CHAPTER XI
ESTIMATES OF FERTILITY & MORTALLY

INTRODUCTION

In this chapter, some demographic parameters such as birth and death rates are estimated indirectly in the absence of reliable data on vital statistics. The reliability of these indirect estimates depends to large extent on satisfying the assumptions each method of estimation posits.

INDIRECT MEASURES

Birth Rates: National Level

The stable population technique was used to estimate fertility / mortality rates by selecting model stable population based on the ogive of the age distribution of each census and the estimated rate of growth[1] . In this technique, the population is assumed to be stable and this assumption is well met by the finding of consistency in the percentage age distribution of population over the census years 1952/54-81(Table 1.4). The selection of model life table was based on the smoothed[2] female age distribution and intercensal growth rate. Table 11.1 provides the level of mortality when one uses the West Life Table.

From these model life tables, the median level was selected to estimate the birth and death rates. And these levels were 8.38, 9.34 and 13.48 for 1961,1971 and 1981 respectively. The estimates of birth and death rates derived from these mortality levels are given in Table 11.2.

It shows little change in fertility, which has remained almost constant at a very high level during the last twenty – eight years (1952/54-81). The crude rates estimated for males and females under the assumption of stable population theory, were within the range of 40 to 43 Per thousand population for males and 39 to 41 for females during the period 1952/54-61 to 1971-81.Although fertility remained high and did not experience any noticeable decline, mortality has declined dramatically over the years. The average annual crude death rate declined from 27 per thousand during 1952/54-61 to 21 and 14 during the intercensal periods 1961-71 and 1971-81 respectively.

The stable population analysis has reveled a trend which is almost consistent with the present demographic situation being observed in many developing countries including those of the neighbouring countries Bangladesh, India and Pakistan, that is, constant high fertility level and fast declining mortality.

Now, a question may be raised as to the validity of the estimates provided by the stable population technique. This could be appropriately answered if we had the reliable data on vital statistics. But no reliable vital statistics are available at the national level with which these estimates could be corroborated.

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[1] The method used to choose the appropriate model life table has been explained in the UN Manual IV (1967).See :United Nations: 1967. Manual IV: Methods of Estimating Basic Demographic Measures from Incomplete Data, population studies NO. 42, New York.

[2] Age data were smoothed by employing the Hill Technique, Hill, K., Zlotnik, H. and Durch, J. 1982. “procedures for Reducing the Effects of Age Errors on Indirect Demographic Estimation Technique” Chapel Hill : The University of North Carolina at Chapel Hill ; U.S.A. Demographic Sample Survey

Table 11.1- Cumulative age distribution and corresponding model (west) life table

Age	1961		1971		1981	
x	C (x)	Level	C (x)	Level	C (x)	Level
5	.1469	9.8	.1545	9.42	.1615	13.29
10	.2812	7.68	.3026	6.28	.2952	13.65
15	.3874	8.54	.4068	8.14	.4059	14.81
20	.4842	8.88	.4959	9.3	.5044	15.24
25	.5729	8.84	.5827	9.5	.5949	14.78
30	.6551	8.38	.6613	9.34	.6782	13.55
35	.7280	7.84	.7340	10.68	.7494	12.49
40	.7883	7.6	.7966	9.94	.8084	11.8
45	.8419	7.12	.8489	8.48	.8571	11.24

Table 11.2- Stable population estimates of fertility and mortality based on smoothed age distribution of the female population of Nepal and the annual rate of growth of the population in the intercensal periods: 1952/54-61, 1961-71 and 1971-81

Year	Level of mortality	Sex	CBR	CDR	RNI	e^o_o
		Both sexes	.0420	.0270	.0150	
1961	7.96	Male	.0432	.0280	.0152	34.89
	8.38	Female	.0408	.0248	.0160	38.45
		Both sexes	.0413	.0214	.0199	
1971	11	Male	.0420	.0213	.0207	42.12
	9.34	Female	.0406	.0226	.0180	40.85
		Both sexes	.0397	.0135	.0262	
1981	16.36	Male	.0401	.0122	.0279	54.98
	13.48	Female	.0394	.0150	.0244	51.2

Note: In these estimates of birth and death rates, we have first found the appropriate Model (west) Life Table on the basis of female age distribution and intercensal growth rates. From this chosen Model life Table, the estimates of births are obtained for females. The male rates were derived from the female rates. The Model Life Table for male was estimated form the information on birth, death and intercensal growth rates of male population

In this situation, the stable population estimates may be acceptable as a confirmation of valid estimation provided these stable population parameters agree with the estimates derived from data of wholly different bases. Keeping in view the above criterion of confirmation of valid estimates, we have chosen the appropriate model (west) stable population from data of wholly different base, which utilizes an estimate of 1 (5) (i.e. probability of surviving to age 5) obtained from the proportion dead among children ever born to women 30-34, the proportion under age 15 for the two sexes combined, and an intercensal growth rate. This method, i.e. the selection of model stable population on the basis of the proportion of the population under age 15 [C (15)], the probability of surviving to age 5[1(5)], and the intercensal growth (r) provide the most robust way of utilizing the age distribution to estimate birth rates during the 15-years preceding the enumeration.[3]

Using these values [i.e.1 (5), C(15) and an intercensal growth rate (r)] We have identified the appropriate female west model[4] (Coale and demeny,1966)[5] stable population and estimated birth rates for 1961,1971 and 1981. These estimates along with the values of 1 (5), C (15) and r are presented in Table 11.3.

If we compare the birth rates estimated by stable population technique using age distribution (Table 11.2) with those stable population estimates derived on the basis of reported proportion of population under age 15 and childhood mortality (Table 11.3), we find the birth rates (adjusted) estimated by the latter closely correspond to those estimated by the former for the year 1961 and 1971. This finding shows that the stable population analysis has provided a good representation of fertility pattern in Nepal during the intercensal periods of 1952/54-61 and 1961-71. Therefore, these fertility measures stable population analysis may be accepted as robust estimates of birth rates for 1961 and 1971. However, the birth rate estimated for 1981 by the stable population analysis based on age distribution is incompatible with that provided by the stable population estimate based on reported proportion of population under age 15 and childhood mortality. The former method provides a crude birth rate of 39.7 per thousand population. It should be pointed out here that the birth rate estimated here by using female (west) model stable population remains almost unchanged even when we male stable population for both methods. The differential estimates of birth rates in 1981 by two methods has resulted mainly from the differential level of mortality implied in the selection of model stable population by two methods. The model stable population identified on the basis of the

3 Among the desirable properties of selecting a model stable population under the age 15 (both sexes) and the probability of surviving to age 5, 1(5) to estimate birth rate include the followings: (i) the method is fairly robust to the effects of typical age misreporting pattern. The population under age 15 for both sexes is often less affected by age misreporting than other points in cumulated age distribution; ii) the use of 1 (5) as an indicator of mortality in childhood also enhances the overall robustness of this method. This method of mortality is fairly reliable; and when mortality has been changing, it refers to a period located some six or seven years before the time of the interview, about the appropriate time refered for estimating the average birth rate during the 15 years preceding enumeration; iii) model stable population identified on the basis of values of C(15), 1(5) and r from the four families of Coale-Demeny models have nearly the same birth rate and total fertility. Such consistency does not extent to stable populations from the different models having the same C(15) and rate of increase; (iv) lastly this method provides an estimate of the birth rate that closely matches the average birth rate during the 15 years preceding enumeration, even when the population in question is far from stable (for details, including the procedures of calculation see United Nations,1983. *Manual X: Indirect Techniques for Demographic Estimation* Population studies, No.81, New York, pp. 168-172).

4 The female life tables for model west are assumed to be adequate representative of true mortality pattern of Nepal.

5 Coale, A.J. and Demeny, p. 1966. *Regional Model Life Tables and stable populations.* Princeton University Press.

Table 11.3- Stable population estimates of birth rates determined by the reported proportion under age 15 [C(15)], childhood mortality [1(5)] and intercensal growth rate r: 1952/54-61, 1961-71 and 1971-81

Year	Parameters					
	1(5)	C (15)*	r	Estimated birth rate	Estimated adjusted birth rate**	West (female) model life table (Coale & Demeny, 1966)
	a		d			
1961	.702	.4000	.0150	.04270	.04194	8.11
	b		e			
1971	.745	.4045	.0199	.04159	.04193	9.71
	c		f			
1981	.786	.4135	.0262	.04118	.04224	11.8

* As recorded in the censuses.

**Birth rate adjusted for the difference between stable population and observed population growth rate.

a. Reconstructed for 1961 from reported dates of birth and death in the Nepal Fertility Survery, 1976(see WFS scientific Report, “The quality of data in the Nepal Fertility Survey, 1976”, Report No. 6, Table 21).
b. Derived from fertility histories as recorded in 1976 Nepal Fertility Survey (see WFS scientific report No.6.*ibid,* Table 22).
c. FP/MCH project. “Nepal contraceptive prevalence survey, 1981”. P.60.
d. Intercensal growth rate 1952/54-61.
e. Intercensal growth rate 1961-71.
f. Intercensal growth rate 1971-81.

proportion of the population under age 15 and the probability of surviving to age 5,1(5) implied a higher level of mortality than that of the mortality level implied when the selection of the model stable population is based on age distribution. As a result the former method has yielded a higher birth rate than the latter. Now the question arises-of the two methods which one provides the most robust estimate of birth rate for the period 1971-81? Logically, this would be the method which provides the best representation of mortality pattern in Nepal during the above period.

In one method stable population was identified by taking 1 (5) in 1981 from the Contraceptive Prevalence Survey as .786, which implied a mortality level of 11.80 and yielded an adjusted rate of .04224 in 1981.

However, if childhood mortality in 1981 is assumed to be lower than that indicated in the Contraceptive Prevalence Survey and accept 1(5) as.837 estimated from the 1981 census data (Table 11.4), this would have implied a mortality level of 13.80 and the preliminary estimates of the stable birth rate and growth rates would have been .04135 and .02475 respectively. Adustment[6] would have yielded a birth rate estimate of .03929 in which the first three significant figures agree with those of the estimates obtained by stable population analysis using age distribution (Table 11.2).

[6] Adjustment is made to allow for the difference between stable population and observed population growth rate.

Table 11.4- Mortality estimates (Bass Technique) based on average number of children ever born and average number of children surviving reported in 1981 census

Age of women	Average number of children per woman: ever born $P_{(I)}$	Average number of children per woman: surviving $S_{(I)}$	$1-\frac{s_{(I)}}{p_{(I)}}$	Multipliers	Age X	Proportion dead by age X X_{q_o}	Proportion survived by Age X X_{10}	Corresponding value of $E_{(o)}$	Corresponding Infant Mortality Rate (IMR)
15-19	0.222	0.158	0.288	0.969	1	0.279	0.721	28.4	0.279
20-24	1.031	0.845	0.180	1.006	2	0.181	0.819	45.8	0.145
25-29	1.989	1.666	0.162	0.991	3	0.161	0.839	50.1	0.120
30-34	2.795	2.339	0.163	1.000	5	0.163	0.837	51.5	0.112
35-39	3.308	2.730	0.175	1.009	10	0.176	0.824	51.7	0.111
40-44	3.568	2.887	0.191	0.985	15	0.188	0.812	51.6	0.112
45-49	3.582	2.839	0.207	0.983	20	0.204	0.796	51.6	0.112

From these findings one may tend to conclude that the stable population analysis based on age distribution and growth rate provided the best representation of mortality pattern of Nepal during the intercensal period 1971-81 and therefore, the estimates of birth and death rates in 1981 derived by using this technique may be considered as the most robust estimate. This closeness of the findings, i.e. close matching of the estimate of birth rate derived by stable population analysis (based on age distribution and growth rate) with that of the estimate provided by stable population identified by proportion of population under age 15 and childhood mortality experience reported in the census of 1981, no doubt attests to the robustness of the estimate of birth rate in 1981 by the stable population analysis based on age distribution and growth rate. However, this robustness hinges on the acceptability of lower mortality in general and childhood mortality in particular as portrayed by the census data. Do we have any reason to believe that the picture of childhood mortality in 1981 represented by the census data is more acceptable than the picture provided by the 1981 Contraceptive Prevalence Survey data ? The answer by all likelihood is no. The number of children ever born particularly those born alive but died later is usually under reported in the census than in the survey. Moreover, if we compare the estimates of 1(5) from the 1981 census and the 1981 Contraceptive Prevalence Survey with that of the recent estimate of 1(5) based on a large data set collected bye the Demographic Sample Survey of 1986[7], we find the estimate of 1(5) from the Contraceptive Prevalence Survey more in line with the time trend than the estimate from the census data. The estimated 1(5) from the 1981 Contraceptive Prevalence Survey and the 1981 Population Census were .786 and .837 respectively. The corresponding preliminary estimate according to the Demographic Sample Survey of 1986 was .806. In view of this recent finding, the census estimate of 1(5) as .837 is

[7] The Demographic Sample Survey (DSS) is a longitudinal survey, launched by Central Bureau of Statistics in 1986. The DSS is based on multi-stage probability sample of nearly 9,000 households selected from all over the country. The survey yielded nearly 12,000 women in the reproductive ages (15-49). See Central Bureau of Statistics. Demographic Sample Survey 1986, Preliminary Report (mimeo).

considered too high and also unrealistic and therefore, accept 1(5) as .786 from the Contraceptive Prevalence Survey as more realistic estimate of childhood mortality in 1981.

We, therefore, find the estimate of birth rate in 1981 derived by stable population analysis based on age distribution as unrealistic and therefore this is rejected in favour of the estimate of birth rate derived by selecting stable population on the basis of childhood mortality reported in the Contraceptive Prevalence Survey, proportion of population under age 15 and intercensal growth rate. This estimate may be considered as most robust since it provided the best representation of mortality situation of Nepal during the intercensal period 1971-81. According to this method, the estimated birth rate (adjusted) in 1981 was 42.24 per thousand for both sexes.

The adjusted birth rate for 1981 estimated by selecting model life table based on 1(5) (probability of survival to age 5), C (15), (the proportion of population below 15) and r (intercensal growth rate) also closely corresponds with that of the estimate derived by "Reverse Survival Method". The estimate of birth rate by "Reverse Survival Method" was obtained by utilizing life tables consistent with 1(2), i.e. probability of survival to age two[8]. The birth rate estimated by "Reverse Survival Method " for the period 1971-81 was .04257 (see Table 11.5).

8. In order to reverse-project to birth the population in age groups 0-4 and 5-9, one only needs values of $5^{L}0$ and $5^{L}5$, the person-years lived by the stationary population constituting the life table between age 5 and exact age 10. These values are usually obtained by assuming that the mortality level associated with 1(2) remained constant during the 10-years preceding enumeration (see United Nations, 1983. Manual X: Indirect Techniques for Demographic Estimation, Department of International Economic and Social Affairs: Population Studies, No. 81, pp. 166-172).The estimate of 1(2) is obtained from the proportion dead among children born to women 20-24 from the 1981 census data. This value was estimated to be .891 (see Table 11.4)and the corresponding west model life tables for males and females were 12.53 and 11.34 respectively.

Table 11.5- Crude birth rate estimated by reverse survival method*

Year	Male	Female	Both sexes
1971-81	.04283	.04230	.04257
1971-76	.04600	.04560	.04580
1976-81	.04007	.03938	.03973

*Births occurred during the decade preceding the census of 1981 were estimated by applying child survival ratios using West Model Life Tables to the number of children recorded in the 1981 census. The life table used in this case is 12.53 for males and 11.34 for females. The Model Life Table were derived from information on proportion surviving among children even born. For details, see footnote No. 8 of this chapter.

Note: It may be noted that the estimates of births were higher during 1971-76 than those in the time-interval 1976-81. The differences between the rates in 1971-76 and 1976-81 can be explained mostly by over-enumeration in the 5-9 year age group and under enumeration in the 0-4 year age-group. Comparing the unadjusted age distribution with those of the adjusted age distribution suggests that the extent (%) of under-enumeration in the 0-4 year age group is almost the same as that of the extent (%) of over-enumeration in the 5-9 year age-group (see Appendix A). And this is cancelled out when the result are provided for the 10 years (1971-81) average.

The birth rate was also obtained by calculating the number of births that would occur to the population being considered if it were subject to the adjusted age scheduled fertility rates[9] and by dividing the total number of births by the total population, was found to be 42.43 per thousand population in 1981(see Table 11.6). The above estimate of birth rate and the one obtained by "Reverse Survival Method" virtually coincides with the estimated of adjusted birth rate of .04224 by stable population analysis which utilizes 1(5), (15) and r in the selection of model life table to estimate birth rate. These identical estimates illustrate the robustness of the method that uses childhood mortality [1 (5)], the proportion of population under age 15, C (15) and the intercensal growth rate (r) to estimate birth rate and also supports the suitability of the model as a good representation of mortality pattern in Nepal during the 15-year preceding 1981.

We may, therefore, accept the adjusted estimate of birth rate of 0.04224 as the best single estimate of fertility for the decade of 1971-81. And the corresponding implied death rate[10] was only .0160 per thousand population. The estimates of birth and the corresponding death rates by sex for the decade of 1971-81 are as follows:

Sex	CBRa	CDRb	RNI
Both Sexes	.04224	.0160	.0262
Male	.04240*	.0145	.0279
Female	.04200**	.0176	0.244

a. The estimate of birth rate is obtained by selecting a model stable population on the basis of the proportion of the population under age 15 (both sexes), the probability of surviving to age 5, 1(5) and the intercensal growth rate (r).
b. Death rate is obtained by subtracting the growth rate from the birth rate.

* Male birth rate is derived as follows: (Total birth rate) (proportion of all births that is male)/Fraction of the total population that is male.

** Female birth rate is derived as follows: (Total birth rate) (proportion of all births that is female)/Fraction of the total population that is female.

Table 11.6 – Estimated number of births from adjusted* age scheduled fertility rates and number of women in the reproductive ages (15-49), Nepal, Census year 1981

Age group	Number of women	Adjusted* age scheduled fertility rate	Estimated No. of births
15-19	632,655	.0855	54,092
20-24	698,769	.2254	157,502
25-29	591,478	.2542	150,354
30-34	507,131	.2321	117,705
35-39	431,399	.1924	83,001
40-44	376,068	.1329	49,979
45-49	289,366	.0859	24,856

*See footnote No.9

Note: The number of births estimated from adjusted age scheduled fertility rates using Brass Multipliers was 637,489.
The total population recorded in the 1981 census was 15,022,839. And the adjusted birth rates would be 42.43.
This rate would be 41.73, if Trussell Multipliers were used.

[9]. The adjusted age scheduled fertility rates were obtained from information on average number of births during the year preceding "the census day" and the children ever born to women in the reproductive ages (15-49) as given in the 1981cencus, employing the Brass Technique (see Brass, W. 1975. Methods for Estimating Fertility and Mortality from Limited and Defective Data. University of North Carolina, Chapel Hill, U.S.A.).

[10] Death rate is obtained by subtracting the growth rate from the birth rate.

2. Total Fertility Rate (TFR)

In the absence of reliable vital statistics, the age-specific and total fertility rates were estimated. These estimates were based on P/F Ratio Technique (Brass and Trussell Multipliers) using information collected by the census on average number of births during the year pereceding the "census day"[11] and children ever born to women in the reproductive ages (15-49). Table 11.7 presents data on adjusted age specific fertility rates and estimation of total fertility rates, for the year 1971 and 1981.

Data shows not only persistence of high fertility but also increasing fertility over the years. The total fertility rate is increased by at least one child over the years 1971-81. The total fertility rates varied between 5.22 and 5.46 in 1971. The corresponding rates ranged between 6.0 and 6.30 in 1981. This apparent increase may be attributed, among other factors, to improvement in the quality of data collection over the years. Examination of age schedule of fertility rates for both 1971 and 1981 consistently shows lower rates among younger women in the age group 15-19 which may be attributed to under enumeration of women in this age group in all the censuses of Nepal and also due to secondary sterility. However, the peak reproduction period begins as early as 20s and continues through mid 30s and there has been no change from this pattern during the last decade.

Table 11.7- The adjusted age-specific fertility rates and estimation of total fertility based on P/F ratio techniques (Brass and Trussell Multipliers), using information collected by the census on average number of births during the year preceding the census day and children ever born to women in the reproductive ages (15-49): for the census year 1971 and 1981

Age (smoothed)	Adjusted* age-specific fertility rates (Brass Multipliers) [a]		Adjusted* age-specific fertility rates (Trussell Multipliers) [b]	
	1971	1981	1971	1981
15-19	0.0876	0.0808	0.0860	0.0786
20-24	0.2349	0.2408	0.2307	0.2344
25-29	0.2643	0.2523	0.2596	0.2455
30-34	0.2205	0.2316	0.2166	0.2253
35-39	0.1623	0.1973	0.1594	0.1920
40-44	0.0885	0.1454	0.0869	0.1415
45-49	0.0338	0.1113	0.0332	0.1085
TFR	5.4593 (2.65)	6.2973 (3.05)	5.3616 (2.60)	6.1283 (2.97)
Mean age of child bearing ($\bar{m}$)**	28.84	27.98		

[11] The "Census Day" i.e. the last day of census was 22nd June 1981.

Table 11.7 continued............

Age (un-smoothed, i.e. recorded in the census)				
15-19	0.0877	0.0855	0.0861	0.0841
20-24	0.2285	0.2254	0.2243	0.2216
25-29	0.2489	0.2542	0.2443	0.2500
30-34	0.2137	0.2321	0.2097	0.2283
35-39	0.1604	0.1924	0.1574	0.1893
40-44	0.0860	0.1329	0.0844	0.1307
45-49	0.0395	0.0859	0.0388	0.0845
TFR	5.3240 (2.58	6.0423 (2.93)	5.2252 (2.53)	5.9420 (2.88)
Mean age of child bearing (m)**	28.65	28.29		

* Adjusted age –specific fertility is based on average of P(2)/ F (2) and P(3) /F (3); where , P(2) and P(3) refer to children even born per women in the age-groups 20-24 and 25-29 respectively; while F(2) and F(3) are estimated average cumulative fertility. The weighted average cumulative fertility. The weighted average of P(2)/F(2) and P(3) /F (3) was preferred given the inconsistency of P/F ratios.

** Obtained by using the formula:(2.25(p (3)/p(2))+23.95;where, P(2) is the average parity per women reported by women aged 20-24 and P(3) be the average partity of women aged 25-29.

Note: The figure in parenthesis refers to Gross Reprouction Rate.

a. Brass, William. 1975. *Methods for Estimating Fertility and Mortality from Limited and Defective Data*. Laboratories for population studies. University of North Carolina, Chapel Hill, U.S.A.

b. Truss ell, J. James. 1975, " A Re-examination of the Multiplying Factors for Determining Childhood Survival" 'Population Studies, Vol. 29, No.1, pp.97-107.

B. MORTALITY

1. Life Expectancy

The intercensal (1971-81) estimate of life expectancy at birth is derived by comparing 1971-81 cohort survival ratios with stable population. The essence of this method is to find a life table (from among the appropriate model tables, in this case the west model) that employed to project the 1971 population, produces a 1981 population most consistent with recorded one. The comparison of 1981 census ogives with the ogives of the projected population, permits bracketing and interpolating different levels of mortality. The median level among the first nine is considered as the best single estimate of the level of intercensal mortality.[12] The median level of mortality (west model) using smoothed female age distribution is found to be 10.72 and the resulting estimates of mortality such as life expectancies and infant mortality rates were as follows:

The estimated expectations of life at birth for the period 1971-81 were 44.29 years for females, 46.28 years for males and 45.31 years for both sexes. This sex differential in mortality in favour of the males is expected given higher socio-economic status of the males

12 . For details and computational purposes see United Nations.1967, *Manual IV: Methods of Estimating Basic Demographic Measures from Incomplete Data,* population Studies No.42, New York.

Table 11.8- The average intercensal (1971-81) estimates of life expectancy at birth and infant mortality rates based on Census Survival Method

Year	Life expectancy at birth (years)			Infant mortality rate		
	Male[1]	Female	Total*	Male[1]	Female	Total*
1971-81	46.28	44.29	45.31	144.5	150.38	147.35

1. The estimated west life table for male population was 12.68 (sec footnote 12 for computational details).
*Life expectancy for both sexes assumes sex ratio at birth of 1.06

than females in Nepalese society and is in accord with the sex differential pattern of mortality observed in the Demographic Sample Survey of 1974-76 (CBS, 1978)[13]. It is also consistent with the findings obtained in other neighbouring countries particularly Bangladesh, Pakistan and rural India.

The life expectancy at birth for both sexes estimated for the intercensal period 1971-81 by employing census survival method almost corresponds to the one which is estimated from the information on proportion dead among children ever born to women in the age group 20-24 (see Table 11.10). However, the life expectancy corresponding to the estimated infant mortality rate (IMR) is slightly higher than that of the one estimated by census survival method. This is what one would also expect to find due to differential time reference of the two estimates. The former estimate refers to 1978 while the latter refers to the average intercensal 1971-81 period centering around 1976. Given this close agreement between estimates of life expectancies at birth from wholly independent bases, we may consider the level of life expectancies at birth derived from the 1971 and 1981 census using census survival method very reasonable.

Using the trend in life expectancy at birth estimated for the intercensal period 1961-71 and 1971-81 by census survival method, we have also provided an estimate of life expectancy at birth for the year 1981 and the results are presented in Table 11.9.

13. Central Bureau of Statistics. 1978. The Demographic Sample Survey of Nepal. Third Year Survey, 1977-78, Kathmandu.

Sex	Average intercensal life expectancies by census survival method		Estimates of life expectancy for 1981
	1961-71 (1966)	1971-81 (1976)	
Total	36.87	45.31	49.53a
Male	37.08	46.28	50.88*
Female	36.66	44.29	48.10*

a. Life expectancy for both sexes assumes a sex ratio at birth of 1.06.
* These estimates were made on the basis of trend observed between 1966 and 1976. The intercensal estimates of 1961-1971 and 1971-81 were centering between the years of 1966 and 1976.

The life expectancy at birth of 49.53 years in 1981 obtained by using the trend observed between 1966 and 1976 looks very reasonable and also in accord with time trend[14] when it is compared with a preliminary estimate of life expectancy of 52.7 years for 1983 based on data proportion children dead among children ever born to women in the age group 20-24 collected by the Demographic Sample Survey of 1986.[15]

2. Infant Mortality

The availability of census data on children ever born and children surviving made it possible to use the Brass (1975) mortality technique[16] as well as the modifications developed by Trussell (1975)[17] to estimate infant and childhood mortality rates. These estimates along with the corresponding life expectancies at birth using 1981 census data [18] are provided in Table 11.10.

The infant mortality rates for 1978 estimated by Brass and Trussell Techniques were almost identical. These rates were 145 and 146 per thousand live birth by Brass and Trussell techniques respectively. The application of census survival method to smoothed female age distribution of 1971 and 1981 also yielded an intercensal estimate of infant mortality rates of 144.5,150.4 and 147.4 for males, females and for both sexes (see Table 11.8).This closeness of the estimate of infant mortality rate based on proportion surviving among children ever born with that of the estimate derived from data of wholly different base by

14 . If the estimated life expectancy at birth in 1981 is projected to 1983 on the basis of the trend observed between 1966 and 1976, the resulting life expectancy would be 51.2 which is not significantly different from 52.7 estimated for 1983 using data on proportion children dead among children ever born to women in the age group 20-24.

15. Central Bureau of Statistics. *Demographic Sample Survey* 1986, Preliminary Report (mimeo).

16 . Brass, William. 1975.*Methods for Estimating Fertility and Mortality from Limited and Defective Data*. Laboratories for Population Studies. University of North Carolina, Chapel Hill, U.S.A.

17. Trussell, T James, 1975."A Re-examination of the Multiplying Factors for Determining childhood

18 . The infant mortality rates estimated from the census data of 1971 were 98.57 and 93.39 for male and female. These estimates are excluded from the purview of the comparative analysis.

Table 11.10- Estimate of infant motality for Nepal based on proportion dead among children ever born to ever married women reported in the 1981 census, by employing Brass and Trussell method

Age group	Age X	Estimates of proportion dead by age x		Corresponding infant mortality rate (IMR)*		Corresponding e^o_o		Corresponding reference year
		Brass	Trussell	Brass	Trussell	Brass	Trussell	
15-19	1	.279	.280	.279	.280	28.4	28.3	
20-24	2	.181	.183	.145*	.146*	45.8	45.6	1978
25-29	3	.161	.159	.120	.118	50.1	50.4	
30-34	5	.163	.161	.112	.111	51.5	51.8	
35-39	10	.176	.174	.111	.110	51.7	51.9	
40-44	15	.188	.188	.112	.112	51.6	51.6	
45-49	20	.204	.203	.112	.111	51.6	51.7	

*Estimate of infant mortality rate (1q0) is obtained by accepting $_2q_0$ as per UN recommendations to exclude child survival data reported by women aged 15 to 19 (United Nations. 1967. Manual IV: Methods of Estimating Basic Demographic Measures from Incomplete Data, New York)

Cohort survival method, provide further confirmation of valid estimation of infant mortality by the former method.

Comparing the estimates of infant mortality derived by using data on proportion surviving among children ever born, collected by the 1981 census and those by the National Fertility Survey of 1976, we find a substantial decline in infant mortality rate from 171[19] in 1974 to 144 in 1978[20]. This decline in infant mortality is consistent with the overall improvement in health conditions and health services of the country over the years.

From the preceding findings, it is clearly evident that there has been a substantial decline in mortality without a corresponding decline in fertility which remains consistently high. And this has resulted in the unprecedented rate of population growth particularly during the intercensal period 1971-81.

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19. Gubhaju, B.B. 1984. "Demographic and Social Correlates of Infant and Child Mortality in Nepal", Ph.D. Thesis. Submitted to the Department of Demography, Australian National University.

20. The reference period of the estimates of infant mortality using survey and census data were 1974 and 1978 respectively.

Estimates of Fertility: Regional Level

Tables 11.11 and 11.12 provide adjusted age-specific fertility rates, total fertility and birth rates for ecological zones and development regions respectively.

Table 11.11 shows that among the ecolo-

Table 11.11- The adjusted age-specific fertility rates and estimation of total fertility based on P/F ratio technique (Brass and Trussell Multipliers), using information collected by the census on average number of births during the year preceding the census day and children ever born to women in the reproductive ages (15-49) for ecological zones, 1981

Age group	Adjusted* age scheduled fertility (Brass method)			Adjusted* age-scheduled fertility (Trussell method)		
	Mountain	Hill	Terai	Mountain	Hill	Terai
15-19	0.0553	.0703	.1108	.0544	.0689	.1092
20-24	0.1931	.2193	.2348	.1898	.2150	.2315
25-29	0.2468	.2585	.2476	.2426	.2535	.2441
30-34	0.2395	.2452	.2141	.2355	.2405	.2111
35-39	0.2037	.2057	.1725	.2002	.2018	.1701
40-44	0.1462	.1410	.1181	.1437	.1383	.1165
45-49	0.0921	.0901	.0780	.0906	.0884	.0769
Total fertility Rate (TFR)	5.8838	6.1509	5.8795	5.7836	6.0323	5.7974
Adjusted** birth rate	40.39	42.78	41.97	39.71	41.96	41.38
Mean age of child bearing ($\overline{m}$)	28.78	28.51	28.03			

* Same as in Table 11.6

** Standardized by using the age distribution of national population.

gical zones, the Hill has the highest fertility, measured in terms of Total Fertility Rate (TFR) as well as adjusted birth rate. The Total Fertility Rates for the Mountain and Terai are the same[21]. However, the adjusted birth rates at the younger ages (15-19 and 20-24 years age-group) in the Terai are higher than those of the rates at the corresponding ages in the Mountain. This higher birth rates at the younger ages coupled with disproportionately higher number of women at these ages (15-19 and 20-24) within the reproductive period, produced higher fertility rate for the Terai. The finding of lower fertility rate at the younger ages in the Mountain compared to those in the Terai, may be attributed among

Table 11.12- The adjusted age-specific fertility rates and estimation of total fertility based on P/F ratio technique (Brass and Trussell Multipliers), using information collected by the census on average number of births during the year preceding the census day and children ever born to women in the reproductive ages (15-49) for development regions, 1981

Age group	Adjusted* age-scheduled fertility									
	Brass					Trussell				
	EDR	CDR	WDR	MWDR	FWDR	EDR	CDR	WDR	MWDR	FWDR
15-19	.0834	.0911	.0793	.0880	.0847	.0818	.0897	.0782	.0867	.0839
20-24	.2496	.2188	.2121	.2262	.1991	.2449	.2155	.2091	.2230	.1970
25-29	.2939	.2397	.2505	.2587	.2304	.2883	.2360	.2470	.2550	.2280
30-34	.2575	.2138	.2299	.2482	.2211	.2526	.2186	.2267	.2447	.2188
35-39	.2098	.1760	.1909	.2160	.1860	.2052	.1733	.1883	.2130	.1840
40-44	.1389	.1239	.1281	.1566	.1350	.1363	.1220	.1263	.1544	.1336
45-49	.0824	.0826	.0851	.1030	.0903	.0808	.0814	.0839	.1015	.0894
Total fertility Rate (TFR)	6.5767	5.7299	5.8795	6.4841	5.7336	6.4527	5.642	5.7977	6.3912	5.6733
Adjusted** birth rate	46.47	40.41	41.16	44.89	39.82	45.55	40.07	40.58	44.26	39.41
Mean age of child bearing ($\overline{m}$)	28.25	28.29	28.14	27.97						

Note: EDR = Eastern Development Region; CDR = Central Development Region

WDR = Western Development Region; MWDR = Mid-western Development Region

FWDR = Far-western Development Region

*Same as in Table 11.6

**Same as in Table 11.11

other factors, to the out flux of people at the younger ages from the former (Mountain) to the latter (Terai).

Among the development regions, fertility

[21] . The differences in Total Fertility Rates among the regions are, however, very negligible and found not to be statistically significant, as determined by one-way analysis of variance.

was found to be highest in the Eastern Development region, followed by the Mid-western Development region, the western Development region, the Far-western Development region and the Central Development region (Table 11.12). The fertility of the latter two regions are almost the same. These findings remain almost unchanged irrespective of our measures of fertility (Total Fertility Rate and Adjusted Birth Rate) and methods of estimation (Brass and Trussell Multipliers).

The total Fertility Rates and Adjusted Birth rates of the Eastern development region and the Mid-western development regions and higher than those of the corresponding rates at the national level; while these rates for the other remaining regions are lower than those of the national levels (see Table 11.12).

Estimates of Infant Mortality: Regional Level

Table 11.13 provides estimation of infant mortality for the ecological zones and development regions of the country. Among the ecological zones, infant mortality is highest in the Mountain, followed by the Hill and Terai. These rates per 1000 live births are 187, 164 and 124 for the Mountain, Hill and Terai respectively in 1978. This differential infant mortality rates by differential access to medical and health services can be easily provided to the people of Terai because of better road communications, while these services are not

Table 11.13-Estimate of infant mortality* and corresponding life expectancy for different ecological and development regions, Nepal based on proportion dead among children ever born to ever-married women, by employing Trussell Method

Ecological zones and Development regions	Infant Mortality Rate* (IMR)	Corresponding e^o_o	Corresponding Reference period	Estimated e^o_o** 1981
a) Ecological Zone				
Mountain	187	39.3	1978	42.1
Hill	164	42.7	1978	46.0
Terai	124	49.2	1978	52.8
b) Development region				
Eastern	130	48.3	1978	51.1
Central	138	46.9	1978	50.0
Western	148	45.2	1978	48.1
Mid-western	177	40.8	1978	43.7
Far-werstern	169	42.0	1978	45.2

* Estimate of IMR ($_1q_0$) is obtained by accepting $_2q_0$.

** To arrive at the estimate of 1981 we have used the same trend in expectation of life at birth as that was observed between 1966 and 1976 for the country as a whole. These were 0.92 and 0.76 per year for male and female respectively. However, the national estimate of life expectancy at birth derived from the weighted average of the regional estimates, falls short of the estimate of life expectancy at birth obtained from age data of the national population. This calls for adjusting the regional estimate. The regional figures were adjusted by taking the difference of weighted average obtained from the regional estimate and the estimate obtained by using national age distribution of population and distributing the difference to the initial estimate of each region/zone proportionately to its population size. (For details see Central Bureau of Statistics, 1986, *population Projection of Nepal, Total and sectoral*:Kathmandu.

only scarce in the Mountain, but it is also difficult to reach people due to poor communications. Communication is also a problem in the Hill but this is not as formidable as in the Mountain. These findings confirm that the higher the availability of health and medical services, the lower the mortality including the infant mortality.

Among the development regions, the infant mortality is found to be highest in the Mid-western Development region, followed by the Far-western, Western, Central and Eastern Development regions.

Direct Measures of Fertility

We have so far discussed indirect measures of fertility. Here we discuss two direct measures of fertility-i) child woman ratio (CWR) and ii) mean number of children ever born.

i) Child Women Ratio (CWR)

Child woman ratio (CWR), i.e. the ratio of children 0-4 years to women in the reproductive age group (15-49), expressed in terms of 1000 provides a measure of the fertility level that can be obtained from a single census. This measure is not very reliable due to under-enumeration of children in the age group 0-4. And if the extent of under-enumeration of children varies from one census to another, this ratio is not a useful measure in examining the trend in fertility because the changes in this ratio could be due to changes in the coverage of children rather than reflecting real changes in fertility. However, if the degree of under-enumeration of children is the same in each successive census, the child woman ratio can be employed in measures of fertility trend. The use of child-woman ratio as a measure of fertility is more deficient particularly when one studies differential fertility. This ratio may be affected by and under-enumeration of young children from one area to another. The child-woman ratio, therefore, may vary from one region to another merely on the basis of differential completeness of the enumeration. Child woman ratio may vary also from one region to the another due to differential infant and childhood mortality. These deficiencies have to be borne in mind while interpreting fertility differentials among regions by using child woman ratio.

Table 11.14 provides child woman ratio for the country as a whole and three ecological zones for 1971 and 1981. Data shows an impressive increase in the child-woman ratio over the last 10 years period 1971-81. During this period, child-woman ratio increased by 12 per cent from 587 children per thousand women in 1971 to 656 children per thousand women in 1981. this increase in child-woman ratio during the last intercensal period was marked not only for the country as a whole but also in every geographical zone (Table 11.14), and development region (Table 11.15), administrative zone (Table 11.16) and district (Table 11.17).

This increase in the child-woman ratio could result from combination of the following factors: i) increase in fertility; ii) improvement in the completeness of the enumeration of children, and (iii) higher proportion and number of children surviving due to reduction in the infant and childhood mortality over the years. Considering the increase in CWR as an indicator of rising fertility is unacceptable because no other measures of fertility showed such an increasing trend. However, the differential coverage of children in the censuses of 1971 and 1981 may very well explain this intercensal rise in the child-woman ratio. All indirect tests suggest better coverage of children in the 1981 census than in the 1971 census. For example, the age data from all the census excepting the 1981 census showed an excess of persons in the age group 5-9 than in the preceding age group 0-4. This is unlikely unless there is evidence of drastic reduction in fertility and/or increase in childhood mortality. But there is no such evidence of declining fertility and/or increasing childhood mortality in Nepal. The finding of higher number of persons in the age-group 5-9 over those in the age group 0-4 in the census held prior to 1981 was merely due to shifting of persons from lower ages to exact age 5 and also due to under-enumeration of children particularly those of the newly born. However, for the first time in 1981 census, the number of persons enumerated in the age-group 0-4 exceeded those in the age group 5-9. This finding is in conformity with one's expectations. This could also imply an improvement in the coverage of census over the years.

Similarly, male children were under-enumerated in all the censuses undertaken prior to 1981 as indicated by low (i.e. less than 100) sex ratio in 0-4 years age group. The sex ratio in the age group 0-4 has been consistently less than 100 in all three censuses conducted since 1952/54. This is contrary to one's expectation. The sex ratio in the child age group 0-4 can be less than one, only in situations where there are more female than male births and/or higher male than female infant/child mortality. There is no evidence to show that at birth there are more females than males. On the contrary, evidence obtained from countries having a complete vital registration system suggests higher male than female births. And this would produce a sex ratio at birth higher than 100. There is also no clear evidence to show higher male than female infant and child mortality. The evidence from neighbouring countries particularly from Bangladesh, India and Pakistan, clearly show higher infant and child mortality for female than male children. And there is no reason to believe that Nepal should be an exception to this general pattern of infant/ child mortality by sex obtained in other neighbouring countries. Therefore, the finding of excess female over male children in the age group 0-4 by the censuses of 1952/54, 1961 and 1971, was mostly due to gross under-enumeration of male children in these censuses. However, an improvement is marked in the 1981 census which gives us a sex ratio of 106 in the child age group 0-4. All these indicators imply an improvement in the coverage of the 1981 census particularly of the children in the age group 0-4. And this has possibly led to the increase in child-woman ratio in 1981 over that of 1971. Part of this increase in child woman ratio was also due to the increasing proportion and number of children surviving in the age group 0-4 due to the sharp reduction of infant/child mortality during the last 10 years (1971-81) period.

Given the better coverage of children in the 1981 census, we discuss here only the child-woman ratio for the 1981 instead of discussing the trend over the last intercensal period.

Child-woman Ratio by Geographical Areas:

The child-woman ratio is found to be the highest in the Terai and lowest in the Mountain (see Table 11.14). The hill occupies the intermediate position. The regional differences in child-woman ratio may partly arise from differential chances of survival of children in these areas. The chances of survival of children as indicated by infant mortality rate is lowest in the Mountain, followed by the Hill and Terai. The highest child woman ratio in the Terai could also arise from higher net migration into this area.

Table 11.14-Child woman ratio by ecological zone, Nepal, Census years 1971-81

Ecological zones	Child woman ratio*	
	1971	1981
Mountain	541	617
Hill	575	643
Terai	616	680
Nepal	587	656

$$* \frac{Children aged 0-4}{No. of women aged 15-49} x1000$$

Source: Central Bureau of Statistics, 1974- Population Census 1971, Vol. I. Table 6;

Central Bureau of Statistics, 1984- population census 1981, Vol, II, Table 5.

Child-woman Ratio by Development Regions

Table 11.15 show highest child-woman ratio in the Far-western Development region followed by Mid-western, Western, Central and Eastern Development regions. This regional differences in child-woman ratios could also be explained by differential chances of survival of children. The chances of survival of children as indicated by infant mortality rate are highest in the Eastern Development region, followed by the Central, Western, Mid-western and Far-western Development regions.

These regional differences in child woman ratio can also be explained in terms of differential chances of survival of children as indicated by infant mortality rates. Infant mortality rate is highest in the Mid-western Development region, followed by Far-western, Western, Central and Eastern development regions. If we correlate the level of infant mortality of a region with that of its child woman ratio, we will find a positive correlation between the two, i.e. the higher the infant mortality of a region, the higher the child woman ratio (CWR). This finding indirectly supports the often posited hypothesized positive relation between infant mortality and fertility. However, the relationship between infant mortality and fertility is too complex to be tested by the present cenus data (Chaudhury, 1982)[22]

Development region	Child woman ratio*	
	1971	1981
Eastern Development region	610	621
Central Development region	587	635
Western Development region	554	661
Mid-western Development region	619	720
Far-western Development region	558	725
Nepal	587	656

*Same as * in Table 11.14

Source: Same as are those in Table 11.14

Child-woman Ratio by Administrative Zones

Table 11.16 provides child-woman ratio for each of the 14 administrative zones of the country. The child-woman ratio is found to be highest in the Bheri zone, followed by Mahakali zone, and lowest in Sagarmatha zone. The Bheri and Mahakali zones are located in the Mid-western and Far-western Development regions of the country while Sagarmatha is located in the Eastern Development region. Given the location of Bheri and Mahakali zones in the Mid-western and Far-western Development regions-the areas having the highest and second highest infant mortality rates (see Table 11.16) and Sagarmatha being located in the Eastern Development region the area having the lowest infant mortality,

[22] Chaudhary, R. H. 1982. *Social Aspects of Fertility with Special Reference to Developing Countries*, New Delhi: Vikas Publishing House Pvt. Ltd.

Table 11.16- Child woman ratio by zones, Nepal, Census years 1971-81

Zone	Child woman ratio*	
	1971	1981
Mechi	648	639
Koshi	639	627
Sagarmatha	575	603
Janakpur	589	623
Bagmati	570	611
Narayani	606	682
gandaki	543	652
Dhawalagiri	534	641
Lumbini	569	673
Rapti	627	704
Bheri	629	763
Karnai	555	642
Seti	557	708
Mahakali	574	752

*Same * in Table 11.14

further attests to the positive relationship between infant mortality of an area and the child-woman ratio.

Child-woman Ratio by Districts

The child-woman ratios were also calculated for the 75 districts of Nepal and these are presented in Table 11.17.

The first five districts having the child woman ratio above the national level are in the following descending order: Kanchanpur (908), Bardiya (895), Kailali (840), Salyan (783) and Surkhet (780). The last five districts having child-woman ratio below the national level are in the following ascending order: Mustang (443), Humla (478), Dolpa (488), Lamjung (499) and Dolakha (499).

An attempt was also made to explain the district level variation in the child-woman ratio by socio-economic factors in a regression

Table 11.17- Child woman ratio by districts, Nepal, Census years 1971-81

Districts	Child woman ratio		Districts	Child woman ratio	
	1971	1981		1971	1981
Taplejung	570	598	Syangja	574	694
Panchthar	570	613	Kaski	519	651
Illam	595	619	Manang	438	574
Jhapa	757	667	Mustang	443	443
Morang	699	657	Myagdi	537	633
Sunsari	677	645	Parbat	558	565
Dhankutta	567	615	Baglung	548	704
Terhrathum	577	577	Gulmi	557	570
Sankhuwasabha	550	544	Palpa	598	745
Bjojpur	578	602	Nawalparasi	630	690
Solukhumbu	537	538	Rupandehi	545	627
Okhaldhunga	561	649	Kapilbastu	510	757
Khotang	585	539	Arghakhanchi	615	673
Udayapur	643	668	Pyuthan	564	765
Saptari	565	607	Rolpa	593	627
Siraha	570	608	Rukum	612	620
Dhanusha	601	603	Salyan	625	783
Mahottari	586	708	Dang-Deokhuri	730	719
Salahi	609	650	Banke	567	720
Sindhuli	651	642	Bardiya	743	895
Ramechhap	569	529	Surkhet	705	780

Table 11.17 continued.....

Dolakha	520	499	Dailekh	566	711
Sindhupalchok	562	652	Jajarkot	621	667
Kavrepalanchok	575	587	Dolpa	528	488
Lalitpur	596	621	Jumla	570	574
Bhaktapur	647	637	Kalikot	675	731
Kathmandu	543	618	Mugu	554	746
Nuwakot	562	561	Humla	452	478
Rasuwa	508	555	Bajura	576	708
Dhading	567	615	Bajhang	477	676
Makwanpur	701	747	Achham	507	615
Rautahat	535	639	Doti	526	657
Bara	566	654	Kailali	727	840
Parsa	592	725	Kanchanpur	655	908
Chitwan	733	659	Dadeldhura	513	664
Gorkha	561	652	Baitadi	539	659
Lamjung	432	499	Darchula	576	769
Tanahu	588	720			

Source: Central Bureau of Statistics, 1975-Population Census 1971, Vol. I
Central Bureau of Statistics, 1984-Population Census 1981, Vol. I.

regression model. The socio-economic variables included in the model are as follows: (i) female singulate mean age at marriage; (ii) per cent male (aged 5 years and above) literate; (iii) per cent female (aged 5 years and above) literate; (iv) female labour force participation rate, and (v) per cent urban.

These district level variables were regressed on child-woman ratio of a district. The child-woman ratio is defined here as number of children in the 0-4 years age group to women in the 15-49 years age group, expressed in a 1000. The results are presented in Table 11.18.

Table 11.18- Regression of socio-economic factors on child woman ratio (CWR) of a district (OLS) N=75

Independent variables	Dependent Variable: Child woman ratio		
	Regression cofficient	t-value	Significance level
1. Female singulate mean age at marriage	-2.8601	-5.7000	0.0010
2. Per cent literate (male)	-0.0635	-0.3740	0.7093
3. Per cent literate (female)	0.0524	0.1410	0.8886
4. Female labour force participation rate	0.1244	2.2100	0.0303
5. Per cent urban	0.2006	1.5590	0.1236
R^2=4063	F=9.44	significant at .01 level	

The child-woman ratio of a district decreases as the female mean age at marriage increases, and this relationship is also found to be statistically significant. It indicates that increasing female age at marriage will have a depressing effect on fertility. The relationship between female labour force participation and fertility is found to be positive and significant. This finding is somewhat unexpected. The female labour force participation and fertility hypothesis usually postulates a negative relationship between the two, on the assumption that the working mother will find it incompatible to discharge the roles of mother and worker outside the home and therefore will have fewer children. However, the role-incompatibility of a working mother in traditional peasant societies like Nepal is not very high as working mothers in these societies receive a lot of support in raising children from the surrogate relations and other kin members. Therefore, the finding of a positive relationship between female labour force participation and fertility, i.e. child-woman ratio is not inexplicable. Moreover, the finding of a positive relationship between female labour force participation and child woman ratio may also result from the fact that the economic pressure resulting from higher fertility among other factors may have forced some women with high fertility to participate in the labour force to augment family income. And this has resulted in the finding of a positive relationship between labour force participation and fertility.

Number of Children Ever Born

The fertility level and trend can also be estimated from data on number of children ever born alive by age of women. However, the figures on total number of children ever born are usually understated, because of recall lapse. And this is also likely to vary with age and other factors such as education. The various censuses and surveys have collected data on number of children ever born and classified these by age of women (see Table 11.15). Examination of completed family size (i.e. number of children ever born to a woman in the age group 45-49) derived from the censuses of 1961, 1971 and 1981 not only indicates low level of fertility but also definite trend of decline in fertility. However, these findings cannot be taken for granted because the number of children ever born reported in the censuses is grossly under reported. For example, the completed fertility (i.e. number of children ever born to a woman in the age group 45-49) implied by the 1981 census was only 3.7 live births per woman. This low level of completed fertility is not only inexplicable[23] but also inconsistent with the similar data collected by the surveys in recent years. The completed fertility of a woman aged 45 year and over obtained from the 1984 Mortality and Migration Survey of New Era was 5.5 live births[24]. These figures according to 1986 Demographic Sample Survey were 5.5 and 4.8 live births in rural and urban areas.[25] Comparing the completed fertility of women aged 45 and over represented in the census with those in the surveys, the former undoubtedly looks highly under reported (see Table 12.5).

The census data also indicates under reporting of children increases with the age of mother. For example, in 1961 women in the age group 35-39 reported only 3.97 live births. Similarly women aged 35-39 reported lower parity in 1981 than in 1971 indicating under reporting of children ever born increases with the age of the mother, resulting from recall lapse. Comparison of data on number of children ever born collected by the surveys with those of census figures also indicate that under reporting is not only confined to higher ages but also to younger ages (see Table 11.15). In view

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[23] This low level of fertility is not consistent with the prevailing low age at marriage and low level of contraception use. The singulate mean age at marriage for female was estimated at 17.2 years in 1981. Only 15 per cent of currently married women were reported to be practicing contraception in 1986 (Ministry of Health. FP/MCH. 1986. Preliminary Reoprt. *Finding from Nepal Fertility and Family Planning Survey.*

[24] New Era. 1986. *Fertility and Mortality Rates in Nepal*. Kathmandu

[25] Central Bureau of Statistics. Demographic Sample Survey 1986, Preliminary Report (mimeo).

of these limitations the use of mean parity particularly those derived from the censuses in determining the level and trend in fertility is questionable.

Regional Variations in Mean Parity

Given no evidence of variation in the under reporting of children by place of residence we have examined the zonal/regional variations in number of children ever born for 1981. Table 11.19 and Table 11.20 provides data on mean number of children ever born by age of ever married women for different ecological zones and development regions of the country. The completed fertility of women aged 45 and over is highest in the Eastern Development region followed by Mid-western, Central, Western and Far-western Development regions. Fertility measured by total fertility rate is also found to be highest in the Eastern Development region followed by Mid-western Development region.

Table 11.19- Mean live births per ever-married woman by age-group for ecological zones, Nepal, census year 1981

Age group	Mean live births per ever-married woman			
	Nepal	Mountain	Hill	Terai
10-14	0.19	0.19	0.23	0.16
15-19	0.44	0.34	0.4	0.48
20-24	1.19	0.96	1.13	0.28
25-29	2.11	1.81	2.03	0.23
30-34	2.88	2.66	2.84	2.98
35-39	3.4	3.29	3.38	0.344
40-44	3.66	3.67	3.7	3.62
45-49	3.71	3.87	3.75	3.44
50+	3.25	3.26	3.41	2.96
Total	2.49	2.56	2.56	2.4

Source: Central Bureau of Statistics, 1984- Population Census 1981, Vol. II, Table 16.

Table 11.20-Mean live births per ever-married woman by age-groups for development regions, Nepal, Census year 1981

Age Group	Mean live births per ever-married woman				
	Eastern dev. Region	Central devt. Region	Western devt. Region	Mid-western devt. Region	Far-west. Devt. Region
10-14	0.22	0.17	0.18	0.19	0.2
15-19	0.5	0.43	0.4	0.42	0.42
20-24	1.27	1.17	1.13	1.21	1.1
25-29	2.3	2.08	1.99	2.1	1.89
30-34	3.26	2.83	2.71	2.87	2.53
35-39	3.9	3.33	3.19	3.4	2.86
40-44	4.28	3.55	3.46	3.63	3.06
45-49	4.34	3.59	3.47	3.64	3.02
50+	3.87	3.11	3.1	3.23	2.62
Total	2.86	2.42	2.39	2.46	2.11

Source: Central Bureau of Statistics, 1984-Population Census 1981, Vol. I, Table 17