUG 1979	53.1	50.8	55.0	45.4	50.7	JUN 1979	51.8	53.1	53.4	55.1
45-50	FEB 1976	50.8	48.7	52.8	44.2	48.7	JUN 1976	50.3	51.7	51.7	53.1

Table A8: Indirect Estimation of Early Age Mortality forTerai, NFHS, 1991-92

ENUMERATION OF NOV 1991 **PROBABLITY OF DYING BEFORE AGE X**

AGE OF WOMAN	AVERAGE NO. OF CHILDREN BORN	SURVIVING	PROPORTION DEAD	AGE X	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
15-20	.202	0.177	.124	1	0.135	.148	0.135	0.134	0.134	0.144	0.142	0.144	0.139
20-25	1.487	1.294	.130	2	0.136	.139	0.137	0.134	0.135	0.136	0.130	0.136	0.136
25-30	2.895	2.496	.138	3	0.139	.141	0.140	0.137	0.138	0.135	0.128	0.136	0.137
30-35	3.967	3.304	.167	5	0.172	.171	0.173	0.169	0.170	0.165	0.160	0.165	0.166
35-40	4.812	3.830	.204	10	0.216	.210	0.216	0.211	0.214	0.204	0.207	0.206	0.207
40-45	5.396	4.222	.218	15	0.221	.221	0.226	0.222	0.221	0.215	0.218	0.216	0.216
45-50	5.761	4.345	.246	20	0.251	.250	0.251	0.252	0.252	0.241	0.243	0.242	0.242

MEAN AGE AT CHILDBEARING = 28.33

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	LAT AM	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	OCT 1990	.135	0.148	0.135	.134	0.134	JAN 1991	0.144	0.142	0.144	0.139
20-25	SEP 1989	.106	0.124	0.108	.109	0.109	AUG 1989	0.112	0.102	0.119	0.108
25-30	NOV 1987	.098	0.119	0.101	.102	0.101	JUN 1987	0.102	0.090	0.112	0.101
30-35	MAY 1985	.108	0.135	0.112	.112	0.111	NOV 1984	0.113	0.097	0.125	0.110
35-40	JUN 1982	.120	0.153	0.126	.123	0.125	DEC 1981	0.127	0.108	0.143	0.123
40-45	APR 1979	.118	0.155	0.128	.121	0.123	DEC 1978	0.126	0.106	0.144	0.124
45-50	SEP 1975	.125	0.162	0.135	.123	0.128	DEC 1975	0.131	0.109	0.152	0.129
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	OCT 1990	.108	0.050	0.097	.088	0.093	JAN 1991	0.082	0.114	0.057	0.102
20-25	SEP 1989	.070	0.036	0.065	.062	0.064	AUG 1989	0.058	0.074	0.043	0.061
25-30	NOV 1987	.061	0.034	0.058	.055	0.056	JUN 1987	0.051	0.062	0.039	0.052
30-35	MAY 1985	.072	0.042	0.069	0.64	0.066	NOV 1984	0.058	0.069	0.046	0.063
35-40	JUN 1982	.086	0.053	0.085	.076	0.079	DEC 1981	0.069	0.079	0.057	0.079
40-45	APR 1979	.084	0.054	0.087	.074	0.077	DEC 1978	0.068	0.078	0.057	0.080
45-50	SEP 1975	.092	0.058	0.095	.075	0.083	DEC 1975	0.072	0.081	0.062	0.087
LIFE EXPECTANCY AT BIRTH											
15-20	OCT 1990	45.6	48.8	50.2	39.3	44.6	JAN 1991	46.0	43.1	50.9	48.5
20-25	SEP 1989	53.0	53.5	56.4	45.2	50.8	AUG 1989	51.8	51.3	54.8	56.1
25-30	NOV 1987	55.0	54.5	58.0	47.0	52.7	JUN 1987	53.6	54.0	55.9	57.9
30-35	MAY 1985	52.7	51.5	55.5	44.7	50.3	NOV 1984	51.6	52.3	53.8	55.6
35-40	JUN 1982	49.6	47.9	52.4	41.9	47.2	DEC 1981	49.0	50.0	51.0	52.3
40-45	APR 1979	50.1	47.6	52.0	42.7	47.7	DEC 1978	49.1	50.4	50.8	52.2
45-50	SEP 1975	48.4	46.3	50.5	42.1	46.4	DEC 1975	48.3	49.7	49.6	50.9

Table A9: Indirect Estimation of Early Age Mortality for Eastern Region, Nepal, NFHS, 1991-92

ENUMERATION OF NOV 1991 **PROBABLITY OF DYING BEFORE AGE X**

AGE OF WOMAN	AVERAGE NO. OF CHILDREN BORN	PROPOR-TION SURVIVING	PROPOR-TION DEAD	AGE X	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) LATAM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
15-20	.108	0.094	.130	1	0.147	.160	0.148	0.145	0.146	0.162	0.160	0.159	0.156
20-25	1.180	1.050	.110	2	0.119	.121	0.119	0.117	0.118	0.120	0.116	0.119	0.120
25-30	2.567	2.264	.118	3	0.121	.122	0.121	0.119	0.120	0.118	0.113	0.119	0.120
30-35	3.618	3.116	.139	5	0.144	.143	0.145	0.141	0.142	0.138	0.135	0.139	0.140
35-40	4.432	3.700	.165	10	0.176	.171	0.175	0.172	0.174	0.167	0.169	0.168	0.169
40-45	5.361	4.421	.175	15	0.180	.180	0.183	0.181	0.180	0.175	0.177	0.175	0.176
45-50	5.587	4.481	.198	20	0.204	.203	0.203	0.206	0.205	0.196	0.197	0.196	0.196

MEAN AGE AT
CHILDBEARING = 28.85

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	LATAM	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	OCT 1990	.147	0.160	0.148	.145	0.146	MAR 1991	.162	.160	.159	.156
20-25	NOV 1989	.094	0.108	0.095	.096	0.096	DEC 1989	.099	.091	.104	.097
25-30	FEB 1988	.087	0.104	0.089	.090	0.090	NOV 1987	.090	.080	.098	.091
30-35	SEP 1985	.093	0.115	0.096	.096	0.096	APR 1985	.096	.084	.106	.097
35-40	OCT 1982	.102	0.128	0.106	.105	0.105	JUN 1982	.105	.090	.119	.106
40-45	AUG 1979	.100	0.129	0.108	.102	0.104	JUN 1979	.104	.088	.119	.107
45-50	FEB 1976	.105	0.136	0.114	.104	0.108	JUN 1976	.107	.090	.125	.111
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	OCT 1990	.125	0.058	0.112	.101	0.106	MAR 1991	0.095	0.131	0.066	0.127
20-25	NOV 1989	.057	0.028	0.053	.050	0.051	DEC 1989	0.049	0.063	0.035	0.049
25-30	FEB 1988	.050	0.027	0.047	.045	0.046	NOV 1987	0.042	0.052	0.032	0.041
30-35	SEP 1985	.056	0.032	0.054	.050	0.051	APR 1985	0.046	0.056	0.036	0.048
35-40	OCT 1982	.065	0.038	0.064	.057	0.060	JUN 1982	0.053	0.062	0.043	0.058
40-45	AUG 1979	.063	0.039	0.065	.055	0.058	JUN 1979	0.052	0.060	0.043	0.058
45-50	FEB 1976	.069	0.042	0.071	.057	0.062	JUN 1976	0.054	0.062	0.046	0.064
LIFE EXPECTANCY AT BIRTH											
15-20	OCT 1990	42.8	46.4	47.6	36.9	42.1	MAR 1991	43.2	40.0	48.6	44.5
20-25	NOV 1989	56.1	56.7	59.1	48.5	54.0	DEC 1989	54.2	53.7	57.1	58.8
25-30	FEB 1988	57.9	57.4	60.5	50.1	55.6	NOV 1987	55.9	56.4	58.1	60.5
30-35	SEP 1985	56.4	55.3	58.9	48.5	54.1	APR 1985	54.7	55.5	56.8	59.0
35-40	OCT 1982	54.1	52.7	56.7	46.4	51.8	JUN 1982	52.9	54.0	54.8	56.6
40-45	AUG 1979	54.6	52.5	56.4	47.0	52.3	JUN 1979	53.2	54.5	54.7	56.5
45-50	FEB 1976	53.2	51.2	55.1	46.6	51.1	JUN 1976	52.6	54.0	53.8	55.4

Table A10: Indirect Estimation of Early Age Mortality for Central Region, Nepal, NFHS, 1991-92

ENUMERATION OF NOV 1991 **PROBABLITY OF DYING BEFORE AGE X**

AGE OF WOMAN	AVERAGE NO. OF CHILDREN BORN	SURVIVING	PROPORTION DEAD	AGE X	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
15-20	.174	0.151	.132	1	0.145	.158	0.145	0.143	0.144	0.155	0.153	0.154	0.149
20-25	1.350	1.206	.107	2	0.112	.115	0.113	0.111	0.112	0.113	0.108	0.113	0.112
25-30	2.715	2.357	.132	3	0.133	.135	0.134	0.132	0.132	0.130	0.124	0.131	0.132
30-35	3.836	3.165	.175	5	0.18	.179	0.181	0.177	0.178	0.173	0.168	0.174	0.175
35-40	4.697	3.748	.202	10	0.214	.208	0.214	0.210	0.212	0.203	0.206	0.204	0.206
40-45	5.045	3.968	.213	15	0.217	.218	0.222	0.218	0.218	0.212	0.215	0.213	0.213
45-50	5.636	4.268	.243	20	0.249	.247	0.248	0.250	0.249	0.239	0.241	0.240	0.240

MEAN AGE AT CHILDBEARING = 28.47

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	LAT AM	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	OCT 1990	.145	0.158	0.145	.143	0.144	JAN 1991	0.155	0.153	0.154	0.149
20-25	SEP 1989	.089	0.103	0.091	.092	0.092	SEP 1989	0.094	0.086	0.099	0.092
25-30	DEC 1987	.095	0.115	0.097	.099	0.098	JUL 1987	0.099	0.087	0.108	0.098
30-35	JUN 1985	.112	0.140	0.116	.116	0.116	JAN 1985	0.118	0.102	0.131	0.115
35-40	AUG 1982	.119	0.152	0.125	.123	0.124	FEB 1982	0.126	0.107	0.142	0.123
40-45	JUL 1979	.117	0.153	0.126	.119	0.121	MAR 1979	0.124	0.104	0.142	0.122
45-50	DEC 1975	.124	0.161	0.134	.122	0.127	MAR 1976	0.130	0.108	0.151	0.128
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	OCT 1990	.121	0.057	0.109	.099	0.104	JAN 1991	0.090	0.124	0.064	0.117
20-25	SEP 1989	.053	0.026	0.048	.046	0.047	SEP 1989	0.045	0.058	0.032	0.043
25-30	DEC 1987	.058	0.031	0.055	.052	0.053	JUL 1987	0.048	0.059	0.037	0.049
30-35	JUN 1985	.077	0.045	0.074	.069	0.070	JAN 1985	0.062	0.074	0.049	0.068
35-40	AUG 1982	.085	0.052	0.084	.075	0.078	FEB 1982	0.069	0.079	0.056	0.079
40-45	JUL 1979	.082	0.052	0.085	.072	0.075	MAR 1979	0.067	0.076	0.056	0.078
45-50	DEC 1975	.092	0.057	0.094	.074	0.082	MAR 1976	0.071	0.080	0.061	0.086
LIFE EXPECTANCY AT BIRTH											
15-20	OCT 1990	43.4	46.8	48.2	37.2	42.5	JAN 1991	44.3	41.2	49.3	46.1
20-25	SEP 1989	57.2	57.6	60.2	49.6	55.1	SEP 1989	55.2	55.0	57.9	60.1
25-30	DEC 1987	55.9	55.3	58.7	47.9	53.6	JUL 1987	54.3	54.7	56.5	58.7
30-35	JUN 1985	51.6	50.4	54.5	43.6	49.2	JAN 1985	50.6	51.3	52.9	54.5
35-40	AUG 1982	49.8	48.1	52.6	42.0	47.4	FEB 1982	49.1	50.1	51.1	52.5
40-45	JUL 1979	50.5	48.1	52.4	42.8	48.1	MAR 1979	49.4	50.7	51.1	52.5
45-50	DEC 1975	48.7	46.6	50.8	42.3	46.7	MAR 1976	48.5	49.8	49.8	51.1

Table A11: Indirect Estimation of Early Age Mortality for Western Region, Nepal, NFHS, 1991-92

ENUMERATION OF NOV 1991 **PROBABLITY OF DYING BEFORE AGE X**

AGE OF WOMAN	AVERAGE NO. OF CHILDREN BORN	PROPOR-TION SURVIV ING	DEAD	AGE X	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
15-20	.115	0.110	.043	1	0.050	.054	0.050	0.049	0.049	0.055	0.054	0.054	0.053
20-25	1.283	1.161	.095	2	0.102	.104	0.103	0.101	0.102	0.103	0.100	0.103	0.103
25-30	2.747	2.452	.107	3	0.109	.111	0.110	0.108	0.109	0.107	0.102	0.108	0.108
30-35	3.687	3.261	.116	5	0.119	.119	0.120	0.117	0.118	0.115	0.112	0.115	0.116
35-40	4.569	3.787	.171	10	0.182	.177	0.181	0.178	0.181	0.172	0.175	0.173	0.174
40-45	5.152	4.176	.189	15	0.194	.194	0.197	0.195	0.194	0.188	0.191	0.189	0.189
45-50	5.393	4.130	.234	20	0.241	.240	0.240	0.243	0.242	0.231	0.232	0.232	0.232

MEAN AGE AT CHILDBEARING = 28.77

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	LAT AM	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	OCT 1990	.050	0.054	0.050	.049	0.049	MAR 1991	0.055	0.054	0.054	0.053
20-25	NOV 1989	.082	0.094	0.083	.084	0.084	DEC 1989	0.086	0.079	0.091	0.086
25-30	FEB 1988	.080	0.096	0.082	.083	0.083	OCT 1987	0.083	0.073	0.090	0.084
30-35	AUG 1985	.080	0.097	0.083	.082	0.082	MAR 1985	0.082	0.071	0.090	0.084
35-40	SEP 1982	.105	0.132	0.110	.107	0.108	APR 1982	0.109	0.092	0.122	0.109
40-45	JUN 1979	.106	0.138	0.114	.109	0.110	APR 1979	0.111	0.094	0.127	0.112
45-50	NOV 1975	.121	0.156	0.130	.119	0.124	APR 1976	0.125	0.105	0.146	0.125
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	OCT 1990	.019	0.008	0.017	.016	0.016	MAR 1991	0.020	0.030	0.012	0.010
20-25	NOV 1989	.046	0.022	0.042	.040	0.041	DEC 1989	0.040	0.052	0.028	0.036
25-30	FEB 1988	.044	0.023	0.041	.039	0.039	OCT 1987	0.037	0.046	0.027	0.035
30-35	SEP 1985	.043	0.024	0.041	.038	0.039	MAR 1985	0.036	0.044	0.027	0.035
35-40	OCT 1982	.068	0.041	0.067	.060	0.063	APR 1982	0.055	0.064	0.045	0.061
40-45	JUN 1979	.070	0.044	0.072	.061	0.064	APR 1979	0.057	0.066	0.047	0.065
45-50	NOV 1975	.087	0.055	0.090	.071	0.078	APR 1976	0.068	0.076	0.058	0.082
LIFE EXPECTANCY AT BIRTH											
15-20	OCT 1990	68.3	68.8	70.1	61.9	66.7	MAR 1991	63.5	63.0	66.1	70.6
20-25	NOV 1989	59.2	59.6	61.9	51.7	57.1	DEC 1989	56.7	56.5	59.3	61.8
25-30	FEB 1988	59.7	59.3	62.2	52.0	57.5	OCT 1987	57.5	58.0	59.5	62.3
30-35	AUG 1985	59.9	58.9	62.1	52.2	57.6	MAR 1985	57.7	58.6	59.5	62.3
35-40	SEP 1982	53.4	51.9	56.0	45.7	51.1	APR 1982	52.3	53.4	54.2	55.9
40-45	JUN 1979	53.0	50.8	54.9	45.3	50.7	APR 1979	51.8	53.1	53.4	55.1
45-50	NOV 1975	49.5	47.4	51.5	43.0	47.4	APR 1976	49.2	50.6	50.6	51.9

Table A12: Indirect Estimation of Early Age Mortality for Mid-Western Region, Nepal, NFHS, 1991-92

ENUMERATION OF NOV 1991 **PROBABLITY OF DYING BEFORE AGE X**

AGE OF WOMAN	AVERAGE NO. OF CHILDREN BORN	SURVIVING	PROPORTION DEAD	AGE X	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
15-20	.180	0.149	.172	1	0.195	.212	0.196	0.192	0.193	0.212	0.210	0.209	0.205
20-25	1.528	1.308	.144	2	0.151	.154	0.152	0.149	0.150	0.151	0.146	0.152	0.151
25-30	2.862	2.347	.180	3	0.180	.183	0.181	0.178	0.179	0.174	0.165	0.176	0.177
30-35	4.250	3.408	.198	5	0.202	.202	0.204	0.199	0.200	0.192	0.186	0.194	0.195
35-40	5.299	4.075	.231	10	0.243	.237	0.243	0.238	0.242	0.228	0.230	0.230	0.231
40-45	5.911	4.414	.253	15	0.256	.257	0.262	0.257	0.257	0.246	0.249	0.248	0.248
45-50	6.112	4.413	.278	20	0.284	.282	0.283	0.284	0.284	0.268	0.270	0.271	0.270

MEAN AGE AT CHILDBEARING = 28.16

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	LAT AM	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	OCT 1990	.195	0.212	0.196	.192	0.193	MAR 1991	0.212	0.210	0.209	0.205
20-25	SEP 1989	.116	0.136	0.118	.120	0.119	OCT 1989	0.124	0.113	0.131	0.118
25-30	OCT 1987	.122	0.151	0.126	.128	0.127	JUN 1987	0.130	0.114	0.142	0.123
30-35	FEB 1985	.123	0.156	0.128	.128	0.128	AUG 1984	0.130	0.112	0.144	0.124
35-40	DEC 1981	.133	0.170	0.139	.136	0.138	JUN 1981	0.141	0.119	0.159	0.133
40-45	AUG 1978	.133	0.176	0.145	.137	0.138	APR 1978	0.144	0.120	0.164	0.137
45-50	DEC 1974	.138	0.179	0.149	.135	0.142	MAY 1975	0.145	0.121	0.169	0.140
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	OCT 1990	.197	0.097	0.179	.163	0.170	MAR 1991	0.133	0.180	0.097	0.198
20-25	SEP 1989	.082	0.043	0.076	.073	0.075	OCT 1989	0.067	0.085	0.050	0.074
25-30	OCT 1987	.089	0.051	0.084	.081	0.082	JUN 1987	0.071	0.085	0.056	0.080
30-35	FEB 1985	.090	0.054	0.087	.081	0.083	AUG 1984	0.071	0.083	0.057	0.081
35-40	DEC 1981	.102	0.064	0.100	.090	0.094	JUN 1981	0.079	0.090	0.066	0.093
40-45	AUG 1978	.102	0.068	0.107	.090	0.094	APR 1978	0.082	0.092	0.069	0.098
45-50	DEC 1974	.108	0.070	0.113	.088	0.098	MAY 1975	0.083	0.093	0.073	0.103
LIFE EXPECTANCY AT BIRTH											
15-20	OCT 1990	32.8	37.5	38.3	27.9	32.5	MAR 1991	35.9	32.3	41.9	34.8
20-25	SEP 1989	50.4	51.1	54.0	42.6	48.3	OCT 1989	49.6	48.9	52.8	53.5
25-30	OCT 1987	49.0	48.3	52.5	40.8	46.6	JUN 1987	48.5	48.8	51.2	52.2
30-35	FEB 1985	48.8	47.4	52.0	40.7	46.5	AUG 1984	48.4	49.2	50.8	52.1
35-40	DEC 1981	46.6	44.8	49.6	38.9	44.3	JUN 1981	46.6	47.7	48.7	49.8
40-45	AUG 1978	46.4	43.8	48.5	38.8	44.1	APR 1978	46.1	47.4	47.9	49.0
45-50	DEC 1974	45.4	43.2	47.5	39.2	43.4	MAY 1975	45.8	47.2	47.1	48.2

Table A13: Indirect Estimation of Early Age Mortality for Far-Western Region, Nepal, NFHS, 1991-92

ENUMERATION OF NOV 1991 **PROBABLITY OF DYING BEFORE AGE X**

AGE OF WOMAN	AVERAGE NO. OF CHILDREN BORN	SURVIVING	PROPORTION DEAD	AGE X	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
15-20	.234	0.208	.111	1	0.117	.129	0.117	0.117	0.117	0.124	0.121	0.124	0.118
20-25	1.561	1.311	.160	2	0.168	.172	0.169	0.166	0.167	0.168	0.160	0.168	0.167
25-30	3.181	2.564	.194	3	0.196	.199	0.198	0.194	0.195	0.192	0.183	0.193	0.195
30-35	4.343	3.487	.197	5	0.203	.202	0.205	0.200	0.201	0.197	0.192	0.197	0.199
35-40	5.308	4.129	.222	10	0.235	.229	0.235	0.231	0.234	0.225	0.229	0.226	0.228
40-45	5.741	4.376	.238	15	0.242	.243	0.247	0.243	0.243	0.238	0.242	0.239	0.240
45-50	5.926	4.400	.258	20	0.264	.263	0.263	0.266	0.265	0.256	0.258	0.256	0.256

MEAN AGE AT CHILDBEARING = 28.54

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	REFERENCE DATE	LAT AM	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) CHILEAN	SO. ASIAN	FAR EAST	GENERAL	REFERENCE DATE	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	OCT 1990	.117	0.129	0.117	.117	0.117	DEC 1990	0.124	0.121	0.124	0.118
20-25	AUG 1989	.128	0.150	0.130	.132	0.131	AUG 1989	0.136	0.124	0.145	0.129
25-30	NOV 1987	.132	0.163	0.136	.138	0.137	JUL 1987	0.142	0.125	0.154	0.134
30-35	AUG 1985	.124	0.156	0.128	.129	0.128	FEB 1985	0.133	0.115	0.147	0.126
35-40	DEC 1982	.129	0.165	0.135	.133	0.134	JUN 1982	0.139	0.119	0.156	0.132
40-45	DEC 1979	.127	0.167	0.138	.131	0.132	AUG 1979	0.139	0.117	0.158	0.133
45-50	JAN 1976	.130	0.169	0.141	.128	0.134	AUG 1976	0.139	0.116	0.161	0.134
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	OCT 1990	.085	0.039	0.076	.070	0.073	DEC 1990	0.067	0.093	0.046	0.074
20-25	AUG 1989	.096	0.051	0.090	.085	0.088	AUG 1989	0.076	0.096	0.058	0.088
25-30	NOV 1987	.101	0.059	0.096	.092	0.093	JUL 1987	0.080	0.096	0.063	0.094
30-35	AUG 1985	.091	0.055	0.088	.082	0.083	FEB 1985	0.073	0.087	0.059	0.083
35-40	DEC 1982	.097	0.061	0.096	.086	0.089	JUN 1982	0.078	0.090	0.064	0.092
40-45	DEC 1979	.095	0.062	0.098	.084	0.087	AUG 1979	0.078	0.089	0.066	0.093
45-50	JAN 1976	.098	0.063	0.102	.080	0.089	AUG 1976	0.078	0.088	0.067	0.095
LIFE EXPECTANCY AT BIRTH											
15-20	OCT 1990	49.9	52.4	54.1	43.1	48.6	DEC 1990	49.6	47.3	53.9	53.6
20-25	AUG 1989	47.6	48.4	51.5	39.8	45.5	AUG 1989	47.4	46.6	50.8	50.9
25-30	NOV 1987	46.6	46.1	50.3	38.5	44.3	JUL 1987	46.4	46.5	49.3	49.8
30-35	AUG 1985	48.7	47.4	51.9	40.6	46.3	FEB 1985	47.9	48.5	50.5	51.6
35-40	DEC 1982	47.4	45.7	50.4	39.7	45.1	JUN 1982	46.8	47.7	49.0	50.1
40-45	DEC 1979	47.9	45.3	50.0	40.2	45.5	AUG 1979	46.8	48.0	48.7	49.9
45-50	JAN 1976	47.2	45.1	49.3	40.8	45.2	AUG 1976	46.9	48.2	48.4	49.5

APPENDIX TABLE:8

Male and Female Life Tables[1/], Nepal, 1991

Male

AGE	M(X,N)	Q(X,N)	1(X)	D(X,N)	L(X,N)	S(X,N)	T(X)	E(X)
0	.10112	0.09456	100000.	9456	93516	.89224/A/	5500000	55.000
1	.01031	0.04016	90544.	3636	352604	.96764/B/	5406484	59.711
5	.00265	0.01314	86907.	1142	431682	.98854	5053880	58.153
10	.00196	0.00976	85765.	837	426735	.98807	4622198	53.893
15	.00303	0.01507	84928.	1280	421645	.98169	4195463	49.400
20	.00431	0.02134	83649.	1785	413923	.97768	3773819	45.115
25	.00464	0.02296	81864.	1879	404683	.97560	3359895	41.043
30	.00530	0.02616	79984.	2093	394810	.97132	2955212	36.947
35	.00643	0.03168	77892.	2468	383487	.96415	2560402	32.871
40	.00830	0.04068	75424.	3069	369740	.95336	2176915	28.862
45	.01100	0.05360	72356.	3878	352495	.93677	1807175	24.976
50	.01544	0.07443	68478.	5097	330209	.91210	1454680	21.243
55	.02182	0.10369	63381.	6572	301182	.87529	1124471	17.742
60	.03221	0.14945	56809.	8490	263621	.82171	823290	14.492
65	.04740	0.21251	48319.	10268	216620	.74601	559668	11.583
70	.07168	0.30443	38050.	11584	161601	.63888	343049	9.016
75	.11032	0.43036	26467.	11390	103245	.43099/C/	181447	6.856
80	.19279	…..	15076.	15076	78203	….	78203	5.187

Female

AGE	M(X,N)	Q(X,N)	1(X)	D(X,N)	L(X,N)	S(X,N)	T(X)	E(X)
0	.10845	0.10131	100000.	10131	93415	.87906/A/	5350015	53.500
1	.01462	0.05633	89869.	5062	346117	.95632/B/	5256601	58.492
5	.00352	0.01746	84807.	1481	420333	.98450	4910483	57.902
10	.00272	0.01350	83326.	1125	413820	.98415	4490150	53.886
15	.00387	0.01917	82202.	1576	407259	.97788	4076330	49.589
20	.00505	0.02493	80626.	2010	398249	.97326	3669071	45.507
25	.00575	0.02835	78616.	2229	387598	.96982	3270822	41.605
30	.00652	0.32070	76387.	2449	375902	.96597	2883224	37.745
35	.00735	0.03611	73937.	2670	363108	.96164	2507322	33.911
40	.00835	0.04090	71267.	2915	349179	.95583	2144213	30.087
45	.00991	0.04837	68352.	3306	333755	.94403	1795034	26.262
50	.01343	0.06505	65046.	4231	315074	.92469	1461279	22.465
55	.01829	0.08763	60815.	5329	291348	.89326	1146204	18.847
60	.02762	0.12956	55485.	7189	260249	.84454	854857	15.407
65	.04097	0.18644	48296.	9004	219791	.77216	594608	12.312
70	.06441	0.27822	39292.	10932	169714	.66619	374817	9.539
75	.10078	0.40175	28360.	11394	113061	.44876/C/	205103	7.232
80	.18434	…..	16967.	16967	92041	….	92041	5.425

[1/] Derived from Coale-Demeny West Model Life Tables, corresponding to e_0° of 55.0 and 53.5 years for males and females respectively.

/A/ VALUE GIVEN IS FOR SURVIVORSHIP OF 5 COHORTS OF BIRTH TO AGE GROUP 0-4 = L(0,5)/500000

/B/ VALUE GIVEN IS FOR S(0,5)=L(5,5)/L(0,5)

/C/ VALUE GIVEN IS S(75+,5)=T(80)/T(75)

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